Gully Guidance Manual:
Solutions for Gully Repair

Friends of the Chicago River
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Friends of the Chicago River gratefully acknowledges our partners and supporters who contributed to the success of the Gullywalking and Gullyfixing projects including: The Boeing Company, Gaylord & Dorothy Donnelley Foundation, Forest Preserves of Cook County, and REI.

In addition, we would like to thank the 100 CREW volunteers (Chicago River Eco-Warriors) who trained as Gullywalkers. Their willingness to dedicate their time and energy made it possible for this project to succeed and for Friends to locate and document the many gullies that need to be repaired within the Forest Preserves of Cook County along the Chicago River system.

Photos are courtesy of Friends of the Chicago River unless otherwise noted.

Released December 2015
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Executive Summary

When Friends of the Chicago River was founded in 1979, the Chicago River system was a forgotten back alleyway, fenced off in many places and regularly inundated with sewage and trash. Ignored by the public and utilized as part of the sewer system for over 100 years, the river had been dredged, straightened and reversed; its natural habitat fragmented or destroyed. Development of the region exacerbated the problems.

Fortunately since then the river’s fortune has changed and progress can be measured in miles of trail; species of fish; and activities above, below, and along the water including whole new communities and riverfront uses. These changes have occurred because of the efforts of Friends of the Chicago River working with a wide variety of nonprofit partners, the Clean Water Act, and government agencies including the Forest Preserves of Cook County (FPCC) who recognize the river’s value to the people who recreate on it and the wildlife that call it home.

In 2012, Friends developed a two-year project to locate and analyze gullies along the river system. Gullies act as unnatural channels for stormwater erosion and provide a fast track for detrimental excess sediment and contaminants to enter the river. With the help of volunteers that we trained as part of the project, we located 139 gullies along 45 miles of river within the boundaries of the FPCC with the ultimate goal of fixing the gullies.

Achieving this goal will restore the landscape, prevent further erosion, and directly impact the health of the Chicago River system and publicly owned land. In addition, this project will contribute to the overall effort to control unwanted and unwarranted stormwater runoff, which has devastated so many water bodies across the United States.

Gullies can be found in watersheds throughout the country, particularly in areas impacted by humans. In the Chicago River system, our Gullywalker survey and analysis helped elevate the issue, pointing to the presence of gullies along the entire length of the river and the potential negative impacts to the river. Gullies have various degrees of severity and complexity, and Friends learned that addressing their impacts was far more complicated due to each gully’s individual characteristics and locations. This report recommends several key steps to addressing gullies in the Chicago River system.

Figures 1 & 2: Friends trained dozens of volunteers to identify and measure gullies along the Chicago River. Training included the use of GPS (Global Positioning System) equipment and time spent outdoors measuring and assessing real gullies.
On its way to becoming the ecological, social, economic, and recreational resource that we envision, the Chicago River system still faces many challenges, chief among is stormwater runoff. According to the U.S. Environmental Protection Agency, stormwater runoff is considered one of the greatest causes of surface water pollution in the United States of America (USEPA, 2013). It continues to be a major source of pollution in the Chicago River watershed.

The impacts of stormwater runoff in the Chicago River system have been exacerbated by the effects of increased human development. Prior to the runaway construction of buildings, roads, and parking lots in the region, rainwater was absorbed naturally into the ground. Today, the majority of stormwater runs off hard surfaces into stormdrains, sewers, and ultimately, the Chicago River system. In addition to contributing to flooding, combined sewer overflows (CSO), street closures, and property and productivity loss, more debris in the river impedes access for paddlers, fishermen, and other recreational users.

In addition to the impact on the human environment, stormwater runoff has a tremendous negative effect on the wildlife that utilizes the Chicago River system. Key habitat along the stream bank and in the riparian zone is destroyed by rapid changes in the velocity and volume of water racing towards the river, in-stream habitat is smothered by sediment that enters the river via unnatural stormwater flows. These impacts begin to aggregate as they are felt throughout the food chain and disrupt life cycles. For example, sedimentation can decimate local mussel and other macroinvertebrate populations, removing both a key food source and diminishing native fishes ability to spawn successfully.

Additionally, as we continue to observe increasing climate change impacts along with widespread urban development, rain events become stark indicators of our need for action.

As part of the Gullywalking project, Friends’ staff and volunteers walked the many reaches of the river, eventually locating and analyzing 139 gullies within the boundaries of the Forest Preserves of Cook County (FPCC). This analysis helped elevate the issue, pointing to the presence of gullies along the entire length of the river and highlighting the potential negative impacts to the system. When data on the depth, length, and width of gullies were analyzed we found that there is considerable descriptive variability between the gullies owing to differences in severity and complexity. Even within the same preserve, no two gullies are completely alike. The uniqueness of gullies truly comes into play when there is a desire to fix them. Gullies’ individual characteristics and locations make addressing their impacts time consuming and complicated.

It is important to recognize the influence that gullies have on riparian systems. As major contributors of undesirable materials to waterways, gullies should be located and monitored as a first step on the way to designing a plan to manage and mitigate their impacts. Gully impact should be considered as landowners strive to make their properties ecologically sustainable.

The goal of this guide is to illustrate how we can work together with large landowners and other partners to repair gullies using a variety of techniques. Friends’ gully work to date has all taken place in the Forest Preserves of Cook County.
Chapter 1: Gullies and the Chicago River System

A typical gully that discharges into the Chicago River system from the property of the FPCC can be characterized as an open erosion channel, fed from an unnatural source (stormwater), that lacks vegetation.

Gullies are formed when channelized stormwater encounters disturbed soil. Their presence advances erosion, providing a direct track for detrimental excess sediment and contaminants to enter the river. Gullies are found in watersheds throughout the country, but can be particularly severe in areas impacted by humans. The Chicago River system is a perfect example.

Development and poorly managed stormwater are the source of most gullies, but, the spread of invasive species has intensified the impacts of stormwater runoff. Invasive plants such as European buckthorn (Rhamnus cathartica) and garlic mustard (Alliaria petiolata) are increasingly common throughout the Chicago River system (Fig. 3). As these plants invade native communities, they create thickets with low biodiversity, minimal undergrowth, and networks of shallow root systems that do little to prevent surface water runoff and soil erosion.

When water runs over this barren soil, as it does when it flows from pipes that empty into the riparian corridor, it often causes a gully. These gullies create an easy path for stormwater, eroded sediment, and any pollutants that either may contain to reach the river.

Both the physical and chemical effects of high sediment levels in waterways lead to detrimental impacts on river communities. From the physical perspective, high levels of turbidity (cloudiness in the water) will block sunlight penetration and impede the growth of algae and aquatic plants, the fundamental base of growth for the aquatic food web. Sediment may also fill microhabitat for both benthic macroinvertebrates, the small insects that live on the river bottom, and fishes. High amounts of sediment will reduce the river's capacity to handle flooding.

Sediment erosion damages not only the river as the outlet of stormwater runoff, but also the surrounding landscape itself. The Forest Preserves of Cook County’s land contains numerous gullies making it susceptible to large-scale topsoil loss. Loss of this topsoil means more unstable land for native plant species and lower productivity as well as habitat loss for ground-dwelling organisms.

Factors Affecting Gully Formation

Before any efforts may be made to fix a gully, the site containing the gully must be assessed. Site topography, size and shape of the catchment, gradient, prevalence of impermeable surfaces, water source, and local vegetative and soil conditions all should be considered when determining how best to move forward.

When assessing a drainage area, one should take into account the size and shape of the depressed land as well as the length and gradient of its slopes. This will help to estimate the volume and velocity of the water that travels through the gully. Aside from standing outside in a rainstorm to observe the pathways of surface runoff these characteristics best illustrate water’s primary routes over the land. Before any efforts are taken to manage a gully, it is imperative that the catchment, the area that drains into the gully, be characterized.
1. Size of the Catchment

Simply put, the larger the catchment, the greater the amount of runoff it will carry to the river during a rain event. A greater volume of water can potentially cause more erosion and do more damage.

2. Shape of the Catchment

Figure 4 shows two catchments, similar in area and drainage pattern but different in shape. For the catchment on the right; because there is greater distance between the outlet and the “headwaters,” water falling on the land will reach the outlet at staggered intervals, which will ultimately slow the rise in the volume of water in the river channel. For the left catchment, water will likely reach the outlet at the same time, creating a burst of water into the river channel, rapidly changing the conditions.

3. Gradient and Topography

The steeper the gradient of the catchment slope, the higher the velocity of the runoff and the greater its erosive power. When dealing with steep slopes, it is important to slow the movement of water as much as possible by mitigating the flow at multiple points throughout the gully. In parts of the country with greater changes in topography highly erosive, steep-sloped gullies are standard but even in Illinois, a difference in elevation of just four feet or more within a short distance can result in challenging gully.

4. Impermeable Surfaces

In urban areas, the prevalence of impermeable surfaces has a dramatic effect on the flow of stormwater. In a built environment, pavement and compacted soil restricts infiltration and increases overland flow. Surface water is often channelized quickly to remove it from the area. Ideally stormwater would be held on site until it can infiltrate into the soil but in many urban areas this is not an option. In traditional built environments water is generally disposed of in two ways:

a. The majority of stormwater runs off hard surfaces into stormdrains, sewers, and ultimately, into the Chicago River system. In addition to flooding, combined sewer overflows (CSO), street closures, and property and productivity loss, more debris in the river impedes access for paddlers, fishermen, and other recreational users.

b. The remainder of this urban stormwater is directed towards natural areas where it is expected to soak in to the soil. However, if measures are not taken to slow this water down before it leaves the channel, it will burst out with a focused, cutting speed that almost certainly will erode the underlying soil quickly forming gullies.

Figure 4: A short squat catchment, left, a long narrow catchment, right (Original source: Hiller, 1979)
http://www.fao.org/docrep/006/ad082e/AD082e01.htm

Figure 5: Flooding along the North Branch of the Chicago River in the Albany Park neighborhood.
5. Water Source

Identifying a water source and considering its location in relation to the gully is another factor that plays an especially important role in urban gully fixing. Attempting to fix a gully without identifying the water source will lead to a re-occurrence of the gully. How water is directed away from a built environment has two major implications for gully fixing:

a. Depending on where the water is draining from, certain pollutant concerns may prioritize a gully for fixing. For example, surfaces like parking lots accumulate harmful contaminants (rubber and metal deposits from tire wear, antifreeze and engine oil) as well as garbage. If runoff flows off these surfaces unchecked, these contaminants will likely end up in the nearest body of water.

b. In a natural area, the source of focused water is often upstream disturbance. The permanence of this type of source can help you determine your options for gully fixing. For example, determining if the water is being routed from a subdivision or off a large, recreational field can help to determine the flashiness, how quickly the water level rises and falls, of the runoff which will inform how resilient the methods used for fixing gullies must be if the solution is sustainable.

6. Soil and Vegetation

Soil and vegetation are counterparts that, depending on their quality, can help or hinder gully creation. High quality soil, composed of minerals, decomposing organic matter (humus), and microorganisms, provides the ideal conditions for native, deep-rooted vegetation. Healthy vegetative cover discourages erosion by intercepting rainfall, slowing overland flow, and retaining soil within its developed root systems. For this reason, planting on gully afflicted land is one of the most common and generally successful ways to remediate a gully. However, not all vegetation results in the same desired effects. For success, a gully repair must utilize native plants that can withstand occasional inundation.

Figure 6: Determining the location of a gully’s water source is important.

Figure 7: Determining the type of soil in a gully and the native vegetation supported nearby is very important.
This section will briefly explore the characteristics of these three types of gullies identified by Friends of the Chicago River and provide some visual examples of gullies within the natural areas of the Forest Preserves of Cook County. The examples used were identified by the Gullywalker volunteers as part of their original assessment. Friends trained 100 volunteer gullywalkers who identified, surveyed and characterized 139 total gullies along the riverbank owned by the FPCC. The data was aggregated and compiled and has been used for planning including maps, analysis, gully fixing, and published in a summary report, *Uncovering Gullies: Protecting the Chicago River in the Forest Preserves of Cook County* which was shared with the FPCC and key landowners and government officials to provide awareness of the issue. The report is available on Friends’ website under “Issues.”

**Volunteer-Based Gully Assessment**

The protocol we designed for gully assessment was created with volunteer capacity in mind. As illustrated in Chapter 1, gullies systems can be quite complex. In order to make the most of volunteer resources for the purpose of initial documentation, it is beneficial to accept certain descriptive simplification. It was the goal of Gullywalkers to traverse the banks of the river, following all gullies’ paths onto shore. Volunteers were asked to measure the width and depth of the gully, as well as mark the location on a GPS, at distances of three feet, 20 feet, and 100 feet from the riverbank. See the Gully Monitoring Data Form in Appendix D for a more detailed explanation of this process. Over time, and with increasing development, gullies may be created or become more severe. For this reason gullies should be re-assessed on a five year basis.

For the purpose of this manual, we have classified gullies into three distinct categories based on the level of severity:

- **Level One: Depths of 1 foot** - Gullies for Continued Monitoring

  At many sites volunteers identified small gullies that were just over the 30 cm (12 inch) threshold that defines a gully rather than a smaller drainage channel. Throughout the entire assessment area volunteers identified 14 Level One gullies, accounting for 10% of the total gullies surveyed. These gullies should be monitored periodically to ensure they are not growing due to a new, possibly illicit, source of stormwater. A rapid increase in size of these gullies could indicate a new source of stormwater entering the preserve from a non-natural source.

- **Level Two: Depths between 1 and 3.5 feet** - Gullies Targeted for Volunteer Fixing

  Friends’ volunteers identified and collected data on 101 gullies with depths between 1 and 3.5 feet. These account for 73% of the total gullies surveyed. These gullies have been identified as the most likely targets for successful, sustainable restoration by volunteers.

- **Level Three: Depths greater than 3.5 feet**

  Figure 8: Example of a Level Two gully at Bunker Hill Woods.
**Preserve Example: Bunker Hill Woods**
The gully in Figure 8 is located in Bunker Hill Woods. Its maximum depth is 2.5 feet deep and it runs for 15 feet before draining into the North Branch of the Chicago River. This gully is similar in size and scope to many gullies identified by Gullywalker volunteers throughout the assessment area and it is a good target for restoration using volunteers.

**Level Three: Depths greater than 3.5 feet - Extreme Gullies**

Friends’ volunteers identified and collected data on 24 gullies with a depth greater than 3.5 feet throughout this process. These accounted for 17% of the total gullies surveyed. Gullies located at Linne Woods (Fig. 9) and Kickapoo Woods (Fig. 10) of this size and scope are explored in this section, but overall these types of gullies were located throughout the assessment area (Figs. 11 & 12). Many of these gullies emanate from one large stormwater outfall, like the Linne Woods example (Figs. 13 & 14), or from a series of stormwater outfalls that discharge into a common gully that flows into a nearby waterway, as is the case in Kickapoo Woods (Figs. 15 & 16). Gullies that have drainage pipes as sources create more severe concerns than gullies without a point source. These gullies tend to be larger and deeper and can be found both on the Chicago and Little Calumet Rivers.

These extreme gullies present a restoration challenge on two fronts. First, because the source for these gullies is frequently stormwater systems that are either antiquated or far removed from the discharge point, it is more difficult to greatly reduce the end of pipe flows during rain storms. In any event, the FPCC lacks the authority to control upstream flows in these situations and must deal with the stormwater from the end of the pipe to its discharge into the waterway. In many cases these large gullies act as de facto tributaries, and restoration and naturalization activities around these systems should focus on managing the existing flow regimes to reduce, or even eliminate, future bank erosion while re-creating the natural processes present in tributaries and small streams.

The remediation of these Level Three gullies may require large-scale contract work and coordination with entities such as the Metropolitan Water Reclamation District of Greater Chicago or the U.S. Army Corps of Engineers. Any efforts requiring the maintenance or removal of a point source may also include utility work and contract work on pipes to construction of check dams, debris dams, or stone toe armoring and its implementation will require professional expertise.
Figure 11: Location of Level Three gullies (depths of 3.5 feet or greater) along the North Branch of the Chicago River.

Figure 12: Location of Level Three gullies (depths of 3.5 feet or greater) along the Little Calumet River.
Preserve Example: Kickapoo Woods
Gullywalker volunteers identified 13 gullies along the banks of the Little Calumet River in Kickapoo Woods. Of these, eight (62%) contained portions with depths greater than 3.5 feet, ranging from 3.8 to 6 feet deep.

The presence of such a high percentage of Level Three, or extreme, gullies is indicative of an underlying problem at the site. These gullies represented some of the most severe cases in the southern portion of the assessment area.

The gully source in Figures 15 & 16 is a pipe, likely draining water from the graded and drained section of the preserve, as well as some residential development east of Halsted Street. The gully runs for more than 100 feet before draining into the Little Calumet River. It is deep throughout its course, ranging from 1.5 to 4.5 feet in depth. This gully is quite extensive and has a major impact on the health of the preserve and the woodland and prairie restoration that are present at the site. In its current condition, it is reasonable to assume that such a large gully contributes large amounts of sediment and contaminants to the Little Calumet River.

Figures 13 & 14: An extreme gully at Linne Woods. The source is from a pipe (top image), which drains 60 feet to the North Branch of the Chicago River (right image). Depth of the gully is up to five feet in places.

Figures 15 & 16: A Level Three gully at Kickapoo Woods. The source is from a pipe (top image), and drains to the Little Calumet River (right image). The river can be seen at the top of the image.
Friends’ goal for gully fixing is to utilize restoration techniques that will both restore the ecological function of the landscape and prevent further soil erosion and the damage to the river system and the aquatic creatures it causes. Our objectives are to:

• Remove woody invasive species
• Reduce non-native canopy trees
• Increase sunlight intensity to ground level
• Reduce or eliminate bare soil areas
• Revegetate the native vegetative community at ground level

This work can also improve floristic quality.

**Steps to Successful Gully Repair**

Figuring out how to fix a gully is a multi-step process that requires a comprehensive understanding of the physical characteristics of the gully; knowledge of where the water causing it comes from; and the tools, permission, and ability to take action.

1. **Understanding Your Gully**

While Friends’ 2014 Gullywalking Report (http://www.chicagoriver.org/issues/gullywalking-project) located and categorized the types of gullies present spread through the FPCC along the Chicago River system, the information gathered by the gullywalking volunteers was obtained to inform gully fixing not as the final data for a restoration plan. More information on the existing conditions will be required including the:

• What is the full size and scope of the individual gully to be addressed?
• Where is the water coming from and can it be dissipated?
• What plants are present, both native and non-native?
• Are there any threatened and endangered species in the vicinity?

Friends’ three level system identifies Level One gullies for continued monitoring but not for immediate repair. Level Two gullies are repairable by a combination of staff and volunteer efforts. Level Three gullies are those which, due to their size and complexity, require special attention and should be repaired by professional contractors in close consultation with the landowner and manager.

**Sample Gully Summary**

“Gully 1 is the westernmost of the five. The origin of this gully is west of the parking lot by 75 feet and south by 20 feet. The understory is formed by a dense thicket of invasive shrubs composed mostly of buckthorn (Rhamnus spp.). There is very little ground vegetation within the specified restoration area. The canopy is composed of a mix of mature upland and flood plain trees as previously discussed. The channel originates from a small pool of water located within the mowed turf just outside of the woodland’s tree line. As the channel moves south, it splits into two smaller channels. Each of the smaller channels cut through the river bluff and terminate at the river floodplain. There are signs of minor soil erosion where each channel cuts through the river bluff. The soil is a degraded woodland soil with a thin layer of topsoil over clay. There are no signs of previous restoration activities within this work area.”

**Size and Scope**

As demonstrated in “Gullywalking: Uncovering the Gullies in the Forest Preserves of Cook County” every gully is an individual with its own parameters. Gullies can vary significantly in size, shape, and depth even if they are adjacent and created by the same water source; therefore, it is important to choose an appropriate gully for a specific group. For example, a group of thirty adult volunteers would be able to clear a quarter acre of invasive vegetation in and around a gully within three hours. It is imperative that a site visit is conducted with the Site Steward, Nature Center Manager or Regional Ecologist at least once prior to the workday. This will give the Workday Leader a better idea on how remediating a specific gully will affect the surrounding
land and waterway, the necessary tools needed for the workday, and how many workdays it will take to completely fix the gully. Ideally, a successful gully fixing will be completed within a week.

Where is the Water Coming From?
To find where the water is coming from, a gully fixer should start at the point where the gully empties into a body of water and walk parallel the length of the gully until the water source is found. The source of water can be runoff from an impervious surface such as a parking lot, a natural occurring source based on the topography of the site, or from a stormwater pipe. It is important to identify the water source because different methods of management can be applied to different gullies. For example, deeper gullies created by a pipe source may need regrading, while wider gullies created by impervious surface runoff may require intense soil stabilization by installing native seed and plugs. Gully-specific remediation processes will encourage a change in drainage patterns and surface flow, which will eventually restore ecological function of the area.

Evaluating the Plants Present
It is essential to identify the existing plant palette to determine which plants should be saved and which plants must be removed. Invasive vegetation has caused major issues within the Forest Preserves and their removal is imperative. Typically, these species leaf early in the season and monopolize available resources (i.e. light, nutrients) leaving native species little to survive. By removing invasive vegetation, volunteers open up the canopy increasing the amount of light penetration to the ground, which allows native vegetation to thrive. As oppose to invasive species, native vegetation has stronger, deeper root systems, which assist in preventing and filtering stormwater runoff, and stabilizing banks and preventing soil erosion. Wildlife prefers native vegetation as a food source and for shelter, so typically an increase in species diversity is observed. Skilled volunteers are welcome to do a site visit to identify the botanical composition of an area, but final approval and a walk-through with FPCC staff is required before any removal begins.

See Appendix C for a sample plant list.

2. Making a Plan

Once the full parameters are understood gully fixers should develop a site plan that includes all of the details of how the gully will be addressed, including who will do the restoration, what is the maintenance afterwards, what is the timeline, when does the FPCC think the project work is best done and any other logistics. For example, certified chain sawyers may need to be brought in to manage larger trees, while resprout control needs to be managed for several seasons after removal. Native seeds from the site may also need to be collected, processed, and planted as an ongoing maintenance protocol.

Generally the phase one work will be conducted in the dormant season to minimize the impact on the ground.

3. Obtaining Permits and Permission

Securing permits and permissions is an essential early step in any ecosystem restoration project including gully fixing. Depending on the location of the gully, landowner permission may suffice but any construction project in Illinois’ waterways, floodplains, and wetlands often requires both state and federal authorization. Work within the Forest Preserves of Cook County

Threatened and Endangered Species
Illinois is home to threatened and endangered plant and animal species and many of them can be found in Cook County or at least should be. To find out which species might be present and must be protected, contact the forest preserve staff and site steward with whom you are working.

A list of endangered species can be found at the U.S. Fish & Wildlife Services’ Endangered Species Midwest/Illinois webpage.


The Chicago U.S. Fish & Wildlife Service contact is:

USFWS
Chicago Illinois Field Office
1250 South Grove, Suite 103
Barrington, Illinois 60010
(847) 381-2253
requires permission and access agreements with the FPCC. Places where threatened and endangered species are found have other requirements. If the project is contiguous with or impacts navigable waters, further permitting by the U.S. Army Corps of Engineers may be required. It is important to ascertain all applicable permits and permissions and obtain them before you start to work.

The following are some of the common permits and applications you may encounter during the gully fixing and remediation process.

**Access Agreement with the FPCC**
The FPCC requires access agreements that must be approved by Forest Preserve’s Board of Commissioners before any work can begin at any forest preserve site. To acquire the access agreement, project designers must coordinate with FPCC Resource Management staff to have their approval for the site plan and an access agreement approved.

General inquiries can be made to the Main Office at the FPCC Headquarters: (800) 870-3666.

**Joint Permits**
For work in Illinois’ waterways, floodplains, and wetlands permits are regularly required from the U.S. Army Corps of Engineers (USACE), the Illinois Department of Natural Resources/Office of Water Resources (IDNR), and the Illinois Environmental Protection Agency (IEPA).

To make it easier they developed a joint application designed to simplify the approval process for the applicant seeking project authorizations. The application can be found on IDNR’s website:

- [https://www.dnr.illinois.gov/WaterResources/Pages/PermitApplicationandInstructions.aspx](https://www.dnr.illinois.gov/WaterResources/Pages/PermitApplicationandInstructions.aspx)

Note that the application requirements include:

- The names and addresses of any property owners who are adjacent to the proposed work site (as they will be invited to make comment on the project during a public comment period)

**Threatened and Endangered Species**
Illinois is home to hundreds of rare and endangered plant and animal species that require special planning and special protections. These species are found throughout all throughout the Chicago River system and need to be planned for and understood.

Generally, the Resource Management staff at the FPCC will be well aware of the threatened and endangered species at any proposed projects sites but more information can be found by a tool developed by IDNR to determine if threatened and endangered species are present.

The information on how to determine their presence is found on IDNR’s website:

- [http://dnr.state.il.us/orep/ecocat/printinstructions.htm](http://dnr.state.il.us/orep/ecocat/printinstructions.htm)

**Navigable Waters**
ACE Section 404: U.S. Army Corps of Engineer (USACE) permits are also necessary for any work, including construction and dredging, in the nation’s navigable waters. The USACE balances the reasonably foreseeable benefits and detriments of proposed projects, and makes permit decisions that recognize the essential values of the nation’s aquatic ecosystems to the general public, as well as the property rights of private citizens who want to use their land.

During the permit process, the USACE considers the views of other federal, state and local agencies, interest groups, and the general public. The results of this careful public interest review are fair and equitable decisions that allow reasonable use of private property, infrastructure development, and growth of the economy, while offsetting the authorized impacts to the waters of the United States. The adverse impacts to the aquatic environment are offset by mitigation requirements, which may include restoring, enhancing, creating and preserving aquatic functions and values. The USACE strives to make its permit decisions in a timely manner that minimizes impacts to the regulated public.
Depending on the project, the USACE may also issue a Letter of No Objection in situations where no significant disturbance will take place.

The following weblinks can help determine if a permit or Letter of No Objection are required.


**Remediation Approval Process**

Any individual interested in leading a gully fixing workday needs to be a Forest Preserves of Cook County (FPCC) ‘Partner Agency Group Leader’ or ‘Stewardship Workday Leader.’ If you are not one of these types of leaders, you may only participate as a volunteer; however, volunteers are encouraged to undergo the certification process to become a Stewardship Workday Leader.

Please see Appendix E and F for workday leader position descriptions.

If you are an active Partner Agency Group Leader or Stewardship Workday Leader and would like to conduct a gully fixing project, select a site that will accommodate the interested group. The gullies should be Level 1 or Level 2 and be easily accessible. A list of identified Forest Preserve gullies can be found here:


Contact the landowner (FPCC) to obtain the Site Steward, Nature Center Manager or Regional Ecologist’s contact information. The interested party will need to initiate contact in order to obtain advanced approval and permission to run a workday. It is important to note that all communications regarding the workday should include the Site Steward, Nature Center Manager or Regional Ecologist.

Once the Site Steward approves the time and date of the workday, the activities are chosen next based off of the site’s Management Plan and Schedule. This information is accessible to all workday leaders via the FPCC or Site Steward.

Workday Leaders will have access to the backend of the FPCC’s site or the Online Volunteer System (OVS). Leaders will need to create a scheduled slot in the database so the FPCC is aware of the workday. Once the scheduled slot is submitted the FPCC will send out a draft Weekly Workday Report. The Workday Leader will verify if all the information is accurate via email. The final Weekly Workday Report is issued on Thursdays.

Indicating whether or not there will be a brush-pile burn is very important. If the Site Steward requests a brush-pile burn, the Workday Leader must complete the site-specific Brush Pile Burn Notification Tracking Form and make sure that a Brush Pile Burn Boss is scheduled to attend the workday.

A permit is required from the FPCC for groups of 25 or more participants. If this is a closed workday led by a Partner Agency Group Leader, the waiver, insurance, and liability is to be covered and provided by the partner agency. If this is a public workday, then the FPCC waiver is required to be completed by all participants. Any participants under the age of 18 will need a parent/guardian to complete the waiver.

Students participating in restoration with their school or an organization must have their parents or guardians complete the Student Restoration Field Trip Agreement and Waiver.

The appropriate equipment and supplies can be ordered or loaned by the FPCC using the Supply Order Form or Loaner Request Form. Please see Appendix G and H for more information regarding supplies for the workday. Any volunteer under 18 years of age is required to wear safety goggles/glasses during brush cutting activities.

Following the workday, the Workday Leader is responsible for reporting the volunteer numbers on the OVS. They will need to fill out the site-specific ADMIN Survey. All questions and inquiries regarding obtaining documents, waivers, tools, and accessing the OVS can be addressed to volunteer.fpd@cookcountyil.gov.
4. Planning Your Day and Recruiting Your Work Force

Initially, it is extremely important to take sufficient time to plan for the steps that are included in the restoration of a Level Two Gully. Prior to arriving on site and beginning a workday, the responsible party needs to ensure that volunteers are arranged, permits and permissions are secured (see Obtaining Permits, pages 14-16), plants are ordered, and any relevant supplies and necessary equipment are available when the work is scheduled to begin. Many low-gradient gullies can be fixed with a large volunteer workforce and a minimal amount of material.

5. Getting to Work

The first phase includes woody invasive species removal, native seed installation, and erosion control blanket installation. This phase should be completed within the span of four days. The end result of these efforts should be the creation of a 50 foot buffer extending along the length of the gully (25 feet on each side of the gully). All work should be performed during the dormant season under dry, firm ground conditions to minimize soil disturbance. A crew of four to six volunteers is ideal for seeding and blanketing one gully. A well-trained crew can typically complete about ½ acre of seeding and blanket installation in an eight hour day (two or three volunteer workdays). Based on that estimate, a medium sized, low gradient gully should take one or two workdays with well-trained volunteers.

Phase two work can be completed the following spring and consists of installing native plant plugs. Installation of seed and the erosion control blankets should take place within the first few days following woody species removal in order to limit the amount of time bare soil is exposed on site. Each site differs, but once the soil is exposed by the clearing of the brush, a rain event can easily result in considerable erosion. As long as the land manager has given their approval, the revegetation process can also occur.

Remove the Woody Plants

The first objective of gully fixing is to remove 100% of specified woody invasive shrubs including, but not limited to, buckthorn (Rhamnus spp.), honeysuckle (Lonicera spp.), and hawthorn (Crataegus spp.). To increase sunlight intensity to ground level, additional canopy trees may be identified for removal by the land manager. Woody stems should be cut using loppers or handsaws to within 4” of the ground level and herbicide should be applied to stumps immediately following removal.

Use of herbicide is key to the prevention of the regrowth of these invasive species. Herbicide types and solutions may be selected by the land manager and should only be applied by a licensed applicator. As woody debris is cut, crew hands should haul brush to specified pile locations and, by the end of the day, should dispose of all cut woody debris in a manner specified by the land manager.

Depending on the length of the gully, with a full crew, many Level Two gullies can be cleared in six to eight hours with a crew of eight volunteers. Volunteers should be split into two teams: cutters and clearers. The cutting team will remove invasive shrubs using the guidelines above and the clearing team will cut the brush into smaller segments and pile it in an organized manner.
6. Revegetating with Native Plants

Revegetation is accomplished by installing seed and live plant plugs under an erosion control blanket. Gully-fixers should work with their local land managers to develop a list of appropriate native plants to revegetate specific gullies (an example is provided in Appendix C). Species lists should reflect native plant communities thriving under similar conditions in nearby preserves and natural areas. Native seeds may be acquired through a combination of commercial sources and hand collection from the site in question or other sites within close proximity.

Native Seed Installation

Following woody species removal and organizing a seed list, volunteers can spread the seed via hand broadcast. This involves holding a handful of seeds in your hand, holding your arm straight out, and moving your arm side to side while releasing seeds from your hand. It is best to do this walking backwards along the area as to not damage the seeds by walking on them. Volunteers can line up about 2’ apart and release the seeds using this method. In addition to the permanent native seed, gully fixers may want to consider adding a cover crop to the seed mix, such as annual winter wheat. This can provide quick vegetative coverage while the native seed establishes itself.

Erosion Control Blanket Installation

Following seeding, volunteers should use rakes to clear any remaining debris and rocks in the area. The straw erosion control blankets should have biodegradable netting made of natural fibers, which is important to reduce loss of snakes and other small animals that can get injured by synthetic netting. The erosion control blanket should then be rolled out in sections covering the entire cleared area and cut using a utility knife. Wooden stakes should be hammered into the blanket every 14”, especially close to the edges. Blankets should also have wooden stakes hammered into the middle of the blanket every 14” for additional stabilization. If additional segments of blankets are needed, the new segment should overlap the existing one by 6” and staked again as described above. If available, large logs can be placed along the borders of the blanket for optimal stabilization.

Native Plant Plugs

Native live plant plugs should be scheduled to be installed in the spring. Live plugs are used to increase species diversity and establish species that are difficult to germinate from seed. As mentioned previously, gully fixers should work with their local land managers to develop an approved list of native plants that are appropriate for each site. The land manager should also be able to recommend the quantity of each species for a given site. Plugs should be installed 18” apart directly into the blanket and along the sides of the gully. A plug can be easily installed into the blanket by tearing a small hole into it and properly planting it. After installation, the plugs should be watered and monitored.
Alternative and Temporary Solutions

The steps listed above in Chapter 3 provide a reliable framework for addressing the most problematic aspects of gully erosion; the sedimentation of water bodies and the loss of topsoil. These measures listed are effective, long-term solutions because they address the root causes of gully formation. They also follow specific timelines and require resources that may not be readily available. In these cases, some alternative and temporary solutions may be employed.

Temporary solutions for eroding gullies serve to slow water movement, limiting the water’s erosive power, while catching mobile sediment. There are many different designs for intra-gully barriers, some of which are suited to volunteer implementation.

Brush fills (Not pictured): This strategy is ideal for small gullies, not exceeding 2 feet in width and depth, in a location that is currently being cleared of brush. The gully is essentially packed with branches of trees, stems of bushy vegetation, etc. with the intention that soil will be held in place by the brush. Starting at the head of the gully, smaller, more pliable branches should be laid down first to protect the soil, with larger branches filled in on top. If possible, the brush should be compacted to impede the flow of water. Brush fills are only suitable for smaller gullies but they are one of the simplest designs for a temporary built solution.

Check dams (Fig. 21): Bigger gullies with more erosive power are better served by some type of check dam. Check dams can work well in gullies up to 3 feet in depth with moderately sloping channels. A base material (rock, brush, or boards) is reinforced and stabilized by wire, steel, or wooden posts that are sunk into the ground. An important aspect of these structures is that the spillway is lowest in the center of the dam, so water will move over the dam rather than finding a way around it. The distance with which check dams are placed is directly related to the area’s topography. The steeper the land, the more closely these dams will need to be places. The more severe the gully and flashy the storm cycle, the more important it is that check dams are properly engineered.

Considering these are only meant to serve as temporary solutions, it is important to keep in mind that there will come a point where projects like these outpace the capabilities and training of volunteers.

Figure 21a: A brush check dam, looking straight on. http://www.fao.org/docrep/006/ad082e/AD082e03.htm

Figure 21b: A brush check dam, cross sectional view. http://www.fao.org/docrep/006/ad082e/AD082e03.htm

Figure 21c: A brush check dam, overhead view. http://www.fao.org/docrep/006/ad082e/AD082e03.htm
Chapter 4: Ensuring Sustainability and Success

Ongoing Management

As with most restoration projects, these gullies require monitoring after the initial fixing, to verify the establishment of the plant community, assess the efficacy of the repairs, and make modifications if necessary. While these general guidelines are useful to consider, it must be noted that each gully fixing project should be approached on an individual basis, as each gully has its own unique set of conditions. To maximize the success of restoration efforts, it is recommended that an adaptive restoration strategy be adopted that can be adjusted based on the site’s response to management activities. Following is an outline of recommended management and monitoring activities.

Control of woody resprouts and seedlings for the first two growing seasons following initial clearing is crucial. Woody resprouts should be treated with a foliar application of Garlon 3A or comparable herbicide. This work should be performed when leaves are fully expanded and the plant height is 6” – 12”. This typically occurs between May 15 and June 15. Two applications spaced two weeks apart is recommended.

Herbaceous invasive species should also be eliminated. An initial flush of exotic invasive species can be expected due to increased sunlight level and a decrease in woody species competing for resources. It may be necessary to aggressively treat herbaceous invasive species until the existing seed bed is exhausted. Treatment methods may include mowing or hand cutting for annual or biennial species and herbicide application for perennial species. Monthly visits from April through September are recommended for the first growing season. By year three only three to four visits per growing season should be required. Annual prescribed burn management is also recommended beginning in year two. Prescribed burns should be conducted during the dormant season as ground conditions allow.

Annual vegetative monitoring is highly recommended as a tool to assess the progress of the restoration, help guide management activities, and establish yearly budgets. Monitoring typically includes two or more events per year to collect plant inventories, which are compiled in a comprehensive report at the end of each growing season.

Addressing Other Contributing Factors

The most common factor that can have a substantial influence on the formation of gullies and the success of gully repair efforts is the number and size of stormwater flows from adjacent properties. As a downstream property owner it is important to identify and mitigate these flows to ensure that the work done to diminish and eliminate the impacts and formation of gullies is successful. For large property owners like the FPCC this includes stormwater flowing from private developments and municipal projects that have an impact on infrastructure and, particularly, roadways. To be successful a large property owner must be pro-active in identifying developments and working with adjacent municipalities and developers to ensure that stormwater is responsibly managed, preferably where it falls.
Conclusion

The impacts from stormwater runoff are a major threat to the ecological integrity of our natural areas, especially natural areas and open spaces that line our rivers and streams. As the region receives storms that are increasing in intensity due to the effects of climate change, the impacts of stormwater runoff will only increase. This runoff destroys habitat, wastes precious topsoil, pollutes our waterways and the physical evidence on the landscape is the formation of a gully. Gullies provide the conduit for this runoff and by addressing gullies from the source of the stormwater, whether a pipe, an adjacent property, or a street end, to the outlet into the river or stream can begin to repair the landscape and prevent future pollution of our rivers and streams.

The preserves of the FPCC play a significant role in the health of our rivers and streams and this manual is meant to assist the FPCC in developing procedures and solidifying an overall agency commitment to addressing gullies throughout all of the preserves. Although this manual is aimed at the gullies that are part of the Chicago River system, all of the techniques listed here are also applicable at FPCC holdings that fall outside of the Chicago River’s watershed.

Most importantly, this manual is meant as a jumping off point for an initiative to address gullies in the preserves. To be successful, this effort will need to include partnerships with non-profits that includes volunteer mobilization and monitoring and maintenance of repaired gullies, a commitment from the FPCC to dedicate staff and other resources to this issues, and the long-term commitment to prevent from the FPCC and their neighbors to prevent the formation of future gullies by striving to capture and manage all stormwater where it falls.
Appendices

A. Sample Permit: Joint Application Form for Illinois................................. page 23

Required for construction in waterways and floodways in Illinois. This joint application is designed to simplify the approval process for the applicant seeking project authorizations from the U. S. Army Corps of Engineers, the Illinois Department of Natural Resources, the Office of Water Resources and the Illinois Environmental Protection Agency. The permits covered by this joint application are designed to protect in-stream and upland habitat, water quality, stormwater conditions, and other similar factors.

B. Sample Permit: U.S. Army Corps of Engineers Section 404 Permit........ page 28

Required for any work, including construction and dredging, impacting the navigable waters of the United States. This permit is designed to limit the impact of such projects on wetlands, water quality, and aquatic ecosystems.

C. Gully Restoration Sample Plant List: Kickapoo Woods (FPCC) – Harvey, Illinois................................................................. page 32

This list was developed as a suggested mix of appropriate native species for potential revegetation of Friends' initial gully fixing project in Kickapoo Woods (FPCC) along the Little Calumet River in Harvey, Illinois. This list was developed to utilize species with seed sources within the Chicago River watershed.

D. Friends of the Chicago River: Gullywalking Volunteer Data Collection Form................................................................................ page 34

This form was utilized by volunteer gullywalkers organized and trained by Friends to gather initial gully assessment data.

E. Forest Preserves of Cook County: Partner Agency Group Leader Position Description................................................................. page 36

Description of the requirements to be a recognized partner agency group leader, and therefore allowed to organize and run volunteer workdays at FPCC sites.

F. Forest Preserves of Cook County: Stewardship Workday Leader Position Description................................................................. page 39

Description of the requirements to be a volunteer stewardship workday leader, and therefore allowed to organize and run volunteer workdays as a volunteer unaffiliated with a partner agency at FPCC sites.

G. Forest Preserves of Cook County: Supply Order Form........................... page 41

Supply order form used by a recognized workday leader in collaboration with a site steward to order and retain supplies for volunteer workdays at FPCC sites.

H. Forest Preserves of Cook County: Volunteer Loaner Request Form......... page 44

Loaner equipment request form used by a recognized workday leader in collaboration with a site steward to check-out equipment such as gloves and hand tools for volunteer workdays at FPCC sites.
Appendix

A

Sample Permit: Joint Application Form for Illinois
Appendix

B

Sample Permit: U.S. Army Corps of Engineers Section 404 Permit
Appendix

C

Gully Restoration Sample Plant List:
Kickapoo Woods (FPCC) –
Harvey, Illinois
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Friends of the Chicago River: Gullywalking Volunteer Data Collection Form
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Forest Preserves of Cook County:
Partner Agency Group Leader
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Forest Preserves of Cook County:
Stewardship Workday Leader Position
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Forest Preserves of Cook County: Supply Order Form
Appendix

H

Forest Preserves of Cook County:
Volunteer Loaner Request Form
A. Kickapoo Woods Restoration Plan: Gully Recommendations

This plan assesses 24 individual gullies in Kickapoo Woods (FPCC) along the Little Calumet River in Harvey, Illinois. It includes suggested practices to repair the conditions on the ground and includes a range of cost estimates to address the conditions at each gully.

This document is available for download on Friends of the Chicago River’s website at http://www.chicagoriver.org/issues/in-action/how-to-fix-a-gully
Contact Friends of the Chicago River if you have questions or require assistance.

B. Kickapoo Woods Gully Restoration Report

This report prescribes very specific restoration activities that can be implemented by a professional contractor to fix five adjacent gullies along the Little Calumet River in Kickapoo Woods (FPCC).

This document is available for download on Friends of the Chicago River's website at http://www.chicagoriver.org/issues/in-action/gullywalking-project
Contact Friends of the Chicago River if you have questions or require assistance.
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FRIENDS OF THE CHICAGO RIVER

MISSION STATEMENT

The mission of Friends of the Chicago River is to improve and protect the Chicago River system for people, plants, and animals. Friends achieves our mission through: education programs that foster awareness, involvement, and a stewardship ethic; public policy and planning efforts that result in systemic river improvements; and on-the-ground projects that physically improve the Chicago River.

VISION STATEMENT

Our vision is that the Chicago River is one of the world’s greatest metropolitan rivers.

ABOUT THE CHICAGO RIVER

Extending from northern Lake to southern Cook County, the 156-mile Chicago River system is an interesting and complex series of waterways, which are inextricably linked to Chicago’s history and the development of the region. Flowing through dozens of communities, the river winds its way past forest preserves, parks, industrial zones, and downtown Chicago where it provides a breathtaking natural vista that complements one of the world’s most famous skylines.

While the Chicago River was once a prairie stream that flowed towards Lake Michigan, over the last 200 years it has been subject to many human modifications including channelization and flow reversal, yet it still maintains its natural character and is an essential asset to the 70 species of fish, 60 species of birds as well as a host of other species including beavers, muskrats, snapping turtles, and the occasional river otter.

Once considered a community detriment, the Chicago River is now a symbol of ingenuity and progress, and is becoming a treasured natural resource that is shared and valued by business leaders, government officials, and the residents of our watershed.