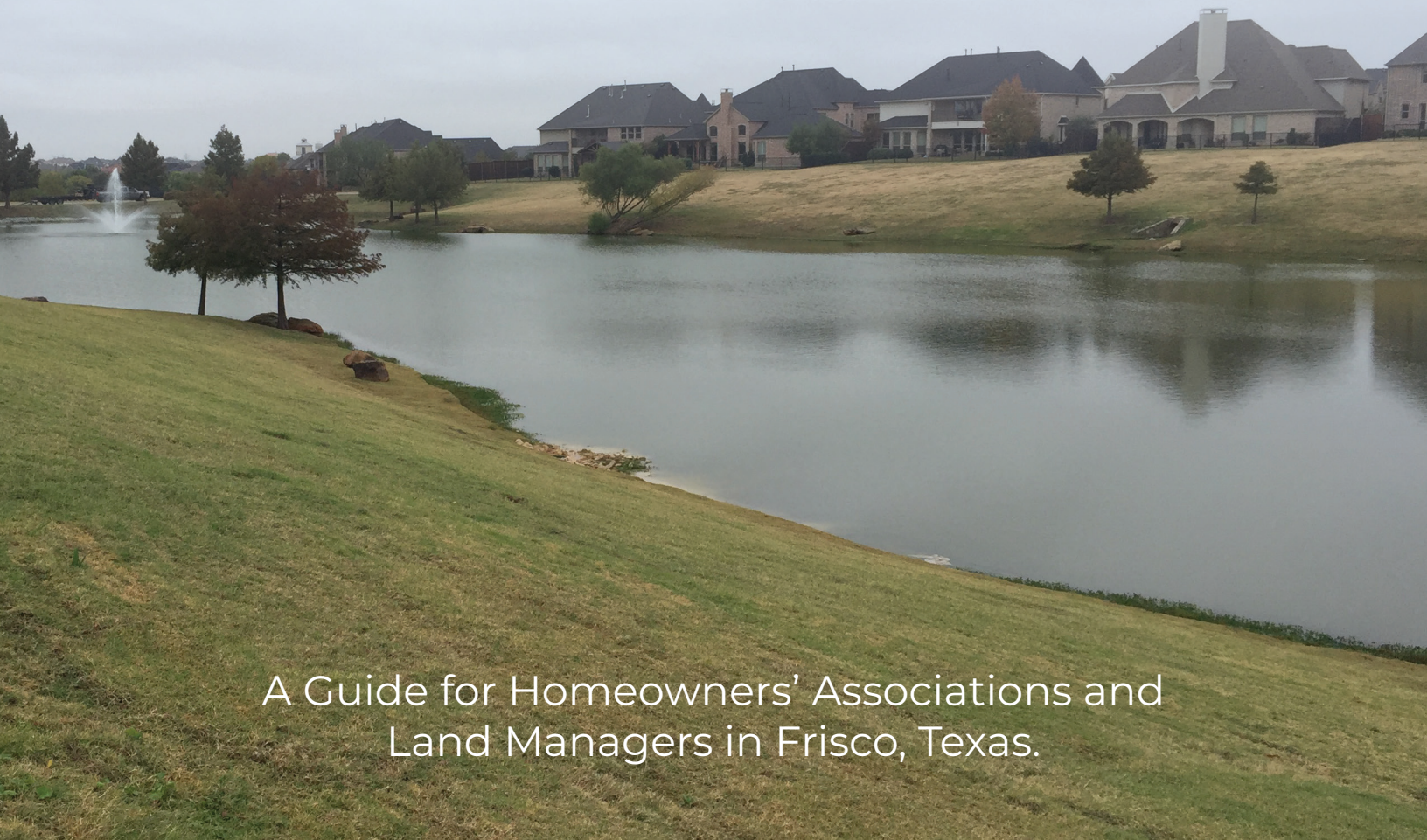
FRISCO

STORMWATER
BEST MANAGEMENT PRACTICES

MAINTENANCE GUIDELINES



A Guide for Homeowners' Associations and Land Managers in Frisco, Texas.

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DEFINITION OF TERMS

Aeration
A fountain or bubbling device installed in a retention pond or wetland that mixes the water with air in order to keep oxygen levels high enough to support aquatic life. These devices are also intended as aesthetic features.

Biomass
A general unit of regional mass quantity for living organisms.

Channel
Permanent waterway (natural or designed) that receives and conveys stormwater.

Detention Ponds
Capturing and confining stormwater within a basin for a short time before draining at a fixed rate (no permanent pool). Detention ponds are designed to drain relatively quickly after a significant rainfall. The ponds may remain saturated for several days after a rain event despite a lack of standing water.

Ditch and Swales
Ditches and swales (herein ditches) transfer stormwater from one area to another area such as a retention pond, creek or other stormwater management feature. Ditches may be made of concrete, rock, or other construction materials; they may be grass-covered soil or bare soil; or some combination of construction and natural materials.

Erosion
The removal and transport of soil by moving water.

Groundwater
Water that flows in the subsurface through porous media such as soil or rock and which may discharge directly from this media (known as a spring or seep).

Hard Armor
An erosion control system using concrete, rock, or other hard materials.

Invasive Species
Species of plants that were introduced into an area from a foreign place that may outcompete the native species.

Retention Ponds
Capturing and confining stormwater within a basin for an extended time (permanent pool or pond) designed to drain excess stormwater at a fixed rate. Many of these ponds are considered amenities and contain devices such as aeration fountains.

Riparian
The natural preserved area of the bank of a natural watercourse such as a river, creek, lake or wetland.

Riprap
Large cobbles of locally-sourced rock (such as limestone) greater than 4 inches in diameter. Typically used to reduce erosion and reduce flow velocity. 6 inches or greater is recommended for use in Frisco.

Runoff
A portion of stormwater that flows over the ground.

Significant Storm Event
A relatively infrequent rainfall event that is near or exceeds the design of a stormwater feature. Evidence of a significant event is a wrack line near the top of a bank on creeks and ponds.

Slope Failure (Expansive Soils)
It is the lateral movement of a soil mass when the weight of the mass exceeds the soil's cohesive strength necessary to maintain the angle of the slope. Changes in moisture content, such as heavy rainfall or drought are frequently the trigger for these types of failures.

Stormwater
Surface water originating as precipitation.

Sustainable/Sustainability
Refers to practices that ensure stormwater features properly function in perpetuity with minimal use of natural and fiscal resources.

Swale
See "ditch".

Weir
A low dam (usually with a notched v-shaped area cut out of its center) that is placed in a stream channel in order to regulate its flow.

Wetland
Any form of marsh, bog, or continously saturated or partly submerged area usually located near or on streams and recognized by a governing authority as such.

Wrack Line
The line of debris left after a significant storm event indicating the highest water level.

LIST OF ACRONYMS

BMPs
Best Management Practices

COF
City of Frisco

HOA
Homeowners' Association

INTRODUCTION

PURPOSE

The purpose of this manual is to provide guidelines for Best Management Practices (BMPs) for maintaining common areas that contain stormwater features such as ponds, swales, streams, and riparian buffers. This guidance manual is intended to be used by homeowner associations (HOAs), the City of Frisco's Parks Department, and other land managers in Frisco, Texas, who are responsible for maintaining stormwater features. Implementing BMPs ensures stormwater features are both functionally and fiscally sustainable.

BY FRISCO, FOR FRISCO

This guidebook was developed by the City of Frisco (COF) specifically to help local property owners and managers. All photography and examples shown and discussed are of sites currently located within Frisco city limits. The management strategies discussed were chosen based on specific concerns collected from field experience and from Q&A sessions with property managers. All controls listed below are appropriate for use in the City of Frisco, and this document will continue to be updated.

BACKGROUND

In 2002 City Council approved the Creek Ordinance which encourages the preservation of natural streams and riparian areas. These areas provide the green belt corridors for Frisco's growing hike and bike trail system.

Another result of the Creek Ordinance has been the development of sustainable systems for drainage. Natural creeks and riparian areas require much less maintenance than man-made structures. This document will provide BMPs for natural and man-made drainage systems which are owned and maintained by HOAs.

MAINTENANCE RESPONSIBILITIES

The HOA has full maintenance responsibilities for all stormwater features on HOA properties.

GOOD MAINTENANCE PRACTICES

Maintenance is most effective when tied to an inspection schedule and checklist. The best practice is to identify and address problems early on *before* they damage adjoining properties.

Common Maintenance Mistakes:

1. Mowing too short or too often.
2. Mowing to the edge of water bodies.
3. Planting inappropriate ground cover.
4. Over-fertilizing and over-watering.
5. Woody vegetation within the flow line of a swale or creek.
6. Using dye to alter the color of a water body. The discharge of discolored water is prohibited by state and local environmental regulations.

Fig. 1
An upstream retention pond has contaminated this stream with dye.

Pond dye can be toxic or disruptive to aquatic life.

BEST MANAGEMENT PRACTICES

ROUTINE & LONG-TERM MAINTENANCE GUIDELINES

BEST MANAGEMENT PRACTICES
~VEGETATION~

1. **Establish a vegetative buffer zone for erosion protection.** The buffer should only be mowed once or twice a year. The depth of roots is proportional to the height of the grass. Deep roots help reduce erosion. Mowing late in winter will help distribute seeds to perpetuate the grass. The mowing should be 5 inches or higher.

   The width of the buffer zone should be:
   a. For ponds: 6 feet to 20 feet along the edge of water on ponds.
   b. For streams: From the edge of water to the top of bank plus 6 feet to 20 feet on top of the bank.

Fig. 2
A vegetated (riparian) buffer zone borders a creek in Beaver's Bend Park. In addition to preventing erosion, riparian buffer zones also help control trash and other pollutants in stormwater runoff.

2. **Plant native prairie turf grasses and ground cover when possible.** They are much more resilient to both flooding and drought than grasses such as Bermuda and St. Augustine grass. Native riparian vegetation requires very little maintenance and no regular watering as it is already adapted to local soil and weather conditions. Roots may extend as deep as 9 feet. Texas boasts many attractive species of both lowland and upland native plants that are extremely effective at reducing erosion.

   These are some suggested riparian plants based on distance to water:

   a. *In water:* Eelgrass, American pondweed, Waterstargrass, American lotus, Water shield
   b. *Edge of water:* Southern naiad, Bulrush, Horsetail, Pickerel weed, Waterleaf, Arrowhead
   c. *On banks:* Switchgrass, Bushy bluestem, Swamp milkweed, Sideoats grama, Goldenrod
   d. *Upland:* Little bluestem, Big bluestem, Indiangrass, Purple coneflower, Gayfeather

3. Minimize fertilizer. Once the appropriate vegetation is established no fertilizer or watering may be needed. Fertilizer can encourage algal growth in water which can deprive aquatic life of oxygen, sometimes resulting in a mass die-off.

4. Outside of buffer zones the best practice is to mow 3 inches and higher.

5. Remove woody vegetation from the flow line of creeks and swales. This can be done by hand or by mowing once a year.

BEST MANAGEMENT PRACTICES
~DETENTION PONDS~

Detention ponds are water bodies that fill during storms but do not maintain a permament pool.

ROUTINE MANAGEMENT

1. Implement BMPs for Vegetation.
2. Perform routine inspections as required on Check List.
3. If necessary implement BMPs for Erosion.
4. If necessary implement BMPs for Standing Water.

PERIODIC LONG-TERM MAINTENANCE

The buildup of sediment and debris over time may restrict the flow of water or reduce storage capacity. If so, sediment may need to be removed.

Fig. 3. Native vegetation rings a typical retention pond with an aeration fountain. Vegetative buffers prevent pollutants from entering the pond, and offer cover to wildlife. Note the elevated outlet structure. Grate-top outlets must be periodically cleaned to prevent flooding.

Fig. 4. A newly constructed detention pond with inflow and outflow forebays. Forebays catch sediment and debris, and help to reduce pollution entering the outflow during rain events. Regularly inspecting side slopes for erosion reduces sedimentation and increases longevity.

BEST MANAGEMENT PRACTICES
~RETENTION PONDS~

Retention ponds are water bodies that always maintain a permament pool. This may vary under drought conditions.

ROUTINE MANAGEMENT

1. Implement BMPs for Vegetation.
2. Perform routine inspections as required on Check List.
3. If necessary implement BMPs for Algae Reduction.
4. If necessary implement BMPs for Erosion.
5. If necessary implement BMPs for Standing Water.

PERIODIC LONG-TERM MAINTENANCE

The buildup of sediment and debris over time will reduce storage capacity and eventually the pond will disappear. The main purpose of the retained water is the value it brings to the community as an amenity. The retained water is not required for drainage. Hence the HOA may have the option to allow the normal pool to silt in.

If an HOA desires to allow the normal pool to silt in, the HOA should:

1. Contact City's Engineering Department to determine if a portion of the pond is needed for detention.
2. Contact the City's Code Enforcement Department to ensure compliance with the City's nuisance ordinance or any other pertinent ordinance.

If an HOA desires to keep the pond it is recommended that a professional be hired to perform sediment surveys and make projections for future budgets. Dredging can be expensive, so it is important to ensure that funds will be available in the future when needed. It is also recommended to perform a sediment survey before and after dredging to calculate the volume of sediment removed.

Pumps or aeration fountain controls should be regularly serviced to ensure functionality. These devices can be essential to ensuring pond wildlife have enough oxygen to thrive. Anoxic (low oxygen) zones can suddenly kill hundreds of organisms, creating a "fish kill" which requires much effort to remediate as the dead fish will begin to smell and decompose within a short amount of time.

BEST MANAGEMENT PRACTICES
~EMBANKMENTS~

Embankments are raised earthen banks used to support bridges and roads over streams or flood prone areas.

ROUTINE MANAGEMENT

1. BMPs for Vegetation should be implemented.
2. Perform inspections.
3. If necessary implement BMPs for Erosion.
4. If necessary implement BMPs for Slope Failure.

PERIODIC LONG-TERM MAINTENANCE

Culverts between embankments may need to be periodically cleaned due to debris and sediment buildup.

Fig. 5. A bridge embankment and culvert near highway 121. Embankments should be inspected for signs of failure and erosion, especially around concrete areas.

Fig. 6. This riparian area was set aside by the development but has been over-maintained. Constant short mowing contributes to the development of headcuts and steeply eroded banks. In addition, this area offers no cover for wildlife which may lead to more encounters with residents.

BEST MANAGEMENT PRACTICES
~RIPARIAN AREAS~

Riparian areas are the ecosystems preserved along streams. They have been deliberately preserved because:

1. The vegetation is deeply rooted which will reduce erosion.
2. It improves the stormwater quality.
3. It is in a flood prone area not suitable for development.
4. They are vital in providing animals with refuge and food.
5. They require little or no maintenance.
6. They preserve ecosystems and have natural beauty.
7. They increase adjacent property values.

In riparian areas, human intervention should be kept to a minimum.

Never perform these activities in a riparian area:

1. Deforestation; neither mechanical nor chemical.
2. Introduce exotic or invasive species of plants or animals.
3. Dispose of yard waste or any other type of waste.

Minimize or cease these activities:

1. Pruning and thinning.
2. Removing fallen branches.
3. Fertilization or irrigation.
4. Foot traffic.

BEST MANAGEMENT PRACTICES
~STREAMS & SWALES~

Streams are defined here as natural drainage channels such as creeks and rivers. Swales are man-made earthen channels or ditches that are typically vegetated.

ROUTINE MANAGEMENT

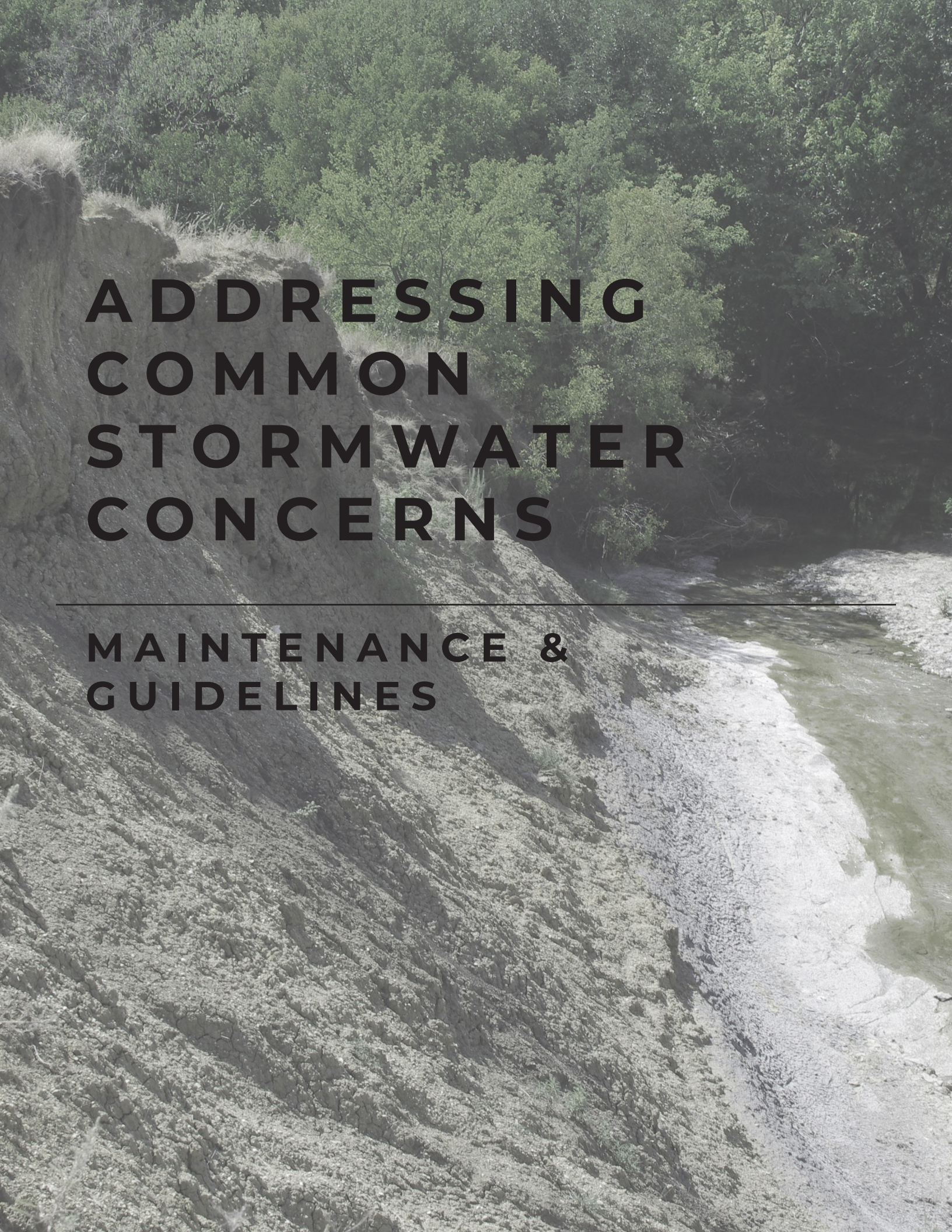
1. Implement BMPs for Vegetation.
2. Perform routine inspections as required on Check List.
3. If necessary implement BMPs for Erosion.
4. If necessary implement BMPs for Stream Course Fluctuations.

PERIODIC LONG-TERM MAINTENANCE

Culverts between embankments may need to be periodically cleaned due to debris and sediment buildup.

Fig. 7. A grassy swale (ditch) leading to a downstream storm drain. The swales act as the overflow outlet for the retention ponds on site. This type of design is referred to as a "treatment train" whereby stormwater moves through multiple water quality controls before entering the storm sewer.

Fig. 8. A culvert is clogged with woody debris after a large storm event. Periodic inspections of culverts are recommended. Contact City of Frisco Public Works when culverts on city streets are blocked.



ADDRESSING COMMON STORMWATER CONCERNS

MAINTENANCE & GUIDELINES

COMMON CONCERNS
~ALGAE~

Conditions favorable to the excessive growth of algae can create anoxic (oxygen-deprived) conditions in water bodies. If nutrient pollution is present (such as fertilizers), algae may bloom out of control. Large masses of algae block light needed by other types of plants, causing them to die and rot, which depletes oxygen in the water. A severe lack of oxygen may kill most or all of the aquatic animals in a water body. Extreme masses of algae are also unsightly and may cause the odor of the water to change.

Some aquatic plants, such as pondweed, are beneficial and should be left alone.

No action may be the appropriate option if all the following conditions are met:

1. The BMPs for Vegetation have been implemented or the area is in an undisturbed riparian state.
2. The aquatic plant growth is not a nuisance.

BMPS TO MANAGE ALGAL GROWTH

1. Reduce fertilizer use in the area that flows into the pond. Native plants require little to no fertilizer . Fertilizer accelerates algal growth.
2. Establish the buffer recommended in the BMPs for Vegetation. The shade will reduce the direct sunlight that algae needs.
3. Aerators can help prevent creating an anoxic (low oxygen) environment. Reducing erosion around pond edges can keep the pond from filling with sediment and losing storage capacity. This can prevent flooding by keeping the pond from becoming shallow. The shallower the pond, the more algae may grow because of increased sunlight. On-stream aeration devices must carefully be selected and installed in order to prevent them from washing downstream.
4. Never use synthetic fertilizers near ponds. These are water soluble, and much of the nutrients will go into the pond and feed the algae rather than into the soil to feed the intended vegetation.
5. If the above measures are not effective, chemicals (algicides) may be necessary. These should only be used as a last resort. State law requires professional application for any algicide treatment.

Fig. 9. Algal bloom (eutrophication) occuring in a retention pond. The water in the pond is used for golf course irrigation and has been overpumped, lowering the level of the pond. Combined with overfertilization of the surrounding area, eutrophication may occur, shading other aquatic species and sometimes causing fish kills.

COMMON CONCERNS
~EROSION~

TYPES OF EROSION

1. **Rill Erosion**: This is embankment scouring as water travels toward a stream or pond.
2. **Pond Bank Erosion**: This is loss of bank material due to wave action in a pond.
3. **Stream Course Migrations**: This is natural scouring along the banks of a stream as it changes course over time.

RILL EROSION BMPS

1. Implement BMPs for Vegetation.
2. If possible and depending on topography, restore area to a natural habitat.
3. Install controls that reduce water flow velocity. These may include:
   a. Wattles.
   b. Rock check dams.
   c. Terracing.
   d. Level spreaders.
4. Velocity reduction is preferred; however, if not an option or if ineffective then hard armor may be needed. This approach covers the scour zone to protect the bare soil from scouring. These include installing:
   a. Riprap (large stones)
   b. Proprietary geotextile products such as Flexamat or Armormax.
   c. A concrete channel

Fig. 10. Rill erosion scours channels in slopes as runoff moves quickly over bare soil. Growing vegetation (especially deep-rooted native plants) on slopes is one of the most effective methods of preventing this type of erosion.

Fig. 11. A new channel is forming by a type of rill erosion known as "headcutting", the initial scouring of a weak area of a slope. This headcut is undermining the fence surrounding a detention pond. Once headcuts form they grow rapidly.

Fig. 12. Wave action and weathering can erode away sections of shoreline. Even though ponds are typically small bodies of water, wind waves are quite powerful. Deep rooted native plants buffering or ringing a pond can go a very long way in preventing bank erosion. Aquatic plants are also very helpful, and also benefit aquatic animals. In areas prone to erosion, cattails or rushes may need to be planted.

POND BANK EROSION BMPS

1. Implement BMPs for Vegetation.
2. If an option, restore area to a natural riparian habitat.
3. Install controls that reduce the velocity for wind along the long axis of the pond. These include:
    a. A tree line of tall ever green trees upwind in the upland area.
    b. Plant switchgrass, horsetail reeds, bulrush, or other aquatic plants in the pond to break up the waves.
    c. Man-made structures to reduce wave action.
4. Manufactured Erosion Control:
    a. Anchored geotextiles (Armormax or similar)
    b. Turf reinforcement mats
    c. Flexamat or similar
5. Hard armor to protect the bare soil from scouring. This should only be used as a last resort. These include installing:
    a. Riprap.
    b. A concrete or stone retaining wall.

COMMON CONCERNS
~STREAM COURSE MIGRATION~

Streams are dynamic systems and are constantly re-aligning both vertically and horizontally. For this reason, the COF development standards require a flood plain and erosion hazard setback zones to create a buffer for stream course fluctuation to occur without property damage.

No action may be the appropriate option if the following conditions are met:

1. The BMPs for Vegetation have been implemented or the area is in an undisturbed riparian state.
2. The stream is not encroaching on a structure. If encroaching on a sidewalk, re-location of the sidewalk may be the best option.
3. The stream is not a nuisance.

If action is required, the next step is to ensure the problem is not a slope failure. This is best determined by a third-party professional. If it is found to be a slope failure, refer to the Slope Failure BMPs.

BMPS FOR STREAM COURSE MIGRATION

1. Repair scoured area and re-vegetate with appropriate native grasses. Do not continue to mow the area. The repair may be supplemented with a geogrid product that provides structure to the soil.

Prior to doing any of the remaining items please call 972-292-5800 to place a service request for technical assistance:

2. Install controls that reduce water velocity just before and along the area being eroded. These include:
   a. Vanes made of rock or concrete.
   b. Vanes or barriers made of woody debris, such as from local trees or discarded Christmas trees.
3. Construct a vegetative wall. There are products available designed to grow grasses on a nearly vertical wall.
4. The above is preferred, but if not effective or an option then hard armor may be needed. This approach covers the affected area to protect the bare soil from scouring. These include installing:
   a. Riprap.
   b. Gabions (anchored metal baskets filled with rock cobbles).
   c. A concrete wall.

COMMON CONCERNS
~SLOPE FAILURES~

It is important to distinguish between slope failure and erosion because the solutions may be very different. Professional services may be needed to make this determination. A slope failure is the movement of a mass of soil down a bank due to gravity. If directly along a stream, some of the resulting debris may be removed by erosion but the initial cause is the failure of the slope itself. If the problem appears to be erosion, visit BMPs for Erosion.

No action may be the appropriate option if the following conditions are met:

1. The BMPs for Vegetation have been implemented or the area is in an undisturbed riparian state.
2. The slope failure is not encroaching on a structure.
3. The issue is not a nuisance.

BMPS FOR SLOPE FAILURES

1. Implementing the BMPs for Vegetation may help to reduce the fluctuations of moisture content that trigger failures.
2. Turn off irrigation immediately. The water adds weight and reduces the cohesive strength of the soil.
3. Remove debris from the slope failure if it has fallen into the flowline of a stream.
4. If space is available, regrade the slope so that it is not as steep. Contact a third-party professional for recommendations before beginning a regrading project.
5. If the slope failure appears to pose a threat to life or property, professional services should be obtained immediately.

Fig. 13. A typical slope failure (slump) likely caused by overly steep grading combined with soil plasticity (shale/clay) and constant saturation of the lower portion. Pond water naturally seeps into banks, which can make soils heavier, pulling the lower parts of the slope away from the upper during extended periods of dry weather. After failure, runoff moving downslope will begin to erode the cracks, exacerbating the problem.

COMMON CONCERNS
~GROUNDWATER~

Groundwater is common throughout Frisco. It may be visible for months after a series of significant rain events. When groundwater appears, check for leaks on water and irrigation lines to rule those out as a potential source. To check for leaks in COF water lines call 972-292-5800.

No action may be the appropriate option if the following conditions are met:

1. Not a water or sewer line leak.
2. Not a breeding ground for mosquitos.
3. Not a nuisance.

BMPS FOR GROUNDWATER SEEPS & SPRINGS

1. Turn off irrigation.
2. Install a French drain.
3. Select plants from this list that uptake large amounts of water.
4. Add a rain garden in saturated areas.
5. Harvest and use the excess water when possible.

Fig. 14. Groundwater discharges from a french drain along a curbline. These are some of the most common "fixes" for a groundwater buildup, or seep. Typically, these drains are perforated and buried beneath the low area between houses most likely to become saturated during storms. Groundwater is always moving towards low areas.

COMMON CONCERNS
~STANDING WATER~

Natural streams will normally alternate between pool sections and riffle (fast-flowing) sections. Pools are often thought to be standing water. Even if difficult to detect, a pool will have a flow of water coming in and out of it.

No action may the best option if any of the following conditions are met:

1. The area is a wetland or pool.
2. The standing water disappears within 72 hours of a rainfall event.
3. Not a nuisance.

BMPS FOR STANDING WATER

1. Regrading.
2. Implement BMPs for Vegetation.
3. Select plants from this list that uptake large amounts of water.

Fig. 15. Though this water appears to be standing, it is immediately downstream of a "riffle" zone. This "pool" has no visible flow to it. In times of low flow on streams, water can appear to be stagnant.

INSPECTION CHECKLISTS

DETENTION PONDS

FREQUENCY	INSPECTION PROCESS	FURTHER ACTION
Monthly and after storm events	Remove litter and debris.	
Twice annually	Check inflows, outflows, or concrete channels for structural damage.	If damaged, consult Frisco Stormwater staff.
Twice annually or after large storms	Inspect side slopes for cracks, headcuts (an effect of rill erosion), or lateral erosion.	If found, stabilize and vegetate areas with native vegetation. If issues continue, consult with an engineering professional.
No more than weekly	Mow routinely at heights greater than 3". If area is native vegetation, mow only once per year.	

Focus Areas

1. Sediment and trash can reduce the ability of the pond to drain, causing it to hold water longer than intended, which may breed mosquitoes. Remove sediment and trash regularly.

2. Watch for signs of scouring on slopes surrounding inlets or outlets. This erosion adds sediment to the pond and undermines these structures, which can cause them to crack or fail. "Riprap" rock can be placed around these structures to reduce flow velocity. Terracing steep slopes can also greatly reduce this. Large volumes of sediment from erosion can reduce the carrying capacity of the pond and increase flood risks.

3. Check steeper slopes around pond for signs of bulging, slump, or failure. Look for horizontal cracks where roots of vegetation have been pulled away and exposed. Call a professional to evaluate slope stability to prevent total failure.

4. Plant or seed water loving native plants in pond. These will help drawdown standing water and prevent erosion. Mowing or landscaping in these areas is not recommended due to the constantly wet ground. Plantings can use this space most effectively.

RETENTION PONDS

FREQUENCY	INSPECTION PROCESS	FURTHER ACTION
Twice monthly and after storm events	Remove litter and debris, monitor status of aeration devices.	
Twice annually	Check inflows, outflows, or concrete channels for structural damage.	If damaged, consult Frisco Stormwater staff.
Twice annually or after large storms	Inspect side slopes for cracks, headcuts (an effect of rill erosion), or lateral erosion.	If found, stabilize and vegetate areas with native vegetation. If issues continue, consult with an engineering professional.
No more than weekly	Mow routinely at heights greater than 3". If area is native vegetation, mow only once per year. Also, note the status of algal growth and aquatic plants.	

Focus Areas

1. As with detention, check steeper slopes around pond for signs of bulging, slump, or failure. Look for horizontal cracks where roots of vegetation have been pulled away and exposed. Call a professional to evaluate slope stability to prevent total failure.

2. Never allow use of synthetic fertilizers near ponds. Always keep cut grass from entering ponds. Nutrient pollution such as fertilizer causes the growth and blooms of unsightly algae. Keeping naturally vegetated buffers around ponds traps pollutants and keep them from entering stormwater.

3. Avoid dyeing water or any sort of color additive. These have a negative impact on both water quality and aquatic life.

4. Large volumes of sediment from erosion can reduce the carrying capacity of the pond and increase flood risks. Be on the lookout for eroding slopes. Something as simple as raising a mower's height by an inch and mowing less often can go a long way in helping prevent erosion and slope failure.

STREAMS & SWALES

FREQUENCY	INSPECTION PROCESS	FURTHER ACTION
Twice monthly and after storm events	Remove litter and debris.	
Twice annually	Check inflows, outflows, or concrete channels for structural damage.	If damaged, consult Frisco Stormwater staff.
Twice annually or after large storms	Inspect side slopes for cracks, headcuts (an effect of rill erosion), or lateral erosion. Thin woody vegetation.	If found, stabilize and vegetate areas with native vegetation. If issues continue, consult with an engineering professional. Disturbed areas (from vegetation removal) may be planted with native species.
No more than weekly	Mow routinely at heights greater than 3". If area is native vegetation, mow only once per year.	

Focus Areas

1. As with detention, check steeper slopes around pond for signs of bulging, slump, or failure. Look for horizontal cracks where roots of vegetation have been pulled away and exposed. Call a professional to evaluate slope stability to prevent total failure.

2. Never allow use of synthetic fertilizers near ponds. Always keep cut grass from entering ponds. Nutrient pollution such as fertilizer causes the growth and blooms of unsightly algae. Keeping naturally vegetated buffers around ponds traps pollutants and keep them from entering stormwater.

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EROSION

FREQUENCY	INSPECTION PROCESS	FURTHER ACTION
Twice annually or after large storms	Inspect side slopes for cracks, headcuts (an effect of rill erosion), or lateral erosion. Thin woody vegetation.	If damaged, consult Frisco Stormwater staff.
No more than weekly	Mow at heights greater than 3". If area is native vegetation, mow only once per year.	Eroding areas may be stabilized by native vegetation that is allowed to grow to full height.

During your inspection and response:

Always…

1. Look closely at area where vegetation is consistently bare. Check below or downstream of the area for accumulated sediment. Note if sediment seems to have come from the bare areas. Take photos and log details.

2. Observe area during a storm event. Log how the water is moving. Take photos or videos, if possible.

3. Attempt to vegetate eroding area with native vegetation. Mulch wattles can be used to dissipate velocity at the site allowing vegetation to establish. If seeding, consider a straw mat over the area to protect seedlings. If vegetation does not address the issue, consult an engineer.

Never…

1. Ignore the area, especially if sediment is moving directly into a creek or storm drain.

2. Install obstructions that hold water in the area or divert the water from the area. These may cause flooding. Permeable controls (such as mulch wattles) designed to locally dissipate velocity may be installed temporarily while area is being re-vegetated. Consult Frisco Stormwater staff prior to installing temporary controls.

3. Regrade or reshape a problem area without consulting an engineer and a geotechnical specialist to design the project.

4. Put heavy equipment on areas of unconsolidated sediment (the sediment that has been piled up by the water).

SLOPE STABILITY

FREQUENCY	INSPECTION PROCESS	FURTHER ACTION
Twice annually or after large storms	Inspect slopes or creeks for signs of slump, stretching, or potential failure.	See details below.

During your inspection and response:

Always…

1. Look for areas where the ground appears stretched along a line perpendicular to the slope. Look for exposed or stretching plant roots.

2. Walk the slope to determine what areas, if any, are remaining consistently saturated.

3. Suspend mowing and cordon off area(s) until it has been evaluated by an engineering or geotechnical professional. Monitor areas and take pictures over time.

4. If a slope has already failed, immediately contact appropriate emergency responders (if necessary), contact Frisco Stormwater to report the failure, and contact an engineering professional.

Never…

1. Ignore the area, especially if near structures or homes.

2. Place heavy equipment or material on areas of potential failure.

3. Allow continued drainage from homes or pools on to areas suspected of slump or failure.

4. Regrade or reshape a problem area without consulting an engineer and a geotechnical specialist to design the project.

GROUNDWATER

FREQUENCY	INSPECTION PROCESS	FURTHER ACTION
Twice annually or if a nuisance	If property is near a creek or remains saturated (moist) during extended dry conditions, conduct inspection of moist area.	See details below.

During your inspection and response:

Always…

1. Conduct groundwater inspections during dry weather conditions at least 72 hours after a rain event.

2. Create a map of the property and note areas of groundwater accumulation. Note the proximity to development on the property. Attempt to pinpoint a source, if possible.

3. Attempt to vegetate area with water-loving native plants. If vegetation does not address the issue and the area is not located in a riparian area, consult a landscaper. Consider storage solutions such as a gravel basin (vegetated at the surface) or a subsurface drainage solution (such as a French drain). Solutions may be combined to maximize effectiveness. If area is in a riparian area or along a creek, contact an engineer or geotechnical specialist.

Never…

1. Continue to mow area more than once/month. Do not mow below 4" height. Discontinue all mowing in area if it remains constantly saturated and address with solutions listed above.

2. Cut channels or surficial drainage structures without consulting an engineer or geotechnical specialist.

3. Put heavy equipment or material on saturated slopes.

DON'T DUMP FLOWS TO CREEK

This guide was developed and produced by the City of Frisco Stormwater Division of Public Works. It is periodically updated to ensure accuracy and relevance.

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Mon - Fri
8 a.m. - 5 p.m.

RESOURCES

North Central Texas Council of Governments

integrated Stormwater Management iSWM

Texas A&M AgriLife

POND
PROTECTING OUR NEIGHBORHOOD DETENTION

United States Environmental Protection Agency

USDA

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