Green Infrastructure Plan

NATURAL RESOURCES

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AIR BASE WING

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Purpose for Plan

The Green Infrastructure (GI) Plan, first published in 2007, is a comprehensive vision for interconnecting and managing natural environmental systems on and adjacent to Tinker AFB to ensure the sustainability of our environment and the military mission. Sensitive environmental resources (e.g., floodplains, wetlands, creek systems) have been identified across the base, and this plan is intended to guide development to support current and future military mission needs while not degrading sensitive environments. The basic tenet is to sustain a green infrastructure network to provide optimal military operational sustainability and promote societal, economical, and ecological benefits for Tinker AFB and its neighboring communities in concert with the desired development pattern of the Installation Development Plan (IDP). Simply put, it is about balancing the environment with human needs (Figure 4). Without this plan, rapid, and often times indiscriminate, land development will jeopardize future sustainability (Figure 1).

Developable land is very limited on Tinker AFB; therefore, every piece of land is extremely valuable and important for future mission needs. The Green Infrastructure Plan recognizes and supports this reality by encouraging development where it is most appropriate and setting forth recommendations to direct it away from areas where it is not appropriate. The majority of the on-base green infrastructure network is not on developable land—it lies within the 500-year floodplain which inherently has many development limitations. Therefore, this plan does not greatly reduce development potential on Tinker AFB but rather significantly enhances the final development product with a view toward national security.

Definitions

The following definitions describe the fundamental areas which comprise the GI Plan. These areas can be viewed graphically on the GI network map (Map 3) at the end of Chapter 3.

Green Infrastructure – An *interconnected* network of waterways, wetlands, woodlands, grasslands, and other natural areas of *base-wide significance*.

Gray Infrastructure – buildings, roads, runways, ramps, utilities, and other man-made features in the landscape.

Regulated Areas – areas that contain environmentally sensitive features, such as waterways (and their associated buffers), 500-year floodplains, and wetlands that are regulated (i.e., protected) during the land development process. This includes environmentally sensitive areas that have been designated in the Installation Development Plan (IDP) as Urban Greenway or environmental buffers. Regulated areas (if in a natural native state) should be preserved, as they are today, with impacts recommended for approval only where necessary for construction of such things as utilities or road crossings and airfield operations. Regulated areas that are not in a natural native state (e.g., mowed turfgrass in creek system corridor; demolished housing areas, Figures 2 and 3) should also be preserved, but activities may be accomplished to restore these areas to a natural native condition where appropriate.



Figure 1. Land Development from 2003 to 2023: Development of land on and surrounding Tinker AFB is far outpacing restoration and preservation efforts. Without an organized plan to preserve select areas, urban sprawl will jeopardize future sustainability.



Figure 2. Housing Demolition: The houses shown in the shaded area were demolished. This area, most of which is 500-year floodplain, provided a significant opportunity for floodplain restoration in compliance with ecosystem management principles of Air Force Manual (AFMAN) 32-7003 and Executive Order 11988.



Figure 3. Land Conversion Site: Site south of Building 1055 before (upper picture) and after (bottom picture) land conversion from mowed turf to native mixed grass prairie/savannah.

Evaluation Areas – areas that contain environmentally sensitive features (or are adjacent to environmentally sensitive features) such as native grasslands/woodlands, sensitive wildlife species, or rare plant species that are not regulated (i.e., no regulatory stature) during the land development process. Evaluation areas will be considered during the review process as areas of high priority for on-going conservation. These are developable areas; however, consideration must be given to natural resources that exist on the site and their priority for preservation and long term conservation.

Network Gaps – areas either inside or outside regulated areas that are critical to the connection of fragmented natural areas. These have been included in the GI Plan to provide areas of possible connectivity. These areas should be evaluated during the land development review process for possible restoration opportunities to enhance the ecological functioning of the network and/or to make critical connections in the green infrastructure network.

500-year floodplain – the lowland and relatively flat areas adjoining waters, including at a minimum, that area subject to a 0.2 percent chance of flooding in any given year.

Wetlands – areas that are inundated by surface or ground water with a frequency sufficient to support, and under normal circumstances do or would support, a prevalence of vegetative or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction.

Tinker's total green infrastructure is comprised of 1033 acres, or 21% of the total base land area. *Regulated areas* comprise 46% of the green infrastructure network; *evaluation areas* comprise 42%; and *network gaps* comprise 12%. It is recognized that much of the GI and regulated areas are in locations (e.g., airfield, clear zones, areas occupied by existing buildings) where restoration goals described in this plan would not apply under the current land use. However, these GI areas remain identified in this plan in the event land use changes occur in the future.



Figure 4. Green and Gray Infrastructure: By employing a balanced approach, preservation and enhancement of green infrastructure amidst gray infrastructure fosters a more sustainable and livable community.

Plan Benefits

Investments in green infrastructure preservation and enhancement produce tremendous dividends. This section describes some of these benefits and why this plan and its implementation are needed for Tinker AFB and its surrounding communities.

Pollution Control/Environmental Compliance

Heavy industrial activities can be very taxing on the surrounding environment. At times over the years Tinker AFB has experienced difficulties in meeting regulatory standards. The GI Plan moves Tinker AFB in a direction that lessens the chances of environmental violations such as exceedances of quantified water quality permit limits and discharge allowances. It encourages the conservation and rehabilitation of Tinker's impaired systems, reflects favorably on the base, and ensures continued unencumbered availability of land for military operations. Moreover, implementation enhances proactive compliance with many regulatory requirements such as:

• Executive Order 11988, Floodplain Management (May 24, 1977, as amended)

Examples of beneficial floodplain functions that the GI Plan promotes include:

- protection of banks from erosion,
- attenuation of flood peaks,
- fish and wildlife habitat,
- flora and fauna migration corridors,
- nutrient/non-point source pollution filtering,
- water quality maintenance by acting as sediment repositories,
- ground water recharge.

Human-derived values gained from Tinker's floodplain include:

- recreational sites/opportunities (e.g., golf course, wooded trail systems),
- natural military training sites,
- flood storage,
- cost savings provided by natural services,
- natural beauty,
- compliance with NPDES permit limits, Oklahoma Water Quality Standards, and storm water permit requirements thereby ensuring continuance of the base mission.

Other regulatory requirements that the GI Plan promotes include:

- Executive Order 11990, Protection of Wetlands (May 24, 1977, as amended)
- Executive Order 14008, Tackling the Climate Crisis at Home and Abroad (January 27, 2021)
- Executive Order 13990, Protecting Public Health and the Environment and Restoring Science to Tackle the Climate Crisis (January 20, 2021)
- Section 438 of the Energy Independence and Security Act of 2007 (EISA)

Military Readiness [Including Readiness Environmental & Integration Protection (REPI) The Glenwood area on the north end of Tinker AFB provides natural areas for realistic training of area military units (Figure 5). The GI Plan ensures that these areas remain in an appropriate natural condition to provide a setting for realistic training. For example, much of the northeast quadrant of Glenwood is being invaded by eastern red cedars. Although these trees would typically be removed for ecological reasons, in this case natural resources staff met with military staff to determine if the cedars were necessary for realistic training. GI Figure 5. Military Readiness: Gray management actions could then be adjusted accordingly to ensure appropriate natural setting availability to



green and infrastructure are integral to military readiness by providing sites for realistic training such as the Glenwood exercise area shown here.

support military requirements while not further degrading the surrounding environment.

"Green readiness" is also promoted and sustained on Tinker AFB through the Department of Defense's Readiness and Environmental Protection Integration (REPI) program. Under the authority of 10 U.S.C. § 2684a, "Agreements to limit encroachments and other constraints on military training, testing, and operations," military installations are permitted to acquire land or interest in land (e.g., conservation easements) outside traditional installation boundaries for the purposes of:

- Limiting any development or use of the property that would be incompatible with the mission of the installation; or
- Preserving habitat on property in a manner that is compatible with environmental requirements and may eliminate or relieve current or anticipated environmental restrictions that would interfere with military training, testing, or operations on the installation.

This program also authorizes military installations to enter into an agreement with a private entity (typically referred to as "Eligible Entity") to address the use or development of real property in the vicinity of, or ecologically related to, a military installation or airspace.

In 2010, Tinker AFB entered into an agreement with Land Legacy for the purposes stated above, and land transactions and establishment of conservation easements are underway for select areas within off-base green infrastructure. The GI plan is a useful supporting tool to the REPI process on Tinker AFB.

Disaster Preparedness

A significant portion of base facilities, roadways, aircraft ramps, and other areas will be flooded when Tinker AFB experiences a 100- or 500-year flood event (Figure 6). This plan aims to reduce, and in many cases eliminate, these future costly flood-related disruptions to military operations.

Good Neighbor/Community Partner

For Tinker AFB to continue to develop its land without addressing the associated cumulative environmental impacts (e.g., flooding) would have significant negative consequences on downstream communities such as Del City and Midwest City. Tinker AFB has implemented limited flood control measures and avoided development in the floodplain in the past. Sustained implementation of the GI Plan ensures Tinker AFB continues to act responsibly in its development decisions, thereby doing its part to not exacerbate already critical-level flooding problems in these off-base communities.

Ecosystem Management

Much of Tinker's existing urban ecosystem, particularly its waterways, is impaired because of past inappropriate development or management practices (e.g., removal of riparian woodlands; mowing to the water's edge on creeks). This has resulted in loss of many ecosystem functions and values and the degradation of land and water quality. In the long term, continued execution of the GI Plan will improve water quality, promote wildlife movement, enhance fisheries, stabilize eroding creek banks, and restore other lost functions and values (Figure 7).



Figure 6. 500-Year Flood Impacts: This figure shows facilities, roads, ramp areas, and other structures that will be flooded to some degree during a 500-year flood event.



Figure 7. Sustainable Wildlife Populations: Green infrastructure is essential for sustainable wildlife populations and lessening negative impacts to species at risk. The Glenwood deer herd shown above did not exist in 1990. Today, this population thrives largely due to the off-base green infrastructure migration corridor that extends from Draper Lake northward to Glenwood.

Holistic Planning

Historically, natural resources conservation was typically done in a reactive, piecemeal, projectby-project fashion which led to inefficiencies and conflicts. GI planning is a more proactive holistic approach which gets away from isolated, haphazard conservation/development actions. It brings development and natural resources conservation under the same umbrella. This integrated approach reduces or eliminates environmental-related obstacles and setbacks during the latter stages of project approval. The plan provides an up-front picture of where to focus environmental restoration, enhancement, and preservation and defines areas where development is appropriate to ensure long-term integrity of the local urban ecosystem.

Cost Savings

It is far cheaper to preserve green infrastructure now than to recreate it later. Tinker's facility development patterns historically have been to clear a site, build the building, and then rebuild the landscape around the building. By not considering sensitive environmental resources up front, it costs the base more in the long-term by the added cost of rebuilding what was destroyed and by eliminating the resources that provided natural services. For example, American Forestry Association estimates that a 50-year-old urban tree saves \$75 a year in air conditioning, \$75 a year in storm water and soil erosion control, and \$50 a year in air pollution control.¹

Enhanced Natural Aesthetics

Tinker AFB is heavily developed to the point that much of the outside urban and industrial environment has the potential for natural aesthetic improvements (Figure 9). GI Plan execution restores select woodland and grassland areas substantially enhancing visual attractiveness.

Warfighter Health and Wellness

¹ Urban Forestry News, Vol. 10, Issue 2, Autumn 2003, page 7.

Completion of the GI Plan supports Executive Order 13195, Trails for America in the 21st Century. Further, it fosters warfighter wellbeing by providing a more livable community for his or her family members and by providing quality areas for troop exercises/runs, biking, jogging and other activities and events that support important fitness programs such as Fit-to-Fight and Fit-for-Life (Figures 8 and 10).



Figure 8. Supporting Warfighter: Green infrastructure supports warfighter conditioning by providing a platform for physical training activities.

Consistency with Other Plans, Policies, Priorities, and Warfighter/Community Needs

Executing the GI plan supports the following AF, AFMC, AFSC, and 72 ABW priorities/goals:

AF Priority

Grow Strong Leaders and Resilient Families

AFMC Goal Strengthen our Team

AFSC Goal

Develop and Support our Airmen

72 Air Base Wing (ABW) Priorities

- Drive Continuous Improvement and Innovation
- Lead Innovative Resource Stewardship and Infrastructure Readiness
- Effectively Lead and Develop our Airmen and their Families

The GI Plan promotes a healthy, sustainable, and accessible outdoor environment intertwined with military family housing and office/industrial facilities. This gray-green fabric provides a platform which strengthens the warfighter and their families mentally, physically, emotionally, socially and spiritually. As mentioned previously, it makes the base more secure—more resilient—by posturing it to better withstand mission-disrupting natural disasters such as severe flooding. It ensures meeting our obligation to execute proper stewardship of federal land as the military mission is accomplished. As stated by former Chief of Staff of the Air Force, General Thomas D. White, "The mission of the Department of Defense is more than just aircraft, guns, and missiles. Part of the Defense job is protecting the lands, water, timber and wildlife, the priceless natural resources that make this great nation of ours worth defending."

Execution of the GI Plan drives continuous improvement by focusing not only on gray facilities (i.e., buildings, roads, etc.) but also on green facilities (i.e., adjoining natural areas which buffer against natural disasters and provide high-quality recreational space). Hybridizing gray and green infrastructure is innovative resource stewardship which provides infrastructure readiness.

Tinker AFB Environmental Policy Statement

Tinker AFB, including all units, mission partners and contractors, is committed to performing its mission in a responsible manner that protects human health and the environment. Tinker's official environmental policy states (in part): "Balance development of built and natural land areas to ensure a quality environment which fully supports and sustains military readiness while meeting environmental conservation mandates." Execution of the GI Plan ensures compliance with this policy.

Tinker Air Force Installation Development Plan (IDP)

The Tinker IDP vision statement is: "TAFB is our nation's hub for DOD logistics, combat and cyber infrastructure operations, and weapons sustainment, powered by a modernized infrastructure, community partnership, *responsible growth*, and the highest quality support to our workforce." The GI Plan sets forth the execution plan that will meet Tinker's vision for responsible growth.

Crutcho Creek Initiative

In 2005 a local steering group was formed consisting of local, state, and federal government officials, business owners, and others. The group began exploring development of a master plan for the Crutcho Creek riparian system, including the portion on Tinker AFB. This plan is called the Greenprint: East Metro Watershed. The GI Plan supports the basic tenets of this initiative by providing floodwater control (e.g., Tinker AFB golf course functions as a flood detention area during flood events, lessening flooding north of SE 29th Street) and developing areas for passive/active outdoor recreation and education. The GI Plan also supports establishing a

continuous natural linkage from the Crutcho Creek headwaters to the North Canadian River within the security requirements of Tinker AFB.

DOD Policy

The GI Plan supports DOD policy to "...work to guarantee DoD continued access to its land, air, and water resources for realistic military training and testing and to sustain the long-term ecological integrity of the resource base and the ecosystem services it provides, in accordance with the...Sikes Act. (DoDI 4715.03, 4.a).

The GI Plan supports this policy by fostering a *greener* vision for Tinker AFB. It promotes meeting mission requirements in world class facilities in a world class environment. Many areas within Tinker's green infrastructure are stressed systems with few trees, eroded creek banks, and little native vegetation. Restoration of these areas would create a more livable and sustainable community by recapturing the free services (e.g., erosion control, improved water quality, air pollution control) provided by natural systems and providing a more comfortable and visually attractive working and living environment. A better quality environment translates to a stronger community and warfighter.



Figure 9. Industrial and Green Infrastructure: Green infrastructure (foreground) east of B-3001 softens industrial surroundings and provides a quality location for a ½ mile fitness trail.



Figure 10. Multi-use Trails: Shaded, multi-use trails through green space areas make outstanding recreation areas for base families. The development of a green infrastructure network is one of the most impacting steps Tinker AFB has taken to improve quality of life on Tinker AFB. In Tinker's 2006 base-wide Natural Resources Marketing Research Survey which assessed natural resources-related use patterns and needs, when trail users were asked what type of trail environment (i.e., urban, rural, natural grassland/woodland) they preferred, 77% ranked natural grassland/woodland as their top preference. Ninety-three percent indicated the trail systems improved quality of life.

The GI Plan focuses on people and promotes health and wellness. In the Natural Resources Marketing Research Survey, over 59% of the respondents said they used the base trail systems, much of which is located in the base's existing green infrastructure areas.

Furthermore, in the Sep 2005 edition of $Redbook^2$, an article was published on the benefits of walking which included an inset entitled *Walking Makes Being a Military Wife Easier*. The caption described how these wives of military husbands benefited from Tinker's trail systems located within the base's green infrastructure.

Chapter 2 IMPLEMENTATION STRATEGY

Objectives

Objective 1: By 2030, continue to promote on- and off-base awareness of GI plan benefits and requirements and institutionalize conservation planning principles and philosophies in all applicable base projects.

Activity 1: Through 2025, annually continue to develop/update, as appropriate, internal and external planning and pre-design checklist(s) to facilitate incorporation of conservation planning principles, floodplain/wetland/invasive species/sustainability executive order requirements, and other pertinent GI guidelines and policies into requirements documents (RD) and other early design documents. (coordinate with CE Engineering Project Management Branch, and supplement with briefings to target audiences as needed to meet intent of objective). [M]

Activity 2: Through 2026, annually continue to update/modify, as appropriate, base contract boiler plate sections (e.g., Sections 00 70 00 and 00 72 00), Architectural Compatibility Guide, grounds maintenance statements of work (e.g., Trace, AAFES), and other documents to reflect requirements outlined in GI Plan (coordinate with CE Engineering Project Management Branch and CE Engineering Services Contractor). [M]

Activity 3: Through 2026, annually continue making presentations on Tinker's GI program to local and regional municipalities and at local, state, and national professional meetings and conferences. [L]

² Hudepohl, Dana. 2005. "Stop Stress, Lose Weight, Love Your Life." *Redbook* (September): 180-189.

Task 1: In Oct 2024, host on-base Urban Native Prairie Restoration Workshop to facilitate information sharing with other military bases, local municipalities, landscape architecture companies, state and federal agencies, and others. In conjunction with workshop, hold prairie dedication of 50-acre KC-46A prairie mitigation site. **[M]**

Activity 4: Through 2026, continue base Greenway tours for new installation commanders/vice commanders, command chiefs, unit commanders, community planners, procurement officials, off-base officials, and others. [L]

Activity 5: By April 2025 (Earth Day), develop a mobile App for Tinker's Urban Greenway to cover Greenway system history and current uses. [L]

Activity 6: By Sep 2025, publish and distribute illustrated Urban Native Prairie Restoration Manual. [M]

Objective 2: Through 2030, continue to restore and maintain Tinker's green infrastructure to improve habitat structure/health for species at risk (SAR), reduce base mowing requirements, increase and sustain free ecological services provided by the network, promote wildland fire safety, and enhance aesthetics.ⁱ

Project 1: Through 2026, continue to annually implement projects and activities as outlined on maps in Section 1 (General Improvements) of the Greenway Master Plan (see Chapter 3 of Green Infrastructure Plan) [Note: Specific projects and activities from these sections will be annually incorporated into the Natural Resources Annual Work Plan] [M]

Task 1: By 2024, install access signs on all Urban Greenway vehicle gates.

Task 2: By 2024, initiate project to construct terraces and drainage structure to address Scissortail Trail erosion issues

Task 3: By 2024 convert Scissortail Trail blind to deck (volunteer project).

Task 4: By 2024, develop and implement split-rail fence line master plan showing where fence is to remain, where it is to be removed, and where living fences are to be established.

Task 5: By 2024, initiate projects to remove all abandoned, aboveground utility markers.

Task 6: By 2028, initiate project to flush-mount select monitoring wells within the Urban Greenway.

Task 7: By 2024, stain and seal wildlife viewing deck and boardwalk.

Task 8: By 2024, continue trailside woodland thinning/tree lifting to improve trail safety and reduce future maintenance.

Project 2: In 2026, develop 5-year phased Greenway Trail widening/resurfacing plan focusing on alternative funding mechanisms such as grants, mission partner support, etc. **[M]**

Project 3: Through 2024, continue to annually implement projects and activities as outlined on maps in Section 2 (Native Grass/Woodland Restoration and Maintenance) of the Greenway Master Plan (see Chapter 3 of Green Infrastructure Plan) [Note: Specific projects and activities from these sections will be annually incorporated into the Natural Resources Annual Work Plan]. Programmed projects which support this are **[M]**:

- Mgt, Habitat (WWYKA53226119 and out-years) & Mgt, Invasive Species (WWYKA53226121 and out-years)¹. This project will provide contractual support to eradicate/control invasive and

other undesirable vegetation and plant native vegetation within the base's green infrastructure network. Supporting 5-year blanket purchase agreements (BPA) and periods of performance: o Invasive Plant Control, Inc. (expires 21 Sep 2027)

This project also funds the purchase of native plant materials to be used in green infrastructure restoration efforts and base native landscaping.

Activity 1: By 2026, research and develop custom grass/forb seed mix specifications that coincide with Tinker's remnant native prairie species composition. Include species that appear to have been lost by activities such as past livestock grazing (e.g., compass plant) and species specifically beneficial to the Texas horned lizard and pollinators. [L]

Activity 2: Annually, plant native grass and forb seed/plugs in GI areas, focusing on Reserves 1 and 3 of the Urban Greenway. [L]

Activity 3: By 2027, utilizing 2011 Invasive Species Assessment (vegetation), evaluate findings and develop prioritized strategy for invasive species eradication/control. [M]

Activity 4: By 2025, conduct basewide evaluation to determine potential conversion of turfgrass or other periodically mowed areas to natural areas, and if candidate areas are identified, initiate conversion process. [L]

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¹ Must fund projects are shown in green italics. Execution of projects labeled as "must fund" (or otherwise indicating that projects are required) is dependent on availability of funds, and nothing in this plan may exceed appropriations available for payment. Further, labeling of projects as "must fund" cannot be considered as implying that Congress will at a later date appropriate funds sufficient to meet deficiencies.

Natural Resources Chemical Usage Requirements

All chemical (including herbicides) usage will meet Enterprise Environmental Safety and Occupational Health – Management Information System (EESOH-MIS) requirements to include the following:

- 1. Pesticides will be Oklahoma-registered and DOD-approved.
- 2. Chemical (pesticide, surfactants, turf colorants/dyes, et al.) SDS's (no more than 5 years old) will be submitted to EESOH-MIS through the HazMat Cell for chemical coding.
- 3. Verify SDS corresponds with EPA Registration No. if pesticide is to be used
- 4. If most current SDS is 5 years or older, acquire written notification (e-mail) from manufacturer stating such.
- 5. Submit following information to the HazMat Cell
 - a. SDS
 - b. Coordination Sheet (AF Form 214)
 - c. FAX Sheet*
- 6. Herbicide Application Record: Pesticide usage will be tracked and recorded on a Herbicide Application Record form. Data to be collected for each application includes, but is not limited to: date, time, applicator name, site, target weeds/pests, pesticide name, EPA Registration Number, temperature, wind speed, wind direction, quantity applied, and pounds of active ingredient (AI) applied. Completed forms will be sent to the Installation Pest Management Coordinator (IPMC) who will populate the Air Force Integrated Pest Management Information System (IPMIS) data base.
- 7. All pesticide will be applied per label instructions.

Policies

The following policies have been developed to ensure Tinker AFB progresses toward sustainability of our environment and the military mission.

Policy 1: Encourage sustainable development and military operational support by balancing gray infrastructure development with green infrastructure enhancement, restoration, and preservation.

[Note: Designers of facilities in evaluation areas or near regulated areas shall consult Tinker AFB natural resources staff early in the design process to evaluate and determine how the project may be designed consistent with principles outlined in the GI Plan. Within these evaluation areas, if impacts to green infrastructure cannot be avoided, they should be minimized. If minimization is not possible, the designer shall provide mitigation alternatives for consideration].

Policy 2: Tinker AFB shall observe a "no net loss of floodplain capacity" policy. Tinker AFB will ensure no increase in the 500-year floodplain boundaries using the 2002 U.S. Army Corps of Engineers TAFB Floodplain Study as the baseline.

Policy 3: In developing future facility plans and as opportunities arise, all facilities located within the 500-year floodplain should be relocated to areas outside the 500-year floodplain.

Policy 4: Employ conservation management principles when developing areas:

- Practice compact development to the maximum extent practicable.
- Focus on designing projects to "fit" the existing landscape or natural community as opposed to designing projects which require clearing and leveling the entire site and subsequently attempting to rebuild the landscape.

Policy 5: Excluding the airfield, restore and maintain network gaps to create natural corridor connectivity wherever possible throughout the GI network. It is desired that these gaps be converted to native grasslands/woodlands a minimum of 300' wide (e.g., 150 feet on each side of a creek/trail) where practicable. In developed areas, any width of natural connectivity is encouraged. Where contiguous connectivity is not possible, the following guidelines shall apply:

- Develop smaller natural areas (i.e., patches) which serve as stepping stones for wildlife movement.
- Decrease distance between stepping stones wherever possible.
- Emphasize larger patches over smaller ones.
- Prioritize restoration by focusing first on higher order streams versus lower order streams and gaps away from roads as opposed to close to roads.

Chapter 3 URBAN GREENWAY MASTER PLAN

Introduction

Part of Tinker's green infrastructure, the Urban Greenway (Figures 11 and 12), has been under conservation and rehabilitation since 1990. The area currently consists of approximately 150 acres of fragmented grasslands, woodlands, parklands, water features, and some highly urbanized land. There are three core reserve areas interconnected by a 3.3 mile asphalt multi-use trail. Each core reserve is surrounded by split-rail fencing. Within the reserves are a family camp area (FAM Camp), ponds, creeks, picnic pavilions, fishing piers, nature trail with trailside exhibits, boardwalk, wildlife observation blind, and other amenities. A portion of Reserve 3 has been designated as a registered natural area by the Oklahoma Biological Survey for protection of the Texas horned lizard, a state-protected species.



Figure 11. Tinker AFB Urban Greenway Trailhead: Entrance to 150-acre Urban Greenway which weaves through residential and industrial areas across the southwest portion of the base.



Figure 12. Tinker AFB Urban Greenway: Urban Greenway shown in relationship to surrounding green infrastructure.

Within the desired development pattern of the Installation Development Plan, the Urban Greenway Master Plan lays out short (5-year) and long term (25-year) direction for continued quality development and enhancement of the base's Urban Greenway. The basic tenets of Tinker's Urban Greenway development and preservation are:

Recreation

Promote warfighter and community wellness through a quality outdoor recreation experience on Tinker AFB. Recreational activities include jogging, cycling, walking, rollerblading, fishing, wildlife viewing, physical training, and other outdoor activities in the natural environment.

Conservation

Encourage sustainable development by balancing gray infrastructure development with green infrastructure enhancement, restoration, and preservation. Gray infrastructure is defined as buildings, roads, runways, and other man-made features. The green infrastructure is defined as an interconnected green space network (e.g., waterways, wetlands, woodlands grasslands, and other natural areas and their associated fish and wildlife) needed for institutional (including military mission), ecological, social, and economic sustainability.

Education

Provide a platform for community environmental education and awareness. The primary aim is to promote a culture which recognizes the importance of balancing urban development and environmental stewardship (i.e., preservation of interconnected green space networks and their associated functions and values within urban areas).

Plan Organization

The plan is framed by five guiding principles. Each principle is followed by examples of improvements that implement the principle.

PRINCIPLE 1: To maximum extent practicable, develop an element of natural solitude to foster a relaxed atmosphere while enhancing aesthetics and promoting user safety.

- Screening (visual, wind, and noise buffers)
- Minimize use of obtrusive signage; where signs are necessary and as possible, use standardized signage throughout greenway system
- Minimize man-made features
- Encourage unmowed areas of native vegetation
- Eliminate/minimize man-induced erosion
- Maintain lines-of-sight, particularly on trail curves for safety reasons
- Employ permanent 300-foot buffer zone standard where practicable
- Plant flowering native trees such as Mexican plum and eastern redbud for visual interest
- Maintain routine trash pickup program
- Control vehicular access to all greenway areas
- Use a combination of open grassland, closed woodland, and wetland/water features where appropriate
- Layout trails and planting of vegetation to create a sense of mystery through a curvy path alignment

PRINCIPLE 2: Create and maintain a permanent healthy native prairie/savannah upland and wooded bottomland system that enhances fish and wildlife diversity.

- Increase habitat complexity and structure
- Manage for a variety of restored prairie stages and disturbance regimes to increase faunal diversity and abundance
- Convert exotic turf grass to native grasses/forbs
- Remove invasive native and non-native grasses, forbs, vines, shrubs, and trees
- Plant a diversity of native aquatic plants in ponds
- Plant high diversity of sustainable grasses, forbs, and woody species consistent with local ecoregion
- Restore and maintain natural corridor connectivity wherever possible
- Employ natural vegetation patch stepping stones if continuous connectivity cannot be achieved
- Decrease stepping stone distance wherever possible
- Prioritize restoration by focusing first on higher order streams versus lower order streams and gaps away from roads as opposed to close to roads.
- Emphasize larger patches over smaller ones
- Provide both interior area and edge diversity
- Clear up pond turbidity
- Place/anchor artificial snags (standing tree stumps) and other natural log/root structures in ponds
- Stabilize shorelines
- Reintroduce native wildlife
- Burn/mow in blocks, always leaving some unburned

PRINCIPLE 3: Improve user satisfaction compatible with sound natural resources stewardship.

- Utilize base-wide market research to determine natural resources use patterns and needs
- Construct permanent restroom facilities
- Construct trailside comfort stations (stretching/rest areas with benches, water fountains, misters, storm canopy, and emergency phones)
- Widen trail (main loop 8' wide; secondary branches 6' wide; rubberized trail surface)
- Create shade in select areas (along trails, ponds, FAM Camp)
- Light trails as feasible considering possible negative ecological impacts and detracting aesthetics.
- Add trail linkages to improve connectivity with primary user groups and enhance trail diversity (Navy, AWACS Alert, Tinker Aerospace Complex, 507th)
- Promote Fit-to-Fight and Fit-for-Life objectives
- Promote selective angling opportunities
- Promote wildlife viewing opportunities
- Promote safety
- Seek expansion opportunities
- Promote loop trail system so users don't have to retrace their paths
- Accommodate disabled users where possible

PRINCIPLE 4: Decrease maintenance requirements to the maximum extent practicable.

- Plant low-growing buffalo grass along trail sides
- Limit mowed areas
- Where possible, develop reserve boundary vegetative screening such that in time it will serve as a living fence, and the existing split-rail fencing, as it deteriorates, can be permanently removed

PRINCIPLE 5: Develop and promote outdoor education and awareness opportunities.

- Conduct Greenway tours with emphasis on balancing gray and green infrastructure development
- Develop and encourage self-guided environmental education tours
- Recruit volunteers who could conduct routine greenway field tours for school, scouting, and other groups
- Design and develop select areas within the Greenway to support and supplement environmental education curriculum and initiatives at local educational institutions such as Tinker AFB Elementary, Rose State College, Mid/Del schools, and base child development centers

The mapping sections which follow illustrate planned short- and long-term improvements and maintenance requirements. Mapping is arranged in two sections:

SECTION 1 General Improvements: This section provides basic descriptions and locations of various improvements planned for the Greenway. The improvements are not in priority order on the maps and will be added to annual work plans each year.

SECTION 2 Native Grassland/Woodland Restoration and Maintenance: This section illustrates plans for restoring and enhancing native grass and woodland areas within the Greenway. The intent is for all unimproved grasslands and some improved turf grass areas to be converted to native grasses and forbs consistent with flora of the local Central Oklahoma/Texas Plains and Central Great Plains ecoregions [*Oklahoma's Biodiversity Plan: A Shared Vision for Conserving Our Natural Heritage, 1996*]. To the maximum extent practicable, all invasive vegetation (refer to Invasive Species under Chapter 2, Flora, of the INRMP for more information) which is ecologically damaging or a human safety risk will be removed from these areas. Special attention will be given to ensure grassland restoration and enhancement efforts do not appreciably disturb native wildlife, particularly sensitive species that currently inhabit these areas.

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Section 1: General Improvements

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Map 1a. Urban Greenway Reserve 1 West/East



Map 1b. Urban Greenway Reserve 2 North

Map 1c



Map 1c. Urban Greenway Reserve 2 South



Map 1d. Urban Greenway Reserve 3

Section 2: Native Grassland/Woodland Restoration and Maintenance

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Map 2a. Urban Greenway Reserve 1 West/East



Map 2b. Urban Greenway Reserve 2 North



Map 2c. Urban Greenway Reserve 2 South



Map 2d. Urban Greenway Reserve 3



Map 3. Green Infrastructure Network

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