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Illinois Coastal Management Program
Issue Paper

Ravine Systems in the Lake Michigan Watershed, Illinois

Overview and History

Ravine systems in the Lake Michigan coastal management zone in Illinois occupy a narrow band extending the entire length of Lake County along the Lake Michigan shoreline and into northern Cook County, ending in Winnetka. Generally, ravines are defined as steep-sided or V-shaped valleys that are larger than gullies but smaller than canyons. They may contain perennial or intermittent streams, but are typically formed when moving water incises and erodes a channel into the underlying material.

The Lake Michigan ravines of northeastern Illinois range from 10 to 75 feet in depth and extend as much as 2 miles inland from the lakeshore. The ravine systems are an important natural legacy, as they represent the only remaining natural drainage systems in the present-day Lake Michigan watershed in Illinois. Historically, almost 673 square miles of northeastern Illinois drained into Lake Michigan via the Chicago and the Calumet River systems and the coastal bluff/ravine systems (Map 1). By 1922, canals had diverted the majority of flow in both the Chicago and the Calumet River systems into the Des Plaines River watershed (within the Mississippi River basin) as a way to provide safe drinking water and alleviate flooding in the Chicago metropolitan area, and to allow for cargo traffic between the Great Lakes and the Mississippi River. The land area of Illinois currently draining to Lake Michigan covers only 88 square miles, or 12 percent of its extent at the time of Euro-American settlement. Of this remaining drainage area, over 50 square miles lie in Lake County, with ravines covering less than 1.6 square miles. The ravine systems are, therefore, both an important and uncommon resource for both Illinois and the Great Lakes watershed.

The drainage area tributary to Lake Michigan ravines in Illinois is composed of two physiographic regions: the Zion beach-ridge plain and the lake border morainic system. The Zion beach-ridge plain extends from Kenosha, Wisconsin to North Chicago, Illinois and lies between the lake border moraines and modern Lake Michigan. Much of this region is included in the Illinois Beach State Park. The lake border moraines consist of five low, north-south trending ridges that roughly parallel the lakeshore and one another, resulting from glacial retreat and re-advance. The entire lake border morainic system extends from southern Wisconsin to northern Cook County but covers no more than 10 miles from east to west. The individual moraines are named after the area in which they are most evident and are from west to east: Park Ridge, Deerfield, Blodgett, Highland Park, and Zion City (Map 2). Of these, only the Highland Park and Zion City moraines lie within the Lake Michigan watershed in Illinois (the others divide the watersheds of the Skokie River, the Middle and West Forks of the North Branch of the Chicago River, and the Des Plaines River). Green Bay Road is constructed on the crest of the Highland Park moraine and therefore approximately marks the divide between the Lake Michigan and the Skokie River watersheds. Consequently, all of the ravines in Illinois draining to Lake Michigan are located east of Green Bay Road, with only a few exceptions.

Following the retreat of the continental ice sheets 10,000-12,000 years ago, the water level in Lake Michigan dropped as much as 260 feet below modern levels (Chrzastowski and Frankie, 2000). At this point, flowing water began to incise the ravines into the Highland Park and Zion City moraines and the exposed glacial lakebed (the flat plain upon which the cities of Zion, Waukegan and North Chicago are built). As lake levels rose to their current stage, coastal processes eroded the lake-ward slopes of the

moraines and lake plain and created the bluff face that runs the entire length of Lake County. South of the Great Lakes naval facility, Lake Michigan intersects the Highland Park moraine and the bluff is located adjacent to the shoreline. North of the Great Lakes naval facility, the bluff line is located as much as a mile inland due to the presence of the Zion beach-ridge plain.

Over the past 4,000-5,000 years, the net-southward littoral (near-shore) transport of sand and periodic deposition by large storm waves have combined to form the beach-ridge plain that currently protects the bluff face in northern Lake County from further erosion by coastal processes. Under natural conditions, the beach-ridge plain would continue to migrate southward and eventually re-expose the Zion City moraine and glacial lakebed to bluff erosion, but construction of the Waukegan harbor facility during the 20th century has greatly slowed beach migration. In southern Lake and northern Cook Counties, various types of armoring techniques have been employed at the toe of bluffs to reduce erosion and alleviate, at least temporarily, the threat posed to homes and real estate.

Zion beach-ridge plain (looking north). Note railroad in upper left (linear feature generally marking bottom of the bluff line) & Bull Creek/Dead River flowing from west (left) to east (right).

The natural history outlined above suggests that two similar yet distinct types of Lake Michigan ravine systems exist in Illinois. The northern ravines are situated in the Zion City moraine and the glacial lakebed. Because the Zion City moraine and glacial lakebed are only present in the northern half of Lake County, the ravines south of the Pettibone Creek watershed are confined to the Highland Park moraine. The lower elevations of the Zion City moraine and surrounding lake plain and the position of the beach-ridge complex cause the northern ravine systems to have lower gradients and greater extent than their southern counterparts. The southern ravines are smaller in geographic extent, more closely grouped, and drain more individual watersheds than the northern ravine systems, but the more extensive northern ravines often contain perennial streams while flow through the southern ravines is generally intermittent and may only be evident for a few days or weeks following rainfall.

Due to the presence of the Zion beach-ridge plain, the northern ravine systems do not discharge directly to Lake Michigan but instead, flow enters the system of swales created by dune accretion. Stream channels may disappear in this swale/wetland complex, eventually discharging to another stream, while in other cases channels have been ditched through the beach-ridge plain (as is the case with Kellogg Creek). Because the northern ravines all discharge to the beach wetland complex, consideration might be given to restoration and management of beach systems in tandem with their tributary ravine systems. Additionally, the differing nature of northern and southern Lake County ravines may have implications for management, restoration, or preservation strategies.

The Lake Michigan ravines of northeastern Illinois are unique not only for their natural history but are an important element of Illinois' cultural history and the identity of many lakeshore communities. In communities such as Waukegan and Lake Bluff, ravine systems have been envisioned as unique open spaces and were preserved as such during those places' foundational years. In cities and villages along Illinois' Lake Michigan coast, this trend continues into the 21st century, as ravines have been set aside as parks and natural areas. After the U.S. Base Realignment and Closure Commission put Fort Sheridan on the list of bases to be closed in 1988, legislation was passed that transferred 259 acres of the Fort to the Lake County Forest Preserve District, including two ravines. Most recently, the U.S. Navy authorized the transfer of 77 acres of lakeshore property at Fort Sheridan (including three ravine systems) to Openlands,

creating the Openlands Lakeshore Preserve. New plans for ravine restoration in places like Highland Park, the Lake County Forest Preserve District's Fort Sheridan Preserve and the Openlands Lakeshore Preserve suggest that the citizens of these communities continue to view ravines as important natural features in an urbanized corner of Illinois. As a natural feature, the character of the ravines has become enmeshed with the character of the surrounding community. Lake Forest, for example, was originally platted with curvilinear streets that followed the natural topography of the area and in doing so, accentuated the ravine landscape. Over the years, these features have become inextricable components of the city's identity. It follows, then, that while the Lake Michigan ravines of Illinois are natural features they have also become fundamental to the historical and cultural legacy of local communities.

Issues of Concern

Ravine management issues encompass a number of interrelated matters, including erosion and stormwater runoff management, development pressure, water quality, infrastructure improvements, contamination from landfills (a use to which ravines have often been subjected) and habitat restoration and preservation. Because the Lake Michigan watershed of Illinois is highly urbanized, land use is not expected to intensify markedly, except perhaps in the northern end of the watershed near the Wisconsin border where some vacant and agricultural land may still be converted to residential or office/industrial uses. For most ravine watersheds, this means that runoff should not change appreciably in the future, as infill and redevelopment are the main options for new development. While great changes may not be expected in the future, the history of urbanization has influenced runoff patterns in the ravine zone. Because the watershed's tributary to Illinois' ravines are typically small and developed, runoff from precipitation events is amplified. This means that for any given storm, the amount of runoff is increased above the amount that would occur following the same storm under natural landscape conditions. Additionally, the amount of time it takes for runoff to reach the stream channel (the ravine) is less under developed conditions than under natural conditions (the period of time between rainfall and stream response is referred to as "lag time"). The implication is that more water reaches ravines more quickly now than in the past, subjecting the landscape to a wider array and, ultimately, higher magnitude of natural forces.

Urban Stormwater Runoff

The primary causes of amplified or higher magnitude runoff are increases in impervious areas (such as roofs and pavement) and the installation of highly efficient stormwater collection and conveyance systems. For example, the Lake County Forest Preserve District has identified the release of urban stormwater runoff into Janes Ravine in Fort Sheridan as the primary contributor to ravine erosion and sedimentation and the associated degradation of the plant community. A number of best management practices (BMPs) can be employed in order to reduce the magnitude of increased runoff resulting from urban development. All stormwater BMPs either slow the speed of runoff (detention) or reduce the amount of runoff reaching the stream (retention). Slowing runoff (detention) is usually accomplished by implementing practices that increase the length, roughness, or ponding potential of flow paths as a way to increase residence time and lag time (Residence time is the amount of time that water is present in a particular location or structure.). BMPs that reduce the amount of net surface runoff (retention) either do so by promoting infiltration or percolation of runoff into the ground and evaporation into the air or by harnessing runoff in plants, which then transpire the water as vapor into the atmosphere. Another way to reduce the speed and amount of runoff is to reduce the connectivity of impervious areas and stormwater networks so that runoff flow paths are more diffuse. This can be achieved using various design strategies and mechanisms, but a few simple ways are to increase the number of curb cuts, eliminate curb-and-gutter systems altogether, or discharge runoff collected from small areas to a level spreader, which releases runoff as diffuse sheet flow across the land surface. However, existing development densities in some areas may severely limit the practical ability to add retention and/or detention facilities and the

elimination of curb and gutter systems in areas where they have existed for decades is extremely unlikely. Streambed armoring or other alternatives may need to be considered where urban stormwater runoff has exponentially increased from predevelopment levels.

Erosion and Incision

In addition to changing the timing and amount of water related to runoff events, the altered hydrologic profile can cause a number of direct and indirect changes to ravine geomorphology and ecology. Previous reports, communication with local officials and site visits to a number of Lake County ravines suggest that at least two of these dynamic processes, bank erosion and bed incision, are both common and problematic. Bank erosion is occurring in many ravines, particularly where the stream has incised into the floodplain or bottomland. Lake County Stormwater Management Commission has conducted stream inventories of both the Bull Creek/Dead River and the Kellogg Creek watersheds and found that the most extensive bank erosion occurred along the ravine portions of the streams (Map 3). It is interesting to note that the South Branch of Bull Creek, which includes that stream's most severely eroded reaches, also has the highest density of discharge pipes per stream mile. Point discharges such as storm sewer outfalls and sump pump drains can contribute to localized bank erosion and retreat. Bank erosion may occur chronically during runoff events but may also occur in larger sudden events, particularly during spring months (Moran, 1978). The process of periodic downslope movements of large quantities of material due to slippage or rotational failure is called "slumping" and may be caused by over-steepening of the bank or by excess moisture between soil particles. Bank erosion is problematic because it transports excess sediment to downstream locations (e.g., Lake Michigan), results in net losses of bank material on property where erosion is occurring, and may destabilize upslope soils and structures such as sanitary lines and buildings.

north bank erosion - approx 7ft from water level to top of bank

Erosion is common along the incised stream channel and ravine bluffs of Bull Creek ravine.

Incision is similar to bank erosion in that it is also a form of localized sediment loss (erosion). Bed incision occurs when a stream erodes sediment from its bed causing incision or "downcutting," and can be likened to gully formation in upland areas. Incision usually occurs because large armoring sediments such as gravel and cobble have been removed from the streambed, the stream has become sediment deficient (or "sediment-poor") due to obstructions or diversions upstream, or more stormwater discharges through the system than under natural conditions sufficient to induce incision. Bed incision results in the net loss of sediment from a particular section of ravine, and net accumulation elsewhere downstream. In some ravines, nearly the entire length of the ravine bed has experienced significant incision. During each rain event, nearly all of the newly eroded soil is transported to Lake Michigan.

Because ravines are naturally high-gradient stream channels, problematic erosion resulting from stormwater runoff may be exacerbated. Urbanization not only increases discharge values for a particular storm event, but it increases stream power (the relationship between gradient and discharge), as well. In other words, the same amount of flowing water has a greater ability to erode on a steep slope than on a flat slope. Ravine streams are therefore more likely to cause erosion than streams carrying the same amount of water over flatter terrain. As a stream incises into its bed, the process may also result in the exposure of new bank material to erosion. The exposure of the toe of the ravine slope may result in slumping, or a rotational failure of the bank material. After this material slumps into the streambed, it is available for suspension by flowing water in the channel and transport downstream. This process not only causes sediment deposition downstream, but also adds to the destabilization of ravine slopes at the point of bank failure. This collection of processes is a significant and chronic problem in Illinois ravines. Restoration projects within ravine sections of both the Waukegan River and Bull Creek have employed artificial riffles to combat channel incision and control grade, while limestone cobbles were used to armor the bed of an intermittent ravine stream in Lake Bluff in order to prevent the same type of erosion.

An artificial riffle installed in a restored section of Bull Creek to control incision and improve water quality and habitat

Debris blockage on Kellogg Creek and eroded bank in background

Debris Blockages and Flooding

It is natural for all stream systems to accumulate and transport debris but excessive debris loads can cause degradation to stream and ravine systems. Problematic debris blockages may act as check dams by trapping additional debris and excess sediment. During high flows, these jams may cause backwater ponding and have the potential to cause flooding problems. Backwater flooding in most ravines should not pose a direct threat to structures unless they are located on the floodplain in the bottom of the ravine. Debris blockages often contribute to erosion by diverting flow into streambanks and initiating scour in the streambed immediately downstream. As discussed above, these processes contribute excess sediment to downstream areas and contribute to the destabilization of ravine slopes.

Development Pressure

Because the Illinois ravine systems are situated in an urban area, development often encroaches into the ravine or to the ravine edge. There are a number of issues that are associated with urban development in the Illinois coastal ravine zone. First, the construction of buildings and roadways and the compaction of the earth resulting from construction decreases the permeability of the ground surface and increases the amount of runoff resulting from a given precipitation event. Second, the development process often disturbs the ground surface and vegetation, which may contribute to destabilization of ravine slopes. Many municipalities in the coastal management zone now have ordinances restricting development on steep slopes or in ravines, but this has not always been the case. Third, after adjacent uplands are developed, overland flows from downspouts and sump pump outfalls may contribute to gully erosion on the ravine slopes. Again, some municipalities have been successful in appealing to citizens to relocate these outfalls from the top of the ravine to the bottom, but this is not a universal condition. Finally, ravines have been greatly altered by urban development and have been filled, constricted and truncated for building and road construction. This type of alteration not only changes the hydrologic and ecological character of the ravine, but also reduces the connectivity of the natural system. If the intent of ravine restoration is to create "green infrastructure" within the coastal management zone, connectivity is an issue that may be of concern.

Infrastructure

Exposed sanitary pipe in Bull Creek that was originally installed 2-3 feet below the streambed.

As suggested above, both bank erosion and bed incision can lead to instability of ravine slopes. This may be compounded by the disturbance of vegetation on or above the ravine. Generally, sloughing or land sliding results from erosion of the ravine slopes. These erosional processes may cause a threat to homes and outbuildings but may also uncover buried utility lines, particularly sewer and water mains. In the communities along Lake Michigan, utility lines were often constructed and buried in the bottom of ravines. Over time, the processes described above have exposed some of the mains and increased the risk of failure. In some lakeshore communities, sewer lines may date to the early 20th Century and be constructed of brick and mortar. When any type of utility line is exposed at the ground surface, the risk of failure increases. With older lines, exposure may also increase the potential for contamination, not only within the ravine but also in downstream areas such as harbors, beaches, and intakes along Lake Michigan. It should also be noted that other utilities may be located in ravines and may be affected by erosion as well (telephone lines located on posts in ravine bottoms, for example).

Pollution

Ravines have historically been used as landfills and therefore may be of concern as sources of groundwater and surface water contamination. In particular, the cleanup/capping of the former Wells Ravine, now known as Landfill #7, in Fort Sheridan has been an issue of concern for several years. The mouth of this ravine formerly opened to Lake Michigan and conveyed runoff directly to the lake. Presumably, leachate from the landfill has the potential to reach Lake Michigan. As a complement to planning efforts in the Dead River and Kellogg Creek watersheds, the Lake County Health Department has monitored water quality in Bull, Kellogg, and Dead Dog Creeks. Water quality problems may be a result of contamination by substances in landfills, leaking or shared sewer lines, or non-point source pollution from stormwater runoff in urban areas. In the monitored streams, periodic changes in water

quality indicators appear to be associated with rainfall events, suggesting that these streams are affected by stormwater (LMU, 2007). Dissolved oxygen in all three streams fell below the IEPA water quality standards during the monitoring period. Additionally, Bull Creek exhibited high daily fluctuations in dissolved oxygen concentrations, indicating an abundance of aquatic vegetation. Dissolved oxygen tended to peak following rainfall events and then slowly decline until the next rainfall. Similarly, specific conductivity, an indirect measurement of dissolved ions in water, was affected by rainfall. Specific conductivity was lowest following rain events and increased as water level declined. Implementation of BMPs might alleviate some of the water quality issues in the ravine streams by filtering pollutants from urban runoff, but other issues may require more mechanical approaches. For instance, sewer connections from individual houses to interceptors are often exposed by erosion and therefore susceptible to damage. Older pipes may be constructed of clay or other materials that are easily damaged by instream debris. Once cracked or broken, direct discharge to the stream occurs. Illicit connections between sanitary and storm sewers also result in the direct discharge of sewage into streams.

Habitat Restoration/Preservation

Habitat restoration or management goals may vary considerably across the Lake County ravines, owing primarily to the natural differences discussed in the preceding overview section. Because of the added runoff resulting from urbanization, it is likely that one or more forms of excessive erosion affect all or nearly all of the ravines in Lake County. Therefore, all ravines would probably benefit from some stabilization measures or vegetation restoration.

Plant communities in the ravines are of particular concern, as many are locally rare, with as many as 16 state-threatened or endangered species potentially present in the ravines. Due to their proximity to Lake Michigan, ravines are subject to microclimatological effects, especially temperature modification. Because the "lake effect" causes annual high temperatures to be somewhat cooler, vegetation found along the lakeshore and in ravines includes relict species no longer found elsewhere in Illinois and whose current natural range is much farther north. These species include paper birch (*Betula papyrifera*), white pine (*Pinus strobus*), arbor vitae (*Thuja occidentalis*), Canadian buffalo-berry (*Shephardia canadensis*) and star-flower (*Trientalis borealis*) (Moran, 1980). These plants were probably more common in the area following the retreat of the glaciers 12,000 years ago when the climate was significantly cooler. The ravines now provide some of the only remaining habitat for such species in Illinois. The only known colonies of beech (*Fagus grandifolia*) in northern Illinois are also found on the cool, moist, north-facing slopes of Lake Michigan ravines (Moran, 1980). Likewise, microclimatic conditions cause uplands adjacent to ravines to be slightly warmer and more arid than the ravines, resulting in a biogeographic boundary.

In some locations, ravines intersect the groundwater table, causing percolation to the surface and the formation of a "seep." These areas often contain unique plant communities adapted to calcareous (mineral-laden) groundwater. Skunk cabbage (*Symplocarpus foetidus*) is often considered the indicator for such communities because it generally outlines the boundaries of seeps (Moran, 1980).

A number of changes have occurred in ravine plant communities during the period of Euro-American settlement, most notably a change in fire regime and the in-migration of

Seeps flowing out of ravine slopes create an unusual wetland habitat supporting plant species that are uncommon in other areas. Skunk cabbage and marsh marigold in seep areas along Bull Creek ravine.

invasive and non-native species. Like many other environments in northeastern Illinois, ravines were historically subject to periodic fire and therefore harbored plants adapted to such conditions, such as red oak (*Quercus rubra*). As burning was suppressed, a number of fire-intolerant species, such as sugar maple (*Acer saccharum*), have increased in abundance. The decreasing frequency of fire and associated increase in fire-intolerant species caused the ravine understory environment to become more shaded. This, in turn affected the abundant pre-settlement understory plants, favoring those that complete their life-cycle in spring or early summer, before the canopy has fully developed. For instance, approximately 75 percent of wildflowers now present in the ravines bloom before mid-June (Moran, 1980). The increase in canopy density has also favored some shade-tolerant invasives, such as garlic mustard (*Alliaria petiolata*) and common buckthorn (*Rhamnus cathartica*). The increase in shade has also resulted in the loss of stabilizing ground cover leading to slope failure through slumping and slippage and creating new areas for colonization by invasives.

Vegetation and woodland rehabilitation, slope and bed stabilization and a return to a more natural hydrologic regime through the attenuation of stormwater runoff flows are the likeliest restoration possibilities for the ravines in southern Lake County. The streams in these ravines are generally intermittent, short, and small, presenting very little in the way of aquatic habitat, although some may contain pools that remain days or weeks after precipitation events. In some cases, streamflow in ravines is contained within a culvert buried at the bottom of the ravine. "Daylighting" such systems would certainly aid in the return to more natural flow regimes and potentially increase the quality of habitat available within the ravine, but could also destabilize streambanks and ravine slopes if the issues of stormwater runoff and erosion control are not simultaneously addressed.

Relative to the smaller southern ravine systems, the northern ravines contain more substantial and extensive stream systems that provide or have the potential to provide significant aquatic habitat. These streams may be intermittent or perennial, but offer prospective foraging and spawning habitat for organisms that regularly reside in downstream areas. In particular, the lower reaches (ravine sections) of Kellogg Creek, Bull Creek, the Waukegan River and Pettibone Creek have significant flows during all or part of the year and are known to contain fish populations. The Waukegan River, for example, is the only Illinois tributary to Lake Michigan that has developed a seasonal salmon run. Habitat restoration efforts on the Waukegan River as part of a larger IEPA 319 program have resulted in higher numbers of individual fish, but not an increase in overall species richness.

Fisheries surveys have also been performed for Bull and Kellogg Creeks. Kellogg Creek exhibited greater species richness than Bull Creek, but neither stream harbored intolerant species, suggesting relatively poor habitat and water quality (IDNR, 2005). Potential for fish community stabilization in Bull Creek may be limited further by the lack of a direct connection to Lake Michigan, a species-rich recruitment source, as the stream disappears into the complex of alternating dunes and wetland swales before discharging to the Dead River (IDNR, 2005). On Kellogg Creek, an open channel has been ditched from the bluff line near Sheridan Road across the beach-ridge plain to Lake Michigan, allowing free migration between the stream and the lake to occur during at least part of the year. The IDNR Chicago River/Lake Shore Area Assessment (2001) suggests that the minor tributaries to Lake Michigan in northern Lake County could support a higher diversity of aquatic macroinvertebrates than the streams of the Chicago River watershed. This is due both to the preservation of habitat within Illinois Beach State Park as well as the historical degradation of and construction of dams on the Chicago River (IDNR, 2001).

Management Considerations

Because the ravines occur along the entire coast of Lake County and a portion of northern Cook County, numerous municipalities and other public agencies are implicated in any planning effort that

spans the entire Coastal Management Zone. There are 8 Lake County and 2 Cook County municipalities containing ravines within their borders and portions of other municipalities may drain to or be located within the Lake Michigan ravines' watersheds. The ravine zone also spans 6 townships, 5 of which are in Lake County. In addition to these entities, there are additional public taxing bodies, such as park districts, that own or manage significant areas of ravine land. The federal government also manages some land in the Lake Michigan watershed, primarily in its remaining holdings at Fort Sheridan (public ownership of ravine parcels in Lake County is illustrated on Maps 3 and 4). In 2007, control of three ravines at Fort Sheridan was turned over to Openlands (See Openlands Map). The Lake County Forest Preserve District manages the other Fort Sheridan ravines. The Great Lakes Naval Training Center contains much of the Pettibone Creek watershed and nearly all ravine portions thereof, but is excluded from the Coastal Management Program. The United States Army Corps of Engineers has regulatory jurisdiction over waterways that are tributary to Lake Michigan and is therefore a permitting authority that would be involved in many ravine-related projects.

Given the fact that many of the ravine systems along the Illinois coast convey stormwater runoff to Lake Michigan, runoff management will likely play a key role in alleviating many of the other associated problems. Therefore, planning and restoration efforts involving the enforcement of local landscape, construction, stormwater and steep slope ordinances will rely upon local officials. Coordinated efforts involving multiple communities would then require the combined efforts of these communities as well as regional authorities and planning bodies, such as the Lake County SMC and the IDNR. The Chicago Metropolitan Agency for Planning (CMAP, formerly NIPC and CATS) is a regional planning agency that coordinates land use and transportation planning across the greater Chicagoland area. Most ravine land is privately owned, so the success of potential restoration efforts may hinge on cultivating support for such projects with private landowners. Public ownership is discussed at length below.

Ownership

Most of the ravine land in Lake County is privately owned and divided into relatively small parcels. Patterns of property ownership often result in the segmentation and/or longitudinal division of ravines, a situation that would likely complicate the coordination of ravine restoration/protection planning efforts. In particular, while the outlets or lower reaches of some ravines are publicly owned and managed, multiple private owners often are responsible for large upstream areas. Under these circumstances, conditions upstream could impact restoration or management efforts in downstream ravine reaches. While the land area of many ravines is divided among multiple private owners, there are significant portions of individual ravines or ravine systems under public ownership and may present opportunities for more immediate management or restoration. As mentioned previously, several communities have already initiated ravine restoration projects and/or set aside ravines as natural areas, preserves, or parks. Of the 300,000 acres of land in Lake County, Lake Michigan ravines occupy approximately 1,000 acres (0.33 %). Of those 1,000 acres of ravines, approximately 300 acres (30%) are in public, utility, or non-profit ownership.

Entities owning all or significant portions of ravines in Lake County include:

Village of Winthrop Harbor (Dead Dog Creek)
Zion Park District (Kellogg Creek)
ComEd (Kellogg Creek)
Waukegan Park District (Glen Flora Tributary and Waukegan River/Yeoman Creek)
U.S. Navy (Pettibone Creek), not included in Coastal Management Zone
Lake Bluff Park District (Ravine Park Ravine)
City of Lake Forest (Cemetery and McCormick Ravines)

Lake County Forest Preserve District (Fort Sheridan Janes and Hutchinson Ravines)
Openlands (Fort Sheridan Bartlett, Van Horne and Schenck Ravines)
Park District of Highland Park (Moraine, Central, Millard, and Rosewood Park Ravines)

There are a total of 7 ravines located entirely in northern Cook County and one additional ravine which is located in both Cook and Lake Counties (Map 5). Of the 7 ravines in Cook County, 6 are located within the Village of Glencoe and one is located within the Village of Winnetka. The 7 ravines located entirely in Cook County occupy a space of approximately 78 acres.

The individual sizes of the 7 ravines are approximated as follows:

Ravine 1 = 19.7 acres
Ravine 2 = 12.9 acres
Ravine 3 = 2.7 acres
Ravine 4 = 17.4 acres
Ravine 5 = 18.7 acres
Ravine 6 = 3.7 acres
Ravine 7 = 3.2 acres

ICMP Opportunities

The Illinois Coastal Management Program (ICMP) affords some exceptional opportunities for the improvement and restoration of hydrologic and ecological functionality to coastal ravine systems in Illinois. With renewed function in ravines comes the added benefit of improvement in the quality of water entering Lake Michigan from Illinois. ICMP grant assistance would offer sustained funding for ravine improvement projects that, up to this point, have been unfunded or relegated to lower priority.

Hydrologic and Water Quality Monitoring

Periodic monitoring and evaluation are needed to assess the hydrologic conditions of flow in the ravines. Currently, Lake County SMC operates 8 stream gages in the Kellogg Creek, Dead River, Waukegan River, and Pettibone Creek watersheds. Hydrologic studies for the bluff/ravine systems south of the Pettibone Creek watershed are sparse and rely heavily upon modeling. Monitoring would provide important scientific data for ravine management and restoration as well as reference for the implementation of stormwater and other development BMPs in ravine watersheds. The Lake County Health Department – Lakes Management Unit is performing a water quality assessment on Dead Dog, Kellogg, and Bull Creeks. Continued water quality monitoring that includes not only chemical, but also biological and physical monitoring would bolster understanding of how water quality in ravine streams is related to water quality in Lake Michigan, especially at beaches. It would also improve understanding of how urban stormwater runoff and implementation of BMPs affect water quality.

In addition to addressing non point source pollution, for purposes of improving water quality and aquatic habitat, it will be important to assess and repair potential problems with cross connections between sanitary and stormwater pipes and infiltration/exfiltration that results when pipes are degraded due to age or erosion.

Hydrologic Restoration

The restoration of more natural hydrologic regimes in ravines would reduce flood peaks and the potential for erosion of slopes and streambeds. Baseflow would also be increased, potentially improving year-round aquatic habitat in some of the northern ravine streams. Installation of infiltration BMPs

throughout the watershed would aid in the restoration of natural hydrologic cycles, although a return to conditions mimicking a completely natural system cannot be expected. Many of the BMPs employed to restore hydrologic functionality would also improve the quality of water flowing through ravines and into Lake Michigan and could provide additional habitat benefits.

Stream Restoration

Streams flowing through the ravines are in need of restoration. Many have severe erosion problems along both their beds and banks caused by increased discharges resulting from stormwater runoff (see photos of Kellogg and Bull Creeks in earlier sections). Restoration methods utilizing bioengineered bank stabilization, clearance of invasive plant species and re-establishment of native plants, and installation of grade control structures would also improve habitat for aquatic species and improve the quality of water flowing into Lake Michigan. In intermittent streams, the replacement of defunct check dams and debris clearance may reduce the amount of erosion and channel degradation occurring. The installation of artificial rock riffles for grade control has also been used to protect utilities exposed by streambed incision. In ravines where severe bed incision is occurring and the existing development density precludes the practical application of other hydrologic restoration methods, armoring of stream beds will likely be necessary to reduce the severe erosion and incision that will otherwise continue to occur. Restoration of streams and stream banks improves water quality within the ravine as well as in receiving waters downstream and can potentially increase seasonal or year-round habitat availability.

Improve Aquatic Habitat

A number of opportunities exist for improvements in the quality and quantity of aquatic habitat. Such improvements may include the daylighting of ravine flows currently contained in culverts and the naturalization of these channels. Aquatic habitat might also be improved through the implementation of pollution prevention practices to reduce pollutant loading to ravine systems. Likewise, multi-objective BMPs can be employed to improve habitat as well as hydrology and water quality. Special attention should be devoted to restoring/creating riparian buffer zones of native plants for the stream channels.

Natural Area/Ravine Restoration and Management

Invasive species control and brush clearing will remain important in order to preserve and restore natural plant communities and combat invasive species. These activities will also help to stabilize ravine slopes. These efforts should include establishing and maintaining stream buffers containing appropriate native plants and protecting or enhancing the wetland seep communities along the side slopes and base of the ravines. In many cases, the establishment of these plant communities will require the stabilization of eroding side slopes where gullies, outfalls and drain pipes discharge to the ravine. In such cases, it may be beneficial to reconfigure the flow paths to the ravine. Restoration can also include prescribed burning and clearance of invasive plant species to both restore native communities as well as provide ground cover and soil stabilization.

Education and Outreach

The ICMP can provide assistance with education and outreach opportunities across the entire ravine coast of Illinois. As mentioned previously, significant portions of individual ravines in Winthrop Harbor, Zion, Waukegan, Lake Bluff, Lake Forest, and Highland Park are under public ownership. The Lake County Forest Preserve District and Openlands maintain ravines within Fort Sheridan at Fort Sheridan Forest Preserve and Openlands Lakeshore Preserve, respectively. These public holdings present excellent possibilities for educational programs and facilities in a setting that clearly demonstrates the relationship between the surrounding landscape, the ravines and Lake Michigan.

Effective management and restoration of the ravines as systems will also require education and outreach targeted toward private landowners since infiltration practices and pollution prevention activities will largely occur on private properties. Ravine and riparian management practices are also needed in and along many of the ravines that are privately owned. A system could be developed whereby private landowners may collaborate with public agencies to protect, restore and manage those areas of ravines that are privately owned.

Existing Authorities

Lake County Stormwater Management Commission
Lake County Health Department-Lakes Management Unit
Cook County
United States Army Corps of Engineers
Illinois Department of Natural Resources-Office of Water Resources
City of Winthrop Harbor
City of Zion
City of Waukegan
Village of Beach Park
City of North Chicago
Village of Lake Bluff
City of Lake Forest
City of Highland Park
Village of Glencoe
Village of Winnetka
United States Department of the Navy (Great Lakes Naval Training Center, not included in the Coastal Management Zone)
Zion Park District
Waukegan Park District
Park District of Highland Park
Lake Bluff Park District
Lake County Forest Preserve District
Beach Park Drainage District
Glencoe Park District
Zion Township
Benton Township
Waukegan Township
Shields Township
Moraine Township
New Trier Township

Existing Committees

Lake County Stormwater Management Commission
Waukegan Harbor Citizens Advisory Group
Waukegan Citizens Council
Lake Bluff Open Lands Association
Lake Forest Open Lands Association
Highland Park Environmental Commission
Highland Park Lakefront Commission
Lake Forest Cemetery Commission
Lake Forest Parks and Recreation Commission

Dead-Kellogg Watershed Planning Committee
Fort Sheridan Homeowners Association
Bull Creek Stakeholders Association
Openlands/Corlands

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