2014 DRAFT WATER QUALITY MANAGEMENT PLAN UPDATE

North Central Texas Council of Governments

July 1, 2014

Prepared by the Environment and Development Department with funding from the Texas Commission on Environmental Quality

North Central Texas Council of Governments

The North Central Texas Council of Governments (NCTCOG) was established in 1966 to assist local governments in planning for common needs, cooperating for mutual benefit, and coordinating for sound regional development.

North Central Texas is a 16-county metropolitan region surrounding the two urban centers of Dallas and Fort Worth. Currently, the NCTCOG has 242 members, including 16 counties, 170 cities, 24 school districts, and 32 special districts. The area of the region is approximately 12,800 square miles, which is larger than nine states, and the population of the region is approximately 6.5 million.

The NCTCOG's structure is relatively simple—each member government appoints a voting representative from the governing body. These voting representatives make up the General Assembly which annually elects an Executive Board. The Executive Board is the policy and fiduciary approval body for all the NCTCOG activities and is supported by technical study and policy development committees as well as a professional staff headed by the Executive Director.

North Central Texas Council of Governments Executive Board 2013-2014

Steve Terrell
President
Mayor
City of Allen

Kathryn Wilemon
Vice President
Mayor Pro Tem
City of Arlington

John Horn
Secretary-Treasurer
County Judge
Hunt County

Bobbie Mitchell
Past President
Commissioner
Denton County

Clay Jenkins
Director
County Judge
Dallas County

B. Glen Whitley
Director
County Judge
Tarrant County

Vonciel Jones Hill
Director
Councilmember
City of Dallas

Daniel Scarth
Director
Councilmember
City of Ft. Worth

Lissa Smith
Director
Mayor Pro Tem
City of Plano

Marcus Knight
Director
Mayor
City of Lancaster

A. J. Mathieu
Director
Councilmember

City of Joshua
Keith Self
Director
County Judge
Collin County

Dr. Larry Marshall
Director
Councilmember
City of Benbrook

Toni Rose
Ex Officio Member
State Representative

Mike Eastland
Executive Director

Water Resources Council 2013-2014

The Water Resources Council, established in 1979, advises NCTCOG's Executive Board on both technical and policy issues related to water resources matters. This committee reviews day to day technical issues, oversees the water resources planning process, and performs technical reviews of water related grant applications.

The Environment and Development Department serves as staff to both the NCTCOG Executive Board and the Water Resources Council. Staff supports a myriad of activities providing technical support, policy guidance, program coordination and development, and project implementation.

Ron McCuller, Chair
Director of Public Works
City of Grand Prairie

Wayne Owen, Vice Chair
Planning Director
Tarrant Regional Water District

Fiona Allen
Northern Regional Manager
Trinity River Authority

John Baker
Managing Director Water and Wastewater
City of Garland

Glenn Clingenpeel
Senior Manager, Planning and Environmental Management Division
Trinity River Authority

S. Frank Crumb
Water Director
City of Fort Worth

Mike Curtis
Managing Director, Development Services
City of North Richland Hills

David Fain
Director of Public Works
City of Haltom City

Elizabeth Fernandez
Trinity Watershed Management Director
City of Dallas

Tim Fisher
Assistant Director Water Utilities
City of Denton

Robert McCarthy
Planning Program Manager
North Texas Municipal Water District

Larry McDaniel
General Manager
Dallas County Park Cities MUD

Kevin Mercer
General Manager
Denton County Fresh Water Supply District 6 & 7

Michael Nieswiadomy
University of North Texas

Larry Patterson
Manager of Engineering
Upper Trinity Regional Water District

Zachary Peoples
Assistant Director Wastewater Operations
City of Dallas

Walter Pishkur
Water Utilities Director
City of Arlington

Greg Porter
Deputy City Manager
City of Cedar Hill

Jody Puckett
Water Utilities Director
City of Dallas

Todd Reck
Water Utilities Director
City of Irving

Craig Schkade
Senior Development Manager
Hillwood Properties

Robert Scott
Texas Coalition for Environmental Awareness

Steve Sievers
Manager
Bethesda Water Supply Corporation

Richard Talley
Regulatory/Environmental Coordinator
City of Fort Worth

James Whitt
Assistant Director of Public Works
City of Euless

North Central Texas Council of Governments Department of Environment and Development

Edith Marvin
Director of Environment and Development

Tamara Cook
Manager of Environment and Development

Jack Tidwell
Manager of Environment and Development

Doug Anthony
Planner

Sandra Barba
Planner

Brian Geck
Digital Media Specialist

Nalani Jay
Planner

Scott Miller
Technology Coordinator

Jennifer Vuitel
Planner

Liz Zecckine
Administrative Assistant

Acknowledgements

The 2014 Water Quality Management Plan Update was written by Doug Anthony under the direction of Tamara Cook and Edith Marvin. Technical assistance was provided by Scott Miller, Brian Geck, Liz Zecckine, and Jennifer Vuitel. Technical review was provided by the members of NCTCOG's Water Resources Council. A special acknowledgement goes to all those providing comment and review.

TABLE OF CONTENTS

Table of Contents 4
Table of Figures 9
Table of Tables 10
Introduction 12
Purpose and Scope 12
Water Quality Management Planning 14
Analysis by Watershed 26
Arlington / Benbrook/Joe Pool/Weatherford Lakes (4 Lakes) Watershed 26
Projected Growth by Watershed 26
Land Use 27
Cities in Watershed 28
East Fork below Lake Ray Hubbard Watershed 33
Projected Growth by Watershed 33
Land Use 34
Cities in Watershed 34
Watershed Wastewater Service Providers 34
Watershed Stream Impairments 35
Status of Treatment Capacity Expansion within the Watershed 35
Elm Fork Trinity Watershed 36
Projected Growth by Watershed 36
Land Use 36
Cities in Watershed 37
Watershed Service Providers 37
Watershed Stream Impairments 38
Reclaimed Water Use 38
Grapevine Lake Watershed 39
Projected Growth by Watershed 39
Land Use 40

Cities in Watershed 40
Current Service Providers 41
Watershed Stream Impairments 42
Lake Bridgeport Watershed 43
Projected Growth by Watershed 43
Land Use 44
Watershed Cities 44
Current Service Providers and 2013 Wastewater Discharges 44
Watershed Stream Impairments 45
Lake Ray Hubbard Watershed 46
Projected Growth by Watershed 47
Land Use 47
Watershed Cities 47
Wastewater Discharges and Current Service Providers 48
Watershed Stream Impairments 49
Watershed Wastewater Recycling 49
Lake Worth and Eagle Mountain Lake Watershed 50
Projected Growth by Watershed 50
Cities in Watershed 52
Watershed Stream Impairments 54
Lake Lavon Watershed 56
Projected Population Growth, 2013 – 2040 56
Land Use 57
Cities in Watershed 58
Current Service Providers 58
Watershed Stream Impairments 60
Lavon Lake Watershed 60
Trinity River Headwaters Watershed 61
Projected Population Growth, 2013 - 2040 61

Cities in Watershed 62
Current Service Providers 63
Watershed Stream Impairments 64
Ten Mile Creek / Red Oak Creek Watershed 65
Projected Population Growth - 2013 – 2040 65
Watershed Cities 66
Current Service Providers 67
Watershed Stream Impairments 68
Trinity below Dallas Watershed 69
Projected Population Growth, 2013 – 2040 69
Watershed Cities 70
Current Service Providers 70
Watershed Stream Impairments 71
West Fork Trinity Watershed 72
Cities in Watershed 74
Current Service Providers 74
Current Known Impairments to Watershed Water Quality 75
Lewisville Lake Watershed 76
Land Use 78
Cities in Watershed 78
Current Service Providers 78
Lewisville Lake East Watershed Greenprint 80
Hickory Creek 319 Grant Project 80
Appendix A: Designated Management Agency Update 82
Appendix B: 208/201 Coordination Activities Update 83
Appendix C: Clean Water State Revolving Fund Commitments 85
Appendix D: City Population Projections 86
Appendix E: Wastewater Treatment Planning Needs and Individual System Assessments 91
Krum Wastewater Treatment Plant 96

Trinity River Authority Central Regional Wastewater System 96
Trinity River Authority Denton Creek Regional Wastewater System..... 97
Trinity River Authority Ten Mile Regional Wastewater System..... 97
Trinity River Authority Mountain Creek Regional Wastewater System..... 98
Upper Trinity Regional Water District Lakeview System..... 98
Upper Trinity Regional Water District Riverbend..... 98
Upper Trinity Regional Water District Peninsula..... 99
Dallas Southside and Central Regional Wastewater System 99
Garland Duck Creek and Rowlett Regional Wastewater Systems..... 100
North Texas Municipal Water District Floyd Branch 100
NTMWD South Mesquite System 101
NTMWD Rowlett Creek and Wilson Creek Regional Wastewater System..... 101
NTMWD Panther Creek 101
NTMWD Muddy Creek..... 102
Regional Wastewater System..... 102
Farmersville/NTMWD System 102
The Colony 102
Palmer Wastewater Treatment Plant..... 103
Azle Ash Creek and Walnut Creek Wastewater System..... 103
Celina Wastewater Treatment Plant 103
Crandall Wastewater Treatment Plant..... 104
NTMWD Sabine Creek Regional Wastewater Treatment Plant 104
Flower Mound Wastewater Treatment Plant 104
Grapevine Peach Street Wastewater Treatment Plant..... 105
Hackberry Wastewater Treatment Plant 105
Johnson County FWSD #1 Wastewater Treatment Plant..... 105
Lewisville Wastewater Treatment Plant 106
Little Elm Wastewater Treatment Plant..... 106
Trophy Club MUD Wastewater Treatment Plant 106

Appendix F: Comments Received and Responses from Public Meeting, May 8, 2014 107

Table of Figures

Figure 1 - Projected population growth 2013 - 2040 12
Figure 2 - Major fresh water suppliers in North Texas 14
Figure 3 - Development growth in watersheds 19
Figure 4 - Impaired waters and associated impairments 21
Figure 5 - Bacteria TMDL watershed and MS4 boundaries 22
Figure 6 - PCB impaired watershed 24
Figure 7 - Wastewater service areas 25
Figure 8 - Lake Arlington planning area 31
Figure 9 - Lake Arlington Greenprint 32
Figure 10 - Current service areas 93
Figure 11 - Capacity comparison 2013 - 2040 95

Table of Tables

Table 1 - Projected Population Growth 2013 - 2040 13

Table 2 - Development Trends in Watersheds 18

Table 3 - Watershed population projection 26

Table 4 – 4 Lakes Watershed Treatment Capacity Utilization, by Plant 30

Table 5 - Mary's Creek Watershed Growth Projections 32

Table 6 – East Fork below Lake Ray Hubbard Subwatershed Population Projections 33

Table 7 – East Fork below Lake Ray Hubbard Watershed Treatment Capacity Utilization, by Plant 35

Table 8 – Elm Fork Trinity Subwatershed Population Projections 36

Table 9 – Elm Fork Watershed Treatment Capacity Utilization, by Plant 38

Table 10 – Grapevine Lake Subwatershed Population Projections 39

Table 11 – Grapevine Lake Watershed Treatment Capacity Utilization, by Plant 42

Table 12 – Lake Bridgeport Subwatershed Population Projections 43

Table 13 – Lake Bridgeport Watershed Treatment Capacity Utilization, by Plant 45

Table 14- Lake Ray Hubbard Subwatershed Population Projections 46

Table 15 - Lake Ray Hubbard Watershed Treatment Capacity Utilization, by Plant 48

Table 16 – Lake Worth / Eagle Mountain Lake Subwatershed Population Projections 51

Table 17 – Lake Worth / Eagle Mountain Lake Treatment Capacity Utilization, by Plant 53

Table 18 – Lake Lavon Subwatershed Population Projections 57

Table 19 – Lake Lavon Watershed Treatment Capacity Utilization, by Plant 59

Table 20 – Trinity Headwaters Subwatersbed Population Projections 62

Table 21 - Trinity Headwaters Watershed Treatment Capacity Utilization, by Plant 63

Table 22 – Ten Mile Creek / Red Oak Creek Subwatershed Population Projections 66

Table 23 - Ten Mile / Red Oak Creek Watershed Treatment Capacity Utilization, by Plant 67

Table 24 –Trinity below Dallas Subwatershed Population Projections 69

Table 25 –Trinity below Dallas Watershed Treatment Capacity Utilization 71

Table 26 - Trinity West Fork Subwatershed Population Projections 73

Table 27 - Trinity West Fork Watershed Treatment Capacity Utilization, by Plant 75

Table 28 - Lewisville Lake Subwatershed Population Projections..... 77

Table 29 - Lewisville Lake Watershed Treatment Capacity Utilization, by Plant 79

Table 30 - Regional wastewater treatment provider and participating city 94

Introduction

Purpose and Scope

Wastewater service is an integral part of the infrastructure support for the Dallas/Fort Worth (DFW) metropolitan area. Even under the constraints of the economic recession, the North Central Texas region, more properly described as the Metropolitan Planning Area (MPA), has been growing over the past decade. The population is currently projected to continue to grow to approximately 10.5 million by 2040. As the region matures, communities now on the perimeter and beyond may become more interdependent as they integrate into the urban metropolitan area and assume new roles in protecting water quality. For such a densely populated and growing area, the provision of adequate treatment services is important, with respect to social, economic, environmental, and health benefits for the region's 10.5 million residents in 2040.

Figure 1 - Projected population growth 2013 - 2040

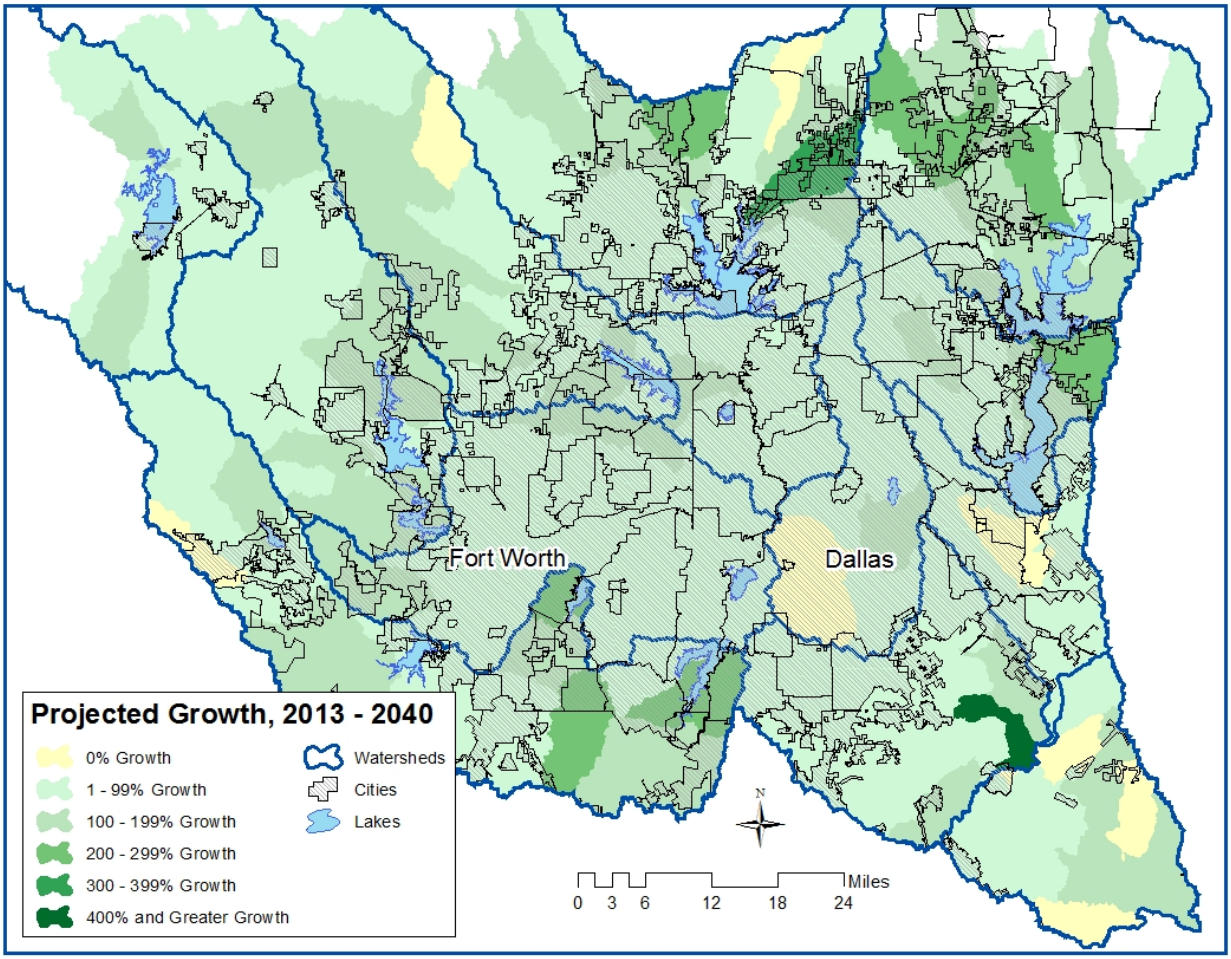


Table 1 - Projected Population Growth 2013 - 2040

Watershed Population Projections, 2013 - 2040	2013 Population	2040 Projected Population	Projected Growth 2013 - 2040
Arlington/Benbrook/Joe Pool/Weatherford Lakes	508,486	1,045,730	106%
E. Fork Trinity below Lake Ray Hubbard	366,206	481,769	32%
Elm Fork Trinity below Lewisville Lake	661,757	945,583	43%
Grapevine Lake*	170,667	306,105	79%
Lake Bridgeport*	14,106	19,675	39%
Lake Ray Hubbard	724,291	1,126,092	55%
Lake Worth/Eagle Mountain Lake*	168,984	345,654	105%
Lavon Lake*	226,605	464722	105%
Trinity River Headwaters	1,210,497	1,815,814	50%
Ten Mile Creek, Red Oak Creek	415,796	501,779	21%
Trinity River below Dallas	34,418	61,543	79%
West Fork Trinity below Lake Worth	1,882,102	2,674,470	42%
Lewisville Lake*	443,926	715,371	61%
Totals for Project Area	**6,827,841**	**10,504,307**	**54%**

*Populations for these watersheds are for the portion within the NCTCOG planning area.

Figure 1 depicts the projected population growth from 2013 to 2040 for the 13 clustered watersheds making up the Upper Trinity River Basin. Table 1 provides the corresponding watershed population projections by watershed. The population growth projected for the entire project area is expected to average 54%.

Proper wastewater treatment, whether accomplished through a large and sophisticated regional collection and treatment system or a small, on-site septic tank, is often taken for granted by residents. They are unaware of the years of planning and a continuing process of redesign and upgrading that have provided the infrastructure and facilities capable of handling the region's wastewater.

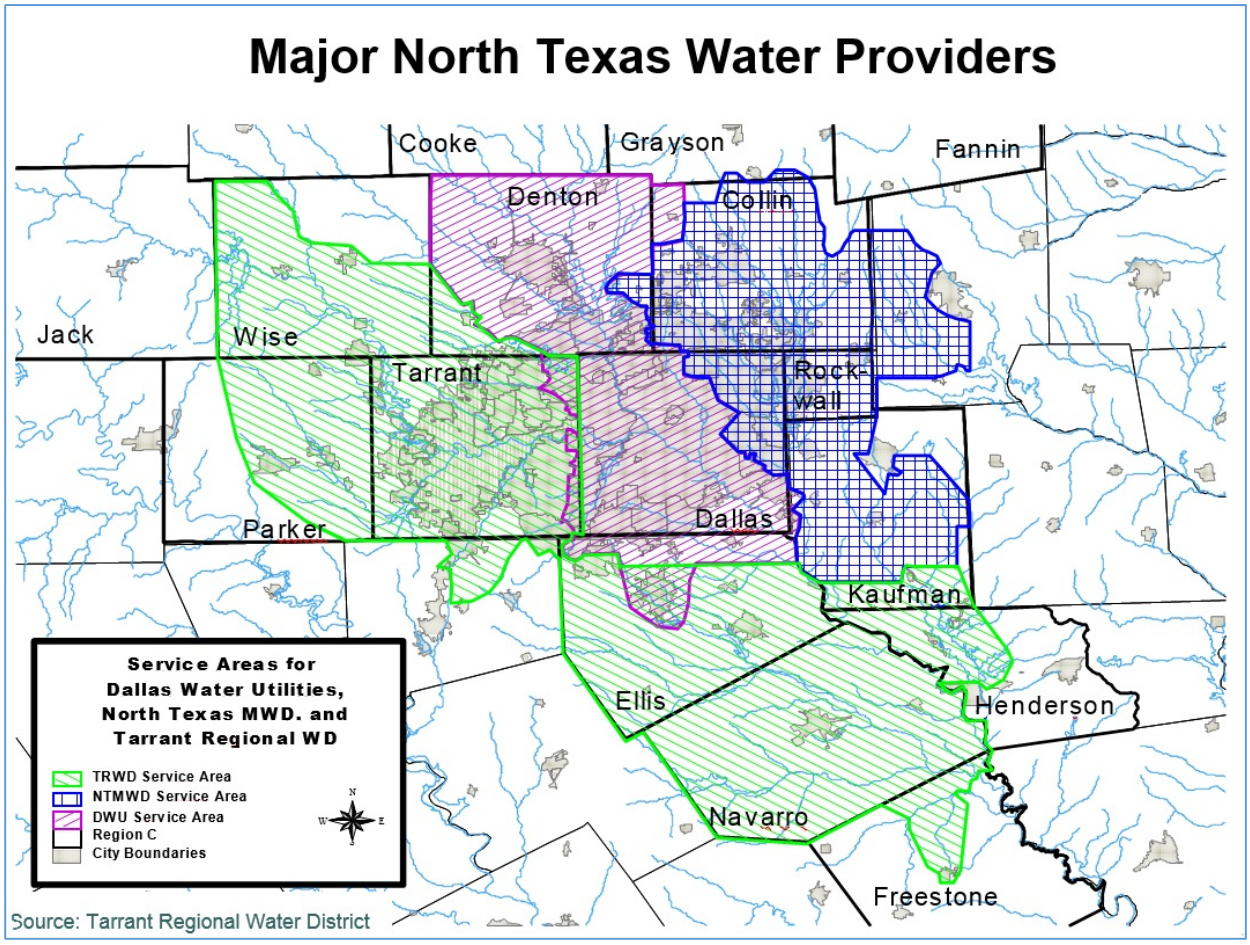
The economic recession impacted the DFW region's wastewater capacity planning in several ways. Slower than projected population growth provided the wastewater service providers a "margin of safety" for their existing and planned treatment capacity. It has also made capacity

planning somewhat less certain going forward as growth trends that were reliable in the past do not hold in the present, and may not in the future.

Water Quality Management Planning

In 1975, the North Central Texas Council of Governments (NCTCOG) was designated by the Governor of Texas as the water quality management planning agency for the North Central Texas region. Protection of water resources and the provision of wastewater services are overseen on a statewide basis by the Texas Commission on Environmental Quality (TCEQ), who in turn rely on the NCTCOG for oversight, conformity review, and evaluation of capacity for wastewater services in the DFW region. The entire water quality management planning process is mandated by the Clean Water Act (CWA) in Section 208(a) for the purpose of encouraging and facilitating the development and implementation of area-wide waste treatment management plans. Implementation of the act is the responsibility of state and local planning agencies. The area for which the NCTCOG is responsible is called the "208 area", after the section of the CWA that establishes the process for water quality review.

Figure 2 - Major fresh water suppliers in North Texas



Fresh Water Supply

The Texas Water Development Board (TWDB) was created in 1957 by the Texas Legislature to administer Texas' fresh water supply. The TWDB administers the Texas Water Bank which facilitates the transfer, sale or lease of water rights throughout the state. Since 1987, it added the Clean Water State Revolving Fund (CWSRF) which provides loans for expansion or improvement of wastewater treatment facilities, wastewater recycling and reuse facilities, collection systems, storm water pollution control projects, and nonpoint source pollution control projects. CWSRF projects in the NCTCOG region are reported in Appendix C. Table 2 highlights the major fresh water suppliers in North Texas.

This Water Quality Management Plan

Each year the NCTCOG Environment and Development Department updates the Water Quality Management Plan for the Upper Trinity River Basin, accounting for treatment capacity and service area changes since the prior year's report. In addition, the report details upgrades in wastewater infrastructure funded either through grants and loans from the State Revolving Fund established for that purpose, or financed by individual municipalities, utility districts, or other entities.

The WQMP is divided into sections which represent developments in each of the 13 watershed groups that make up the Upper Trinity Basin planning area. Watersheds define natural regions that feed a particular stream system and activities within the watershed area influence the ecological health of that system and all waters downstream. In DFW, water in the Upper Trinity Basin flows into the Trinity River.

Each WQMP is reviewed by the Water Resources Council, followed by regional review by municipalities and any other interested entities. Finally, a formal public hearing offers the opportunity for individual stakeholders from the planning area to review and comment on the Plan. After the public hearing, staff reviews and incorporates any modifications to the final plan, which is then presented to the NCTCOG's Executive Board for adoption. Following adoption by the NCTCOG Executive Board, the annual WQMP is submitted to the TCEQ and to the U.S. Environmental Protection Agency, Region 6, for review. Finally, the locally adopted plan is certified by the TCEQ Board.

WQMP Objective 1

The WQMP supports several objectives for planning, coordination, and implementation of wastewater treatment facilities in the DFW region such as facilitate planning, design, and construction of wastewater treatment facilities that meet permit limits and wastewater discharge requirements.

Permit limits are set by the state to avoid pollutant overload to surface waters. Such threats are minimized when facilities are properly and timely planned. As the designated water quality

management planning agency for North Central Texas, the NCTCOG makes recommendations to the TCEQ to designate agencies for wastewater collection and treatment according to provisions of Section 208 and Section 604(b) of the Federal Clean Water Act.

This WQMP will:

- Identify emerging water quality issues that will impact wastewater treatment strategies or that require adjustments to treatment processes.
- Track and summarize wastewater treatment performance for regional joint system and community plants.
- Ensure that critical infrastructure is considered in emerging regional emergency response and coordination activities.
- Facilitate wastewater treatment facility planning that assures capacities are sufficient to meet future wastewater needs.

Wastewater overflow due to insufficient treatment capacity causes surface water contamination from bacteria, solids, and other pollutants normally removed in treatment processes. As part of water quality management planning, the NCTCOG has historically provided periodic assessment of wastewater treatment planning activities and needs.

This objective is addressed by the NCTCOG continuing to:

- Monitor and regularly update wastewater treatment service area information.
- Provide feedback to regulatory agencies to improve data acquisition and use.
- Re-evaluate demographic and wastewater generation projections using the NCTCOG forecasts based on 2010 census information to ascertain capacity planning needs.
- Compile and summarize wastewater treatment reported flows on a regular schedule.
- Participate in coordination efforts between the NCTCOG and state demographic forecasting processes to enhance consistency of data for planning purposes.
- Encourage planning, construction, and effective maintenance of wastewater collection infrastructure to convey wastewater to treatment facilities, limit inflow and infiltration, and keep pace with regional growth.

WQMP Objective 2

Provide support for infrastructure maintenance, rehabilitation, capital improvement, replacement etc. of transmission pipelines and collection systems.

The transmission pipelines that convey wastewater from a source to the treatment facility are an integral part of the treatment system. Decaying or insufficient pipelines allow wastewater to

seep into the ground, which can surface when the ground becomes saturated. Decaying or insufficient pipelines also allow rainwater to inflow and infiltrate the pipeline system, which causes increased volumes at the treatment plant and increased potential for capacity exceedances. Focusing attention on infrastructure is appropriate based on evidence gained by the NCTCOG's administration of the Community Development Fund grant of the Texas Community Development Program. NCTCOG also follows regional wastewater infrastructure updates by monitoring the Texas Water Development Board's Clean Water State Revolving Fund, and contacting individual municipalities concerning development or upgrade of their collection or community treatment systems.

This objective is addressed by the NCTCOG continuing to:

- Examine and summarize the status of wastewater treatment and collection systems in small communities for use in targeting resources for infrastructure improvements.
- Document and summarize local government actions to construct, maintain, and rehabilitate collection systems.
- Provide assistance on the use of planning, policy, and other measures and approaches to effectively address state and federal water quality regulations.

WQMP Objective 3

Inform and support regional water quality management efforts by providing planning, policy assistance, and information for local agencies to use in compliance efforts. This objective is addressed by the NCTCOG continuing to:

- Participate in stakeholder meetings conducted by the TCEQ on new regulations as they are developed.
- Inform NCTCOG committees of updated, new, or upcoming regulation.
- Provide access to regulatory information from the NCTCOG web site.
- Develop a calendar of water quality meetings on the NCTCOG web site.
- Monitor and facilitate transitions of wastewater treatment from rural settings to dense growth areas to promote efficient and appropriate processes that accommodate local government interests while maintaining adequate capacity and discharge quality.

WQMP Objective 4

Facilitate municipal awareness of water quality issues. In North Central Texas, rural areas are often developed in patches as development advances on the fringe of incorporated areas. As the urbanizing rural areas become incorporated, municipalities eventually become responsible for providing public service to areas which are often served by onsite or septic wastewater systems.

Mismanaged onsite or septic systems are difficult and costly for municipalities to integrate into public service systems. Municipal awareness of, or involvement in, early development stages will conserve public resources over the long term. Table 2 shows development trends.

Table 2 - Development Trends in Watersheds

Watershed	Percent Developed Area 2005	Percent Developed Area 2010	Percent Increase in Developed Area
Arlington/Benbrook/Joe Pool/Weatherford Lakes	37%	40%	4%
E. Fork Trinity below Lake Ray Hubbard	45%	50%	5%
Elm Fork Trinity below Lewisville Lake	70%	84%	14%
Grapevine Lake*	31%	44%	12%
Lake Bridgeport*	15%	26%	11%
Lake Ray Hubbard	52%	57%	5%
Lake Worth/Eagle Mountain Lake*	18%	24%	6%
Lavon Lake*	17%	21%	4%
Ten Mile Creek, Red Oak Creek	42%	49%	7%
Trinity River Headwaters	79%	86%	7%
Trinity River below Dallas	1%	9%	8%
West Fork Trinity below Lake Worth	69%	76%	8%
Lewisville Lake*	19%	44%	25%
Totals for Project Area	38%	47%	9%

*Percentages for the portion of the watershed within the Metropolitan Planning Boundary

This objective is addressed by the NCTCOG:

- Tracking new permit information for non-municipal wastewater discharges.
- Exploring future ways of tracking permits.
- Identifying neighborhoods or other developed tracts that do not receive service from the local or regional wastewater treatment plants, but which lie within an incorporated area that is otherwise served.
- Promoting and encouraging exploration of opportunities to maximize wastewater effluent use.

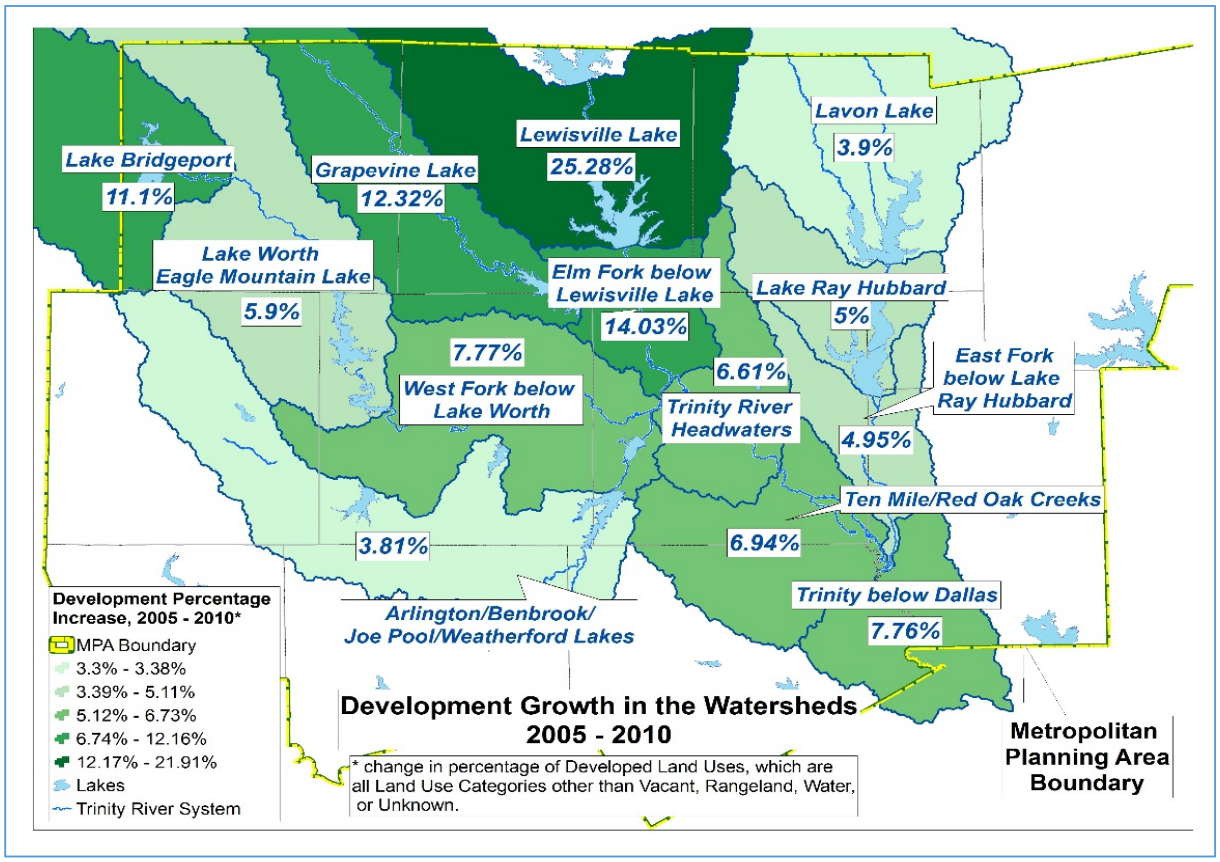
WQMP Objective 5

Support wastewater reuse strategies and water conservation. By 2050, this region will require at least two billion gallons of water per day to meet drinking water demand. Currently available resources cannot meet this goal, and expanding traditional water sources is not the only method to meet the shortfall. One method to make up the deficit is to increase the reuse of treated wastewater. Wastewater reuse enhances water conservation and particularly conserves and supplements raw drinking water supplies. The *State Water Plan*, as compiled by the Texas Water Development Board, identifies conservation as a valuable water supply tool for every region in Texas.

This objective is addressed by the NCTCOG:

- Annually identifying and updating current regional projects where treated effluent is used for alternative purposes.
- Pursuing opportunities to work with the major water systems and their customer cities to ensure the efficient and effective use of water.

Figure 3 - Development growth in watersheds



Watersheds Planning Approach in the Upper Trinity Basins

The North Central Texas region's population is expected to reach approximately 10.5 million by 2040. There are many efforts on-going across the region that will help prepare for this influx of people and the increased strain on water resources. However, a collaborative, long-range effort involving all North Central Texas communities to ensure protection efforts are being applied efficiently and effectively is needed. This will not be an easy task and there are several challenges to protecting water supply reservoirs and their watersheds that must be addressed.

Both Table 2 and Figure 3 above illustrate the growth in developed area between the NCTCOG's 2005 Land Use data and the updated 2010 Land Use dataset. Each of the Upper Trinity River watersheds has added significant developed acreage during the five year period between land use updates. Data for some of the watersheds are limited to the areas for which land use data are available, which is the area within the MPA. These are indicated in Appendix E: Wastewater Treatment Planning Needs and Individual System Assessments.

Watershed Planning and Integrating Infrastructure Planning

The NCTCOG has established a Regional Ecosystem Framework (REF) for North Central Texas which "is based on a collaboratively developed vision of desired future conditions that integrates ecological, economic, and social factors." This is being accomplished on a watershed basis by connecting people, places, and programs.

For fiscal year (FY) 2014, the NCTCOG is revisiting and expanding the REF under a grant from the Federal Highway Administration. The REF identifies and prioritizes areas' primary ecological values in order to streamline future transportation planning efforts. The goal of the REF is to identify valuable ecological and social features in each watershed, and to develop mitigation strategies and opportunities prior to the planning of a transportation infrastructure project. This long-range planning resource and dataset could be used in planning other infrastructure needs, and provide a framework to integrate conservation planning and ecological aspects into long-term watershed analyses.

Water Quality Concerns – Municipal Stormwater

Municipal Stormwater refers to the runoff which occurs whenever rain falls on an urbanized area. Regulation to promote water quality began with industry, and industrial water discharges have been cleaned up significantly since the promulgation of the Clean Water Act in 1975. It became apparent that the industrial and commercial sources of water pollution that had been the focus of environmental regulation were not the only contributors of toxins to our waters, and greater attention needed to be paid to "non-point" sources of contamination: contaminants that are not easily traced to any particular source. Most of these contaminants are picked up as rain falls to the ground, falling on whatever structures and activities occur on land prior to the water entering

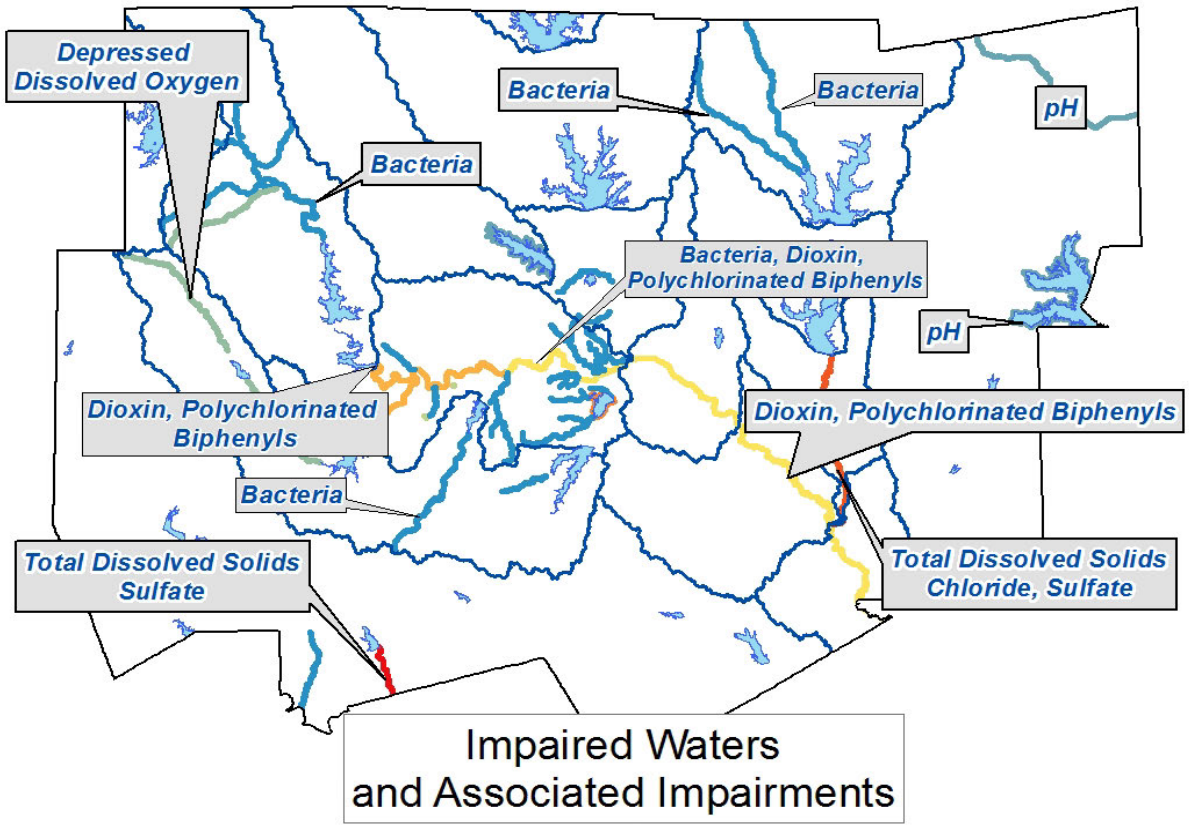
a stream. One important part of the effort to protect water quality is the Municipal Separate Stormwater Sewer System (MS4) permitting program mandated by the EPA, and administered in Texas by the TCEQ. MS4 permits make municipalities (and some other entities) responsible for the stormwater runoff in their jurisdiction.

Most of the cities in the Urbanized Area (UA) are covered under Texas Pollutant Discharge System (TPDES) Phase I and II MS4 Permits. Phase I permits are required for cities in the UA that had a population above 100,000 in the 1990 U.S. Census, and require, among other things, sampling and testing of stormwater flow. The Phase II permits for smaller cities are focused on attaining water quality improvements by implementing Best Management Practices. The six minimum measures are Public Education and Outreach, Illicit Discharge Detection and Elimination, Pollution Prevention, Monitoring, Construction, and Post Construction.

Water Quality Concerns – 303(d) Impairments

The 16-county NCTCOG region has dozens of water bodies listed as impaired on the state's 303(d) list from the *2012 Texas Integrated Report of Surface Water Quality,* which addresses assessment requirements under the federal Clean Water Act. Illustrated in Figure 4, NCTCOG continues to facilitate stakeholder-driven efforts to address regional water quality concerns in areas that have water bodies included on the 303(d) list.

Figure 4 - Impaired waters and associated impairments



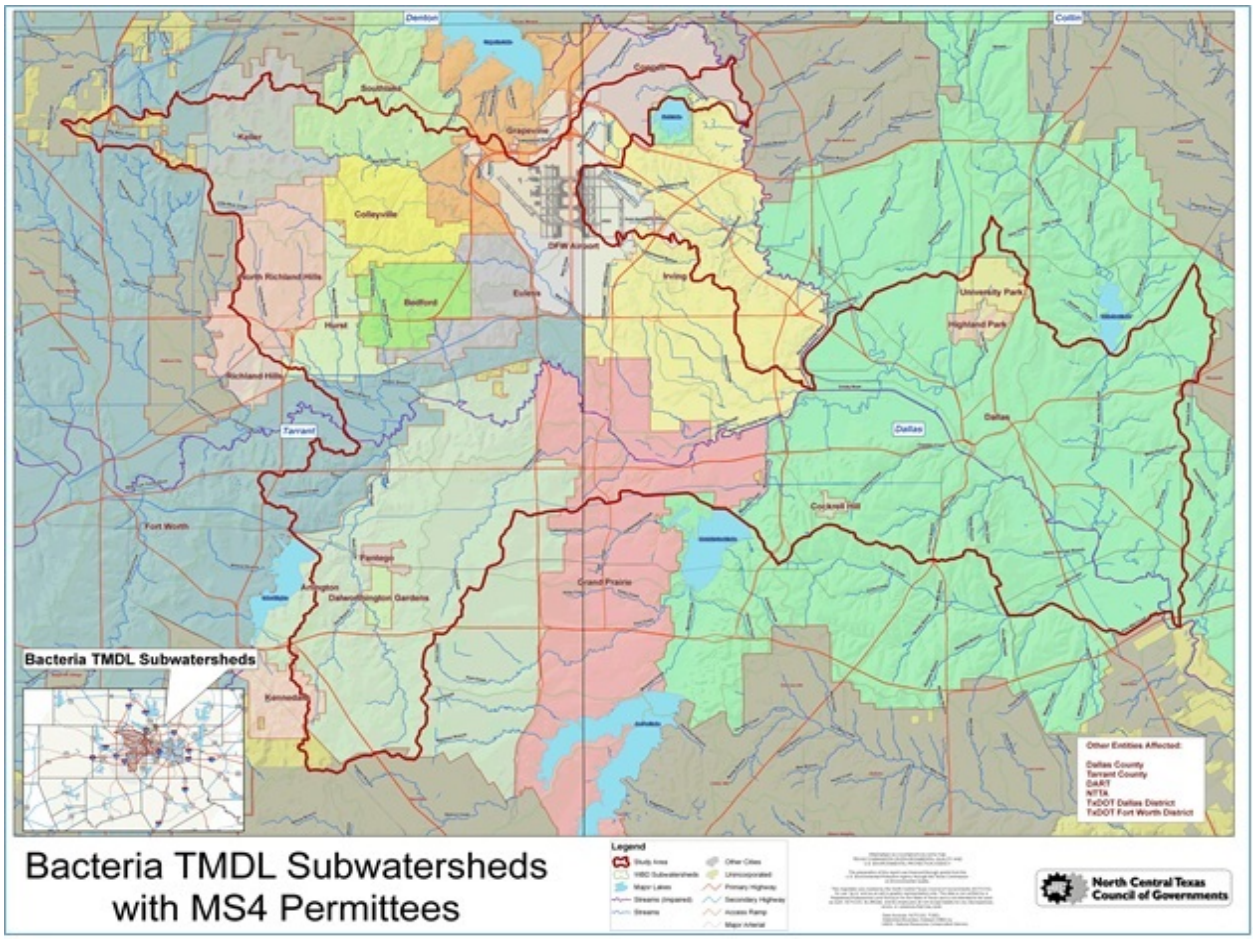
Bacteria Total Maximum Daily Loads and the Implementation Plan

In December 2013, the "Implementation Plan (I-Plan) for 17 Total Maximum Daily Loads for Bacteria in the Greater Trinity River Region" was approved by the TCEQ Commissioners. The I-Plan describes strategies which can be taken to reduce the levels of bacteria in portions of the Trinity River and its tributaries that are included on the 303(d) list for bacteria. These actions and target levels for reduced bacteria are determined by stakeholders in meetings organized by the NCTCOG and funded by the TCEQ. Figure 5 shows the cities within the boundary of this I-Plan.

The areas covered by the I-Plan include the watersheds for a continuous segment of the Upper Trinity River beginning at the confluence of Five Mile Creek and running upstream, past the confluence with the Elm Fork Trinity River, to the confluence of Village Creek with the West Fork Trinity River. Also included are two tributaries off of the Elm Fork Trinity River, Cottonwood Branch and Grapevine Creek, and 11 tributaries of the West Fork Trinity.

Segments 0805_03 and 0805_04 represent the portion of the Upper Trinity included in the I-Plan. The watersheds for these segments encompass the central portion of the City of Dallas as well as the cities of Cockrell Hill, University Park, and the Town of Highland Park.

Figure 5 - Bacteria TMDL watershed and MS4 boundaries



The two tributaries of the Elm Fork Trinity River, Grapevine Creek and Cottonwood Branch – 0822B and 0822A respectively - have smaller watersheds, involving the cities of Coppell, Irving, and the Dallas-Fort Worth International Airport.

The segments of the West Fork Trinity River included in the I-Plan are 0841_01 and 0841_02. In addition to the river segment, there are 11 tributaries that are also impaired for bacteria. They are: Bear Creek, Arbor Creek, Copart Branch, Mountain Creek, Dalworth Creek, Delaware Creek, Estelle Creek, Johnson Creek, Kee Branch, Rush Creek, Village Creek, and West Irving Branch. The watersheds of 0841 cover a significant portion of the central Metroplex cities, including Haslet, Keller, Southlake, Colleyville, and North Richland Hills in the northwest; Fort Worth, Hurst, Bedford, Euless, and Irving in the central portion; and Arlington, Grand Prairie, Kennedale, Pantego, and Dalworthington Gardens in the south are included in this watershed of the West Fork of the Trinity River.

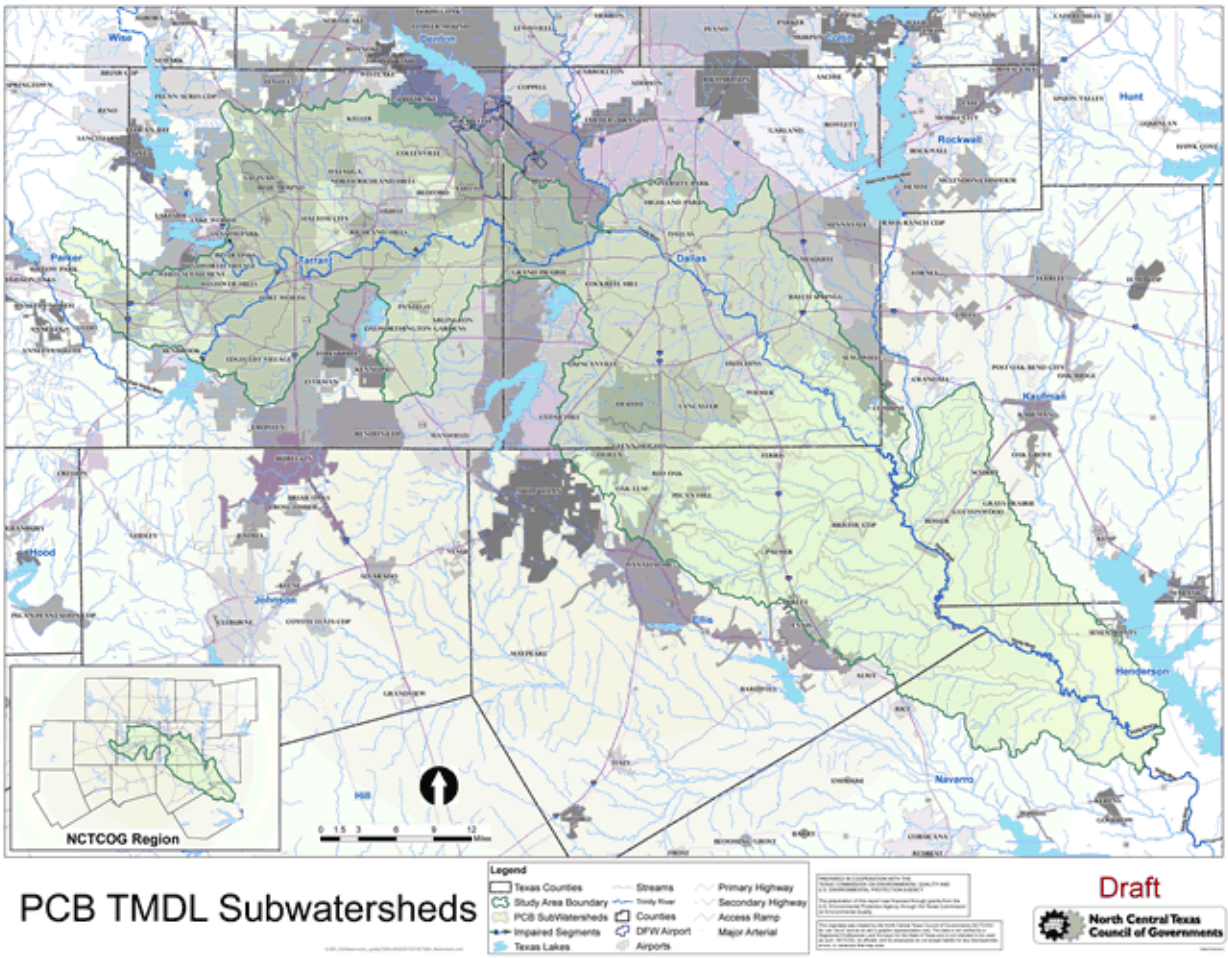
In addition to the cities that are parties to the I-Plan, a number of other jurisdictions and agencies in these watersheds are included because they have MS4 permits regulating their wastewater discharges. These include Dallas County, Tarrant County, Dallas Area Rapid Transit (DART), North Texas Tollway Authority (NTTA), and Texas Department of Transportation (TxDOT) Dallas and Fort Worth Districts.

The overall population in the greater bacteria total maximum daily load (TMDL) watershed is 1.33 million people according to 2010 U.S. Census data and is fairly densely populated with urban and suburban clusters.

PCB and Dioxin Impairment

Bacteria is not the only impairment impacting the Trinity River. In 1996, segments of the Trinity were first listed as impaired for Polychlorinated Biphenyls (PCBs) on the state's 303(d) list which references a section of the Clean Water Act mandating the evaluation of a state's water bodies. In 2002, the Texas Department of State Health Services issued a fish consumption advisory for 150 miles of the Trinity River due to PCBs in fish tissue. In 2010, another fish consumption advisory expanded the area of impairment to cover 12 assessment units. Also in 2010, dioxin was listed as impairment for the same stream segments as those impacted by PCBs. Figure 6 shows the extent of the PCB, and by extension, dioxin, and watersheds in the NCTCOG region. The Trinity's PCB and dioxin impairments begin in south Navarro County running upstream to the confluence with the Elm Fork (Segment 0805). From there, it proceeds upstream along the West Fork (Segment 0841) to below Lake Worth (Segment 0806) and to the confluence with the Clear Fork. A portion of the Clear Fork below Lake Benbrook Dam is also included (Segment 0829). The combined watersheds of all four segments cover 1,540 square miles.

Figure 6 - PCB impaired watershed

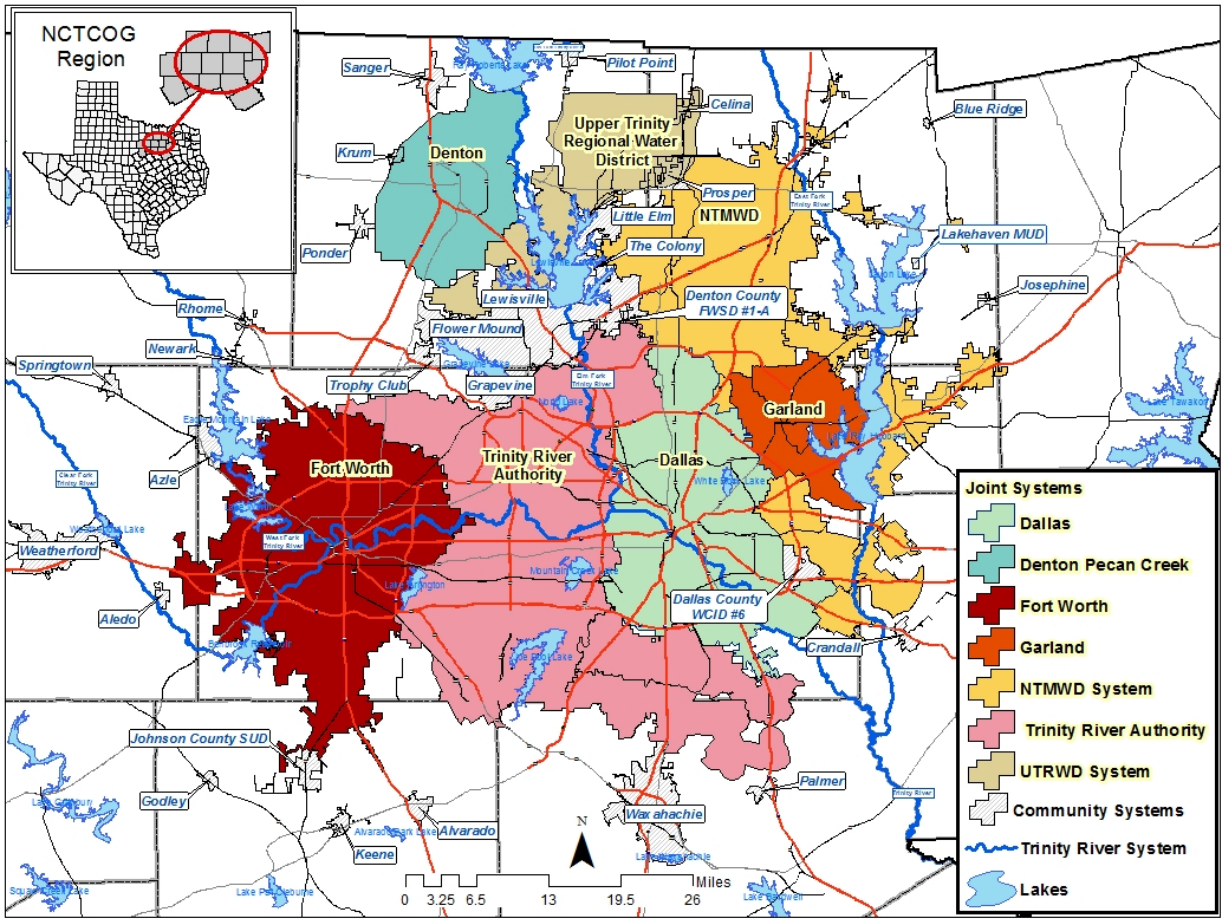


In September 2013, the TCEQ tasked the NCTCOG with facilitating a program to coordinate stakeholder-led efforts to address potential solutions to the PCB impairment. PCBs are a challenging contaminant having been banned since 1976, leaving few, if any, potential current sources. PCBs may be present in sediments or on surfaces slowly leaching or releasing them into stormwater or groundwater.

Wastewater Planning Needs

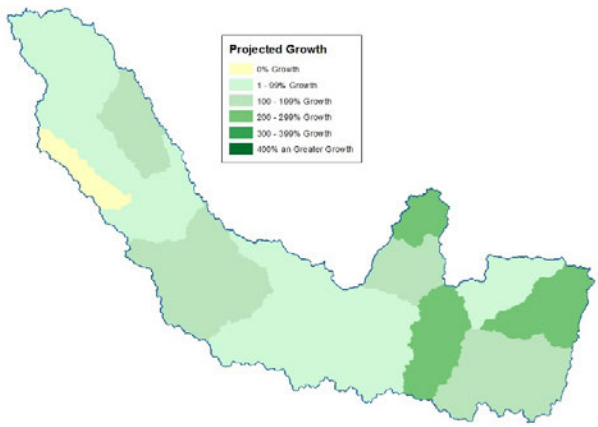
The NCTCOG assesses planning needs for wastewater treatment to protect water quality. Appendix E, Wastewater Treatment Planning Needs and Individual System Assessments, discusses procedures and results of the 2014 update. Figure 7 illustrates the territories currently served by large wastewater treatment facilities in the NCTCOG region.

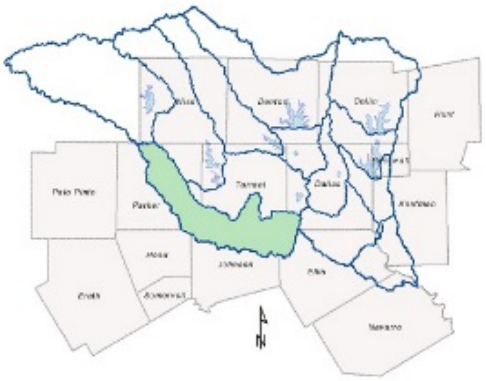
Figure 7 - Wastewater service areas



Analysis by Watershed

ARLINGTON / BENBROOK/JOE POOL/WEATHERFORD LAKES (4 LAKES) WATERSHED





PROJECTED GROWTH BY WATERSHED

The Arlington/Benbrook/Joe Pool/ Weatherford Lakes watershed ("Four Lakes") is projected to have population growth in most of its 22 subwatersheds, with higher population growth rates generally occurring in the area of the 'second tier suburbs' at the southern side of the watershed. From its current estimated population of 508,486, the region is projected to grow to 1,045,730 by 2040, an overall population of 106% over the 27 year period. Only the Town Creek subwatershed is projected to lose population during this period, as shown in Table 3.

Table 3 - Watershed population projection

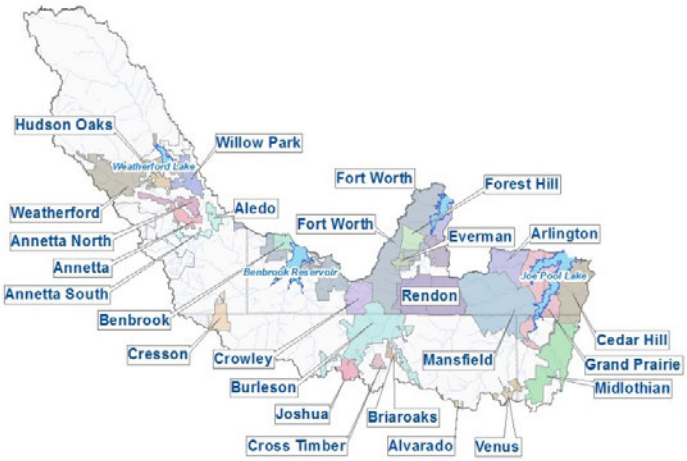
Arlington/Benbrook/Joe Pool/Weatherford Lakes Subwatershed Name	2013 Population	2040 Projected Population	Projected Growth 2013 - 2040
Bear Creek	3,133	7,946	154%
Brown Branch-Clear Fork Trinity	7,851	21,036	168%
Clear Fork Trinity - Lake Weatherford	7,234	17,727	145%
Cottonwood Creek-Clear Fork Trinity River	3,883	4,393	13%
Deer Creek-Village Creek	39,275	56,611	44%
Dutch Branch-Benbrook Lake	19,340	29,257	51%
Gourdneck Creek	2,302	38,68	68%
Headwaters Mountain Creek	14,095	32,611	131%

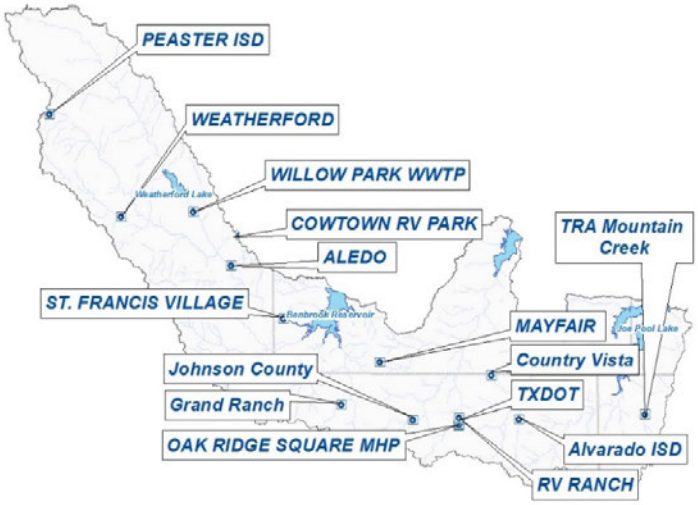
Arlington/Benbrook/Joe Pool/Weatherford Lakes Subwatershed Name	2013 Population	2040 Projected Population	Projected Growth 2013 - 2040
King Branch-Walnut Creek	24,195	72,654	200%
Low Branch-Mountain Creek	26,281	82323	213%
Lynn Creek-Walnut Creek	106,516	151,409	42%
Mustang Creek	10,508	17,807	69%
Quil Miller Creek-Village Creek	54,916	74,989	37%
Rock Creek	12,304	18,033	47%
Soap Creek	10,095	29,979	197%
South Bear Creek	1,357	3,711	173%
South Fork	9,790	10,815	10%
Squaw Creek-Clear Fork Trinity River	10,037	11,349	13%
Town Creek	21,836	18,114	0%
Underwood Branch-Willow Creek	13,986	19,185	37%
Village Creek-Lake Arlington	48,650	129,713	167%
Wildcat Branch-Lake Arlington	60,902	232,200	281%
Watershed Total	**508,486**	**1,045,730**	**106%**

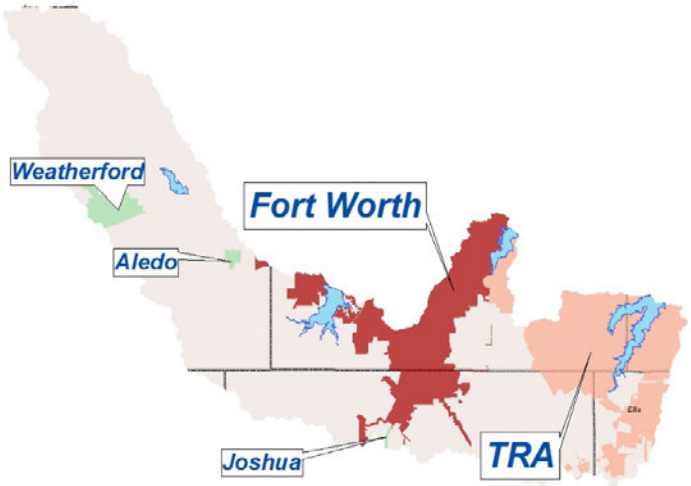
LAND USE

The Four Lakes watershed is located at the southwest corner of the Dallas – Fort Worth urbanized area. Although there are 26 communities located in the watershed, 19 of these cities have a majority of their jurisdiction within the watershed's boundaries, and only seven of these fall within the current UA. The cities of Burleson and Mansfield both have 99 percent of their jurisdiction within this watershed and are Phase II MS4 permit holders. The increase in the area of developed land for the four lakes watershed between 2005 and 2010 was relatively small (3.81 percent). The overall proportion of developed land increased to 40.29 percent.

Cities in Watershed







The Four Lakes watershed comprises 533,430 acres and includes all or part of 26 incorporated cities. Among these cities are small portions of both Arlington and Fort Worth, parts of Cedar Hill, Midlothian, Benbrook, Cresson, and Grand Prairie, and all or most of Burleson, Joshua, Crowley, Everman, Forest Hill, Kennedale, Venus, Mansfield, Aledo, Rendon, Annetta, Annetta South, Annetta North, Weatherford, Willow Parks, and Hudson Oaks. Overall, the watershed is currently about 15 percent urbanized (Urbanized = City Limits Area/Watershed Area).

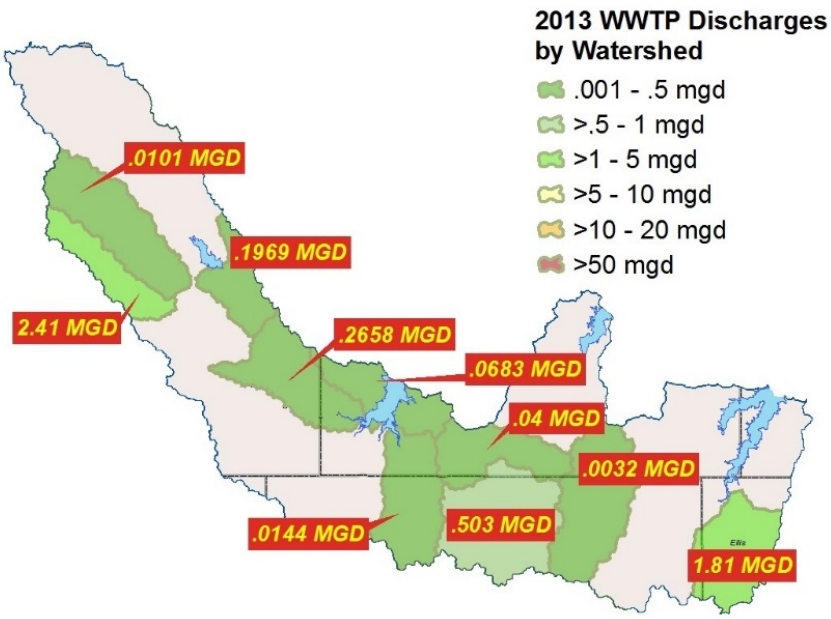
Watershed Wastewater Service Providers

The Four Lakes Watershed is broadly served by four Trinity River Authority (TRA) facilities, and the City of Fort Worth system.

Watershed Wastewater Treatment Facilities

This watershed, although it contains all or part of 26 incorporated cities, is about 15 percent urbanized. Many small wastewater treatment facilities serve the area, resulting in small discharges in 11 of the 22 subwatersheds, which drain to all four lakes in the region.

Watershed Wastewater Discharges – 01/2013 to 12/31/2013

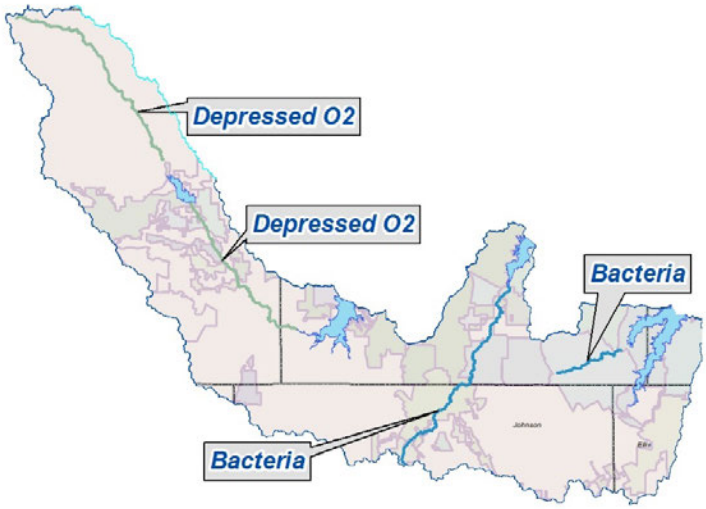


Total municipal wastewater discharges into the watershed increased to 5.33 million gallons per day (MGD) in 2013, a 61 percent increase over the previous year. About 34 percent of the total was discharged by one of the regional wastewater treatment plants, TRA's Mountain Creek facility, while the City of Weatherford facility handled 54 percent, or 2.41 MGD.

Table 4 – Four Lakes Watershed Treatment Capacity Utilization, by Plant

Wastewater Treatment Plant	Permitted Average Daily Flow, MGD	Average Daily Flow 2013, MGD	Percentage of Permitted Average Daily Flow
PEASTER ISD WWTP	0.036	0.0101	28%
WEATHERFORD WWTP	4.5	2.4079	54%
WILLOW PARK WWTP	0.3	0.1969	66%
COWTOWN RV PARK	0.0216	0.0093	43%
BENBROOK VILLAGE	0.035	0.0284	81%
ST. FRANCIS VILLAGE	0.085	0.0683	80%
GRAND RANCH	0.0305	0.0144	47%
MAYFAIR WWTP	0.096	0.04	42%
JOHNSON CTY SPEC.	0.7	0.4412	63%
JOHNSON COUNTY NB	0.006	0.0018	30%
OAK RIDGE SQUARE	0.0195	0.0356	0%
TXDOT WWTP	0.006	0	0%
RV RANCH WWTP	0.024	0.0244	102%
COUNTRY VISTA WWTP	0.042	0	0%
WALNUT CREEK MHP	0.0225	0	0%
ALVARADO ISD WWTF 1	0.035	0.0032	9%
TRA MOUNTAIN CRK (#2)	3	1.814	60%
ALEDO	0.35	0.2374	68%
Totals	**9.3091**	**5.3329**	**57%**

As shown in Table 4, overall the 18 wastewater treatment facilities in the region operated at 57 percent of capacity. Only the RV Ranch plant was exceeding its permitted average daily flow of .024 MGD.



Watershed Stream Impairments

The Four Lakes Watershed contains three streams that are characterized as impaired by the TCEQ:

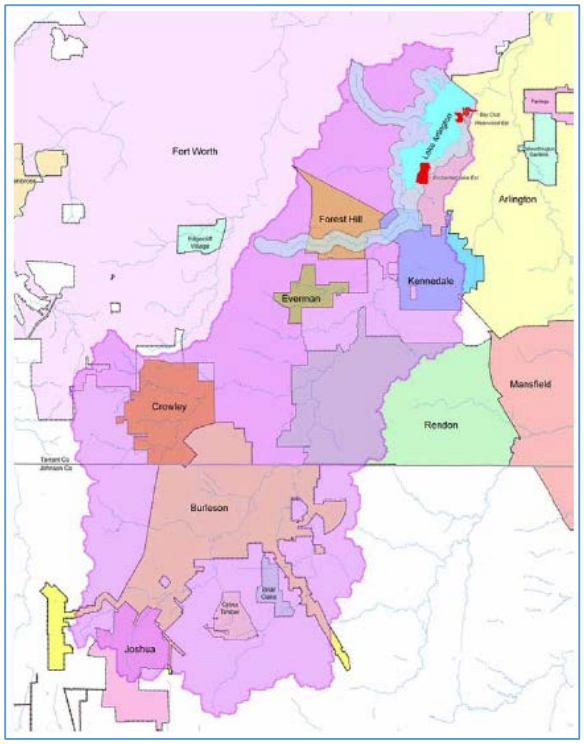
- Clear Fork of the Trinity above and below Lake Weatherford
- Village Creek
- Walnut Creek

Regional Water Quality Projects

Lake Arlington Watershed Protection Plan

The City of Arlington manages Lake Arlington, which provides drinking water for multiple cities, cooling for a power generating station, and recreational facilities. The Arlington City Council adopted the Lake Arlington Master Plan on April 12, 2011. Figure 8 depicts the Lake Arlington Watershed Protection Plan area and participating cities.

Figure 8 - Lake Arlington planning area



The Master Plan incorporates:

- water quality computer modeling;
- the development of Best Management Practices (BMPs) for water quality protection;
- the preparation of standards and guidelines for activities around the Lake; and
- planning for recreational activities, open space, and determining boating capacity.

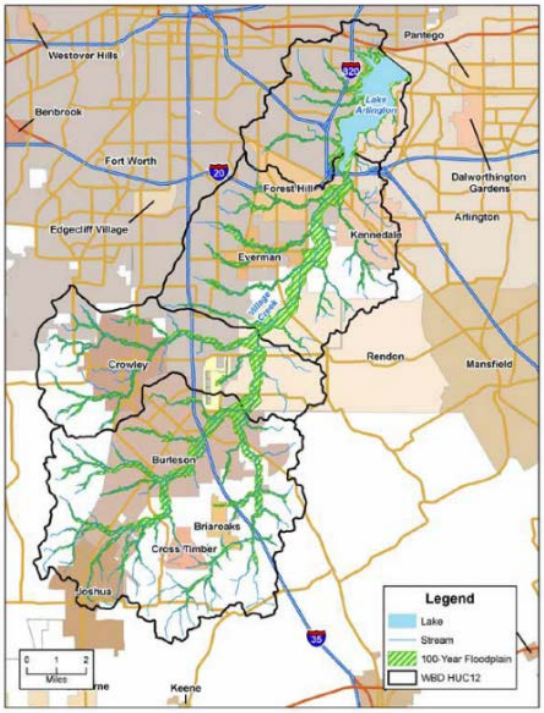


Figure 9 - Lake Arlington Greenprint

The Master Plan builds upon a *Greenprint* of the Lake Arlington Watershed which characterizes areas' suitability for protection or development. The NCTCOG contracted with the Trust for Public Land (TPL) in 2010 to Greenprint the Lake Arlington watershed. Greenprinting is a geographic information system (GIS) technique developed by TPL to prioritize areas for protection. The goal of this project was to identify areas that would offer the greatest benefit to water quality, if conserved. Figure 9 shows the water resources within the watershed that should be preserved to ensure the lake's water quality. The Lake Arlington watershed Greenprint is based on land use, proximity to streams, proximity to ponds and wetlands, water erosion potential, floodplains, and proximity to the reservoir. Most of the areas identified as priorities for conservation generally follow riparian corridors. The City of Arlington and the Trinity River Authority are currently implementing the Watershed Protection Plan for Lake Arlington.

Status of Treatment Capacity Expansion within the Watershed

The City of Fort Worth continues working toward construction of the Mary's Creek Water Recycling Center, with a planned startup in 2025. This project will relieve the city's Village Creek WWTF as development increases flows on the west side of the City of Fort Worth. Land adjacent to the closed West Side Landfill has been purchased, and design of the Mary's Creek Reclamation Facility is ongoing. Table 5 shows the projected growth to the west of Fort Worth and the Eastern Parker County cities to be served by the Mary's Creek Reclamation Center Although permitting, design and construction may not begin until 2017 or later, preliminary activities include water quality and stormwater modeling of Mary's Creek.

Growth Projections

- The Mary's Creek basin has the most potential for development
- The basin is centrally located and near potential water reuse opportunities
- Preliminary Wastewater Master Plan identifies a need by 2025
  - regional development could impact schedule

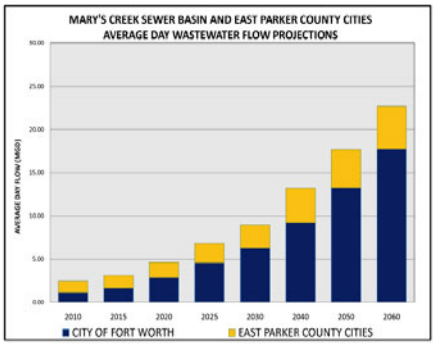
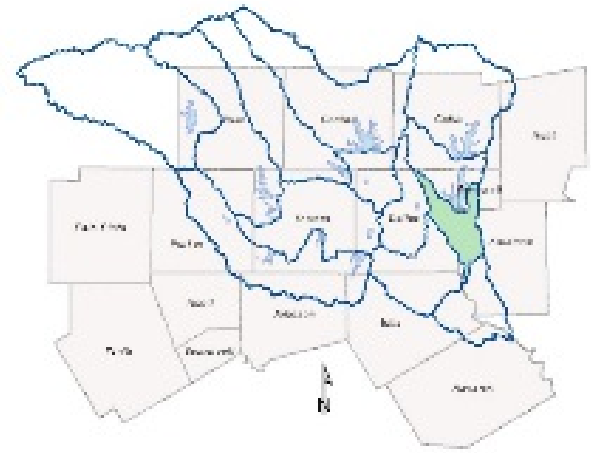


Table 5 - Mary's Creek Watershed Growth Projections

East Fork below Lake Ray Hubbard Watershed



Projected Growth by Watershed

The East Fork below Lake Ray Hubbard Watershed is projected to have somewhat lower-than-average growth in most of its seven watersheds, with two watersheds, the North Mesquite Creek and Long Branch-Buffalo Creek showing insufficient data for projecting population growth. From its current estimated population of 366,206, the region is projected to grow to 481,769 by 2040, an overall growth rate of 32 percent.

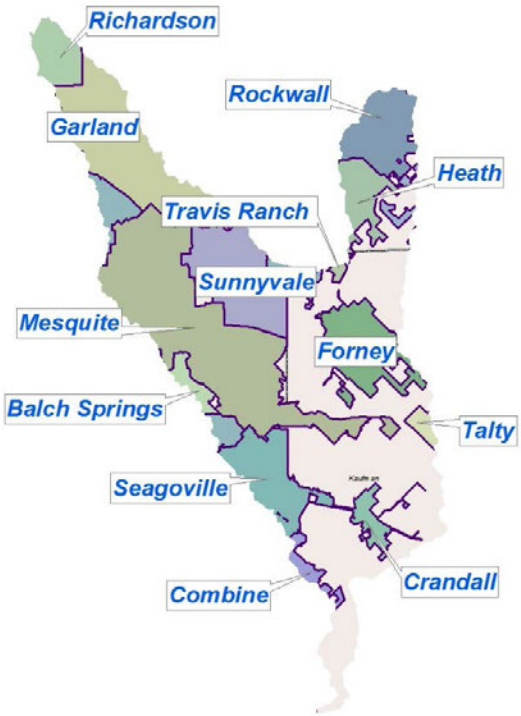
Table 6 – East Fork below Lake Ray Hubbard Subwatershed Population Projections

East Fork below Lake Ray Hubbard Subwatersheds	2013 Population	2040 Projected Population	Projected Population Growth 2013 - 2040
White House Ridge	2,982	4,908	65%
Anthony Branch-Buffalo Creek	12,496	18,864	7%
Mustang Creek – E. Fork Trinity	40,115	45,749	14%
North Mesquite Creek	60,067	103,935	73%
South Mesquite Creek	109,488	118,490	8%
Long Branch-Buffalo Creek	25,205	47,349	88%
Duck Creek	175,920	189,823	8%
Watershed Totals	**366,206**	**481,769**	**32%**

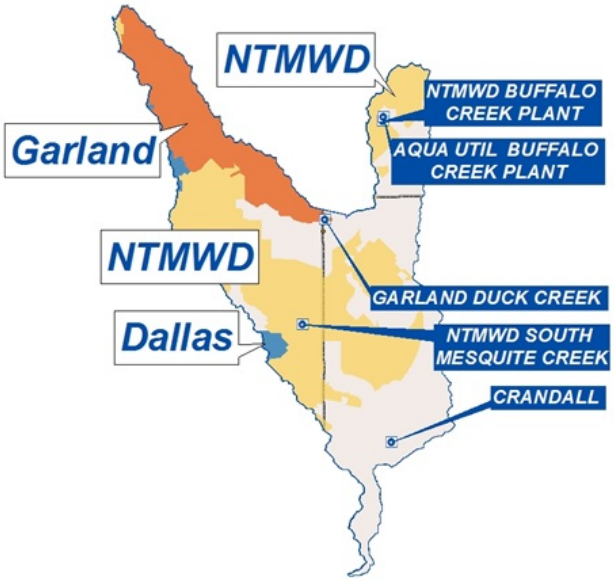
Land Use

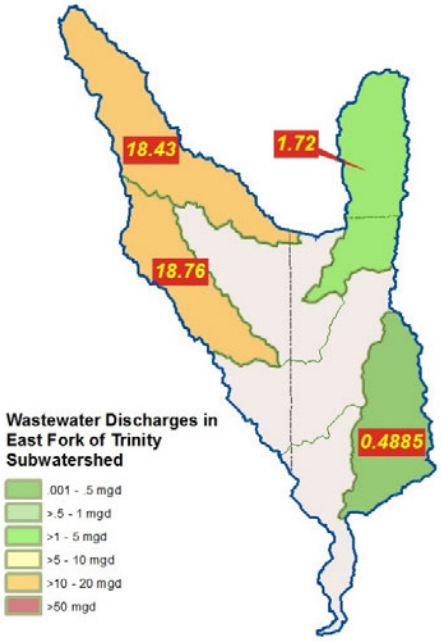
Almost half the area of the East Fork Watershed is within municipal boundaries, and nearly 50 percent of the watershed area is undeveloped. An additional 64,547 people are projected to live in the watershed by 2040.

Cities in Watershed



The East Fork below Lake Ray Hubbard Watershed comprises 149,020 acres and includes all or part of 13 incorporated cities. Among these cities are small portions of Combine, Seagoville and Balch Springs, parts of Garland, Rockwall, Mesquite and Sunnyvale, and all or most of Heath, Forney, Talty, Crandall, and Travis Ranch. Overall, the watershed is currently 50 percent urbanized.





Watershed Wastewater Service Providers

The East Fork below Lake Ray Hubbard Watershed is primarily served by North Texas Municipal Water District and the City of Garland. A small portion at the western edge of the watershed is served by the City of Dallas.

Watershed Wastewater Discharges – 01/2013 to 12/31/2013

Significant municipal wastewater discharges totaling over 32 MGD occur in the Duck Creek and South Mesquite Watersheds, although their contribution primarily affects the North Mesquite Creek and Mustang Creek Watersheds

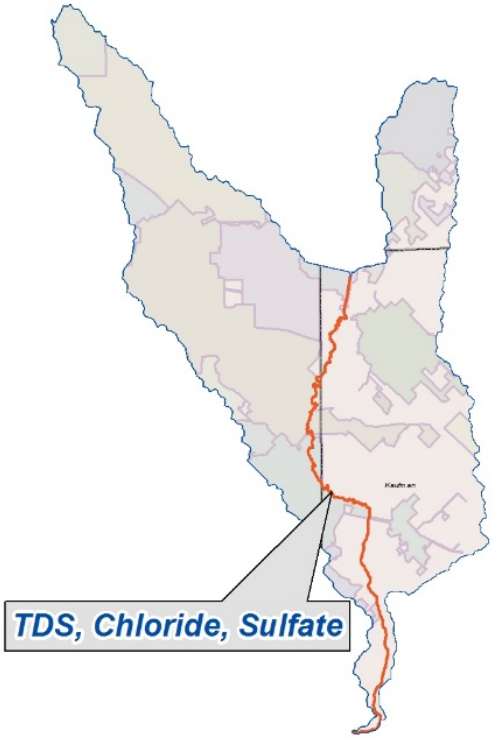
draining directly to the East Fork of the Trinity River. Overall, the wastewater treatment plants in this watershed discharged 57% of the permitted flows in 2013. Table 7 shows the permitted treatment capacity and discharge for each facility.

Table 7 – East Fork below Lake Ray Hubbard Watershed Treatment Capacity Utilization, by Plant

Wastewater Treatment Plant	Permitted Average Daily Flow, MGD	Average Daily Flow 2013, MGD	Percentage of Permitted Average Daily Flow
NTMWD S. MESQUITE CREEK	25	18.76	75%
GARLAND DUCK CREEK WWT	40	18.43	52%
NTMWD BUFFALO CREEK PLANT	2.5	1.7154	68%
AQUA UTIL BUFFALO CREEK PLANT	0.2	0	0%
CRANDALL WWTP	0.9	0.4885	54%
Watershed Totals	**68.6**	**39.39**	**57%**

Watershed Stream Impairments

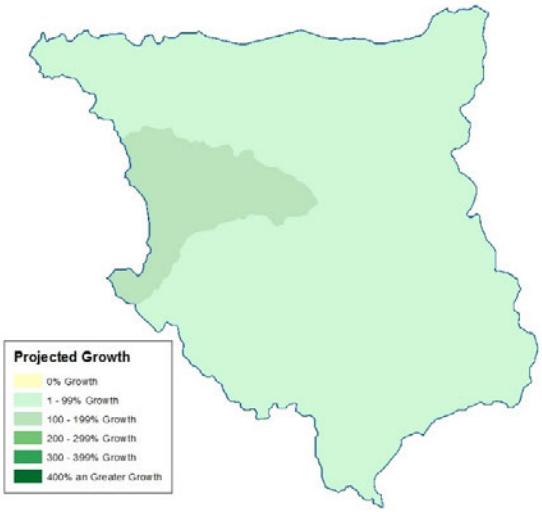
The East Fork of the Trinity River below Lake Ray Hubbard is listed as an impaired water body on the 2012 303(d) list. Buffalo and Duck Creeks were previously listed, but are no longer. The East Fork of the Trinity River is listed for chloride, sulfate, and total dissolved solids that are contaminants which may potentially be addressed in the stormwater programs of the contributing cities in the watershed.



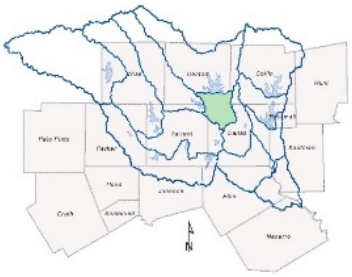
Status of Treatment Capacity Expansion within the Watershed

There are no known projects to expand wastewater capacity in this watershed.

Elm Fork Trinity Watershed



Projected Growth by Watershed



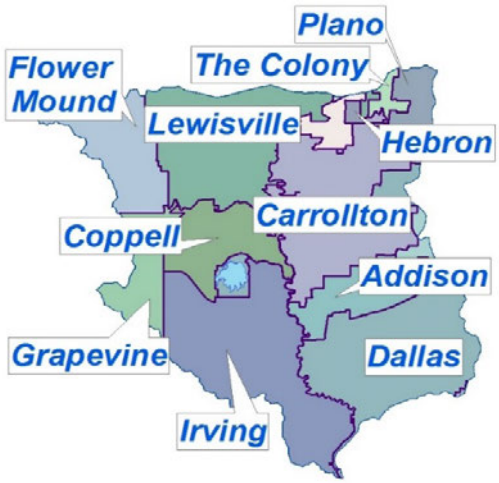
The Elm Fork Trinity watershed is projected to have growth in most of its eight watersheds. From its current estimated population of 661,757, the watershed's population is projected to grow to 945,583 by 2040, an overall population increase of 43 percent. Infill will account for most of the growth in this area, which is 98 percent urban as of 2010. Table 8 show the projected increase in population by subwatershed.

Table 8 – Elm Fork Trinity Subwatershed Population Projections

Elm Fork Trinity Subwatersheds	2013 Population	2040 Projected Population	Projected Population Growth 2013 - 2040
Bachman Branch-Elm Fork Trinity River	139,363	211,744	52%
Cottonwood Branch-Denton Creek	57,847	137,277	137%
Cottonwood Branch-Hackberry Creek	45,855	71,537	56%
Farmers Branch-Elm Fork Trinity River	78,340	103,846	33%
Grapevine Creek-Elm Fork Trinity River	74,818	87,576	17%
Indian Creek-Elm Fork Trinity River	117,089	157,078	34%
Prairie Creek-Elm Fork Trinity River	49,833	61,731	24%
Timber Creek	98,612	114,794	16%
Watershed Totals	**661,757**	**945,583**	**43%**

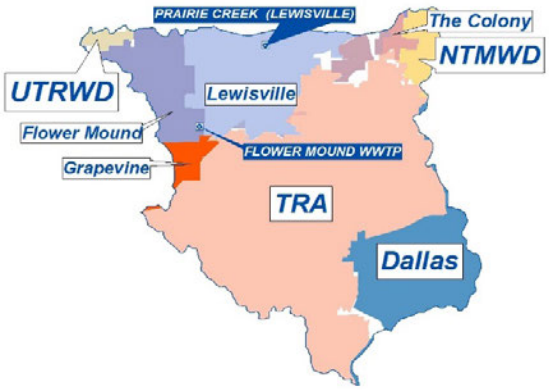
Land Use

Although the urban density within the Elm Fork Trinity Watershed is already high, developed land uses will increase by 14% between 2005 and 2010.



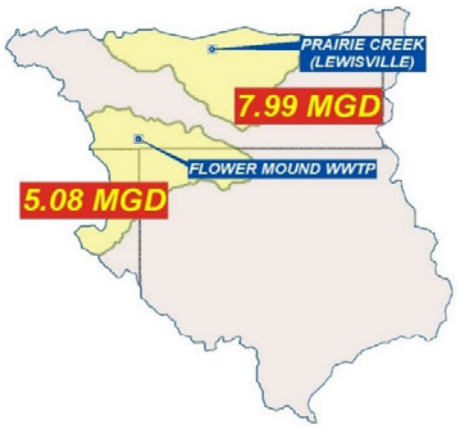
Cities in Watershed

There are 11 cities with all or a portion of their area in this watershed. Most of these cities participate in the NCTCOG's Regional Stormwater Management Program (RSWMP). The City of Irving is one of three Phase I communities within this watershed.



Watershed Service Providers

The Elm Fork Trinity Watershed is primarily served by TRA Central WWTP and the Dallas Central and Southside facilities, with the Upper Trinity River Water District (UTRWD) Lakeview and NTMWD Wilson Creek facilities at its margins.



Watershed Wastewater Discharges – 01/2013 to 12/31/2013

The municipal wastewater discharged in the Elm Fork Trinity Watershed comes from two facilities, the Lewisville Prairie Creek WWTP at 7.99 MGD and the Flower Mound WWTP at 5.08 MGD. These figures are the average of average daily flows for the 2012 reporting year, for a total of 13.08 MGD. The majority of municipal wastewater generated in the watershed goes south to the TRA Central WWTP and the Dallas Central WWTP, which are both outside of the Elm Fork Trinity watershed. This is one of a few watersheds with slightly greater wastewater throughput than the previous year. Table 9 shows the permitted treatment capacity and discharge for each facility. Overall, wastewater treatment plants in this watershed operated at 60% capacity during 2013.

Table 9 – Elm Fork Watershed Treatment Capacity Utilization, by Plant

Wastewater Treatment Plant	Permitted Average Daily Flow, MGD	Average Daily Flow 2013, MGD	Percentage of Permitted Average Daily Flow
FLOWER MOUND WWTP	10.00	5.08	51%
PRAIRIE CREEK (LEWISVILLE)	12.00	7.99	67%
Watershed Totals	**22.00**	**13.07**	**59%**

Watershed Stream Impairments

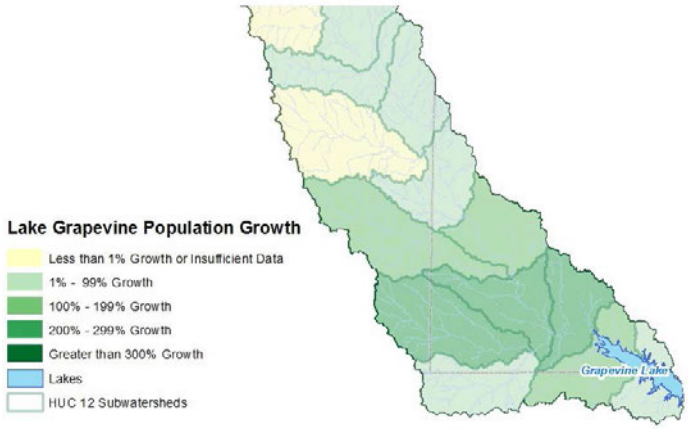
State studies indicate that two tributaries of the Elm Fork Trinity River are affected by high bacteria levels; Grapevine Creek and Cottonwood Branch. Their watersheds include land in the Cities of Grapevine, Coppell, and Irving, as well as the Dallas-Fort Worth International Airport.

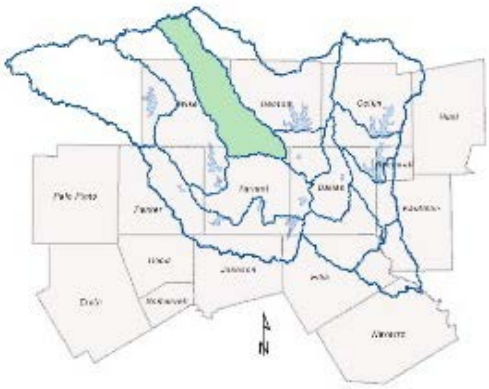
When pollutants such as bacteria reach high levels, the state, under the CWA, establishes a TMDL for that particular water body or stream segment. TMDLs are the maximum amount or load of a pollutant that a water body can receive and still maintain its uses (recreation, fish/wildlife habitat, etc.). The load is then allocated among the sources of pollution within the watershed and measures to reduce pollutant loads are developed as necessary. These measures are combined into an I-Plan, and developing them is a group effort, requiring participation from cities, businesses, and interest groups.

Reclaimed Water Use

The UTRWD contracts with Denton County Fresh Water Supply District #1A to supply up to two MGD of treated effluent from the City of Lewisville Wastewater Treatment Plant to the Castle Hills Golf Course in Carrollton for irrigation.

GRAPEVINE LAKE WATERSHED





PROJECTED GROWTH BY WATERSHED

The Grapevine Lake Watershed is projected to have population growth in all of the 14 subwatersheds for which population projections have been performed.[1] From its current estimated population of 170,667, the watershed is projected to grow to 306,105 by 2040, an overall population increase of 79 percent. In the Grapevine Lake watershed, which is less than 12 percent urbanized, very few entities are impacted by the TPDES stormwater permit.

Table 10 – Grapevine Lake Subwatershed Population Projections

Grapevine Lake Subwatersheds	2013 Population	2040 Projected Population	Projected Population Growth 2013 - 2040
Black Creek-Denton Creek	1,226	2,902	137%
Catlett Creek-Sweetwater Creek	3,243	8,088	149%
Denton Creek-Grapevine Lake	11,934	18,993	59%
Dove Creek-Grapevine Lake	46,546	61,061	31%
Elizabeth Creek-Denton Creek	8,731	13,688	57%
Harts Creek-Denton Creek	699	712	2%
Headwaters Elizabeth Creek	14,986	43,416	190%

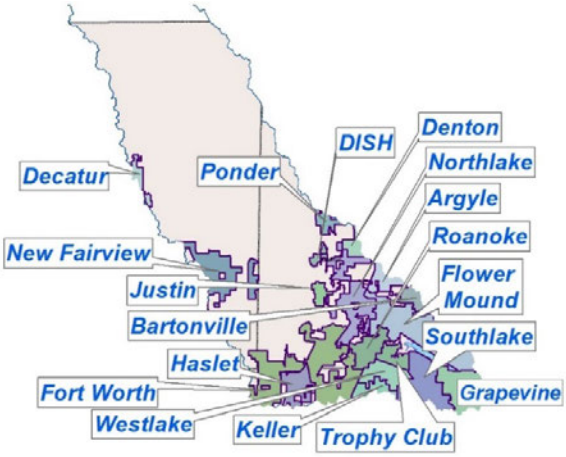
[1] There is insufficient data for subwatersheds lying above the Project Area (Montague, Cooke, and Grayson Counties): these areas are not covered in this plan.

Grapevine Lake Subwatersheds	2013 Population	2040 Projected Population	Projected Population Growth 2013 - 2040
Henrietta Creek	31,734	55,723	76%
Hog Branch-Denton Creek	6,867	11,707	70%
Marshall Branch-Grapevine Lake	35,103	71,957	105%
North Pecan Creek-Denton Creek	1,089	1,098	1%
Oliver Creek	5,725	11,986	109%
Panther Creek-Denton Creek	653	1,049	61%
Watershed Totals	**170,667**	**306,105**	**79%**

As population growth continues, the urbanized area will become larger. For now, the handful of cities in the watershed that have stormwater permits have to be mindful of impact to Lake Grapevine and implement management programs to address this. Table 10 shows current and projected populations for the Grapevine Lake Watershed.

Land Use

In 2005, land use within the watershed was primarily agricultural; approximately 31 percent of the watershed was developed. By 2010, the developed portions of the watershed had increased to 44 percent. The Grapevine Lake Watershed comprises 444,470 acres, although the subwatersheds at the northern reaches in Montague County are outside the NCTCOG's water quality management planning area. Only 14.5 percent of the area for which we have data is currently urbanized.

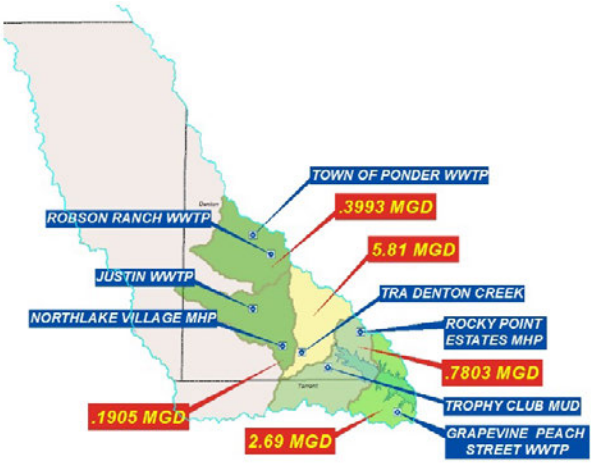


Cities in Watershed

The area includes all or part of 18 incorporated cities. Most of the cities are clustered in the southeast portion of the watershed, which is northwest of Grapevine.

CURRENT SERVICE PROVIDERS

The Grapevine Lake Watershed includes nine permitted wastewater dischargers, with over 80 percent of the permitted and actual 2013 discharges for two treatment facilities adjacent to the lake–the Grapevine Peachtree Plant and the Trinity River Authority's Denton Creek Plant. Although smaller plants such as Robson Ranch rapidly approaching their permitted discharge limits, the larger facilities are operating at about 50 percent of current capacity.



Watershed Wastewater Discharges – 01/2013 to 12/31/2013

Wastewater treatment services are limited to the southern portion of the Grapevine Lake Watershed, which generated about 9.9 MGD average daily flow in 2013. This represents an increase from the previous year (7.8 MGD), but is more consistent with 2011's 9.14 MGD. The majority of treated wastewater discharged in the watershed came from the Trinity River Authority's Denton Creek facility, (5.8 MGD), and the Grapevine WWTP (2.7 MGD).

Table 11 shows the wastewater treatment plants in the watershed, their 2013 discharges and current permitted average gallons per day. Overall, the Grapevine Lake Watershed wastewater treatment plants are discharging 49% of their permitted discharges.

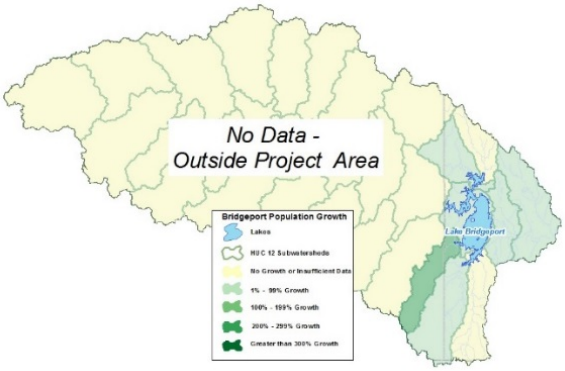
Table 11 – Grapevine Lake Watershed Treatment Capacity Utilization, by Plant

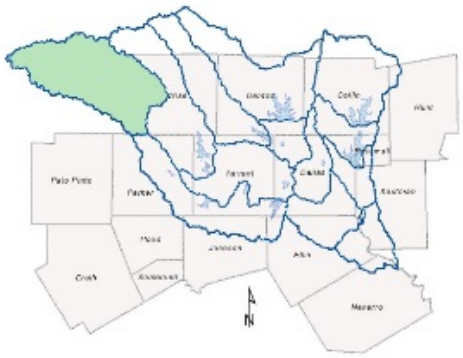
Wastewater Treatment Plant	Permitted Average Daily Flow, MGD	Average Daily Flow 2013, MGD	Percentage of Permitted Average Daily Flow
JUSTIN WWTP	0.4000	0.1804	45%
TOWN OF PONDER WWTP	0.2250	0.1566	70%
ALTA VISTA MHP WWTP	0.0080	0.0044	55%
ROBSON RANCH WWTP	0.3750	0.2100	56%
NORTHLAKE VILLAGE MHP WWTP	0.0250	0.0101	40%
TRA DENTON CREEK	11.5000	5.8072	50%
TROPHY CLUB MUD WWTP	1.7500	0.7803	45%
ROCKY POINT ESTATES MHP WWTP	0.0600	0.0000	0%
GRAPEVINE PEACH STREET WWTP	5.7500	2.6986	47%
Watershed Totals	**20.093**	**9.8476**	**49%**

Watershed Stream Impairments

Grapevine Lake, a long impoundment on the Denton Creek section that ultimately drains to the Elm Fork of the Trinity River, has one listed segment, the upper portion of the reservoir, on the 303(d) list as impaired for pH. Grapevine Lake is a U.S. Army Corps of Engineers lake that also features significant use for flood control and recreation. While Grapevine Lake is used to some extent as a water supply reservoir, it does not contribute as much to the regional water supply as some of the other reservoirs. The cities of Grapevine, Dallas, and Dallas County Park Cities are eligible to take a combined volume of 161,250 acre-feet from Grapevine Lake.

LAKE BRIDGEPORT WATERSHED





PROJECTED GROWTH BY WATERSHED

Lake Bridgeport Watershed is the uppermost impoundment on the West Fork of the Trinity River. Lake Bridgeport has received attention from recent watershed studies conducted as part of the 2010 Trinity River Basin Environmental Restoration Initiative. These studies focused on the impacts of sediment and nutrient loads to all of the impoundments on the Upper West Fork Trinity River.[2] Table 12 shows current and projected populations for the Lake Bridgeport Watershed, and projects a 39% increase in population for the portion of the watershed within project boundaries.

Table 12 – Lake Bridgeport Subwatershed Population Projections

Subwatershed Name	2013 Population	2040 Projected Population	Projected Population Growth 2013 - 2040
Big Creek-Lake Bridgeport	622	1361	119%
Boons Creek	950	2,330	145%
Cottonwood Creek-Big Creek	75	138	84%
Dry Creek-West Fork Trinity River	6,222	7,757	25%
Jasper Creek	682	1,000	47%
Lake Bridgeport	1,810	2,427	34%
Venchoner Creek	741	1,055	42%

[2] There is insufficient data for subwatersheds lying above the Project Area (Montague, Cooke, and Grayson Counties): these areas are not covered in this plan.

Subwatershed Name	2013 Population	2040 Projected Population	Projected Population Growth 2013 - 2040
Village Creek-West Fork Trinity River	1,474	1,510	2%
Willow Creek	1,530	2,097	37%
Watershed Totals	**14,106**	**19,675**	**39%**

Land Use

The watershed can be characterized as largely rural, with primarily ranchland and agricultural activities. Scattered coal mining and gravel pits have mostly reverted to undeveloped land.

Watershed Cities

Three of the four small cities in the Lake Bridgeport Watershed provide wastewater service.

Current Service Providers and 2013 Wastewater Discharges

There are four municipal wastewater treatment facilities in the Lake Bridgeport Watershed. The Runaway Bay, Chico, and Bridgeport facilities are adjacent to the lake, while the City of Jacksboro wastewater treatment plant is farther up in the watershed beyond the planning area. Wastewater discharges should not generate major impacts, although the level of nutrient loading may be an issue to consider in the future. Table 13 shows the wastewater treatment plants in the watershed, their 2013 discharges and current permitted average gallons per day. The average daily volume of the Runaway Bay, Bridgeport, and Chico treatment plants is 65% of their combined permitted volume.

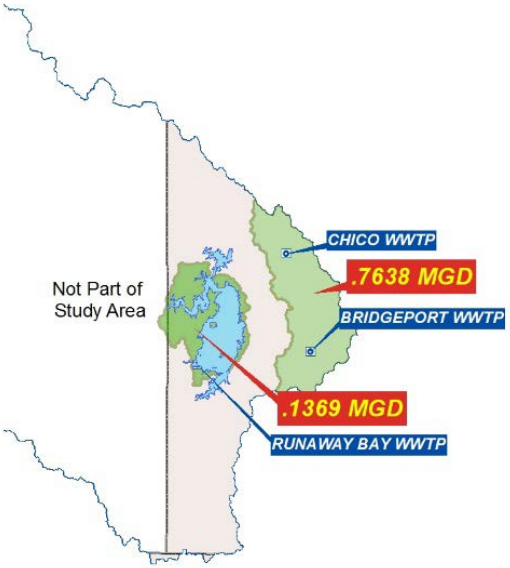


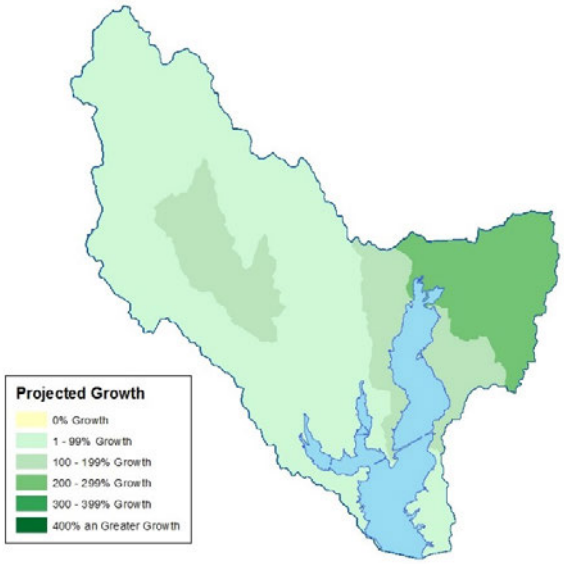
Table 13 – Lake Bridgeport Watershed Treatment Capacity Utilization, by Plant

Wastewater Treatment Plant	Permitted Average Daily Flow	Average Daily low 2013	Percentage of Permitted Average Daily Flow
RUNAWAY BAY WWTP	0.4	0.1369	34%
JACKSBORO WWTP	N/A	N/A	N/A
BRIDGEPORT WWTP	0.84	0.6489	77%
CHICO WWTP	0.15	0.115	76%
Watershed Totals	**1.39**	**0.9008**	**65%**

Watershed Stream Impairments

Sand and gravel pit operations could become significant contributors of sediment loading, but most are located in watersheds that drain to waterways below the Lake Bridgeport dam and not into the reservoir itself. Additional development in the watershed and recreational uses may contribute additional loading. The West Fork of the Trinity River below Bridgeport Reservoir is an impaired water with high levels of bacteria.

LAKE RAY HUBBARD WATERSHED



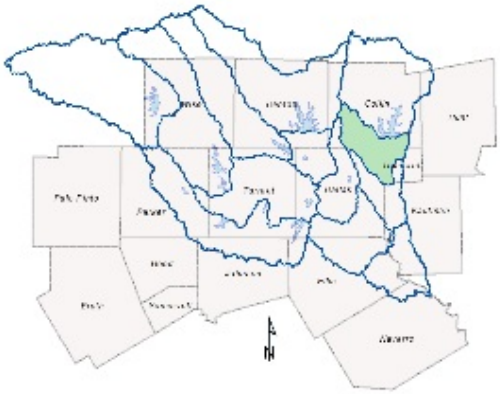


Table 14- Lake Ray Hubbard Subwatershed Population Projections

Subwatershed Name	2013 Population	2040 Projected Population	Projected Population Growth 2013 - 2040
Brown Branch Rowlett Creek	87,150	217,516	150%
Camp Creek-Lake Ray Hubbard	12,105	36,825	204%
Cottonwood Creek-East Fork Trinity River	65,494	141,172	116%
Headwaters Rowlett Creek	121,408	167,221	38%
Muddy Creek-Lake Ray Hubbard	99,334	165,322	66%
Pittman Creek-Spring Creek	155,361	187,872	21%
Rowlett Creek-East Fork Trinity River	24,687	34,048	38%
Rowlett Creek-Lake Ray Hubbard	93,253	95,765	3%
Town of Allen-Cottonwood Creek	65,499	80,351	23%
Watershed Totals	**724,291**	**1,126,092**	**55%**

Projected Growth by Watershed

The nine subwatersheds of the Lake Ray Hubbard watershed are projected to have population growth, with the greatest growth occurring in the Camp Creek and Brown Branch watersheds surrounding Lake Lavon to the northeast of the City of Rockwall. From its current estimated population of 724,291 the population is projected to grow to 1,126,092 by 2040. Lake Ray Hubbard is the primary water supply reservoir on the East Fork Trinity River. It was originally designed to provide water to the North Texas region, with a storage capacity of approximately 490,000 acre-feet. Table 14 shows current and projected populations for the Lake Ray Hubbard Watershed, and projects a 55% increase in population from 2013 to 2040.

In addition to water coming from its watershed and lake releases from Lake Lavon, Lake Ray Hubbard also receives water from lakes in East Texas—Lake Tawakoni and Lake Fork—with plans to connect with Lake Palestine in the near future. Lake Ray Hubbard therefore represents the cornerstone of water supply reservoirs for Dallas and the customers of the Dallas system.

Land Use

Lake Ray Hubbard is a major drinking water source in North Central Texas and has nine cities in its watershed. The 193,036 acre Lake Ray Hubbard watershed is currently 91 percent urban land uses – the management of stormwater discharges is extremely important to maintaining the long term water quality in this watershed.

Watershed Cities

The watershed includes all or part of 19 incorporated cities. The cities of Sachse, Wylie, Murphy, Parker, and St. Paul are entirely within the watershed while significant portions of Richardson, Plano, Allen, Frisco, and Garland occupy nearly half the watershed. Most of the cities in this watershed fall in the Dallas-Fort Worth-Arlington UA boundary and are actively participating in the NCTCOG's Regional Stormwater Management Program. Garland and Plano are both Phase I, which means because of their size, they are required to follow a wet weather sampling program to demonstrate the quality of their stormwater runoff.

Wastewater Discharges and Current Service Providers

The Lake Ray Hubbard watershed receives wastewater flows from seven WWTPs generating a total of 36 MGD on average for 2013. This represents about 57 percent of permitted average daily flow overall. The northern portion of this watershed hosts five NTMWD WWTPs which generate the majority of the watersheds wastewater flows, to which the Garland Rowlett Creek WWTP added 14 MGD on average during 2013. Table 15 shows the wastewater treatment plants in the watershed, their 2013 discharges and current permitted average gallons per day.

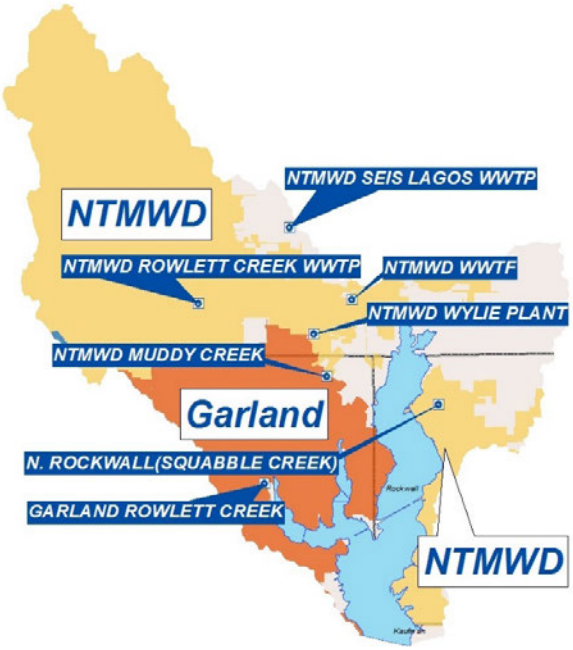


Table 15 - Lake Ray Hubbard Watershed Treatment Capacity Utilization, by Plant

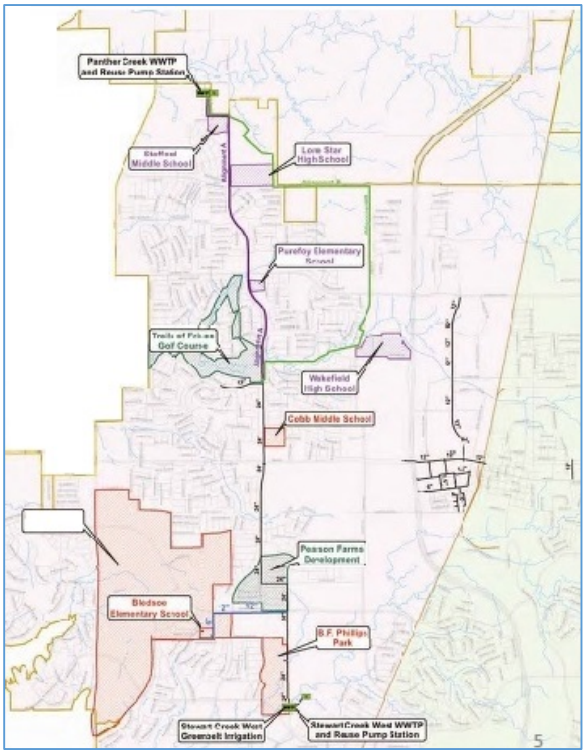
Wastewater Treatment Plant	Permitted Average Daily Flow	Average Daily Flow 2013	Percentage of Permitted Average Daily Flow
NTMWD ROWLETT CREEK WWTP	16	13.63	85%
NTMWD SEIS LAGOS WWTP	0.25	0.1817	73%
NTMWD WYLIE PLANT	*Retired* 0.00%		
NTMWD MUDDY CREEK REGIONAL WWTP	20	6.82	34%
NORTH ROCKWALL (SQUABBLE CREEK)	1.2	1.02	85%
GARLAND ROWLETT CREEK PLANT	24	13.98	58%
NTMWD WWTF	0.15	0	0%
Watershed Totals	**63.6**	**35.63**	**56%**

Watershed Stream Impairments

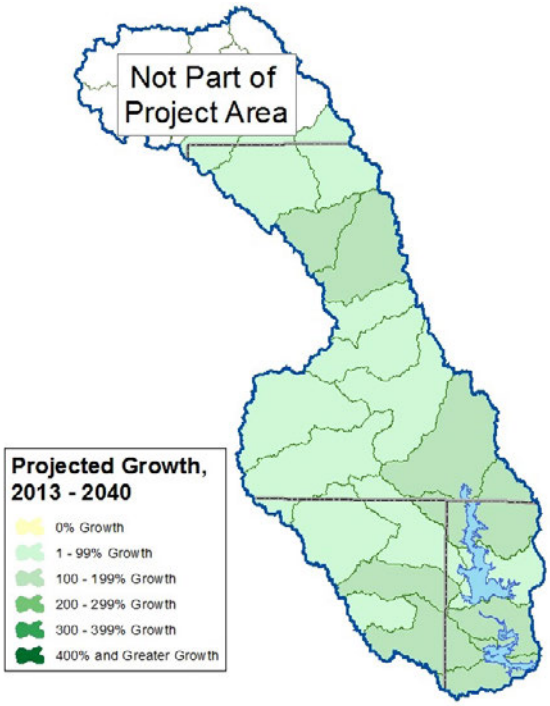
There are currently no impaired waters in the Lake Ray Hubbard Watershed

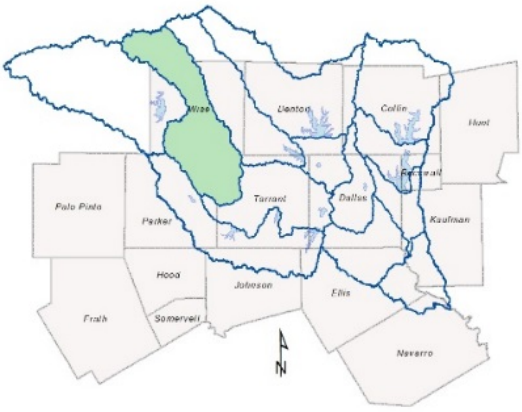
Watershed Wastewater Recycling

The City of Frisco uses a portion of the effluent of both the Panther Creek and Stewart Creek WWTPs for irrigation at area golf courses and public facilities. The figure to the right diagrams the flow of reclaimed water to its final users.



LAKE WORTH AND EAGLE MOUNTAIN LAKE WATERSHED





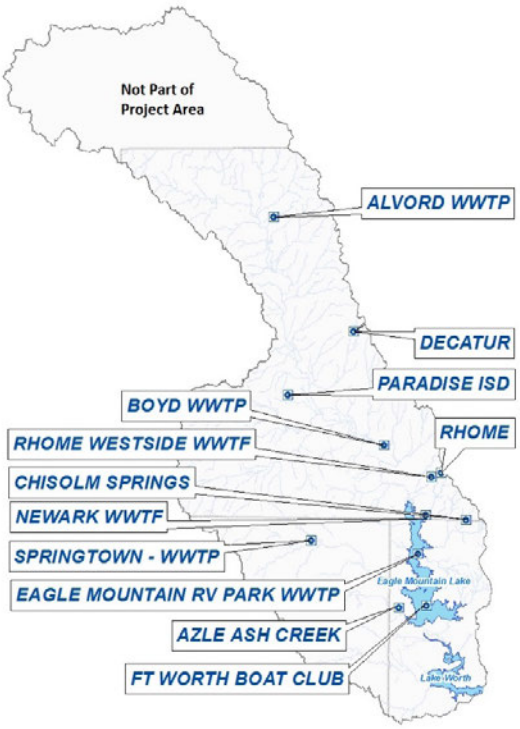
PROJECTED GROWTH BY WATERSHED

Lake Worth is the impoundment of the West Fork Trinity River in Fort Worth. It was constructed in 1914 by Fort Worth for water supply. Lake Worth and Eagle Mountain Lake operate in tandem to contribute significant drinking water resources for the Fort Worth system. Eagle Mountain Lake is owned by the Tarrant Regional Water District (TRWD). The TRWD is permitted to divert approximately 160,000 acre-feet of water annually for municipal and irrigation purposes.

The Lake Worth and Eagle Mountain Lake Watershed is projected to have population growth in all of its 20 watersheds. From its current estimated population of 168,984, the region is projected to grow to 345,654 by 2040. Two subwatersheds, Lower Brushy Creek and Pringle Creek, are projected to experience little growth during the same period. Table 16 shows current and projected populations for the Lake Worth and Eagle Mountain Lake Watershed, and projects a 105% increase in population from 2013 to 2040.

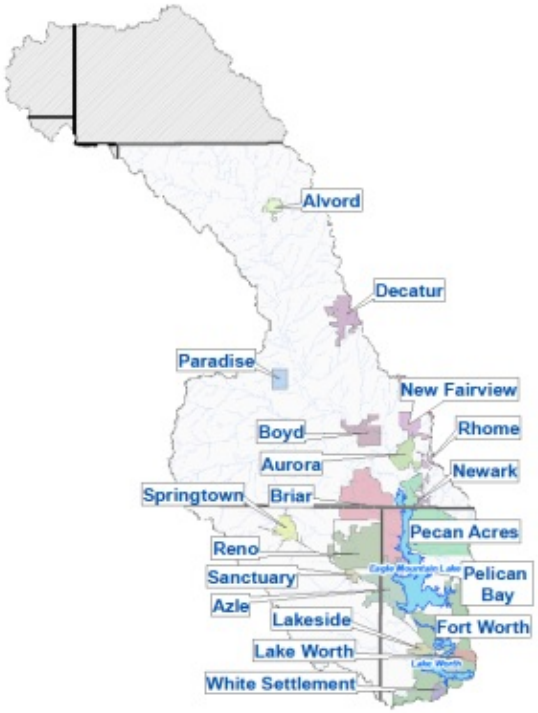
Table 16 – Lake Worth / Eagle Mountain Lake Subwatershed Population Projections

Subwatershed Name	2013 Population	2040 Projected Population	Projected Population Growth
Ash Creek	13,325	32,424	143%
Blue Creek-Eagle Mountain Lake	9,964	27,180	173%
Briar Branch-Big Sandy Creek	1,950	4,615	137%
Chicken Creek-Big Sandy Creek	2,057	4,869	137%
Cowskin Creek-Big Sandy Creek	148	229	55%
Dosier Creek-Eagle Mountain Lake	18,691	27,533	47%
Garrett Creek	3,919	4,430	13%
Headwaters Silver Creek	3,469	6,095	76%
Indian Creek-Eagle Mountain Lake	14,270	37,183	161%
Live Oak Creek	18,366	44,801	144%
Lower Brushy Creek	1,519	1,550	2%
Lower Walnut Creek	18,430	28,885	57%
Martin Branch-West Fork Trinity Branch	4,882	6,706	37%
Pringle Creek-Big Sandy Creek	1,392	1,507	8%
Salt Creek	5,219	6,724	29%
Silver Creek-Lake Worth	11,275	25,808	129%
Upper Walnut Creek	12,009	18,734	56%
Waggoner Branch-Big Sandy Creek	3,582	4,317	21%
Walnut Creek-West Fork Trinity River	4,559	5,958	31%
West Fork Trinity-Lake Worth	19,958	56,106	181%
Watershed Total	**168,984**	**345,654**	**105%**



Cities in Watershed

The Lake Worth and Eagle Mountain Watershed encompasses 567,829 acres, of which 505,424 lie within the project area. Only 57,368 acres (11%) are currently devoted to urban uses. The watershed includes all or part of 19 incorporated cities, and two Census Defined Places, Briar CDP and Pecan Acres CDP. Small portions of Weatherford and Fort Worth, as well as all or most of Lake Worth, Lakeside, Springtown, Aurora, Rhome, Boyd, Paradise, Decatur, and Alvord are cities in this primarily rural watershed.

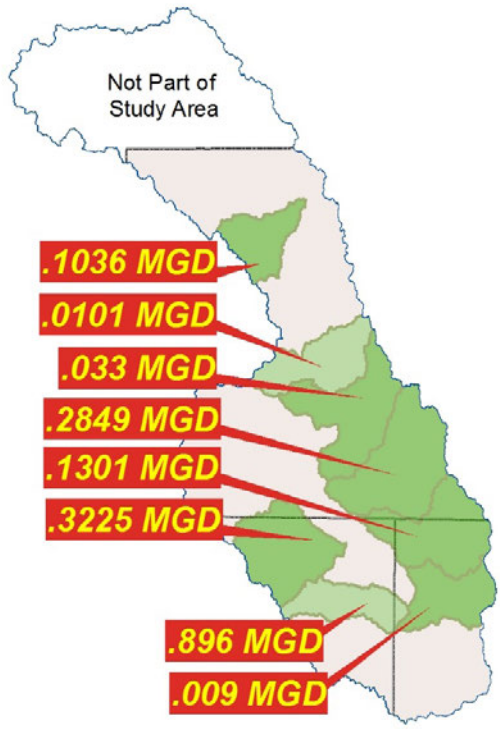


Current Service Providers

The upper reaches of the Lake Worth/Eagle Mountain Lake watershed are served by individual municipal systems in Chico, Alvord, Boyd, Springtown and Decatur. Below Lake Worth a significant area is served by Fort Worth, and a smaller part by the TRA's Denton Creek facility.

Table 17 – Lake Worth / Eagle Mountain Lake Treatment Capacity Utilization, by Plant

Wastewater Treatment Plant	Permitted Average Daily Flow	Average Daily Flow 2013	Percentage of Permitted Average Daily Flow
PARADISE ISD WWTF	0.03	0.033	110%
SPRINGTOWN WWTP	0.48	0.3225	67%
DECATUR WWTP	1.2	0.6732	56%
EAGLE MOUNTAIN RV PARK	0.006	0.012	200%
FORT WORTH BOAT CLUB	0.0158	0.009	57%
NEWARK WWTF	0.1	0.0848	85%
RHOME WESTSIDE WWTF	0.15	0.1553	104%
RHOME	0.08	0	0
ALVORD WWTP	0.112	0.1036	93%
BOYD WWTP	0.12	0.1296	108%
CHISHOLM SPRINGS WWTP	0.225	0.0333	15%
AZLE ASH CREEK WWTP	2.45	0.896	37%
Watershed Totals	**4.9688**	**2.4523**	**49%**



Watershed Wastewater Discharges – 01/2013 to 12/31/2013

The Lake Worth - Eagle Mountain Lake watershed receives the discharges of 12 small wastewater treatment facilities, with only one approaching a MGD average in 2012: Azle Ash Creek WWTP at .896 MGD. Paradise Independent School District, Eagle Mountain RV Park, Rhome Westside and Boyd are all exceeding their permitted capacity according to the available records, with a total average daily volume of 23,900 gallons per day. The exceedance amounts to about one percent of average daily flow in the watershed.

Table 17 shows the wastewater treatment plants in the watershed, their 2013 discharges and current permitted average gallons per day.

WATERSHED STREAM IMPAIRMENTS

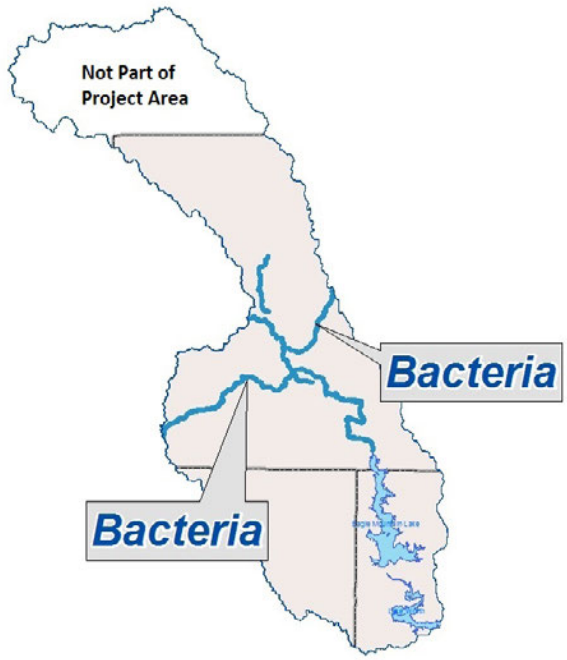
Currently, bacteria in the West Fork Trinity River and its tributaries are at levels that require their inclusion in the 303(d) list of impaired waters. Just downstream of Lake Worth, the West Fork is listed for high levels of dioxin and PCBs.

The levels of PCBs in fish tissue have made fish from Lake Worth off limits for consumption since 2000. The TCEQ issued a TMDL for PCBs that went into effect August 23, 2006. Even though PCBs have not been manufactured or used in the United States for decades, PCB contamination leaching from lake and stream sediments will continue for years.

Although an I-Plan for the TMDL for PCBs in fish tissue in Lake Worth was approved by the TCEQ in 2006, fish contamination remains too high to allow for human consumption. An advisory against consuming blue catfish, channel catfish, and smallmouth buffalo from Lake Worth was issued by the Texas Department of Social and Health Services on November 15, 2010 due to elevated levels of PCBs along with the insecticides aldrin and dieldrin in fish samples collected from the lake. This advisory replaced a 2000 advisory that warned against consuming all species of fish.

Lake Worth Vision Plan

The Fort Worth City Council adopted the Lake Worth Vision Plan on May 10, 2011. The Lake Worth Vision Plan describes and depicts the most appropriate future land use, development patterns and forms, recreational use, and facilities on and around Lake Worth. The Plan is based on the following four principles to guide future decision-making for Lake Worth:

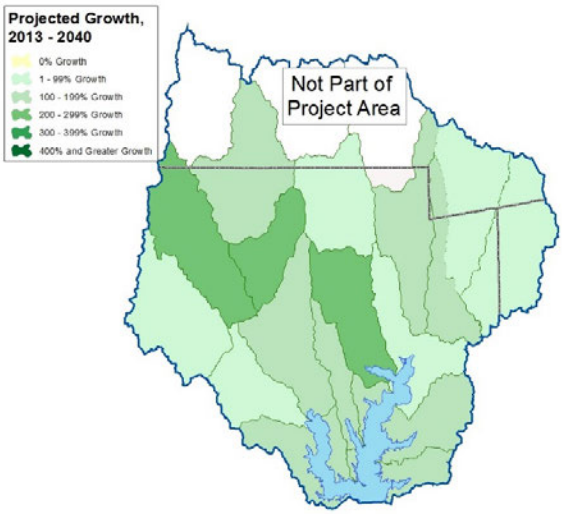


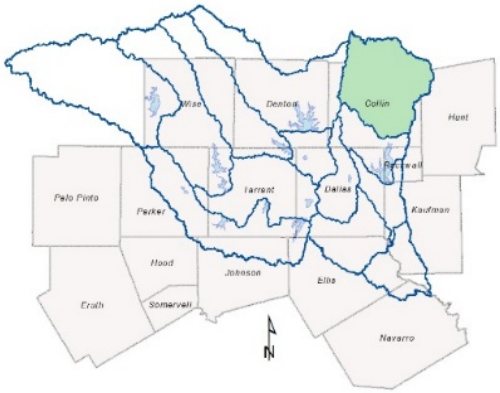
- Protect and enhance Lake Worth's water quality, natural beauty, and recreational character.
- Develop model sustainable communities in the Lake Worth area that create desirable places to live and work while enhancing livability of existing communities.
- Create Lake Worth Regional Park, a linear park that encompasses the lake and provides high-quality recreational amenities and cultural hubs.
- Connect communities, resources, and amenities with parkways, greenways, and trails.

Eagle Mountain Lake Watershed Protection Plan

The Tarrant Regional Water District and Texas AgriLife Research and Extension Service are working together with watershed stakeholders to develop a Watershed Protection Plan for the Eagle Mountain Lake watershed. The development of this plan was initiated in 2008 in response to future concerns over nutrient and sediment loadings in the lake. The TRWD and Texas AgriLife seek to change landowner land management practices to reduce these pollutant loadings in Eagle Mountain Lake.

LAKE LAVON WATERSHED





PROJECTED POPULATION GROWTH, 2013 – 2040

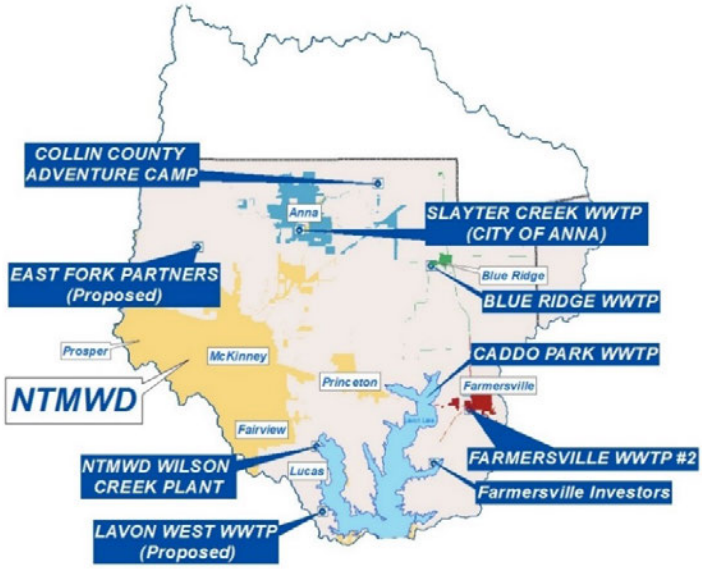
Lake Lavon was constructed by the USACE in 1954 for flood control and water conservation. The purpose of Lake Lavon is to provide protection to the East Fork of the Trinity River with a 35 year occurrence flood protection. At total storage capacity, Lake Lavon holds 245 billion gallons of water. The Lake Lavon watershed will experience high growth in most of its 16 watersheds, with over 200% growth in Honey Creek, Stiff Creek, and Throckmorton Creek watersheds. Depicted in Table 18, its current estimated population of 226,605, the region is projected to grow to 464,722 by 2040, an overall growth rate of 105 percent. No subwatersheds are projected to lose population during the same period. This watershed is projected to double in population between 2013 and 2040, contributing almost 240,000 additional people.

Table 18 – Lake Lavon Subwatershed Population Projections

Subwatershed Name	2013 Population	2040 Projected Population	Projected Population Growth 2013 - 2040
Arnold Creek	1,512	2,049	36%
Clemons Creek-E. Fork Trinity River	24,239	54,242	124%
Desert Creek-Pilot Grove Creek	3,349	6,709	100%
Elm Creek-Lavon Lake	8,728	25,419	191%
Headwaters Sister Grove Creek	3,942	7,564	92%
Honey Creek	7,541	26,674	254%
Lower Wilson Creek	58,399	88,632	52%
Pot Rack Creek-Indian Creek	1,047	2,127	103%
Price Creek-Lavon Lake	4,254	10,852	155%
Sister Grove Creek-Pilot Grove Creek	4,427	7,437	68%
Stiff Creek-Sister Grove Creek	5,439	17,488	222%
Throckmorton Creek-E. Fork Trinity	10,879	33,364	207%
Ticky Creek-Lavon Lake	10,439	24,643	136%
Upper Wilson Creek	58,171	102,942	77%
White Rock Creek-Lavon Lake	23,884	53,633	125%
Whites Creek-East Fork Trinity	355	947	167%
Watershed Total	**226,605**	**464,722**	**105%**

Land Use

Land use throughout the watershed is predominantly agricultural/undeveloped, interspersed with small cities. The southwestern portion of the watershed is currently primarily urbanized, and from this area population growth spreads to the north, on both the east and west sides of Lake Lavon. The Lake Lavon Watershed encompasses 491,719 acres, of which about 200,671 acres (41 percent) were devoted to urban land uses in 2010. The subwatersheds at the northern reaches of the watershed are in Grayson and Fannin Counties, outside the planning boundary.

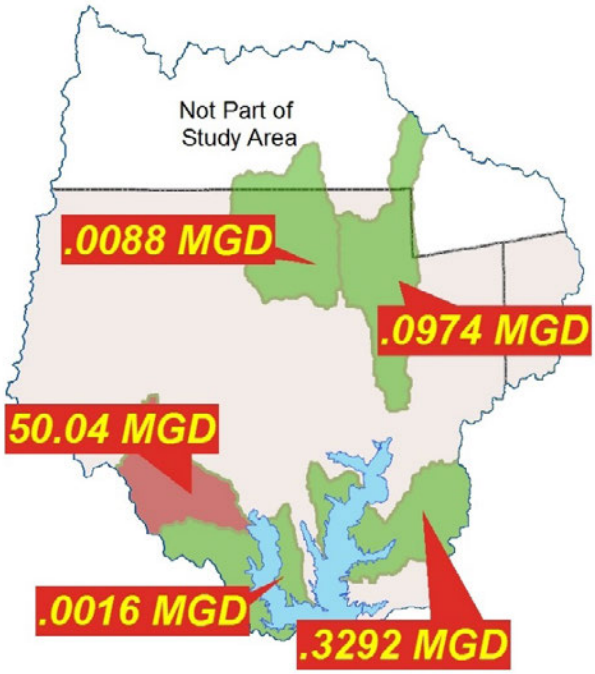


Cities in Watershed

The Lake Lavon watershed includes all or part of 17 incorporated cities. The subwatersheds projected to experience the greatest growth surround the cities of Anna and Melissa, and the area east of Princeton and north of Lake Lavon.

Current Service Providers

The Lake Lavon watershed is served by a number of North Texas Municipal Water District facilities including Wilson Creek, Anna, and Farmersville wastewater treatment facilities. In addition to these facilities, there are three campgrounds operating their own wastewater treatment facilities.



Watershed Wastewater Discharges – 01/2013 to 12/31/2013

The Lake Lavon watershed receives the discharges of seven WWTPs, of which three are small park plants. There are two to three additional wastewater treatment facilities planned, although the largest proposed facility, the planned 2.5 MGD East Fork Partners Plant in Weston, may join the North Texas Municipal Water District. The only large wastewater treatment plant discharging in the Lake Lavon watershed is NTMWD's Wilson Creek Plant.

As shown in Table 19, the Lake Lavon Watershed is currently at about 75% treatment capacity utilization.

Table 19 – Lake Lavon Watershed Treatment Capacity Utilization, by Plant

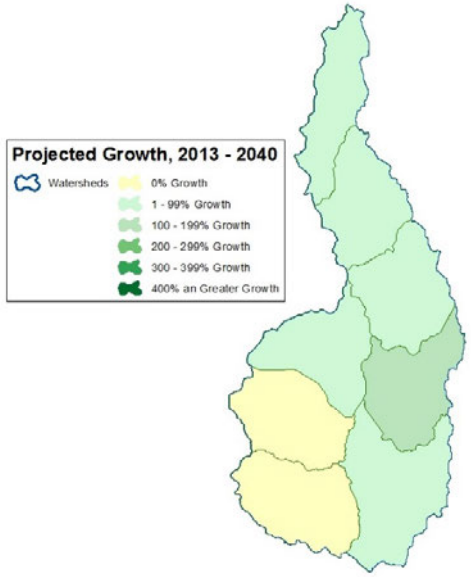
Wastewater Treatment Plant	Permitted Average Daily Flow, MGD	Average Daily Flow 2013, MGD	Percentage of Permitted Average Daily Flow
NTMWD Wilson Creek WWTP	64	50.0449	78%
BLUE RIDGE WWTP	0.28	0.0974	38%
FARMERSVILLE WWTP #2	0.53	0.3292	86%
FARMERSVILLE WWTP	0.2250	Permit active but no flow since 2007	
FARMERSVILLE INVESTORS WWTP (PROPOSED)	0.0000	Outfall listed, but no flow	
EAST FORK PARTNERS (PROPOSED)	2.5000	Proposed, but appears will go to NTMWD	
Watershed Totals	**67.535**	**50.4715**	**75%**

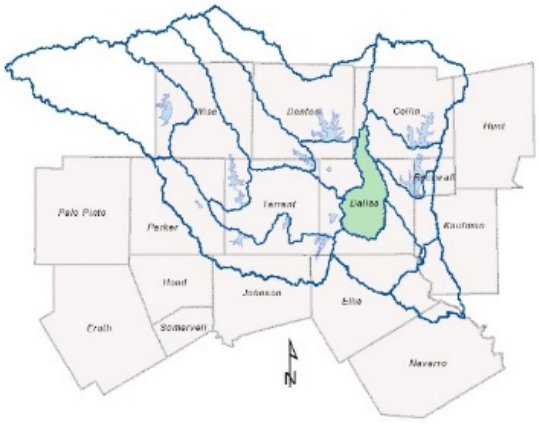
WATERSHED STREAM IMPAIRMENTS

From 2000 to 2002, Lake Lavon was listed on the TCEQ's 303d impaired list for Atrazine. The issue was solved when Texas State Soil and Water Conservation Board along with Collin County Soil and Water Conservation Board implemented a variety of BMPs in the surrounding watershed. The remediation was very successful and Lavon was delisted for Atrazine in 2004.

Other concerns in 2002 and 2004 were depressed dissolved oxygen and levels of nitrate + nitrite nitrogen in certain parts of the lake. These are concerns, but there is not sufficient information to require a TMDL. The East Fork Trinity River above Lake Lavon is listed as impaired for bacteria as is Wilson Creek.

TRINITY RIVER HEADWATERS WATERSHED





PROJECTED POPULATION GROWTH, 2013 - 2040

The Trinity River Headwaters Watershed is so called because it begins the main stem of the Trinity River, just past the junction of the Elm and the West Fork Trinity. This watershed also receives the drainage from White Rock Lake.

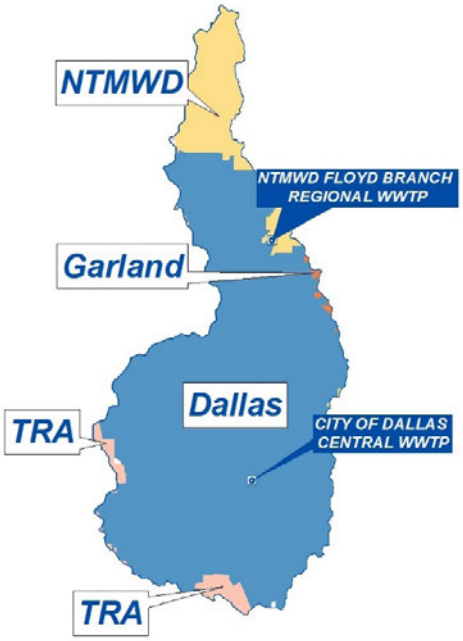
The population of the Trinity Headwaters Watershed is projected to increase by almost half in seven of its eight watersheds. From its current estimated population of 1,210,497, the region is projected to grow to 1,567,666 by 2040, an overall growth rate of 30 percent. Two subwatersheds are projected to lose population during this period, although at about one percent each, the effect is minimal. Because of the current high population density in this watershed, it is not surprising that the Trinity Headwaters is one of four watersheds that are projected to provide 25 percent of the regions 2013 to 2040 growth, amounting to 357,169 additional people. Table 20 highlights these changes.

Table 20 – Trinity Headwaters Subwatersbed Population Projections

Subwatershed Name	2013 Population	2040 Projected Population	Projected Growth 2013 - 2040
City of Dallas-White Rock Creek	158,860	450,371	184%
Headwaters Five Mile Creek	140,335	139,382	0%
Five Mile Creek-Trinity River	90,936	112,522	24%
Turtle Creek-Trinity River	163,655	161,394	0%
Headwaters Turtle Creek	159,512	228,287	43%
White Rock Creek-White Rock Lake	196,588	302,076	54%
Floyd Branch-White Rock Creek	163,784	218,127	33%
Headwaters White Rock Creek	136,827	203,655	49%
Watershed Totals	**1,210,497**	**1,815,814**	**50%**

Cities in Watershed

The City of Dallas occupies the majority of the watershed, with portions of 11 other cities making up the rest of the watershed.



Current Service Providers

The Trinity Headwaters are served entirely by NTMWD, TRA, and the City of Dallas Central and Southside WWTPs. The City of Garland provides wastewater treatment to a small area at the eastern edge of the watershed.

Watershed Wastewater Discharges – 01/2013 to 12/31/2013

The watershed's two wastewater treatment facilities generated a total average daily flow of approximately 96 MGD during 2013. Shown in Table 21, this represents 62 percent of the watershed's permitted 155 MGD average daily flow.

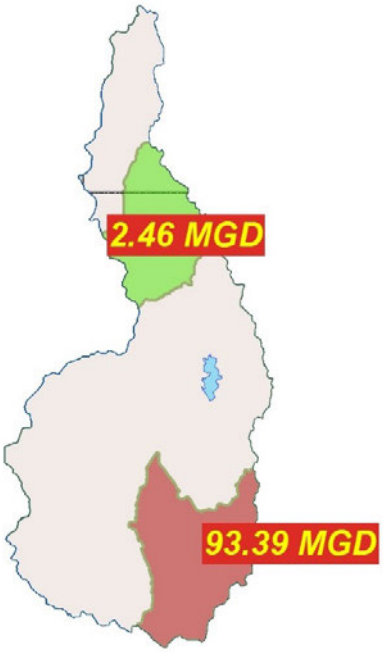


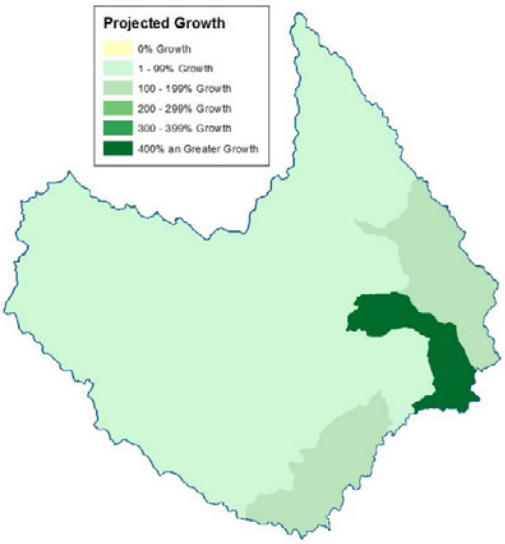
Table 21 - Trinity Headwaters Watershed Treatment Capacity Utilization, by Plant

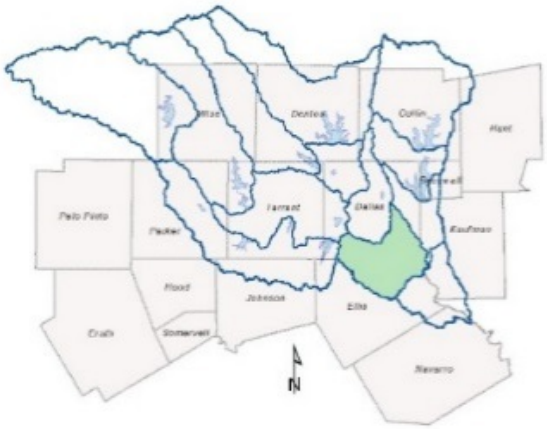
Wastewater Treatment Plant	Permitted Average Daily Flow, MGD	Average Daily Flow 2013, MGD	Percentage of Permitted Average Daily Flow
NTMWD FLOYD BRANCH WWTP	4.75	2.46	52%
DALLAS CENTRAL WWTP	150	93.39	62%
Watershed Totals	**154.75**	**95.85**	**62%**

WATERSHED STREAM IMPAIRMENTS

State studies indicate that the headwaters of the Trinity River, also known as the Upper Trinity (Segment 0805), are impacted by high bacteria levels along a section that runs from the confluence of the Trinity's West Fork and Elm Fork in Dallas, downstream to Five Mile Creek, and its confluence with the Trinity River. Segment 0805 is also impaired for PCBs and dioxin. Since the City of Dallas occupies most of the area within this segment's watershed, its stormwater program and implementation of BMPs have the greatest influence on reducing pollutants from runoff. The Cities of University Park, Highland Park, and Cockrell Hill are also located along this segment.

TEN MILE CREEK / RED OAK CREEK WATERSHED





PROJECTED POPULATION GROWTH - 2013 – 2040

The Ten Mile Creek / Red Oak Creek Watershed drains across southern Dallas and northern Ellis Counties. It is comprised of a group of tributaries to the Trinity River below Dallas, as well as the Main Stem of the Trinity River running through southeast Dallas County.

This watershed is projected to experience growth in all 11 subwatersheds, with a 408 percent growth rate in the Lower Red Oak Creek subwatershed. From its current estimated population of 415,796, the area is projected to grow to 501,779 by 2040, an overall increase of 21 percent, as shown in Table 22.

Table 22 – Ten Mile Creek / Red Oak Creek Subwatershed Population Projections

Subwatershed Name	2013 Population	2040 Projected Population	Projected Growth 2013 - 2040
Deep Branch-Tenmile Creek	26,138	42,099	61%
Headwaters Red Oak Creek	41,935	54,202	29%
Headwaters Tenmile Creek	131,634	144,164	10%
Hickory Creek-Parsons Slough	50,541	55,848	11%
Lower Grove Creek	3,660	7,567	107%
Lower Red Oak Creek	1,208	6,139	408%
Middle Red Oak Creek	30,123	42,101	40%
Parsons Slough-Trinity River	7,205	14,595	103%
Prairie Creek-Trinity River	89,092	93,886	5%
Upper Grove Creek	9,942	11,962	20%
Upper Red Oak Creek	24,318	29,216	20%
Watershed Totals	**415,796**	**501,779**	**21%**

Watershed Cities

There are portions of 19 cities in the Ten Mile Creek / Red Oak Creek Watersheds. The cities in the watershed are primarily suburban, but it also contains several rural cities.

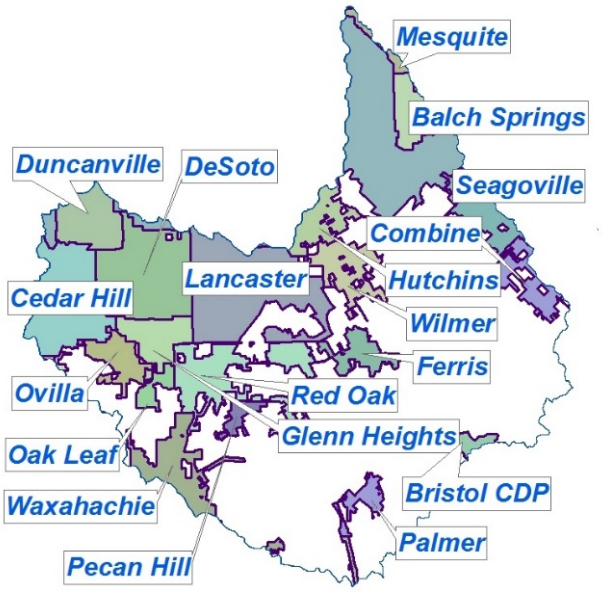
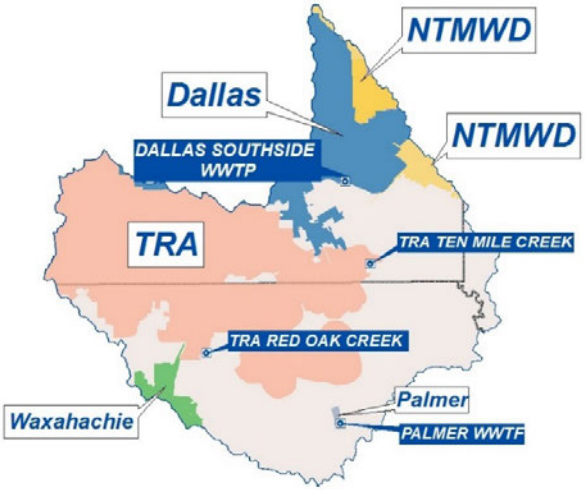


Table 23 - Ten Mile / Red Oak Creek Watershed Treatment Capacity Utilization, by Plant

Wastewater Treatment Plant	Permitted Average Daily Flow, MGD	Average Daily Flow 2013, MGD	Percentage of Permitted Average Daily Flow
TRA RED OAK CREEK REGIONAL WWTF	6	3.24	54%
PALMER WWTF	0.23	0.2074	90%
SOUTHSIDE WWTP (DALLAS)	110	55.79	51%
TRA TEN MILE CREEK	24	14.74	61%
Watershed Totals	140.23	73.9774	53%

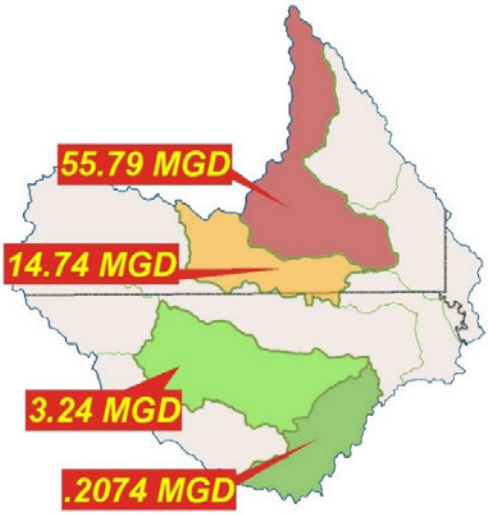
Current Service Providers

Ten Mile Creek / Red Oak Creek Watershed is currently served by the TRA's Ten Mile Creek and Red Oak Creek facilities, the City of Dallas Southside WWTP, and by municipal systems in Waxahachie and Palmer.



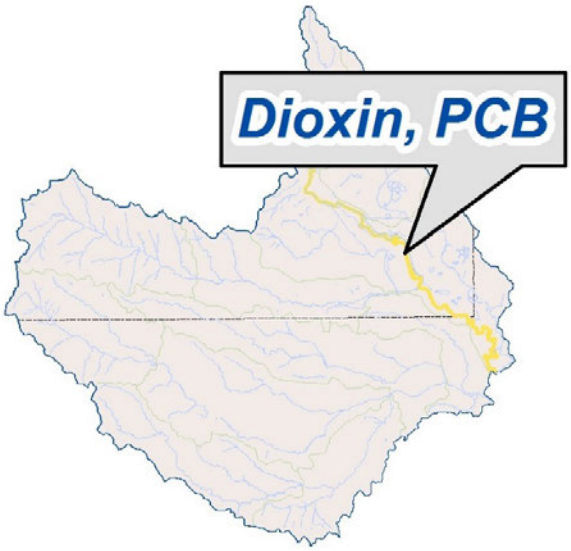
Watershed Wastewater Discharges – 01/2013 to 12/31/2013

As shown in Table 23, the largest wastewater discharges in the watershed occurred in the Prairie Creek subwatershed (approximately 56 MGD) and the Deep Branch/Ten–Mile Creek subwatershed (approximately 15 MGD) during 2013.

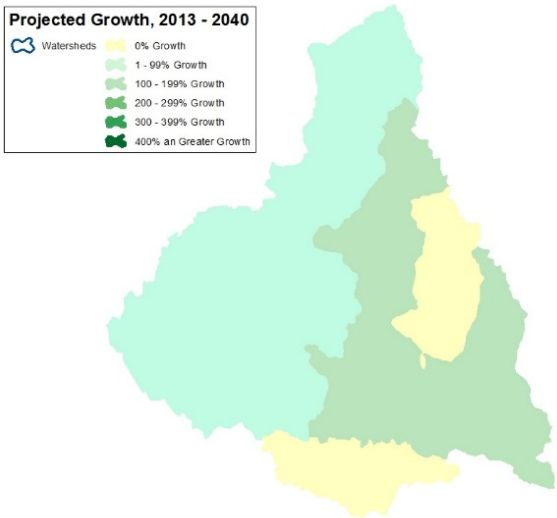


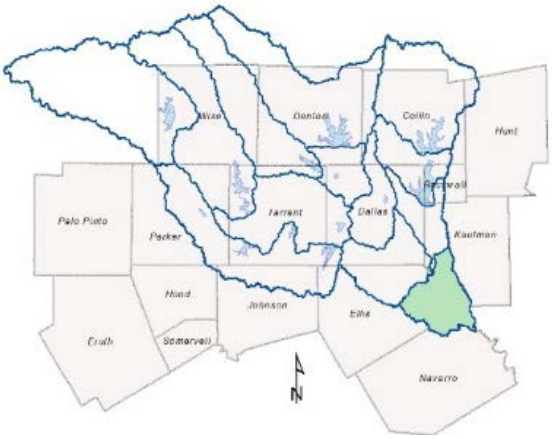
WATERSHED STREAM IMPAIRMENTS

The Trinity River in this watershed is impaired for PCBs and dioxin from a point immediately upstream of the confluence of the Cedar Creek Reservoir discharge canal in Henderson/Navarro County to the confluence of Five Mile Creek with the Trinity River.



TRINITY BELOW DALLAS WATERSHED





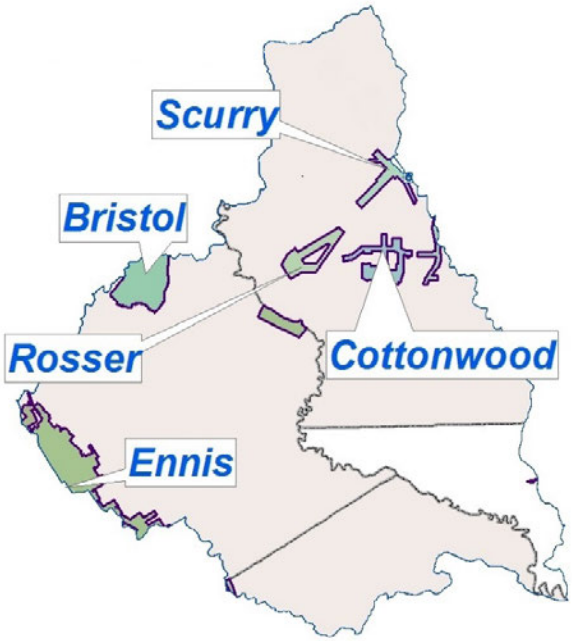
PROJECTED POPULATION GROWTH, 2013 – 2040

Table 24 –Trinity below Dallas Subwatershed Population Projections

Subwatershed Name	2013 Population	2040 Projected Population	Projected Growth 2013 - 2040
Bois d'Arc Creek-Trinity River	9,764	25,086	157%
Caney Creek-Trinity River	2,060	5,223	154%
Coal Iron Creek-Cottonwood Creek	3,038	7,703	154%
Headwaters Bois d'Arc Creek	3,664	3,669	0%
Headwaters Old Channel [East Fork Trinity River]	3,133	6,249	99%
Old Channel East Fork Trinity River-Trinity River	1,390	2,735	97%
Smith Creek-Trinity River	1,742	2,281	31%
Town of Chatfield-Grays Creek	693	1,185	71%
Walker Creek-Village Creek	9,831	11,372	16%
Watershed Totals	**35,315**	**65,503**	**85%**

The Trinity below Dallas Watershed is not densely populated. The increase in population is projected to be 85% between 2013 and 2040; that will mount to 30,188 additional people at 2040.

The small cities in the watershed are expected to grow modestly, with the principal impact of wastewater flows coming from onsite sewage systems. Table 24 illustrates the projected population increase for these subwatersheds.

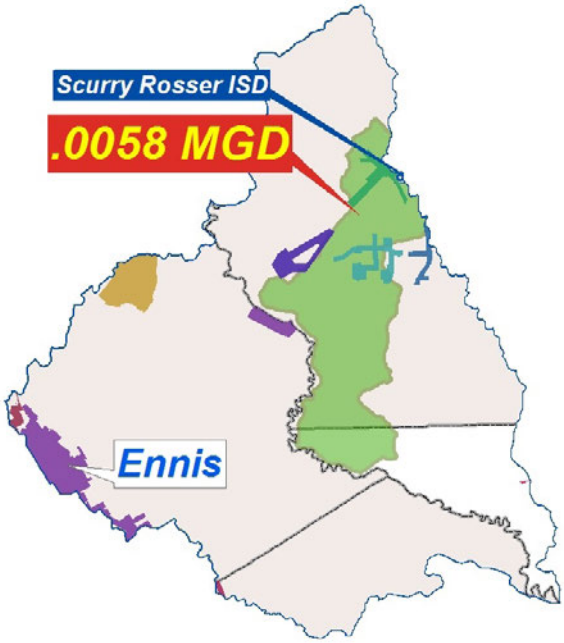


Watershed Cities

The Trinity River below Dallas watershed is a rural area. Ennis is the principal city in the watershed, along with all or parts of rural cities including Cottonwood, Scurry, Rosser, and Bristol.

Current Service Providers

Only the Scurry-Rosser Independent School District (ISD) and the Ennis Oak Grove WWTP serve the Trinity below Dallas watershed area. Of these two, only Scurry-Rosser ISD's discharge is within the Trinity below Dallas watershed. The Ennis service area extends into the southwest corner of the watershed, but the Oak Grove WWTP does not discharge wastewater into the watershed



Watershed Wastewater Discharges – 01/2013 to 12/31/2013

The only municipal wastewater discharge in the Trinity below Dallas watershed is from the Scurry- Rosser ISD.

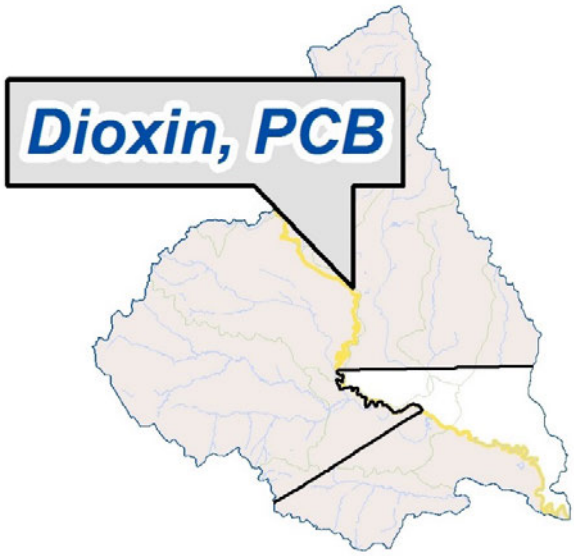
As indicated in Table 25, the treatment capacity available within the Trinity below Dallas watershed was only being 15 percent utilized, but this figure does not take into account the flow to the Ennis Oak Grove WWTP, which lies outside the watershed. The Ennis plant operated in 2013 at 93 percent of its currently permitted capacity. The watershed is primarily served by on-site sewage systems.

Table 25 –Trinity below Dallas Watershed Treatment Capacity Utilization

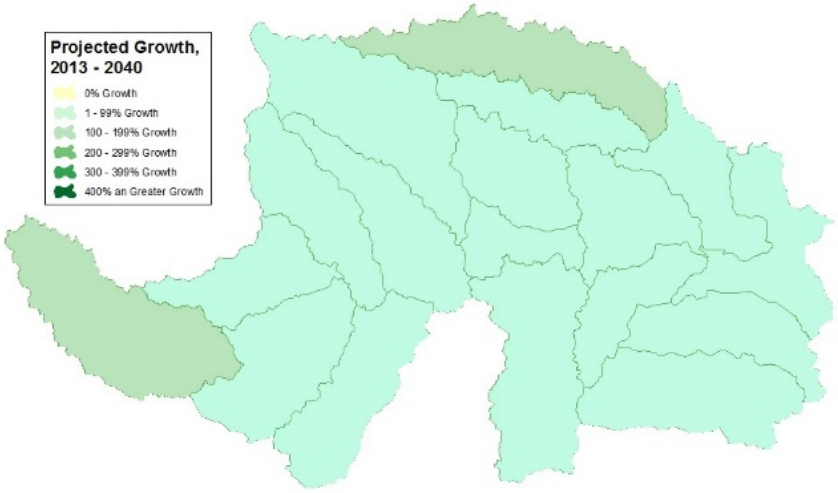
Wastewater Treatment Plant	Permitted Average Daily Flow, MGD	Average Daily Flow 2013, MGD	Percentage of Permitted Average Daily Flow
SCURRY ROSSER ISD WWTP	0.04	0.0058	14.50
Watershed Total	**0.04**	**0.0058**	**14.50**

WATERSHED STREAM IMPAIRMENTS

The entire length of the Trinity River in this watershed is impaired for PCBs and dioxin, likely the result of activities upstream rather than local impacts.



WEST FORK TRINITY WATERSHED



Growth - 2013 – 2040

The West Fork of the Trinity watershed is projected to have strong growth in all but three of its 18 Watersheds. From its current estimated population of 1,882,102, the region is projected to grow to 2,674,470 by 2040, an overall growth rate of 42 percent**.** The West Fork of the Trinity watershed is among the four watersheds that are projected to provide 25 percent of the regions 2013 to 2040 growth, contributing a projected population increase of 792,368, as illustrated in Table 26.

Projected Population

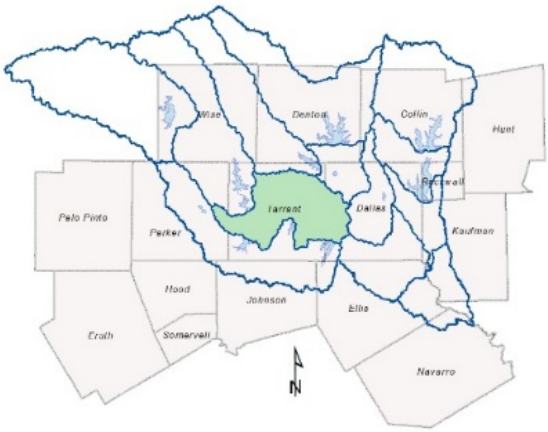
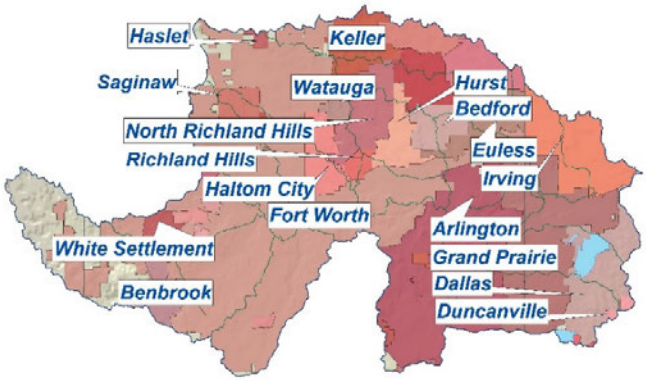


Table 26 - Trinity West Fork Subwatershed Population Projections

Subwatershed Name	2013 Population	2040 Projected Population	Projected Population Growth 2013 - 2040
Big Bear Creek	98,379	285,720	190%
Cottonwood Creek-Mountain Creek Lake	104,493	108,127	3%
Delaware Creek-West Fork Trinity River	104,542	131,518	26%
Estelle Creek-Bear Creek	69,337	88,404	28%
Farmers Branch-West Fork Trinity River	83,172	120,747	45%
Fish Creek-Mountain Creek Lake	154,581	175,089	13%
Headwaters Sycamore Creek	162,335	174,022	7%
Headwaters Walker Branch	109,590	136,125	24%
Johnson Creek	84,671	104,736	24%
Johnson Creek-West Fork Trinity River	95,351	175,110	84%
Lake Como-Clear Fork Trinity River	132,912	203,085	53%
Little Bear Creek	91,470	134,244	47%
Marine Creek-West Fork Trinity River	96,105	134,790	40%
Marys Creek	40,050	108,670	171%
Rush Creek-Village Creek	164,177	232,732	42%
Sycamore Creek-West Fork Trinity River	85,194	109,943	29%
Walker Branch-West Fork Trinity River	29,664	50,978	72%
Whites Branch-Big Fossil Creek	176,079	200,430	14%
Watershed Totals	**1,882,102**	**2,674,470**	**42%**

CITIES IN WATERSHED

Portions of 18 cities make up this watershed encompassing much of the mid-cities region between Dallas and Fort Worth. This large watershed is predominantly suburban, with a wide variety of development patterns, and a population of approximately 1.9 million.

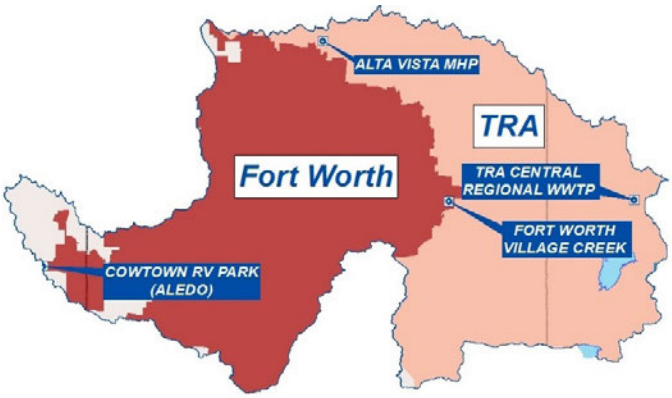


Current Service Providers

The West Fork of the Trinity watershed is broadly served by the Fort Worth Village Creek and Trinity River Authority Central Regional wastewater treatment plants. At the edges of the watershed are two very small plants at the Alta Vista Mobile Home Park and Cowtown RV Park.

Watershed Wastewater Discharges – 01/2013 to 12/31/2013

The West Fork of the Trinity contains two large wastewater discharges from plants that treat water generated from within and outside the watershed. Both the Fort Worth Village Creek and TRA Central wastewater treatment plants discharge an average daily flow of 107 MGD and 136 MGD, respectively.



The watershed's treatment capacity utilization is 69 percent of permitted average daily flow. The TRA Central Regional plant is the largest WWTP in the watershed, and is currently discharging about 72 percent of its permitted average daily flow. Table 27 details each plant's permit and 2013 discharge.

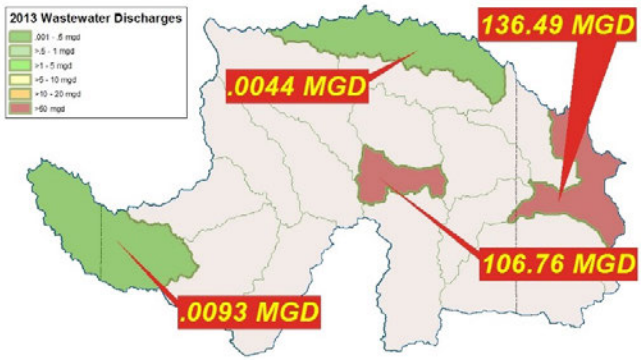


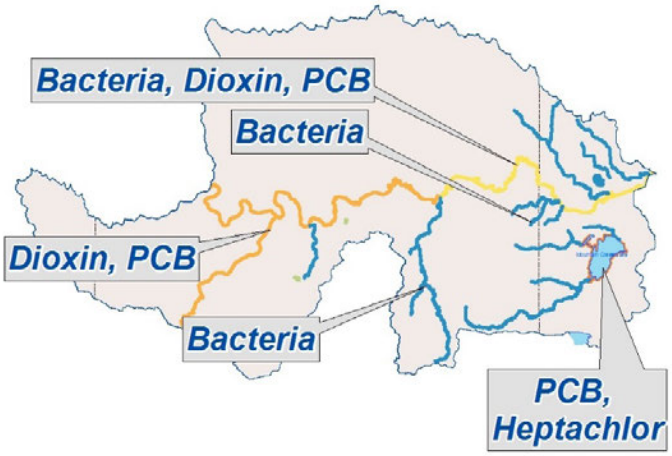
Table 27 - Trinity West Fork Watershed Treatment Capacity Utilization, by Plant

Wastewater Treatment Plant	Permitted Average Daily Flow, MGD	Average Daily Flow 2013, MGD	Percentage of Permitted Average Daily Flow
ALTA VISTA MHP WWTP	0.008	0.0044	55%
CITY OF FORT WORTH VILLAGE CREEK	166	106.76	64%
COWTOWN RV PARK WWTF (ALEDO)	0.0216	0.0093	43.%
TRA CENTRAL REGION WASTEWATER	189	136.4864	72%
Watershed Total	**355.0296**	**243.2601**	**69%**

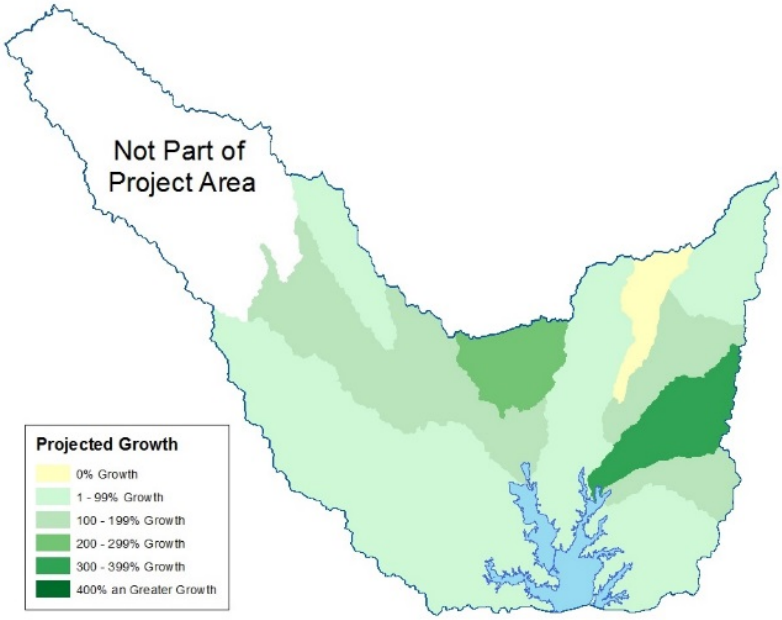
The watershed's treatment capacity utilization is approximately 69 percent of permitted average daily flow. The TRA Central Regional plant is the largest WWTP in the watershed, and is currently discharging 72 percent of its permitted average daily flow.

Current Known Impairments to Watershed Water Quality

The West Fork of the Trinity River is impaired by bacteria; the portion included in the I-Plan is segment 0841. In addition to the river segment, there are 11 tributaries that are also impaired for bacteria. They are: Bear Creek, Arbor Creek, Copart Branch, Mountain Creek, Dalworth Creek, Delaware Creek, Estelle Creek, Johnson Creek, Kee Branch, Rush Creek, Village Creek, and West Irving Creek. Also impaired for bacteria but not covered under the current I-Plan are Cottonwood Creek, Fish Creek, Kirby Creek, Crockett Branch, and Vilbig Lakes. The West Fork Trinity is also impaired for PCBs and dioxin. Mountain Creek Lake, once listed as impaired for multiple legacy pollutants, is now listed as impaired for only PCBs.



LEWISVILLE LAKE WATERSHED



Projected Population Growth 2010 – 2040

The Lewisville Lake watershed is projected to have growth in most of its 18 Watersheds. From its current estimated population of 443,926 the region is projected to grow to 715,371 by 2040, an overall increase of 61 percent. The watershed is anticipated to add 271,445 people by 2040, as shown in Table 28.

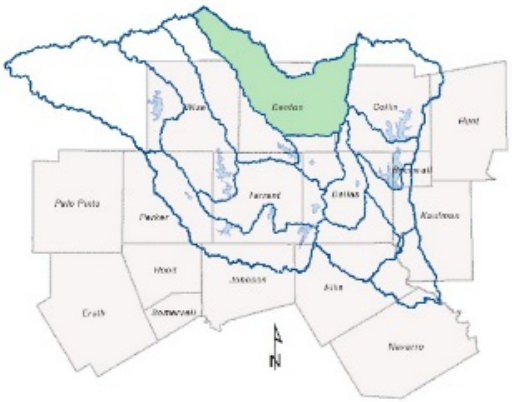


Table 28 - Lewisville Lake Subwatershed Population Projections

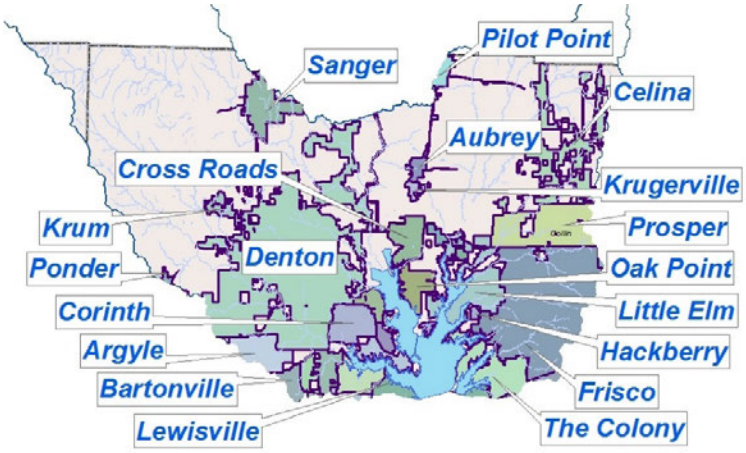
Subwatershed Name	2013 Population	2040 Projected Population	Projected Population Growth 2013 - 2040
Buck Creek-Clear Creek	3,336	7,867	136%
Cottonwood Branch-Little Elm Res.	62,143	111,289	79%
Culp Branch-Elm Fork Trinity River	4,703	17,393	270%
Doe Branch-Little Elm Reservoir	14,468	67,273	365%
Harmony Ranch-Little Elm Res.	3,912	9,259	137%
Headwaters Hickory Creek	4,779	6,231	30%
Headwaters Little Elm Creek	842	1,425	69%
Little Duck Creek-Duck Creek	4,626	5,090	10%
Lower Hickory Creek	54,256	54,560	Roughly 0%
Milam Creek-Clear Creek	5,536	12,896	133%
Moores Branch-Clear Creek	8,278	20,764	151%
Mustang Creek	10,508	17,807	69%
Panther Creek-Little Elm Res.	25,202	55,353	120%
Pecan Creek	6,851	12,461	82%
Pecan Creek-Little Elm Res.	117,126	151,344	29%
Running Branch-Little Elm Res.	12,319	16,046	30%
South Hickory Creek	3,690	6,237	69%
Stewart Creek-Little Elm Res.	80,976	109,199	35%
Town of Celina-Little Elm Res.	4,574	12,224	167%
Upper Hickory Creek	15,801	20,653	31%
Watershed Totals	**443,926**	**715,371**	**61%**

Land Use

Roughly 16.3 percent of the Lake Lewisville watershed is currently urbanized. The areas excluded from this figure are north of our planning boundary. Much of the Lewisville Watershed lies within the Denton and Dallas Fort Worth Urbanized Areas, yet the northern reaches are primarily agricultural and pasture land. Due primarily to residential development pressures, this watershed will experience growth over the next 30 years.

Cities in Watershed

Portions of 19 cities lie within the Lewisville Lake watershed. Many of these cities are relatively small in population today; Denton, Frisco, and Lewisville are currently the largest cities in the watershed.



Current Service Providers

Table 29 - Lewisville Lake Watershed Treatment Capacity Utilization, by Plant

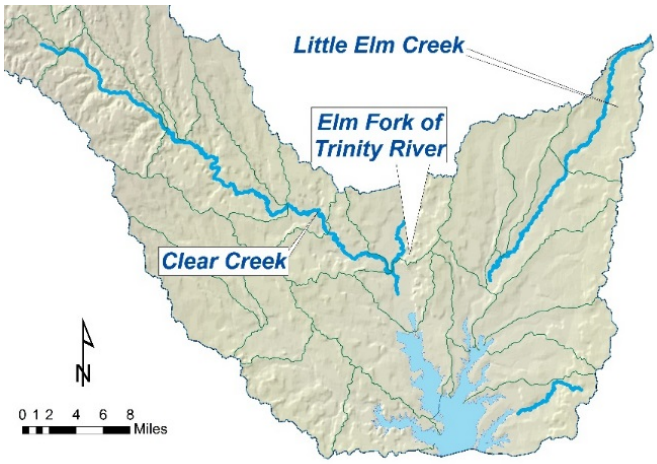
Wastewater Treatment Plant	Permitted Average Daily Flow, MGD	Average Daily Flow 2013, MGD	Percentage of Permitted Average Daily Flow
SLIDELL ISD WWTP	0.02	0.0025	13%
KRUM WWTP	0.137	0.0172	13%
SANGER WWTP	2	0.714	36%
BRAIRWOOD WWTP	0.005	0.0022	44%
DENTON PECAN CREEK PLANT	21	14.42	69%
UTRWD LAKEVIEW REGIONAL PLANT	7.5	4.45	59%
UTRWD PENINSULA REG REC PLANT	0.94	0.2695	29%
TOWN OF LAKEWOOD VILLAGE WWTF	0.1	0.0645	65%
HIDDEN COVE PARK WWTP	0.016	0.0076	48%
HACKBERRY WWTP	0.71	0.2469	35%
TOWN OF LITTLE ELM WWTF	4	2.39	60%
UTRWD DOE BRANCH REG WATER REC PLANT	2	0	0
THE COLONY STEWART CREEK PLANT	4.5	3.90	87%
TOWN OF PROSPER WWTP	0.556	0	0.00
NTMWD PANTHER CREEK WWTP	10	4.44	44%
NTMWD STEWART CREEK WEST PLANT	5	3.03	61%
COTTONWOOD CREEK WWTP	0.3	0.2585	86%
CELINA WWTP	0.5	0.622	124%
UTWRD RIVERBEND	5.7	0.4006	7%
AUBREY WWTP	0.4	0.1849	46%
Watershed Totals	**65.38**	**35.44**	**54%**

Watershed Wastewater Discharges – 01/2013 to 12/31/2013

As shown in Table 29, the Lewisville Lake watershed receives significant wastewater discharges from both regional wastewater treatment plants (UTRWD Lakeview and Riverbend; NTWMD Panther Creek and Stewart Creek) and municipal systems, of which the largest contributor was Denton's Pecan Creek WWTP. Discharge volumes in 2010 from those five plants totaled nearly 30 MGD. Essentially all of the significant publicly owned treatment works dischargers within the Lewisville Lake watershed have permit limits for selected nutrients. Several of the wastewater treatment facilities have plans for expansion or construction is underway.

The Lewisville Lake watershed includes 24 permitted wastewater discharges, most of which serve the more developed areas adjacent to the lake. Of the approximately 65 MGD permitted within the Lewisville Lake watershed, nearly 80 percent is allocated to the five largest wastewater treatment plants adjacent to the lake, including: Denton Pecan Creek Plant, NTMWD's Stewart Creek West Plant, UTRWD's Lakeview Regional Plant, NTMWD Panther Creek Plant, and The Colony Stewart Creek Plant. Discharge volumes in 2013 from those five plants totaled nearly 30 MGD. Essentially all of the significant publicly owned treatment works dischargers within the Lewisville Lake watershed have permit limits for selected nutrients. Several of the wastewater treatment facilities have plans for expansion or construction is underway.

LEWISVILLE LAKE EAST WATERSHED GREENPRINT



NCTCOG contracted with the Trust for Public Land (TPL) in 2010 to Greenprint the Lewisville Lake East watershed. Greenprinting is a GIS technique developed by TPL to prioritize areas for protection. The goal of this project was to identify areas that would offer the greatest benefit to water quality, if conserved. The Lewisville Lake East Watershed Greenprint is based on land use, proximity to streams, proximity to ponds and wetlands, water erosion potential, floodplains, and proximity to the reservoir. Most of the areas identified as priorities for conservation generally follow riparian corridors.

HICKORY CREEK 319 GRANT PROJECT

Although Lewisville Lake is not currently impaired, there are significant water quality concerns for the lake. The Lewisville Lake watershed, for example, has one of the highest application rates in the state for new or amended wastewater permits. Development is increasing within the

Hickory Creek watershed, creating increases in runoff volumes and reductions in open space. Past monitoring efforts by the TCEQ have resulted in Hickory Creek being listed as a "nutrient enrichment concern" due to high ammonia concentrations. The sources of ammonia are currently not well understood within this watershed, and are generally listed as "originating from unknown point and nonpoint sources." Watershed monitoring and modeling efforts indicate that the current approaches to managing nonpoint source pollution in Hickory Creek is not sufficient. New tools are needed to stimulate BMP development and reverse declining water quality trends. The goals of this project are to:

- develop a practical, cost-effective approach to managing point and nonpoint source pollution within the Hickory Creek watershed;
- use the monitoring and modeling research generated within this project to demonstrate the effectiveness of BMPs; and
- use stakeholder advisory group feedback and research results to create a watershed plan for Hickory Creek.

Appendix A: Designated Management Agency Update

2013 Area-wide Water Quality Management Plan
For North Central Texas

As the designated water quality management planning agency, the North Central Texas Council of Governments recommends entities for designation as management agencies, for either collection, or treatment, or both. For entities to be designated as management agencies for wastewater collection or treatment, they must demonstrate the legal, institutional, managerial, and financial capability necessary to carry out the responsibilities in accordance with Section 208(c) of the Clean Water Act. An entity must be recommended for the appropriate designation before it can apply for state revolving loan funds. Designation does not require the entity to provide wastewater services, but it does enable the designated management agency to apply for grant and loan funds to provide those services. Formal designation requires that the entity be recommended by the water quality management planning agency, and have submitted Designated Management Agency (DMA) resolutions to the TCEQ (formerly TNRCC.) Whether recommended by the TCEQ or a designated management planning agency like the NCTCOG, the DMA information is transmitted as part of the appropriate planning document to the EPA for approval as an update to the water quality management plan.

Because of permit application and issuance constraints, wastewater service entities within the NCTCOG's area-wide jurisdiction may be incorporated into the TCEQ's quarterly updates to the Texas Water Quality Management Plan in order to facilitate the permit process. In these situations, the North Central Texas Council of Governments usually has recommended designation in prior WQMP amendments, and the remaining action is for the entity to submit the resolution to the state.

Appendix B: 208/201 Coordination Activities Update

208/201 Coordination Activities 2013 Water Quality Management Plan for North Central Texas		
Since the 2013 Amendment of the Annual Water Quality Management Plan for North Central Texas, the NCTCOG has addressed the following items for information on systems that are seeking funding for construction of infrastructure or facilities.		
Planning Entity and Service Area	**NCTCOG Evaluation**	**Conclusion and/or WQMP action**
City of Grand Prairie **CWSRF Tier III Project No. 73654** **Wastewater Replacement Pipelines**	The population projections and engineering detail for the proposed project are consistent with the NCTCOG forecast data.	The population projections are reasonable for facility planning purposes, and the NCTCOG staff confirms that this project conforms to the Water Quality Management Plan for North Central Texas.

As the designated water quality management planning agency, the NCTCOG is required to undertake 208/201 coordination with the TCEQ. The NCTCOG is to evaluate and facilitate development and implementation of wastewater treatment management plans and practices to meet the goals of the Clean Water Act as amended, and to specifically coordinate with the state agency to ensure that plans developed under Section 208 fit with companion requirements under Section 201 which deals primarily with facility planning and funding of treatment facilities or infrastructure. The 208/201 coordination activities typically involve examination of facility plans submitted as part of funding applications. The NCTCOG compares the facility planning information with regional goals and plans included as part of the current amended Area-wide Water Quality Management Plan.

As part of this ongoing process, the NCTCOG prepares a response to TCEQ regarding facility planning proposals, and conformance with elements of the Water Quality Management Plan for North Central Texas. The NCTCOG may make specific recommendations regarding proposals on

an as-needed basis, and in some circumstances the planning information for specific facilities may be revised in the subsequent amendment of the regional WQMP.

This appendix indicates those entities for which the NCTCOG has done 208/201 coordination activities in partnership with the TCEQ since the last amendment of the WQMP. NCTCOG has indicated, as needed, where specific adjustments to the WQMP have been made to accommodate any 208/201 evaluation.

Appendix C: Clean Water State Revolving Fund Commitments

2013 Regional CWSRF Construction Starts		
Entity	**Construction Start**	**Net Amount**
West Tawakoni	6/28/2013	$115,000
West Tawakoni	6/28/2013	$112,500
Bedford	7/1/2013	$630,000
Commerce	1/17/2013	$3,490,000
Keller	3/25/2013	$5,835,000
Springtown	4/23/2013	$3,930,000
		$14,112,500

2013 Construction Completions		
Entity	**Complete**	**Net Amount**
Aledo	6/6/2013	$675,000
Aledo	6/6/2013	$2,110,000
Aledo	6/6/2013	$3,345,000
Aledo	6/6/2013	$1,900,000
Commerce	4/4/2013	$2,005,000
Greenville	8/27/2013	$20,000,000
		$30,035,000

Appendix D: City Population Projections

City	NCTCOG 2013	NCTCOG Population Estimate 2040	Percentage Increase
Addison	13,840	31,999	131.21
Aledo	2,830	2,973	5.05
Allen	87,800	122,292	39.28
Alvarado	3,850	5,321	38.21
Alvord	1,340	2,512	87.46
Anna	9,360	17,305	84.88
Annetta	1,310	1,360	3.82
Argyle	3,420	17,550	413.16
Arlington	369,320	508,707	37.74
Aubrey	2,610	3,020	15.71
Aurora	1,280	2,398	87.34
Azle	10,960	16,054	46.48
Balch Springs	24,270	29,200	20.31
Bedford	47,310	71,322	50.75
Benbrook	21,530	36,633	70.15
Burleson	39,010	49,808	27.68
Caddo Mills	1,380	2,267	64.28
Carrollton	122,280	160,660	31.39
Cedar Hill	45,570	72,466	59.02
Cleburne	29,120	37,375	28.35
Colleyville	23,270	60,739	161.02
Combine	1,960	3,268	66.73
Coppell	39,090	38,343	-1.91
Copper Canyon	1,340	1,574	17.46
Corinth	20,420	24,557	20.26
Cross Roads	1,620	9,018	456.67
Crowley	13,440	18,662	38.85

City	NCTCOG 2013	NCTCOG Population Estimate 2040	Percentage Increase
Dallas	1,213,600	1,710,511	40.95
Dalworthington Gardens	2,290	4,215	84.06
Denton	116,950	160,302	37.07
DeSoto	49,930	63,663	27.50
Double Oak	2,890	3,091	6.96
Duncanville	38,680	38,751	0.18
Edgecliff Village	2,870	3,862	34.56
Ennis	18,590	19,076	2.61
Euless	51,750	80,598	55.74
Everman	6,110	9,895	61.95
Fairview	8,000	23,158	189.48
Farmers Branch	28,800	40,769	41.56
Farmersville	3,290	2,875	-12.61
Fate	7,370	7,996	8.49
Ferris	2,440	3,619	48.32
Flower Mound	65,710	94,669	44.07
Forest Hill	12,360	17,325	40.17
Forney	16,030	14,582	-9.03
Fort Worth	767,560	1,202,359	56.65
Frisco	129,680	176,436	36.05
Garland	229,120	256,842	12.10
Glenn Heights	11,410	16,152	41.56
Granbury	8,290	12,395	49.52
Grand Prairie	178,290	246,565	38.29
Grapevine	47,070	85,144	80.89
Greenville	25,990	29,580	13.81
Haltom City	42,190	59,654	41.39
Haslet	1,550	5,082	227.87
Heath	7,260	18,014	148.13

City	NCTCOG 2013	NCTCOG Population Estimate 2040	Percentage Increase
Hickory Creek	3,250	6,848	110.71
Highland Park	8,500	10,539	23.99
Highland Village	15,420	15,064	-2.31
Hudson Oaks	1,800	1,588	-11.78
Hurst	37,460	53,721	43.41
Hutchins	5,350	10,706	100.11
Irving	220,750	291,142	31.89
Joshua	6,010	7,000	16.47
Justin	3,250	3,362	3.45%
Kaufman	6,660	6,537	-1.85
Keene	6,120	6,540	6.86
Keller	41,090	67,605	64.53
Kennedale	6,820	18,807	175.76
Krugerville	1,670	2,499	49.64
Lake Dallas	7,140	11,117	55.70
Lake Worth	4,780	7,539	57.72
Lakeside	1,320	2,435	84.47
Lancaster	36,980	64,582	74.64
Lewisville	97,140	135,882	39.88
Little Elm	29,230	37,804	29.33
Lowry Crossing	1,720	4,229	145.87
Lucas	5,750	25,504	343.55
Mabank	3,080	2,648	-14.03
Mansfield	58,490	127,049	117.21
McKinney	140,390	203,842	45.20
McLendon-Chisholm	1,560	8,206	426.03
Melissa	5,710	12,659	121.70
Mesquite	140,240	182,750	30.31
Midlothian	19,330	48,807	152.49

City	NCTCOG 2013	NCTCOG Population Estimate 2040	Percentage Increase
Murphy	18,440	20,039	8.67
New Fairview	1,270	5,984	371.18
Newark	1,010	1,282	26.93
North Richland Hills	64,240	87,500	36.21
Northlake	2,160	17,496	710.00
Oak Leaf	1,300	1,882	44.77
Oak Point	2,930	11,697	299.22
Ovilla	3,510	5,427	54.62
Pantego	2,430	5,072	108.72
Pelican Bay	1,560	25,167	1513.27
Pilot Point	3,870	1,447	-62.61
Plano	264,360	353,027	33.54
Princeton	7,440	12,290	65.19
Prosper	13,380	49,898	272.93
Red Oak	11,230	12,352	9.99
River Oaks	7,280	9,511	30.65
Roanoke	6,470	13,800	113.29
Rockwall	38,990	61,876	58.70
Rowlett	56,420	85,176	50.97
Royse City	9,690	19,676	103.05
Runaway Bay	1,310	1,437	9.69
Sachse	21,090	31,340	48.60
Saginaw	20,140	22,463	11.53
Sanger	7,170	12,569	75.30
Sansom Park	4,690	4906	4.61
Seagoville	15,020	25,638	70.69
Shady Shores	2,620	4,787	82.71
Southlake	27,080	46,102	70.24

City	NCTCOG 2013	NCTCOG Population Estimate 2040	Percentage Increase
Springtown	2,660	2,766	3.98
St. Paul	1,070	2,597	142.71
Stephenville	19,320	26,324	36.25
Sunnyvale	5,270	26324	399.51
Talty	1,770	1,967	11.13
Terrell	15,210	18,726	23.12
The Colony	37,360	42,804	14.57
Trophy Club	9,400	11,124	18.34
University Park	22,920	23,795	3.82
Watauga	23,500	23,602	0.43
Waxahachie	31,550	33,925	7.53
Weatherford	25,940	27,385	5.57
Westlake	1,040	3,680	253.85
Westworth Village	2,500	5,690	127.60
White Settlement	16,390	27,784	69.52
Wilmer	4,050	9,077	124.12
Wylie	43,450	64,370	48.15
Total	5,833,110	8,433,355	44.58

Appendix E: Wastewater Treatment Planning Needs and Individual System Assessments

Data sources, assumptions, and procedures used to assess planning needs are as follows.

Data and Sources:

- Monthly average flows (January 2013 – December 2013) reported by each wastewater treatment system to the TCEQ, the EPA, the NCTCOG, or a combination of these sources.
- City boundaries according to the NCTCOG current city boundaries.
- Wastewater service area boundaries of joint systems updated in 2013 according to information provided by the joint systems
- Capacity plans to 2040 were requested from facility owners, managers or consultants in 2013. Where no new information was provided, information provided in previous years was assumed
- Demographic data for 2010 Census and demographic projections/estimations for 2013 to 2040.

Assumptions and Procedures:

- Yearly average of monthly average daily flows approximates average flow and remains constant over time
- Proportions of contribution from each category of flow are as reported by EPA (June 2000) referencing Association of Metropolitan Sewerage Agencies 1997 Financial Survey figures:
  - Inflow & Infiltration = 33 gallons per capita per day Commercial & Industrial Flow = 20 percent of average flow (including combined sewer); 21 percent (corrected figure excluding combined sewer effects since Texas has separate sewer facilities for sanitary and storm sewers)
  - Residential Flow = 55 percent of average flow (including combined sewer); 57% percent (corrected)
- Service areas are defined by the destination of wastewater to a particular treatment plant
- Service areas default to 2010 current city boundaries for community systems
- Population and employment figures for joint systems was calculated with GIS tools using traffic survey zones, 2010 current city boundaries and updated service area boundaries
- Population is evenly distributed within a traffic survey zone
- Population and employment assigned to a service area is proportional to the area of a traffic survey zone that lies within that service area
- Assume entire population within incorporated boundaries of a community or joint wastewater treatment system is served
- Population and employment data per city was downloaded from the NCTCOG website for projecting community systems (i.e., adjusted Census)

- Linear growth was assumed between each five-year increment of demographic projection in years 2013 (two-year increment), 2015, 2020, 2025, 2030, 2035, and 2040
- Capacity plans are considered adequate if the NCTCOG-projected flow remains less than or equal to 90 percent of planned permitted capacity. Capacity plans are also considered adequate if a facility's planned capacity exceeds 90 percent of the NCTCOG-projected flow for a temporary period less than or equal to five-years. This five-year allowance is made to offset inaccuracies of the NCTCOG-projected flow that may result from gaps in flow data, uncertainty in demographic projections, and inaccuracies introduced in data analysis using GIS because the actual distribution of population within a traffic survey zone may be concentrated in a relatively small area.

Calculation of Percent Capacity:

- Infiltration and Inflow (I&I)= 33 gpcd
- Residential Flow Rate = 57 percent of Average Flow
- Commercial Flow Fate = 21 percent of Average Flow
- Average Flow is calculated from the yearly average of monthly averages reported by WWTP operators for each facility.
- Residential Flow = Residential Flow Rate X Average Flow 2013 (or available year)
- Commercial Flow = Commercial Flow Rate X Average Flow 2013 (or available year)
- Residential Rate = Residential Flow/Residential Population
- Commercial Rate = Commercial Flow/Employment
- I&I Rate = I&I Rate (0.000033) X Residential Population (residential population and employment taken from the NCTCOG demographics projections)

Total projected flow = Residential Rate X Residential Population + Commercial Rate X Employment + I&I Rate X Residential Population

Total flow was calculated for 2015, 2020, 2025, 2030, 2035, and 2040, and intervening years were extrapolated from these figures.

Percent Capacity = Projected Flow/Plant Capacity

A handful of cities intersect the 208 planning boundary because of growth in the community, but do not currently discharge treated wastewater within the 208 boundary. Planning assessments were not performed for the communities fitting this description, which are Alvarado, Ennis, and Waxahachie. Farmersville also fits the same description except that its plants are managed by the North Texas Municipal Water District and was therefore included as part of a regional system. Approximately 57 percent of treatment capacity plans are adequate to 2040 according to the NCTCOG-projected flows calculated March 2014. The remaining 43 percent of treatment facilities likely need additional planning to accommodate future flows.

Plant capacity is based on figures provided to us by community and regional wastewater treatment plant owners, managers or consultants in 2014 based on their own planning. The capacities indicated through 2040 do not represent approved permit limitations, and simply reflect planned expansions. The Water Quality Management Plan for North Central Texas does not currently examine or seek to correlate the planned expansion data with any state wasteload allocation or approved permit limits. The state addresses permits on a five-year timeframe, which makes it difficult to match with the 25 year planning timeframe illustrated for the wastewater plants.

For each of the 13 Upper Trinity River Basin watershed shown in Figure 1 on page 18, the NCTCOG assessed the projected growth by watershed/HUC12 subwatershed, land use changes, and percent of urbanization. These factors, along with wastewater discharges from regional and community municipal wastewater systems during 2013 inform the individual plant assessments. Individual treatment plant assessments appear on the following pages.

Figure 10 shows the current areas served by both the large regional wastewater service providers, and by smaller community systems designed to handle the wastewater needs of a particular city, or in some cases, water district.

Figure 10 - Current service areas

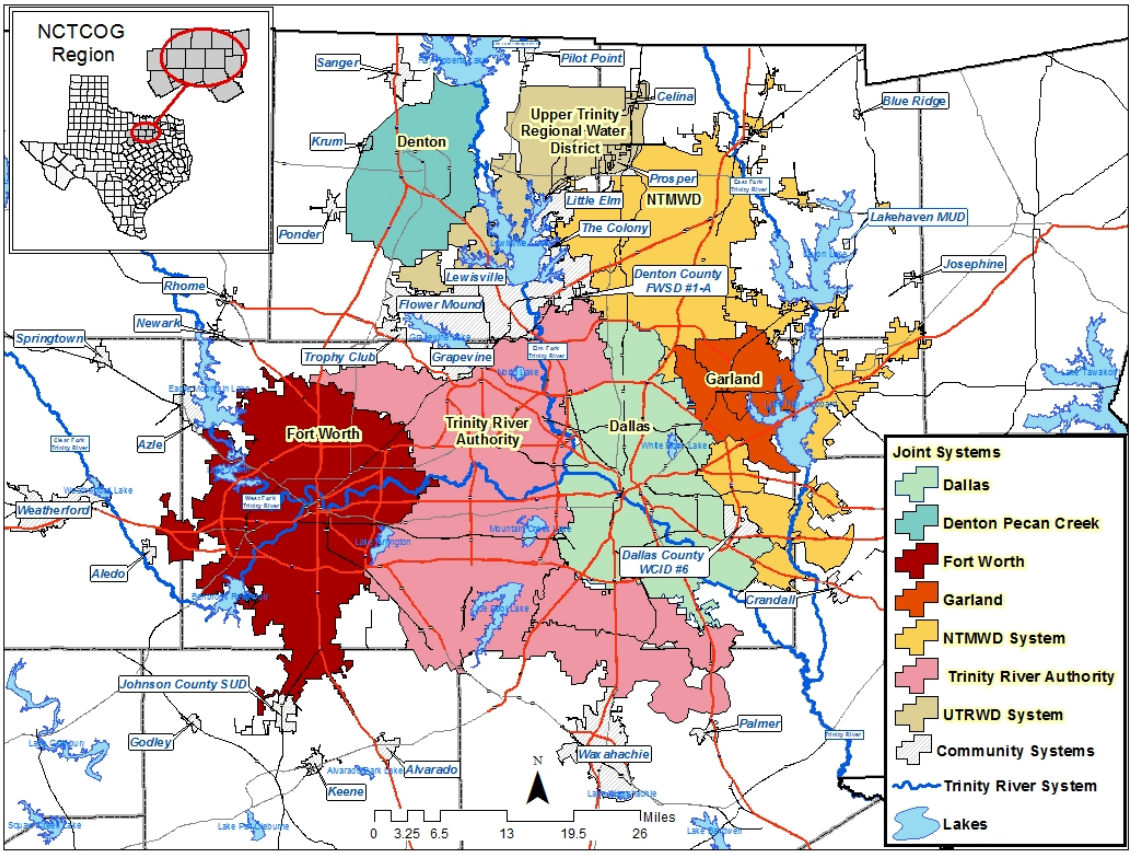
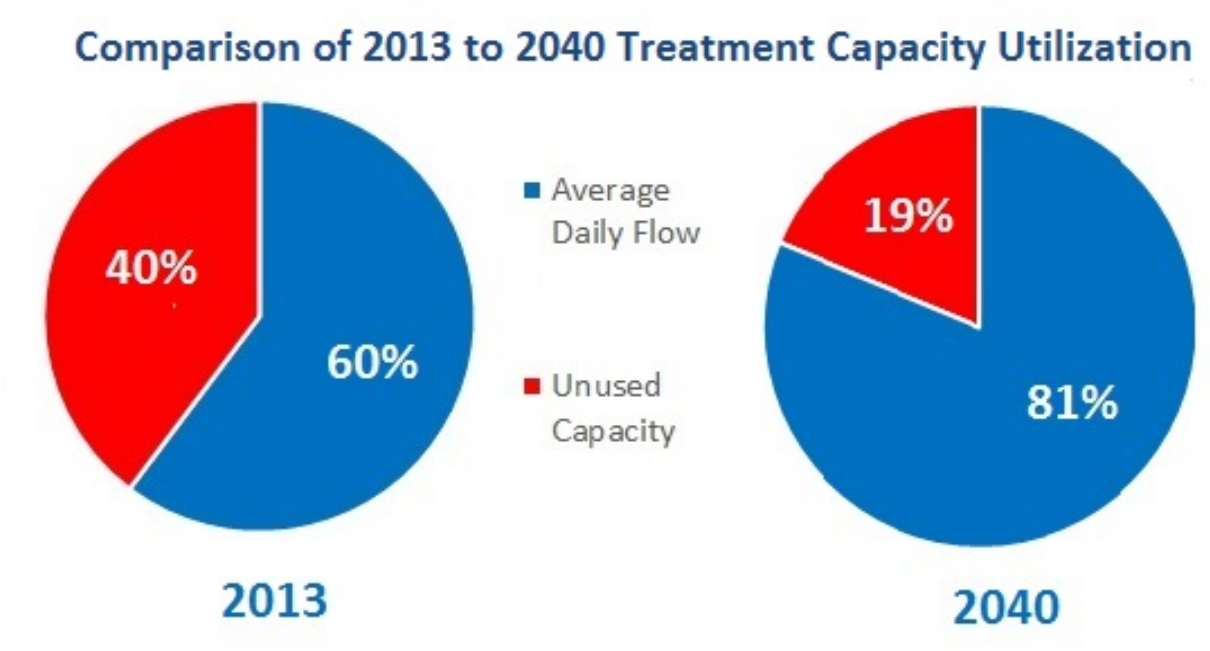


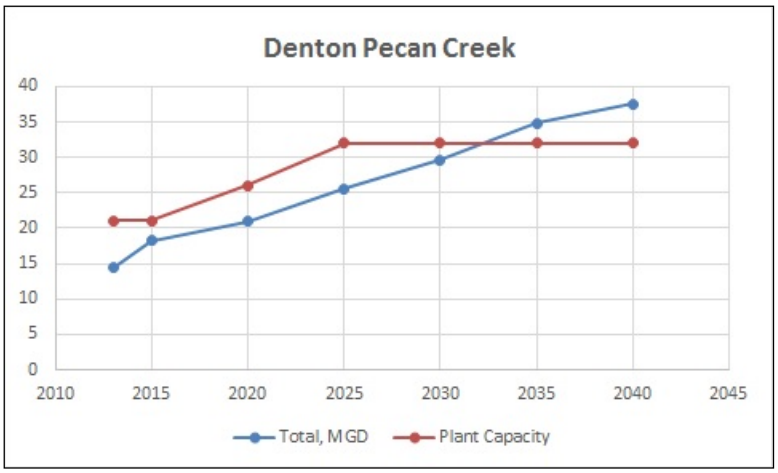
Table 30 - Regional wastewater treatment provider and participating city

Regional Wastewater Treatment Provider	Participating Cities
Dallas	Dallas, Cockrell Hill, University Park, Highland Park
Denton Pecan Creek	Denton
Fort Worth Village Creek	Westover Hills, Benbrook, Forest Hills, Edgecliff Village, Everman, Saginaw, Blue Mound, Lakeside, Westworth Village, White Settlement, Lake Worth, River Oaks, Sansom Park, Crowley, Burleson, Pantego, Haltom City, Richland Hills, Hurst, Watauga, North Richland Hills
Garland (Duck Creek and Rowlett)	Garland, Richardson, Rowlett, Sachse, Sunnyvale
NTMWD	Anna, Melissa, Princeton, Fairview, Royse City, Fate, Allen, Murphy, McKinney, Frisco, Seagoville, Rockwall, Heath, Lavon, Wylie, Parker, Plano, Mesquite, Forney, Anna, Crandall, Prosper
TRA	Northlake, Haslet, Roanoke, Bedford, Euless, Southlake, Dalworthington Gardens, Mansfield, Kennedale, Arlington, Westlake, Keller, Colleyville, Duncanville, DeSoto, Coppell, Carrollton, Cedar Hill, Farmers Branch, Addison, Grand Prairie, Irving Midlothian, Lancaster, Ferris, Glenn Heights, Ovilla, Venus, Corral City
UTRWD	Double Oak, Celina, Highland Village, Hickory Creek*, Lantana, Mustang SUD, Oak Point*, Cross Roads, Bartonville*, Lake Dallas*, Lincoln Park, Aubrey, Corinth, Shady Shores*, Prosper, Sanger, Double Oak
*Indirect customer – receives wastewater service from a wholesale customer	

Because Regional Wastewater Treatment Providers offer services by contract to customers who may not be geographically located within their designated service areas, Table 30 above shows by city who are the customers of each of the regional providers. Figure 11 addresses capacity utilization.

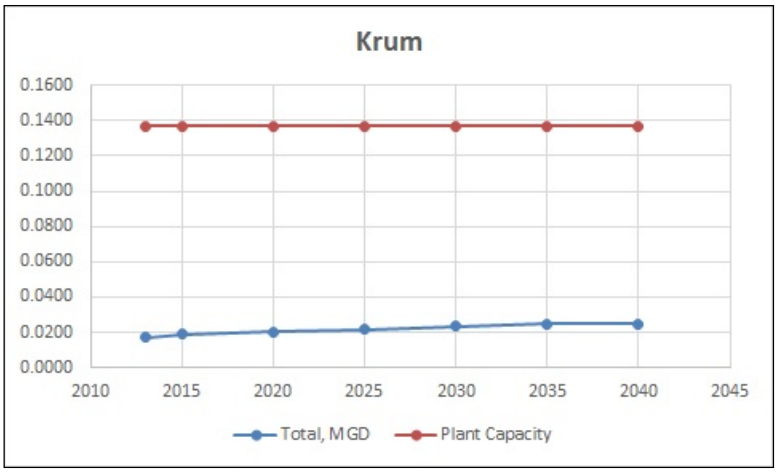
Figure 11 - Capacity comparison 2013 - 2040





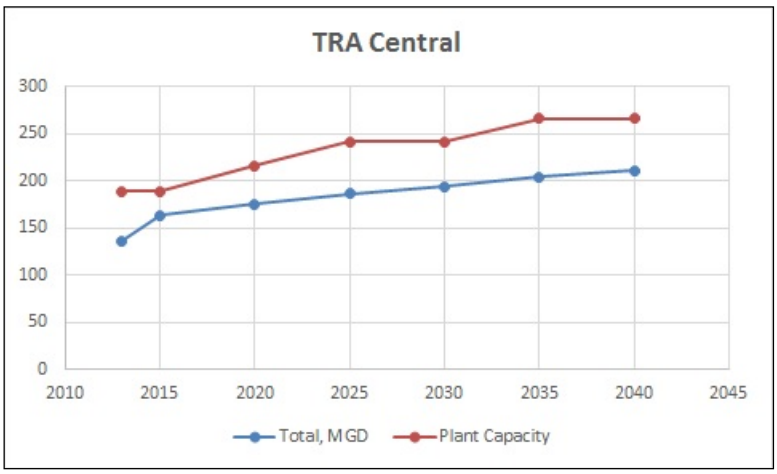
Denton Pecan Creek Regional Wastewater System

Denton Pecan Creek System currently serves part of Argyle. Denton Pecan Creek System capacity plans are sufficient to treat the NCTCOG-projected flows through 2030 when additional capacity would be necessary to remain under 90 percent of permit limit.



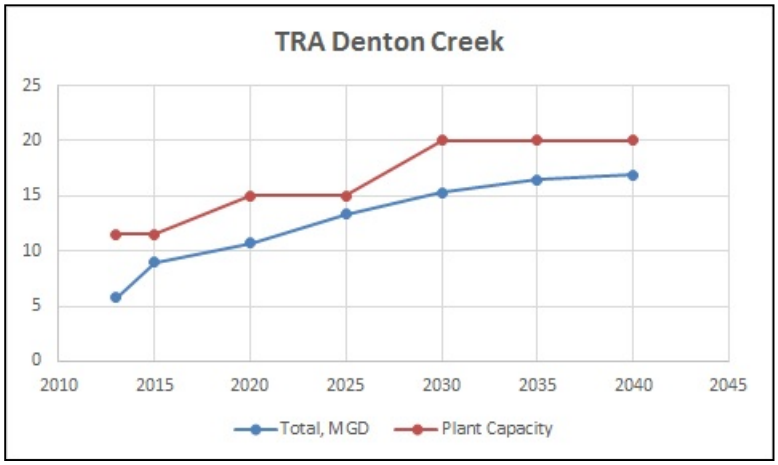
KRUM WASTEWATER TREATMENT PLANT

Krum contributes to the Denton Pecan Creek System, although they still reported discharges at their community plant during each month of 2013. It is assumed that future the NCTCOG-projected flows will be treated at the Denton Pecan Creek plant.



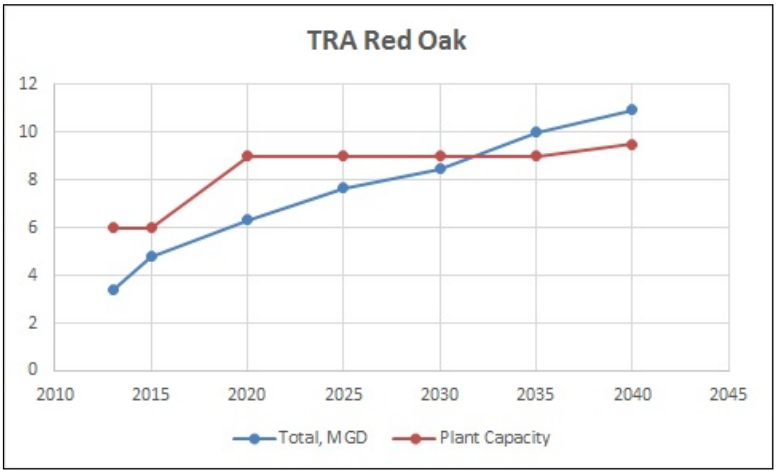
TRINITY RIVER AUTHORITY CENTRAL REGIONAL WASTEWATER SYSTEM

TRA Central Regional Wastewater System capacity plans are sufficient to treat the NCTCOG-projected flows through 2040.



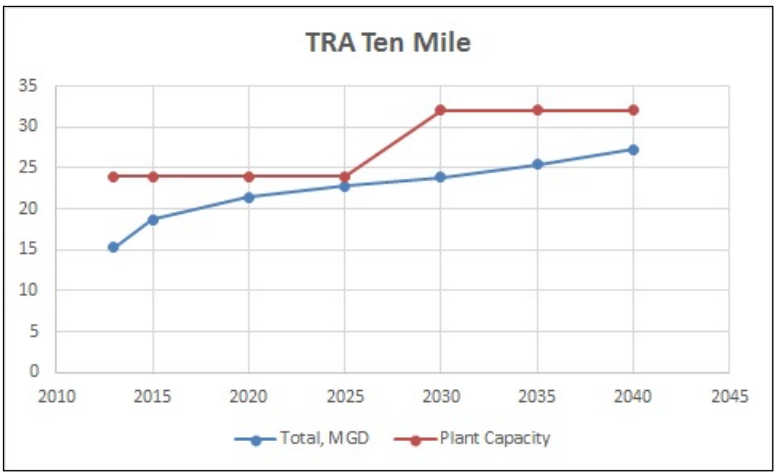
Trinity River Authority Denton Creek Regional Wastewater System

TRA Denton Creek Regional Wastewater System capacity plans are sufficient to treat the NCTCOG-projected flows through 2040.



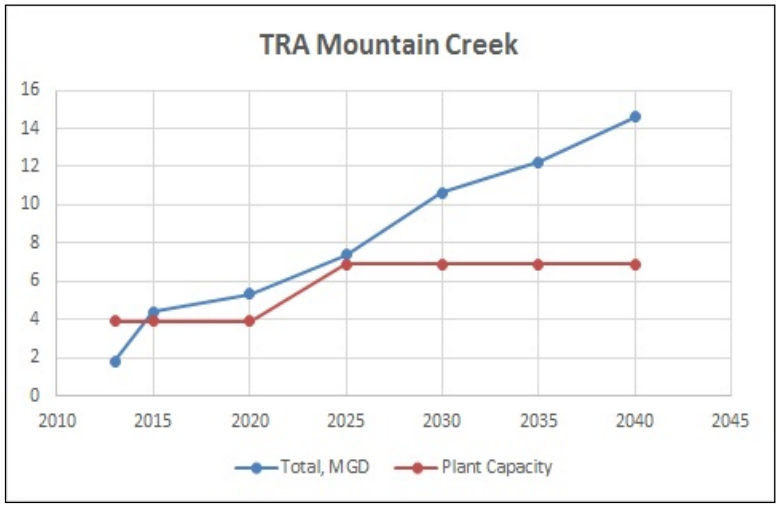
Trinity River Authority Red Oak Regional Wastewater System

TRA Red Oak Regional Wastewater System capacity plans are adequate until almost 2030, when the projected waste volume exceeds known system capacity increases.



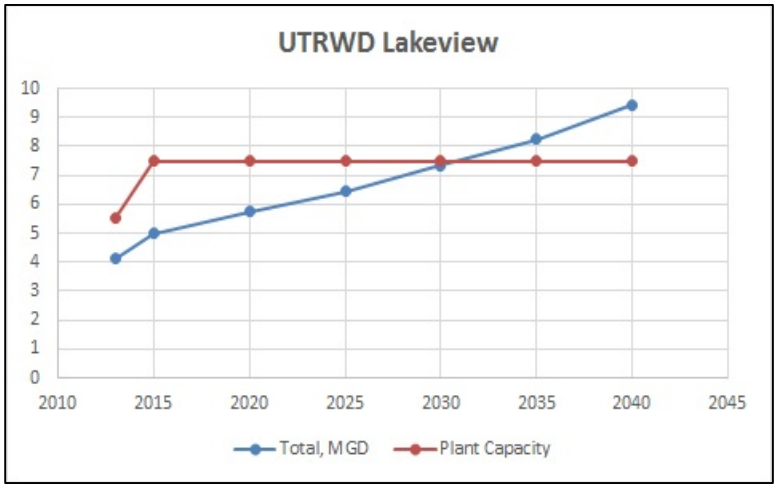
Trinity River Authority Ten Mile Regional Wastewater System

TRA Ten Mile Regional Wastewater System capacity plans are sufficient to treat the NCTCOG-projected flows until nearly 2025, when projected waste flows exceed 90 percent of their current capacity.



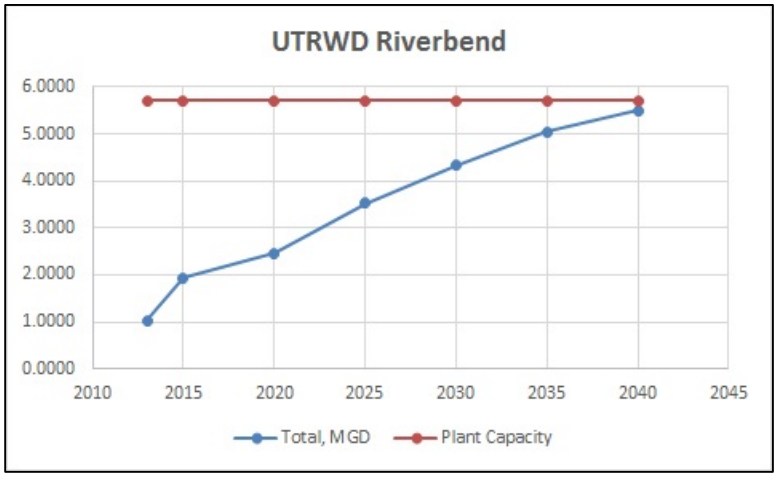
Trinity River Authority Mountain Creek Regional Wastewater System

TRA Mountain Creek Regional Wastewater System (MCRWS) plans to seek additional contracting parties located within the MCRWS' service area to meet future wastewater treatment if the NCTCOG-projected growth occurs over the next 25 years.



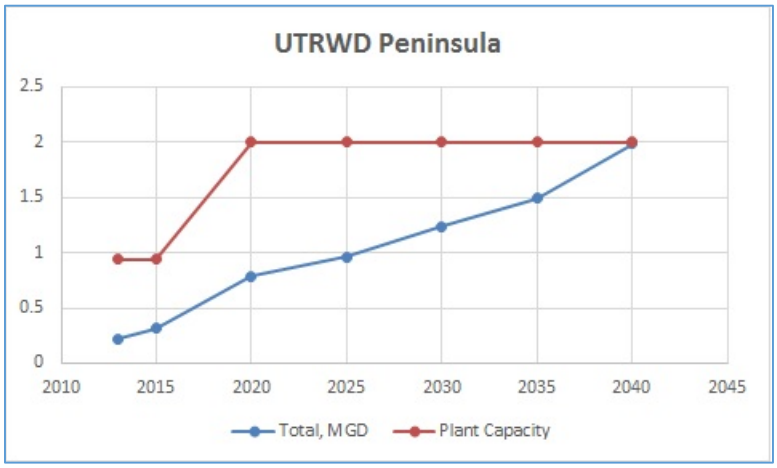
Upper Trinity Regional Water District Lakeview System

UTRWD Lakeview System capacity plans are sufficient to treat the NCTCOG-projected flows through 2030, but will required increased treatment capacity soon thereafter.



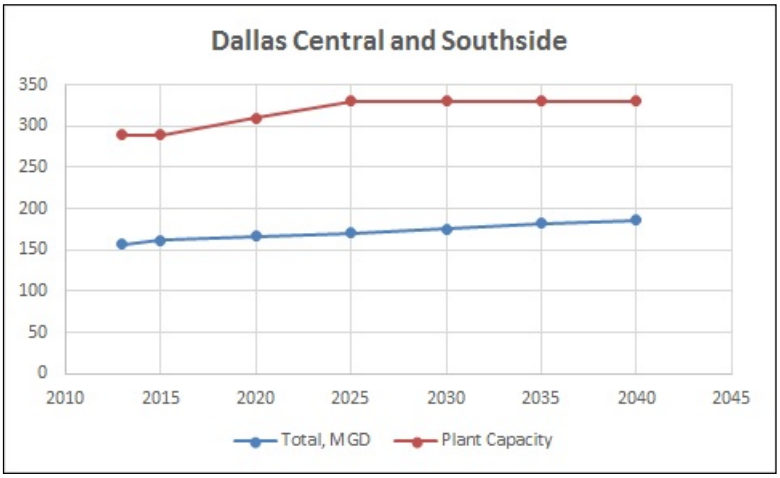
Upper Trinity Regional Water District Riverbend

UTRWD Riverbend Regional Water Reclamation Plant treated 1.2 MGD average daily flow, and is permitted at a maximum of 2.0 MGD. In addition to the Riverbend Plant, the Doe Branch Water Reclamation Plant will serve part of Celina and other unincorporated areas in northeast Denton County. It reported no average daily flow for 2013, but is currently permitted to discharge two MGD average daily flow, and ultimately 5.225 MGD.



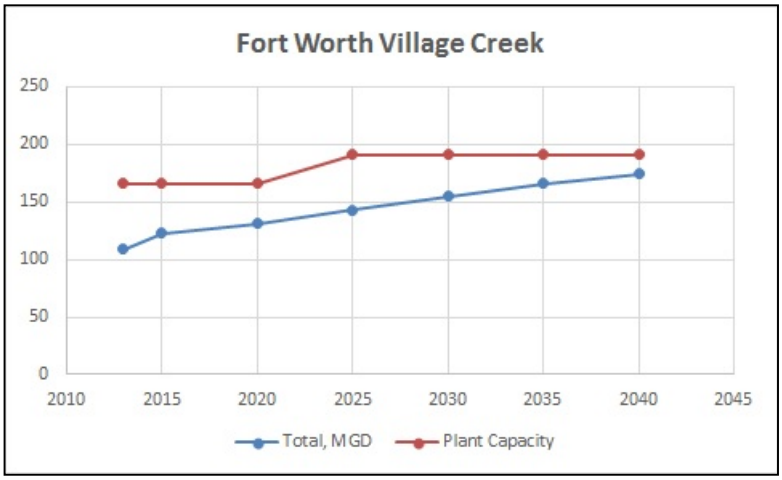
Upper Trinity Regional Water District Peninsula

UTRWD Peninsula is treating wastewater from part of Oak Point and unincorporated areas in northeast Denton County. UTRWD Peninsula System capacity plans are sufficient to treat the NCTCOG-projected flows through 2035, but will require additional capacity before 2040.



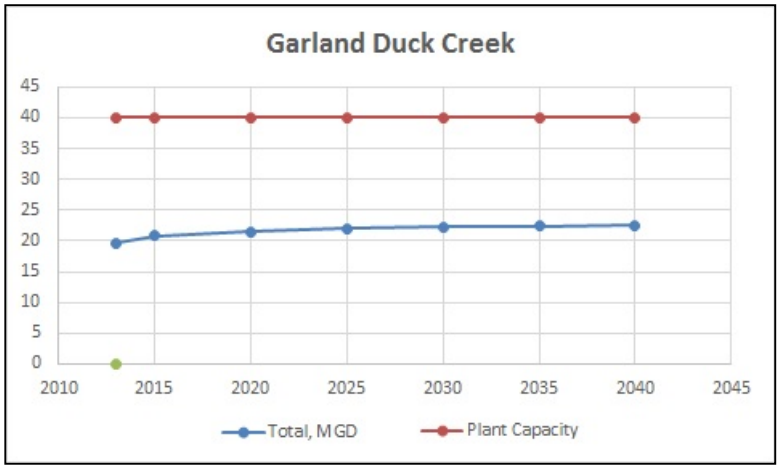
Dallas Southside and Central Regional Wastewater System

Dallas Southside and Central plants are interconnected and function as one system. Capacity plans are sufficient to treat the NCTCOG-projected flows through 2040.



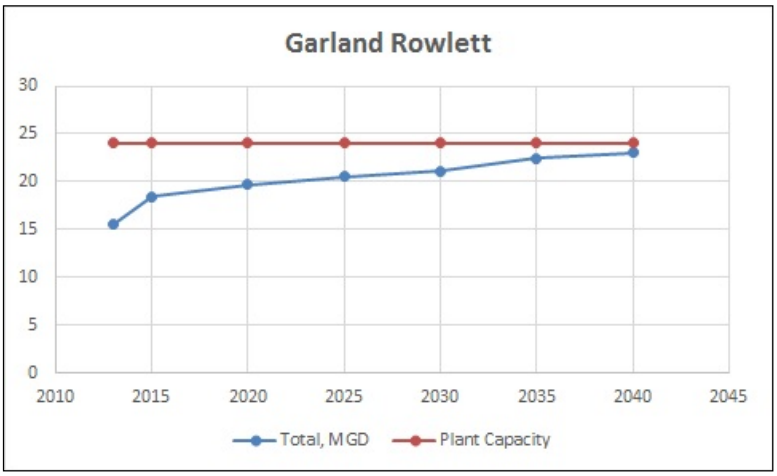
Fort Worth Village Creek Regional Wastewater System

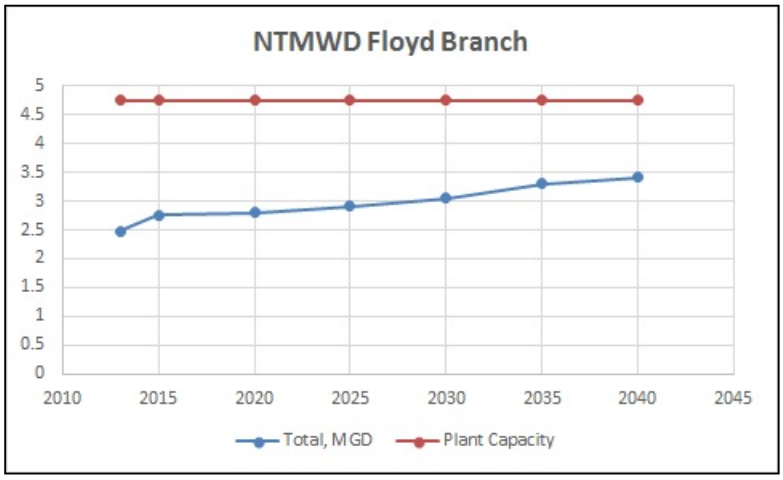
The City of Fort Worth approved a plan in July 2011 to build a second wastewater treatment facility to serve the rapidly growing western region of the service area. The Mary's Creek Water Reclamation Facility is to be sited adjacent to the closed westside landfill, and is scheduled to open in 2025.



Garland Duck Creek and Rowlett Regional Wastewater Systems

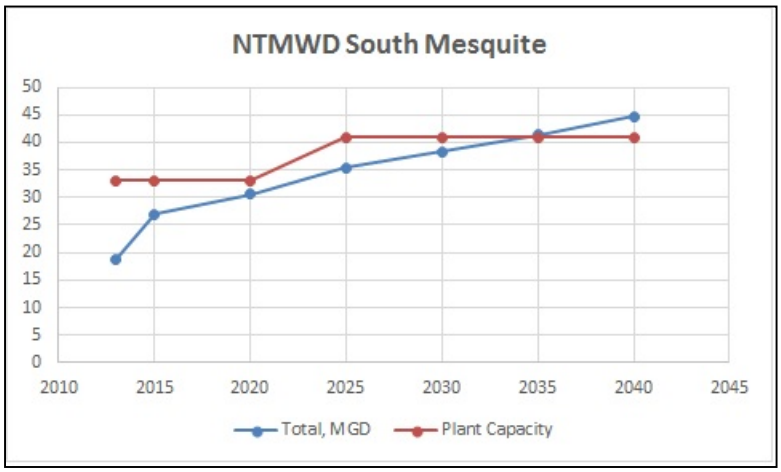
Capacity plans for both facilities are sufficient to treat both the NCTCOG-projected and Garland-projected flows through 2040.





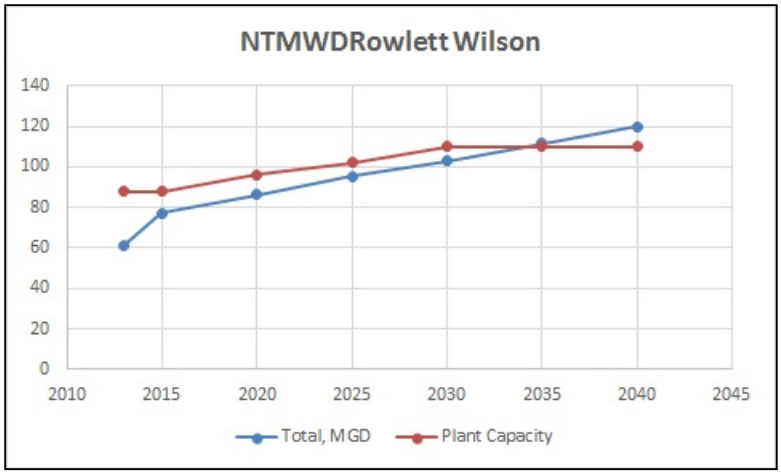
North Texas Municipal Water District Floyd Branch

NTMWD Floyd Branch capacity plans are sufficient to treat the NCTCOG-projected flows through 2040.



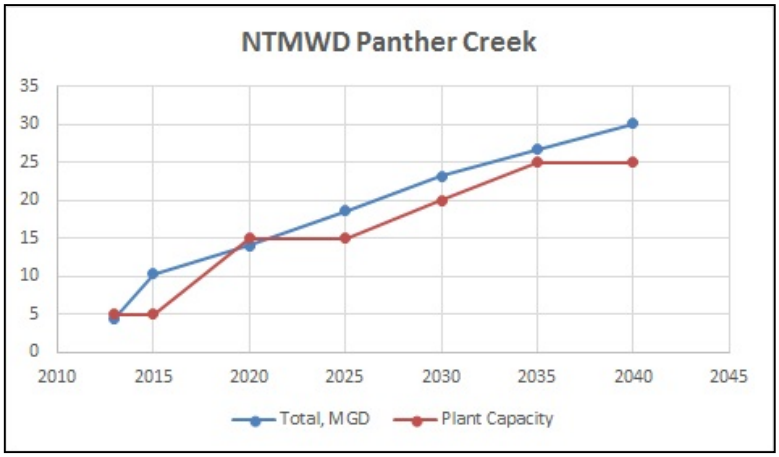
NTMWD South Mesquite System

The NCTCOG-projected flows will approach 90 percent of the known planned treatment capacity by 2030.



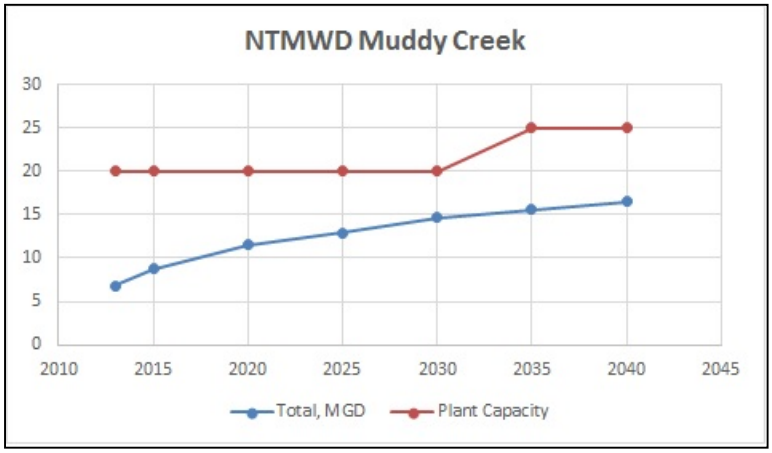
NTMWD Rowlett Creek and Wilson Creek Regional Wastewater System

NTMWD Rowlett Creek and Wilson Creek are interconnected and function as one system. According to the NCTCOG-projected flows, the system will remain below 90 percent capacity until at least 2025.



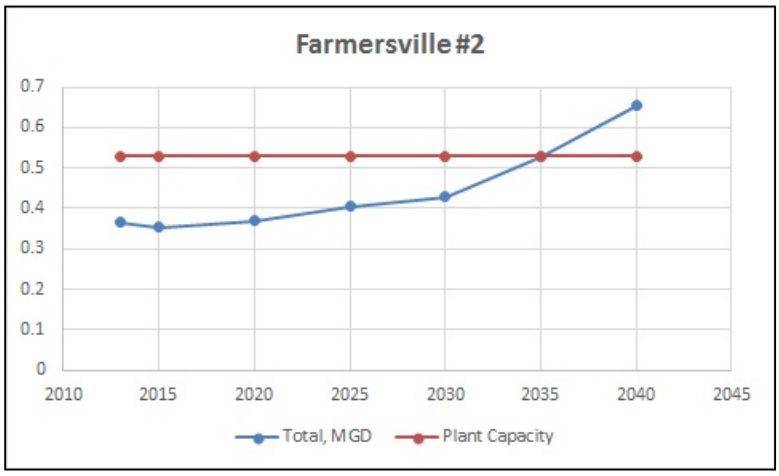
NTMWD Panther Creek

Panther Creek is one of the Frisco area plants that combine to handle a rapidly increasing population. Although there is some flexibility between plants, the Panther Creek facility will need to add capacity in the very near future.



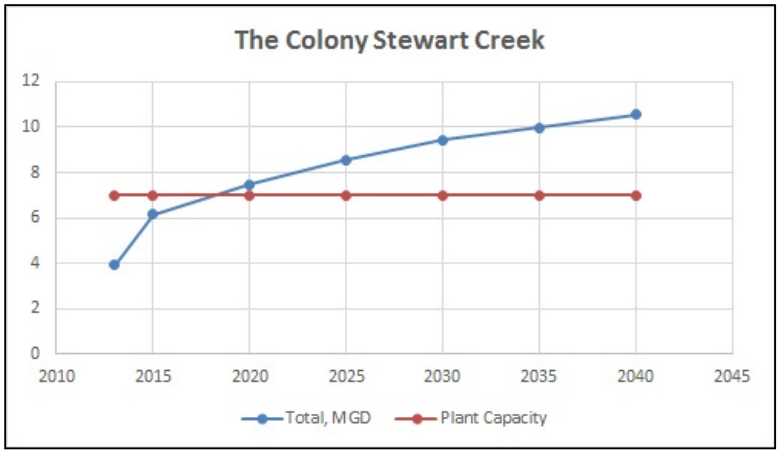
NTMWD Muddy Creek Regional Wastewater System

The NTMWD Muddy Creek system easily handles the NCTCOG-projected wastewater flows through 2040.



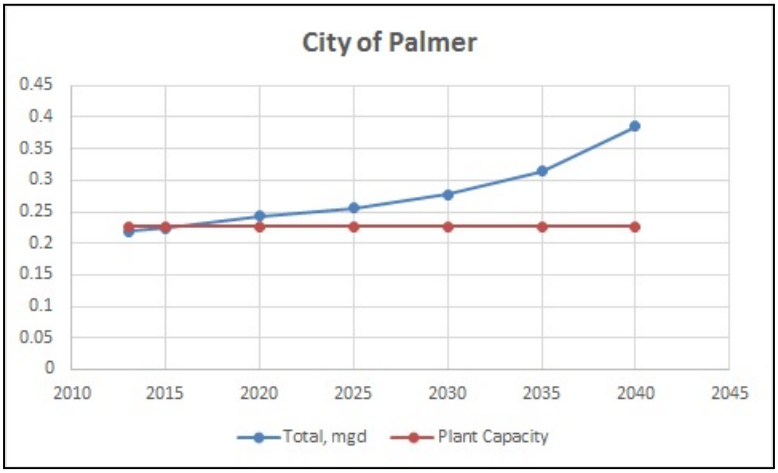
Farmersville/NTMWD System

Farmersville owns two wastewater treatment plants managed by NTMWD. Only #2 is currently in operation; #1 would increase capacity by at least .225 MGD. The Farmersville system capacity plans are sufficient to treat the NCTCOG-projected flows through 2040.



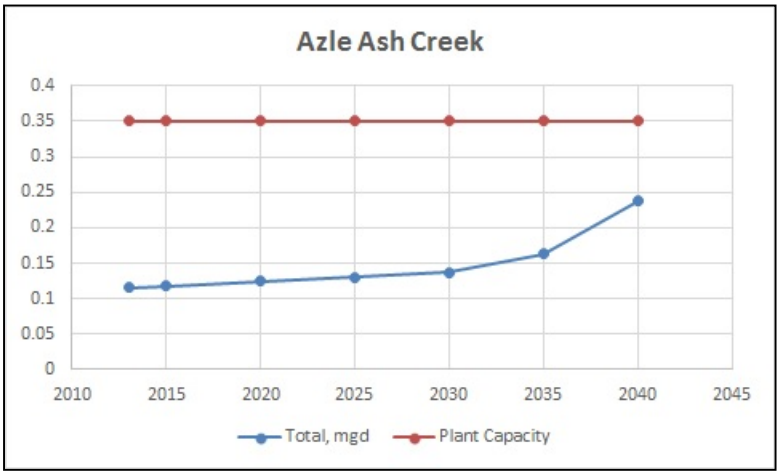
The Colony

The Colony capacity plans are sufficient to treat the NCTCOG-projected flows only through about 2018, when projected flows will exceed 90 percent capacity.



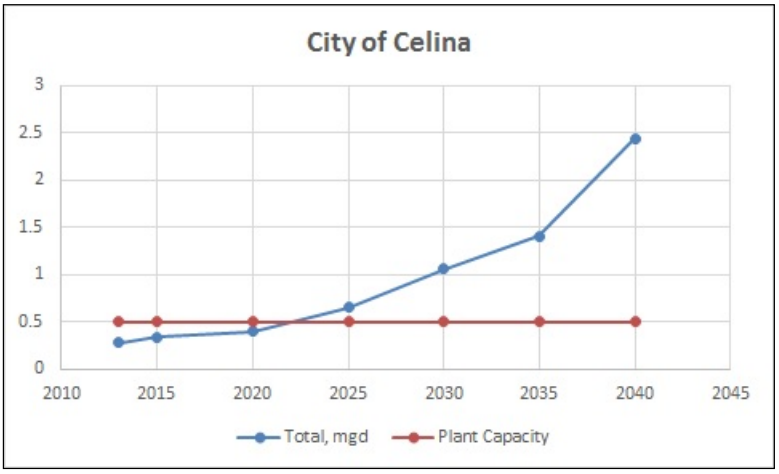
Palmer Wastewater Treatment Plant

Palmer's wastewater treatment plant is operating at known capacity currently, and is expected to require at least double its current capacity of .225 MGD.



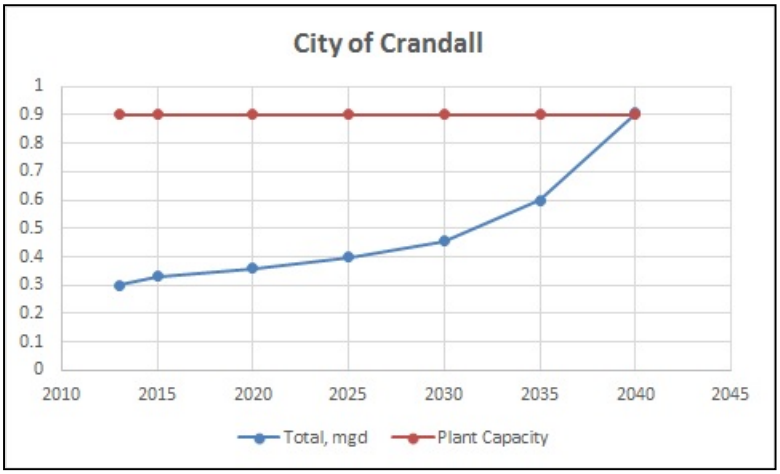
Azle Ash Creek and Walnut Creek Wastewater System

Azle capacity plans are sufficient to treat the NCTCOG-projected flows through 2040.



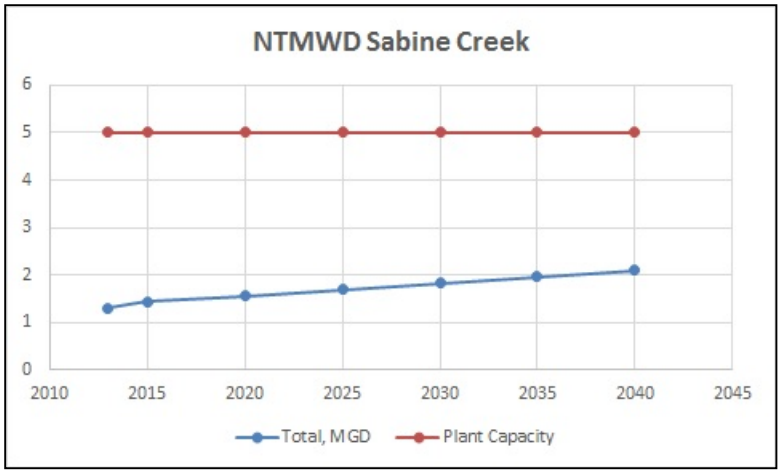
Celina Wastewater Treatment Plant

Celina has committed to sending .6 MGD to the UTRWD Doe Run Water Reclamation Facility, which should handle future needs through 2040.



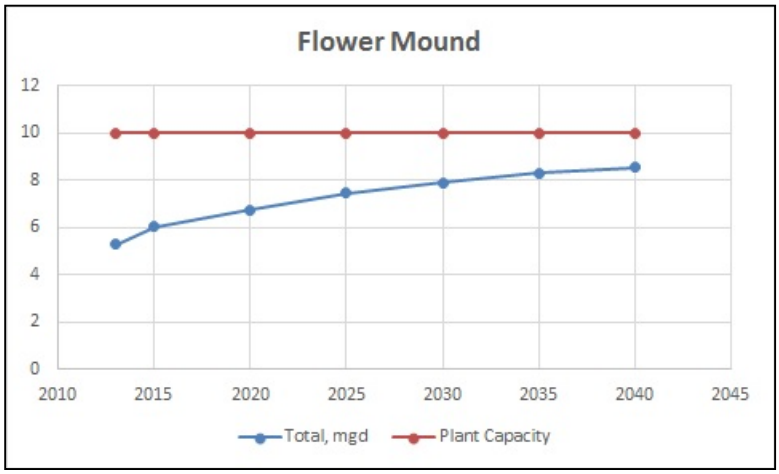
Crandall Wastewater Treatment Plant

Crandall capacity plans are sufficient to treat the NCTCOG-projected flows through at least 2038.



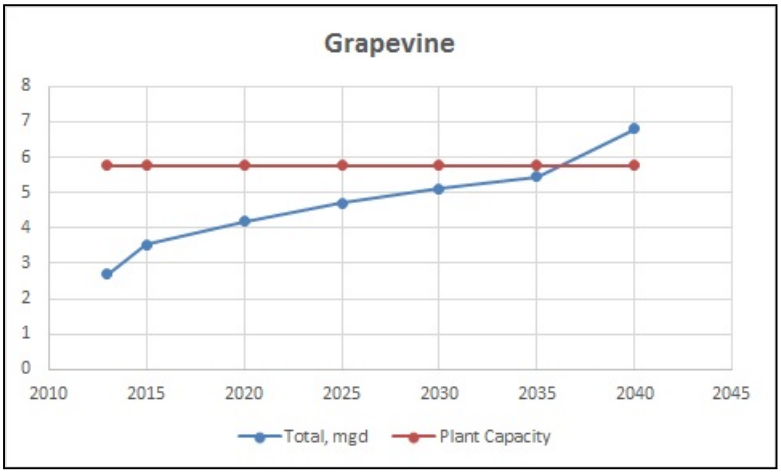
NTMWD Sabine Creek Regional Wastewater Treatment Plant

The Sabine Creek Wastewater Treatment Plant treats wastewater from Fate and Royse City and is permitted for 5.0 MGD. Plant capacity plans are sufficient to treat the NCTCOG-projected flows through 2040.



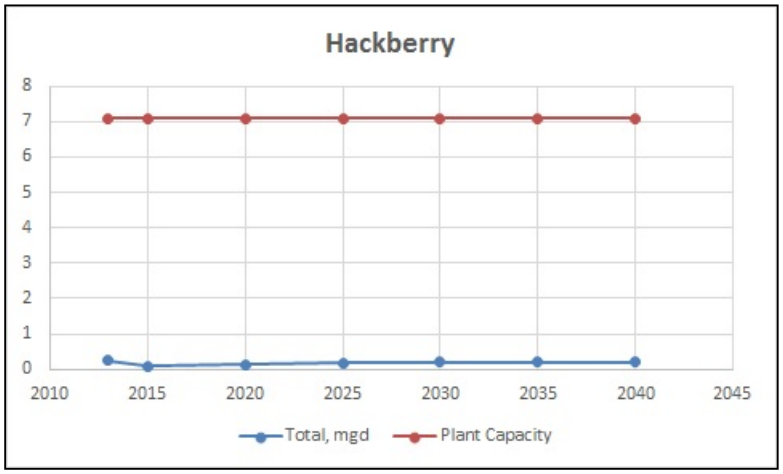
Flower Mound Wastewater Treatment Plant

Flower Mound wastewater treatment plant capacity plans are sufficient to treat the NCTCOG-projected flows through 2040.



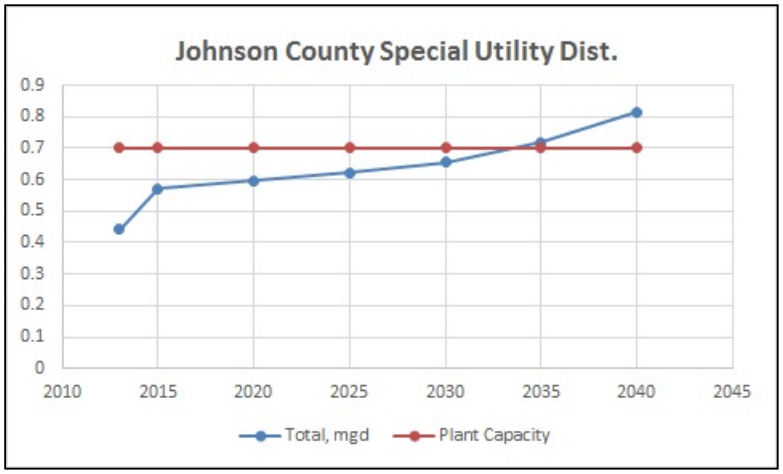
Grapevine Peach Street Wastewater Treatment Plant

Grapevine wastewater treatment plant capacity plans are sufficient to treat the NCTCOG-projected flows through 2035. The current permit limit of 5.75 MGD will need to be addressed if the population grows as predicted, although 'build-out' may occur earlier than projected.



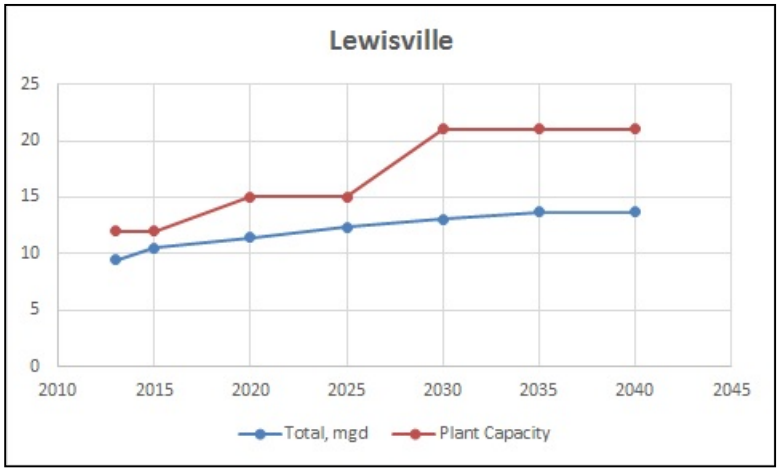
Hackberry Wastewater Treatment Plant

Hackberry has sufficient capacity to service the NCTCOG-projected flows to 2040 and beyond.



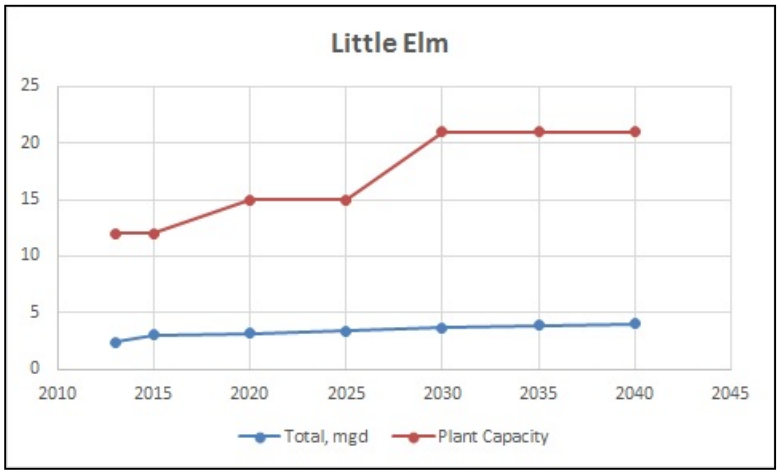
Johnson County FWSD #1 Wastewater Treatment Plant

Johnson County FWSD #1 provides wastewater treatment to Joshua and a small part of Burleson. Current capacity is sufficient to treat the NCTCOG-projected flows through 2030, when the NCTCOG-projected flows reach 90 percent of permit limit.



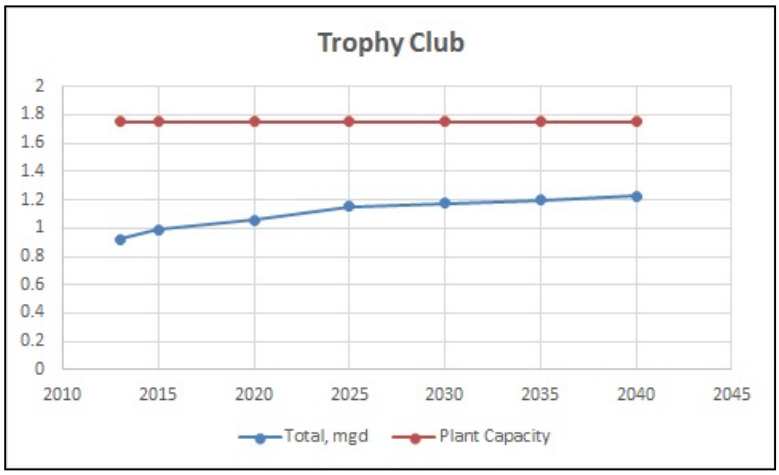
Lewisville Wastewater Treatment Plant

In addition to its own residents, Lewisville provides wastewater treatment for a subdivision in the Denton County FWSD #1-A. The Lewisville Wastewater Treatment Plant capacity plans are sufficient to treat the NCTCOG-projected flows through 2040.



Little Elm Wastewater Treatment Plant

Little Elm wastewater treatment capacity plans are sufficient to treat the NCTCOG-projected flows through 2040.



Trophy Club MUD Wastewater Treatment Plant

Trophy Club MUD wastewater treatment capacity plans are sufficient to treat the NCTCOG-projected flows through 2040.

Appendix F: Comments Received and Responses from Public Meeting, May 8, 2014

- **Question** - *Are both Pecan Creek subwatershed and Pecan Creek – Little Elm Reservoir subwatershed both in the Lake Lewisville watershed? If so, are you sure that one subwatershed has 6,800 people, while the other has 117,000 people?*

Answer – the two subwatersheds are both in the Lake Lewisville watershed. The current population was recalculated using the method described in Appendix E, with similar results. The population figures were also consistent with 2013 orthophotography of the two subwatersheds.

- A representative of the City of Garland wrote to update the Permitted Average Daily Flow of the Garland Duck Creek plant to 40 MGD.

- **Question –** *What is the source of your data for average daily flow through each wastewater treatment plant?*

Answer – The Permit Compliance System and Integrated Compliance Information System databases of the U. S. Environmental Protection Agency provide information on public and private entities that hold permits to discharge wastewater into rivers. This online report details when a permit was issued and expires, how much the permittee is permitted to discharge, and the actual monitoring data showing the volume of wastewater generated monthly.

A customized search is used to retrieve the average daily flow of wastewater treatment plants (SIC code 4259) during the period from January 1 to December 31 of the prior year.

In future water quality management plans, the NCTCOG staff will improve the quality and timeliness of average daily flow data by arranging to acquire access to the NetDMR system operated by the TCEQ.