



7 | ECOLOGY & NATURAL RESOURCES

Ecology and Natural Resources Principles

- PRINCIPLE 1:** Utilize a “greenprint” map (showing areas within the city and its ETJ that contain important limited resources and unique natural assets) to review zoning applications, design capital infrastructure and create natural amenities for the community.
- PRINCIPLE 2:** Adopt and implement planning and development practices that encourage public and private property owners to maintain, or even enhance, the quality of the region’s air, aquifers, streams and lakes and to retain important natural assets as focal points and amenities.
- PRINCIPLE 3:** Continue Frisco’s leadership in green design and engineering for residential and commercial buildings and encourage design of City facilities, development sites and neighborhoods based on low life-cycle cost and green engineering principles.
- PRINCIPLE 4:** Develop and use Frisco’s floodplain areas to maximize stormwater management, protect surrounding properties from extreme weather events, preserve natural areas as amenities and minimize future costs and liabilities for the community.
- PRINCIPLE 5:** Protect, enhance and increase healthy tree cover as new development occurs throughout Frisco to maximize the many benefits that trees bring to the community—lower energy costs, reduced heat island effect, improved air quality, increased livability and enhanced quality of life.
- PRINCIPLE 6:** Use non-renewable energy resources efficiently, take advantage of opportunities to conserve energy, use renewable energy resources when feasible and cost-effective and encourage Frisco businesses and residents to do the same.
- PRINCIPLE 7:** Evaluate methods for monitoring the community’s environmental footprint and look for ways to reduce this footprint when doing so is consistent with other quality-of-life objectives.
- PRINCIPLE 8:** Continue to play a leadership role in the region’s efforts to maintain and enhance North Texas’ air and water quality and natural assets, particularly among the growing suburban cities in the area.
- PRINCIPLE 9:** Take advantage of Frisco’s natural areas and features to create focal points, connect City and regional network of trails and contribute to the identity of Frisco’s neighborhoods and the daily life of Frisco’s residents.
- PRINCIPLE 10:** Partner with residents and businesses, school districts and outside organizations to offer programs that educate and engage Frisco citizens in the benefits of sharing nature and using resources responsibly.

Introduction

Frisco is a city that has undergone rapid growth and development over the past two decades. As it looks to the future, the community plans to focus on growth that will create a place that is vital, desirable and resilient over the long term. A community such as this takes advantage of its natural assets and uses its limited resources in ways that are responsible and effective. This Ecology and Natural Resources Strategy provides the framework for this aspect of Frisco's continuing growth.

This Strategy will help the City of Frisco carry out the City Council's objectives for seven *Strategic Focus Areas*, (see also, *Appendix A1, Strategic Focus Areas*). It directly supports the Sustainable City Strategic Focus Area—"Promote the continued development of a diverse, unique and enduring city." It will also assist the City in achieving the Council's vision for Long-Term Financial Health, Public Health and Safety and Infrastructure.

The issues addressed here are also important to Frisco residents and stakeholders. When participants in the 2015 Comprehensive Plan update process were asked, "How important is this issue or approach to the best possible future for the Frisco community?", 91% of them said that it was very important or somewhat important that Frisco be "sustainable (desirable or resilient) over the long term."

Finally, the efficient use of resources and design that is based on local ecology are important to Frisco's economic vitality. Private sector investors are looking for offices and commercial areas that cost less to operate because tenants have come to expect this. Millennials, potential future residents of Frisco, place a high value on natural amenities and green lifestyles. This Strategy will help Frisco remain competitive in the marketplace of the future.

Focus on Ecology

Ecology is the "branch of science dealing with the relationship of living things to their

environments."⁹ Instead of studying one particular species or aspect of the environment, it considers the interactions between natural systems and looks at the impact of human beings on those interactions.

Many ecological impacts, both positive and negative, seem to occur on a scale that is bigger than a single local government or community. Even though one city cannot, by itself, change the quality of the air or the salinity of the oceans, it can have an effect. Each community, its residents and businesses, can make choices about the consequences of their actions on the local ecology and help reduce the negative impacts of poor choices on regional, national and global systems.

This *Ecology and Natural Resources Strategy* addresses some, though not all, of the concepts usually considered under the heading of "sustainability." Definitions of sustainability vary, but all of them generally include the idea of using resources to satisfy today's needs without jeopardizing the ability of future generations to meet their own needs. This concept is often expressed in terms of the three E's--Environment, Equity and Economy. This *Ecology and Natural Resources Strategy Planning for Sustaining Places* is an initiative of the American Planning Association (APA) focused on the role of comprehensive plans in creating sustainable communities. This initiative has identified characteristics of plans that support sustainable communities and the processes that are most likely to create those plans. For this APA initiative, "Planning for 'sustaining places' is a dynamic, democratic process through which communities plan to meet the needs of current and future generations without compromising the ecosystems upon which they depend by balancing social, economic and environmental resources, incorporating resilience and linking local actions to regional and global concerns."¹⁰ The relevant best practices recommended by this initiative are reflected in this strategy.

9 www.dictionary.com. Accessed 10/12/2014.

10 Godschalk and Anderson, 2012, *Sustaining Places: The Role of the Comprehensive Plan*, APA PAS Report 567.

Vision North Texas

Vision North Texas is a public-private-academic partnership that seeks to make the North Texas region successful and sustainable, even as it is expected to absorb a significant amount of new growth in the coming years. *North Texas 2050*, a report released by this partnership in 2010, focuses on the entire 16-county North Texas region. As the report states, “If current trends continue, the 16-county North Texas region will have over 75% more people in 2030 than in 2000, and the population will more than double by 2050.”¹¹ The goal of this effort was to establish a vision for a preferred future for the region and to identify a set of policies and actions to achieve that goal. Frisco is one of the Outer Tier Communities defined in *North Texas 2050*. The recommendations contained in the report were considered in drafting this strategy, and the ones appropriate to Frisco are included.

Stewardship of Limited Resources

Whenever the supply of a resource is limited, a prudent user or investor seeks to achieve the greatest benefit from that asset. Natural resources—air, land, water, natural systems, unique land features—are among the most precious and limited of assets; therefore, the best approach for a growing community like Frisco is to manage these existing resources to provide the greatest benefit to property owners and the community as a whole.

To demonstrate responsible stewardship of limited resources, decisions made by the City should help the community act mindfully in its consumption of non-renewable resources and in the management and use of renewable, but limited, assets. The City should use its capacity to educate, influence and persuade other decision-makers—businesses, households, schools, community groups—to practice responsible stewardship as well, (see also *Chapter 10, Implementation, pp. 91-93 and Strategy P09, p. 97*).

¹¹ Page 2, *North Texas 2050*, Vision North Texas, 2010.

Resource Inventory

The first step in responsible stewardship is to develop an understanding of the resources that exist. Maps of important natural areas depict the geographic distribution of these natural assets. Data on current resource consumption provides a baseline for the evaluation of future resource needs, and the knowledge of existing programs and management tools enhances the community’s capacity to manage limited resources.

See also *Appendix A7, Ecology & Natural Resources* contains an evaluation of the Frisco’s existing natural resources, assets and programs. This information forms the foundation for both future community development and for investment that manages these resources wisely. Key findings include:

- The Northern Blackland Prairie ecosystem in which Frisco is located is characterized by clay soils that shrink when dry and swell when wet. These soils create challenges for the construction of buildings, roads and other infrastructure.
- Ranching, farming and urban development have altered most of the prairie habitat that once covered this area. Riparian habitat along streams and creeks features stands of trees that provide shade, beauty and opportunities to walk and enjoy nature. Frisco’s remaining prairie and riparian areas can create unique amenities for the community.
- Development has increased Frisco’s tree cover. Trees provide significant economic and health benefits, (see also *Appendix A7, Ecology & Natural Resources, 152-154*). Trees that are appropriate to this climate can provide additional value to the Frisco community when planted and irrigated properly. Healthy tree cover is a natural asset that can be expanded as Frisco continues to grow.

A coordinated inventory of natural resources is an important tool for managing and enhancing these assets. In 2010, the North Central Texas Council of Governments contracted with the Trust for Public Land to conduct a “greenprint” study of the Lewisville Lake East sub-watershed, which includes

much of Frisco. An individual watershed may consist of thousands of acres; a sub-watershed is a portion of one of these larger geographical areas. The greenprint methodology analyzes both mapped data and stakeholder decisions about values and priorities. The end product is a map showing the areas that are most important to support the values of a specific community.

For this particular sub-watershed, the most important stakeholder priority was the protection of the quality of the water supply, specifically, the water in the supply reservoir. approximately 18% were identified as priority Figure 7-1 shows the results of this greenprint study.¹² Of the 51,746 acres in the study area, lands for the protection of

water quality. As the exhibit shows, most of these priority lands are located along the creeks and streams in the sub-watershed. Completion of a greenprint analysis for all of Frisco, and for issue priorities specific to this community, will provide:

- A stronger basis for the design of parks and open space within new developments;
- The location of natural corridors throughout the community; and
- The information needed for the creation of initiatives designed to protect these important natural assets.

(See also Chapter 10, Implementation).

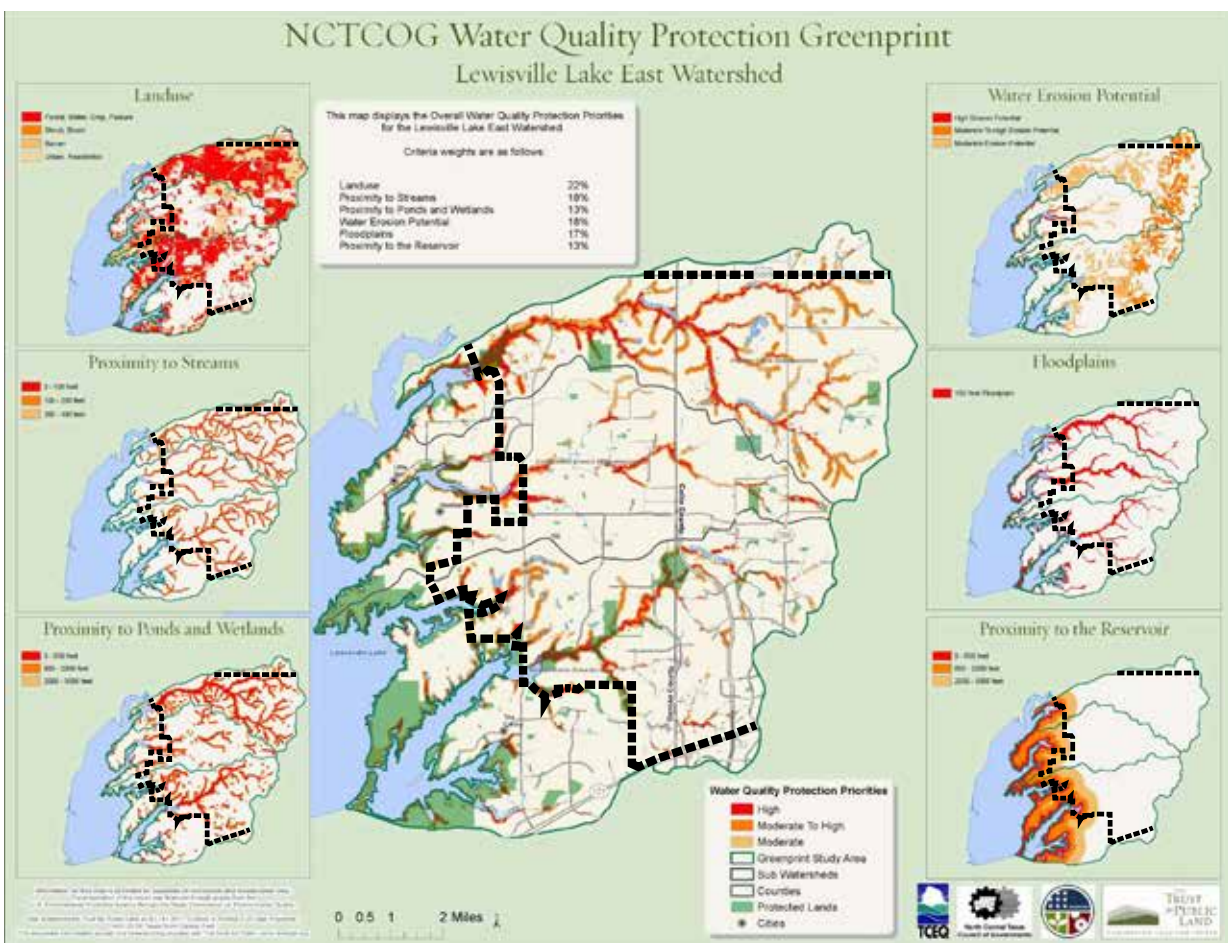


Figure 7-1: Lewisville Lake East¹³

12 "NCTCOG Water Quality Protection Greenprint: Lake Arlington Watershed and Lewisville Lake East Watershed", Project Report, 2011.

13 "NCTCOG Water Quality Protection Greenprint", 2011.

Natural Asset Amenities

The City of Frisco supports practices that recognize natural features as development amenities, (see also *Chapter 3, Place Making & Resiliency* and *Chapter 4, Land Use*). As much as possible, these natural systems and amenities should be protected so they continue to add value to the community. Developers are encouraged to work with existing topography rather than alter it and to incorporate streams, creeks, wetlands, tree groves and other natural amenities into water features and open space. The City also promotes the use of native or drought-tolerant plants in landscape areas.

Cluster development—configuring a neighborhood so that residential lots are located close together and large areas of natural open space are preserved around them—is possible under current Frisco regulations. The natural areas in these cluster or conservation subdivisions create amenities for the neighborhood’s residents and retain the benefits of the natural systems. These areas are typically placed in a conservation easement so they provide tax advantages to the property owner. *Appendix A7, Ecology & Natural Resources* describes the role the Connemara Conservancy Foundation could play in helping property owners and the Frisco community benefit from these amenities.

The natural topography provides additional opportunities for the creation of distinctive places and amenities within Frisco. Whenever possible, ridge lines and high points should be used to create locations for viewing the community and its key features, such as major open spaces and Frisco’s Center City. Development design should retain the viewsheds to notable landmarks and features.

Human and Economic Value of Natural Areas

Local and national research documents the value of natural places to the residents and property owners in a community. In “Last Child in the Woods,” Richard Louv summarizes a range of studies showing that simply viewing nature, even from a hospital room, can measurably reduce a person’s stress level.¹⁴ Louv states that “nature in or around the home appears to be a significant factor in protecting the psychological well-being of children in rural areas.”¹⁵ He documents a positive relationship between time in nature, including close-to-home nature, and a variety of health and behavioral improvements:

- Reduced anxiety;
- Lower ADHD;
- Better focus on studying and tasks;
- Increased creativity; and
- Lower stress.

The effects of the “nature-deficit disorder” described in his book argue for the preservation or revitalization of natural areas close to urban and suburban neighborhoods so that residents have the opportunity to connect with nature as part of their daily lives.

There is economic value in natural areas as well. A 2009 study by the Trust for Public Land, “Measuring the Economic Value of a City Park System,” defined seven different ways parks provide value. It documented an average increase of 5% in the value of properties near parks,¹⁶ and estimated an annual health benefit of \$250 for significant park users and \$500 per year for seniors. This study and others demonstrate that parks, open spaces and natural areas provide both public health benefits to park users and economic benefits to property owners near the parks, (see also *Appendix A2, Placemaking & Resiliency, p. 107*).

14 “Last Child in the Woods: Saving Our Children from Nature-Deficit Disorder”, Richard Louv, 2006.

15 Ibid., page 49.

16 “Measuring the Economic Value of a City Park System”, the Trust for Public Land, 2009.

The Quality of Frisco's Natural Assets

Frisco is located within a large metropolitan area and within natural regions that extend beyond its city limits. For these reasons, the actions of the City alone will not determine the quality of the natural assets available to its residents, but actions by the City of Frisco and the Frisco community can make a difference. The community can use its plans, investments and other initiatives to help maintain or improve the quality of the region's natural assets, and it can play a leadership role in regional efforts.

Regional Watersheds

The City of Frisco includes parts of five different regional watersheds within the Trinity Basin.¹⁷ Two of these watersheds, the Elm Fork below Lewisville Lake and the Trinity River Headwaters, drain to the Upper Trinity River, (*see also Appendix A7, Ecology & Natural Resources*).

For the areas within these watersheds, key issues include:

- The quality of the water for recreational use of rivers and streams;
- The erosion of stream banks and the resulting damage to adjacent property; and
- Public safety and the impact of flooding on property.

Frisco's other three watersheds drain to the region's water supply reservoirs—Lewisville Lake, Lavon Lake and Lake Ray Hubbard. Recreational water quality, erosion and public safety are concerns in these watersheds as well. In addition, runoff, pollution and sedimentation from development in the water supply watersheds affects the quality of the water in the reservoirs, impacting the drinking water supplies and increasing the cost of water treatment for local communities.



The streams and creeks that define watersheds also provide a framework for other natural systems at a regional scale. Water and wastewater systems are typically structured to follow watersheds because this design takes advantage of gravity flows to reduce the cost of pumping water and wastewater across topographic boundaries. Open space networks tend to follow stream courses as well because in these areas, the intrusion of urban development is more limited and the native habitats are the healthiest. All of these networks relate to watersheds and subwatersheds,

¹⁷ "Valuing Our Watersheds: A User's Guide to the North Central Texas Regional Ecosystem Framework", First Draft, North Central Texas Council of Governments, 2010.



2015
COMPREHENSIVE PLAN

FLOODPLAINS &
TREE COVER

LEGEND

- Frisco City Limit
- Frisco ETJ Limit
- Railroad
- Lake / Pond
- River / Creek
- Tree Cover
- Parks
- Planned Parks
- Open Space
- 100 Year Floodplain
- 500 Year Floodplain

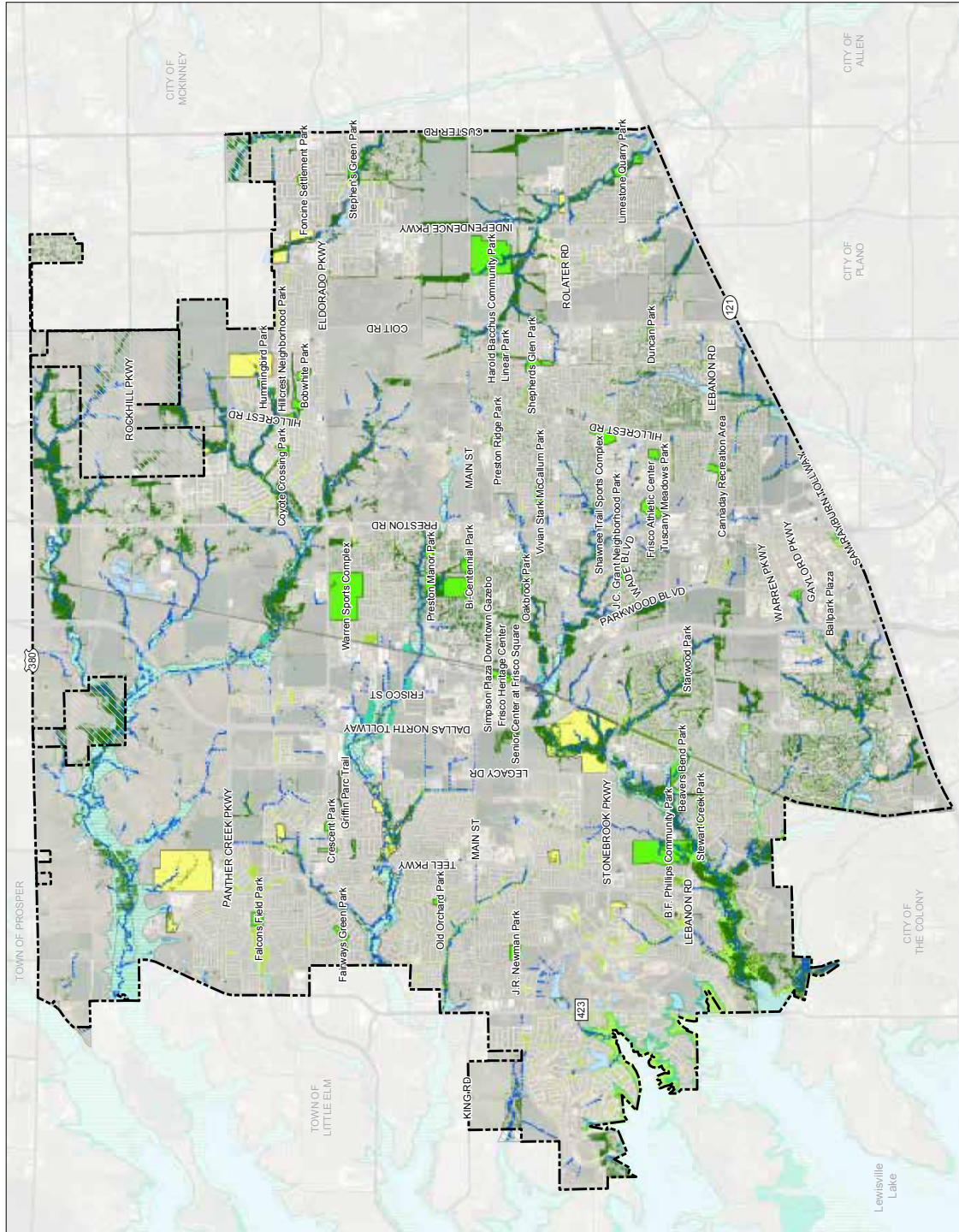
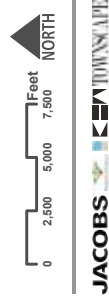


Figure 7-2: Floodplains and Tree Cover

not city boundaries; therefore, collaboration across communities is the most effective way to maximize the benefits of the natural systems in the region. As Frisco plans for its own future, it can also look for opportunities to support regional systems.

Since these stream and creek networks define connected corridors, they are often desirable locations for trail systems. The open spaces along streams and creeks must be designed so they can provide trails appropriate for future users (pedestrians, cyclists, equestrians, etc.) while still maintaining the benefits of the natural watersheds and drainage systems. In open space areas along creeks, trails must be designed so that they are ADA-compliant and do not reduce drainage capacity necessary to accommodate the level of anticipated storm runoff. Changes to the natural topography as part of trail design must not contribute to streambank erosion or increased sedimentation.

Figure 7-2 shows the 100-year floodplains in Frisco.¹⁸ These corridors create linked areas of open space, opportunities to connect with nature, valuable locations for trails and options for residents who want to experience the North Texas environment as they walk or bike between destinations in Frisco.

Air Quality

As noted in the Public Health and Public Safety and Transportation Strategies, the Environmental Protection Agency (EPA) has classified Collin and Denton Counties as moderate non-attainment zones for 8-hour ozone levels. While one community within this region cannot change regional air quality by itself, each community can do its part to reduce the health and environmental impacts of air pollution. The North Central Texas Council of Governments manages *Air North Texas*, a regional clean air partnership and campaign to:

- Provide a comprehensive air quality resource;

- Promote a consistent, regional air quality message;
- Leverage existing resources and program strengths in a collaborative effort;
- Increase public awareness of specific opportunities for residents to reduce emissions; and
- Motivate residents to make clean air choices.

Partners in this campaign include business organizations, local/state/federal governments, universities and non-profit organizations. The City of Frisco should consider joining this partnership to support air quality awareness and action. It can review and act on the many recommendations this campaign has made to local governments. For private sector interests, the North Texas Commission's *Clean Air Texas* program offers assistance to businesses trying to reduce their air quality impact. The City can encourage Frisco-based businesses to participate in these programs as part of their contribution to the air quality improvement initiative.

Regional Leadership

Addressing regional assets and systems requires leadership that looks beyond the boundaries of individual jurisdictions. Frisco has been one of the fastest-growing cities in the region for many years and is among the largest of these growing communities. As a result, Frisco's choices about development design help to shape the development underway in other, smaller communities. Frisco has been actively involved in regional decision-making as part of the Regional Transportation Council, *Vision North Texas* and other initiatives. The City can expand its role as a leader in the region as it focuses on a future where natural assets play a more important role in shaping community character and identity and where wise use of resources is the goal, (*see also Chapter 10, Implementation*).

¹⁸ A 100-year floodplain is the area that has a 1% chance of flooding in any given year.



The Design of the Built Environment

Since World War II, American metropolitan areas have enjoyed tremendous growth and success. Beginning in the 1940's, the techniques of mass production that had successfully supported the war effort were applied to other industries to meet the needs of American GI's returning home and looking for places to live and work. More recently, private development has been considered successful if subdivisions, shopping centers and office buildings were largely occupied and the initial developers realized a profit on their investments. Today, however, the measures of success have changed. The residents, property owners and leaders of a community understand that their long-term viability rests on the community's ability to be desirable and cost-effective over a long period of time. This view considers the life-cycle costs of a development and the long-term benefits it brings to the community. Frisco's development and investment policies should support this life-cycle view of lasting success.

Energy Efficiency and Green Building

Decisions about construction, site design and the operation and maintenance of City facilities all translate into a use of natural resources. Research on best practices of "green building" demonstrate that these techniques reduce the use of water, energy and materials, attract buyers and save money. The National Association of

Realtors', *2012 Profile of Home Buyers and Sellers* reports that "86 percent of those surveyed said that heating and cooling costs were somewhat or very important when considering their home purchase."¹⁹ The Green Resource Council, a National Association of Realtors subsidiary, advises its members that "going green makes sense" in terms of the environment, financial savings and health.²⁰ The Urban Land Institute (ULI) reported in 2010 that "effective rents are 2.8 percent higher in buildings with the Energy Star rating than in conventional buildings" and that "energy efficiency seems to drive up the resale value of buildings".²¹ ULI members who develop non-residential buildings indicate that the market has shifted to the point that energy efficiency is now expected by buyers, investors and tenants. Lastly, CBRE Research reports that as of the end of 2013, green, LEED-certified space now makes up 19.4% of the U.S. commercial office market.²² This increase in green building is due, in part, to a "recognition that many Fortune 500 firms, the most desired tenants, are now demanding sustainable buildings to meet their own environmental policies."²³

The City of Frisco was an early leader in green building. A green building code for residential construction has been in effect since 2001 (the first mandatory residential green building program in the nation), and green building requirements for commercial and multi-family

¹⁹ National Association of Realtors, website www.realtor.org, accessed December 7, 2014.

²⁰ Green Resource Council, website www.greenresourcecouncil.org, accessed December 7, 2014.

²¹ "Green Market Value", Urban Land magazine, 2010.

²² "National Green Building Adoption Index 2014", CBRE Research, 2014.

²³ Ibid., page 5.

construction were put in place in 2007. Today, Frisco has over 60 buildings that are recognized by LEED, EnergyStar or similar programs for their efficiency and sustainability features.²⁵ The LEED projects in Frisco save an estimated 14% on energy costs compared to an energy code baseline.

Energy Use

In a metropolitan area, energy is consumed in transportation, industry and at the household scale. Since energy sources and pricing are largely determined at a state, national or international level, the residents and businesses in an individual community cannot set the unit prices of energy resources. They can, however, manage their use of these resources by carefully considering several key factors:

- Decisions about where to live and work affect the amount of travel someone does on a daily or weekly basis. Since most of that travel involves the use of private vehicles, these choices affect gasoline consumption.
- Choices about how and where to build a home, office or commercial building affect the costs of the transmission lines required to provide electric and gas services from a regional provider.
- The details of building design, site layout and landscaping have an important impact on energy consumption.
- Alternatives related to the sources used to produce energy have generally been left to the energy providers. In recent years, interest in distributed energy (energy produced at a smaller scale and closer to the customer) and renewable or alternative energy sources has given consumers more choice about the sources of the energy they use.
- Energy conservation—energy-efficient design, smart building operations and other techniques—lowers the demand for energy and reduces or postpones the need to construct major new power plants to provide service to consumers.

The American Council for an Energy-Efficient Economy (ACEEE) has identified a range of design techniques that can reduce the urban heat island effect, lowering energy bills and reducing health impacts.²⁴ These techniques relate to local government operations, buildings, energy and water utilities, transportation and the community as a whole.²⁵ Developers should be encouraged to implement these techniques, particularly in non-residential developments and master-planned communities.

Water Use

Over the past several years, Frisco has implemented the outdoor watering restrictions established by the North Texas Municipal Water District (NTMWD). It also encourages water conservation through its green building initiatives. Water conservation will continue to be important in the future because of the number of new households and businesses anticipated in Frisco and since the climate of Texas and the Southwestern U.S. is expected to be drier in the future. Frisco's land use patterns and its buildings, infrastructure and landscapes should be designed for conservation and the efficient use of water. Over time, Frisco can take advantage of emerging systems and technologies to monitor actual water usage and reduce unnecessary consumption, (*see also Chapter 10, Implementation*).

State Goal

- The annual water use goal as established by the Texas Legislature in the State Water Plan is 140 gallons per person (per capita) per day (gpcd).

NTMWD Conservation Goal

- During Stage 3 drought restrictions, a 10% water use reduction goal was set by the North Texas Municipal Water District (NTMWD) for district customers based on individual annual usage. During the most recently completed reporting period

²⁴ "Cool Policies for Cool Cities: Best Practices for Mitigating Urban Heat Islands in North American Cities", American Council for an Energy-Efficient Economy, 2014.

²⁵ "2013 City Energy Efficiency Scorecard", American Council for an Energy-efficient Economy, www.aceee.org, 2013.



(October 2013 through September 2014), the City of Frisco reduced water usage by 23.6% in addition to the reduction goal of 10% set by the water district for a total reduction of 33.6%.

Conservation Results

- During calendar year 2013, the City of Frisco used about 180 gpcd. During calendar year 2014, the city further reduced usage to 148 gpcd only eight (8) gpcd above the state goal of 140 gpcd.
- Since the year 2000, the City has reduced usage from about 300 gpcd for a 15 year reduction close to 50%.

Landscape Ordinance

Frisco has been a regional leader in implementing sustainable landscape practices; it was the first to require Evapo Transpiration (ET) adjustments, water reductions, and other measures to reduce and/or conserve water. In Frisco, non-residential developments are required to set aside an area equal to 5% of the parking surface as low impact development Water Resource Zones in the form of bioretention or pervious pavers. The City’s landscape requirements set an annual



Landscape Water Allowance that is 50% less than conventional landscape practices and historical Potential Evapo Transpiration (PET). Developers are encouraged to meet the landscape water allowance through design of Natural Landscape Zones, Water Resource Zones, and efficient irrigation.

WaterWise Education Programs

Water Resources focused on key outreach programs for residential and non-residential water customers in Frisco. In 2014, the *WaterWise Workshop Series* was expanded to include both spring and fall workshops. More than 600 residents attended a free workshop such as Converting to Drip Irrigation, Healthy Lawns 101, Rainwater Harvesting or, Fix-a-Leak.

The weekly *WaterWise newsletter* base grew to more than 10,800 subscribers. The weekly watering recommendation, based on Frisco’s own weather station, is highlighted in the newsletter. In addition, lake level monitoring, updates on water restrictions, informational articles pertaining to reducing water usage, and upcoming workshops are key elements in each newsletter.



Other educational programs that contributed to the awareness campaign include the Block Captain program, Smart Controller program, and outreach to HOA's. A watering line was also established in 2014 that allows residents to call in and check Frisco's weekly watering recommendation.

Rain Barrel Program

The City of Frisco partners with Rain Water Solutions, Inc., to offer discounted rain barrels to Frisco residents. Residents purchased the rain barrels online and picked them up during a distribution event located at the Public Works offices. A total of 621 rain barrels were sold as a result of the 2014 pilot program. The program was offered again in 2015.

Free Sprinkler System Checkups

As part of an ongoing conservation effort to reduce outdoor water usage, the City of Frisco offers free sprinkler system checkups to residents. A total of 3,653 checkups were performed in 2014. During a free sprinkler checkup, a City of Frisco licensed Irrigation Specialist guides residents through their irrigation system, checks for inefficiencies, and sets the controller in compliance with the current water restrictions.

Green Infrastructure

The concept of green infrastructure design recognizes that natural systems can often do a better job of serving communities than the "grey infrastructure" of pipes and concrete that has been the focus of systems designed over the past several decades. Investment in grey infrastructure has had unintended consequences—paving and other impervious surfaces cause increased runoff, reduced groundwater recharge and higher urban temperatures, for example. The costs required to operate, maintain and rehabilitate this infrastructure have increased the total cost of these improvements over their life cycle. Cities and their constituencies have begun to recognize that retaining natural areas and systems can not only counteract some of the negative

impacts of the grey infrastructure, but also provide aesthetic amenities to the community. Green infrastructure includes natural swales, healthy tree canopy, pervious pavement, green roofs, infiltration planting in medians, curbsless streets, bioretention areas that double as open space and/or landscaping and a number of other techniques, (see also *Chapter 10, Implementation*). These features yield aesthetic and health benefits and provide infrastructure service to the community.²⁶

Green infrastructure design, or low impact development, uses nature to detain storm water, recharge groundwater and reduce runoff. In North Texas, the Council of Governments has convened a group of local governments to develop the *integrated Storm Water Management (iSWM)* program. This program is "a cooperative initiative that assists cities and counties to achieve their goals of water quality protection, streambank protection and flood mitigation, while also helping communities meet their construction and post-construction obligations under state stormwater permits."²⁷ This program provides technical tools that can be used by cities and developers to design



26 "Green Infrastructure: A Landscape Approach", American Planning Association PAS Report 571, 2013.

27 *integrated Storm Water Management*, website iswm.nctcog.org, accessed December 7, 2014.

neighborhoods and business areas that use natural systems as part of a safe, cost-effective infrastructure.

Community Engagement, Education and Involvement

The City of Frisco can make responsible choices about its own use of resources and use its planning tools to create a land development pattern that reduces the use of resources. Many of the choices about the use of natural resources in Frisco, however, are made by individuals, families and business, not by the City. Even so, the City can play an important role in educating these decision-makers as to the wisdom and value of the mindful use of resources, *(see also Appendix A7, Ecology & Natural Resources)*.

The City can and should work in partnership with other organizations to educate residents and property owners so that their choices lead to a more sustainable use of natural resources, *(see also Chapter 10, Implementation)*. These partners include the Frisco, Little Elm, Lewisville and Prosper school districts; business and development organizations such as the Chamber of Commerce and the Frisco Developer's Council; and neighborhood groups, civic organizations and others who can inform and educate the community.

As individuals, neighborhoods and businesses change their behaviors to reduce the use of resources, it is important to monitor the results and to share the lessons learned with others in the community. There are numerous programs for tracking, certifying and recognizing achievement in these areas. In a recent online article, Eliot Allen provides a summary of fifteen current programs that can be used to monitor and track improvements at a neighborhood level.²⁸ Many of these are web-based; increasingly, smart phone apps are likely to

give residents even more choices about how to engage with and support a green community. Frisco can use these tools to support responsible resource consumption in City operations and can educate residents and business about these tools and encourage their use.

²⁸ "How Green is My Neighborhood? Let Me Count the Ways", Planetizen article dated May 29, 2014. Accessed at www.planetizen.com on December 7, 2014.

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