Red Creek-Grand River
HUC-12: 041100040607
Nine-Element
Nonpoint Source Implementation Strategic Plan (NPS-IS Plan)

Version 1.0
April 3, 2017

Approved May 8, 2017

Table of Contents **Page**

List of Figures **Page**

Acknowledgements

Prepared and written by Maurine Orndorff, Watershed Coordinator
Lake County Soil & Water Conservation District
125 E. Erie Street, Painesville OH 44077
morndorff@lakecountyohio.gov
440.350.5863

With gratitude for the assistance from:

- Chad Edgar, Lake County Soil & Water Conservation District
- Leanne Exum, City of Painesville Engineer
- Mike Manary, Painesville Township
- Tim Miller, Lake County Stormwater Management Department
- David Radachy, Lake County Planning & Community Development
- Wally Siegel, Perry Township
- Bill Thompson, Painesville Township
- Vince Urbanski, Lake Metroparks
- Erin Fink, Lake County Engineer
- Keely Davidson-Bennett, Chagrin River Watershed Partners

Chapter 1: Introduction

1.1 Report Background

The Red-Creek Nine-Element Nonpoint Source Implementation Strategic (NPS-IS) Plan brings the communities together to protect the Grand River, manage stormwater runoff and reduce flooding in the watershed.

The plan was created to restore and maintain the chemical, physical and biological integrity of water bodies within the watershed and to access funding from USEPA, Ohio EPA and other granting entities for those purposes.

1.2 Watershed Profile & History

The Red Creek-Grand River HUC-12 Watershed is located in northeastern Lake County in Northeast Ohio (Figure 1). The Red Creek-Grand River 12 digit Hydrologic Unit Code (HUC) is 041100040607; the watershed drains approximately 26.2 square miles. It is located within the 10-digit HUC 0411000406 known as the Lower Grand River Watershed. This watershed is at the lowest end of the Grand River Watershed, and includes the mouth of the River as it empties into Lake Erie (figure 2). The Grand River, including both upper and lower, drains 705.5 square miles as it flows through portions of Ashtabula, Trumbull, Geauga, Portage and Lake Counties.

The HUC-12 watershed encompasses five subwatersheds (Figure 3): Red Creek, "Wild" Designated Grand (upstream of SR 84), Grand River (downstream of SR 84), Unnamed Creek and Tiber Creek.

Approximately 6 miles of the Grand River are designated “Wild” in this watershed, between SR 84 and the upper end of the “Wild” Designated Grand (upstream of SR 84) subwatershed.
It encompasses portions of Perry, Grand River and Fairport Harbor Villages, the City of Painesville, and Concord, Painesville, Perry, and Leroy Townships in Lake County. The center of the watershed is approximately 30 miles from the City of Cleveland central business district. The City if Painesville in the center of the watershed is the seat of Lake County Government.

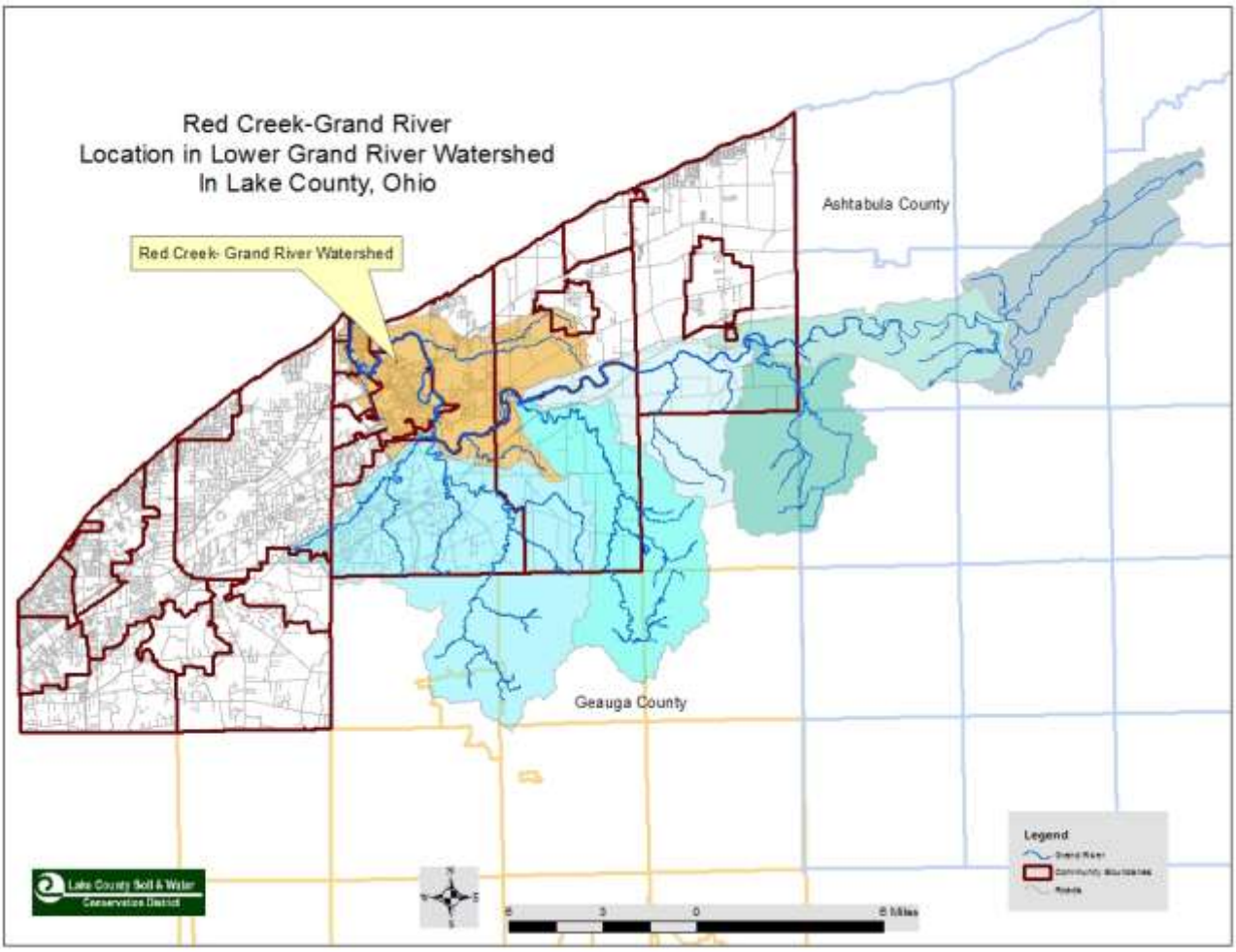
As described by the Upper Grand River Watershed Action Plan (December 13, 2012), “The Grand River has two distinct reaches. The Upper reach flows slowly through the broad valley of an ancient glacial lake, past some of the state's largest wetlands, floodplain forests, marshes, wet meadows, and swamps. The lower reach, west of Harpersfield, has cut a steep shale gorge notable for its cold, fast flow, spectacular sedge meadows, glacial slumps, and deep ravines. The lowest reaches of the river created sand dunes and palustrine sand plains; and aquatic beds and emergent marshes were once plentiful. Lake effect precipitation in Ohio's "snow belt" increases the biological diversity of the watershed.

Hemlock/white-pine/northern hardwood forests in steep ravines and rare hemlock swamp forests provide habitats for plant and animal species usually found in colder, mountainous climates.
Rich in forested communities, the watershed supports beech-maple, oak-hickory, and hemlock-northern hardwood forests. Riparian and floodplain areas are often dominated by trees that tolerate frequent flooding, such as eastern cottonwood, sycamore, black willow, and black walnut. These streamside forests are critical to the health of the river. They minimize streambank erosion and filter out pollutants from agricultural and urban runoff. Forest canopies lower water temperature and allow the river to support a diversity of aquatic life such as river redhorse, rainbow trout, eastern sand darter, and northern brook lamprey. The Grand provides habitat for Ohio's smallest salamander, the rare four-toed salamander, and the elusive spotted turtle. Beavers frequent the riverbanks, and thanks to the Ohio Division of Wildlife's reintroduction program, river otters once again seen flourishing along the banks of the Grand.

Diverse wetlands along the Grand River protect the quality of the stream's water from degradation. Many of these remaining wetlands support rare plant species, such as painted trillium and bunchberry. The forests along the river shelter nesting and migratory bird populations, including yellow-bellied sapsuckers and cerulean warblers. The Eastern Massasauga rattlesnake, a very rare inhabitant of the watershed, has suffered dramatic population declines in recent years. The watershed may provide one of the best areas for recovery of this secretive reptile in coming years…. The single greatest threat to the Grand River basin is suburbanization.”

Figure 1. Location of Watershed

Figure 2. Location in the Lower Grand River Watershed

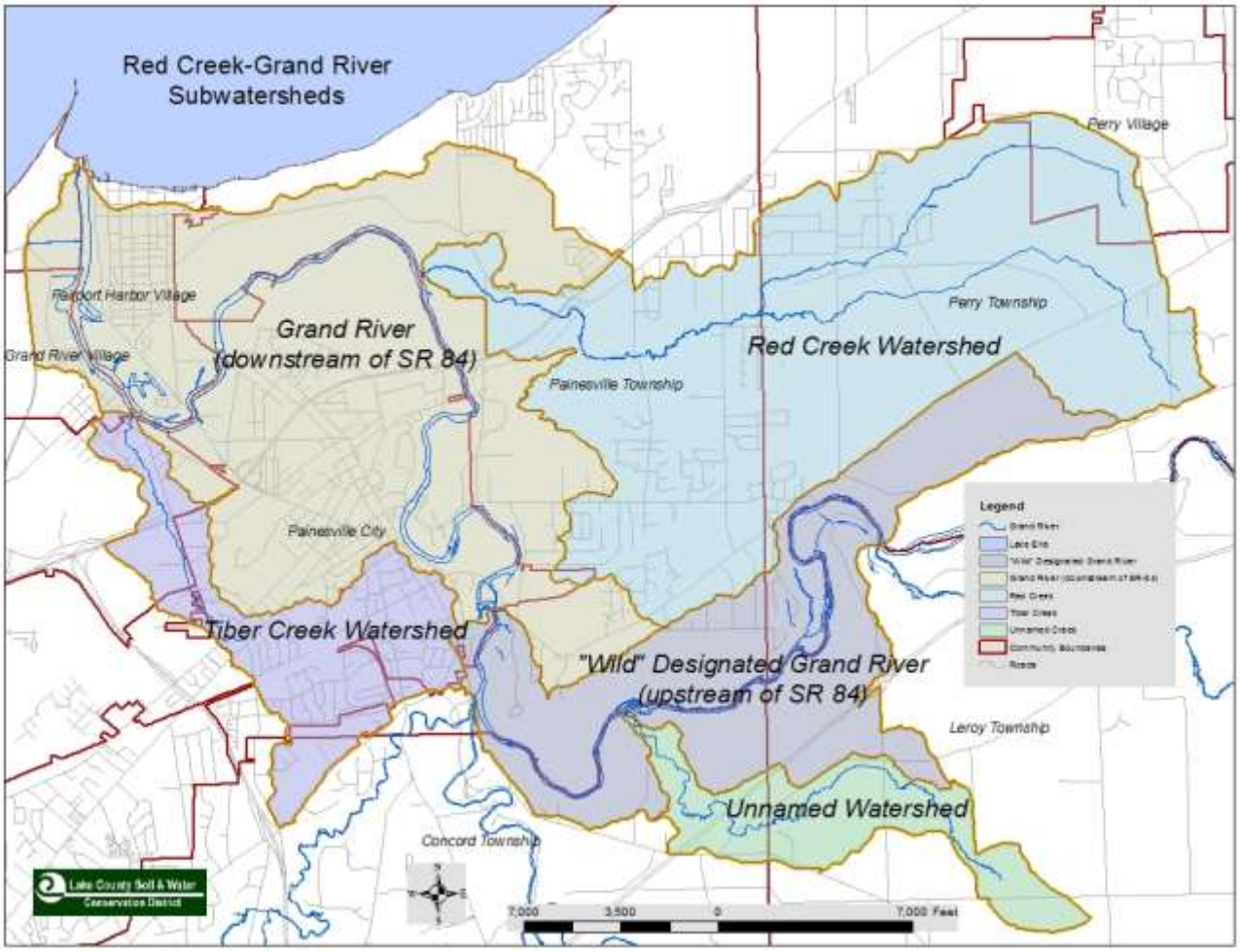


Fairport Harbor Village, Grand River Village, Painesville City, Concord Township, Painesville Township and Perry Village are members of the Lake County Stormwater Management Department (SMD) and meet the National Pollution Discharge Elimination System (NPDES) requirements through the county program. All of the member communities are Level Two, enabling them to utilize the services of the Lake County SMD for all six minimum control measures, and receive funding assistance to maintain and upgrade the storm sewer infrastructure within the community. Perry Township takes care of NPDES requirements on its own. Leroy Township is not a Phase II mandated community.

Prior to European settlement, the watershed was mostly forested with a mixed oak forest. Following early settlement, many of the forests were cleared for agricultural production, and the areas with poorly drained soils were drained with subsurface drainage and ditches. Portions of channels were dredged and straightened to improve water flow. The primary agricultural industry was nursery production. Population growth from the Cleveland Metropolitan Area to the west has displaced most of the agricultural operations, which have moved to eastern Lake County townships. This subwatershed has the second highest amount of land in urban land uses, second only to the Big Creek

subwatershed of the Lower Grand River. 61.3% of the watershed is developed, of which 32.1% is considered low intensity development and 24.4% has forest cover.

Figure 3. Watersheds within the HUC 12



1.3 Public Participation and Involvement

This plan was created with the input of members of the community, local officials, state and local agencies, including:

- Chad Edgar, Lake County Soil & Water Conservation District
- Leanne Exum, City of Painesville Engineer
- Mike Manary, Painesville Township
- Tim Miller, Lake County Stormwater Management Department
- David Radachy, Lake County Planning & Community Development
- Wally Siegel, Perry Township
- Bill Thompson, Painesville Township
- Vince Urbanski, Lake Metroparks
- Erin Fink, Lake County Engineer
- Keely Davidson-Bennett, Chagrin River Watershed Partners

Chapter 2: HUC-12 Watershed Characterization and Assessment Summary

2.1 Summary of HUC-12 Watershed Characterization

2.1.1 Physical and Natural Features

A brief set of descriptive data follows.

Water Resources

100 year floodplain	1945.0 ac
Wetlands (2007)	474.3 ac
Ponds & lakes	283.0 ac
Streams & rivers	46.5 ac
Approx. number of water wells	264
Highly sensitive to groundwater contamination	16,800.5 ac
Ohio EPA permitted CSOs	0

Land Use and Environment

Conservation & recreation land	820.7 ac
Ohio EPA NPDES industrial & municipal discharge permits	10
Ohio EPA Approved bio-solid app. Fields	2.2 ac
Dams	7
Ecological region:	Erie Lake Plain, Erie Gorges, Mosquito Creek/Pymatuning Lowlands, Low Lime Drift Plain

Land Use (acres)	**1994**	**2001**	**2009**
Agriculture	6,402	3,450	1,770
Water	1,902	2,025	348
Urban	2,088	6,191	10,425
Forest	8,461	5,079	4,294
Barren	20	0	2
Shrub/scrub	478	87	1

Ohio EPA Aquatic Life Use Designation Miles

Coldwater Habitat (CWH)	0
Exceptional Warmwater Habitat (EWH)	9.4
Warmwater Habitat (WWH)	14.6
Seasonal Salmonid Habitat (SSH)	21.8

Ohio EPA Stream Classifications (Miles)

Primary Contact Recreation Class A Waters	14.9
Outstanding State Waters	9.1

Ohio EPA Source Water intakes & Protection Areas

Fairport Harbor Village Public Water Supply	1,445 ac
Lake County East Water Subdistrict	2,743 ac
Painesville City Public Water Supply	1,564 ac

People (reported by tract)

Rural:	1,882
Urban:	26,588
Agricultural:	11
In Labor Force:	14,977

Source: 2011 ERIN Watershed Report

Topography
The elevation ranges from 1012 feet above sea level in the southern watershed boundary on the Allegheny Plateau to 572 feet along the Lake Erie shoreline, a change of 440 feet.

The watershed is located in the Lake Plain physiographic region, which is characterized by glacial sediment overlaying Devonian shale, ranging from fine sand, silt and clay. The southern boundary of the watershed is on the Portage Escarpment, which marks the boundary between the Lake Plain region and the Allegheny Plateau (Figure 4).

The Lake Plain is relatively flat and is poorly drained in most places. The Mentor Marsh just west of the mouth of the Grand River is the former and ancient channel of the Grand River (Figure 6).

Figure 4. Topography

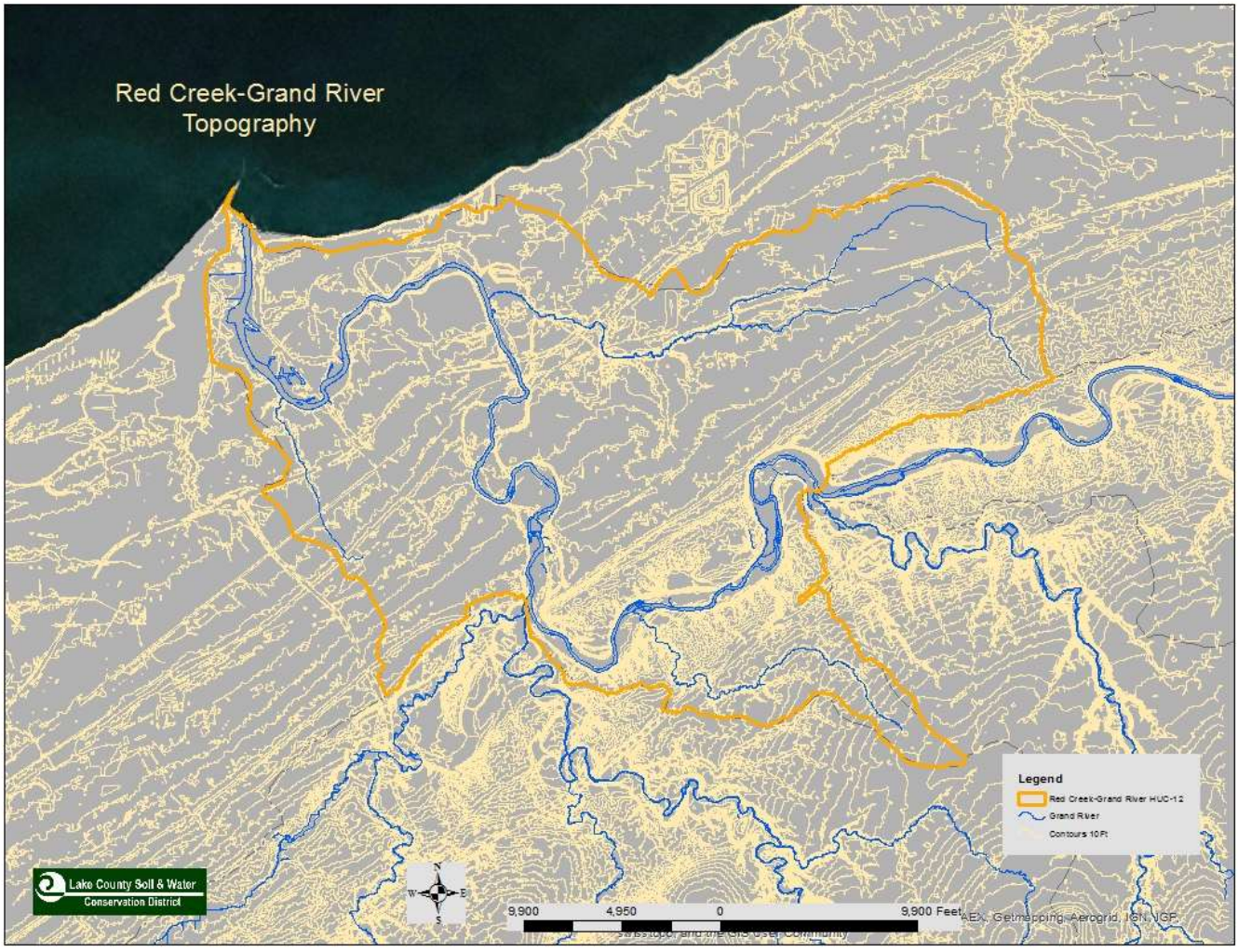


Figure 5. Topography- Shaded Relief

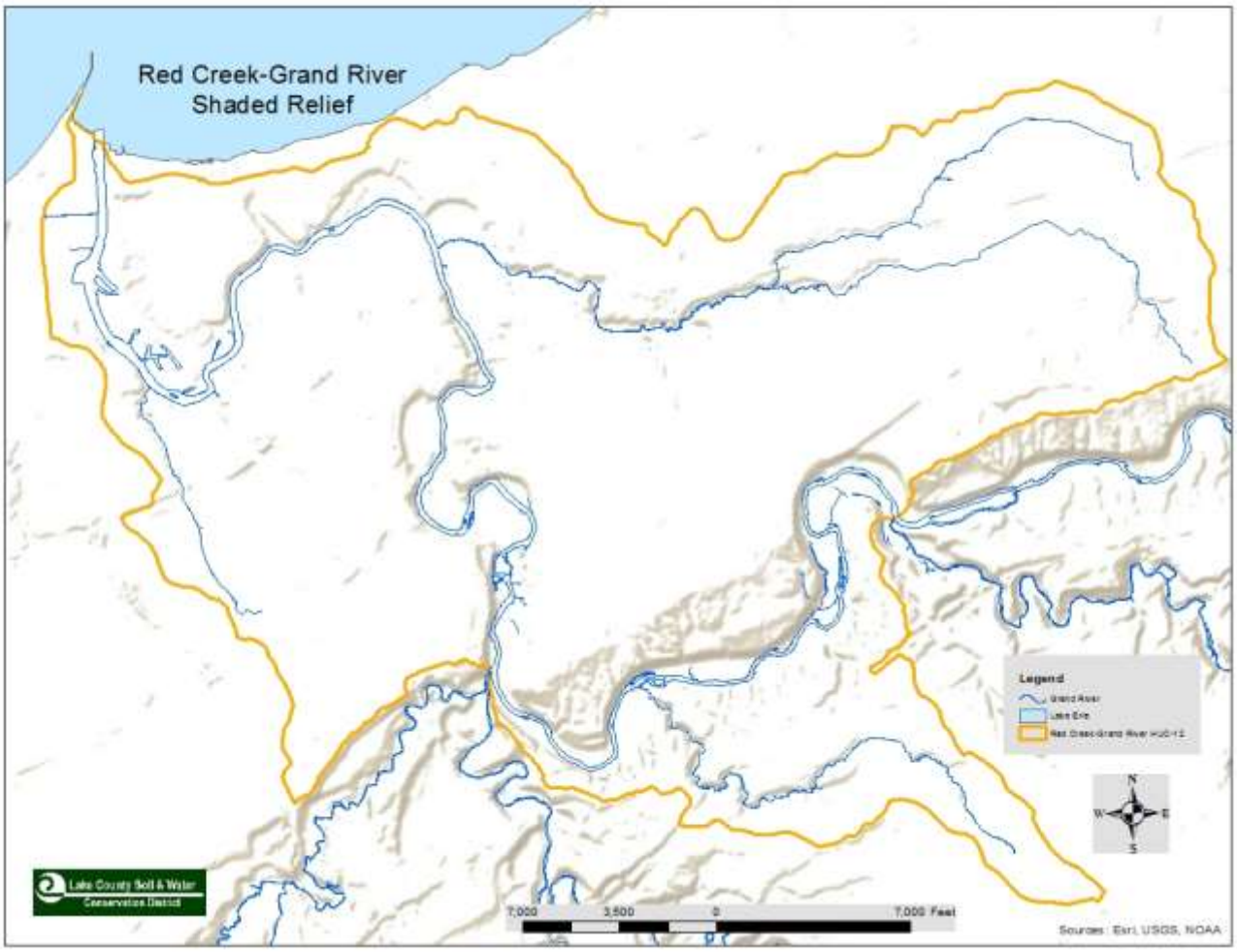


Figure 6. Mentor Marsh, Early Grand River Channel

Geology & Glacial History (Figure 7)

The Red Creek-Grand River Watershed is in the glaciated plateau of Ohio and underlain by the Lake Plain. The Lake Plain averages 4 miles in width. It is relatively level and characterized by poor drainage, except where there are beach remnants from ancient lakes. Early Lake Erie was more than 200 feet higher than it is today. As the glaciers retreated, lower outlets were uncovered by the melting ice and the lake decreased in size and elevation. The beach ridge deposits that were left behind are the location of the progressively lower shorelines. These sandy and gravelly ridges, from earlier higher lake levels parallel the present Lake Erie shoreline, run in an east-west direction. The southern-most ridge, Johnny Cake Ridge Road, is the approximate boundary between the lake plain and the Portage Escarpment. These beach-dune ridges were early Native American trails and were important in the European settlement of the region because of their sandy, slightly elevated ground, which provided well-drained, nearly level areas for roads and homesites.

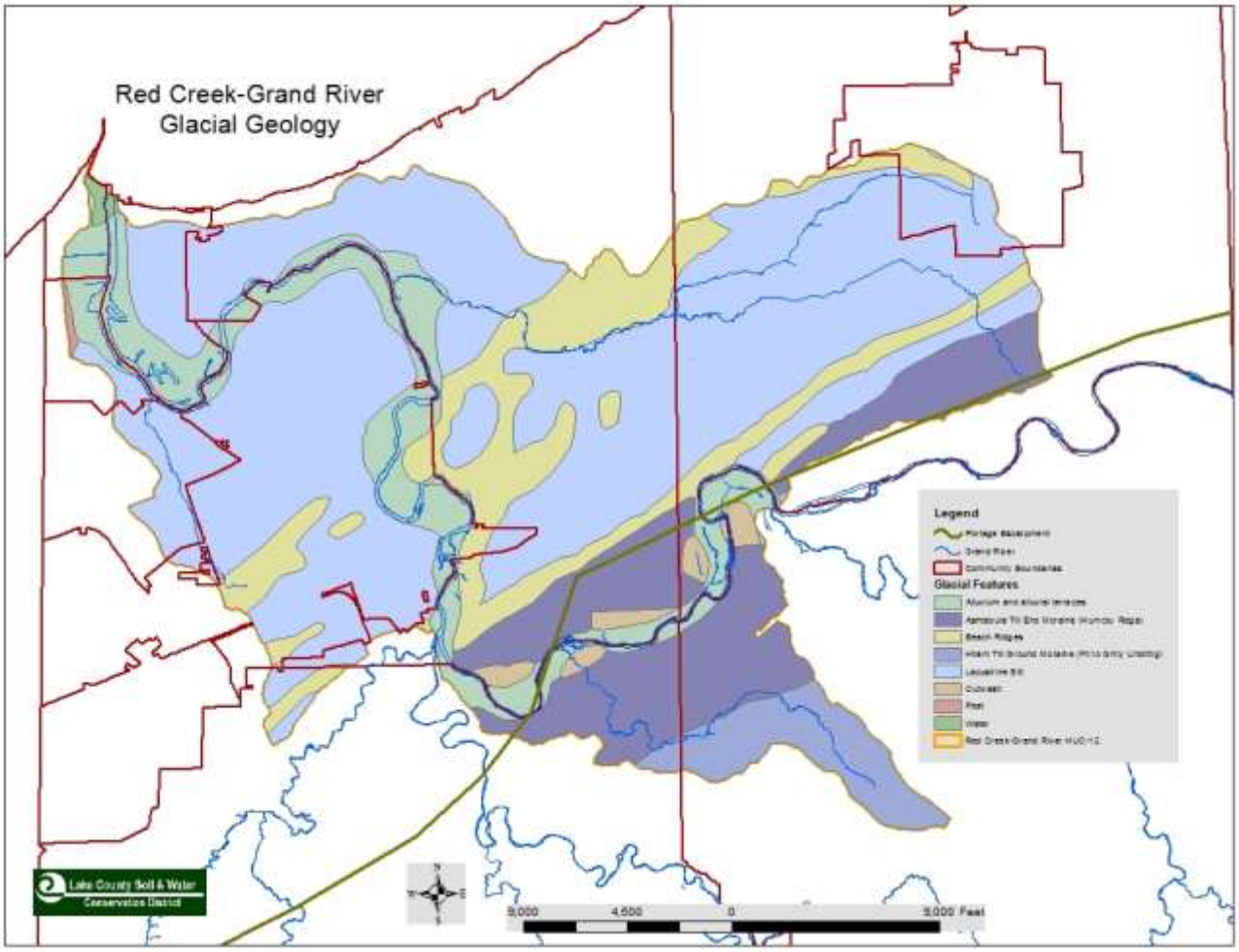
The watershed is underlain by Chagrin Shale bedrock of Devonian age, part of the Paleozoic area which lasted about 416 to 2.8 million years ago. The gray shales and siltstones of the Chagrin Shale were deposited as sea-bottom muds in alternating layers which were compressed over time into shale

and siltstone. The Chagrin Shale bedrock is close to the surface in some areas and exposed in some stream beds.

The Lake Plain is characterized by ephemeral and low quality Warmwater streams. The potential for stream habitats to reach their highest quality is limited by the geology as well as the present and historical land uses in the watershed. High quality habitat requires large substrates, such as bedrock, boulders and cobbles which are not typically found in the Lake Plain. Intensive agricultural use and development have limited the ability of streams to develop pools, stable substrate and access to floodplains, which aquatic organisms need to survive.

The watershed is underlain by rock formations that contain Marcellus and Utica oil shales, deeper resources that can be mined through hydraulic fracturing- more commonly called "fracking". Large amounts of water are needed in the drilling process, and the potential for environmental degradation can be high if proper regulations are not implemented for this emerging industry in Ohio.

Figure 7. Glacial Geology



Soils

The soils (Figure 8) in the watershed reflect the glacial history of the region and can be divided into four categories: soils on the lake plain and offshore bars; soils on beach ridges, terraces and offshore bars; soils on flood plains, terraces and marshes; and soils on till plains. Refer to the Soil Survey of Lake County, Ohio for more information about the soils and their properties.

More than 75% of the soils have severe limitations for development because of seasonal wetness. 3.4% have 30 to 75% slopes, and are found along the Grand River in the Allegheny Plateau, and on sections of Red Creek and Tiber Creek (Figure 9).

Six soil types are designated by the United States Department of Agriculture (USDA) as "unique and of local importance" for agricultural production.

Soils designated as "unique and of local importance":

- Colonie loamy fine sand with 2% to 6% slope
- Elnora loamy fine sand with 1% to 5% slope
- Granby sandy loam
- Kingsville fine sand
- Otisville gravelly loamy sand
- Stafford loamy fine sand

The agricultural industry has been historically important and continues to be an important economic driver and measure of the quality of life in Lake County. Agricultural land use in the watershed has declined from 3,877 acres in 1994 to 1,770 acres in 2009, a drop of 45%.

Soil drainage characteristics information is essential for siting Best Management Practices (BMPs) so that they will work properly. BMPs such as rain gardens and pervious pavers that are based on infiltration are best suited for well drained soils (in shades of green, Figure 10), whereas wetlands and on-site storage BMPs should be utilized in hydric soils (in shades of blue, Figure 10).

Figure 8. Soils

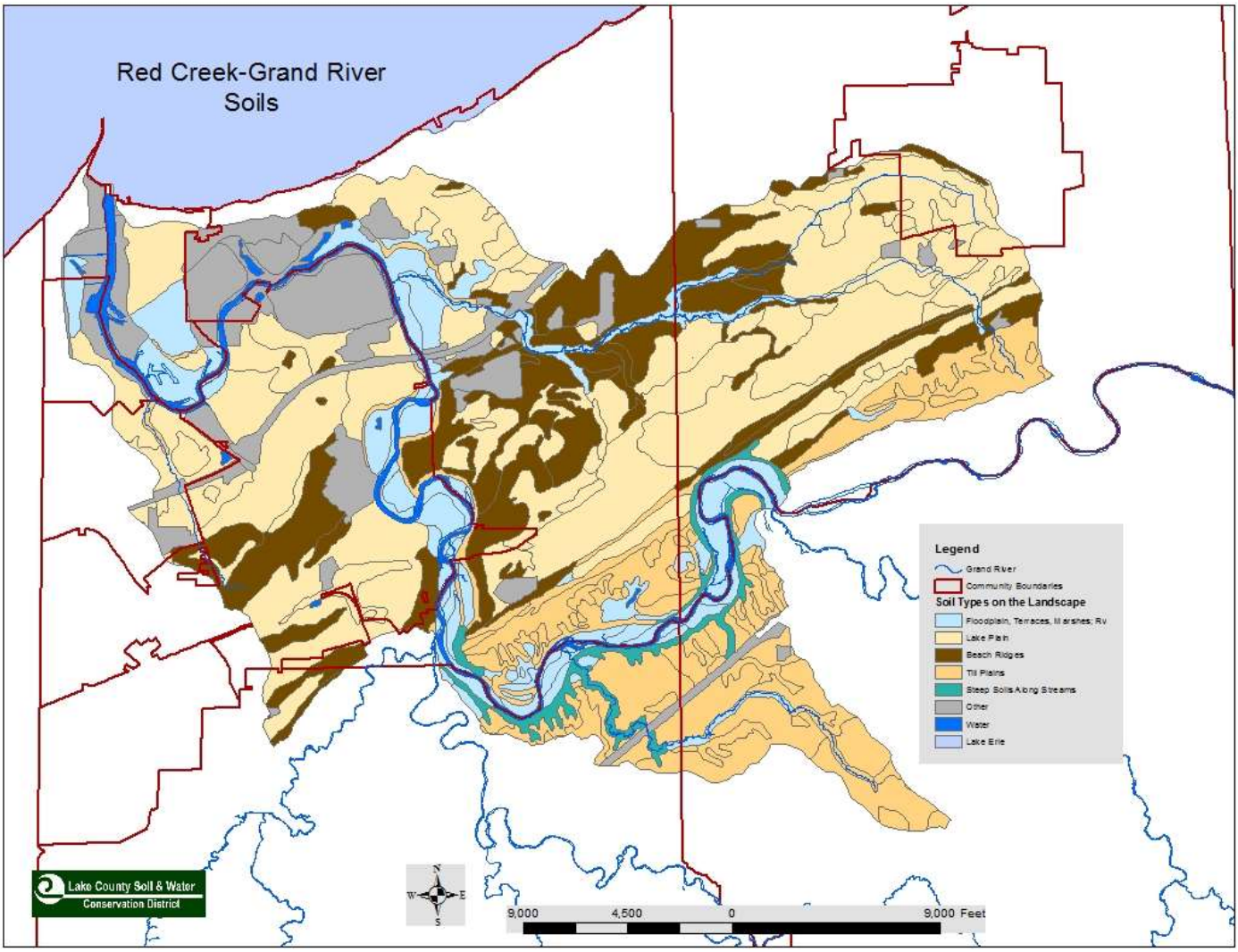


Figure 9. Soils with Steep Slopes

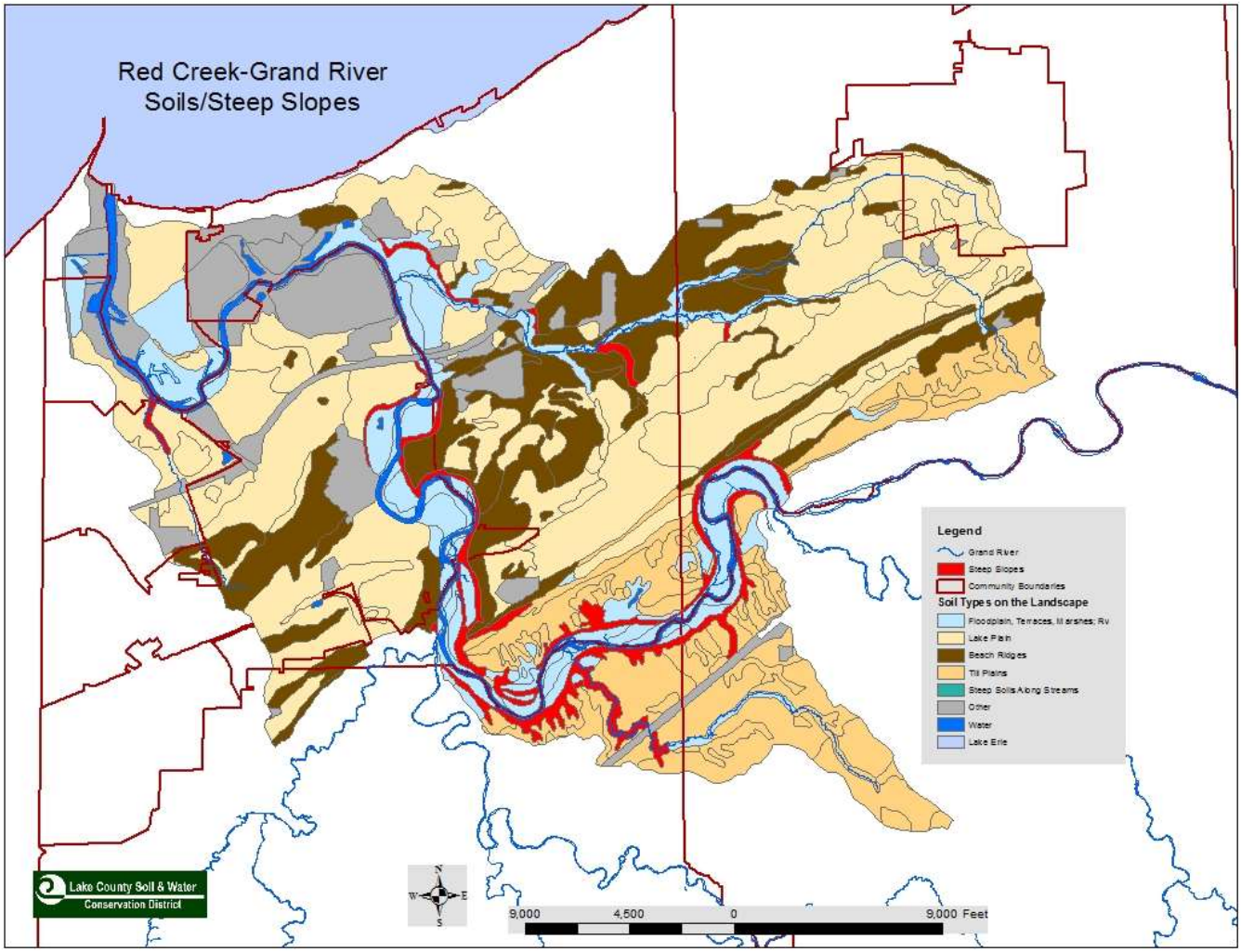
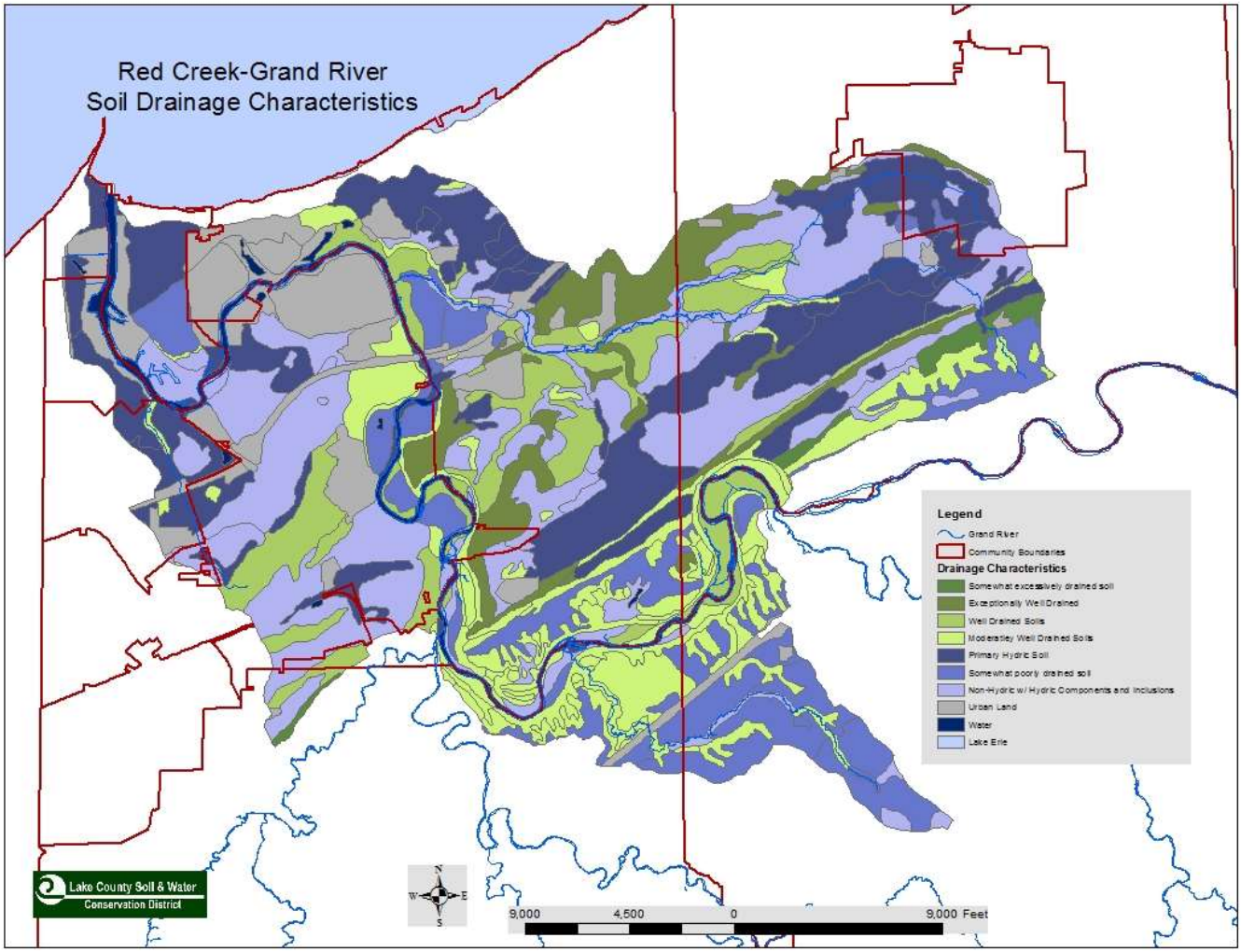


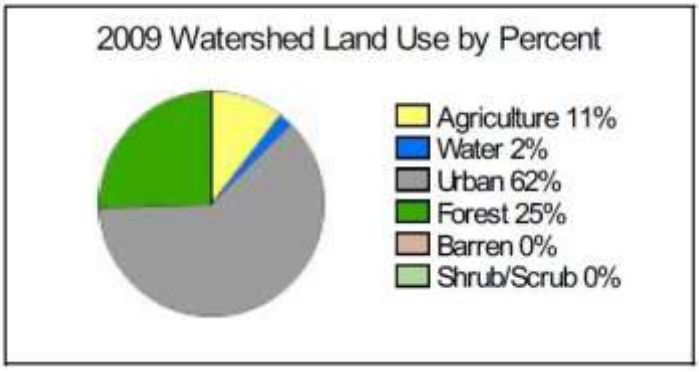
Figure 10. Soil Drainage Characteristics



2.1.2 Land Use and Protection

The ERIN Watershed Report delineated 62% of the land use as urban in 2009, with forest the next highest percentage at 25% and agriculture at 11% (Figure 11).

Figure 11: Land Use Percentage (ERIN Watershed Report 2009)



5% of the land is protected by Lake Metroparks, with parks located along the Grand River, and a section of walk/bike path in Painesville. Lake Metroparks will continue to evaluate natural areas along the Grand River and its tributaries for potential permanent protection and park development.

12% of the land is publicly owned, which includes boards of education property, churches, and County, Municipality-owned properties (Figure 13).

Imperviousness of a watershed has an effect on the physical and biological characteristics of a stream. Increases in impervious cover cause decreases in conditions. Channel instability will occur when the impervious area is greater than 10%. Sharp declines in macroinvertebrate diversity occur when imperviousness is greater than 8%. (USEPA CADDIS Volume 2: Sources, Stressors & Responses) U.S. Geological Survey StreamStats data show the imperviousness in selected subwatersheds as follows:

- Red Creek- 10.6%
- Tiber Creek- 30.7%

Red Creek is at the balance point for degradation, Tiber Creek has tipped over the balance point. Opportunities for retrofits with green infrastructure should be utilized wherever possible.

Former Diamond Shamrock Facility

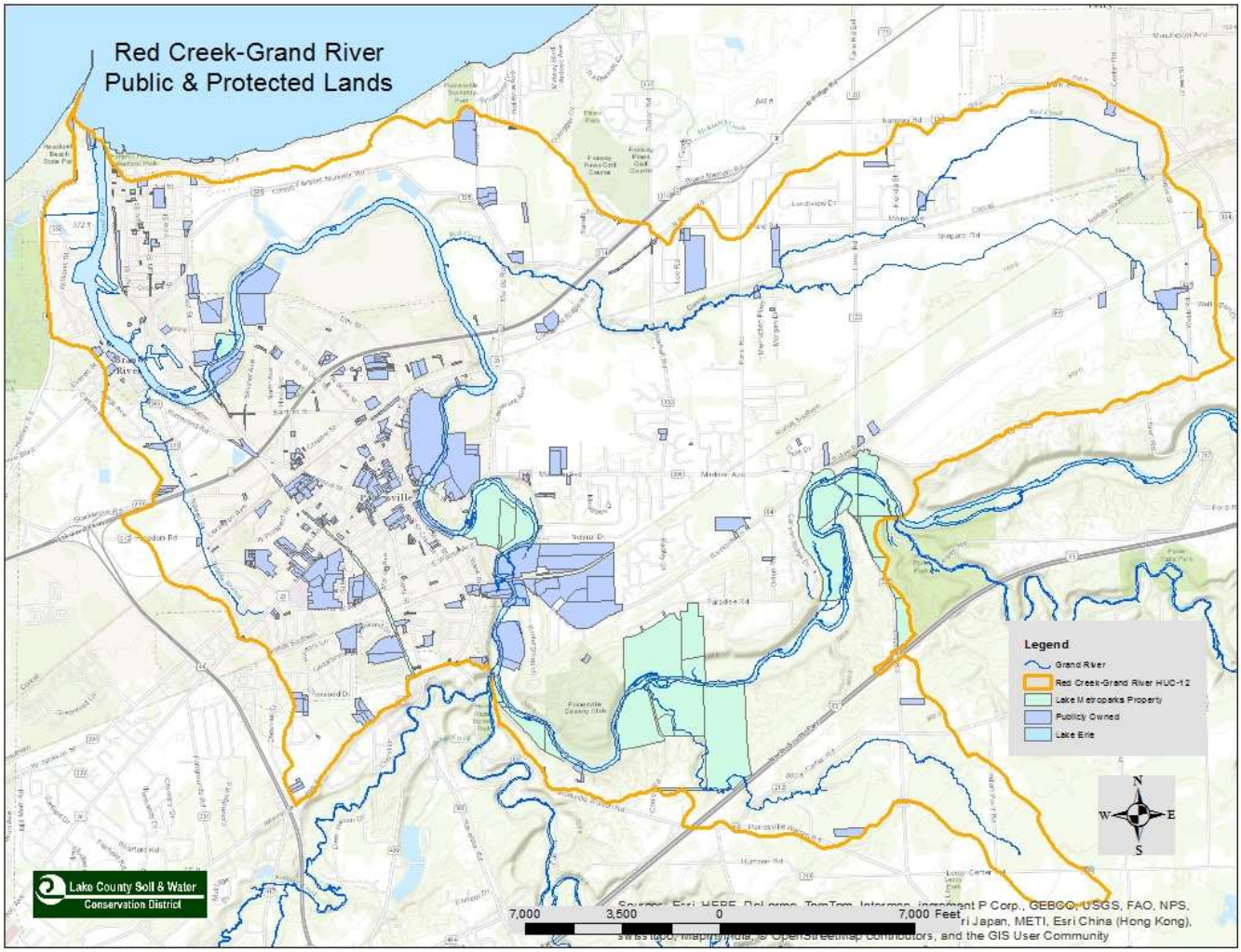
The Diamond Shamrock Painesville Works site in this subwatershed is a former chemical manufacturing facility approximately 1,100 acres in size. The Grand River bisects the site and Lake Erie borders it to the north (Figure 12). The facility operated from 1912 through 1977 and manufactured a variety of products that included soda ash, baking soda, chromium compounds, carbon tetrachloride, hydrochloric and sulfuric acids, chlorinated wax, and coke.

The site has plans for development, and is currently a brownfield/ reclamation site. Waste containment ponds from the abandoned Diamond Alkali chemical plant are located adjacent to the Grand River. As part of a remedial effort, clay dikes and caps have been placed around and over the waste lagoons; however, chromium continues to leak into the Grand River, with at least two known discharges reported during the spring of 2004 that violated water quality standards for hexavalent chromium.

Periodic review of the sampling plans and procedures, as well as the analytical results obtained from the monitoring efforts by the Ohio EPA is vital in order to ensure that progress is made in meeting the water quality criteria.

Figure 12: Aerial photograph of the Diamond Shamrock Painesville Works site

Figure 13: Public and Protected Lands



2.2 Summary of HUC-12 Biological Trends

The Ohio EPA has designated 9.4 miles of Exceptional Warmwater Habitat, 14.6 miles of Warmwater Habitat and 21.8 miles of Seasonal Salmonid Habitat in the Red Creek-Grand River subwatershed.

EPA Biological and Water Quality Study of the Grand River Basin 2003-2004

- Red Creek- Aquatic life in Red Creek did not meet standards for WWH.

Figure 14: Red Creek WWH Aquatic Life Use

Mile	IBI	ICI	QHEI	Attainment Status	Causes	Sources
0.5	30	Fair	67.0	**NON**	Flow alteration, toxicity	Urban runoff

- Red Creek drains a suburbanized former lake plain; consequently, its parent, fine-grained Lacustrine substrates are moderately embedded with silt. The lower reach, where sampled, had not been channelized, and so has sufficient habitat attributes to support a Warmwater stream fish assemblage.
- Red Creek is the most urbanized catchment in the Grand River basin, with mixed commercial, industrial and residential landuse. Impervious cover is estimated at 7.6% from Landsat imagery, and population densities within the sub catchment range between ~ 250 and 1100 people•mi^{-2}. Not coincidentally, the fish community sampled at Mantle Road did not meet WWH. The individual IBI metrics suggest episodic events that pauperize the fish community and contribute to contaminated sediments as evidenced by fewer than expected species, low relative abundance, and no darters. Sustained flow was evidenced in the collection of 12 steelhead trout smolts.
- The macroinvertebrate community sampled on Red Creek (RM 0.5) was highly degraded with low EPT (higher water quality taxa) and sensitive taxa diversity. Stream substrates were embedded, which is an indication of increased sedimentation and possibly increased flow flashiness. The impact at this station may be a combination of various causes associated with the surrounding urban area.
- Red Creek- The macroinvertebrate community sampled on Red Creek did not meet standards for WWH. It was highly degraded with low sensitive taxa diversity. Stream substrates were embedded, which is an indication of increased sedimentation and possibly an increase in flow flashiness. Restoration of aquatic life in Red Creek will be difficult to achieve given the historic practices of stormwater management in densely populated areas.
- Red Creek is in non-attainment of its WWH designation because of flow alteration and pollutants associated with urban storm water. It is impaired along its entire length. Attainment of the WWH aquatic life use is unlikely given the current state of stormwater management. However, Red Creek is physically intact with wooded riparian zones and high QHEI scores, but it is impacted by toxic runoff from the urban areas.

- Kellogg Creek and Red Creek, draining the most suburbanized portions of the basin, no longer meet the biological criteria for Warmwater Habitat aquatic life use, and serve as examples of what will happen if growth is not properly planned and controlled.
- Grand River- Aquatic life in the Grand River is fully attaining standards for Exceptional Warmwater Habitat (EWH) from Sweitzer Road (RM 42.2) to the SR 2 bridge in Painesville (RM 5.2), and is fully meeting standards for Warmwater Habitat (WWH) downstream from the SR 2 bridge. The Seasonal Salmonid use designation currently in place should be retained.
- Grand River- the state listed Species of Concern crayfish Orconectes propinquus (Great Lakes Crayfish) was collected at 19 of the 35 stations in this assessment unit. Seventeen species of freshwater mussels (Unionidae) were collected from the lower Grand River. In total, this study found two state Endangered species, three state Threatened species, and four state Species of Concern to be present in the lower Grand River basin. This assessment unit had an unusually high number of uncommonly collected sensitive taxa and state listed species, which is an indication of the exceptional resource quality in the lower Grand River basin.

Headwater Habitat Evaluation Index

Lake SWCD worked with the EPA to develop and collect Headwater Habitat Evaluation Index (HHEI) data for Lake County watersheds to establish a baseline database of existing conditions. HHEI data was collected by Lake SWCD staff in the Red Creek-Grand River Watershed between 2007 and 2008. 53 sites were assessed, with the majority occurring on the "Wild" portion of the Grand River and the "Unnamed" tributary. Twenty-three sites were assessed as Class III; thirty were Class II Modified or below. (Figures 15 and 16) See Figure 17 and the following text for an explanation of the Ohio Stream Classification system.

Figure 15: Stream Class Percentages

Class	%
Class I	13
Class I Modified	15
Class II	25
Class II Modified	4
Class III	23
	100

Figure 16: Stream Class

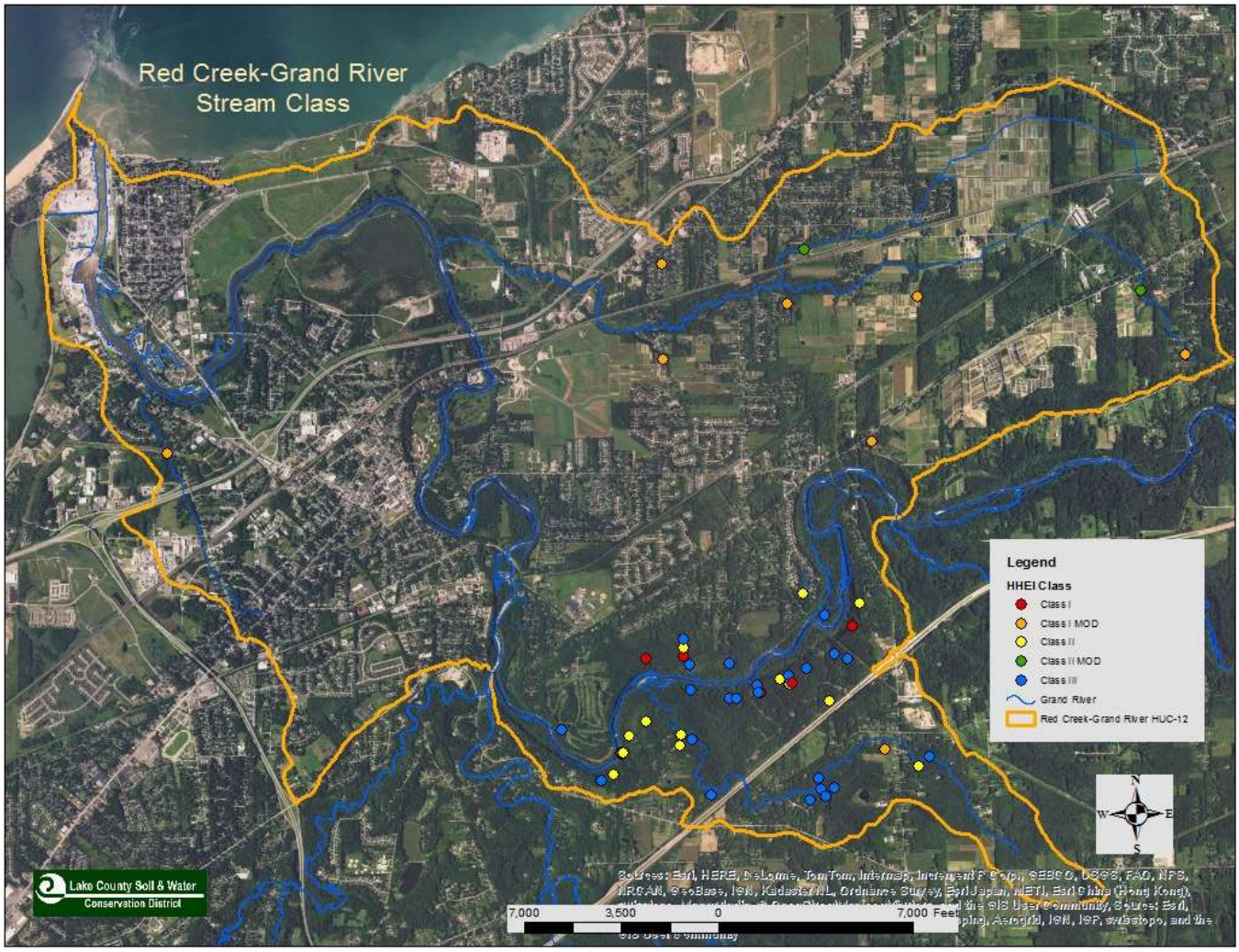
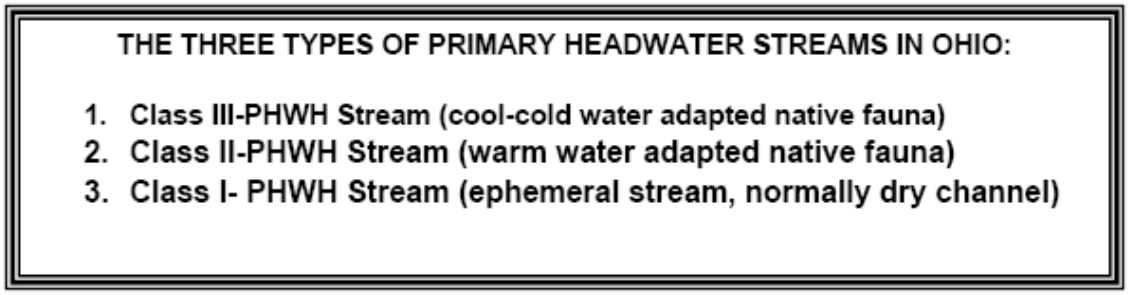


Figure 17: Three Types of Primary Headwater Streams in Ohio (OEPA. 2009.)



Class III-PHWH (Primary Headwater Habitat) streams have a diverse population of native fauna adapted to cool-cold perennial flowing water, with larval stages continuously present in the stream. They exhibit the highest quality of headwater stream habitat, with HHEI scores > 70.

Class II-PHWH streams have a moderately diverse population of warm-water adapted native fauna on a seasonal or annual basis. They are usually intermittent streams, but may have perennial flow in some instances. Class II streams will score between 30 and 70 on the HHEI.

Class I-PHWH streams are ephemeral, with water present for short periods of time, from snow melt or rainwater runoff. Since they are normally dry, there is little or no aquatic life present. They score <30 on the HHEI and do not provide good habitat for salamanders or macroinvertebrates.

The primary physical habitat distinction between Class I and Class II- PHWH streams is that Class II-PHWH streams are watered- either with the presence of flowing water or isolated pools during the summer months, and Class I-PHWH steams are dry. The primary biological habitat distinction is that Class I-PHWH streams have either no species of aquatic life present or the biological community has poor diversity. (OEPA. 2009.)

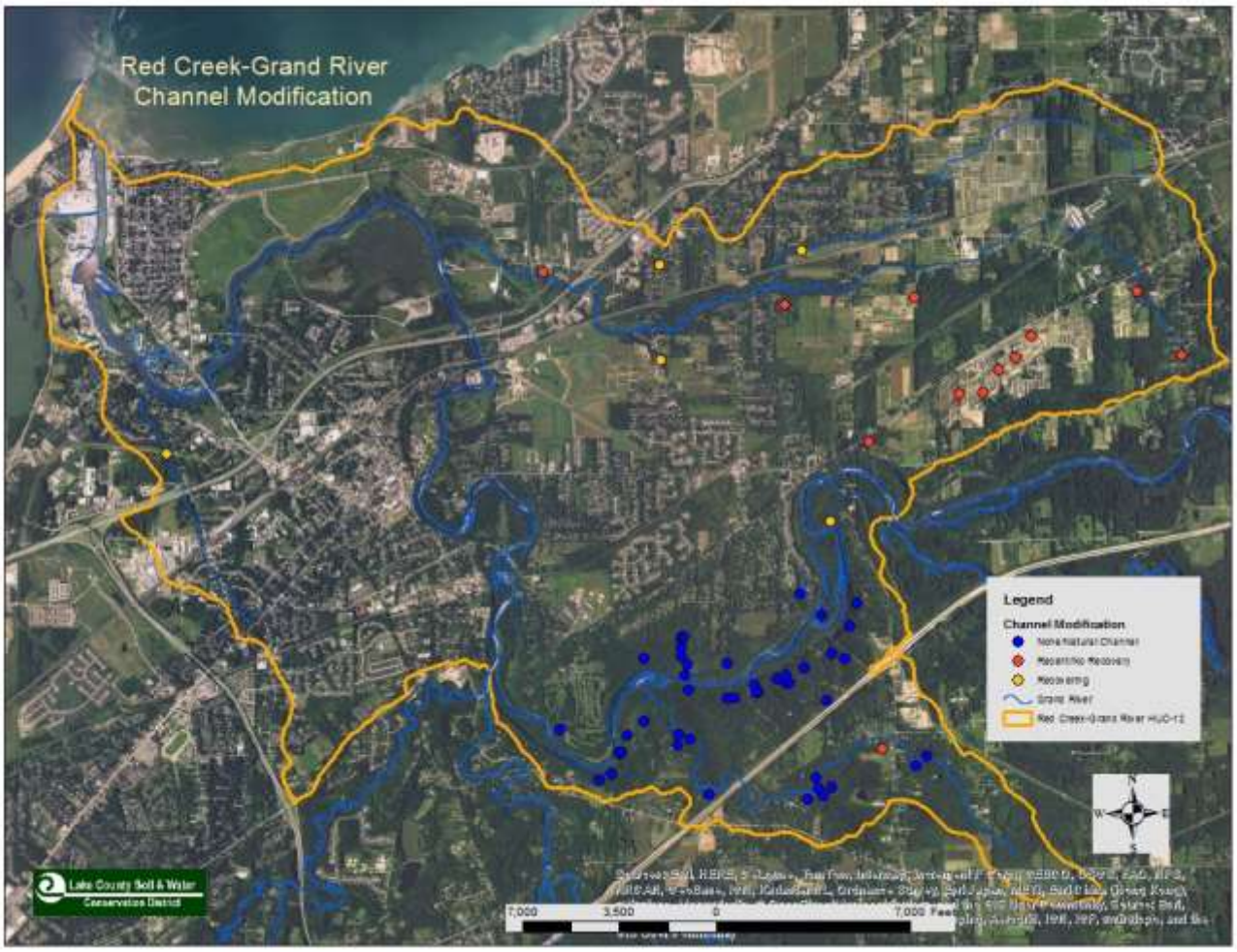
A natural "stream channel is characterized by the presence of riffles and pools, heterogeneous substrate deposition, the presence of point bars or other evidence of floodplain sediment deposition, appropriate stream channel sinuosity for the setting of the stream in the landscape, varied water depths and current velocity (when flowing), no obvious evidence of current or past bank shaping or armoring activities is present. Natural wooded or wetland riparian vegetation dominates the stream margin." (OEPA. 2009.)

When channels have been historically altered by man, they are categorized as "Modified". This can include a status of "Recovered", where the stream shows evidence of channel alteration, but has fully recovered many of the natural stream channel characteristics listed above; "Recovering", where there is evidence of alteration and the stream is in the process of adjusting, channel sinuosity is lacking and riparian vegetation is in early stages of re-growth; and "Recent or No Recovery", where alteration is evident and few if any natural characteristics are present. Highly modified streams are characterized by uniform depths, over-wide channels, homogeneous substrates, embeddedness of substrates and low sinuosity. (OEPA. 2009.

Figure 18: Channel Modification Percentages

Channel Modification	%
None/Natural Channel	73
Recovering	8
Recent/No Recovery	19
	100

Figure 19: Channel Modification



When the HHEI assessment was done in 2008, 19% of the channels were identified as recent with no recovery, and 81% as recovering or natural channel. Figures 20, 21 and 22 illustrate the different stream classifications within the watershed.

Figure 20. Class I Modified Stream, Recent with No Recovery in Red Creek Subwatershed

Figure 21. Class II Modified Stream in Red Creek Subwatershed

Figure 22. Class III Stream in "Wild" Grand River Subwatershed

2.3 Summary of HUC-12 Pollution Causes and Associated Sources

As listed in the 2012 Lower Grand River Watershed TMDL, Ohio EPA has determined that the causes of impairment in the watershed include direct habitat alteration, flow alteration, organic enrichment/dissolved oxygen, siltation, unknown causes and pollutants associated with urban storm water. The following parameters constitute the causes:

- Habitat alteration
- Siltation and sedimentation
- Flow alteration and imperviousness
- Metals
- Organic enrichment and low dissolved oxygen
- Temperature

Ohio EPA identified urban/suburban runoff and storm sewers as potential sources that could cause impairments. The natural hydrology of the watershed is altered by impervious surfaces, such as roads, roofs and parking lots. Biological communities are impacted by the change in flow hydrology, resulting in the following stressors:

- Degraded habitat and siltation
- High stream flow velocities
- Erosion, channel scour and bank failure
- Poor storm water quality
- Increased temperatures or rapid temperature flux
- Reduction in base flow

The impairment causes and sources reported in Ohio's 2010 303(d) Integrated Water Quality Monitoring and Assessment Report (Ohio EPA 2010a) are shown in the following table.

Figure 23: Lower Grand River watershed assessment units to be addressed by TMDLs

Name	Causes	Probable Sources
Red Creek-Grand River	Flow alteration	Urban runoff, storm sewers (non-point sources)
	Pollutants associated with urban stormwater	Urban runoff, storm sewers
	Bacteria	

The EPA 2010 Waterbody report for Red Creek-Grand River classified the overall status of this waterbody as Impaired for all assessed designated uses (Figure 24).

Figure 24: Water Quality Assessment Status for Reporting Year 2010

Designated Use	Designated Use Group	Status
Aquatic Life Use	Fish, Shellfish, Wildlife Protection & Propagation	Impaired
Human Health Use	Aquatic Life Harvesting	Impaired
Recreational Use	Recreation	Impaired

A TMDL (Total Maximum Daily Load) was published for the Lower Grand Watershed on January 31, 2012. The report concluded that: "The water quality impairments in the lower part of the Grand River watershed can be corrected through a variety of actions. The impact of development can be lessened by retaining storm water on-site or allowing it to infiltrate the ground and by adopting better site design practices. Agricultural practices that minimize runoff from fields would reduce both sediment and nutrient impacts. Inspecting home sewage treatment systems and replacing or repairing failing systems would reduce bacteria. Finally, future permits for some point sources should include lower effluent limits for E. coli and monitoring requirements for total phosphorus." The next field monitoring is scheduled for 2019.

2.4 Additional Information Determining Critical Areas and Developing Implementation Strategies

Flooding has been a long-standing problem in the watershed. Numerous studies have been undertaken to determine how to alleviate the flooding and improve water quality.

2.5.1

Grand River Riparian Corridor Protection Plan (Davey Resource Group, March 1998)
Initiated by the Grand River Partnership, a consortium of public agencies and private organizations in Ashtabula, Geauga, Lake and Trumbull Counties, the protection plan identified three targeted "critical areas" for acquisition of conservation easements in the riparian corridor of the Grand River.

The goals of the project were to:

1. Protect the water quality and aquatic habitat, wetlands and associated forest communities of the Grand River watershed
2. Provide education for landowners on the ecological and economic benefits of riparian buffers, wetlands, floodplains and steep slopes
3. Assist elected officials, public servants, decision makers and concerned citizens in making the right choices for watershed protection

2.5.2

Tiber Creek Drainage Study, City of Painesville, February 2008

The City of Painesville contracted with Metcalf & Eddy/AECOM to conduct an analysis of alternatives for ameliorating drainage problems within the Tiber Creek area. The objectives of the study were to:

1. Define the Tiber Creek drainage area
2. Develop a computer model of the drainage system
3. Evaluate the hydraulic capacity of the existing drainage system
4. Determine restrictive drainage areas
5. Recommend potential improvements and planning-level costs

The study created an existing hydrologic and hydraulic model of Tiber Creek and recommended a series of projects that the City of Painesville is in the process of implementing, which includes expansion of existing retention/detention basins and storm sewer improvements.

2.5.3

Tiber Creek Drainage Study, City of Painesville, February 2013

The City of Painesville and the Lake County Stormwater Management Department contracted with ARCADIS to extend the scope of the 2008 study to the confluence of Tiber Creek at the Grand River, and to evaluate detention and stream restoration improvements not considered in the original study. Recommendations included detention projects as well as stream restoration improvements to help alleviate the flooding concerns in the southwest section of the City.

2.5.4

Stormwater Financing Report to the City of Painesville

Sandy Point Environmental Consulting, LLC produced the Stormwater Financing Report to the City of Painesville in April 2014 as an assessment of the capacity and effectiveness of the City's stormwater management program.

The recommendations included:

1. Improve the management and administration of the City's stormwater program
2. Partner with County agencies such as the Lake County Stormwater Management Department and Lake County Soil & Water Conservation District that provide expertise and education in stormwater management
3. Incorporate stormwater management into all facets of life and activity
4. Make stormwater financing a priority
5. Implement the Tiber Creek watershed improvements

6. Implement a backflow preventer program
7. Implement a green infrastructure grant program for rain gardens and rain barrels

2.5.5

Painesville Township worked with the Lake County Planning Commission on a comprehensive plan in 2007 and 2016. One of the plan goals is to discourage activities and land uses that could harm waterways and watersheds. The plan contains the following Objectives to help fulfill that goal:

1. Work with county, state and federal agencies to purchase or acquire easements on high priority sites and areas of outstanding natural significance, for restoration and/or preservation.
2. Support appropriate uses along rivers and streams that limit their impact and protect the environmental qualities of these natural systems, such as parks and open space, carefully planned residential development, institutional uses, and civic uses located outside floodplains.
3. Promote conservation along rivers and streams through parks, open space, floodplain preservation, forested buffers, and conservation easements.
4. Encourage green construction practices, such as permeable pavement and green roofs to reduce stormwater runoff.
5. Work with state and federal officials to obtain grants and assistance to clean or seal toxic sites.
6. Riparian setbacks shall be required on all land adjacent to designated watercourses.

2.5.7

The Perry Village Comprehensive Plan adopted in 2005, includes goals to manage future development of land in order to protect and improve the quality of air, surface water resources (creeks, lakes, wetlands, floodplains) and other natural resources from pollution, sedimentation and unnecessary alteration of their natural forms and functions and maintain the rural character of the Village. The plan states that the floodplains of the two main watersheds of the Village are building constraints for future growth and development, and that the Village and Perry Township will need to collaborate to properly manage stormwater as new development continues. The Village will need to adopt a drainage policy to "eliminate negative impacts on environmentally sensitive areas and to protect existing horticultural activities".

2.5.8

City of Painesville Source Water Protection Plan (SWPP), August 2016

The SWPP was the first in the State to protect a Lake Erie drinking water system, and was written through a collaboration between the City of Painesville Water Division, The Nature Conservancy, NOACA, Lake County Soil & Water Conservation District, Lake County GIS Department and Lake County General Health District. The drinking water intake is in Lake Erie, close to the mouth of the Grand River, and is affected by the water quality of the Grand River. Recommendations were given for Best Management Practices for non-point source pollution in the watershed within Critical Assessment and Potential Influence Zones.

2.5.9

Riparian Setbacks

Three communities in the watershed have riparian setbacks:

- Painesville Township: 75 feet on Red Creek and most of the tributaries, 25 on any tributary draining one square mile or less
- Perry Township: 30 feet on Red Creek and zero on the tributaries
- Perry Village: 75 feet on Red Creek, 25 on any tributary draining ½ of square mile or less

Chapter 3: Critical Area Conditions & Restoration Strategies

3.1 Overview of Critical Areas

The Critical Areas for the Red Creek-Grand River watershed are the Grand River (downstream of SR 84) and Red Creek subwatersheds. The rationale for this determination follows.

Critical Area 1: Grand River (downstream of SR 84)

The Grand River is the only Ohio tributary to Lake Erie that harbors a self-sustaining population of Great Lakes muskellunge, making it a priority for conservation. The Grand River also has a native population of walleye and northern pike, which is unique among Ohio streams. The Grand River provides habitat for many species considered rare by Ohio EPA, or listed as threatened or endangered by the Ohio Department of Natural Resources including 32 macroinvertebrate and freshwater mussel species, and 11 fish species. Because of limited summer base flows, the Grand River and its tributaries are especially sensitive to pollution and disturbance.

Aquatic life in the Grand River is fully attaining standards for Exceptional Warmwater Habitat (EWH) from Sweitzer Road (RM 42.2) to the SR 2 bridge in Painesville (RM 5.2), and is fully meeting standards for Warmwater Habitat (WWH) downstream from the SR 2 bridge. Assessments of the aquatic life habitat showed attributes for WWH began to decline downstream from River Mile 6.2 (Biological and Water Quality Study of the Grand River Basin 2003-2004, Ohio EPA, November 1, 2006). (Figure 25) "Habitat conditions on the Grand River ranged from fair to excellent with a large segment of the river above Painesville having excellent habitat. In the lowest reaches of the river, all the metrics' scores decreased successively downstream. The worsening habitat conditions may reflect the increasing levels of development (i.e., urbanization, imperviousness) and historic modifications from industrial land uses in the lower reaches of the Grand River." (Total Maximum Daily Loads for the Grand River (lower) Watershed, Final Report January 31, 2012)

Restoring and protecting high quality in-stream habitat is an objective (4.01) of the Ohio EPA Nonpoint Source Management Update. The Grand River (downstream of SR 84) is the most densely developed of the subwatersheds along the mainstem of the Grand River, making it a critical area for protection of the high quality in-stream habitat.

Figure 25: Aquatic Life Use Designation

Critical Area 2: Red Creek

Red Creek is in non-attainment of its WWH designation because of flow alteration and pollutants associated with urban storm water runoff/storm sewers. "Aquatic life in Red Creek did not meet standards for WWH, and will be difficult to achieve given the historic practices of stormwater management in densely populated areas." (Biological and Water Quality Study of the Grand River Basin 2003-2004, Ohio EPA, November 1, 2006.) At 10.6% imperviousness, Red Creek is above the threshold for channel stability and macroinvertebrate diversity.

Red Creek has the most agricultural land in the Red Creek-Grand River watershed (Figure 32). The results of the HHEI data collected by Lake SWCD show many of the stream channels in the upper or agricultural portions of the watershed have been modified, and are classified as "recent/no recovery" (Figure 19). Figure 37 shows the extent and pattern of the modifications. The stakeholders believe that attainment of aquatic life designation will occur by restoring natural flow in the agricultural areas with installation of controlled discharge systems and two-stage channels (Objective 2.04.01 (C), and Objective 2.04.01(D), respectively, Nonpoint Source Management Plan Update, Ohio EPA).

Figure 26: Critical Areas

Critical Area 1	Grand River (downstream of SR 84)
Critical Area 2	Red Creek

3.2 Critical Area 1: Conditions, Goals & Objectives for the Grand River (downstream of SR 84)

3.2.1 Detailed Characterization

The Grand River (DS of 84) covers 5,631 acres and approximately 8.8 square miles. It is at the bottom of the Grand River and contains the mouth where it drains into Lake Erie (Figure 26). The land use is largely residential, with approximately 28% of the land in industrial uses, including the former Diamond Shamrock brownfield site (Figure 27). The watershed encompasses portions of Painesville City, Painesville Township, Grand River Village and Fairport Harbor Village (Figure 28).

As the watershed increases in imperviousness over time, and storm volumes and frequency have increased, the volume of water flowing through this lowest section of the Grand River has increased as well. Velocities have increased because the river channel is largely confined by high steep cliffs. The higher volumes and velocities are very erosive in flood areas where there are no cliffs (Figure 29).

The remnants of a dam, the Abbott's Mill dam, are located under the Main Street Bridge in Painesville City. The dam is more than 100 years old; remnants include concrete and rebar sections, which have deteriorated and begun to break off and move downstream. The natural sediment transport of the river is impeded by the dam remnants. Dam remnants along the western bank of the river deflect the flow and deny the river access to the western floodplain area, placing stress on the eastern banks and floodplain areas.

Figure 27. Grand River (downstream of SR 84) Location

Figure 28. Grand River (downstream of SR 84) Land Use

Figure 29. Grand River (downstream of SR 84) Communities

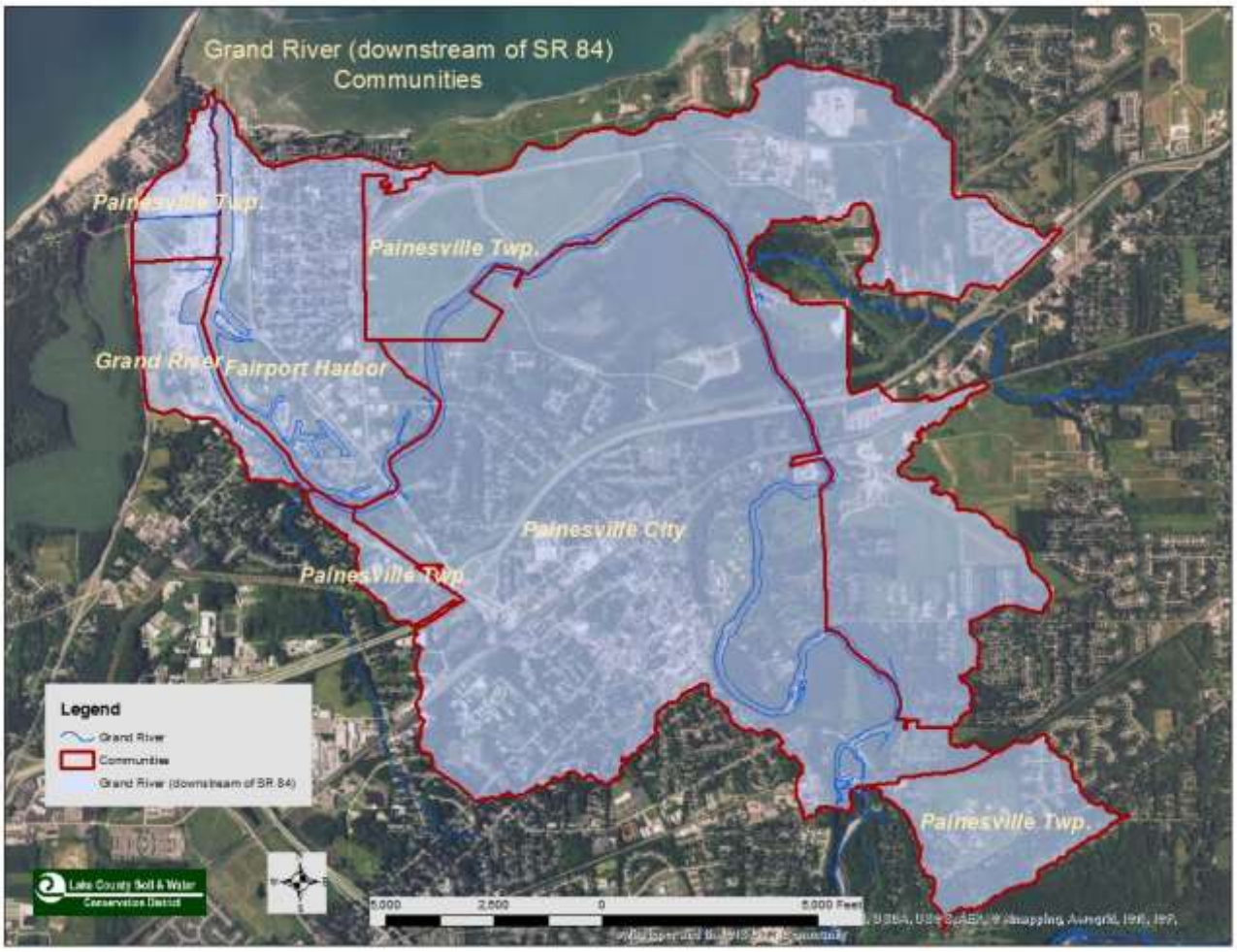
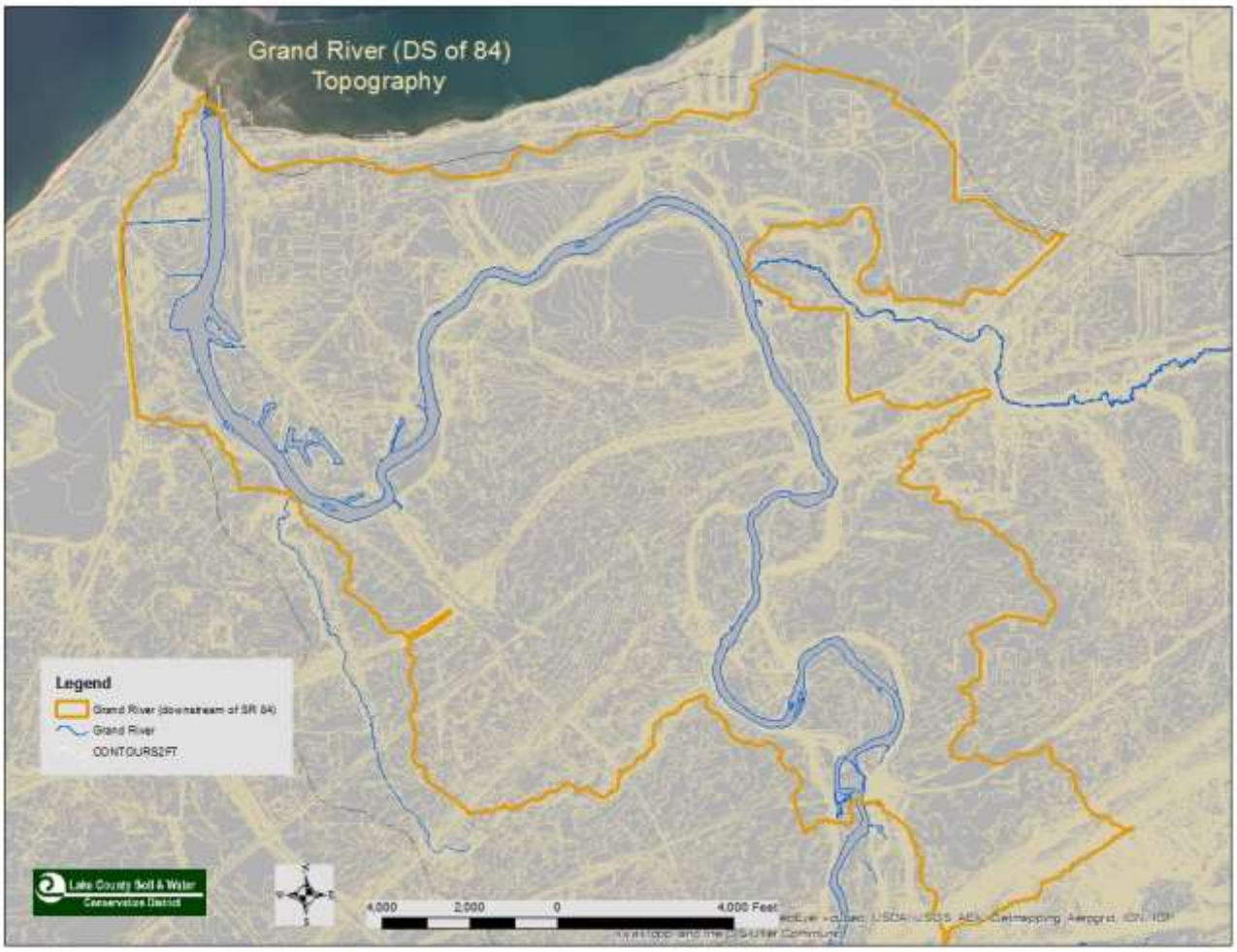


Figure 30. Grand River (downstream of SR 84) Topography



3.2.2 Detailed Biological Conditions

Aquatic life in Critical Area 1, the Grand River (DS of 84) is designated as a Warmwater Habitat (WWH) with a Seasonal Salmonid use designation. The QHEI ranges from 78 near the East Erie Street Bridge in Painesville to 91 near the upper end of the watershed. Aquatic life in the Grand River is fully attaining standards for Exceptional Warmwater Habitat (EWH) from Sweitzer Road (RM 42.2) to the SR 2 bridge in Painesville (RM 5.2), and is fully meeting standards for Warmwater Habitat (WWH) downstream from the SR 2 bridge. Fish communities in the Grand River have an exceptionally high degree of biological integrity. "The Grand River is one of the few rivers in Ohio that has a full suite of endemic, naturally reproducing and self-sustaining top carnivores including walleye, northern pike and muskellunge. The latter is the Great Lakes subspecies (Esox masquinongy masquinongy), and so represents a vitally important area for genetic and habitat conservation. Given the propensity for muskellunge to differentiate into unique strains, the population in the Grand River may well be a truly endemic strain. As it stands, it is the last naturally reproducing muskellunge population found in any of Ohio's Lake Erie tributaries.

The Grand River is the only Ohio tributary to Lake Erie that harbors a self-sustaining population of Great Lakes Muskellunge, and therefore is a priority for conservation. The Grand River is also has a native population of walleye and northern pike making it singularly unique among Ohio streams. The Grand River and its tributaries provide habitat for many species considered rare by Ohio EPA, or listed as threatened or endangered by the Ohio Department of Natural Resources including 32 macroinvertebrates and freshwater mussel species, and 11 fish species. The single greatest threat to the Grand River basin is suburbanization. " (Lower Grand River Watershed Plan; Grand River Partners.)

The Ohio EPA's *2012 TMDLs for the Grand River (Lower) Watershed* stated that habitat analysis data from 2003 and 2004 indicated that all of the metrics' scores decreased successively downstream. It suggested that decreases in habitat quality may be due to historical modification from industrial land uses and increased urbanized development and imperviousness (2012).

The Grand River main stem is especially sensitive to pollution and disturbance to limited summer base flows and steps must be taken to maintain the biological integrity of the River. (Lower Grand River Watershed Plan; Grand River Partners.)

3.2.3 Detailed Causes and Associated Sources

The causes and sources of impairment in Grand River (DS of 84) are outlined below (Total Maximum Daily Loads for the Grand River (lower) Watershed; Ohio EPA, January 2012; stakeholder identification).

Cause	**Source**
Habitat alteration	Urban/Suburban runoff Hydromodification
Siltation and sedimentation	• Riparian deforestation • Streambank erosion, channel scour, bank failure • Lowhead dam
Flow alteration and imperviousness	• Urban runoff/storm sewers
Organic enrichment/dissolved oxygen	Untreated/Undertreated Stormwater Runoff • Residential, single family development • Commercial/Institutional development • Riparian deforestation
Temperature	• Urban/Suburban runoff

3.2.4 Outline Goals and Objectives for the Critical Area

Goals	Objectives

1. Maintain EWH attainment
• Maintain QHEI at or above 70
  o Site currently has a score of 78
• Maintain IBI at or above 50
  o Site currently has a score of 58
• Maintain MIwb at or above 9.4
  o Site currently has a score of 9.8
• Maintain ICI at or above 46
  o Site currently has a score of 54
	1.1 Restore natural flow
	• Remove 1 lowhead dam under Madison Avenue bridge
	1.2 Reduce the rate and amount of stormwater runoff
	• Install LID retrofits on at least 5 acres of practices on urbanized land use
	1.3 Manage invasive species
	• Remove 15 acres of invasive species in riparian areas
	• 1.4 Stabilize severely eroding streambanks
	• Stabilize 2200 feet of eroding stream bank

Maintaining the Exceptional Warmwater Habitat attainment in the Grand River is a top priority for the stakeholders. The level of development in the lower reaches of the watershed requires a looking back to address imperviousness as never before, and a looking forward to maintain a balance that protects the unique and treasured resources of the watershed.

As the objectives are implemented, water quality monitoring will be conducted (both project related and regularly scheduled monitoring) to determine progress toward meeting the identified water quality goals. These objectives will be reevaluated and modified or added to if determined to be necessary. Reevaluation will utilize the Ohio EPA Nonpoint Source Management Plan Update (Ohio EPA, 2013) which lists all the eligible NPS management strategies to address:

- Urban sediment and nutrient reduction
- Altered stream and habitat restoration
- Nonpoint source reduction
- High quality waters protection

3.2 Critical Area 2: Conditions, Goals & Objectives for the Red Creek Subwatershed

3.2.1 Detailed Characterization

Critical Area 2, the Red Creek Subwatershed, drains 5,551 acres or 8.7 square miles (Figure 36). It has a higher percentage of developed land than most of the rest of the Grand River Watershed. 40% of the land is in agricultural land use (nurseries) and 37% is in residential land use (Figure 37). As such, it has begun to develop water quality issues related to increased imperviousness and is experiencing larger runoff volumes, higher peak flows, and flashy streams. Its hydrology is dominated by small coldwater tributary streams and storm water flows. Unlike in the Grand River, Red Creek has sustained flow throughout the summer because of ground water from beach ridges and a thick soil horizon.

The watershed encompasses Painesville Township and Perry Township, with small portions in Perry Village and the City Painesville (Figure 38).

The Red Creek Watershed is on the Erie/Ontario Lake Plain. It is fairly level, but cuts down through the glacial till to the level of the Grand River along Red Creek in the central and western sections of the watershed (Figure 39). 65% of the soils have hydric or somewhat poorly drained drainage characteristics (Figures 40 & 41). It becomes apparent that there has been extensive work to drain the nursery fields, when looking at a close-up view of the topographical map (Figure 42).

Figure 31. Red Creek Subwatershed Location

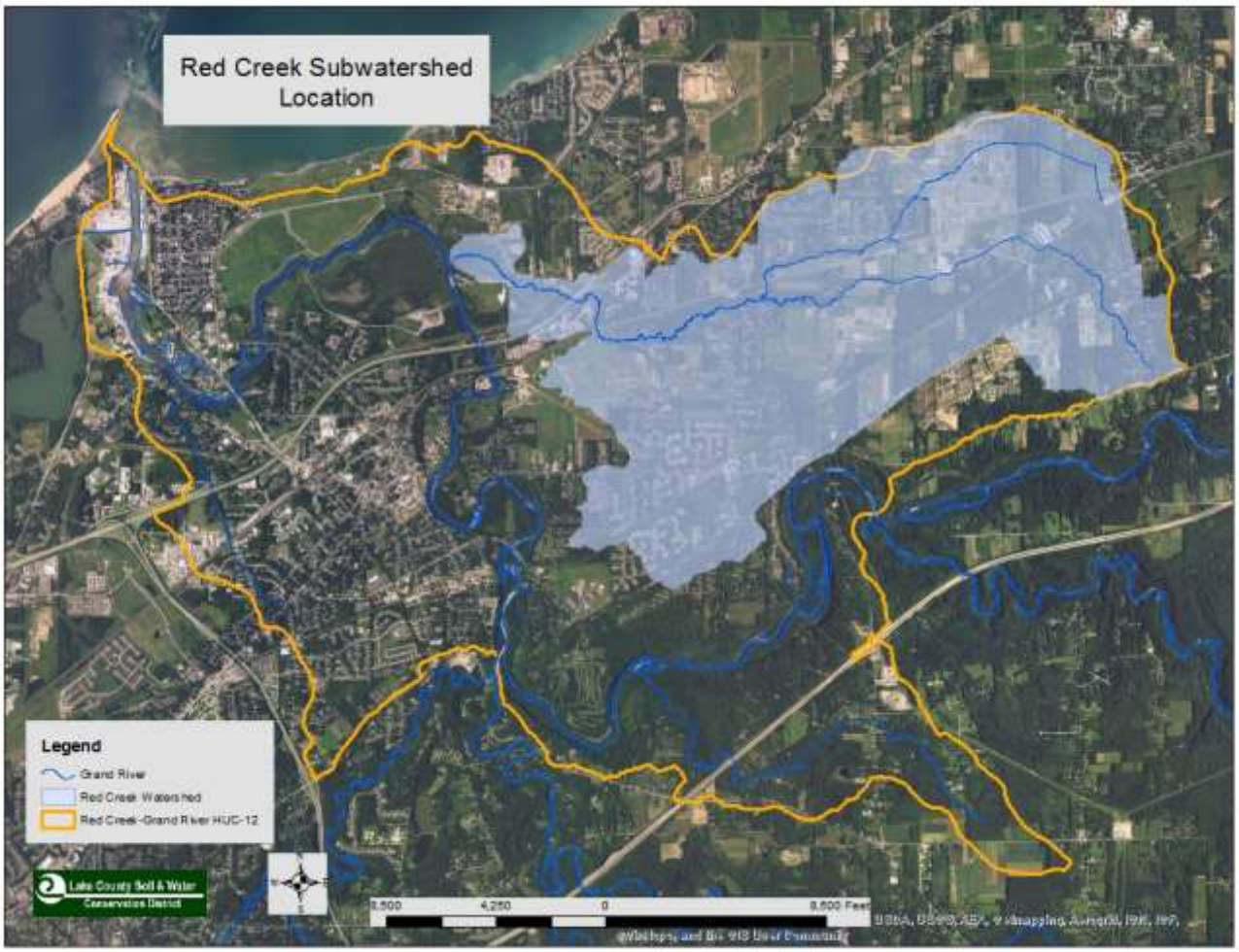


Figure 32. Red Creek Subwatershed Land Use

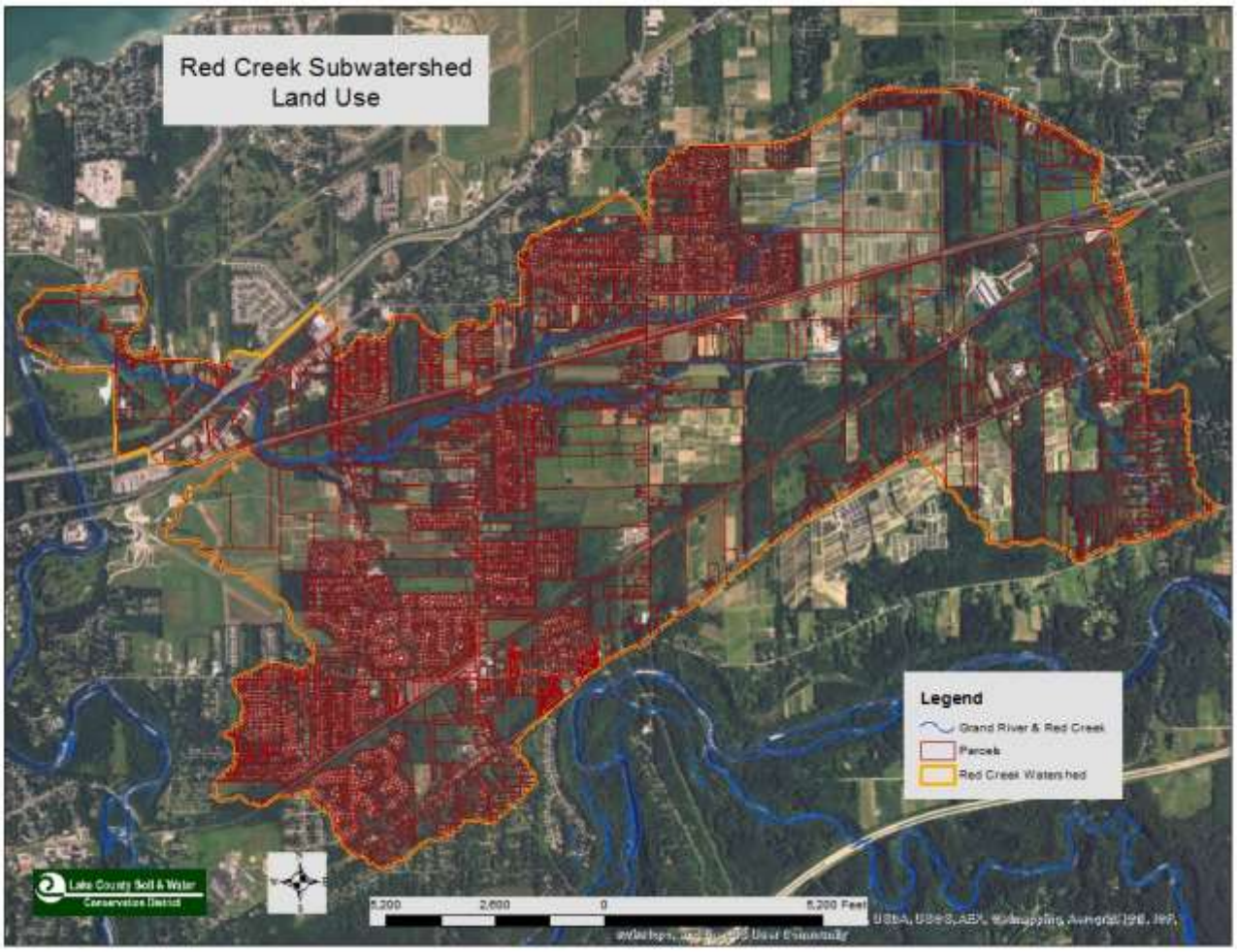


Figure 33. Red Creek Subwatershed Communities

Figure 34. Red Creek Subwatershed Topography

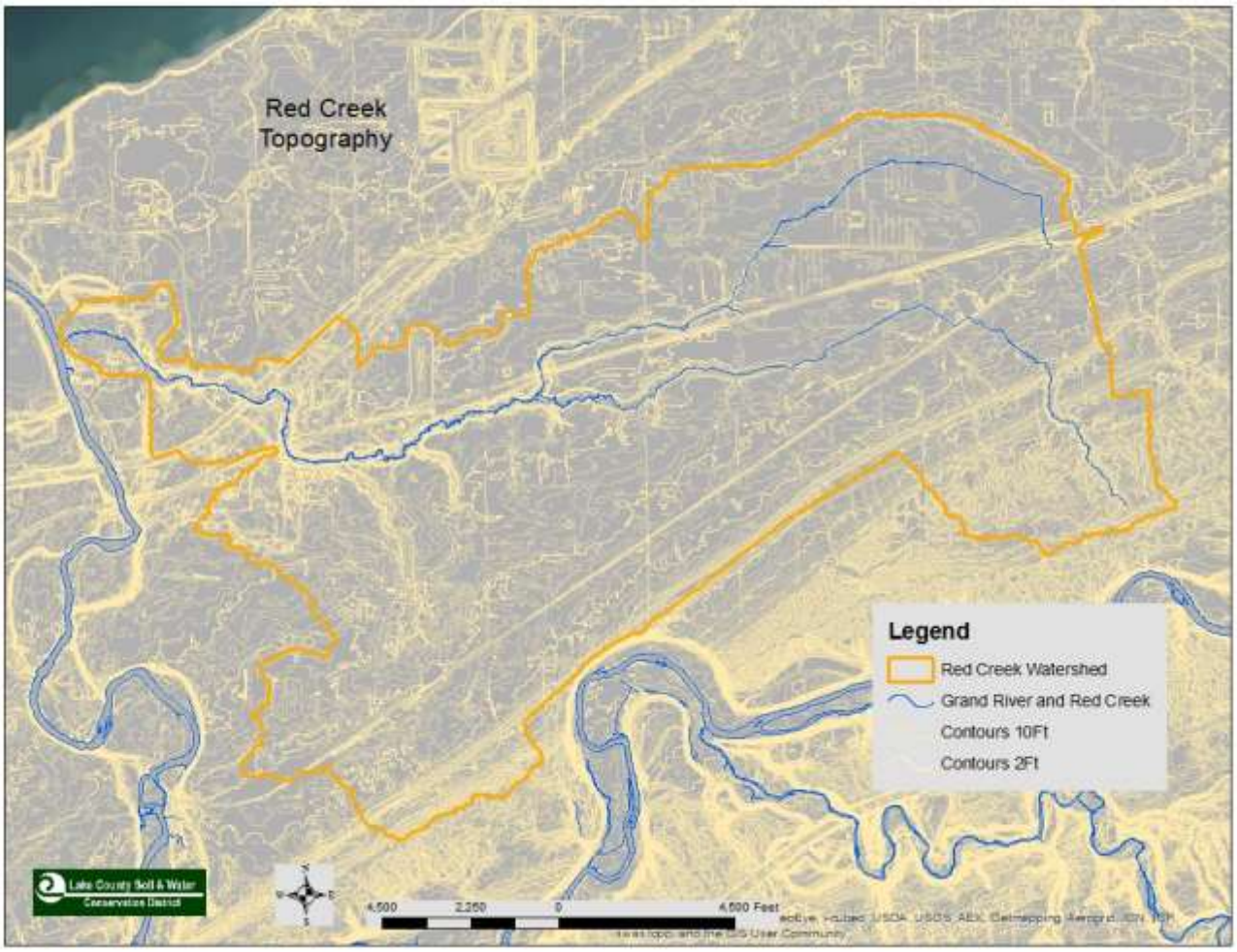


Figure 35. Red Creek Subwatershed Soil Hydrology

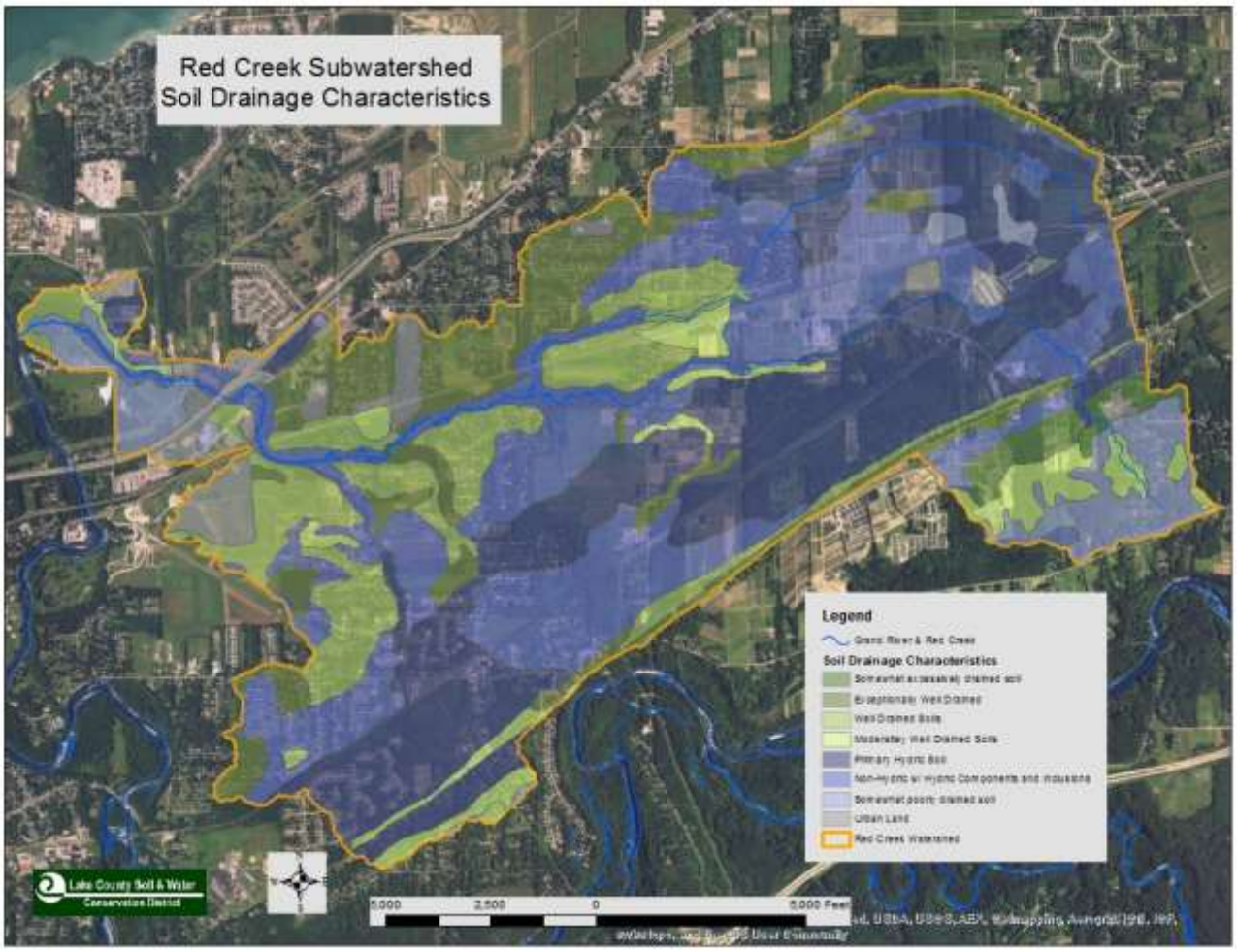


Figure 36. Red Creek Soil Drainage Characteristics

Soil Drainage	Percentage
Exceptionally Well, Well, Mod. Well Drained	30.5%
Hydric, Somewhat Poorly Drained	65%
Urban	4.5%
	100%

Figure 37. Red Creek Subwatershed Topography & Drainage

3.2.2 Detailed Biological Conditions

The Ohio EPA has given Red Creek Warmwater Habitat (WWH) and Seasonal Salmonid Habitat (SSH) designations. Waterbodies with SSH designation are "capable of supporting the passage of salmonids from October to May and are waterbodies large enough to support recreational fishing." (Ohio EPA Lower Grand River Watershed TMDL)

Red Creek has been identified as Impaired for Aquatic Life Use by the Ohio EPA. Bacteria impairments have also been identified in Red Creek, with *E. coli* readings of 428 (greater than seasonal geometric mean standard of 161 counts per 100 mL for PCR Class B waterbodies). Maximum Phosphorus data (0.098) exceeded 0.08 mg/L in for headwaters WWH, although the average readings were 0.067. Maximum and average Nitrate data (1.71 and 1.56 respectively) exceeded 1.0 mg/L for WWH. (Ohio EPA Lower Grand River Watershed TMDL)

In 2003 and 2004 Ohio EPA assessed the habitat conditions and found them to be good to excellent. The QHEI score for Red Creek was 67. Ohio EPA found it noteworthy that good to excellent habitat is still on streams that have been developed or are beginning to develop. However, 4 out of 7 of the

habitat scores for Red Creek measured 50 to 75% of the maximum score (in orange), and 1 measured in the 0 to 50% range (in red) (Figure 43).

Red Creek drains a suburbanized former lake plain; consequently, its parent, fine-grained lacustrine substrates are moderately embedded with silt. The lower reach, where sampled, had not been channelized, and so had sufficient habitat attributes to support a Warmwater stream fish assemblage (Ohio EPA 2006, p. 66).

Red Creek is in non-attainment of its WWH designation because of flow alteration and pollutants associated with urban storm water.

Figure 38. QHEI Metric Scores for Red Creek

Substrate (20)	In-Stream Cover (20)	Channel Morph. (20)	Bank erosion & riparian zone (10)	Pool/glide (12)	Riffle/run (8)	Gradient (10)
13	16	14.5	6.5	9	2	6

(The numbers in parentheses are the total possible metric scores.)

3.2.3 Detailed Causes and Associated Sources

The causes and sources of impairment in Red Creek are outlined below (Biological and Water Quality Study of the Grand River Basin 2003-2004, Ohio EPA, November 1, 2006; stakeholder identification).

Cause	Source
Flow alteration, toxicity	Urban runoff
Hydromodification	Agricultural land drainage

3.2.4 Outline Goals and Objectives for the Critical Area

Goals	Objectives
2.1 Raise HHEI scores to 50 at Lane Road south of the Railroad tracks • Not Achieved: Site currently has a score of 36	2.1.1 Restore and protect riparian habitat. Plant riparian buffer on 2000 feet on agricultural fields
2.2 Raise HHEI scores to 50 at Lane Road north of the Railroad tracks • Not Achieved: Site currently has a score of 46	2.2.1 Restore and protect natural flow conditions. Install 5 controlled drainage systems on nursery fields. 2.2.2 Convert 2000 feet of agricultural ditches to two-stage channels
2.3 Raise HHEI scores to 50 at Park Drive • Not Achieved: Site currently has a score of 36	2.3.1 Protect and restore riparian forested areas. Acquire conservation easements on 50 acres of wooded wetlands

Hydromodification is a large source the nonpoint pollution in the watershed, so the stakeholders chose to use biological community performance measures to determine attainment levels. Using biology lets us look at trends over time and assess habitat conditions including sediment transport and water quality. If the biology is there, it is a good indicator of a healthy watershed and not just a healthy stream segment.

As the objectives are implemented, water quality monitoring will be conducted (both project related and regularly scheduled monitoring) to determine progress toward meeting the identified water quality goals. These objectives will be reevaluated and modified or added to if determined to be necessary. Reevaluation will utilize the Ohio EPA Nonpoint Source Management Plan Update (Ohio EPA, 2013) which lists all the eligible NPS management strategies to address:

- Urban sediment and nutrient reduction
- Altered stream and habitat restoration
- Nonpoint source reduction
- High quality waters protection

Chapter 4: Projects and Implementation Strategy

4.1 Projects and Implementation Strategy Overview Table

The projects and evaluation needs that are believed to be necessary to remove the impairments to the Red Creek-Grand River HUC-12 are listed below. They were determined by evaluating the identified causes and associated sources of nonpoint source pollution. Because the attainment status is based upon biological conditions, it will be necessary to periodically re-evaluate whether or the implemented projects are sufficient to achieve restoration. The response of biological systems may take some time following project implementation. If issues other than nonpoint source pollution are causing impairments, they will need to be addressed under different initiatives, authorities or programs.

There are two Project and Implementation Strategy Overview Tables, one for each Critical Area. Critical Area 1 has one Goal, to maintain the EWH attainment in that section of the Grand River. Critical Area 2 Goals aim to address flow alteration and toxicity from urban runoff and hydromodification of agricultural land drainage through restoration of natural flow conditions and habitat.

The projects described in the Overview Tables have been prioritized using the following three step prioritization method:

Priority 1: Projects that specifically address one or more of the listed Objectives for the Critical Area.

Priority 2: Projects where there is land-owner willingness to engage in projects that are designed to address the cause(s) and source(s) of impairment or where there is an expectation that such potential projects will improve water quality in Red Creek- Grand River.

Priority 3: In an effort to generate interest in projects, an information and education campaign will be developed and delivered. Such outreach will engage citizens to spark interest as stakeholders to participate and implement projects like those mentioned in Priority 1 and 2.

Project Summary Sheets (PSS) are in subsection 4.2. These PSS provide the essential nine elements for short-term and/or next step projects that are in development and/or in need of funding. As projects are implemented and new projects developed these sheets will be updated. Any new PPS created will be submitted to the state of Ohio for funding eligibility verification (i.e., all nine elements are included).

Section 4.1 Project and Implementation Strategy Overview Table(s)

For *Red Creek- Grand River HUC-12* (*041100040607*) — Critical Area 1								
Applicable Critical Area	**Goal**	**Objective**	**Project #**	**Project Title** *(EPA Criteria g)*	**Lead Organization** *(criteria d)*	**Time Frame** *(EPA Criteria f)*	**Estimated Cost** *(EPA Criteria d)*	**Potential/Actual Funding Source** *(EPA Criteria d)*
Recommend that your critical areas be numbered or coded for reference.That number/code listed here comes from Chapter 3 section 3.1	*It is recommended that your goals and objectives be numbered or coded for easy reference. The number/code listed here comes from Chapter 3 section 3.x.4.*		*The information listed here comes from the Project Summary Sheets Chapter 4 Table 4.2.*	*The information listed here comes from the Project Summary Sheets Chapter 4 Table 4.2.*	*The information listed here comes from the Project Summary Sheets Chapter 4 Table 4.2.*	*The information listed here comes from the Project Summary Sheets Chapter 4 Table 4.2.*	*The information listed here comes from the Project Summary Sheets Chapter 4 Table 4.2.*	*The information listed here comes from the Project Summary Sheets Chapter 4 Table 4.2.*
Urban Sediment and Nutrient Reduction Strategies								
Altered Stream and Habitat Restoration Strategies								
Agricultural Nonpoint Source Reduction Strategies								
High Quality Waters Protection Strategies								
1	1	1.1	1	Removal of Abbott's Mill Dam Remnants on the Grand River	Lake County Engineer	1-3 years	$88,426	319
1	1	1.2	2	LID Retrofits	Lake SWCD	Medium		319, GLRI
1	1	1.3	3	Invasive species removal	Lake SWCD	Medium		319, GLRI
1	1	1.4	4	Bank stabilization	Lake SWCD	Long		NRCS
Other NPS Causes and Associated Sources of Impairment								

For *Red Creek- Grand River HUC-12* (*041100040607*) — Critical Area 2								
Applicable Critical Area	**Goal**	**Objective**	**Project #**	**Project Title** *(EPA Criteria g)*	**Lead Organization** *(criteria d)*	**Time Frame** *(EPA Criteria f)*	**Estimated Cost** *(EPA Criteria d)*	**Potential/Actual Funding Source** *(EPA Criteria d)*
Recommend that your critical areas be numbered or coded for reference.That number/code listed here comes from Chapter 3 section 3.1	*It is recommended that your goals and objectives be numbered or coded for easy reference. The number/code listed here comes from Chapter 3 section 3.x.4.*		*The information listed here comes from the Project Summary Sheets Chapter 4 Table 4.2.*	*The information listed here comes from the Project Summary Sheets Chapter 4 Table 4.2.*	*The information listed here comes from the Project Summary Sheets Chapter 4 Table 4.2.*	*The information listed here comes from the Project Summary Sheets Chapter 4 Table 4.2.*	*The information listed here comes from the Project Summary Sheets Chapter 4 Table 4.2.*	*The information listed here comes from the Project Summary Sheets Chapter 4 Table 4.2.*
Urban Sediment and Nutrient Reduction Strategies								
Altered Stream and Habitat Restoration Strategies								
2	1	2.1.1	1	Riparian plantings	Lake SWCD	Medium		319, Clean Ohio
2	2	2.2.1	2	Controlled Drainage systems	Lake SWCD	Medium		319, NRCS
2	2	2.2.2	3	Two-stage channels	Lake SWCD	Medium		319, NRCS
2	3	2.3.1	4	Riparian forest easements	Lake SWCD	Medium		319, NRCS
Agricultural Nonpoint Source Reduction Strategies								
High Quality Waters Protection Strategies								
Other NPS Causes and Associated Sources of Impairment								

Section 4.2 Critical Area 1: Project Summary Sheet(s)

The project summary sheets provided below were developed based upon the actions needed to maintain EWH attainment for Critical Area 1. This project is considered a next step or priority/short term project because it has been thoroughly planned and is ready for implementation. Other short term, medium and longer term projects will not have a project summary sheet because they are not yet ready for implementation.

Nine Element Criteria	Information needed	Explanation
n/a	**Title**	Removal of Abbott's Mill Dam Remnants on the Grand River
criteria d	**Project Lead Organization & Partners**	Lake County Engineer, City of Painesville Engineer
criteria c	**HUC-12 and Critical Area**	HUC 12- 041100040607; Critical Area 1
criteria c	**Location of Project**	*Lower Grand River, under the East Main Street Bridge in the City of Painesville, Lake County Ohio*
n/a	**Which strategy is being addressed by this project?**	*Provide the NPS reduction, restoration or protection strategy from* Ohio's Nonpoint Source Management Plan (Update) *that will be addressed by this project.* Restore free flowing stream
criteria f	**Time Frame**	Short-Term (1-3 yr.)
criteria	**Short Description**	The Lake County Engineer proposes to remove 106 yards of concrete and steel remnant dam materials from the Grand River. The project will improve floodplain access and natural flow along at least 500 linear feet of downstream areas on both banks.
criteria g	**Project Narrative**	The Lake County Engineer, with the assistance of the City of Painesville Engineer will remove the remnants of the Abbott's Mill Dam on the lower Grand River, underneath the East Main Street Bridge in the City of Painesville. The removal activity will fully eliminate the physical alteration to the river caused by the old dam. The concrete and rebar remnants of the dam are more than 100 years old and have begun to deteriorate, break off and move downstream. The dam remnants will be broken up and removed from the bridge directly above the project site, which will minimize disturbance to the river bed, floodplains and riparian areas. The project will improve the flow regime of the lower Grand River and improve water quality by returning natural sediment transport to the river and reducing riverbank erosion. Aquatic habitat and fish passage will be improved. The Grand River is the only Ohio tributary to Lake Erie that contains a self-sustaining population of Great Lakes muskellunge. Native populations of walleye and northern pike are also present. The project site is located within a designated seasonal salmonid habitat. The Grand River mainstem is especially sensitive to pollution and disturbance due to limited summer base flows, and this project will help to maintain the

		biological integrity of the river.
criteria d	**Estimated Total cost**	Total cost: $88,426 (see table below)
criteria d	**Possible Funding Source**	Ohio EPA 319
criteria a	**Identified Causes and Sources**	Cause: Direct Habitat Alteration/Flow Alteration Source: Lowhead dam
criteria b & h	**Part 1: How much improvement is needed to remove the NPS impairment for the whole Critical Area?**	This project is aimed to protect attainment of the aquatic beneficial use at or above a QHEI score of 70.
	Part 2: How much of the needed improvement for the whole Critical Area is *estimated* to be accomplished by this project?	This project will restore free movement of the Grand River, of sediment loads and of fish passage. It completely addresses Objective 1 in Critical Area 1.
	Part 3: Load reduced?	10 tons/ year of sediment, 19 pounds/year of nitrogen, and 10 pounds/year of phosphorous. This project is aimed to protect the attainment of the aquatic life beneficial use above the threshold metrics of 70 for QHEI, 50 for IBI, 46 for ICI and 9.4 for MLwb.
criteria i	**How will the effectiveness of this project in addressing the NPS impairment be measured?**	Staff from the OEPA-DSW Ecological Assessment Unit will perform both pre and post project monitoring. The next full-scale OEPA-DSW watershed assessment is scheduled for 2019.
criteria e	**Information and Education**	Lake County, the City of Painesville and Chagrin River Watershed Partners (CRWP) will promote and highlight how this project improves hydrology and water quality within the lower Grand River Watershed, with the following activities: • The County will issue a press release following the grant award • The County will install a project sign onsite to educate the public about the benefits of dam removal projects and allowing rivers access to their floodplains • Develop a factsheet detailing the project for distribution by Lake County • Highlight the project on the Lake County website • Highlight the project on the City of Painesville website • Highlight the project in the City of Painesville news publication, the *Painesville Pride* CRWP will present information about the project to attendees of the Board of Trustees meeting which typically averages over 40 local officials

Federal

Budget Justification

*Provide a summary of your **TOTAL FEDERAL GRANT FUNDS** project budget (by category) and include a **BRIEF** justification and **ITEMIZED** breakdown for the amount proposed in each category. **ANY** budget category with an amount entered **MUST** be accompanied by a justification/description. Applicants requesting PERSONNEL and/or FRINGE BENEFIT funding MUST also complete a PERSONNEL ROSTER.*

Category	Federal $$ Requested	BUDGET Justification & Description
Personnel: Include a Personnel Roster if Personnel funds are requested. (Check activity description for any limits on personnel)	**$13,818**	Lake County personnel to break up and remove the dam remnants, haul away the materials, and construct the educational sign: -Laborer -Truck Driver -Laborer -Equipment Operator -Laborer -Sign Shop Laborer
Fringe Benefits Include a Personnel Roster if Fringe Benefit funds are requested	**$6,963**	Fringe benefits for the following Lake County personnel to break up and remove the dam remnants, haul away the materials, and construct the educational sign: -Laborer -Truck Driver -Laborer -Equipment Operator -Laborer -Sign Shop Laborer
Travel		
Equipment		
Supplies	**$8,000**	Purchase of the following supplies: • 40 diamond tip blades @ $200/unit = $8,000
Subcontract: Include a Subcontract Worksheet.	**$47,445**	Subcontract costs for: • Environmental permitting and associated site assessments and environmental analyses • Grant administration and management
Other	**$12,200**	Other items include educational sign materials ($200) and the rental of the following equipment: • 1 hydraulic excavator @ $100/hr X 80 hr = $8000 • jack hammer attachments @ $50/hr X 80 hr = $4000
Cost Share		
TOTAL	**$88,426**	

Works Cited

Center for Watershed Protection. (2002). Watershed Vulnerability Analysis report. (http://online.sfsu.edu/jerry/geo_642/refs/Vulnerability_Analysis.pdf)

ERIN Watershed Report. Red Creek- Grand River Watershed.

Ohio EPA. (2006). Biological and Water Quality Study of the Grand River Basin 2003-2004.

Ohio EPA. (2009). Three Types of Primary Headwater Habitat. Field Evaluation Manual for Ohio's Primary Headwater Habitat Streams.

Ohio EPA. (2004). Integrated Water Quality Monitoring and Assessment Report. (http://www.epa.ohio.gov/dsw/tmdl/ohiointegratedreport.aspx)

Ohio EPA. (2012). Total Maximum Daily Loads for the Grand River (lower) Watershed.

Ohio EPA. (2013). Ohio's Nonpoint Source Management Plan Update (FY 2014-2018). Columbus.

Ohio EPA. (2016). Guide to Developing Nine-Element Nonpoint Source Implementation Strategic Plans in Ohio. Columbus.

Ohio EPA. (2016). Water Quality Summary- 2016 Integrated Report. (http://www.epa.ohio.gov/dsw/tmdl/ohiointegratedreport.aspx)

The Cleveland Museum of Natural History. (2002). *A Natural History of Lake County, Ohio*. Rosemary Szubski, editor.

United States Army Corps of Engineers. (2016). Red Creek- Grand River Watershed Assessment for Sediment Transport. Great Lakes Tributary Modeling Program 516(e). Sediment Transport Analysis and Regional Training (START) Initiative.

Appendix A. Acronyms

BMP	Best Management Practice
CWH	Cold Water Habitat
EQIP	Environmental Quality Incentives Program
ERIN	Earth Resources Information Network
EWH	Exceptional Warmwater Habitat
GIS	Geographic Information System
FEMA	Federal Emergency Management Agency
HHEI	Headwater Habitat Evaluation Index
HIT	High Impact Targeting
HUC	Hydrologic Unit Code
IBI	Index of Biotic Integrity
ICI	Invertebrate Community Index
LF	Linear Feet
L-THIA	Long-Term Hydrologic Impact Assessment
LID	Low Impact Development
MIwb	Modified Index of Well Being
NPDES	National Pollutant Discharge Elimination System
NPS	Nonpoint Source
NPS-IS	Nonpoint Source Implementation Strategy
NRCS	Natural Resources Conservation Service
NWI	National Wetlands Inventory
ODA	Ohio Department of Agriculture
ODNR	Ohio Department of Natural Resources
OEPA	Ohio Environmental Protection Agency
PHWH	Primary Headwater Habitat
QHEI	Qualitative Habitat Evaluation Index
SMD	Stormwater Management Department
START	Sediment Transport Analysis and Regional Training
SWCD	Soil & Water Conservation District
TMDL	Total Maximum Daily Load
TSS	Total Suspended Solids
USACE	United States Army Corps of Engineers
USDA	United States Department of Agriculture
USEPA	United States Environmental Protection Agency
WEPP	Web-Based Water Erosion Prediction Project
WWH	Warmwater Habitat