The Parks and Recreation Trail Network

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The provision of recreation trails and pathways system continues to gain importance in many communities as trials are a primary requested recreation resource for both light and intense recreation and exercise. When developed and located properly the trail system can provide an alternative transportation route for commuting and improve the overall city mobility plan. A trail and bikeway system that is well planned allows people to access various destinations and helps to foster a more healthy and active population. Trails enhance overall quality of life and can generate a healthy return on investment.

A study conducted on the city of Dallas estimated that for every $1 invested in trails, the city saw a return of $50. Though these projections are high and not exact for all other cities, Denton will experience a return on investment when the trails and bikeways match expected quality and improve connectivity.

In this chapter of the Parks Master Plan the opportunities and constraints for the Parks and Recreation Department Trail and Pathway needs and potential developments are presented and recommendations for areas and corridors to pursue for multiple trails and pathways are presented.

THIS CHAPTER IS NOT A COMPREHEHSIVE CITY TRAIL/PATHWAY MOBILITY PLAN. Many cities have developed a comprehensive city trail and pathway plan to maximize mobility, use opportunity and accessibility across the city where both street, sidewalk transportation assets, and park and recreation off-street trails have been or are planned for development and linages to create a comprehensive multi-purpose mobility and recreation trail system. The City of Denton has made substantial efforts in the development of on street pathways and off-street pathways and sidewalks in addition to adopting exceptionally high-quality development policies for the road network to include additional pathways in many road projects. The City of Denton has a full-time staff member dedicated to the improvement of the overall non-motorized transportation strategies. All work in this chapter has been completed with consideration of the efforts by the department of transportation.

The work in this chapter is an initial step in providing guidance to a comprehensive trail plan. This chapter of the master plan will need to be expanded into a full details trail network development strategy that may also be part of a city-wide collaborative effort with the Denton Department of Transportation and Mobility and then each individual segment identified will eventually need unique individual engineering plans and documentation.

It is recommended that the Park and Recreation Department complete an independent **Comprehensive Parks and Recreation Trail Network Plan.** This plan would provide the full details of current trail locations, trail use types and percentage of use, land acquisition, easements, amenity details and concept drawings for each trail the department will develop over the next ten years.

The recommendations in this section of the master plan are specific to maximizing the current City of Denton Park and Recreation trail network for a variety of recreation activities.

A Future Comprehensive City of Denton Pathway Plan

There are high priority non-motorized transportation-mobility pathway needs within the city. Over the past 5 years, many increase non-motorized use, accessibility, and connectivity across the city. Some of those become part of the Parks and Recreation Trail System.

On-street (Bike lanes, shared lanes), Side Paths (8 ft. or wider concrete pathways located in adjacent road easements) and Trails (bike and pedestrian friendly pathways in park property) and pedestrian sidewalks and specific segment connectors contribute to the City of Denton Non-Motorized Transportation/Mobility system. The need to increase the overall accessibility of the non-motorized city pathway infrastructure and the needed funding to develop a comprehensive city pathway system justify the need for the completion of a comprehensive city (Multi-department and partnership) City of Denton Pathway Plan. That document would include the Park and Recreation Departments Recreation Trails Network.

GOALS AND PURPOSE of the TRAIL CHAPTER of the MASTER PLAN

The purpose of this chapter is to identify areas and corridors for potential trail or bikeway development and to develop a strategy to implement a connected trail and bikeway system to increase accessibility and service across the city.

The goals and objectives related to parks and recreation trail development:

GOAL

CREATE A COMPREHENSIVE PARKS SYSTEM TRAIL, PATHWAY NETWORK CORRIDOR BASEMAP TO INCREASE TOTAL MILES, ACCESSIBILITY AND SERVICE.

OBJECTIVES:

Identify land around greenbelts and creeks to serve as future trail corridors.

Identify corridors for future trails that will Increase total miles of trails by 100%

Identify corridors for future trails to improve connectivity and linkages of individual parks by 30%

Identify corridors for future trails to increase overall accessibility to trails in each city zone by 20%.

Design trails for new recreation use.

Provide recommendations for road crossing standards

Target miles by 2030

City	Miles of Trail	Population	
Denton	**210**	**250, 000**	**1 mile per 1,190**
Dallas	250	1,500,000	1 mile per 6,000
Houston	150	1,250,000	1 mile per 8,333

Current Park and Recreation Trail Uses (in rank order):

1. Active walking	with family and pets for exercise
2. Exercise	that includes running and bike riding
3. Nature walks	experience the natural environment/ view wildlife
4. Adventure	single-track bike riding and trail running
5. Passive walking	enjoy nature and park environment
6. Educational	walks to learn about ecosystems
7. Events	races and fundraising walks hosted on park trails

PERTINENT CITIZEN INPUT

Denton Parks and Recreation Citizen Survey Master Plan Needs Assessment determined that expansion of the trail system was the highest requested feature. The Park and Recreation Department hosted multiple open public Trail Network Meetings, collaborated with City Mobility Meetings, and acquired data on activity interest specific to trail development from the Master Plan Needs Assessment.

One key theme that emerged from the multiple community engagement meetings and specific public trail planning meetings was to connect the city via trails and bikeways and develop specific unique loop trail systems or dedicated marked loops within the city. Residents recommended multiple types of trails as well as designs for all levels of trail use/ability and when appropriate increased (extreme) challenges for advanced cycling/mountain biking as a sport and for trail (ride, run, walk, and paddle) related programming.

The master plan needs assessment survey provided additional insight and support for the expansion of the overall trail network. To review those details please read that chapter of this master plan.

The Existing Trails currently managed by the Parks Department provide a variety of recreation opportunities and contribute to the overall connectivity for non-motorized access across portions of the city**.** The trails are a mix of internal park loops, connectors, linear trails utilizing creek corridors, a rail-to-trail development, side paths, and dirt trail loops and networks in existing parkland. These trails are highly used by the residents for walking, running, biking, and hiking.

Existing Trails

Within the city of Denton in 2020 there are approximately 34 miles of existing trails providing 1 mile of trail for approximately every 4,000 residents.

(DFW area cities level of trail service generally ranges from 2,500 to 8,000)

Location	Length	Type	Condition
Avondale Park Trail Bridge,	.40	Concrete	Good
Bowling Green Park	.29	Concrete	Good
Carl Young Park	.29	Concrete	Good
Cooper Creek Trail	1.55	Concrete	Good
Cross Timbers Park	1.62	Mixed	Good
Denia Trail Project	1.63	Concrete	Good
Denton Rail Trail	8.39	Concrete	Good
Evers Park Trail (connected pathway)	2.86	Concrete	Good
Fred Moore Park	.85	Concrete	Good
Lake Forest Park	1.74	Mixed	Good
Nette Shultz Park (connect to Avondale)	.56	Concrete	Good
North Lakes Park (internal + connected)	4.0	Mixed	Good
North Pointe Park (connected)	.68	Concrete	Good
Quakertown Park	.50	Concrete	Good
Preserve at Pecan Creek	.40	Concrete	Good
Sequoia Park	.40	Concrete	Good
South Lakes Park	3.76	Concrete	Good
Sweet Cloud Park	.50	Concrete	Good
Unicorn Lake/Briercliff Park	1.46	Concrete	Good
Wheeler Ridge Park	.30	Concrete	Good
Clear Creek (Denton or Corps)	4.0	Dirt	Moderate
Total	**33.86**		

***The current trail system needs a series of improvement investments that include signage and crossing safety improvements*.**

Recommendations

The following recommendations of 210.49 additional miles of trail provide an expansion to the exiting trail network created from consideration of the available resources and need for connecting major destinations and demand-based opportunities.

Before implementation of these corridors, the organization should complete a comprehensive Trails and Bikeways Master Plan to identify feasibility of corridors, detail costs, and identify implementation strategies.

Needs for signage and crossing safety improvements to the existing trail network are a high priority and the individual needs should be identified and reviewed

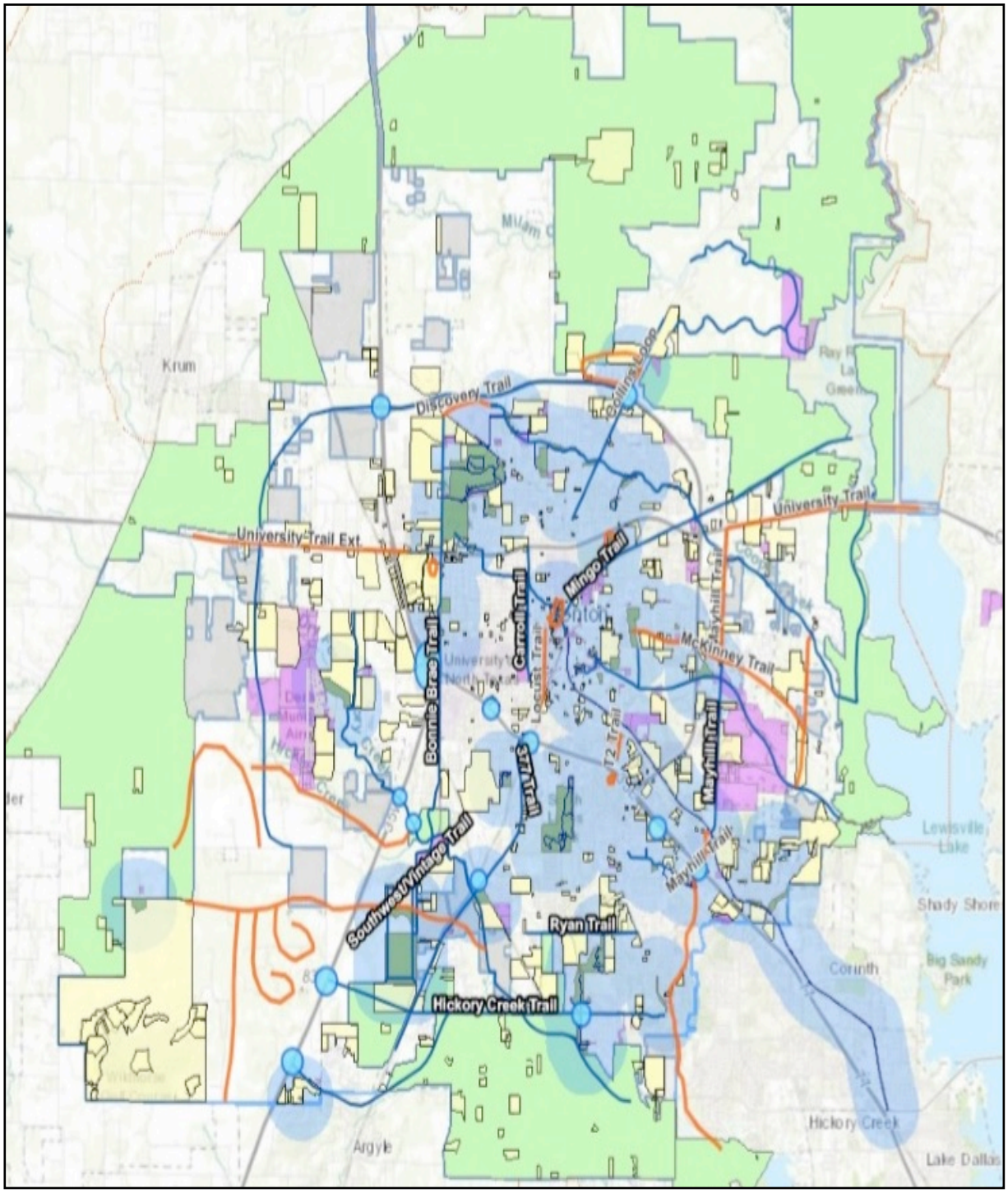
Planned Trails by General Category

Type	Length	Build	Maintenance
Creek/Drainage Trails	17.42	20 million	$106,750
Internal Park Trails	31.69	35 million	$86,000
Sidepath Trails	130.43	Transportation	$351,500
Paddling Trails	30.95	5 million	$11,000
Equestrian	5.35	Shared	shared
TOTAL	210.49	60 million	$555,250

Internal Connectivity for the proposed trail system will increase to enhance internal providing corridor links to 22 parks and the neighborhoods between Quakertown/Downtown and each section of Denton. This system creates connectivity to 12 additional schools. The proposed trails complement the city mobility plan increasing overall non-motorized community access by 70%.

External Connectivity of the proposed trail system expands and completes portions of the regional Velo Web project creating non-motorized trail links to adjacent cities. The proposed system has trails that when completed will provide access for future trail attachments to the following: Aubrey, Argyle, Corinth, Hickory Creek, Highland Village, Krum, Little Elm, Ponder, & Sanger

The 2020 Trail System Master Plan Proposed Trail Network



Internal Park Trails	Tread type	Est Length	Rank	Fiscal Year	Maint Cost*
Mountain Bike Park Loop	Dirt/Crushed	5.75	5	2021	$5,000
McKenna Park Loop Trail	Concrete	0.60	2	2020	$2,500
Denia Trail Loop Phase 1 (Internal Loop)	Concrete	0.23	10		$7,500
Southwest Park Loop	Concrete	2.50	9	2025	$12,500
Joe Skiles Park Loop	Concrete	0.28	7	2023	$1,500
Quakertown Park Loop	Concrete	0.25			$1,500
South Lakes Park (expansion)	Dirt/Crushed	1.16			$1,000
Sagebrook Property Loop	Dirt/Crushed	0.56			$500
Collins Stadium Loop	Concrete	3.00			$15,000
Unicorn Lake Loop/Briercliff Park	Concrete	0.21	6	2023	$1,500
Lake Forest Park Trail (South)	Dirt/Crushed	1.95			$2,000
Crosstimbers Trail (Connection)	Concrete	0.10	4	2021	$500
Don Carter Property Trail	Dirt/Crushed	6.00			$3,000
Welch Property Trail	Dirt	1.45			$1,500
Rayzor Ranch Park Trail Loop	Concrete	1.00	1	2020	$5,000
Nette Shultz Park Trail Loop	Concrete	0.10	8	2023	$500
Township 2 Trail	Concrete	0.38			$1,500
Mills Property Trail	Dirt/Crushed	1.72			$1,500
Mingo Trail Phase 3 (Collins to Greenbelt)	Concrete	1.10			$5,000
Bowling Green Trail Loop	Concrete	0.34	3	2021	$2,000
Bowling Green to NLP Rec Center	Concrete	0.33			$2,000
Wheeler Ridge to Hickory Creek	Concrete	1.68			$8,000
Discovery Trail Connection (BBT to CCT)	Concrete	1.00			$5,000
TOTAL MILES		**31.69**			**$86,000**

Internal Park Trails (Paved Loops)

Short loop trails inside park boundaries typically paved for multi-use to accommodate exercise and passive bicycle traffic and are typically 8 feet wide or greater. Internal park trails also include soft-surface trails using decomposed granite or compacted earth. Width of these trails vary from 2’ to 6’ and are not always multi-use and include

- Nature Trails
- Active Recreation Trails – Single Track / Pump Track / BMX Track
- ATV – Motocross Trails and Tracks

Creek and/or Drainage Trails	Tread Type	Est Length	Rank	Fiscal Year	Maint Cost*
Denia Trail Loop Phase 1 (Internal Park Loop)	Concrete				$0
Denia Trail Loop Phase 2 (Borman Elementary/Denia Park)	Concrete	0.05	5	2024	$2,500
Denia Trail Loop Phase 3 (Forestar Rayzor to Roselawn)	Crushed	0.60			$2,500
Hickory Creek Trail Phase 1 (Lake Lewisville to Old Alton Bridge)	Crushed	1.41		2025	$1,500
Hickory Creek Trail Phase 2 (Old Alton Bridge to Crosstimbers)	Crushed	1.55	8	2025	$1,500
Hickory Creek Trail Phase 3 (Crosstimbers to Hickory Creek Rd)	Crushed	0.10	6	2025	$250
Hickory Creek Trail Phase 4 (Hickory Creek Rd to Country Club)	Concrete	1.26			$2,000
Hickory Creek Trail Phase 5 (Country Club to Bonnie Brae)	Crushed	3.36			$3,250
Hickory Creek Trail Phase 6 (Bonnie Brae to 35W)	Crushed				$0
Hickory Creek Trail Phase 7 (35W to Cole Rd)	Concrete	2.76			$7,000
Dry Fork Hickory Creek Phase 8 (BBrae Bridges to J Christal)	Crushed	4.84			$5,000
North Hickory Creek Trail Phase 9 (Cole Rd to J Christal)	Concrete	1.61			$7,500
North Hickory Creek Trail Phase 910 (J Christal to 380)	Concrete				$0
South Hickory Creek Trail Phase 11 (Cole-UNT Ast to 156)	Concrete				$0
Clear Creek Trail (East of 428)	Crushed	2.30			$2,250
Clear Creek Trail (West of 428)	Crushed	0.52			$500
Greenbelt Trail (Relocated?)	Crushed				$0
Cooper Creek Trail Phase 1 (Evers Connection)	Concrete	0.21			$1,250
Cooper Creek Trail Phase 2 (Sherman to Avondale)	Concrete	0.51			$2,500
Cooper Creek Trail Phase 3 (Old North to Mingo)	Multi-use	0.62			$3,000
Cooper Creek Trail Phase 3 (Mingo to Lake)	Multi-use	3.17			$15,000
Pecan Creek Trail Phase 1 (DCTA Trail to FMP)	Crushed	0.12			$500
Pecan Creek Trail Phase 2 (FMP to Woodrow)	Concrete	0.88	1	2022	$4,000
Pecan Creek Trail Phase 3 (Woodrow to Mayhill)	Concrete	5.00	4	2025	$25,000
Pecan Creek Trail Phase 3a (Shady Oaks)	Dirt	0.00	2	Completed	$0
Pecan Creek Trail Phase 4 (Loop to Mayhill)	Dirt	0.40			$500
Pecan Creek Trail Phase 5 (Mayhill to City Property)	Dirt	2.15			$2,250
Pecan Creek Trail Phase 6 (City Property to Lake)	Dirt	0.77	3	2025	$750
Pecan Creek Trail Phase 7 (Quakertown/Parkway to Denton)	Concrete	0.46			$2,500
Pecan Creek Trail Phase 8 (Parkway/Denton to Panhandle)	Concrete	0.21			$1,750
Pecan Creek Trail Phase 9 (Panhandle/Fulton/Crescent/Malone)	Concrete	1.10			$2,500
Pecan Creek Trail Phase 9a (Drainage Ch:Denton to Fulton)	Concrete	0.45			$2,500
Pecan Creek Trail Phase 9b (Drainage Ch:Fulton to Malone/380)	Concrete	0.46			$2,500
Pecan Creek Trail Phase 10 (Malone to North Lakes Park)	Concrete	0.91			$4,500
Loving Branch Trail	Dirt				$0
Milam Creek Trail	Dirt				$0
Fincher Branch Trail	Dirt				$0
Bryant Branch Trail	Dirt				$0
TOTAL CREEK TRAIL LENGTH IN MILES		**17.42**			**$106,750**

Creek /Drainage Corridor Path (provide connectivity)

An off-street multi-use trail (also referred to as shared-use path) is typically located in an independent right-of-way such as a creek or river corridor, greenway, utility corridor, or a railroad corridor. The expected use guides the selected width of the trail but generally, these are a minimum of 8 feet wide.

Sidepaths Along Roadways	Tread type	Est Length	Rank	Fiscal Year	Maint Cost*
Mayhill Trail Phase 1 (380 to Quailcreek Rd)	Concrete	3.47	1	2020	$17,500
Mayhill Trail Phase 2 (Quailcreek Rd to Katy Trail)	Concrete	0.30	2	2020	$2,000
Mayhill Trail Phase 3 (Katy Trail to 35E)	Concrete	0.24			$1,500
Mayhill Trail Phase 4 (35 Interchange)	Concrete	0.05			$500
Bonnie Brae Trail Phase 1	Concrete		3	2023	
Bonnie Brae Trail Phase 2	Concrete		4	2023	
Bonnie Brae Trail Phase 3	Concrete		5	2023	
Bonnie Brae Trail Phase 4	Concrete	5.89	6	2023	$30,000
Bonnie Brae Trail Phase 5	Concrete		7	2023	
Bonnie Brae Trail Phase 6	Concrete		8		
Bonnie Brae Trail Phase 7	Concrete		9		
University Trail (US 380/US 377)	Concrete	9.00	10		$45,000
Hickory Creek Rd Trail Phase 1 (377 to Country Club)	Concrete	1.44			$7,500
Hickory Creek Rd Trail Phase 2 (Country Club to Railroad)	Concrete	0.70			$4,000
Hickory Creek Rd Trail Phase 3 (Bridge Connection)	Concrete	0.00			$0
Hickory Creek Rd Trail Phase 4 (Railroad to Teasley)	Concrete	1.51	14		$7,500
Hickory Creek Rd Trail Phase 5 (Teasley to 2499)	Concrete	0.44	15		$2,500
North Hickory Creek Trail Phase 9 (Cole Rd to J Christal)	Concrete	3.22			$4,000
Brush Creek Trail (35W to Railroad)	Concrete	1.47			$7,500
Crawford Road (377 to 35W)	Concrete	1.10			$5,000
428/Sherman Trail Phase 1 (US77 to Loop 288)	Concrete	2.15			$10,750
428/Sherman Trail Phase 2 (Loop 288 North to Greenbelt 428)	Concrete	5.52			$27,600
Mingo Trail Phase 1 (Bell to Loop 288)	Concrete	2.55			$12,500
Mingo Trail Phase 2 (Loop 288 to Collins)	Concrete	1.79			$8,000
Mingo Trail Phase 3 (Collins to Greenbelt)	Concrete				$0
Carroll Trail	Concrete	0.50			$2,500
377 Trail (35E to .26 miles south of FM1830)	Concrete	1.51	12	2021	$7,500
377 Trail to Brush Creek (Future Phases)	Concrete	2.47	13	2025	$12,500
2499 Trail	Concrete	0.50			$2,500
288 Loop Trail Phase 1 (428 to 35N)	Concrete	4.00			$20,000
288 Loop Trail Phase 2 (288/35N interchange connection)	Concrete	0.11			$550
288 Loop Trail Phase 3 (Expansion 35N to 35W)	Concrete	7.75			$38,750
Vintage Trail	Concrete	1.33	11	2021	$6,500
Country Club Trail (377 to Hickory Creek Rd)	Concrete	2.62			$13,100
Sycamore Trail	Concrete	2.00			$10,000
Hunter Ranch Trails (Various Phases)	Concrete	32.00			$0
Cole Ranch Trails (Various Phases)	Concrete	26.00			$0
Preserve to Pecan Creek (Post Oak Rd)	Concrete	1.71			$8,500
Pecan Creek Trail to Cooper Creek Trail	Concrete	2.40			$12,000
Jim Christal/Oak St	Concrete	3.25			$16,250
East Mission Street	Asphalt	0.34			$2,500
South Lakes Park to Katy Trail	Concrete	1.10			$5,000
TOTAL SIDEPATH TRAIL LENGTH IN MILES		**130.43**			**$351,500**

Sidepaths (City of Denton Mobility Plan Projects)

A sidepath is a shared-use paved path or trail located adjacent to a roadway; they can create increased conflicts between path users and motor vehicles at intersections and driveway crossings. The AASHTO's Guide for the Development of Bicycle Facilities is 8'. In order to develop a sidepath, a minimum corridor width of 20' is required to accommodate a 12' path, two 3' shoulders, and 2' setback from the roadway.

Paddling Trails	Type	Est Length	Rank	Fiscal Year	Maint Cost*
Lake Lewisville West Shore Paddling Trail	Blue	6.00			$2,000
Hickory Creek Paddling Trail (Lake to Old Alton Bridge)	Blue	3.55			$2,000
Pecan Creek Paddling Trail (from Lake Lewisville)	Blue	1.87			$1,000
Ray Roberts Greenbelt Trailhead Paddling Trail (to Greenbelt 428)	Blue	4.16			$2,000
Greenbelt 428 Paddling Trail (to Greenbelt 380)	Blue	6.69			$2,000
Greenbelt 380 PaddlingTrail (to Camp Copass)	Blue	8.68			$2,000

Paddling Trails are designated routes along a lake, river, creek, canal or bay specifically designed for people using small boats like kayaks, canoes, single sailboats or rowboats. The trails, sometimes called “blueways,” are the aquatic equivalent of a hiking trail (or “greenway”). Water trails feature well-developed access and launch points; are typically near significant historical, environmental or cultural points of interest; and often include nearby amenities such as restaurants, hotels and parks and possibly campgrounds.

Equestrian Trails	Type	Est Length	Rank	Fiscal Year	Maint Cost*
Hickory Creek Corridor (Shared Use)	Dirt/Sand	5.35	1	2025	Shared

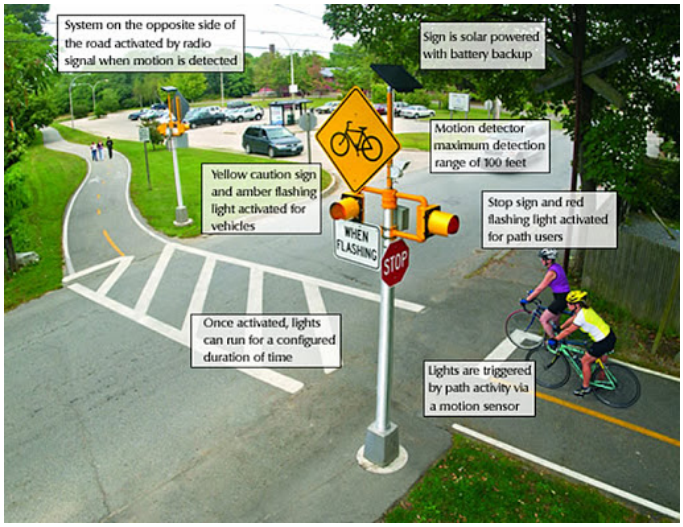
Equestrian Trails for use by equestrians (horseback riders) are designed to meet the requirements of horses and their riders, protect resources, and achieve sustainability. They can be multi-use trails, but they are not the primary user for whom the trail is designed to accommodate. Multi-use equestrian trails require consideration for horse behavior and education on safe interactions of horse riders and non-riders on the trail.

Inclusion and ADA

The Americans with Disabilities Act of 1990 (ADA) and the Architectural Barriers Act of 1968 (ABA) mandates that newly constructed and altered public facilities must be accessible and useable by individuals with disabilities. An accessible route is required that provides a continuous unobstructed path connecting all accessible elements and spaces of a building, facility, or site. All trails and trailheads including paddling trails will be developed to meet the required ADA standards as needed.

Existing Trail Use Issues to Mitigate

Crossings and Crossings Standards



Crossing design is an extremely important component of a trail system development that traverses though neighborhoods and intersects traffic roadways, other trails, sidewalks, and driveways. Safety is always a priority when designing a crossing, since there is potential for conflict between wide varieties of users, and therefore planning and designing appropriate crossings is essential for the trail users and drivers on the roads. Alerting drivers and alerting the trail user to an upcoming crossing is also essential and signage, markings, and the physical design can improve overall awareness, access, usability, and safety of crossings and intersections.

A good first resource for crossings is the *Guide for the Development of Bicycle Facilities*, produced by the American Association of State Highway and Transportation Officials (AASHTO), which provides guidelines for traffic engineers designing bicycle facilities. It includes a section on intersections and crossings. The guide addresses three types of crossings: midblock, adjacent path and complex. These crossings can include public roadways, private driveways and railroads.

This chapter presenting an overview of the trail system and a proposal of future trails and their possible locations recommends examination of each individual trail and all crossings in detail and create appropriate engineering plans using the national guidelines and local successful examples to guide installation of appropriate design for each crossing.

Alerting Drivers and Trail Users to a Crossing (Signage)

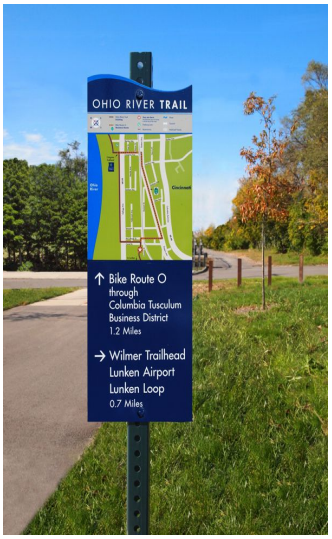
An important issue when designing a crossing is ensuring that drivers, who control the fastest and heaviest vehicles involved in the crossing, are aware of the presence of trail users. Trail users, especially cyclists and joggers, also have a responsibility to slow or stop before a crossing to ensure the safety of themselves and others. These overlapping goals can be accomplished in several ways. The first and most obvious tool is signage, both on the intersecting road and along the trail itself, to warn road and trail users of an upcoming crossing.

Signage is not the only, or often the best, way to create safer crossings. The Manual on Uniform Traffic Control Devices (MUTCD) states that "the use of warning signs should be kept to a minimum, as the unnecessary use of warning signs tends to breed disrespect for all signs." In addition to signs, pavement treatments and other more permanent traffic-calming measures on both the road and the trail are alternative methods to improve driver and trail user recognition of crossings.

On a trail, these steps can take the form of rumble strips that alert cyclists to slow down or, more significantly, a swerve in the trail to force the same effect. On the road, different pavement treatments, including coloring or special materials, can alert drivers. If a more drastic change is necessary, speed tables or speed humps can be used as traffic-calming measures near trail crossings. When considering textured pavements or traffic calming, be sensitive to the needs of trail users. Inline skaters, for example, often have problems with rumble strips and textured pavement.

On-trail signage and support

A bicycle wayfinding system consists of comprehensive signing and/or pavement markings to guide bicyclists to their destinations along preferred bicycle routes. Signs are typically placed at decision points along bicycle routes – typically at the intersection of two or more bikeways and at other key locations leading to and along bicycle routes.



The 4 general types of trail wayfinding signage are: Trail Identification and Safety Information, Confirmation, Turn, Decision

Trail Identification and Safety Information (use rules) that are typically at trailheads to welcome the trail user and provide pertinent information about the trail system and specific trail use rules and safety information.

Confirmation Signage: indicate to trail users that bicyclists that they are on a designated pathway. Make motorists aware of the pathway route. Can include destinations and distance/time. Typically placed every ½ mile and another type of sign is used within 150 ft of a turn or decision sign. Should be placed soon after turns to confirm destination(s). Pavement markings can also act as confirmation that a bicyclist is on a preferred route.

Turn Signs indicate where a bikeway turns from one street onto another street. Can be used with pavement markings. Typically placed near-side of intersections and where bike routes turn. Pavement markings can also indicate the need to turn to the bicyclist.

Decision Signs mark the junction of two or more pathways, these inform bicyclists of the designated bike route to access key destinations. Destinations and arrows, distances, and travel times are optional but recommended.

OPPORTUNITIES AND CONSTRAINTS

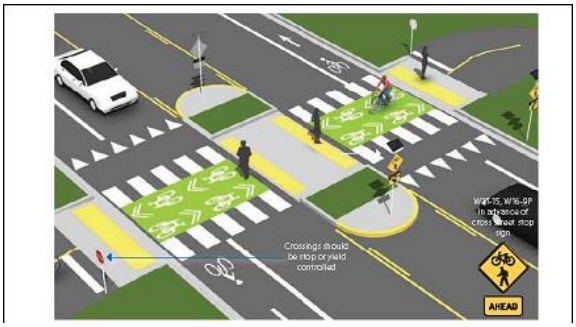
There are several resource-based opportunities to enhance the number of trails and bikeways. This section analyzes opportunities and constraints for trail and bikeway connectivity in more depth.

Opportunities

The major opportunities for additional trails and bikeways are the miles of creeks and streams, wide rights-of-way on some roadways, and existing sidewalks that could be expanded to function as pathways.

The land that surrounds these creeks is often designated as floodplain, which means that most development should not occur except for uses such as trails and passive parkland. These corridors are prime for trail development, especially since many destinations (parks and schools) are located near the creeks. Additionally, some roadways have wide right-of-ways that could accommodate off-street pathways.

Constraints



There are significant barriers to trail and bikeway connectivity strategies that will attempt to link the city. This includes crossing major roadways such as I35, Loop 288, the two Railways and 6 lane roads that have high traffic volume.

Above or below-grade crossings will be required for any trails that traverse IH35, Loop 288.

Crossings at signalized intersections is preferred, but other solutions such as HAWK pedestrian signals and associated crosswalk striping and cautionary signage could be incorporated. Additionally, any project that crosses into railroad ROW requires significant coordination with the railroad operator.

Location of Future Trails (Existing and Future Properties)

Trail Right-of-Way Trails can occupy a variety of rights-of-way. Some trails are located wholly within city owned rights-of-way including city parks, greenbelts, creek corridors, and streets. However, this is not always possible with an extensive trail system, and other right-of-way alternatives must be considered. Acquiring trail right-of-way should be a positive process, as public trails can contribute to the success of certain facilities owned by other public entities such as mass transit centers, and private entities such as retail and mixed-use centers. Many of the existing and proposed trail corridors contain right-of-way that is utilized through a lease or license instrument. Utility and railroad corridors are the most common types of right-of-way that are not owned by the city. Utility owed properties and landowners with existing utility easements have demonstrated their willingness to allow the usage of their properties for public trail use subject to their review and approval. Utility rights-of-way for trail purposes gives an additional function to properties that are perceived, in many cases, as unusable and unsightly strips of land.

In some cases, it may be necessary to acquire fee simple title to a proposed trail corridor in order to preserve the corridor from development that may render a proposed trail project impossible. In other cases, trail easements may be an option when working with developments that would benefit from an adjacent trail. It will be important to continue to work with the Transportation and Economic Development Department to improve the city's ability to secure and preserve future trail right-of-way.

Use of On-Street Trails

Part of the Denton Transportation Mobility Plan may provide connectivity to park trail assets but are not part of the Denton Parks and Recreation Trails Plan.

Implementation and Funding

Due to the extensive nature of the trail network, it will be difficult to rely solely on one source of funding for implementation. The primary source of city funding is from the municipal bond program. In addition to bond funds, federal, state and local government grants periodically become available for trail projects. In fact, a large portion of trail projects are funded by grants provided by the Texas Department of Transportation, The COG, Texas Parks and Wildlife.

Inclusion of trail funding in the city bond programs increase the likelihood of securing grants and other outside funding. Grant programs typically have specific scoring criteria. To ensure the highest probability for acquiring grant funding, it will be important to suggest projects that would rank the highest based on the scoring criteria for the grant program being pursued. For example, grant programs administered by the Texas Department of Transportation typically fund projects that provide significant transportation enhancement benefits. As such, long linear trails that would connect schools, parks, employment centers, and transit centers score better than a loop trail or nature trail.

Trail partnerships, such as friends' groups, will increasingly become important to successfully implement the Trail Plan. Friends groups are effective in creating public advocacy for a trail project, as they can focus their resources to assist the city in developing, maintaining, programming, and marketing of a specific trail. The ability to acquire private funding becomes more attainable when an active and organized advocacy group exists.

Type	Length	Build	Internal Funding	External Funding
Creek/Drainage Trails	17.42	20 million	75% (Bonds)	25% combination of Texas Parks and Wildlife Grants and Sponsors/Volunteers
Internal Park Trails	31.69	35 million	85% (Bonds)	15% combination of Texas Parks and Wildlife Grants and Sponsors
Sidepath Trails	130.43	Transportation	$0	100% City of Denton Transsportation and Developers
Paddling Trails	30.95	5 million	20% (Matching)	80% Texas Parks and Wildlife and Sponsors/Volunteers
Equestrian	5.35	Shared	$0	shared use with portion of Hickory Creek Trail System
TOTAL	215.84	60 million	$45,750,000	$14,250,000

Trail Funding Examples

Texas Parks and Wildlife Park Development Grants

As of 2019, the Texas State Legislature was allowed to appropriate revenue from the sales tax (6.25 percent) on sporting goods to the state Parks and Wildlife Department and the state Historical Commission to protect Texas' natural areas, water quality, and history by acquiring, managing, and improving state and local parks and historic sites while not increasing the rate of the state sales and use taxes.

The National Recreational Trails Fund comes from a portion of the federal gas tax generated by the sale of gasoline for use in off-road recreational vehicles such as dirt bikes and All-Terrain Vehicles (ATVs). Money from the trail fund goes toward the creation and maintenance of motorized and non-motorized recreational trails.

The program provides 80-20 matching grants, so that in each case the grant recipient must pay for 20 percent of the total project cost. Dollar amounts shown below are 80 percent of the project cost.

Texas Parks and Wildlife Local Park Grants

$499,750 The city of Slaton was the recipient of the non-urban outdoor grant for its Compress Lake Park project. Proposed development for this project includes improvements to the existing lake, fishing piers, shelter with picnic tables, lighted pavilion, **lighted trail**, lighted playground, natural play area, lighted skate park, benches, pedestrian bridge, native landscaping and restrooms.

Texas Parks and Wildlife Trails Fund Grant

$ 180,000 Childress County City of Childress, ATV & Moto Park Improvements, motorized trail park improvements, fencing, tools, erosion control.

Texas Parks and Wildlife Equestrian Trails / Bridle Path Funding

$100,000 Hays County — City of Dripping Springs, Harrison Ranch Park Equine Trail, new 1.8-mile natural surface trail, parking area, signs.

Trail Tread Management

The trail tread is the actual surface of the trail. Most of the existing trail tread is concrete and then dirt (mostly at Clear Creek). There are sections of each trail that currently need some general repair but overall, the staff is diligent to repair damaged sections of trail.

Denton Parks and Recreation has taken over management of the trail system at Clear Creek and will need to acquire appropriate dirt trail tread management certification and acquire the needed equipment for maintaining a dirt trail system.

Trail Tread Types

Paved

Paved, off-street travel ways are designed to serve non-motorized travelers. Bicyclists are typically the most common user, but other users may include skaters, scooters, runners, walkers, and people with disabilities, people pushing strollers, children, the elderly, and others. Paved pathways must be built to meet the demands of the local soils and impact of long-term use. In Texas, this will typically require at least 4-inch concrete slab that has internal iron reinforcement. Though designed to last for years weather and other stress cause damage and a maintenance plan to replace sections annually is needed.

The existing standard minimum width for multi-use paved trails according to the American Association of State Highway Transportation Officials (AASHTO) Guide for the Development of Bicycle Facilities is 10’ but is recommended to be at least 12’ to accommodate more and different types of users. If land must be acquired for developing a trail along a creek or utility corridor, it is desirable to secure a corridor at least 30’ wide to accommodate the trail, shoulders, tree protection, overlooks, and rest areas.

Gravel or Crushed Rock/Stone

Commonly used on more rural trails, gravel is often favored for its more natural look and its affordable front-end installation. Gravel is also easier on runners’ joints and good for flat areas outside of floodplains. This material does have drawbacks, however. One of the biggest challenges with gravel is that it requires a great deal of maintenance and has a difficulty meeting ADA surface standard. With a gravel trail, it is hard to maintain consistent surface quality, and gravel erosion can cause environmental damage.

For bikers, steep gravel slopes (which also face the issue of gravel migration) and loose gravel are challenging to traverse. While gravel is better in terms of minimizing the impact on runners’ joints, the material has less stability for those on foot, whether they are running or walking.

Gravel is an affordable initial investment, but its frequent required maintenance over time does start to add up. For this reason, presenting a life cycle maintenance chart is a great way to demonstrate long-term planning to a client.

Dirt/ Natural Earth

Trails built from the existing dirt/clay offer inexpensive maintenance costs limited primarily to fixing drainage problems, repairing eroded areas and removing vegetation. The trail can usually be built and maintained by volunteers.

Boardwalk

Boardwalk is most often used as a trail surface for segments through wetlands, as it allows adequate drainage and impacts the fragile ecosystem less than other surface types. However, it can be slippery when wet and is quite expensive to install and maintain.

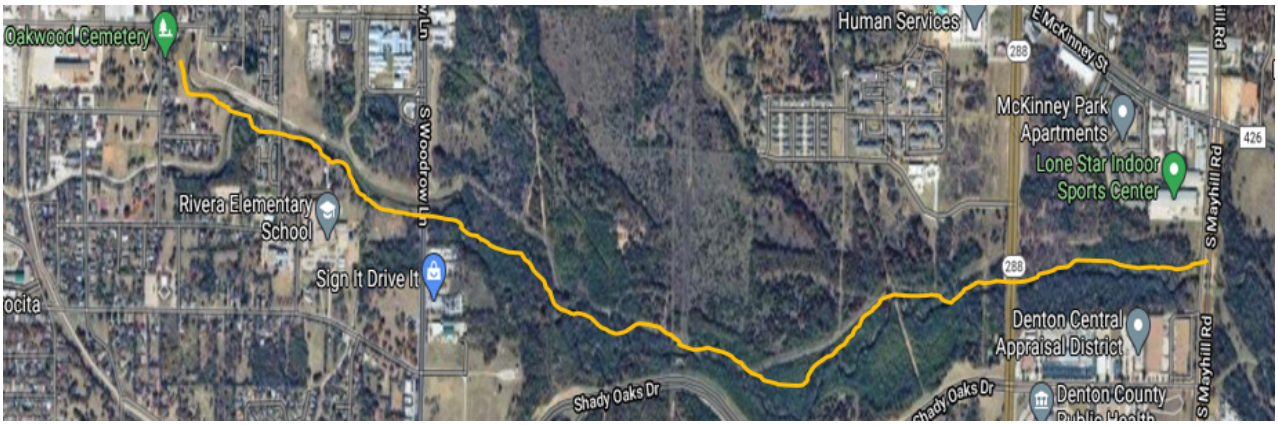
Inclusion Strategy and ADA Trail Design Requirements

The Americans with Disabilities Act of 1990 (ADA) and the Architectural Barriers Act of 1968 (ABA) mandates that newly constructed and altered public facilities must be accessible and useable by individuals with disabilities. An accessible route is required that provides a continuous unobstructed path connecting all accessible elements and spaces of a building, facility, or site. Exterior accessible routes may include parking access aisles, curb ramps, crosswalks at vehicular ways, walks, ramps, and lifts

Pecan Creek Trail East

The Pecan Creek Trail – East will link the Eastern Parks to Lake Lewisville. The trail and connector pathways will connect several parks and several other off-street pathways. Long-term plans connect to the Katy rail-trail and eventually to Downtown and Quakertown Park.

Estimated Length:	5 miles
Surface:	Crushed Rock - Width: 12 Feet
Right-of-Way Status:	Portions of the current R.O.W. are city owned. Will need to coordinate with developers and install multiple street level crossings.
Est. Unfunded Need:	$2 Million
Advocacy/Partnership:	Wastewater, Developers, Transportation, Corps of Engineers
Assessment of Existing Trail:	Portions of the floodplain of Pecan Creek have established dirt pathways that are used by residents and landowners to access different neighborhoods and the creek. Existing trail treads that are stable and out of the primary flood-level should be examined for conversion to reduce impacts to the existing natural areas.



2. Pecan Creek North through Quaker to North Lakes

Pecan Creek North Katy through Quaker to North Lakes trail will link the Katy Trail from the Downtown area to Quaker Town Park to North Lakes Park using the city owned storm drain system and some on-street connector sections. The trail and connector pathways will link several city properties and recreation assets increasing connectivity to other off-street pathways.

Estimated Length:	4 miles
Surface:	Concrete - Width: 8 to 12 Feet (built into the sloped storm creek)
Right-of-Way Status:	Portions of the current R.O.W. are city owned. Will need to coordinate with other city departments and install multiple street level crossings.
Est. Unfunded Need:	$8 Million
Advocacy/Partnership:	Wastewater, Developers, Denton ISD, Transportation, Corps of Engineers
Assessment of Existing Trail:	Portions of the floodplain of Pecan Creek have established dirt pathways that are used by residents and landowners to access different neighborhoods and the creek. Existing trail treads that are stable and out of the primary flood-level should be examined for conversion to reduce impacts to the existing natural areas.