COLDWATER FISHERIES INVENTORY FOR KENT COUNTY, MICHIGAN

2018 UPDATE

Prepared By:

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

EXECUTIVE SUMMARY

The Schrems West Michigan Chapter of Trout Unlimited's district covers over 4,700 square miles and includes an overwhelming number of streams and rivers. Attempting to fulfill our mission over this geographic area requires an understanding of these resources beyond what is currently available. While a great deal of information exists on our streams, it has never been compiled into a single document for use by an organization such as ours.

This report represents our first efforts in a comprehensive understanding of the coldwater resources in our district, and is intended to serve as a detailed reference for all of the coldwater streams in Kent County, which lies within the center of our district, is home to many or our members and board members, and includes our largest population center, the City of Grand Rapids, and its bedroom communities.

In addition to background information relative to the location, history, biology and known impairments of Kent County coldwater streams, this report includes specific recommendations for monitoring, protection and restoration. This report is intended to be a "living" document, with continuous updates and revisions as additional information becomes available. A vast amount of information has been compiled and summarized in this report. An attempt was made to present the information in a format that is not overwhelming and can lead to protection and measureable improvement of our coldwater resources.

Many of the small tributary streams to our larger rivers such as the Grand and Rogue flow through private land and are not necessarily fishable, but serve critical roles as nursery streams by providing a spawning and rearing habitat, and provide seasonal refuge for temperature sensitive fish. Streams such as Shaw, Stegman and Rum Creeks flow icy cold and are lifelines to the thermally-threatened mainstem of the Rogue River. Protection of these small streams and their habitats for supporting early-life stages of coldwater fish are crucial.

Medium-sized streams, especially those that are blocked from migratory salmon and steelhead, support sustainable brown trout populations with various age-classes of trout. Bear, Cedar, Tyler and Duke Creeks are prime examples and all offer some degree of public access. Instream and riparian improvement and barrier removal projects would benefit their coldwater ecosystems.

A surprising number of Kent County streams harbor self-sustaining brook trout populations. While most of the populations are small and dominated by brown trout, a few places were found to exist where brook trout are the dominant species and the fish thrive in small, often overgrown and unfishable streams. Generally, these streams are inaccessible to non-native trout and salmon. These small streams are true treasures and are very susceptible to impacts.

Urban streams such as Buck, Indian Mill and Mill Creeks and the lower Rogue River represent the last of our urban coldwater fisheries in Kent County. These streams offer unique recreational and educational opportunities to a large population. Based upon the data collected for this report, Indian Mill and Mill Creeks and the Rogue River appear to serve as important nursery habitats for

migratory trout and salmon. Buck Creek is unique to these three streams in that it contains trout populations near areas of significant public access.

INTRODUCTION

Schrems West Michigan Chapter of Trout Unlimited

Schrems West Michigan Chapter of Trout Unlimited (Schrems) was founded in 1962 because of concerns for the health of local streams and the trout that live in them. Our chapter, since its beginning, has been involved with many activities from river clean-up, stream monitoring, bank erosion monitoring and stabilization, fish shocking, invertebrate studies and fly fishing clinics, along with the many concerns that effect our environment in today's society. Our work on the river needs continuous attention, dedication and volunteer labor from trout enthusiasts, because what affects us today will be left behind for the next generations.

Mission Statement

To conserve, protect and restore West Michigan's coldwater fisheries and their watersheds, and to provide a forum for the exchange of information concerning coldwater fisheries and the techniques and the sport of trout fishing.

Vision Statement

Schrems looks to an increasing presence in the conservation, protection and restoration of coldwater fisheries in the West Michigan region. Leading by example, the chapter will work on all levels to create awareness of and involvement in trout fishing. Projects in fisheries protection and restoration will be selected on the basis of need, resources and appropriateness to its overall mission, and will be used in an environmentally responsible manner.

Schrems will act as an educator, facilitator and catalyst using partnerships to expand its reach and effectiveness. While maintaining regional focus, Schrems will remain open to support from, and will provide support to, the State Council and the National Chapter of Trout Unlimited to:

- Encourage research into the basic biology and ecology of trout populations.
- Advocate increased emphasis on habitat preservation, pollution abatement, stream improvement, watershed rehabilitation and lake and stream reclamation.
- Encourage the adoption of appropriate regulations and limitations on trout fishing that conserve and enlarge the wild trout fishery and expand the opportunity to fish for native trout.
- Emphasize wild trout and anadromous fish management.
- Urge the inventory and classification of all trout streams.
- Vigorously resist the unnecessary alteration, pollution and destruction of trout habitat by road construction, industry, agriculture, mining, impoundments, etc.

- Utilize every available means to educate the public to a better understanding of trout problems, a more tolerant attitude toward trout regulations and a richer enjoyment of the sport.
- Support the efforts of institutions, agencies, organizations and individuals actively engaged in carrying out Trout Unlimited's and similar mission and vision.
- Encourage the participation of all members in all aspects of chapter activities: to have fun, meet exceptional people, and to celebrate the joys of trout fishing

With an active membership and strong desire to promote the mission of Trout Unlimited (TU), Schrems boasts many accomplishments, including receiving TUs highest award, the Gold Trout, from TU National in 2010. Only one Gold Trout award is granted annually in North America, to the chapter that has made the most noteworthy contribution to the cause of coldwater conservation during the previous year. Schrems was also awarded the Michigan Chapter of the Year in 2006 and 2007, and completed over $150,000 in stream improvement projects during the few years leading up to the initial draft of this project. Between the years of 2008 and 2018, over $1 million has been spent on projects directly benefiting area coldwater streams in Schrems' district. In 2010, Schrems sponsored nine Salmon in the Classroom projects with local schools. In 2018, that

Schrems boasts many accomplishments, including receiving TUs highest award, the Gold Trout, from TU National in 2010

number has doubled to 18 schools.

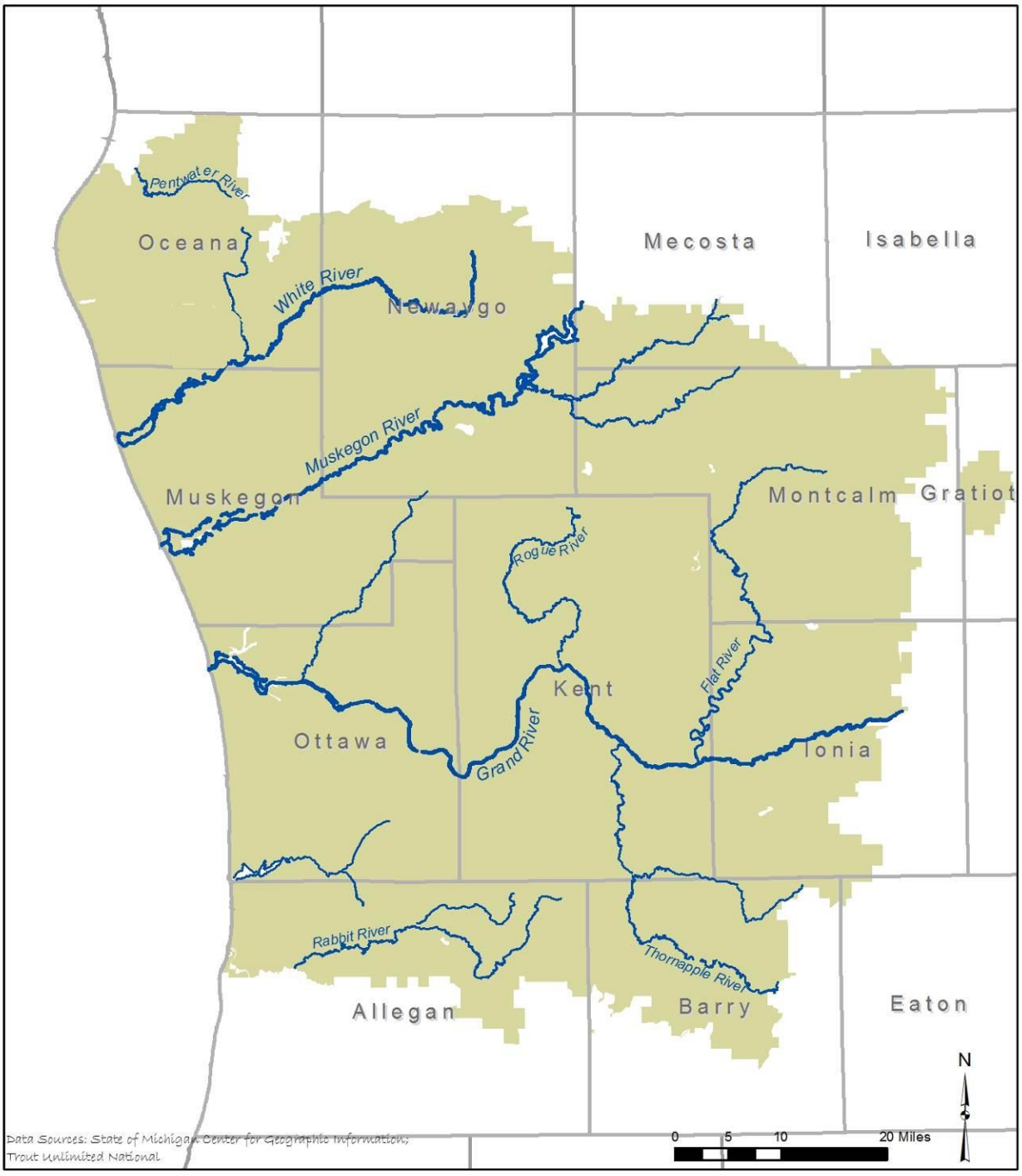
Purpose

Schrems' district covers over 4,700 square miles and includes an overwhelming number of streams and rivers (Figure 1). Attempting to fulfill our mission over this geographic area will require an understanding of these resources beyond what is currently available. While a great deal of information exists on our streams, it has never been compiled into a single document for use by an organization such as ours, and a strategic plan has been a missing component to planning projects and pursuing funding.

This report represents our first efforts in understanding the coldwater resources in our district, and is intended to serve as a detailed reference for all of the coldwater streams in Kent County, which lies within the center of our district, is home to many or our members and board members, and includes our largest population center, the City of Grand Rapids and its bedroom communities.

In addition to background information relative to the location, history, biology and known impairments of Kent County coldwater streams, this report includes specific recommendations for monitoring, protection and restoration. This report is intended to be a "living" document, with continuous updates and revisions as additional information becomes available.

Information contained in this report has been summarized from existing literature, data and publications, interviews with individuals with knowledge of specific streams and geographic areas, field collected data, and other pertinent sources. When possible, this report includes citations to parent documents and more detailed information. Certain updates have been added in 2018, following additional research, completed conservation, and future goals.



SCHREMS WEST MICHIGAN Environmentally Involved Since 1962 TROUT UNLIMITED	SCHREMS WEST MICHIGAN TU COLDWATER INVENTORY	JUNE, 2012
	SCHREMS DISTRICT BOUNDARIES	FIGURE NO. 1

COLDWATER STREAMS - DEFINITIONS

Scientific literature supports the idea that temperature is the most critical factor affecting trout distribution in a stream. The Michigan Department of Natural Resources, Fisheries Division, classifies streams according to, in large part, water temperature. The following definitions were copied, with minor changes, from the Water Withdrawal Assessment Tool website at: http://www.miwwat.org/wateruse/regulations.asp

- Cold Stream segments are defined (by the DNR, Fisheries Division) as typically having cold July mean water temperatures that do not exceed 63.5ºF. July water temperatures in a Cold Stream are diurnally (day-night) stable constantly cold, even on a hot summer day due to continuous groundwater inputs). Flow discharge and velocities are strong, even during the lowest-flow months. The typical summer fish assemblage of a Michigan Cold Stream includes only 5-8 species adapted to cold or thermally transitional conditions: daces, juvenile salmons, trouts, and sculpins. No warmwater fishes are found. Cold Streams anchor the cold end of the summer water temperature range for Michigan river systems and support excellent populations of coldwater fishes; small changes in July water temperature will not result in a significant change to fish populations.

- Cold-transitional Stream segments are defined as typically having fairly cold July mean water temperatures between 63.5ºF and 67.1ºF. July temperatures in Cold-transitional Streams fall at the warmer edge of the acceptable range for trouts and juvenile salmons, and the slightly warmer (than in Cold Streams) temperatures often promote rapid growth in trout and salmon. The typical summer fish assemblage of a Michigan Cold-transitional Stream includes 10-18 fish species: some cold-adapted (juvenile salmons, trouts, and sculpins), and several that are well-adapted to grow and reproduce at cool temperatures (daces, chubs, suckers, mudminnows, and sculpins). It is also not unusual for limited numbers of warm-adapted species to be present. Cold-transitional Stream fish populations are sensitive to small changes in July water temperature.

- Cool Stream segments are defined as having cool July mean water temperatures between 67.1ºF and 69.8ºF. diurnally variable temperatures, and smaller waters. The typical summer fish assemblage of a Michigan Cool Stream includes 15-20 fish species: most adapted to transitional and somewhat variable temperatures (minnows, daces, chubs, suckers, bullheads, mudminnows, and darters), and a few warm-adapted (shiners, chubs, pikes, and sunfishes). July diurnal temperature fluctuations are modest, allowing several warm-adapted fishes to be supported (chubs, shiners, minnows, pikes, sunfishes, and darters).

- Warm Stream segments are defined as typically having warm July mean water temperatures greater than 69.8ºF. Warm Streams are home to a limited number of fish species that tolerate extreme diurnal temperature fluctuations (often 50ºF), associated

> swings in dissolved oxygen concentrations, and smaller waters. The typical summer fish assemblage of a Michigan Warm Stream includes 15-18 tolerant fish species, including several adapted to transitional temperatures (chubs, minnows, daces, bullheads, mudminnows, and darters), and a few warm-adapted species (shiners, pikes, pirate perch, and sunfishes).

For purposes of this report, unless explicitly stated, the above-referenced definitions will be used to classify and describe streams within Kent County. However, the term "coldwater" is generally and widely used throughout this report and does not necessarily refer to these definitions. Generally speaking, "coldwater" streams would be capable of supporting a fishery containing one or more of the following species: brown trout, rainbow trout (steelhead is the migratory rainbow), coho salmon, chinook salmon, or our only native trout (char), the brook trout. A myriad of information exists on each of these species, though a particularly useful general reference is *Fishes of Wisconsin*, which is available at: http://www.seagrant.wisc.edu/greatlakesfish/becker.html

Coldwater fisheries are protected as a designated use under State of Michigan law; specifically, R 323.1100 Designated uses: (7) All waters listed in the publication entitled "Designated Trout Streams for the State of Michigan," Director's Order No. DFI-101.97, by the director of the Department of Natural Resources under the authority of section 48701(m) of 1994 PA 451, MCL 324.48701(m) are designated and protected for coldwater fisheries. Under R 323.1043 Definitions; A to L. Rule 43. As used in this part: (r) "Coldwater fishery use" means the ability of a waterbody to support a balanced, integrated, adaptive community of fish species which thrive in relatively cold water, generally including any of the following: (i) trout…

IDENTIFYING COLDWATER STREAMS IN KENT COUNTY

Based upon the definitions listed in the previous section, a complete inventory of Kent County's coldwater streams was completed using the following methods:

Literature Review

A vast amount of information exists for coldwater streams in Kent County. An attempt was made to obtain all pertinent information from such sources including, but not limited to: Michigan Departments of Natural Resources and Environmental Quality (DNR and DEQ) data and reports, fish stocking records, Watershed Management Plans, Watershed Councils, and various university reports and documents. Information specific to each stream is included in this document.

General information for Kent County streams includes the following:

> Under the authority of Section 48701(o), as amended, being Sections 324.48701(o) of the Michigan Compiled Laws, the Director of the Department of Natural Resources on November 8, 2007, ordered that for a period of five years the streams and portions of streams in the list which follows are hereby designated as trout streams (Figure 2):
>
> - All tributaries to Grand River in Kent County *EXCEPT: Flat and Thornapple Rivers and Plaster and Rush Creeks*
> - Thornapple River Basin

- Unnamed tributary (a.k.a. Schoolhouse, School, Cascade Creek) on west bank (T6N, R10W, S10) of Thornapple River, originating as outlets from Wood and Walden Lakes
- Coldwater River (mainstream only) (T5N, R10W, S35) to M-43 bridge (T4N, R8W, S16)
- Unnamed Tributary (T5N, R9W, S31)
- Unnamed Tributary (T5N, R10W, S36)
- Duck Creek
- Tyler Creek (T5N, R9W)
- Bear Creek (T5N, R8W; T5N, R9W)

- Flat River Basin
  - Butternut Creek (T10N, R9W, S34)
  - Page Creek (T7N, R9W, S24)

Fish stocking records (http://www.michigandnr.com/fishstock/) indicate that the following Kent County streams have been stocked with brown and/or rainbow trout within the last ten years: Buck Creek, Coldwater River, Duck Creek, Flat River and Rogue River.

Personal Interviews

An attempt was made to contact certain professionals with specific information regarding coldwater streams, including DNR and DEQ biologists, professors and consultants. Local anglers and conservationists provided indispensable information that may not have otherwise been recorded or became public. All information derived from personal interviews is cited as "personal communication".

Field Assessment

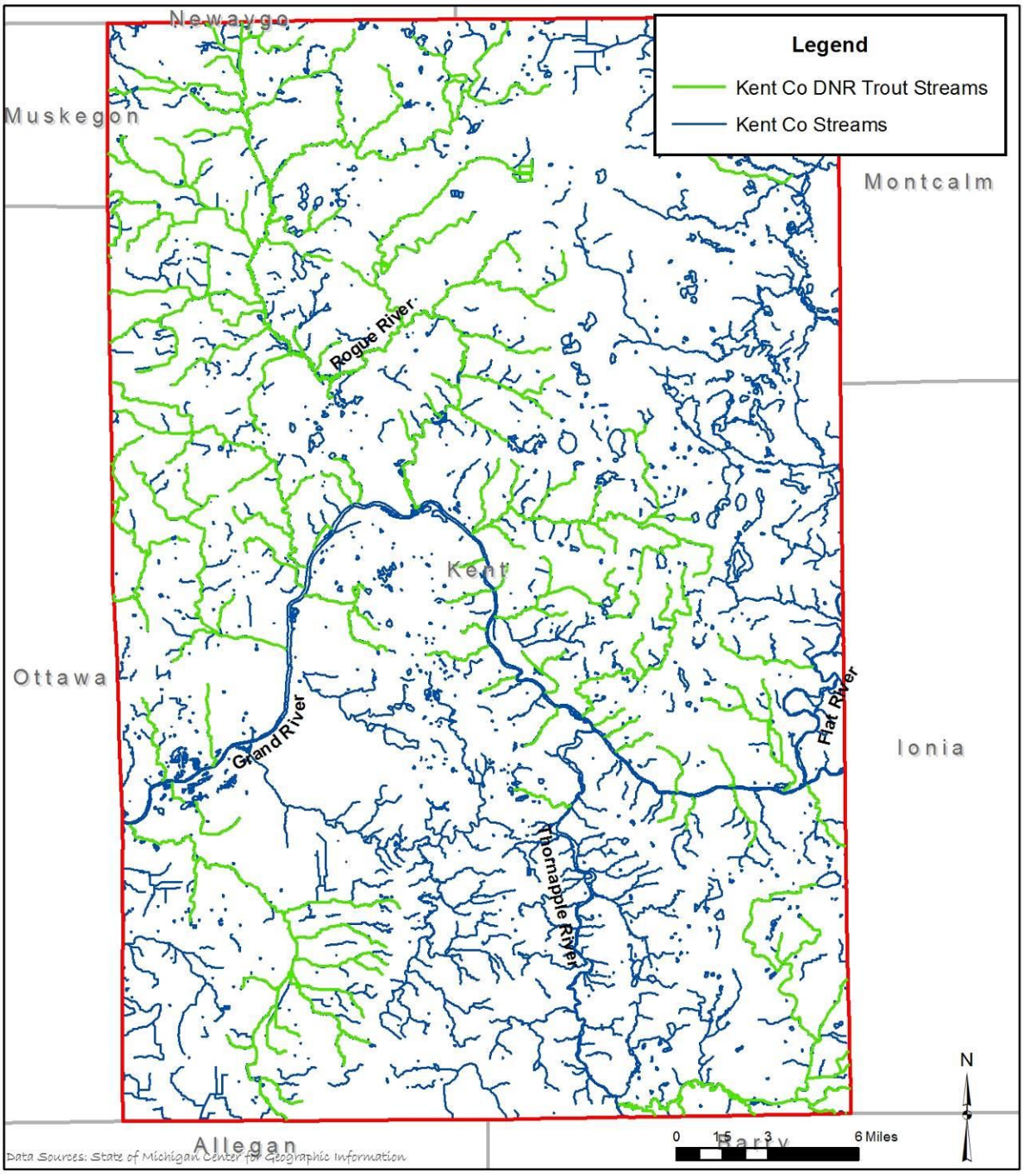
As a first step in identifying which streams have the potential to harbor coldwater aquatic communities, a Geographic Information System (GIS) was used to display Kent County, its townships, roads and streams, existing water temperature information, and existing stream mapping, including Michigan's Designated Trout Streams and Valley Segment Ecological Classification (VSEC) data from the Michigan Center for Geographic Information. Each stream segment within Kent County was reviewed on GIS and compared with existing information to determine which streams were known to be warmwater. In addition, the list of Kent County streams was presented to local anglers and experts to determine if trout have been documented in the streams in recent years. If a stream is definitely known to be warmwater, the stream was eliminated from further consideration.

Those streams with any potential to be coldwater were field inspected. Initial inspection included a "point in time" water temperature measurement at road crossings during the peak of June heat; it was assumed that if the water was too warm for coldwater fish in June, the stream is warmwater. Therefore, if the stream temperature was 80° or higher, the stream was eliminated from further consideration.

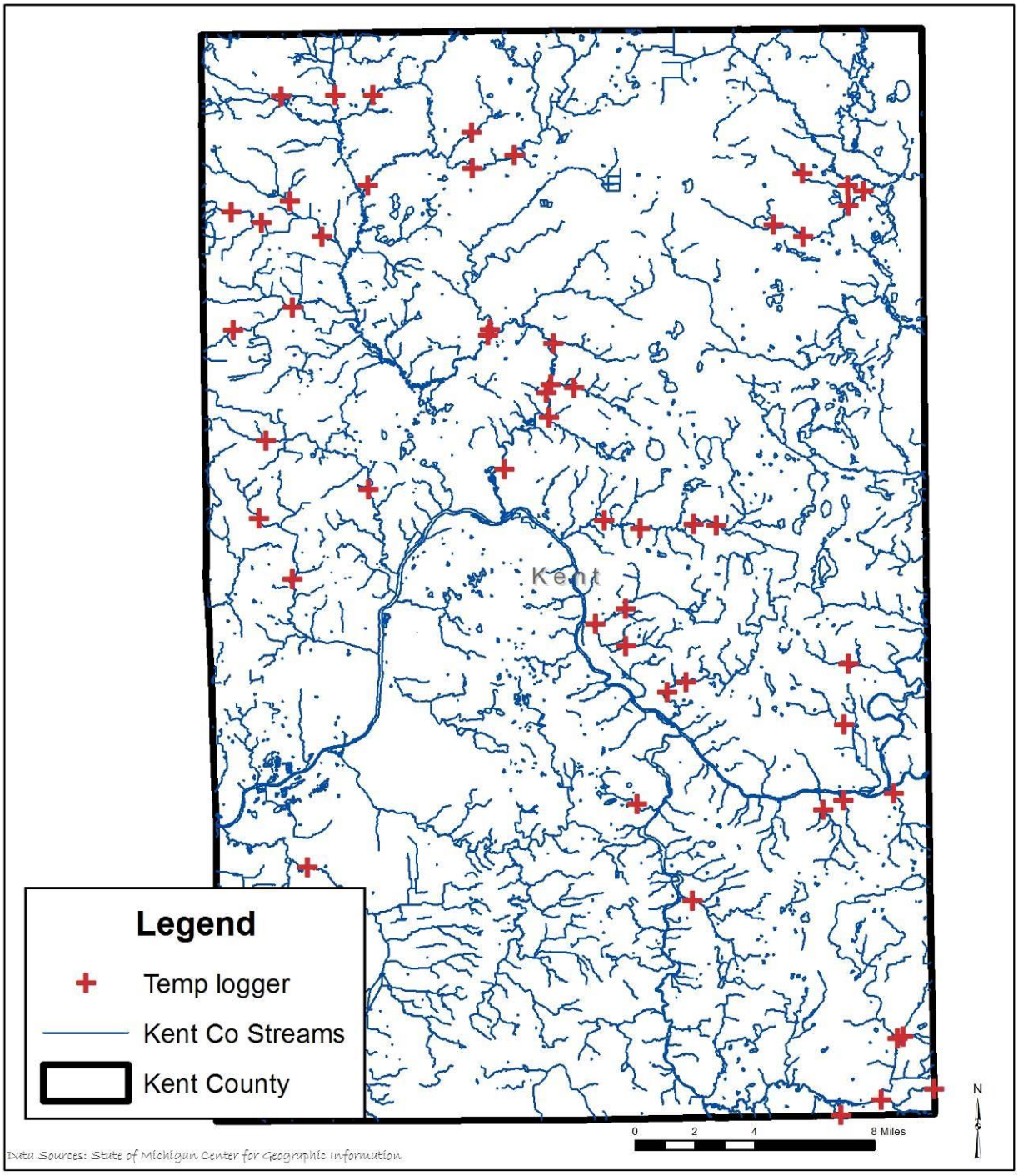
Those streams that met the general coldwater temperature criteria were monitored in July and/or August, 2011, and again in 2018, using Onset HOBO® Water Temp Pro V2 data loggers (Figure

3). Loggers were programmed to record water temperature every hour for the duration of their deployment. Point in time water temperature results, field inspection, existing data and personal interviews were used to select the locations for placement of temperature loggers; an attempt was made to place the loggers in the coolest stream segments.

All streams containing trout or meeting the coldwater criteria, based upon temperature data, personal interviews or existing data, were slated for further data collection and are included in this report.



SCHREMS WEST MICHIGAN TROUT UNLIMITED	SCHREMS WEST MICHIGAN TU COLDWATER INVENTORY	JUNE, 2012
	KENT COUNTY DNR DESIGNATED COLDWATER STREAMS	FIGURE NO. 2



SCHREMS WEST MICHIGAN TROUT UNLIMITED	SCHREMS WEST MICHIGAN TU COLDWATER INVENTORY	JUNE, 2012
	2011 TEMPERATURE LOGGER LOCATIONS	FIGURE NO. 3

DATA COLLECTION

Once coldwater streams were identified and mapped, an effort was made to gather a variety of information, including existing data and reports, rapid presence/absence fish surveys, habitat surveys, human interest surveys and full walking assessments of specific streams. All information was compiled and summarized to aid in determining distribution of trout within each stream, identifying the relative quality of each stream, identifying possible impairments to each stream, and prioritizing each stream for future protection or enhancement. The following information was reviewed and methods were used for data collection:

Coldwater Designated Drains

It is important to consider designated county drains in coldwater management, since these waterways are subject to different laws and regulations (State Drain Code; http://law.onecle.com/michigan/280-drain-code-of-1956/index.html) than streams that are not designated. In Kent County, the Drain Commissioner is responsible for the administration of the State Drain Code as it applies to the receipt of petitions for the establishment, improvement or maintenance of over 533 miles of stream channel (county drain). While some Drain Commissioners may be relatively progressive when it comes to the environment, goals of petitions and other constituents often differ greatly than those of conservation-minded groups or individuals. Negative impacts of channelization are well-documented, and include altering the natural diversity of depths, velocities, and substrates of streams.

Maps of all designated drains in Kent County can be found at: http://www.accesskent.com/YourGovernment/DrainCommisioner/drainmaps.htm

Public Access

Public access is an obviously important consideration for Schrems and the information included in this report is intended to provide general guidelines for accessibility to our local streams. **Schrems or its partners take no responsibility for issues of public access, riparian or angler rights or any similar issues stemming from this report.** Public access definitions and the information included in this report are based upon existing information and data. Public lands identified in this report are from data obtained from the Kent County GIS Department, and the CARL (2008) database (http://www.ducks.org/conservation/glaro/carl-gis-layer).

According to MDNR (1993), a navigable inland stream is open to public access, and is defined as: 1) any stream declared navigable by the Michigan Supreme Court; 2) any stream included within the navigable waters of the United States by the U.S. Army Corps of Engineers for the administration of the laws enacted by Congress for the protection and preservation of the navigable waters of the United States; 3) any stream which floated logs during the lumbering days or has sufficient capacity for the floating of logs in the condition which it generally appears by nature, notwithstanding there may be times when it becomes too dry or shallow for that purpose; 4) any stream having an average flow of approximately 41 cubic feet per second, an average width of some 30 feet, an average depth of about one foot, capacity of floatage during spring seasonal periods of high water limited to loose logs, ties and similar products, used for fishing by the public

for an extended period of time, and stocked with fish by the state; 5) any stream which has been or is susceptible to navigation by boats for purposes of commerce or travel; 6) all streams that have been meandered by the General Land Office Survey in the mid-1800s.

Trout Distribution

Based upon data review, mapping and water temperature monitoring, a selection of streams meeting, or nearly meeting, the coldwater definition was surveyed using electrofishing equipment to document the fish community. Specifically, a presence/absence survey was conducted for trout in an attempt to determine if fish inhabit the stream and the approximate upstream and downstream limits of inhabitation. An effort was made to collect fisheries community information from all coldwater streams that have either no, or old, data records.

Migration Barriers

For each coldwater stream in this report, a migration barrier inventory was conducted to determine the level of connectivity of each stream. This effort was completed in coordination with Timberland Resource Conservation and Development, under funding from the United States Fish and Wildlife Service's (USFWS) National Fish Passage Program. An attempt was made to inventory all barriers, including culverts, dams or other structures where fish passage has been compromised. All data collection was conducted in accordance with USFWS procedures using their pre-approved data sheets. Pertinent results from the work are included in this report.

Physical Habitat

Great Lakes Environmental Assessment Section (GLEAS) Procedure No. 51 (P51) (MDEQ 2007) was used to quantify physical habitat at several reaches on many coldwater streams. Existing P51 data from DEQ's reports database was also reviewed and compiled. The P51 protocol uses a system of 11 metrics to score a representative site. Scoring for each metric was based on visual observation and best professional judgment.

In the current version of P51, each metric was scored on an individual basis and then compiled, resulting in an overall score of up to 200 points for each site. Sites scoring less than 56 are considered to be "poor", those scoring between 56 and 104 are "marginal", between 105 and 154 points are "good", and sites scoring over 154 are "excellent". Individual metrics are often used to describe conditions directly affecting the biological community, while overall score describes the general environment at the site.

"Walking" Stream Assessment

For many of the streams included in this report, an assessment was completed by walking the entire length, or significant portions, of the streams. General information was recorded for each stream, as well as more specific information related to fish migration barriers, high quality spawning habitats, eroded banks, poor riparian management, stormwater inputs, and more.

COLDWATER MANAGEMENT

While coldwater streams are a relatively unique resource in southern Michigan, Kent County has a disproportionately high abundance due to rolling topography, soils, geology and groundwater input. The best stream habitats offer such variety to support various age classes and life histories of fish. Higher gradients create a diversity of habitat for fish and other aquatic life. Fish and other aquatic life are typically most diverse and productive in river sections with gradient between 10 and 69.9 feet per mile (Hay-Chmielewski et al. 1985). Such gradients are rare in Michigan because of the naturally low-relief landscape and the fact that areas of high gradient have been dammed or channelized.

Coldwater streams are under constant pressure from a variety of sources, many of which are related to land use. Urbanization and agriculture, among other land uses, can have a dramatic effect on the aquatic environment. Development increases the percentage of impervious land area, resulting in more water reaching the stream channel more quickly as surface runoff. Channelization destroys the natural channel diversity of depths, velocities, and substrates of streams, eliminating many habitats critical to reproduction and survival of aquatic species. Shallow, uniform channels result in increased water temperature and greater daily fluctuations. Woody debris is removed from the channel and riparian vegetation is often eliminated, thereby eliminating instream cover for organisms and contributing to increased water temperatures. Channelization and stormwater systems also speed surface runoff, leading to an increase in the frequency, duration and magnitude of high-flow events. Increased flows are harmful to habitat and survival of many aquatic organisms, lead to more erosion, decreased groundwater recharge and increased summer temperatures. Flow stability has been shown to be a determining factor in ecological processes in streams and is related to fish abundance, growth, survival, and reproduction (Coon 1987).

Dams, road crossing and other barriers negatively impact indigenous freshwater fish populations. Natural movements of fish in Kent County streams are restricted or eliminated due to at least 59 dams and dozens of “impassable” culverts. Artificial barriers such as dams, weirs, causeways and perched or under-sized culverts obstruct the free passage of native fish and other organisms by preventing or impeding their movement from one part of a stream or river system to another. Many species of fish must move between habitat areas at some stage in their life cycle to spawn or seek food and shelter, with many having definite migration requirements. Obstructions which impede the free passage of fish often result in declining populations or extirpations, as documented in myriad publications. The hydrologic condition of the river determines the extent and continuity of the obstruction. Some obstructions prevent fish passage in periods of low flow. Some may allow the movement of fish in times of flood when high water levels provide free passage and the obstacle is said to be 'drowned-out'. Some obstacles prevent fish passage at all times, and are therefore a total barrier, which leads to local extinction of migratory species upstream, and perhaps even downstream.

It is noteworthy that fish migration barriers can also restrict the movements of undesirable or invasive species such as sea lamprey, round gobies, common carp and others. Similarly, some of our self-sustaining trout populations are protected from impacts associated with potamodromous (migratory) trout and salmon. As such, barriers to passage are not always considered to be detrimental.

As part of the Grand River Assessment, Hanshue and Harrington (2011) thoroughly laid out many management options for the Grand River and its tributaries. Many of these options overlap with the Schrems TUs Mission and Vision. As such, an opportunity exists to collaborate with DNR to ensure that the coldwater resources of Kent County thrive. The following options, as presented by Hanshue and Harrington (2011), were considered in developing the recommendations set forth in this report:

- Protect remaining stream margin habitats, including floodplains and wetlands, by encouraging setbacks and vegetated buffer strips in zoning regulations, controlling development in the stream corridor, and acquiring additional greenbelts through agricultural conservation programs, conservation easements, or direct purchases by conservation organizations or government agencies.
- Protect and rehabilitate cold, cold-transitional, and warm-transitional thermal habitat areas and their unique biological communities.
- Survey and map biological community distributions in the watershed using advanced technology including global positioning and geographic information systems. Identify measures to protect areas with unique biological communities and locations supporting significant aquatic biodiversity.
- Survey distribution and status of aquatic invertebrates and fish fauna.
- Survey fish populations and inventory habitat in waters where data is limited or lacking (e.g., Flat River).
- Survey water temperatures and trout survival in managed waters (e.g., Buck Creek, etc.) to determine if trout stocking is prudent (e.g., summer temperatures too marginal, natural reproduction can sustain fishery, adjust strains, or continue stocking).
- Rehabilitate habitat continuity by removing unnecessary dams. Require upstream and downstream fish passage of all fish species on those dams that remain.
- Improve angling opportunities by continued improvement and acquisition of public access property (e.g., Bear Creek and others)
- Maintain fishing opportunities through existing stocking programs (e.g., walleye, brown trout, coho salmon, Chinook salmon, and steelhead). Stocked waters should continue to be surveyed to evaluate fish populations and angler use to justify future stocking.
- Protect, encourage, and support existing parks and promote responsible management for riparian areas in public ownership.
- Protect recreational use of small tributaries by supporting establishment of a “recreational” definition of legal navigability as opposed to the “commercial” definition.
- Protect angler access by considering development of a stream public right-of way by purchasing easements for angler access from private land owners.
- Maintain and improve strategies to educate the community to the benefits of river ecosystems, wetlands, and floodplains by supporting local conservation organizations.

- Rehabilitate and improve river habitat by encouraging and supporting habitat improvement projects conducted by sport and/or Watershed Councils.
- Improve citizen use of the river by supporting programs that encourage use and contact with the river and its tributaries.

"Good farmers, who take seriously their duties as stewards of Creation and of their land's inheritors, contribute to the welfare of society in more ways than society usually acknowledges, or even knows. These farmers produce valuable goods, of course; but they also conserve soil, they conserve water, they conserve wildlife, they conserve open space, they conserve scenery."

– Wendell Berry

OUR COLDWATER RESOURCES - SUMMARY AND RECOMMENDATIONS

Based upon results of intensive literature review and data collection, the following streams were found to have conditions favorable for the survival of trout and other coldwater aquatic communities (Figure 4):

Table 1. Coldwater streams in Kent County, MI

Flat River Tributaries
Butternut Creek
Coopers Creek
Page Creek
Grand River Tributaries
Bear Creek
Buck Creek
Cherry Creek
Egypt Creek
Honey Creek
Indian Mill Creek
Mill Creek
Portfleet Creek
Spring Brook
Stiles Creek
Trout Creek
Several unnamed tributaries

Rogue River and Tributaries
Ball Creek
Barkley Creek
Blakeslee Creek
Cedar Creek
Duke Creek
Rogue River
Rum Creek
Shaw Creek
Spring Creek
Stegman Creek
Thornapple River Tributaries
Cain Creek
Cascade Creek
Coldwater River
Duck Creek
Tyler Creek

The following sections of this report are devoted to presenting of all information compiled during this project, organized by each of these individual streams. Table 2 contains water temperature data from each of these streams. Table 3 contains a list of all fish species that have been documented in the streams.

" There he stands, draped in more equipment than a telephone lineman, trying to outwit an organism with a brain no bigger than a breadcrumb, and getting licked in the process."

- Paul O'Neil

Table 2. Water Temperature Data for Kent County Streams

		July Temperature (°F)			August Temperature (°F)			
Stream	**Year**	**Mean**	**Minimum**	**Maximum**	**Mean**	**Minimum**	**Maximum**	**DNR Designation**
Ball Creek at Fruit Ridge	2011	70.6	65.6	76.1				Warm
Ball Creek at Peach Ridge	2011				65.1	57.8	74.9	
Ball Creek at Rusco	2011				64.4	56.0	74.8	
Ball Creek at Sparta Ave	2011	66.4	58.6	76.3				Cold-Transitional
Ball Creek at Sparta Ave	2018	66.9	58.4	78.1	66.9	58.1	84.6	Cold-Transitional
Barkley Creek	2010	65.8	54.2	72.9				Cold-Transitional
Barkley Creek	2011	65.4	57.8	74.9	62.9	56.5	70.2	Cold-Transitional
Barkley Creek	2018	67.8	58.9	78.0	66.9	58.5	84.6	Cold-Transitional
Bear Creek at Cannonsburg Rd	2011	65.6	59.0	73.7				Cold-Transitional
Bear Creek at Giles	2011	69.3	61.3	79.4				Cool
Bear Creek at Ski Area	2011				64.3	57.8	71.6	
Bear Creek at Townsend Park_Ramsdell	2011				65.0	58.0	72.4	
Becker Creek	2000	53.9	49.0	59.3				Cold
Blakeslee Creek	2011	63.2	56.6	72.1	61.7	55.6	68.7	Cold
Buck Creek at Byron Center	2011	68.8	62.5	76.7	67.7	62.5	74.6	Cool
Butternut Creek at 17 Mile	2011				58.5	51.1	68.6	
Butternut Creek at Lincoln Lake	2011				64.1	56.8	70.9	
Butternut Creek at Podunk	2011	66.4	58.1	77.4				Cold-Transitional
Cain Creek at 108th	2011	59.5	54.2	67.2				Cold
Cascade Creek at Burton	2011				62.7	54.5	73.4	
Cedar Creek at Rogue	2011	69.0	57.9	80.8	65.4	55.4	74.0	Cool
Cedar Creek below meadow	2010	64.5	54.5	72.7				Cold-Transitional
Cedar Creek in Cedar Springs	2010	67.9	56.0	76.1				Cool
Coopers Creek at Harvard	2011	60.1	52.9	73.0				Cold
Coopers Creek at Podunk	2011	63.0	57.4	70.2				Cold
Coopers Creek at Wabasis	2011				64.1	54.4	76.0	

		July Temperature (°F)			August Temperature (°F)			
Stream	**Year**	**Mean**	**Minimum**	**Maximum**	**Mean**	**Minimum**	**Maximum**	**DNR Designation**
Duck Creek	1997	66.0	56.1	76.3				Cold-Transitional
Duck Creek at Montcalm	2011	69.5	63.5	77.7	67.4	62.2	73.8	Cool
Duke Creek at 17 Mile	2011				63.4	57.7	70.5	
Duke Creek at 18 Mile	2011				64.9	58.3	71.6	
Duke Creek at Algoma	2011	68.0	61.0	80.0				Cool
Egypt Creek at Egypt Valley	2011				61.5	54.1	68.8	
Egypt Creek at Pettis	2011	64.7	57.6	74.0				Cold-Transitional
Egypt tributary at Egypt Valley	2011	63.0	57.4	70.2				Cold
Frost Creek at Algoma	2011				61.5	55.3	68.5	
“Gulliford” Creek at Grand River	2011	61.7	55.7	69.4				Cold
Honey Creek at Dogwood	2011	65.7	58.7	75.1				Cold-Transitional
Honey Creek at Honey Creek	2011				62.1	55.8	69.1	
Indian Mill Creek at 4 Mile	2011	69.0	61.7	77.6				Cool
Indian Mill Creek at 6 Mile	2011				64.4	57.5	73.9	
Lee Creek at Vergennes	2011	69.5	61.0	78.8				Cool
Mill Creek (north) at Peach Ridge	2011				65.9	58.8	74.1	
Mill Creek at 7 Mile	2011	67.7	61.5	75.0				Cool
Nash Creek at Fruit Ridge	2011				65.7	59.3	74.1	
Nash Creek at Phelps	2011	67.7	60.3	77.6				Cool
Page Creek at McPherson	2011	63.0	56.6	73.2				Cold
Page Creek in Fallasburg Park	2018	66.0	59.1	74.3	65.7	58.8	71.8	Cold-Transitional
Rogue River above Cedar	2011	71.2	59.4	95.6*	67.9	62.6	75.3	Warm
Rogue River at 20 Mile	2011	71.2	58.8	85.9				Warm
Rogue River at Packer	2011	71.1	61.2	81.8	67.8	61.9	76.9	Warm
Rum Creek	2011	55.1	51.3	68.9	55.3	52.8	64.3	Cold
Rum Creek at Main St	2011				60.9	55.6	67.3	
Shaw Creek	2010	57.6	53.3	59.1				Cold

		July Temperature (°F)			August Temperature (°F)			
Stream	**Year**	**Mean**	**Minimum**	**Maximum**	**Mean**	**Minimum**	**Maximum**	**DNR Designation**
Shaw Creek at White Pine Trail	2011				59.4	54.4	65.6	
Spring Brook at Bewell	2011	60.3	55.7	68.4				Cold
Spring Creek at 20 Mile	2011				61.5	55.1	69.0	
Stegman Creek	2011	57.2	52.8	64.2	56.7	52.6	61.4	Cold
Trout Creek at Grand River	2011	61.9	55.8	73.6				Cold
Tyler Creek at Dolan	2010	62.7	54.3	70.5				Cold
Tyler Creek at golf course (east)	2010	60.4	54.9	66.0				Cold
Tyler Creek at golf course (west)	2010	59.2	53.0	66.1				Cold
Walter Creek at 20 Mile	2011	67.7	58.9	79.3				Cool

- Cold Stream segments are defined (by the DNR, Fisheries Division) as typically having cold July mean water temperatures that do not exceed 63.5ºF. July water temperatures in a Cold Stream are diurnally (day-night) stable constantly cold, even on a hot summer day due to continuous groundwater inputs). Flow discharge and velocities are strong, even during the lowest-flow months. The typical summer fish assemblage of a Michigan Cold Stream includes only 5-8 species adapted to cold or thermally transitional conditions: daces, juvenile salmons, trouts, and sculpins. No warmwater fishes are found. Cold Streams anchor the cold end of the summer water temperature range for Michigan river systems and support excellent populations of coldwater fishes; small changes in July water temperature will not result in a significant change to fish populations.

- Cold-transitional Stream segments are defined as typically having fairly cold July mean water temperatures between 63.5ºF and 67.1ºF. July temperatures in Cold-transitional Streams fall at the warmer edge of the acceptable range for trouts and juvenile salmons, and the slightly warmer (than in Cold Streams) temperatures often promote rapid growth in trout and salmon. The typical summer fish assemblage of a Michigan Cold-transitional Stream includes 10-18 fish species: some cold-adapted (juvenile salmons, trouts, and sculpins), and several that are well-adapted to grow and reproduce at cool temperatures (daces, chubs, suckers, mudminnows, and sculpins). It is also not unusual for limited numbers of warm-adapted species to be present. Cold-transitional Stream fish populations are sensitive to small changes in July water temperature.

- Cool Stream segments are defined as having cool July mean water temperatures between 67.1ºF and 69.8ºF. diurnally variable temperatures, and smaller waters. The typical summer fish assemblage of a Michigan Cool Stream includes 15-20 fish species: most adapted to transitional and somewhat variable temperatures (minnows, daces, chubs, suckers, bullheads,

mudminnows, and darters), and a few warm-adapted (shiners, chubs, pikes, and sunfishes). July diurnal temperature fluctuations are modest, allowing several warm-adapted fishes to be supported (chubs, shiners, minnows, pikes, sunfishes, and darters).

- Warm Stream segments are defined as typically having warm July mean water temperatures greater than 69.8ºF. Warm Streams are home to a limited number of fish species that tolerate extreme diurnal temperature fluctuations (often 50ºF), associated swings in dissolved oxygen concentrations, and smaller waters. The typical summer fish assemblage of a Michigan Warm Stream includes 15-18 tolerant fish species, including several adapted to transitional temperatures (chubs, minnows, daces, bullheads, mudminnows, and darters), and a few warm-adapted species (shiners, pikes, pirate perch, and sunfishes).

Table 3. Fish Species Documented in Kent County Streams.

	brook trout	brown trout	rainbow trout	coho salmon	black bullhead	black crappie	blacknose dace	blackside darter	bluegill	bluntnose minnow	bowfin	brook stickleback	burbot	central mudminnow	central stoneroller	common carp	common shiner	creek chub	creek chubsucker	finescale dace	golden redhorse	golden shiner	goldfish	grass pike	greater redhorse
Ball Creek		x					x					x	x	x				x							
Barkley Creek		x	x				x											x							
Bear Creek	x	x	x			x	x	x	x	x				x			x	x	x					x	
Buck Creek		x	x			x			x			x		x		x	x	x						x	
Butternut Creek	x						x							x				x							
Cascade Creek	x								x									x							
Ball Creek																									
Cedar Creek	x	x			x		x		x	x		x	x	x	x		x	x		x					
Cherry Creek	x						x					x						x							
Coldwater River	x	x	x				x	x	x	x	x	x		x	x	x	x	x			x				x
Coopers Creek	x						x	x										x							
Duck Creek		x					x		x									x							
Duke Creek	x	x					x		x					x				x							
Egypt Creek	x	x	x				x							x			x	x							
Honey Creek	x	x	x					x						x			x	x							
Indian Mill Creek		x	x	x	x		x		x				x	x			x	x	x				x		
Mill Creek		x	x				x							x			x	x							
Page Creek	x						x							x				x							
Rouge River		x	x				x	x		x	x		x	x		x		x			x				
Rum Creek	x	x							x					x										x	
Scott Creek							x											x							
Shaw Creek	x	x							x																
Spring Brook	x		x																						
Spring Creek	x	x						x						x				x							
Stegman Creek	x	x	x				x		x			x	x	x											
Sunny Creek	x		x				x							x			x	x							
Trout Creek	x		x	x			x	x	x			x	x												
Tyler Creek		x			x	x	x		x		x	x		x			x	x				x			
Walter Creek		x					x	x	x									x							

Flat River and Tributaries

The Flat River enters the Grand River in the southeast corner of Kent County in the City of Lowell (Figure 5), and its watershed covers 564 square miles of land. From its headwaters in Six Lakes to its confluence with the Grand, the Flat River flows approximately 70 miles and is primarily a warmwater stream. The Flat has excellent water quality and is known for its smallmouth bass fishery.

The Flat River has been designated a Natural River by the Natural Resources Commission under the Natural Rivers Act, Act 231, P.A. of 1970. Under the Act, the Commission is obligated to provide for the preservation, protection and enhancement of designated rivers, as well as its tributaries. A Flat River Natural Plan was developed in 1979 and is available online (http://www.michigan.gov/documents/dnr/Cover_preface_TOC_183373_7.pdf).

Anadromous species including pacific salmon and steelhead are known to seasonally occur between the Grand River and the King Milling Dam in Lowell and, since 1979, the Flat has been stocked with rainbow trout/steelhead at this dam. Current DNR management includes the annual stocking of approximately 5,000 steelhead downstream of the King Milling Dam. Returns of these fish provide a popular fishery during the spring and fall runs. However, the mainstem of the Flat is not listed as a designated trout stream.

According to the Draft Grand River Assessment, future DNR management of the Flat River will "concentrate on maintaining self-sustaining populations of native fish species through habitat protection and the implementation of the Flat River Natural River Plan. The potamodromous fishery in the lower river should be maintained through continued stocking. Opportunities to improve river connectivity, such as dam removal or construction of natural fishways, should be promoted".

Butternut and Page Creeks are listed as designated trout streams in Kent County. Coopers Creek, while not listed as a trout stream, was found to harbor trout and to be one of the coldest streams in the county. These three tributaries are discussed in the following sections.

The Flat River Watershed Council was formed in 2011 to protect, enhance, and maintain land and water quality, and other natural resources in the Flat River Watershed. Several of the Schrems Board members were instrumental in forming this group and continue to serve on both Boards.

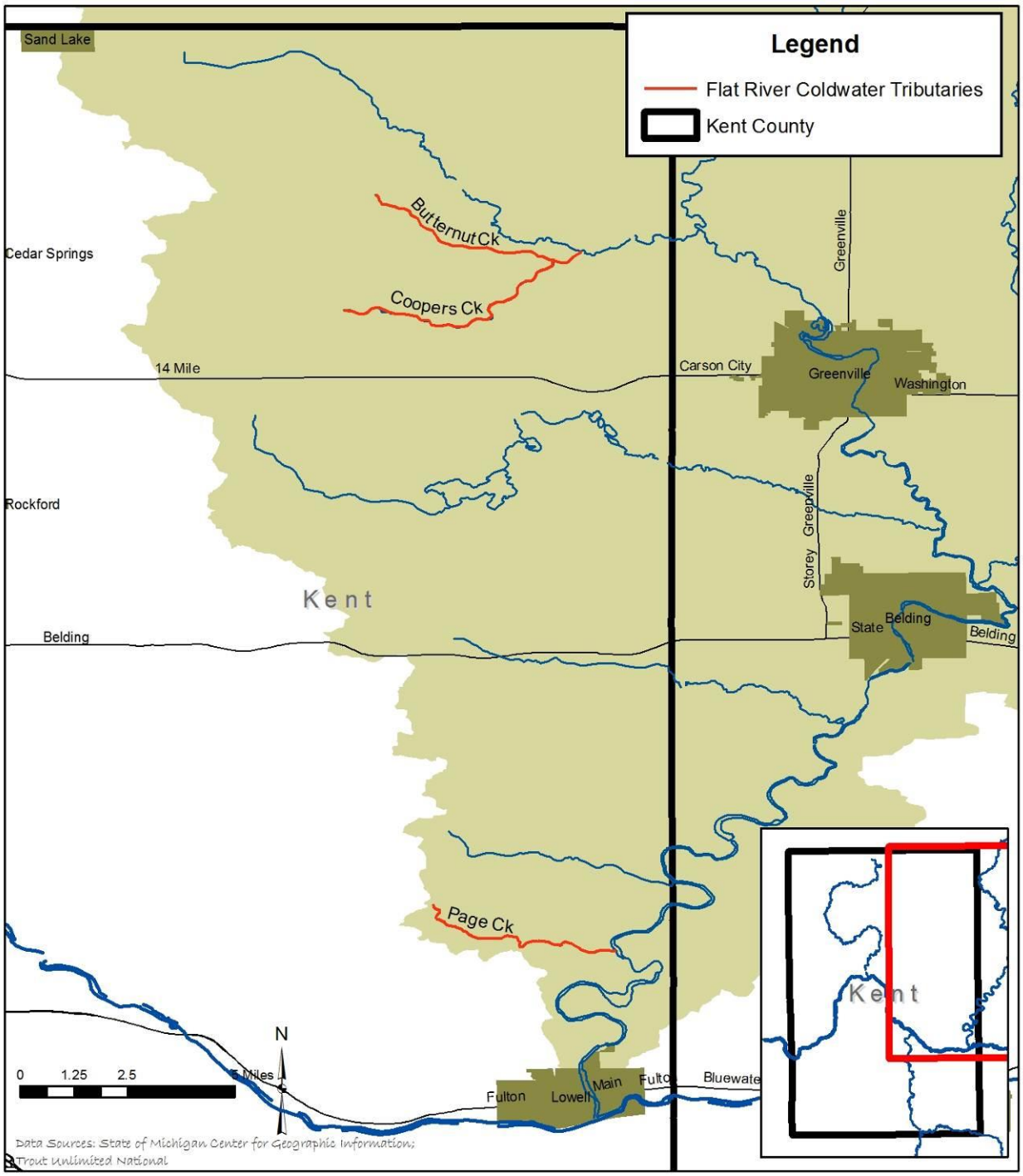
In, 2013, in coordination with the Flat River Watershed Council, Schrems completed the Flat River Monitoring Project, with funding from the Clean Michigan Initiative (CMI). Among other things, the study recommended that West Branch, Butternut, Coopers, Unnamed and Page Creeks should be considered coldwater designated trout streams. Butternut and Page Creeks are located in Kent County and discussed below. Dickerson Creek, while being listed by DNR as a trout stream, was found to be too warm for trout.

The Flat River Watershed Council completed a Watershed Management Plan for the Flat River in 2017. The WMP suggests that *E. coli,* sediment and nutrients are a problem throughout the

watershed, and that Dickerson Creek's desired use as a coldwater fishery is impaired by adjacent land uses and associated warming of the water.

Recommendations:

1. Removal of the dam on Dickerson Creek should be explored and, if possible, completed



SCHREMS WEST MICHIGAN Environmentally Involved Since 1962 TROUT UNLIMITED	SCHREMS WEST MICHIGAN TU COLDWATER INVENTORY	JUNE, 2012
	FLAT RIVER WATERSHED	FIGURE NO. 5

Butternut Creek

Background:
Butternut Creek begins in a series of wetlands and flows about 4.5 miles to its confluence with Coopers Creek in Town 10N, Range 9W, Section 34 (Figure 6). Coopers Creek is a tributary to Clear Creek, which flows into the Flat River.

Butternut Creek is a small, shallow designated coldwater stream with very dense overhanging vegetation and a wild, self-sustaining population of brook trout. The stream is located in a rural landscape and flows through many wetlands; as such, the substrate consists of fine, organics in many areas. The creek is nearly unfishable due to the dense vegetation and naturally soft substrate.

Public Access:
None

2011/2012 Data Collection:
Based upon 2011 water temperature monitoring, Butternut Creek had an average July temperature of 66.4°F at Podunk Ave, which designates it as a Cold-Transitional stream. Average August water temperature was 58.5°F at 17 Mile and 64.1°F at Lincoln Lake Rd. Point in time water temperatures indicate that the entire length of Butternut is suitable for trout.

Six brook trout were found during electrofishing surveys conducted at the 17 Mile Road crossing. Most brook trout were between three and five inches in length, though one fish was collected that measured nearly seven inches. Areas of apparently suitable spawning substrate were identified downstream of 17 Mile Road.

Published Studies:
In 1968, Department of Conservation surveyed Butternut Creek near Sand Hill Road. Twenty-seven small brook trout were captured.

In 1998, DEQ found the macroinvertebrate community to be accepatble and habitat to be good at the Podunk Road crossing (Rockafellow 2004). Butternut Creek was described as a natural, meandering stream with stable streambanks and wide, well-vegetated riparian zones. The stream lacked instream cover and bottom substrate was impacted by fine sediments.

Similar results were found in 2003, when a DEQ survey at the Podunk Rd crossing found the macroinvertebrate community to be acceptable, with six taxa of caddisflies, three taxa of mayflies, and 20 other types of aquatic organisms (Walterhouse 2009). The riparian zone contains a dense concentration of tag alders that form a canopy over the stream. Substrate was dominated by sand, but logs and overhanging brush provided cover for aquatic organisms. There was an obvious lack of pools.

Schrems (2013) found the average July water temperature to be 66.4°F and the physical habitat to be good, with a score of 137/200, at Sand Hill Road.

Recommendations:

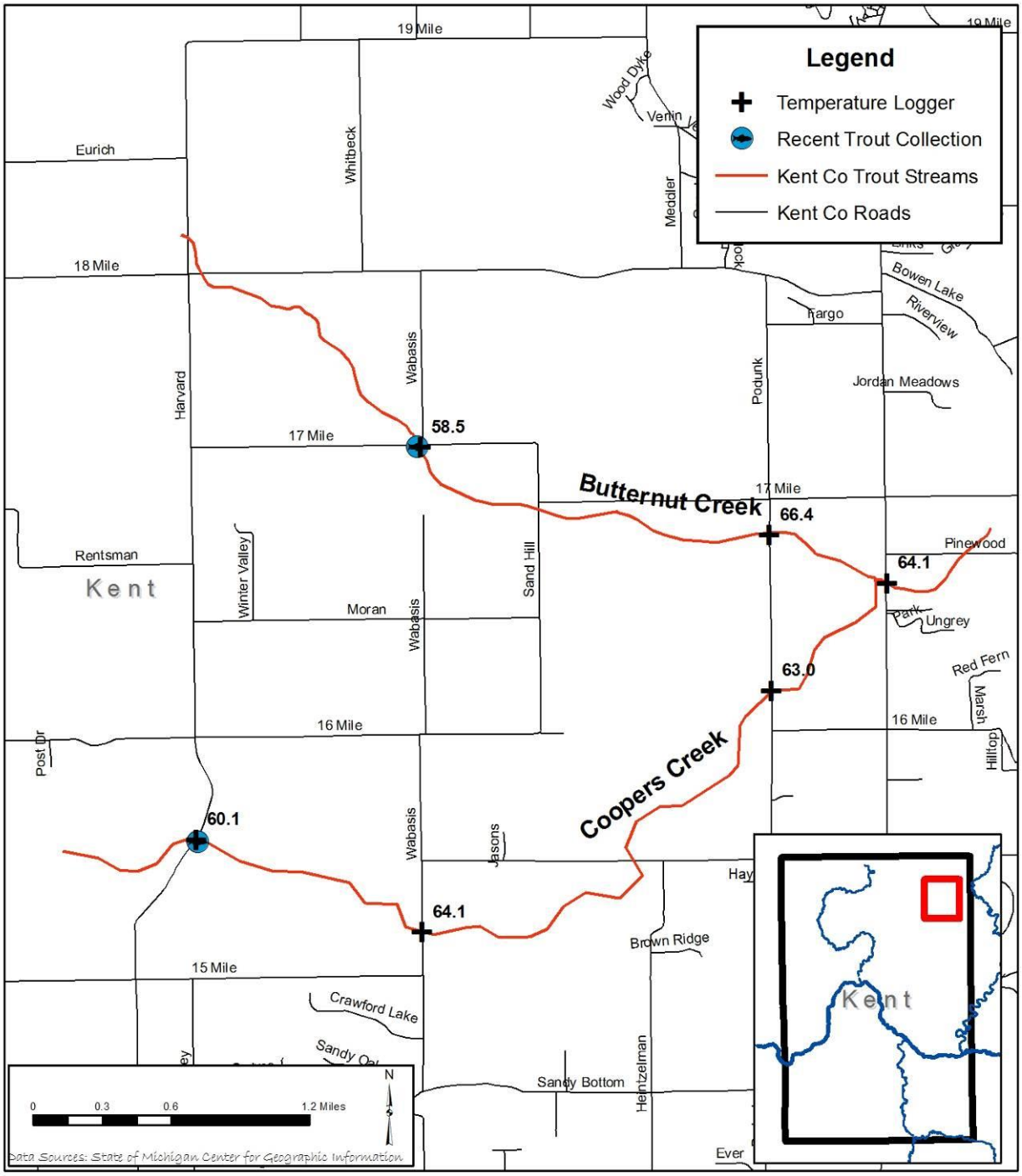
1. Baseline population estimates of brook trout; encourage state agencies to include this work in their monitoring program.
2. Support continued DNR/DEQ monitoring efforts
3. Support the Flat River Watershed Council in future monitoring, protection or enhancement efforts.

Butternut Creek Data Resources:

- Michigan Department of Natural Resources, Fisheries Division Files. Contact: Scott Hanshue, Fisheries Biologist
- Rockafellow, D. 2004. A biological survey of the Flat River and selected tributaries, Mecosta, Montcalm, Ionia and Kent Counties, Michigan. August 2003. Michigan Department of Environmental Quality Staff Report No. MI/DEQ/WD-03/130.
- Walterhouse, M. 2009. A biological survey of sites in the Flat River Watershed, Ionia, Kent and Montcalm Counties, Michigan. July and August 2008. Michigan Department of Environmental Quality Water Bureau Staff Report No. MI/DEQ/WD-09/056.
- Schrems. 2013. Flat River Monitoring Project. Clean Michigan Initiative #2011-0505

"Be the change you want to see in the world."

- Mahatma Gandhi



SCHREMS WEST MICHIGAN Environmentally Involved Since 1962 TROUT UNLIMITED	SCHREMS WEST MICHIGAN TU COLDWATER INVENTORY BUTTERNUT AND COOPERS CREEKS	JUNE, 2012 FIGURE NO. 6

Coopers Creek

Background:
Coopers Creek is described as a warmwater tributary to Clear Creek, which flows into the Flat River (Figure 6). However, water temperature monitoring completed as part of this study indicates that Coopers Creek, at the Harvard Rd crossing, is one of the coldest streams in Kent County. Coopers Creek flows through many wetlands and other natural areas, and has a naturally soft bottom throughout much of its length. Harder substrates were found near the Harvard and Podunk Road crossings. All of the areas surveyed have very stable streambanks, dense riparian vegetation and an abundance of instream cover.

Public Access:
Limited public access is available in the vicinity of 17 Mile and Morgan Hills Roads; however, Coopers Creek is reportedly a warmwater stream at this location.

2011/2012 Data Collection:
July 2011 average water temperature was 60.1°F at Harvard Rd and 63.0°F at Podunk, which indicates that Coopers Creek is a Cold stream at these locations. Average August water temperature was 64.1°F at Wabasis Rd. Point in time water temperature readings indicate that at least three miles of Coopers Creek would be able to support trout.

Fish sampling resulted in the collection of one small brook trout. This is the only known record of a brook trout in this stream. Several mottled sculpin, which are often found alongside trout, and a variety of other species were also found during electrofishing efforts (Table 3).

Schrems is currently monitoring water temperature at one location in Coopers Creek as part of a Clean Michigan Initiative grant for the Flat River.

Published Studies:
A 2004 DEQ report indicates that, at Pinewood Street, Coopers Creek is warmwater with an acceptable macroinvertebrate community and good (slightly impaired) habitat (Rockafellow 2004). The macroinvertebrate community was described as well balanced and diverse. The stream is surrounded by dense growth of alder and dogwood, resulting in stable banks and buffer from surrounding agricultural land use. However, sand was noted to be affecting large portions of the stream.

Schrems (2013) found average July water temperature to be 74.3°F at Wise Road, classifying the stream as "warm" at this location. Physical habitat was found to be excellent, with a score of 166/200. Water chemistry samples show that total phosphorus and *E. coli* concentration exceed water quality standards for the State of Michigan.

Recommendations:
1. Expand water temperature monitoring to classify the entire stream.
2. Work with DNR and DEQ to determine if the stream should be reclassified as coldwater based on average July water temperature and presence of brook trout.

3. Inventory fish populations to better evaluate management goals and potential.
4. Support continued DNR/DEQ monitoring efforts
5. Support the Flat River Watershed Council in future monitoring, protection or enhancement efforts.

Coopers Creek Data Resources:

- Rockafellow, D. 2004. A biological survey of the Flat River and selected tributaries, Mecosta, Montcalm, Ionia and Kent Counties, Michigan. August 2003. Michigan Department of Environmental Quality Staff Report No. MI/DEQ/WD-03/130.
- Schrems. 2013. Flat River Monitoring Project. Clean Michigan Initiative #2011-0505

"The last word in ignorance is the man who says of an animal of plant: 'What good is it?'"

- Aldo Leopold

Page Creek

Background:
Page Creek is located north of the City of Lowell (Figure 7). Page Creek flows east through Fallasburg Park, where it discharges to the Flat River. The upper reaches of Page Creek, from its headwaters to the McPherson Rd crossing, are very small and resemble a roadside ditch. From McPherson Rd downstream to the Flat River, Page Creek is larger in size and is an attractive, steep, cobble-filled stream.

Public Access:
Public access is available in Fallasburg Park, though trout populations are relatively low in this location.

2011/2012/2018 Data Collection:
Results of 2011 water temperature monitoring found Page Creek to have an average July temperature of 63.0°F at McPherson Rd, which meets the criteria for the Cold designation. Brook trout were observed at this location. In 2018, average July water temperature in Fallasburg Park was 66.0°F, with a minimum of 59.1°F and maximum of 74.3°F. Page Creek is Cold-transitional in this area.

The Alden Nash Rd crossing of Page Creek was identified to be a complete migration barrier to all fish during all seasons, since the culvert is perched. All other public road crossings provide suitable conditions for fish passage. An unknown number of private crossings along McPherson Rd could impact fish migration, but were not assessed.

Page Creek is heavily impacted by human activity in Fallasburg Park. In areas easily accessible to foot traffic, streambanks are trampled and rock check dams are prevalent. Localized streambank erosion is an issue of concern and excessive sedimentation of the streambed appears to be a problem. Riparian management by Kent County Parks could be improved by leaving larger areas of natural vegetation along the streambanks to prevent indiscriminant access to the stream.

While no electrofishing surveys were conducted, the fish community visually observed in the park appears to consist largely of creek chubs and other more tolerant species.

Erosion of the roadside and streambank along McPherson Rd was also noted during stream assessments. Some of the eroded areas have been repaired, though erosion still exists and should be monitored. To a large extent, the creek is not acknowledged as more than a roadside ditch along McPherson. Recent maintenance by the KCRC has resulted in the removal (mowing) of all vegetation within the road right-of-way, in which the creek flows.

Published Studies:
DNR conducted fish surveys in 1994 and found 54 brook trout at Alden Nash Avenue and three brook trout at Fallasburg Park Drive.

In 2003, a DEQ survey resulted in an excellent habitat rating (181/200) and excellent macroinvertebrate community rating at Biggs Rd, near the Fallasburg Park boundary. Mayflies, caddisflies and stoneflies were observed as part of a very diverse community. All habitat parameters were found to be excellent.

In 2012, Schrems (2013) measured average July water temperature to be 69.7°F (coolwater) at Biggs Road. The unusually hot and dry weather during the summer of 2012 was suspected of causing water temperatures to rise beyond what are typically tolerated by trout. Physical habitat was scored 154/200, just one point shy of being excellent. The stream exceeded water quality standards for total phosphorus and *E. coli.*

Recommendations:

1. Work with the Kent County Road Commission (KCRC) to replace the culvert under Alden Nash Rd, which currently acts as a complete migration barrier for trout and other aquatic organisms.
2. Work with KCRC to stabilize/improve the road right-of-way along McPherson Ave, which has an unstable side slope that is eroding into the stream.
3. Work with County Parks to improve riparian management and instream habitat.
4. Contact landowners to document condition of driveway crossings, in terms of fish passage.
5. Baseline population estimates of brook trout; encourage state agencies to include this work in their monitoring program.
6. Support continued DNR/DEQ monitoring efforts
7. Support the Flat River Watershed Council in future monitoring, protection or enhancement efforts.

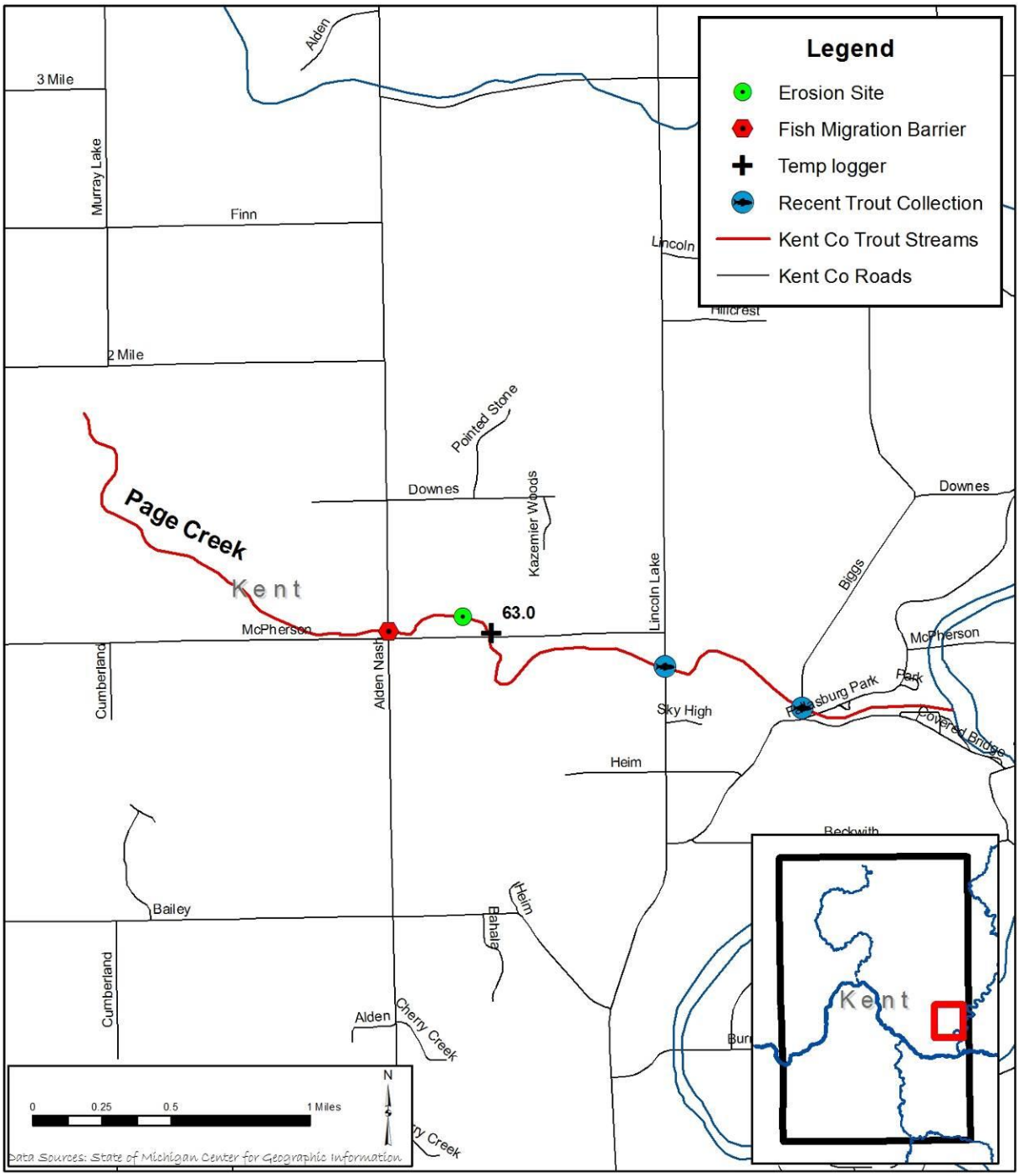
Page Creek Data Resources:

- Michigan Department of Natural Resources, Fisheries Division Files. Contact: Scott Hanshue, Fisheries Biologist
- Rockafellow, D. 2004. A biological survey of the Flat River and selected tributaries, Mecosta, Montcalm, Ionia and Kent Counties, Michigan. August 2003. Michigan Department of Environmental Quality Staff Report No. MI/DEQ/WD-03/130.

- Schrems. 2013. Flat River Monitoring Project. Clean Michigan Initiative #2011-0505

"We learn something every day, and lots of times it's that what we learned the day before was wrong"

- Bill Vaughan



SCHREMS WEST MICHIGAN Environmentally Involved Since 1962 TROUT UNLIMITED	SCHREMS WEST MICHIGAN TU COLDWATER INVENTORY PAGE CREEK	JUNE, 2012 FIGURE NO. 7

Grand River and Direct Tributaries

The Grand River watershed is the second largest river basin in Michigan, encompassing approximately 5,575 square miles. The Grand River mainstem is 248 miles long, making it the longest river in the state. About 38 miles of the Grand River flows through Kent County and its major tributaries in this area include the Flat, Thornapple and Rogue Rivers.

The watershed currently supports 107 species of fish, 93 of which are native to Michigan. Fishery management of the Grand River began in the 1800's, with direct manipulation of fish populations through species introduction or augmentation. These actions occurred regardless of the temperature and habitat needs of individual species. During this period, several small first and second order coldwater tributaries in Kent County were stocked with trout. Many of these stockings were successful in creating long-standing naturalized populations, as documented by DNR Fisheries surveys. Current management is guided by knowledge of individual lakes and streams, emphasizing habitat protection and restoration with a goal of self-sustaining populations, but, particularly on small streams, it is often limited to periodic surveys.

The watershed supports significant and economically valuable coldwater fisheries. The entirety of the Grand River mainstem in Kent County is open to the passage of fish migrating upstream from Lake Michigan, including salmon, steelhead and, unfortunately, sea lamprey. There are numerous coldwater tributaries that support popular fisheries for brown trout, brook trout, salmon and steelhead. Public access is assured through many public access sites, state game areas, and publicly owned parks. One of the most popular locations for angling is at the 6th Street Dam in downtown Grand Rapids. The 6th Street Dam is a partial barrier to sea lamprey; it is believed to block approximately 90% of the upstream migration (personal communication, Scott Hanshue).

Many small, direct tributaries outlet to the Grand River. With few exceptions, these streams are considered to be designated coldwater (see pgs 6 and 7 of this report). Most of these streams are short, flow entirely through private land and have not been studied by DNR or others. As such, there is no available information on many of these tributaries, nor, while still important, are they considered to be a priority by Schrems. For purposes of this report, only those tributaries with existing information, public lands or direct invitation from landowners are included.

An excellent, updated reference exists for the Grand River in the form of the Grand River Assessment, which the DNR has made available in draft form at: http://www.michigan.gov/documents/dnr/Draft_Grand_River_Assessment_10_2011_369541_7.pdf

Bear Creek

Background:
Bear Creek originates east of Bostwick Lake and flows about 14 miles through wetland and agriculturally dominated headwaters, Warren Townsend Park, the Village of Cannonsburg, and Cannonsburg Ski Resort before entering the Grand River (Figure 8). The watershed encompasses about 31 square miles and contains eighteen first order tributaries, the largest of which are Waddell, Stout, Armstrong and Shein Creeks.

The watershed contains a moderate amount of residential development. The average monthly stream flows range from 19 to 44 cubic feet per second (cfs), with an overall annual average of 28 cfs (Fulcher 1991).

In the upper six miles of Bear Creek (upstream of Giles Road), stream gradient is low, water velocity is slow and the channel is impacted by accumulations of muck and organic debris. Coldwater habitat is somewhat limited in this reach. From Giles Road downstream to the Grand River, a distance of about eight miles, stream gradient increases and soils are conducive to high infiltration rates and groundwater recharge. These soils result in a dominance of groundwater input and lead to colder temperatures suitable for trout and other coldwater organisms.

A dam at Chauncey Rd, near the confluence with the Grand River blocks the migration of all fish and other aquatic organisms, including sea lamprey that are able to navigate past the 6th Street Dam in Grand Rapids.

Public Access:
Approximately 1.4 miles of public stream access is available in Warren Townsend County Park.

2011/2012 Data Collection:
Temperature monitoring indicates that average July water temperatures were 65.6°F (Cold-transitional) at Cannonsburg Rd, downstream of the ski area, and 69.3°F at Giles Rd (Cool). Average August water temperatures were 64.3°F at the ski area and 65.0°F at Townsend Park. Point in time water temperatures indicate that coldwater habitat is limited to areas downstream of 6 Mile and Tiffany Roads.

Low numbers of brown trout were collected during electrofishing surveys at Giles Rd, and larger numbers of trout, ranging to 18 inches, were found in Townsend Park near Ramsdell Rd. Brown trout were also collected near Egypt Valley Rd and observed at the ski area.

In addition to the Chou-Cannon Dam at Chauncey Road, a number of other dams and fish migration barriers exist in the Bear Creek watershed. Another significant dam is located on Bear Creek in the Village of Cannonsburg under Joyce Road, and the culvert under Ramsdell Road, at the downstream end of Townsend Park, is a complete barrier due to

three concrete weirs constructed within the culvert. Two small private dams were identified on Armstrong Creek near Cannonsburg Road. Another small dam is located at the mouth of Frost Creek. A small rock dam was observed on Stout Creek on private land off of 7 Mile Road. In addition, a large number of check dams are known to occur on private lands that could impact fish migration.

A significant volume of sediment continues to enter Bear Creek at the Cannonsburg Ski Area. Evidence of erosion of the ski slopes and maintenance building parking lot is readily observed. Streambank erosion and lack of a riparian buffer were also noted at this location.

Published Studies:

VanScoy and Vandyke (1991) reported that Bear Creek was first assessed by the Michigan Department of Conservation (now DNR) in 1927 and subsequently managed as a coldwater stream. The stream condition at the time was noted to be unpolluted, with clear water, gravel and sand bottom, swift currents, and abundant plant and animal life including watercress, shrimp, larvae, worms, and flies. Brown trout were stocked in the late 1940's until about 1965, when it was determined that the stream was supporting a self-sustaining population. In July 1972, the Department of Conservation conducted a general fish survey which reported a fair trout population, but a lack of natural reproduction in the stream. The water was clear, with a mostly fast velocity, and had no higher aquatic vegetation in evidence. Natural food was reported as excellent to poor. A few brook, brown and rainbow trout were caught, along with a number of other species. Several sites were monitored, with sand/silt noted in several of these, especially in sites near the Cannonsburg Ski Area, which was under development at the time.

In 1990, District 9 DNR Fisheries Biologist E.J. Trimberger wrote to Janice Tompkins, DNR Surface Water Quality Division Analyst: "Bear Creek is a self-sustaining brook and brown trout stream in west central Kent County. It lies in an area that until recently has remained relatively undeveloped. The urban sprawl of the last decade has put considerable pressure on this stream through development within the watershed" (Trimberger, 1990, correspondence *in* VanScoy and Vandyke 1991).

A 1991 DNR biological assessment found the presence of various age classes of trout, inferring the existence of a healthy, self-sustaining population that reflects the presence of suitable, diverse habitat. The numbers of trout collected in the main stream of Bear Creek increased substantially in the higher gradient reach between Giles and the Grand River.

The Armstrong and Stout Creek tributaries contained numerous young-of-year brown trout and juveniles, which indicates that these streams serve as important habitats for reproduction. It also appears that these tributaries are essential in maintaining the coldwater fishery in Bear Creek upstream of the dam at Chauncey Drive. Waddell Creek contained limited numbers of young brown and brook trout. Both Armstrong and Waddell Creeks were found to be substantially impacted by sediment, reportedly from pasturing, road crossings and housing development in the high relief, erosion prone areas of their upper watersheds.

Data gathered to date indicates that, based upon stream morphology and biological communities, the reach from Giles Road downstream to Chauncey Drive is 'critically' important. Armstrong and Stout Creek are also biologically important.

Important populations identified as part of the Bear Creek survey include brook and brown trout, blacknose dace, the caddisfly family Glossosomatidae, the stonefly families Perlidae and Perlodidae and the mayfly family Oligoneuridae. The success of these species depends on clean gravel and larger substrate for reproduction and large, unobscured cobble for colonization and feeding. Observations indicate that the important gravel beds essential for fish spawning are severely imbedded with sand throughout Bear Creek. Suitable spawning beds remain in portions of Armstrong and Stout Creek, but are threatened by sedimentation.

The general consensus of all studies is that Bear Creek has the potential to be a productive trout habitat and a clean, non-polluted water resource with significant recreational and aesthetic value. At the present time, this habitat is threatened by many forces - some of recent origin, but many of several decades duration. All research points to the need to take immediate action to preserve and protect the remaining positive features of this unique ecosystem, as well as to restore the features which have been lost over time through neglect and damaging land and water management practices.

From 2005 through 2007, DNR sampled Bear Creek as part of the Status and Trends program. Very high numbers of brown trout, up to 17 inches in length, were found in each year of the survey.

According to the Bear Creek Watershed Stewardship Plan (http://www.cannontwp.org/department/division.asp?fDD=16-20), "Two water quality problems are primary: Sedimentation and Bacterial contamination, principally with fecal coliform organisms. These two primary problems are associated with a variety of interrelated factors, including but not limited to: Soil erosion from water and wind on unprotected fields, construction sites, and other vulnerable surfaces; Stormwater runoff, particularly from increasing amounts of impervious groundcovers such as asphalt and concrete; Removal of native vegetative cover and lack of replacement vegetation,

particularly along the stream corridor; Improperly installed or poorly maintained septic systems; Improper disposal of animal wastes; Public and private stormwater drainage systems that increase both the volume and velocity of the overland flow of water; Destruction or damage to watershed wetland areas; Historical and current practices of stream diversion, damming and channelization with associated disturbances of stream processes and fish migration; and Inadequate public knowledge base for dealing with complex water resource issues, despite a high level of public interest in appropriate water and land stewardship practices."

Previous Conservation Efforts:
In 2008, an initial habitat inventory was done in the area around Armstrong Creek and Egypt Valley, and some large woody debris habitat features were installed with Grand Rapids Community Foundation (GRCF) funds. The United States Fish and Wildlife Service funded improvements in the Townsend Park stretch. Habitat work in Bear Creek inspired local landowners to initiate BMPs in their riparian zones on their property, and to clear trash and log jams from smaller tributaries to free up fish passage.

Recommendations:

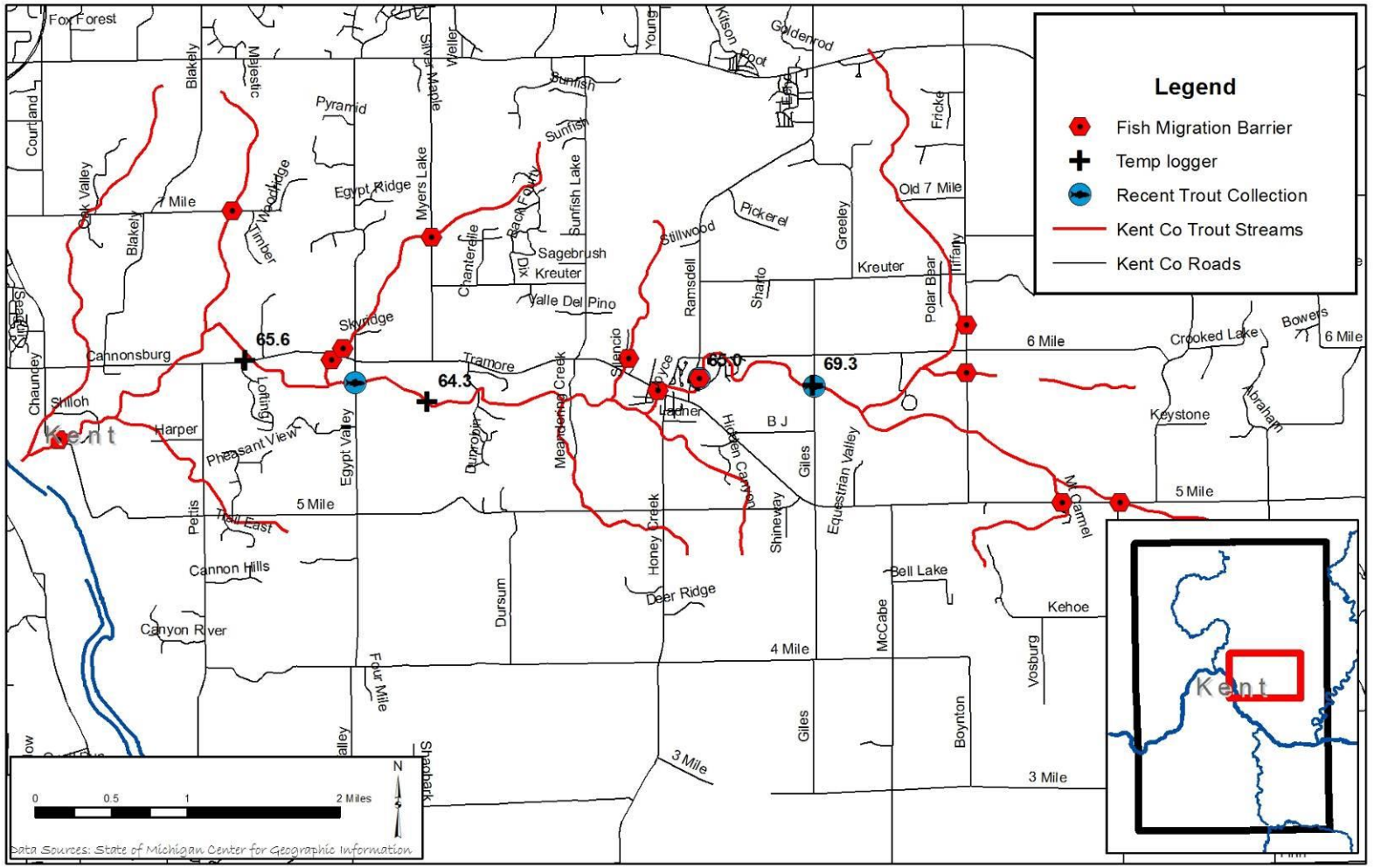
1. Bear Creek has its own watershed council and Cannon Township is an active partner in monitoring the stream. These groups would serve as great partners for future cooperation.
2. Work on establishing more public fishing access.
3. Improve riparian management and instream habitat in Townsend Park
4. Work with the landowner to improve riparian management and overland erosion at Cannonsburg Ski Area
5. Work with KCRC to improve fish passage at the Ramsdell Rd crossing
6. Explore the pros and cons of removal of the dams at Chauncey Drive and at Joyce St., as well as those smaller dams on Armstrong, Frost and Stout Creeks.
7. Work to reduce sediment input to Bear Creek and critical tributaries.
8. Protect Armstrong and Stout Creek from degradation of spawning beds through sedimentation.
9. Restore spawning beds in Bear Creek and critical tributaries.
10. Support the Bear Creek Watershed Council and Cannon Township's environmental program in protecting and improving Bear Creek.

Bear Creek Data Resources:

- Fulcher. J. 1991. Bear Creek Hydrologic Investigation. Incorporating both water quantity and quality considerations in urbanizing watersheds. Michigan Department of Natural Resources, Land and Water Management Division.
- Kosek, S. 1992a. A biological survey of Bear Creek, Kent County, MI, June 18, 1991. Michigan Department of Natural Resources, Surface Water Quality Division Staff Report No. MI/DNR/SWQ-92/211.
- Michigan Department of Natural Resources, Fisheries Division Files. Contact: Scott Hanshue, Fisheries Biologist
- VanScoy and Vandyke (1991) http://www.gvsu.edu/wri/isc/bear-creek-stewardship-plan-table-of-contents-265.htm

"Ethical behavior is doing the right thing when no one else is watching- even when doing the wrong thing is legal."

- Aldo Leopold



SCHREMS WEST MICHIGAN TROUT UNLIMITED	SCHREMS WEST MICHIGAN TU COLDWATER INVENTORY BEAR CREEK	JUNE, 2012 FIGURE NO. 8

Buck Creek

Background:
Buck Creek, a tributary to the Grand River, drains about 51 square miles of land in the Cities of Kentwood, Wyoming and Grandville (Figure 9). Many of the tributaries and portions of the mainstem are designated county drains. The creek and its tributaries are also currently listed as a designated trout streams and have been stocked with brown trout as recently as the spring of 2018. Significant development of the watershed has led to a variety of impacts typically found in urban watersheds, including extreme hydrologic fluctuation, sedimentation and thermal pollution.

Public Access:
Public access is available to nearly the entire stretch of Buck Creek between Byron Center and Clyde Park Ave. Charles Lemmery and Linus C. Palmer Parks offer parking and access to the stream. Other small, scattered areas, such as Wedgewood, Mill Race and Kellogsville Parks, are available to access Buck Creek and its tributaries.

2011/2012/2015-16 Data Collection:
Water temperature data collected at Byron Center Rd indicates that the stream is on the upper thermal limits for supporting trout. Average July water temperature was 68.8°F, with a maximum temperature of 76.7°F. Based on these data, Buck Creek is a Cool stream.

Point in time water temperature data collection suggests that the headwater reaches, upstream of M-6, are far too warm to support coldwater communities. Further details from the most current research are below.

Large brown trout are known to occur in some reaches and are often caught by anglers (personal communication, Jim Bedford).

Published Studies:
In 1992, the DNR rated the fish community as fair (moderately impaired) to good (slightly impaired) (Kosek 1992). Brown trout were found at two of the three stations sampled. Macroinvertebrate communities were impacted at all survey stations, with scores ranging from poor to fair. Sedimentation was found to be having severe negative impacts on the biological communities. It was suggested that local land use patterns, including urbanization, with associated sedimentation and flow fluctuations from stormwater runoff, was impairing the stream.

The Buck Creek Watershed Management Plan (2003) indicates that the most abundant nonpoint source pollutants were trash and debris, including grass clippings and other yard wastes. Construction activities related to the new M-6 crossing over Buck Creek was found to be supplying excess sediment. Livestock access to a tributary in Gaines Township was also noted. Streambank erosion was observed in the residential and commercial areas, where human activities had disturbed the riparian buffer. The plan listed the coldwater

fishery as being impaired north of 84th Street to the limits of the City of Grandville, and severely impaired in Lemery Park and near Burlingame Avenue.

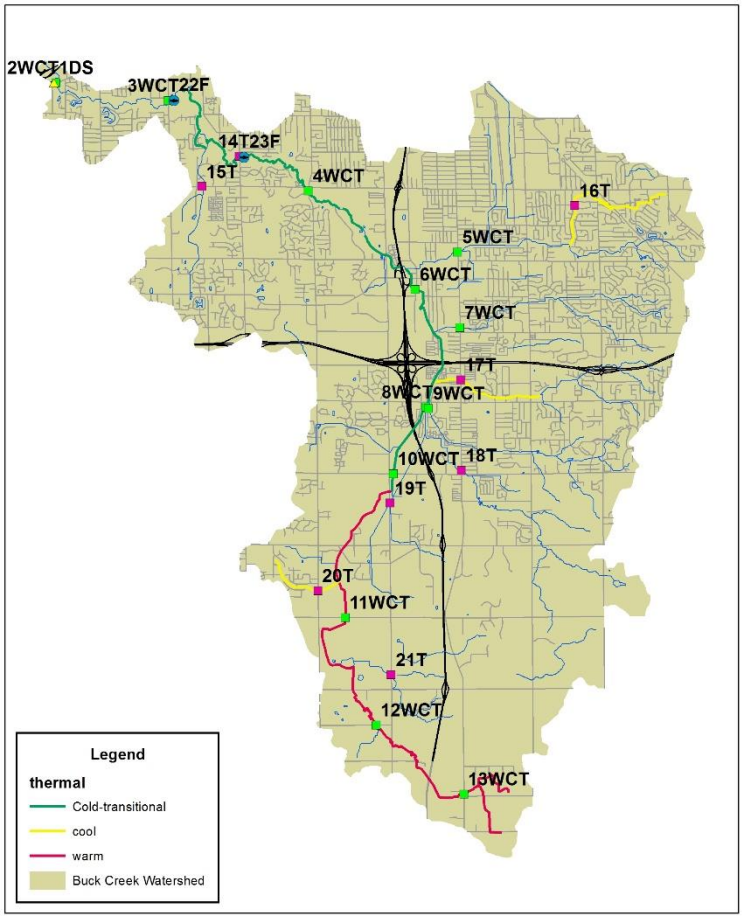
The latest fish survey of Buck Creek was conducted by DNR in 2002. The results included 28 brown trout and one rainbow trout. An angler survey conducted during the 2002 trout season found an estimated 46 angler trips on Buck, and reported no trout in the catch (Hanshue and Harrington 2011).

In 2009, DEQ found the macroinvertebrate community to be toward the low end of acceptable at Ivanrest Ave and at 76th Street (Rippke 2011). Physical habitat was found to be marginal at both of these locations.

The 2011 Lower Grand River Watershed Management Plan lists Buck Creek as a critical area for restoration due to pollution by pathogens and bacteria, sediment and nutrients (http://www.gvsu.edu/wri/isc/lower-grand-river-watershed-management-plan--312.htm). The coldwater fishery is listed as being threatened by sediment and nutrients.

In 2015, Schrems received a CMI grant to monitor the biology and water chemistry in the Buck Creek watershed. One objective of this work was to thermally classify the entire watershed, a recommendation made in the original, 2011, version of this document.

Water temperature data was collected at a total of 22 sites during 2015 and 2016. The upper reaches of Buck Creek appear to be managed strictly as an agricultural drain, with little regard for ecological communities or processes. The water temperatures associated with this upper section are very high, but cool rapidly as the stream receives cooler water from Mink Creek and the Hudson Drain in the vicinity of 100th Street.



From approximately 84th Street downstream to Ivanrest, on the mainstem of Buck Creek, water temperatures cool to the extent that they are conducive to the long-term survival of trout and other coldwater species. Sharps Creek received the highest summer score due to coldest mean and maximum temperatures. Buck Creek and Cutlerville Drain nearly meet the requirements of cold-transitional streams. Conversely, Buck Creek at Ivanrest and Carlisle Drain are pushing the upper limit for trout and slight warming could make these stream reaches too warm. Based upon the data collected, Figure 4 illustrates the thermal classification of most major stream reaches in the watershed.

Fish surveys were completed on the mainstem of Buck Creek at the Grandville Cemetery and at Lemery Park, on October 13 and 14, 2015. Conditions were optimal for completing the survey, with relatively low, clear water. At the cemetery site, a total of 136 trout were captured, measured, marked and released on October 13. The following day, 107 brown trout, 48 of which had been marked, were captured, resulting in a population estimate of 1,549 trout per mile of stream (420 trout/acre). Trout ranged from three to 15 inches in size, with about 22% of fish being at least eight inches in length, the legal size for harvest. Most trout (56%) were six to eight inches in length. Four trout were under five inches and presumed to be wild based upon their small size relative to the initial size of stocked trout. About 7% of the trout collected were presumed to be at least two years of age, based upon their larger size. Twenty-one other species of fish were collected at the site, with a diverse mix of cold, cool and warmwater species. White sucker was the dominant species.

At Lemery Park, only six brown trout and three rainbow trout were captured during the marking run – too few to complete a reliable population estimate. Brown trout were, on average, larger in size than those at the cemetery and likely greater than one year old. Only nine species of fish were collected and the community was dominated by approximately equal numbers of white sucker, round goby, mottled sculpin and johnny darter. Overall, numbers and diversity of fish seemed low for the relatively high-quality habitat.

Relative to other brown trout streams in the region, and disregarding the numbers of fish stocked, the size of the trout population in Buck Creek (420/acre) appears to be comparable. Bear Creek (Kent County) had an estimated 350 trout/acre (Bear Creek is not stocked), Coldwater River had around 315 trout/acre and Tyler Creek (Kent County) averaged about 800 trout/acre during fish surveys conducted over the past five years (SES, unpublished).

Procedure No. 51 physical habitat assessments were also conducted at these two sites. At Lemery Park, epifaunal habitat is relatively abundant and diverse in the form of woody debris and vegetation. Substrate is impacted by fine sediments, though a bit of gravel and manmade riffles do exist. Deep holes with overhanging banks and debris jams provide excellent cover. Flow appears to be very flashy and, along with excess sedimentation, appears to be the primary reason for degradation of this site. The stream corridor is quite natural on the north bank and upstream of the maintained park area. Within the park, parking lot runoff and erosion from foot traffic are evident.

The Grandville Cemetery is bordered by residential development on the upstream side, and associated impacts to the riparian corridor are prevalent. The southern stream bank, however, is in natural condition and contains many mature trees that help shade the stream. Overall, the habitat at the cemetery is slightly better than that at Lemery Park. A nice combination of riffles, runs and both shallow and deep pools are present. Overhanging vegetation and woody debris harbored many fish. The stream appears to be flashy here as well, but is better equipped to handle high flows due to accessible floodplains. The impacts of fine sediment are not as profound as the park site.

The water temperature data collected for this study represents the most significant effort to thermally classify Buck Creek and its tributaries. In contrast to Hanshue and Harrington (2011), results of this study indicate that the headwaters are warm, but the water cools as it nears the lower portions of the watershed. Despite warm water associated with agricultural land use in the upper watershed and high-density urban development in the rest of the watershed, the stream cools enough from groundwater contribution (i.e. baseflow) and contains a fish community to be considered a designated coldwater stream (DNR) from approximately 84th Street downstream to Ivanrest. Mean July water temperatures were used to classify this stream reach as “cold-transitional”. This portion of Buck Creek is meeting its use as a designated coldwater stream, pursuant to Part 4 of the WQC.

Buck Creek and Cutlerville Drain nearly meet the requirements of cold-transitional streams. Conversely, Buck Creek at Ivanrest and Carlisle Drain are pushing the upper limit for trout and slight warming, or a warmer than average summer, could make these stream

reaches too warm. At several sites, the maximum July water temperatures could negatively impact trout populations, especially if colder water refuges, such as springs or groundwater seeps, are scarce or not accessible. Sharps Creek appears to be especially important for protection since it was the coldest site in the study area.

Not only are stream temperatures favorable for trout, fish surveys confirmed their presence (along with associated coldwater species) and indicate that Buck Creek is meeting its coldwater designation at the Grandville Cemetery. Based only upon population estimates derived from fish surveys, and not considering the numbers of fish stocked, etc., the size of the trout population at the Grandville Cemetery appears to be consistent with those of other, similarly sized, streams in the region.

Despite having cooler water than the cemetery site, the data indicate that the trout population is depressed near Lemery Park. Though, the few trout captured during electrofishing surveys were, on average, larger in size and likely survived multiple years in the stream. Anglers do report good fishing for large brown trout in this reach. It is possible that the habitat near Lemery Park, with sandy substrate, and more deep holes and runs than the cemetery, favors lower numbers of larger trout.

Data collected during this study indicates that environmental factors are conducive to trout survival for at least a single season. It is also evident from the survey data that some trout are surviving year-round, some for multiple years. Anecdotal evidence from anglers indicates that Buck Creek provides the environment necessary to grow low to moderate numbers of large trout; however, data also supports the suggestion that the coldwater fishery is threatened by water temperature in several reaches and impaired near Lemery Park.

In addition to elevated water temperature, reasons for threats or impairments to the coldwater fishery might include degraded water quality and/or physical habitat. Results of monitoring indicate that the stream is flashy and impacted by excessive sediment. Hydrolab data shows that levels of dissolved oxygen and total dissolved solids are far from ideal for supporting a high-quality aquatic community, and could be limiting the survival of sensitive aquatic species. The role of elevated levels of nutrients and, chlorides, is unclear.

E. coli bacteria, which are associated with fecal contamination and typically indicate presence of other pathogens, bacteria and viruses, appears to be one of the pollutants of greatest concern. *E. coli* concentrations throughout the Buck Creek Watershed exceed WQC, meaning that the stream is not meeting its designated uses of partial and/or full body contact recreation and should not be used for these purposes. The highest values were found within the most urbanized areas of the watershed.

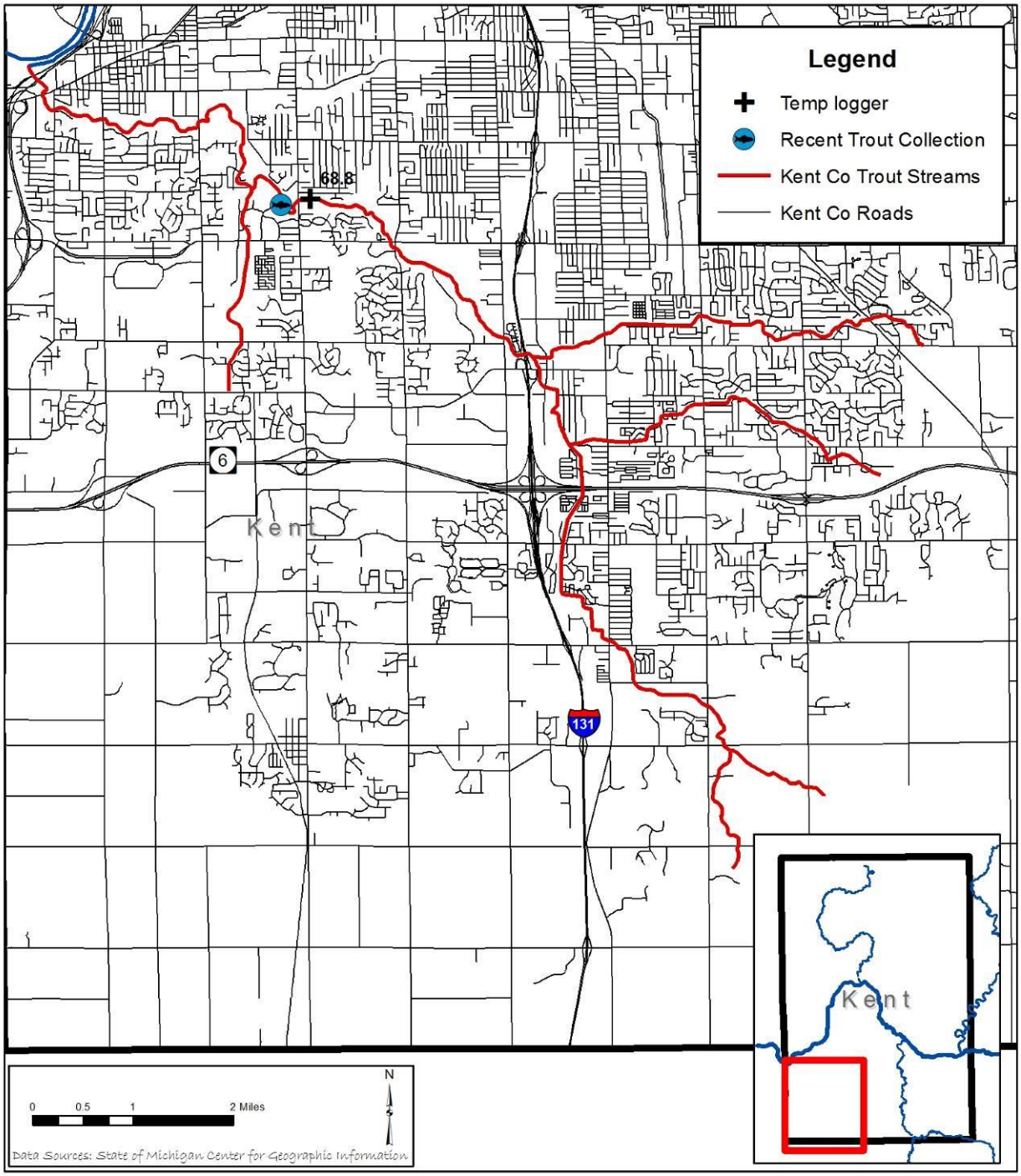
Recommendations:

1. Encourage DNR to continue the stocking of trout.
2. Periodic updates of trout population data in “prime waters”.
3. Support watershed management strategies aimed at reducing stormwater impacts to water temperature, quantity and quality

4. Improvement of instream habitat using methods capable of withstanding extreme flow conditions
5. Support DNR/DEQ in monitoring efforts
6. Explore opportunities to implement best management practices throughout the watershed, with emphasis at the aforementioned sites, to cool the stream.
7. Planting/Protecting riparian vegetation is obviously important. Large-scale removal of vegetation, especially along the south and west streambanks, should be discouraged. Local ordinances could be used to protect stream corridors.
8. Wetland restoration or other "pre-treatment" of stormwater runoff would be beneficial. Direct runoff of stormwater during summer storms, especially from hot surfaces such as roofs and asphalt, can increase stream temperatures dramatically.
9. Continue monitoring to decipher impacts of summer air temperature and precipitation on water temperature.
10. All sources of sediment should be identified and sediment input should be quantified. Priority areas include those sites that show impacts to stream habitat. Known sources should be stabilized as soon as possible.

Buck Creek Data Resources:

- Buck Creek Watershed Management Plan. http://www.michigan.gov/documents/deq/ess-nps-wmp-buck-creek_208920_7.pdf
- Hanshue, S. K., and A. H. Harrington. 2011. Draft Grand River Assessment. Michigan Department of Natural Resources Fisheries Division, Special Report, Ann Arbor.
- Kosek, S. 1992b. A Biological Survey of Buck Creek, Kent County, Michigan, June 19, 1991. Michigan Department of Natural Resources Staff Report No. MI/DNR/SWQ-92/212.
- Michigan Department of Natural Resources, Fisheries Division Files. Contact: Scott Hanshue, Fisheries Biologist
- Rippke, M. 2011. A biological survey of the Lower Grand River Watershed, August-September 2009. Michigan Department of Environmental Quality Water Division Staff Report No. MI/DEQ/WRD-11/036.
- Schrems. 2017. Buck Creek Monitoring Project. Clean Michigan Initiative #2015-0524



SCHREMS WEST MICHIGAN TU COLDWATER INVENTORY

BUCK CREEK

JUNE, 2012

FIGURE NO. 9

Cherry Creek

Background:
Cherry Creek flows through the City of Lowell before entering the north bank of the Grand River in Town 6N, Range 9W, Section 10, approximately one mile downstream of the mouth of the Flat River (Figure 10). Lee Creek is a tributary to Cherry Creek and is also listed as a designated trout stream. Both of these streams flow through wooded lands in their headwaters. Lee Creek flows through agricultural land before joining Cherry Creek and entering the City of Lowell, where the land use is primarily residential and commercial. Portions of the stream are relatively well-buffered, but some reaches are heavily impacted by riparian activities.

Public Access:
Lee Creek flows through the Wittenbach/Wege Environmental Center and borders Creekside Park. No other public access is known to exist.

2011/2012 Data Collection:
Water temperature data from Lee Creek indicates that this tributary is Cool at Vergennes Rd, with an average July temperature of 69.5°F. The maximum temperature recorded at the site was 78.8°F. No water temperature data was collected in Cherry Creek, but brook trout were observed in the stream and seasonal migrations of steelhead and salmon are known to occur.

Minor fish migration barriers were noted at Bowes, Foreman and Vergennes Roads.

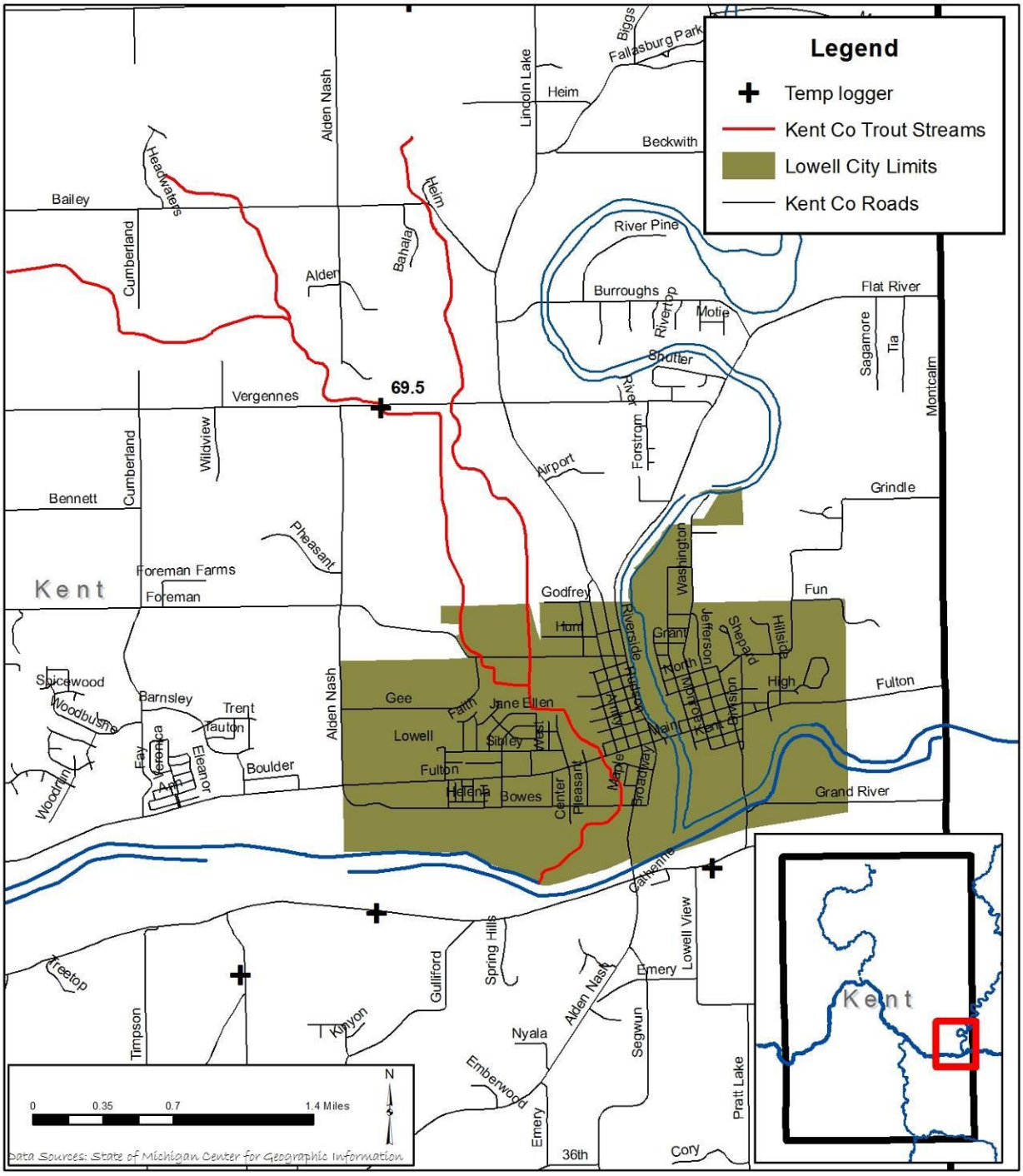
Published Studies:
In 1999, DNR sampled Cherry Creek and found an abundance of brook trout, ranging up to seven inches in length.

Recommendations:
1. Work with riparians in the City of Lowell to improve the stream and adjacent land.
2. Support the Wittenbach/Wege Environmental Center's education efforts, and help promote coldwater education and conservation
3. Support continued DNR/DEQ monitoring efforts

Cherry Creek Data Resources:
- Michigan Department of Natural Resources, Fisheries Division Files. Contact: Scott Hanshue, Fisheries Biologist

"A trout is a moment of beauty known only to those who seek it."

- Arnold Gingrich



SCHREMS WEST MICHIGAN TU
COLDWATER INVENTORY

CHERRY AND LEE CREEKS

JUNE, 2012

FIGURE NO.
10

Egypt Creek

Background:
Egypt Creek is about 3.5 miles long and enters the Grand River in Town 7N, Range 10W, Section 7, near the corner of Pettis Ave. and Knapp St. (Figure 11). The stream originates as an outlet from Chase Lake. The dominant land use appears to be forested and residential, which has been converted from agriculture in the last several years. Egypt Valley Country Club is also located in the watershed. One major tributary flows northwest and enters Egypt Creek about one quarter of a mile from the Grand River. This tributary, which is about three miles long with significant gradient in the upper half, is not listed as a DNR designated trout stream.

Public Access:
The upper reaches of Egypt Creek flow through the Cannonsburg State Game Area, specifically, select reaches located north of 3 Mile Rd and east of Inman. Trout fishing opportunities are unknown in this area.

2011/2012 Data Collection:
The average July water temperature of Egypt Creek was 64.7°F at Pettis Rd, resulting in a classification of Cold-transitional. At Egypt Valley Rd, no July data was collected, but average August water temperature 61.5°F. Based on surrounding land use, it is likely that the Egypt Valley Rd crossing is cooler throughout the summer.

Presence/absence electrofishing in the unnamed tributary of Egypt Creek in the spring of 2012 revealed four brook trout in the 8-9 inch range, and one rainbow trout in the six inch range, at the Egypt Valley road crossing near the Darby Farms development.

Brook and brown trout were observed at Pettis Rd in 2011.

The public road/stream crossings along Egypt Creek allow free passage of fish and other aquatic organisms. The 2 Mile Road crossing over the unnamed tributary is perched and likely blocks most fish passage.

Egypt Creek flows through natural lands for most of its length. The unnamed tributary flows through natural land in its headwaters before flowing through horse pasture and through Forest Hills Eastern school property. The headwaters are steep and cold, with high

quality substrate. Unfortunately, once it flows into the horse pasture upstream of the school, the stream is nothing more than a sand-laden, straightened ditch.

Published Studies:
A 1987 DNR survey determined Egypt Creek to be a high quality trout stream based on fish populations, macroinvertebrates and habitat (McMahon, 1988). Both brook and brown trout were documented. All indicators suggested excellent water quality for a southern Michigan stream.

A 1992 DNR survey found trout to be reproducing naturally at all sampling stations (Kosek, 1993). Rainbow, brown and brook trout were documented, with rainbow and brown trout being equally dominant in the sample and brook trout found in lesser numbers. This survey reported lower percentages of gravel and cobble substrates and greater fish densities compared to earlier surveys. Egypt Creek was determined to be a fair quality coldwater stream, but it was suggested that increasing development in the area could have significant negative impacts on its quality.

In 2002, DNR conducted a fish survey of Egypt Creek and found six brown trout and 21 rainbow trout.

Recommendations:

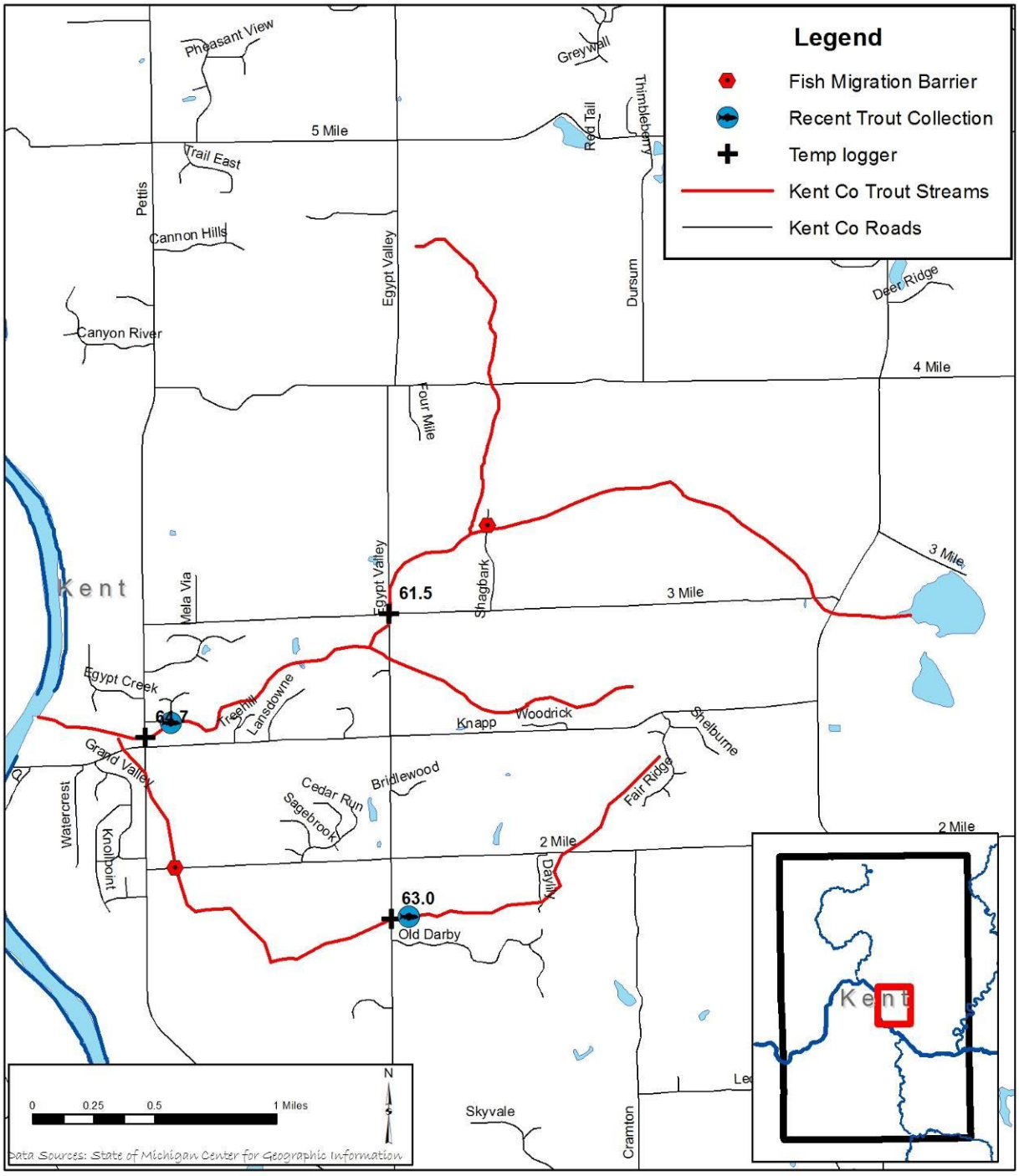
1. Determine status of coldwater fishery on public land; temperature monitoring and fish survey.
2. Work with KCRC to replace culvert under 2 Mile Road
3. Support continued DNR/DEQ monitoring efforts

Egypt Creek Data Resources:

- Kosek, S. 1993. A biological survey of Egypt and Honey Creeks, Kent County, MI, August 20, 1992. Michigan Department of Natural Resources, Surface Water Quality Division Staff Report No. MI/DNR/SWQ-93/003.
- McMahon, M. 1988. A biological survey of Egypt Creek, Kent County, MI, August 8, 1987. Michigan Department of Natural Resources, Surface Water Quality Division Staff Report. Report No. MI/DNR/SWQ-88/017.
- Michigan Department of Natural Resources, Fisheries Division Files. Contact: Scott Hanshue, Fisheries Biologist

"The water you touch in a river is the last of that which has passed, and the first of that which is coming; thus it is with time."

- Leonardo DaVinci



SCHREMS WEST MICHIGAN TROUT UNLIMITED	SCHREMS WEST MICHIGAN TU COLDWATER INVENTORY EGYPT CREEK	JUNE, 2012 FIGURE NO. 11

Honey Creek

Background:
Honey Creek enters the Grand River in Section 27 of Ada Township (Figure 12). The stream is of relatively high quality, but significantly impacted by residential land use, including maintained lawns, manmade dams and riffles and unsuitable private crossings. Anadromous fish are known to occur in Honey Creek and, despite the presence of two fairly significant dams, an unknown portion of these fish are known to migrate to the headwaters of Honey Creek. The stream is quite fishable, but angling is reportedly highly discouraged by landowners.

Public Access:
A small stretch of Honey Creek flows through Seidman Park near the corner of Honey Creek and Conservation Rds.

2011/2012 Data Collection:
Water temperature data from July indicates that the stream averages 65.7°F and is Cold-transitional at Dogwood Rd. Minimum and maximum July temperatures were 58.7 and 75.1°F, respectively. In August, average temperature was 66.4°F. At Honey Creek Rd, average August water temperature was 62.1°F, and no July data were collected.

Fish migration barriers include two significant dams, the first located about 1,100 feet upstream of the Grand River, the second about one mile upstream of the first, at Dogwood Rd. In addition, a number of small rock dams are visible from the public roads; the impact of these smaller barriers is likely insignificant, but noteworthy. Culverts at Downes and Fero Roads were determined to be fish migration barriers. Anadromous fish are known to bypass both dams and the culverts at Downes and Fero, since steelhead were observed upstream as far as 2 Mile Rd during the 2012 spawning migration.

During assessments, significant runoff from Dogwood Rd, a gravel natural beauty road, was observed at two crossings. Stormwater runoff down the edges of the road carries apparently large volumes of sediment load from the road to the stream. Evidence of livestock access is apparent at the 2 Mile Rd crossing, though no animals were observed during multiple visits in 2012.

Published Studies:
In 1991, DNR surveyed Honey Creek near Conservation Road, and found an equal proportion of rainbow and brook trout. Nearly all of the trout were found in a deep pool with manmade habitat structure.

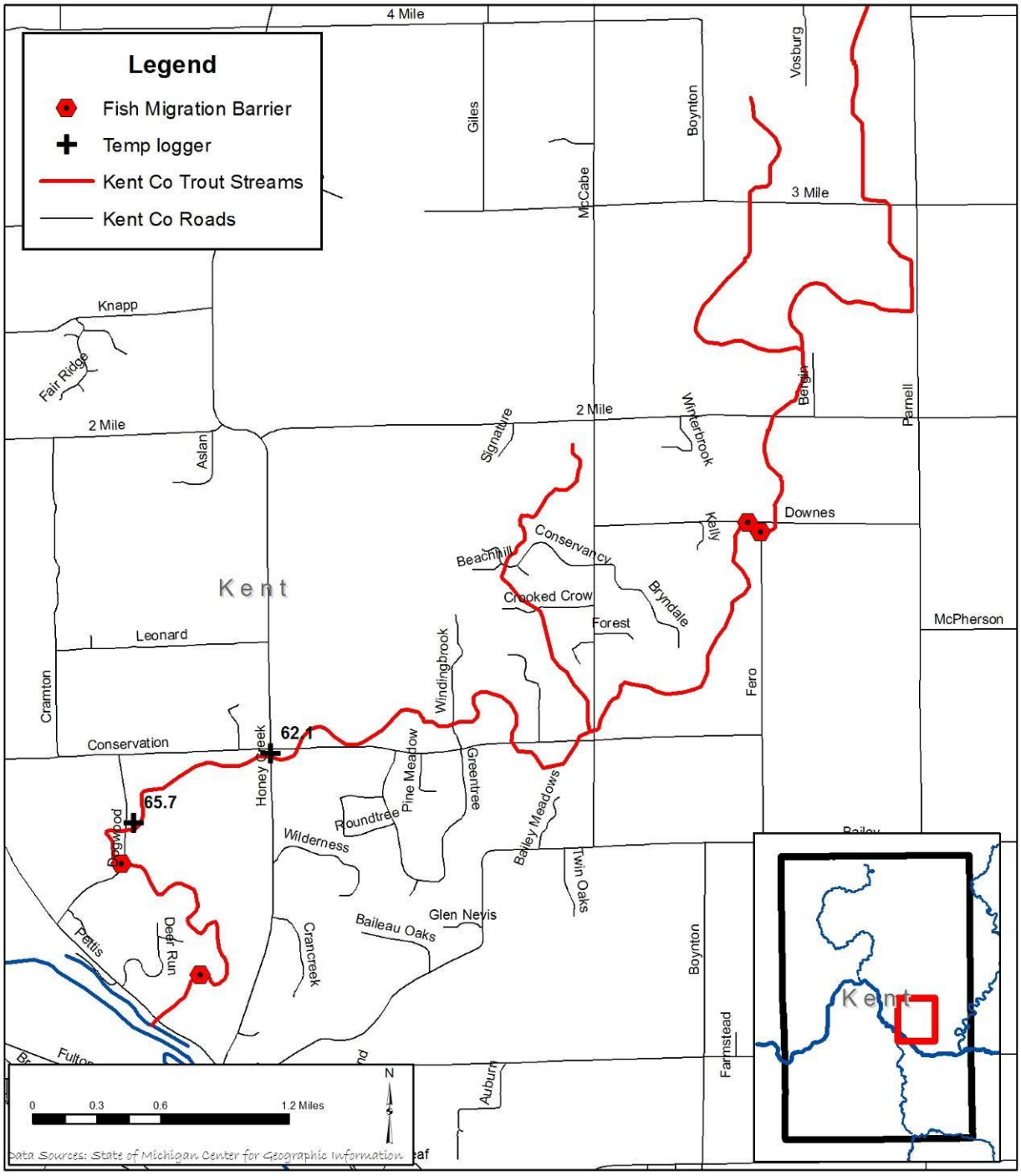
A 1992 DNR survey found Honey Creek to be a fair quality coldwater stream, with anticipated negative impacts from development and associated sediment load (Kosek, 1993). Fish communities were rated as 'good' at all stations sampled during this survey. Macroinvertebrate communities were found to be fair to good. Overall, aquatic habitat was considered to be good. Rainbow, brown and brook trout were found within Honey Creek; rainbow trout were, by far, the most abundant (66), followed by brook (23) and brown (4) trout. A habitat improvement project constructed by a landowner was found to have resulted in the highest fish density of all stations sampled.

Recommendations:
1. Work with the KCRC to reduce the input of sediment from Dogwood Rd near crossings.
2. Work with partners and landowners to improve passage for fish and other aquatic organisms
3. Ensure that livestock do not have free access to the stream.
4. Support continued DNR/DEQ monitoring efforts

Honey Creek Data Resources:
- Kosek, S. 1993. A biological survey of Egypt and Honey Creeks, Kent County, MI, August 20, 1992. Michigan Department of Natural Resources, Surface Water Quality Division Staff Report No. MI/DNR/SWQ-93/003.
- Michigan Department of Natural Resources, Fisheries Division Files. Contact: Scott Hanshue, Fisheries Biologist

"There will be days when the fishing is better than one's most optimistic forecast, others when it is far worse. Either is a gain over just staying home."

- Roderick Haig-Brown



SCHREMS WEST MICHIGAN TROUT UNLIMITED	SCHREMS WEST MICHIGAN TU COLDWATER INVENTORY HONEY CREEK	JUNE, 2012 FIGURE NO. 12

Indian Mill Creek

Background:
Indian Mill Creek is a third order tributary to the Grand River. Land use includes a mixture of row crops and orchards in the headwaters, and urban and industrial in the lower reaches. Upstream of the intersection of Walker and 4 Mile Roads, the stream is considered a designated county drain. The creek enters the Grand River near US-131 and Ann Street in downtown Grand Rapids (Figure 13).

Public Access:
Access is available to Brandywine Creek, a tributary, in Blandford Nature Center, though the ability of the watercourse to harbor coldwater fish is suspect at this location and angling opportunities are very limited.

2011/2012 Data Collection:

Water temperature monitoring indicates that the July temperature ranged from 61.7 to 77.6°F at 6 Mile Road, with an average monthly temperature of 69.0°F, for a designation of Cool. At 4 Mile Road, the average monthly temperature for August was 64.4°F. Based upon these water temperatures, it was uncertain if stream could support trout or other coldwater fish.

As such, backpack electrofishing was conducted near Richmond Park and at Walker Ave. At the park, sampling resulted in the capture of 11 different species of fish, including rainbow trout (yoy and adult steelhead), resident brown trout (yoy and adult) and adult coho salmon. At Walker Ave, eight species of fish were documented, including various age classes of resident brown trout, an adult steelhead and many juvenile steelhead. Both locations appear to be meeting their coldwater designation.

Stream crossing surveys indicate that fish passage on Indian Mill Creek is good to excellent. Eighteen crossings were inspected and only one (Richmond Ave culvert) was found to have minor passage issues. Most of the crossings consist of bridges that span the stream width.

Published Studies:
A fish kill occurred on April 18, 1998, as a result of ammonia refrigerant spilling into the stream from Thornapple Meat Company. All fish species were lost in the lower two miles of the creek.

In 1991, DNR conducted a fish survey near Bristol Road. In areas with higher quality habitat, rainbow trout were captured. This is the only species noted on the survey card.

Biological investigations conducted in 1993 found communities to be depressed, apparently as a result of sedimentation and accelerated bank erosion (Wuycheck 1993a).

In 2009, DEQ conducted several studies on Indian Mill Creek in response to a request by the West Michigan Environmental Action Council (Rippke, 2011). The purpose of the studies was to determine the attainment status of the coldwater fish and other indigenous aquatic life and wildlife designated uses. This report indicated that a fish community survey at Richmond Park resulted in the capture of only 36 fish in 45 minutes of sampling. The community included nine rainbow trout and one brown trout, but was dominated by white suckers. The north bank was a walled junk yard and the soil composing this bank was embedded with trash. The substrate in the stream was composed of a mix of cobble, gravel and boulders with little fine sediment. There was nothing evident in the in-stream habitat assessment which would obviously impair the fish community. Macroinvertebrate surveys at this site scored acceptable and the community was dominated by mayflies, caddisflies and sowbugs. For a point of reference, another Indian Mill Creek site was surveyed upstream at 3 Mile Road. Backpack electroshocking at this site resulted in the capture of 121 individuals, 4% of which were salmonids, resulting in the determination that the upstream portion of Indian Mill Creek is attaining the coldwater fish designated use. At 3 Mile Road, the in-stream habitat and macroinvertebrate community was similar to Richmond Park, but the riparian zone aspects of the habitat survey were clearly higher quality than the Richmond Park station. Salmonids were found at both Indian Mill Creek sites, but the failure to capture the required minimum of 50 fish at Richmond Park indicates that this reach of the creek is not attaining the coldwater fish designated use for unknown reasons. Water samples and sediment samples were collected at both stations.

Although there did appear to be higher concentrations of some metals in the sediments at Richmond Park, additional investigation is needed, and the concentrations are below the United States Environmental Protection Agency threshold concentrations.

The results of the 2009 DEQ sampling at Richmond Park appear to be in contrast to the 2011 sampling conducted as part of this study.

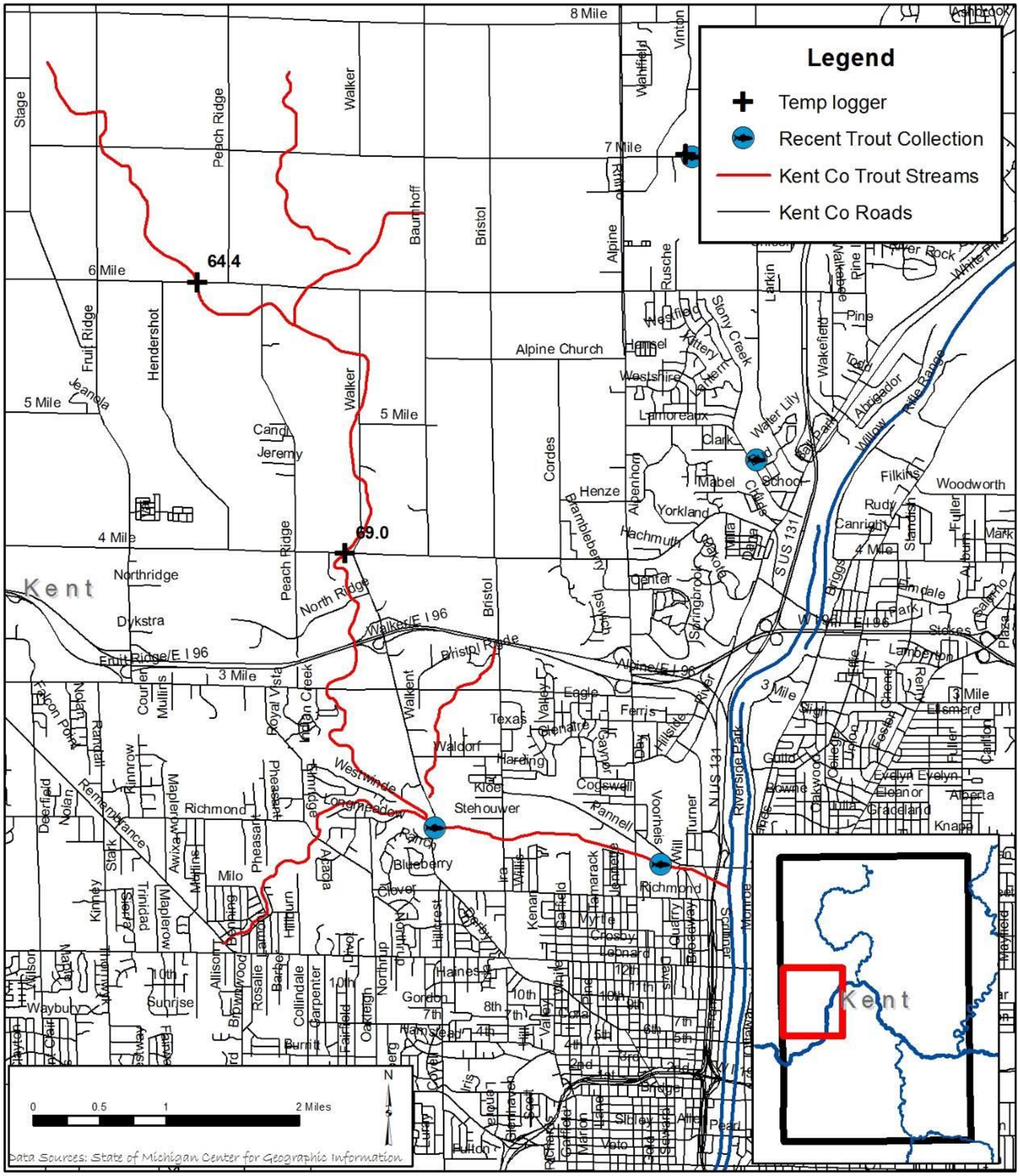
The impacts of urbanization on the Indian Mill Creek Watershed have been profound. Total runoff volume from a 2-year storm under average watershed conditions was found to have increased 131 percent from 1800 to 1978, with every subbasin showing increases (Fongers 2010). From 1978 to 2005, it increased an additional 24 percent overall, with one subbasin showing a decrease.

Recommendations:

1. Complete thermal classification of the stream and its tributaries
2. Estimates of trout populations in the upper, middle and lower portions of the watershed.
3. Additional investigation of the status and possible impairment of the coldwater community near Richmond Park.
4. Work with the Cities of Walker and Grand Rapids and the Kent County Drain Commissioner (KCDC) to improve water quality and to reduce the impacts of stormwater runoff.
5. Promote agricultural BMPs in the upper watershed
6. Work with local schools on education and establish a Salmon in the Classroom program, with release at Richmond Park.
7. Stream cleanup
8. Instream habitat improvement

Indian Mill Creek Data Resources:

- Fongers, D. 2010. Indian Mill Watershed Hydrologic Study. Hydrologic Studies and Dam Safety Unit, Michigan Department of Natural Resources and Environmental Quality. Lansing, MI.
- Michigan Department of Natural Resources, Fisheries Division Files. Contact: Scott Hanshue, Fisheries Biologist
- Rippke, M. 2011. A biological survey of the Lower Grand River Watershed, Kent, Ottawa, Muskegon, Montcalm, Ionia and Newaygo Counties, Michigan. August-September 2009. Michigan Department of Environmental Quality Water Division Staff Report No. MI/DEQ/WRD-11/036.
- Wuycheck, J. 1993a. A biological assessment of Indian Mill Creek, Kent County, Michigan, 4 September 91. Michigan Department of Natural Resources, Surface Water Quality Division Staff Report. Report No. MI/DNR/SWQ-93/022.



SCHREMS WEST MICHIGAN Environmentally Involved Since 1962 TROUT UNLIMITED	SCHREMS WEST MICHIGAN TU COLDWATER INVENTORY	JUNE, 2012
	INDIAN MILL CREEK	FIGURE NO. 13

Mill Creek

Background:
Mill Creek is a second order stream that enters the Grand River in the City of Walker (Figure 14). The headwaters originate at Cranberry Lake and near 9 Mile and 10 Mile Roads. Mill Creek flows about 14 miles, with the lower portion of the stream flowing through urbanized areas with substantial areas of impervious surfaces.

Public Access:
Access is available near Mill Creek's confluence with the Grand River, at Dwight Lydell County Park. In the upper reaches, the stream can be accessed in Wahlfield County Park.

2011/2012 Data Collection:
Average July water temperature was 67.7°F at 7 Mile Rd, with a minimum and maximum temperature of 61.5 and 75°F, respectively. Based upon the July water temperature, Mill Creek meets the criteria of a Cool stream at 7 Mile Rd. Average August water temperature was 65.9°F at Peach Ridge Rd.

Backpack electrofishing surveys resulted in a catch of four brown trout and eight rainbow trout at 7 Mile Rd, and four brown trout, seven rainbows and one adult steelhead at Lameroux Drive. Most trout were small, likely yoy; though one larger resident brown trout was captured at 7 Mile Rd. Based on survey results, Mill Creek appears to be an important tributary for anadromous reproduction.

Stream crossing surveys indicate that Mill Creek is highly dissected by culverts that do not provide adequate passage for all life stages of fish at all flows. Of the 20 crossing inspected, ten were found to have inadequate passage.

Mill Creek is a slow moving stream as it flows through Dwight Lydell County Park. There are multiple bridge crossings throughout the stream for public use. The embankment consists of about 80% manmade material. The west side of the stream is mainly concrete throughout the park, while the east bank is primarily concrete, with some more natural material. Due to the concrete embankment, there is little to no erosion of the banks within the confines of the park. There are several rock check dams present, some spanning the width of the stream. In the upstream portion of the park, above the railroad tracks, there is a small pond held back by a small dam. The outlet of this dam releases into Mill Creek.

Published Studies:
A major fish kill occurred in November 1983 as a result of storm runoff that contained chicken manure (Wuycheck 1994a). The discharge, which happened near 10 Mile Road, resulted in the loss of fish throughout the entire length of stream, including many brown trout and steelhead.

In 1989, DNR Fisheries survey data indicated that Mill Creek supported a self-sustaining brown trout population and natural reproduction of coho salmon and steelhead in the vicinity of 6 Mile and 7 Mile Roads, and Vinton Avenue (Wuycheck 1994a).

Strawberry Creek, a 3.5 mile long tributary to Mill Creek, contained numerous juvenile brown trout, and a few coho salmon and steelhead in 1987. In January 1989, numerous dead brown trout and steelhead were found downstream of M37 and 6 Mile Road. Investigation found that the kill was a result of industrial discharge. Results of these two studies do indicate, however, that Strawberry Creek was capable of sustaining naturally reproducing brown trout and steelhead.

Physical habitat in each stream was determined to be impaired due to sedimentation, elevated turbidity, unstable flow and extreme streambank erosion. The upper two thirds of Mill Creek and most of Strawberry Creek were not optimally supporting their designated use as coldwater streams.

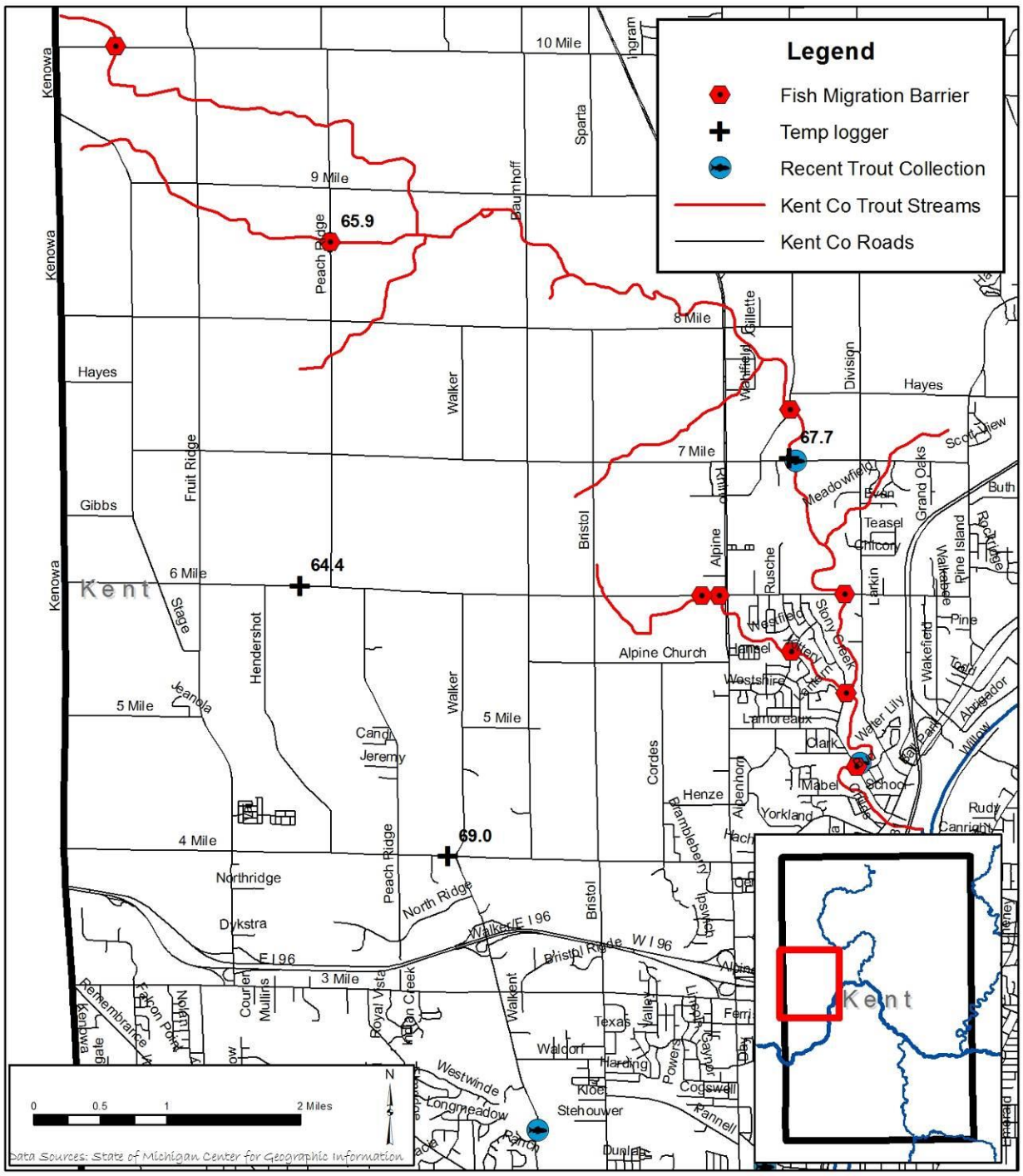
In 1999, DNR found 12 brown trout, up to 14 inches in length, during a general survey.

Recommendations:

1. Work with the KCRC to improve road/stream crossings to provide adequate passage of fish
2. Determine if year round survival of trout can occur in Dwight Lydell Park; if so, consider habitat improvement and naturalization of stream banks
3. Soil erosion and runoff control BMPs need to be implemented and maintained throughout the watershed.
4. Support DNR/DEQ monitoring efforts

Mill Creek Data Resources:

- Michigan Department of Natural Resources, Fisheries Division Files. Contact: Scott Hanshue, Fisheries Biologist
- Wuycheck, J. 1994a. A biological assessment of Mill Creek and Strawberry Creek, Kent County, Michigan, 9 June 92. Michigan Department of Natural Resources, Surface Water Quality Division Staff Report No. MI/DNR/SWQ-94/039.



SCHREMS WEST MICHIGAN TU COLDWATER INVENTORY

MILL CREEK

JUNE, 2012

FIGURE NO. 14

Portfleet Creek

Background:
Portfleet Creek is a first order coldwater stream with a very small drainage area (Figure 15). The stream is a designated receiving water for up to 2.6 million gallons of mine drainage water per day from Domtar Gypsum. Still, portions of the stream are noted to be ephemeral.

Public Access:
Portfleet Creek flows through Millenium Park, where it discharges to the Grand River.

2011/2012 Data Collection:
None

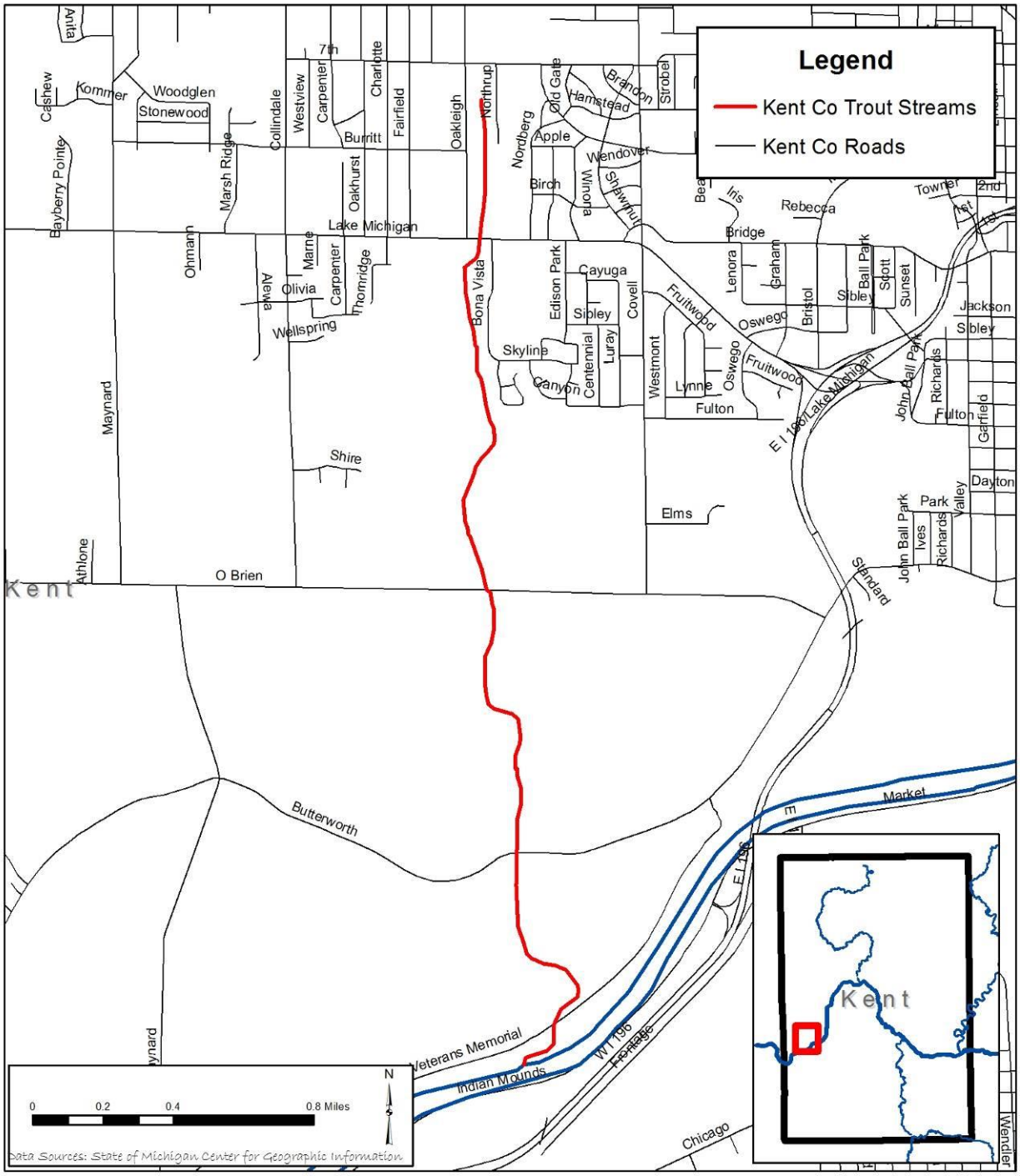
Published Studies:
In 1996, DEQ found Portfleet Creek to harbor scuds, crayfish, dragonflies and caddisflies (Hanshue, 1996). About 25 fish were observed, but there is no indication as to the species present. The physical habitat was found to be limited by depth and riffle quality. The stream serves as a connecting channel from the Grand River to upstream ponds, which were said to provide suitable spawning and nursery habitat for fish. Based on these observations, it was recommended that Portfleet Creek is protected for coldwater designated use downstream of the ponds.

Recommendations:
1. Support continued DNR/DEQ monitoring efforts

Portfleet Creek Data Resources:
- Hanshue, S.K. 1996. Biological assessment of an unnamed tributary (Portfleet Creek) to the Grand River, Kent County, March 19, 1996. Michigan Department of Environmental Quality, Surface Water Quality Division Staff Report No. MI/DEQ/SWQ-96/056.

"In these sad and ominous days of mad fortune chasing, every patriotic, thoughtful citizen, whether he fishes or not, should lament that we have not among our countrymen more fishermen."

-Grover Cleveland



SCHREMS WEST MICHIGAN TROUT UNLIMITED	SCHREMS WEST MICHIGAN TU COLDWATER INVENTORY PORTFLEET CREEK	JUNE, 2012 FIGURE NO. 15

Spring Brook

Background:
Spring Brook is a coldwater, direct tributary into the Grand River near the City of Lowell (Figure 16). This stream was historically managed for trout and was stocked with brook trout from 1938 through 1951. Recent fisheries surveys report Spring Brook contains a naturalized population of brook trout and is utilized to some extent by spawning steelhead.

Public Access:
None

2011/2012 Data Collection:
Average July water temperature was 60.3°F, with a minimum of 55.7°F and maximum of 68.4°F. This stream is designated as Cold.

A fish migration barrier was identified at the culvert under Alden Nash Rd.

Published Studies:
From 2005 through 2007, DNR sampled Spring Brook as part of the Status and Trends program. Each year, very high numbers of brook and rainbow trout (steelhead) were reported. These were the only two species of fish mentioned on the survey card.

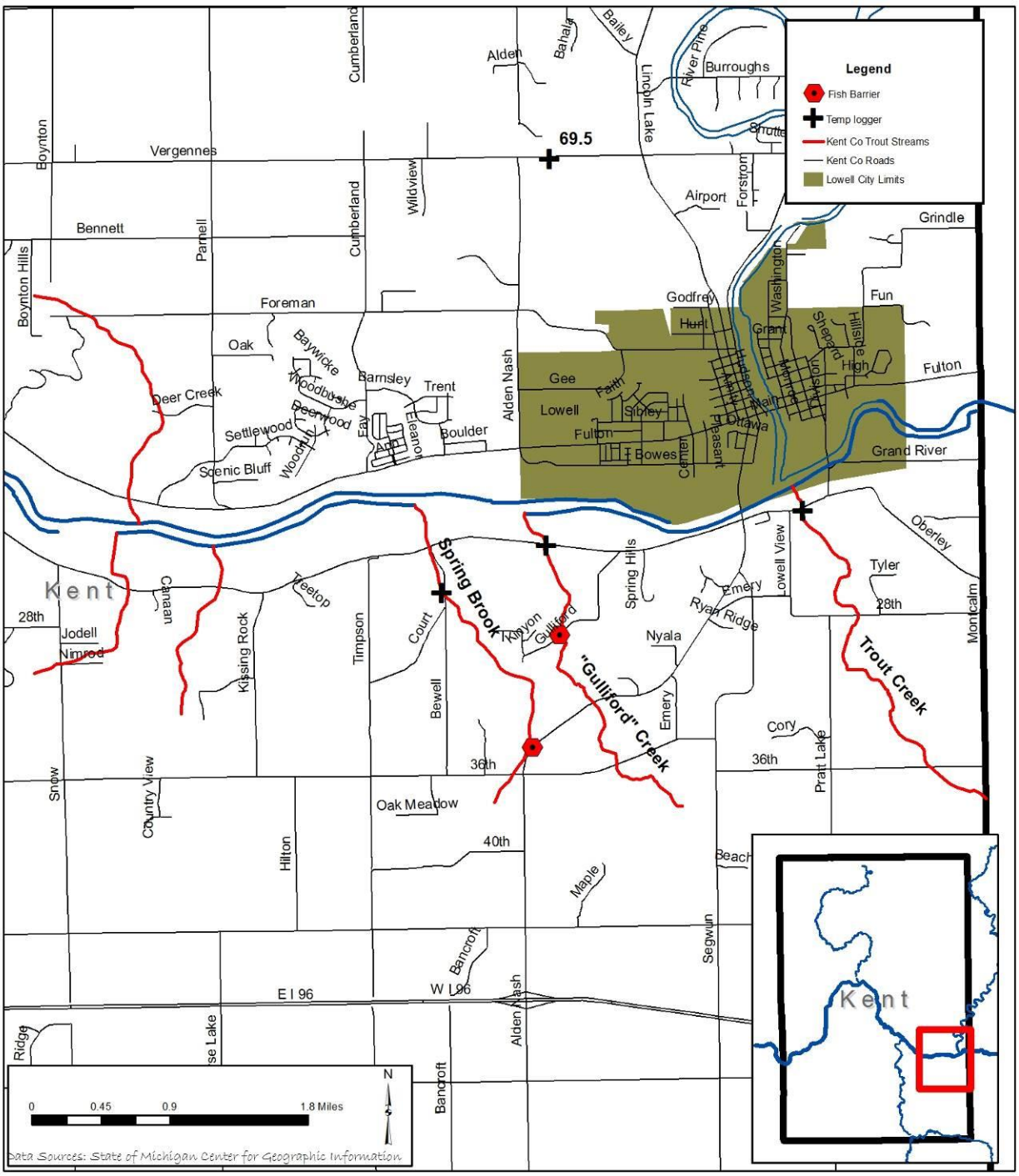
Spring Brook is a long-term fixed monitoring location that is sampled at regular intervals as part of Fisheries Division's Status and Trends Program (Hanshue and Harrington, 2011).

Recommendations:
1. Support continued DNR/DEQ monitoring efforts

Spring Brook Data Resources:
- Hanshue, S. K., and A. H. Harrington. 2011. Draft Grand River Assessment. Michigan Department of Natural Resources Fisheries Division, Special Report, Ann Arbor.
- Michigan Department of Natural Resources, Fisheries Division Files. Contact: Scott Hanshue, Fisheries Biologist

"Angling is extremely time consuming. That's sort of the whole point."

- Thomas McGuane



SCHREMS WEST MICHIGAN TU
COLDWATER INVENTORY

TROUT, GULLIFORD CREEKS
SPRING BROOK

JUNE, 2012

FIGURE NO.
16

Stiles Creek

Background:
Stiles Creek originates in Section 36 of Plainfield Township and flows about 1.25 miles to its confluence with the Grand River in Section 31 of Cannon Township (Figure 17). Stream gradient is about 52 feet per mile.

Public Access:
None

2011/2012 Data Collection:
None

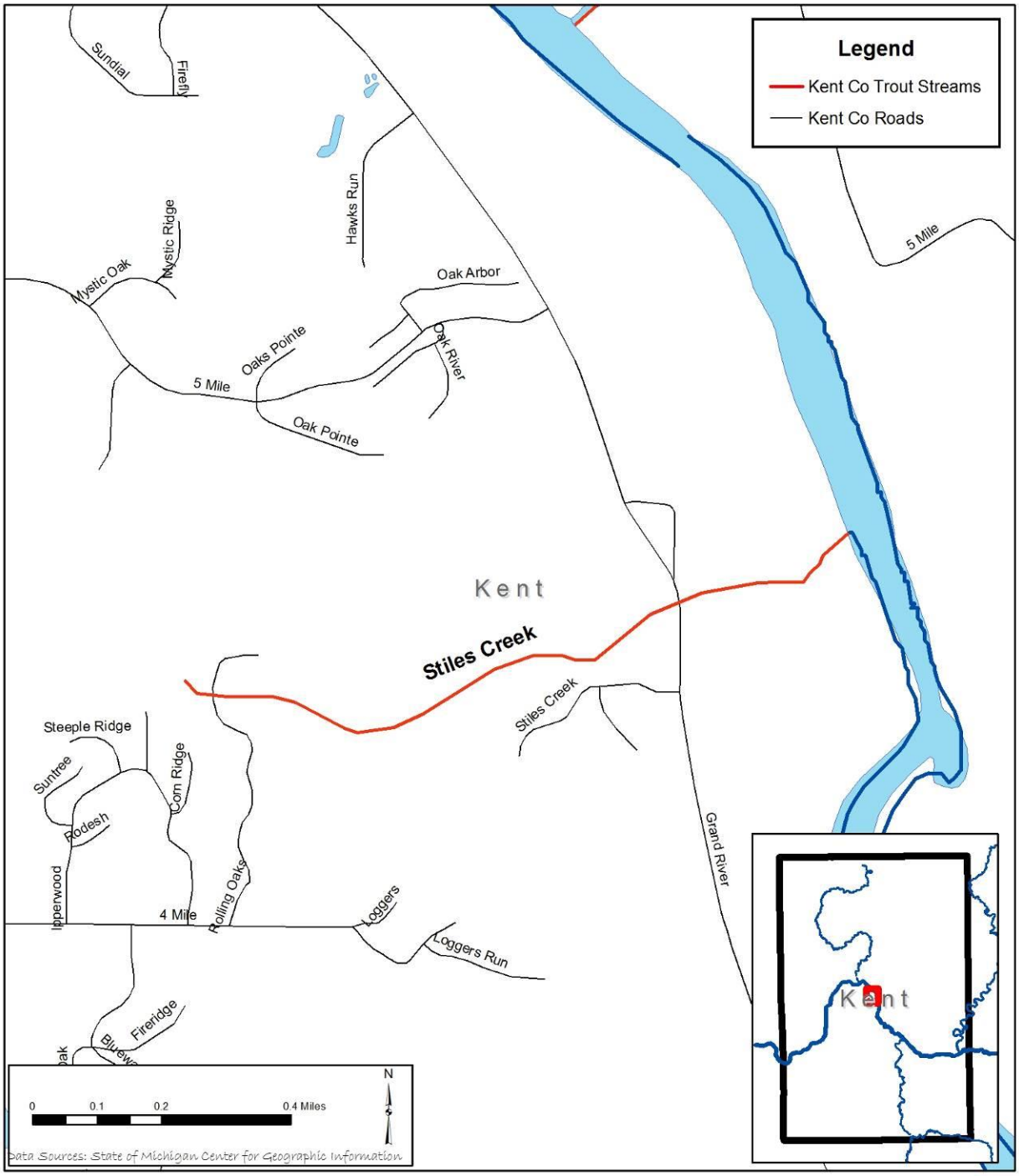
Published Studies:
Fish sampling conducted by DEQ in 1992 found the Stiles Creek (referred to in Cooper 1998 as "Tributary A") to harbor a modest population of brook trout, with three different age classes. No other species of fish were noted. Macroinvertebrate populations were found to be acceptable, with mayflies, stoneflies and caddisflies all represented in the sample. Ample groundwater input was noted, but instream habitat was impaired by excess sand; habitat scores were only fair.

Recommendations:
1. Support continued DNR/DEQ monitoring efforts

Stiles Creek Data Resources:
- Cooper, J. 1998. A biological survey of three unnamed tributaries to the Grand River, Kent County, June 11, 1992. Michigan Department of Environmental Quality, Surface Water Quality Division, Staff Report No. MI/DEQ/SWQ-98/042.

"There's a fine line between fishing and standing on the shore like an idiot."

-Steven Wright



SCHREMS WEST MICHIGAN Environmentally Involved Since 1962 TROUT UNLIMITED	SCHREMS WEST MICHIGAN TU COLDWATER INVENTORY STILES CREEK	JUNE, 2012 FIGURE NO. 17

Trout Creek

Background: Trout Creek is a first order direct tributary to the Grand River, located just south of the City of Lowell on the south bank of the Grand River (Figure 16). The stream enters the Grand in Section 11 of Lowell Township.

Public Access:
None

2011/2012 Data Collection:
Average July water temperature in Trout Creek was found to be 61.9°F at Grand River Ave, which indicates that this is a Cold stream. The July minimum and maximum tempertures were 55.8 and 73.6°F, respectively.

No migration barriers were identified on Trout Creek.

Published Studies:
Macroinvertebrates and habitat were found to be fair throughout the length of this small stream (Alexander 1996). Irregular flow patterns, lack of deep pools, substrate embeddedness and lack of bank stability were noted as factors negatively influencing aquatic habitat. Despite these impacts, the fish community was found to be comprised of a large proportion of salmonids. Rainbow trout (102), brook trout (11) and coho salmon (6) were found during the survey. In addition, blacknose dace, brook stickleback, green sunfish, pumpkinseed sunfish, bluegill, rainbow darter, blackside darter and burbot were documented.

Recommendations:
1. Support continued DNR/DEQ monitoring efforts.

Trout Creek Data Resources:
- Alexander, M. 1996. A biological survey of Trout Creek in Kent County, August 31, 1995. Michigan Department of Environmental Quality Staff Report No. MI/DEQ/SWQ-96/057.

"I think I fish, in part, because it's an anti-social, bohemian business that, when gone about properly, puts you forever outside the mainstream culture without actually landing you in an institution."

-John Gierach

Unnamed Tributary 1

Background:
Unnamed 1 begins in Section 24 of Grand Rapids Township and flows about 1.7 miles toward the east, where it enters the Grand River in Section 18 of Ada Township (Figure 18). Stream gradient is about 110 feet per mile.

Public Access:
None

2011/2012 Data Collection:
None

Published Studies:
In 1992, DEQ found the fish community of Unnamed 1 to be typical of a cold, headwater stream, though overall density was somewhat low (Cooper 1998). A total of 21 brook trout were collected. The macroinvertebrate community was rated as excellent. Glossostomid caddisflies were found here, which are indicative of excellent water quality. Instream habitat was also found to be excellent, with sufficient hard substrate and good flow diversity.

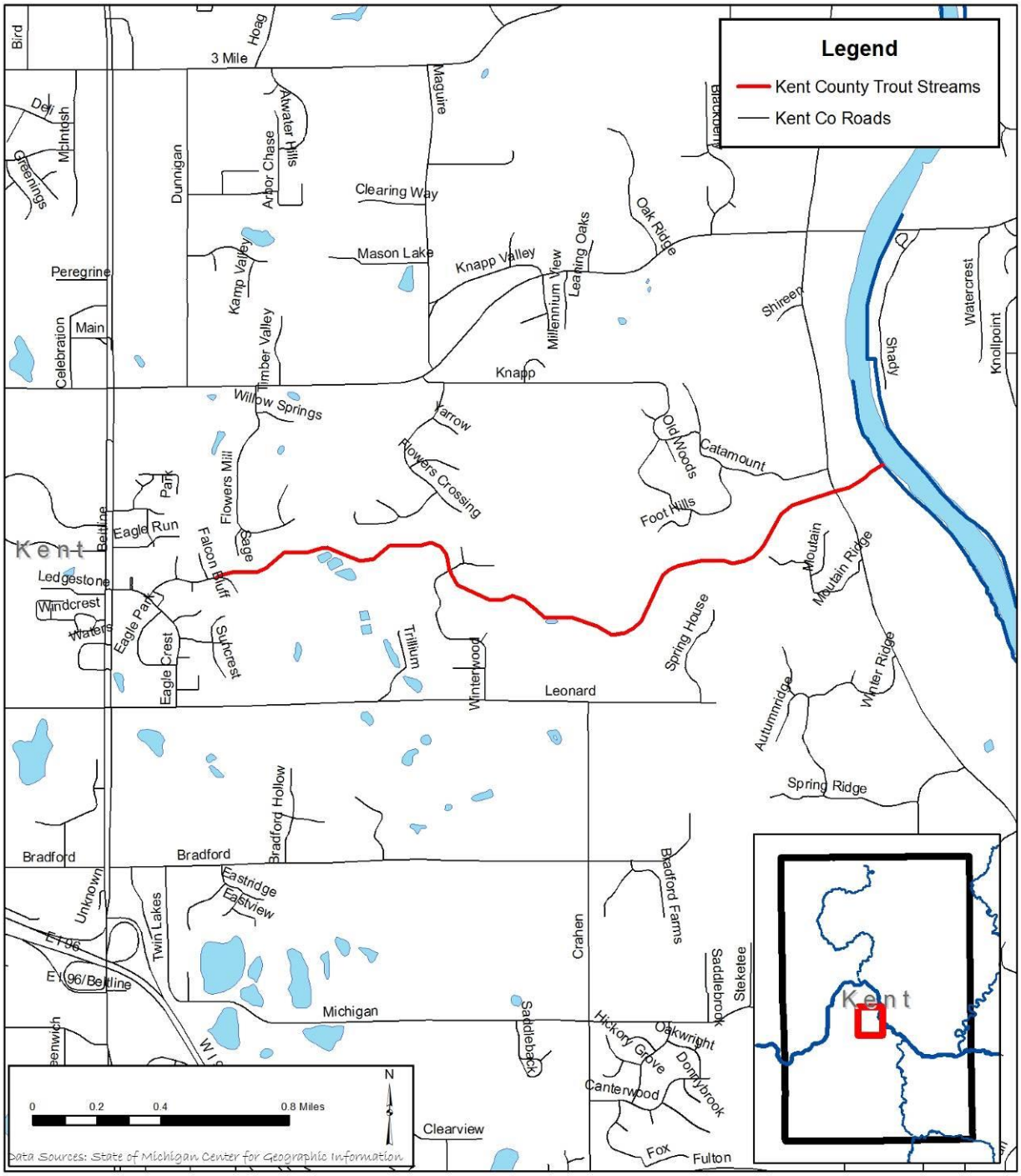
Recommendations:
1. Support continued DNR/DEQ monitoring efforts

Stiles Creek Data Resources:

- Cooper, J. 1998. A biological survey of three unnamed tributaries to the Grand River, Kent County, June 11, 1992. Michigan Department of Environmental Quality, Surface Water Quality Division, Staff Report No. MI/DEQ/SWQ-98/042.

"Somebody just back of you while you are fishing is as bad as someone looking over your shoulder while you write a letter to your girl.

- Ernest Hemingway



SCHREMS WEST MICHIGAN TROUT UNLIMITED	SCHREMS WEST MICHIGAN TU COLDWATER INVENTORY UNNAMED TRIBUTARY 1	JUNE, 2012 FIGURE NO. 18

Unnamed Tributary "Gulliford Creek"

Background:
This is a small, unnamed direct tributary to the Grand River, located south of the City of Lowell (Figure 16). The stream is 2.5 miles long and high gradient.

Public Access:
This stream flows through the Grand River Riverfront Park prior to discharging to the Grand River. Its headwaters flow through the Bradford Dickinson White Nature Preserve, though the stream is very small and fishing opportunities are unknown.

2011/2012 Data Collection:
Average July water temperature was 61.7°F, with a minimum of 55.7°F and maximum of 69.4°F. This stream is designated as Cold.

A fish migration barrier was identified at the culvert under Gulliford Rd, about one mile upstream from the Grand River.

Brook and brown trout were observed in the spring of 2012. A landowner indicated that the stream used to be good for brook trout and that salmon and steelhead enter the stream to spawn.

Published Studies:
None

Recommendations:
1. Encourage DNR/DEQ monitoring efforts

"Gulliford Creek" Data Resources:
None

"It has always been my private conviction that any man who pits his intelligence against a fish and loses has it coming."

- John Steinbeck

Rogue River and Tributaries

Background:
The Rogue River Watershed is 167,625 acres in size and feeds the river a supply of water from wetlands, county drains, lakes, and both warm and cool-cold water tributaries (Figure 19). The cool-cold water tributaries help to sustain trout and associated species in the southern section of the Rogue River. Land use throughout the watershed consists of 8% urban, 38% agricultural, 30% forested, 4% wetlands, and 20% other. The Rogue has been designated a Natural River by the Natural Resources Commission under the Natural Rivers Act, Act 231, P.A. of 1970. Under the Act, the Commission is obligated to provide for the preservation, protection and enhancement of the Rogue River, as well as the Barkley, Cedar, Duke, Rum, Shaw, Spring, and Stegman Creek tributaries.

The Rogue is one of Trout Unlimited's "Home Rivers". Each Home Rivers project is a collaborative multi-year effort that combines applied scientific and economic research, community outreach, on-the-ground restoration, and the development of long-term conservation and management strategies and tools. This project on the Rogue River will work with other organizations over the next several years to address the impacts of urbanization on the river. The emphasis of the work will be to focus on restoration actions to improve existing river conditions, working with local governments to improve municipal planning and increasing capacity to help ensure advocates for long-term protection of the Rogue.

Published Studies:
According to the Hanshue and Harrington (2011), "the Rogue River has a long history of trout management, with initial stocking of brook trout in 1884. The river has been managed through annual stockings of both brown trout and rainbow trout since 1933. Although limited natural recruitment of brown trout occurs, the trout fishery is maintained through annual stockings of approximately 16,500 yearling rainbow trout and 16,500 yearling brown trout. The mainstem also supports a significant steelhead fishery from the confluence with the Grand River upstream to the Rockford Dam. This fishery is maintained by stocking 30,000 steelhead yearlings on an annual basis. Due to its close proximity to the City of Grand Rapids, the Rogue River receives a high amount of angling pressure. Spring and fall angler surveys were conducted above and below the Rockford Dam during 2002-2004. Total catch estimates (harvest and released) for the three year survey period were 13,683 brown trout and 28,672 rainbow trout (including steelhead). The survey estimated a total combined effort of 60,559 trips during the 2002-2004 trout seasons (DNR Fisheries Division, unpublished data). At a value of $24 per angler trip per day, the combined value of spring and fall angling trips to the Rogue River was 1.45 million dollars or approximately $485,000 per year (U.S. Department of Interior, Fish and Wildlife Service, and U.S. Department of Commerce, U.S. Census Bureau 2006)".

Hanshue and Harrington (2011) further state that "The Rogue River has several cold, cold-transitional, and warm-transitional tributaries which were actively managed in the past. Many of the tributaries (i.e., Spring, Duke, Cedar, Stegman, Becker, Shaw, and Rum Creeks) were stocked with brook trout and brown trout from 1933 until the mid-1960s. These tributaries now support self-sustaining trout populations and are no longer stocked. Groundwater yield to these tributaries

is significant, providing stable coldwater rearing habitat for juvenile trout and summer thermal refuge for adult trout inhabiting the warmer mainstem".

Each Home Rivers project is a collaborative multi-year effort that combines applied scientific and economic research, community outreach, on-the-ground restoration, and the development of long-term conservation and management strategies and tools.

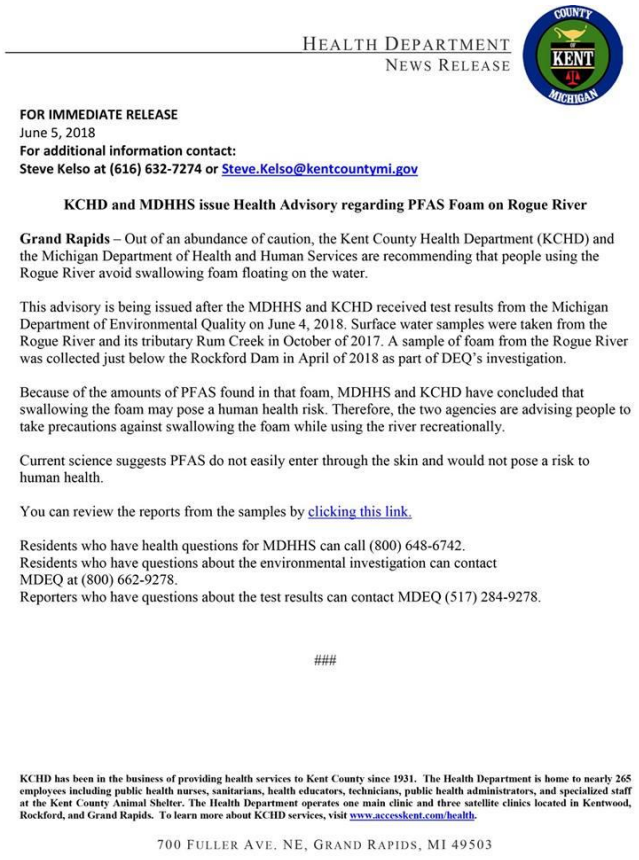
According to the Rogue River Watershed Management Plan (WMP) (http://www.gvsu.edu/wri/isc/online-publications-25.htm), "the Rogue River is unique because it supports a diverse coldwater fishery relatively close to a major urban area and many stream segments in the watershed are accessible to fisherman. Along with the resident trout populations, anadromous salmonids are a popular sport fishery below the Rockford dam, the upstream limit of fish migration. Above Rockford, a popular brown trout fishery is maintained by natural reproduction and hatchery stocks planted by the DNR fisheries personnel. During the fall spawning runs, Chinook salmon provides a popular fishery, whereas steelhead can offer spectacular fishing during fall, winter, and spring months. In October of 2011, DNR Fisheries stocked 101,000 coho salmon at Jericho Street in the lower Rogue. The upper limit of the cold water fishery lies between the U.S. 131 bridge and Grange Road. The fish community in this region is comprised of a mix of warm and cool-cold water species with moderate numbers of trout holding in deeper holes. There are reports of brown trout being taken farther upstream during the spring and early summer. However, there were no trout observed in this region during the 1999 summer survey carried out by Project Biologist – Mark Luttenton, Ph.D. with assistance from Grand Valley State University students. Several tributaries also support cool-cold water fisheries. Stegman Creek, a relatively cold stream, supports a large number of brown trout. The DNR maintains trout populations in many tributaries through a long running fish stocking program. Stocked fish have one of their fins clipped at the hatchery to distinguish them from fish that reproduce naturally. The electrofishing survey at the lower and mid-reaches of Stegman Creek exhibited a self-sustaining fish population. Cedar Creek also supports a thriving trout population. The lower portion of Cedar Creek is dominated by brown trout of which 33% were fin clipped. Brown trout and brook trout were also common in the middle reach along Cedar Creek."

In 1973, the Michigan Department of Natural Resources assembled a comprehensive "Natural River Report" for the Rogue River. The report stated that the Rogue River had the distinction of being one of Michigan's southernmost trout streams; however, during the summer months water temperatures approached the maximum tolerance level for trout. Sluggish water, eroding banks, sedimentation, and the lack of cover resulted in habitat destruction. In this report the importance

of the cold water tributaries for the trout fishery was stressed. “The tributaries of the Rogue River maintain its excellent water quality. Without these spring fed tributaries (Spring, Cedar, Duke, Stegman, Rum, Shaw, and Barkley Creeks) the Rogue River could not support cold water species of fish. If the cold water conditions were altered and the waters of the Rogue River warmed, the trout fishery would probably be destroyed.”

The WMP lists the coldwater designated use as being threatened in the Duke, Cedar, Stegman/Becker, Shaw, Rum and Barkley Creek subwatersheds due to sediment, nutrients, temperature and invasive species A known cause of thermal pollution in the Rogue River Watershed is lack of streamside canopy. Suspected sources of thermal pollution are water withdrawals, water inputs from an extensive drainage network, and stormwater runoff. Groundwater input and cold water temperatures are important factors to sustain the watershed’s irreplaceable cool-cold water fishery.

“Implementation of the Rogue River Natural River Plan to protect riparian corridors and coldwater habitats associated with these tributaries is critical to maintaining the coldwater fishery in the Rogue River mainstem. Future fisheries management of the Rogue River and tributaries will continue stocking brown trout, rainbow trout, and steelhead, to maintain the current recreational fisheries. The potential removal of the Rockford Dam should be explored. If dam removal is not a feasible option, then fish passage in the form of a constructed rock arch rapids or other natural fishway should be considered. The thermal effects of the dam should also be evaluated and mitigated for as necessary. Additional habitat protection measures, such as the development of comprehensive storm water management plan to protect the hydrology and thermal quality of the watershed, should be a priority (Hanshue and Harrington, 2011)”.



HEALTH DEPARTMENT
NEWS RELEASE

FOR IMMEDIATE RELEASE
June 5, 2018
For additional information contact:
Steve Kelso at (616) 632-7274 or Steve.Kelso@kentcountymi.gov

KCHD and MDHHS issue Health Advisory regarding PFAS Foam on Rogue River

Grand Rapids – Out of an abundance of caution, the Kent County Health Department (KCHD) and the Michigan Department of Health and Human Services are recommending that people using the Rogue River avoid swallowing foam floating on the water.

This advisory is being issued after the MDHHS and KCHD received test results from the Michigan Department of Environmental Quality on June 4, 2018. Surface water samples were taken from the Rogue River and its tributary Rum Creek in October of 2017. A sample of foam from the Rogue River was collected just below the Rockford Dam in April of 2018 as part of DEQ’s investigation.

Because of the amounts of PFAS found in that foam, MDHHS and KCHD have concluded that swallowing the foam may pose a human health risk. Therefore, the two agencies are advising people to take precautions against swallowing the foam while using the river recreationally.

Current science suggests PFAS do not easily enter through the skin and would not pose a risk to human health.

You can review the reports from the samples by clicking this link.

Residents who have health questions for MDHHS can call (800) 648-6742.
Residents who have questions about the environmental investigation can contact MDEQ at (800) 662-9278.
Reporters who have questions about the test results can contact MDEQ (517) 284-9278.

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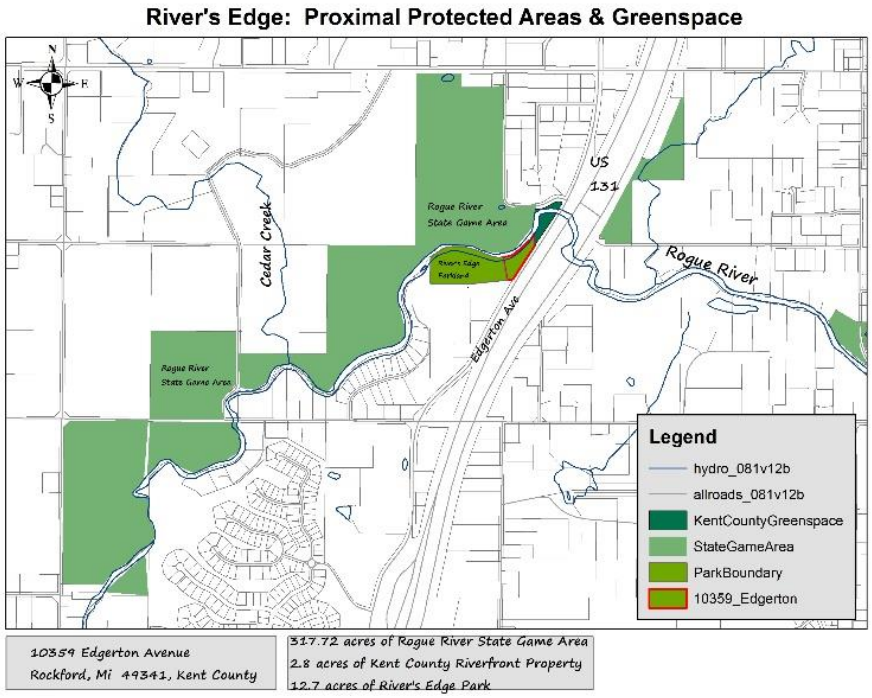
KCHD has been in the business of providing health services to Kent County since 1931. The Health Department is home to nearly 265 employees including public health nurses, sanitarians, health educators, technicians, public health administrators, and specialized staff at the Kent County Animal Shelter. The Health Department operates one main clinic and three satellite clinics located in Kentwood, Rockford, and Grand Rapids. To learn more about KCHD services, visit www.accesskent.com/health.

700 FULLER AVE. NE, GRAND RAPIDS, MI 49503

In 2017 and 2018, identification of locally elevated levels of Polyflouroalkyl Substances (PFAS’s) compounds in multiple drinking water wells in the Rogue River Watershed has led to increased testing and awareness of the compounds in the community. In June of 2018, the Kent County Health Department issued the following warning regarding foam in the Rogue River: “Out of an abundance of caution, the Kent County Health Department (KCHD) and the Michigan Department of Health and Human Services are recommending that people using the Rogue River avoid swallowing foam floating on the water” (KCHD News Release, June 5th, 2018).

Public Access:

The Rogue River has many places where the public can access the resource. The lower Rogue has seen increases in public access in recent years due to land purchases by municipalities. Plainfield Township is in the process of acquiring a campground at the mouth of the Rogue, where the opposite shore is already public access, owned by the Department of Natural Resources. Upstream along Packer Road, Kent County owns 57 acres of public access named Rogue River Park.



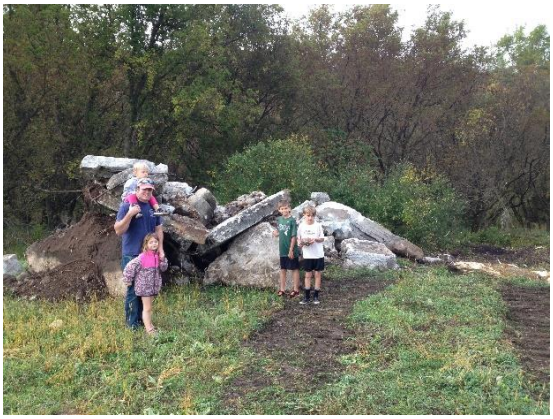
Upstream from the Childsdale crossing, the Department of Natural Resources owns frontage totaling over 3,000 feet, a popular fishing area. The City of Rockford owns several parcels with public access; the DNR and Kent County own several parcels upstream from the City; and Algoma Township and the DNR own significant frontage west of US 131.

The Rogue River State Game Area is a series of parcels upstream from US 131 in Kent County, totaling thousands of acres with miles of frontage on the Rogue River. Across from one of these parcels, Algoma Township has owned 11 acres along the Rogue with roughly 1,000 feet of frontage. In 2016, Algoma completed purchase of 200 more linear feet and 1.7 more acres of frontage here, with help from Schrems TU and the Home Rivers Initiative, and a Natural Resources Trust Fund grant. In 2018, Algoma completed purchase of 3.1 more acres with 600 more feet of river frontage, with another Natural Resources Trust Fund grant. Both Schrems TU and the HRI are contributors to this project as well, named "River's Edge Park." The Kent County Road Commission donated another 3.7 contiguous acres to the park, bringing the total to 19.43 acres at River's Edge. Josh Zuiderveen of South Peat Environmental helped Algoma Township secure state grant funds for these acquisitions.

Conservation Efforts:

In decades past, both the DNR and the local RC&D have completed instream habitat projects in the Rogue. In the fall of 2014, Schrems TU worked with local firms South Peat Environmental and Kanouse Outdoor Restoration to remove the remains of the failed Childsdale Dam from the area known as the "paper plant." The project aimed to improve aesthetics and safety for anglers and boaters both. Over a dozen large trees were planted along the Rogue in this area, many of which are flourishing today (several were killed by beaver). Red maples in particular had a high degree of success, shading portions of the Rogue where previously there was hardly any.

Removing Dam Remains



Rubble Removed

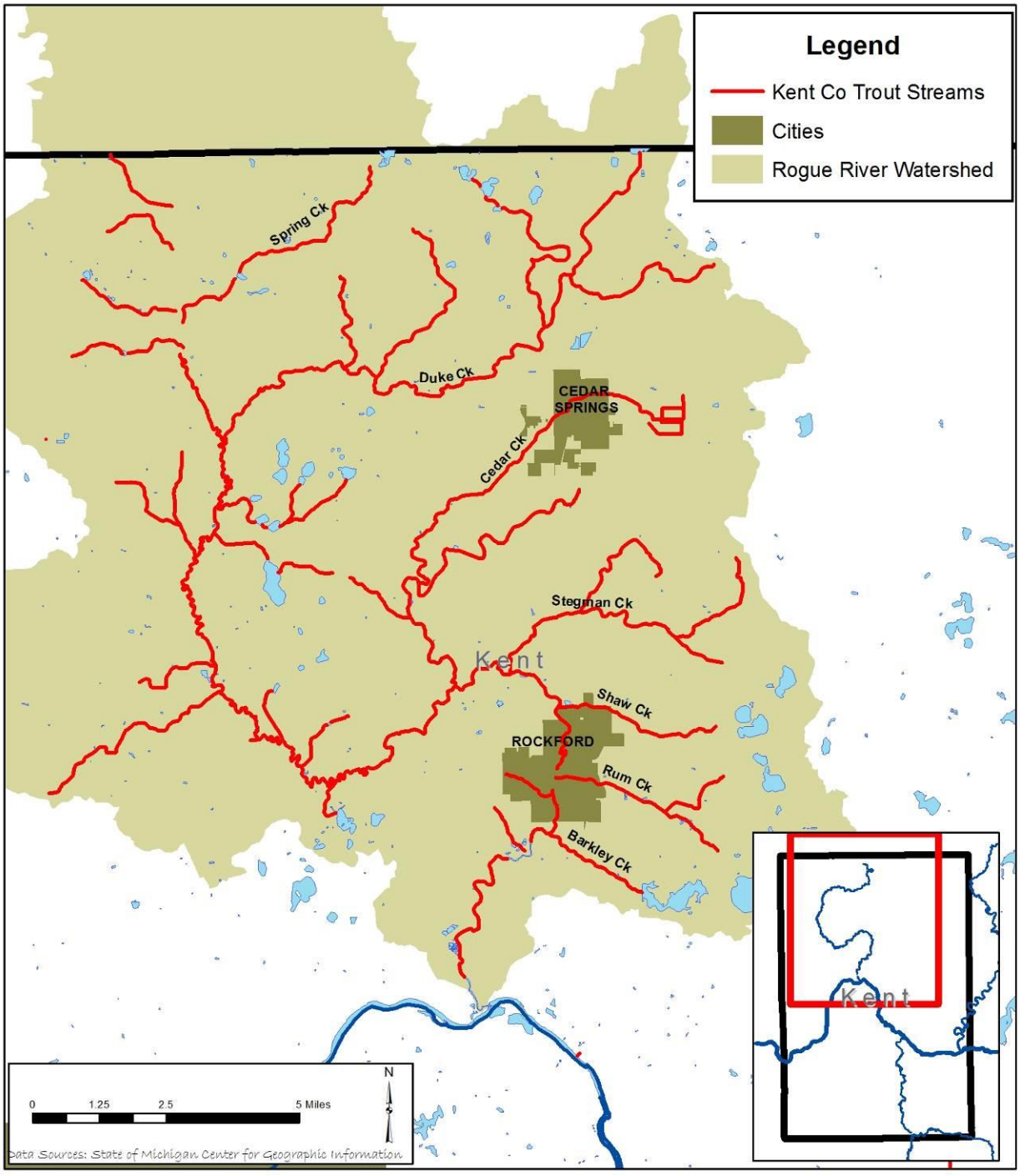
A Phase II at the Paper Plant/Bridgeway Community Church site is currently under development through the Trout Unlimited Home Rivers Initiative for 2019.

Part of the Home River's Initiative's 319 Grant project, approximately 50 more acres of greenspace, much of it wetland, will be placed into a conservation easement through the Land Conservancy of West Michigan in 2019. This will add to a total of 124 acres of preserved land at the site, where considerable wetlands directly attached to the Rogue River are protected.

In the years 2017-2018, Trout Unlimited Home River's Initiative worked with South Peat Environmental to identify potential wetland restoration sites in the Rogue River Watershed. These sites were identified using the Department of Environmental Quality's ***Landscape Level Wetland Functional Assessment Tool***. GIS data incorporating historic soil surveys, topographical maps, and historical photos and land use surveys, roughly describe current and historical wetland areas. TU and SPE staff then identified 253 potential wetland restoration sites in the Rogue Watershed.

Recommendations:

1. Continue to support land acquisitions for preservation
2. Support efforts to restore wetlands through Trout Unlimited Home Rivers Initiative and other programs to reduce sediment and thermal inputs
3. Support other efforts to reduce thermal & sediment inputs into the Rogue, such as planting initiatives at the Childsdale site
4. Monitor PFAS levels in groundwater, Rogue main stem, Rogue River foam, and other locations relevant to the Rogue



SCHREMS WEST MICHIGAN TU COLDWATER INVENTORY

JUNE, 2012

ROGUE RIVER WATERSHED

FIGURE NO. 19

Ball Creek

Background:
Ball Creek is located in northwest Kent County and flows through the Village of Sparta (Figure 20). Ball Creek is a county designated drain, and in large part, is heavily impacted by channelization and surrounding land use. The towns of Casnovia and Kent City seasonally discharge treated wastewater to the upper reaches of the stream (Rockafellow 2003).

Public Access:
None

2011/2012/2018 Data Collection:
At Sparta Ave, average July 2011 water temperature was 66.4°F, which indicates that Ball Creek is a Cold-transitional stream at this location. In 2018, the average July water temperature at Sparta Ave. was 66.9°F, with a minimum of 58.4°F and maximum of 78.1°F. Ball Creek is still considered to be a Cold-transitional stream. The maximum temperature recorded at this site was 76.3°F. Upstream, at Fruit Ridge Ave, the average July water temperature was 70.6°F, with a minimum of 65.6°F and a maximum of 76.1°F, which designates it as a Warm stream at this location. August average water temperatures at Peach Ridge Ave and Rusco Road were 65.1°F and 64.4°F, respectively. Point in time water temperature measurements indicate that Ball Creek has potential to be coldwater from Fruit Ridge Ave downstream to the Rogue River.

Electrofishing was conducted at the Sparta Ave crossing and resulted in collection of 12 brown trout, with the largest one approaching 20 inches in length. Despite intensive effort, no trout were found at any of the crossings upstream of this location.

Stream crossing surveys indicate that all of the Ball Creek crossings offer sufficient passage to fish. Sixteen crossings were inspected on Ball Creek and its tributaries.

Published Studies:
A three mile reach of Ball Creek, from Rusco Rd upstream to Ball Creek Rd, was listed on Michigan's 2000 303(d) list of impaired waters due to poor macroinvertebrate communities.

In 2001, the upper reaches of Ball Creek were described as being inappropriately classified as coldwater, based on site-specific assessments and other available information (Wuycheck, 2001a). The fish communities were rated as poor at all five sites sampled

during the 1993 survey work. None of the sites met their coldwater designation based upon P51, and only one brown trout was captured, at Sparta Ave. Intermittent flow conditions indicated that the three stations upstream of Peach Ridge Ave were noted to be the primary cause of habitat decline.

Degraded stream conditions were noted in 1993 at Rusco Rd, downstream of National Fruit Products, which operated a wastewater spray irrigation system. The nutrient rich water was found to be venting to Ball Creek, causing bacterial slimes and a degraded macroinvertebrate community including only four taxa. A 2001 survey at the same site, after termination of the discharge from National Fruit Products, resulted in collection of 14 taxa and a much improved macroinvertebrate community.

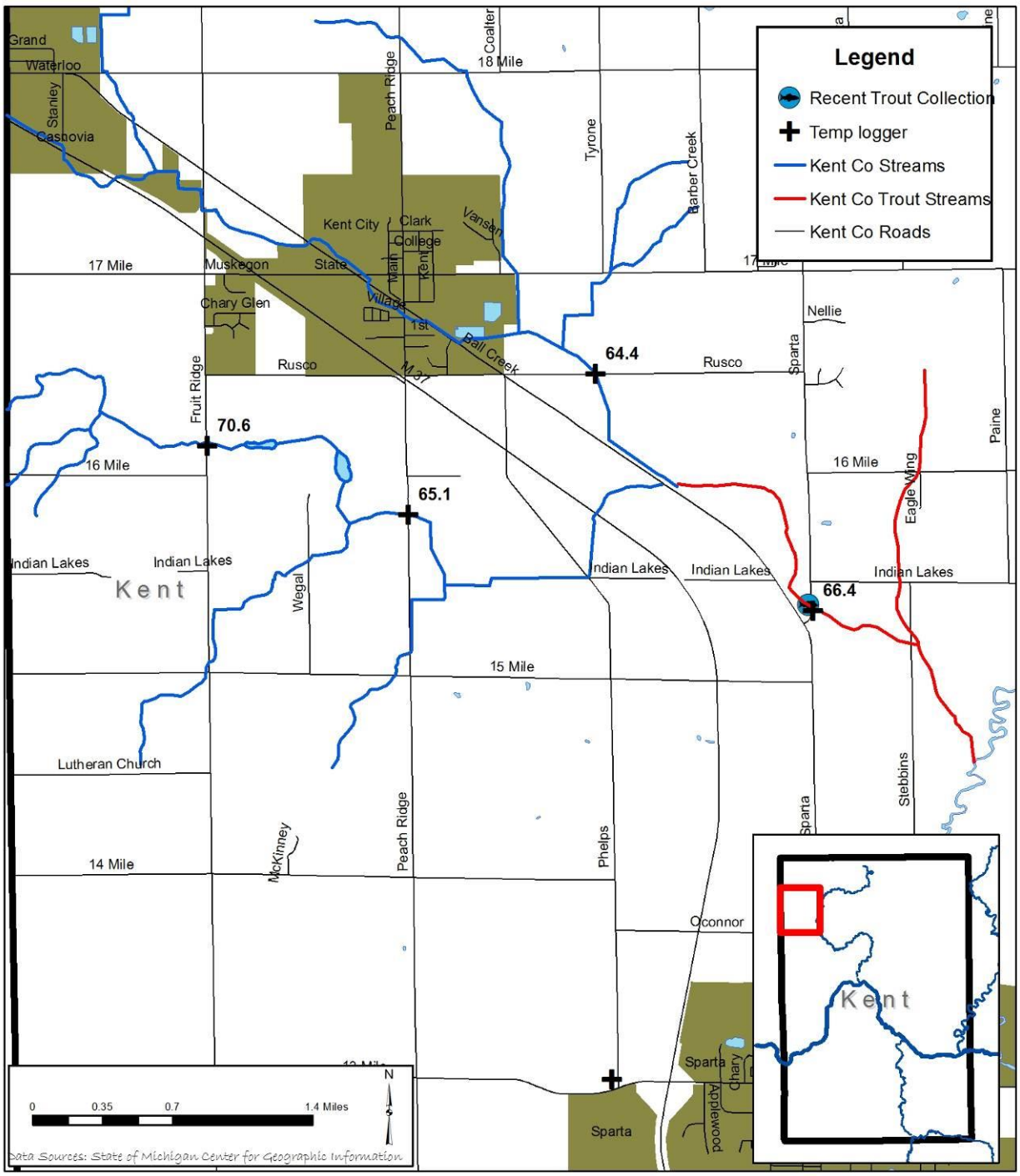
Water chemistry sampling conducted in 1998 reported elevated levels of calcium, magnesium, ammonia and total phosphorus.

Recommendations:

1. Expand water temperature monitoring effort to determine limits of coldwater fishery
2. Protect, monitor and explore improvement of coldwater fishery in vicinity of Sparta Ave
3. Wetland restoration has been identified as high-priority within this watershed; special effort should be made in order to restore the coldwater fishery.
4. Support DNR/DEQ monitoring efforts

Ball Creek Data Resources:

- Rockafellow, D. 2003. A biological survey of the Rogue River Watershed, Kent and Newaygo Counties, Michigan. August 1998. Michigan Department of Environmental Quality Water Division Staff Report No. MI/DEQ/WD-03/076.
- Wuycheck, J. 2001a. A biological community and habitat assessment of Ball Creek, Kent County, Michigan, June 1, 1993. Michigan Department of Environmental Quality, Surface Water Quality Division Staff Report No. MI/DEQ/WD-01/086.
- Wuycheck, J. 2001b. A biological community and habitat assessment of Ball Creek, Kent County, Michigan, June 27, 2001. Michigan Department of Environmental Quality, Surface Water Quality Division Staff Report No. MI/DEQ/SWQ-01/087.



SCHREMS WEST MICHIGAN Environmentally Involved Since 1962 TROUT UNLIMITED	SCHREMS WEST MICHIGAN TU COLDWATER INVENTORY BALL CREEK	JUNE, 2012 FIGURE NO. 20

Barkley Creek

Background:
Barkley Creek is a three mile long tributary of the Rogue River (Figure 21). Barkley begins as outflow from the manmade Lake Bella Vista and enters the Rogue one quarter of a mile downstream from the Rockford Dam, just below the city limits of Rockford and across from the Mill Pond condominiums. The Barkley Creek watershed is small and nearly untouched by agricultural influences.

Public Access:
None

2011/2012/2018 Data Collection:
In 2011, Barkley Creek was a Cold-transitional stream based on an average July water temperature of 65.4°F. The July temperature ranged between 57.8 and 74.9°F. In 2018, the average July water temperature was 66.9°F, ranging from 58.4°F to 78.1°F, which still classifies the stream as Cold-transitional.

Insect sampling in Barkley Creek below Old Northland Drive revealed intolerant species including stonefly and mayfly nymphs. In addition, steelhead were seen in the few deep holes. Brown trout, juvenile steelhead and white suckers have been caught in this section in 2012, and numerous minnows and shiners of several species were visible.

The lower 4,700 feet of the stream, between the mouth and Old Northland Drive, is predominantly high gradient, with long winding stretches of clean gravel. There are few pools other than those found immediately downstream from Old Northland.

Barkley is joined by an unnamed tributary flowing from the north approximately 1,500 feet upstream from the Rogue River. The tributary has very low baseflow, but flashes considerably during rain events. Throughout the unnamed tributary there are signs of severe flooding and erosion. At Old Northland Drive, stormwater runoff is routed into the tributary. Parking lot stormwater runoff from D&W and adjacent stores may contribute substantially to high temperatures in the unnamed tributary, which in turn would affect the lower 1,500 feet of Barkley below the confluence. Just above Old Northland Drive, the tributary is impounded by a manmade dam which is a fish passage barrier; the culvert here is also perched.

The unnamed tributary flowing out of D&W is incurring widespread erosion and channel damage throughout its lower 2,000 feet (below Old Northland to the confluence). Evidence of 3-foot high flooding could be seen in April of 2012 during field surveys. Sediment and erosion monitoring are recommended to document negative effects, and to pinpoint sources of excess stormwater. Suspected sources of excess stormwater are a modified storm sewer/drain tile at Old Northland and the outlet from the D&W and condominium complex.

There is a significant erosion site in Barkley below the confluence with the tributary, as well as a sizeable log jam. Both sites are in need of repair in the near future. Upstream from the confluence with the tributary, Barkley has completely bypassed an antiquated dam. Steelhead can be found in the hole near the dam's remnants. Riparian habitat throughout this area is excellent; instream habitat contains abundant gravel, but lacks deep pools and large timber.

Between Old Northland Drive and Wolverine Boulevard, the stream corridor is densely forested and contained within private land. Gravel substrate in this section is ideal, but deeper pools and cover for larger fish are still absent. Floodplain access is abundant, as it is in the upstream reaches, and signs of severe flooding are absent. Small trout are readily observed. Upstream of Wolverine Boulevard, Barkley flows through a triple-culvert, which is a fish passage barrier that could be taken out easily and inexpensively. Data from upstream of Courtland Drive has not been obtained.

Steelhead and salmon spawn in fair numbers relative to the size of the stream. Yet, there is no data for natural reproduction of these species, or for fish of any kind in this stretch. Habitat improvements in 2008 made the lower mile all open to fish passage while combining several braided sections into deeper channels. Steelhead have been witnessed spawning in these locations for the past four years.

Published Studies:

In 1998, Barkley Creek was evaluated at Northland Drive to determine stream conditions and to assess the biological community (Rockafellow, 2003). The macroinvertebrate community was rated excellent and contained a diversity of species, including mayflies, stoneflies and caddisflies. The physical habitat was rated as good. The stream banks were fully vegetated with little erosion. Substrate consisted of cobble, gravel, sand and some silt.

Recommendations:

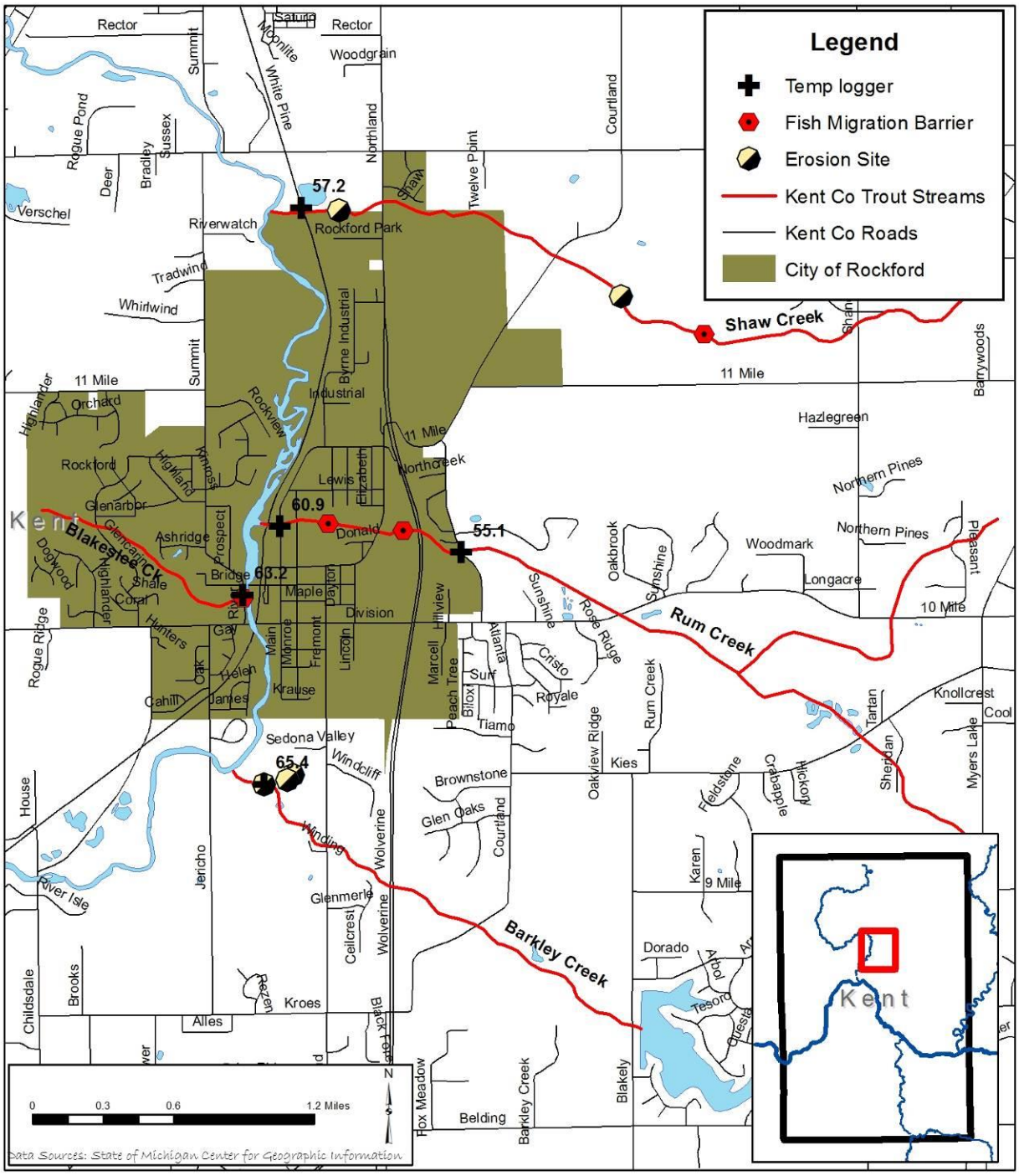
1. Existing temperature data is from down near the mouth; it is recommended that further temperature monitoring be undertaken in the unknown tributary that flows from the north, as well as at Barkley at Old Northland Drive.
2. Fish surveys including trout population estimates
3. Sediment and erosion monitoring are recommended to document negative effects, and to pinpoint sources of excess stormwater. Suspected sources of excess stormwater are a modified storm sewer/drain tile at Old Northland and the outlet from the D&W and condominium complex.
4. Support DNR/DEQ monitoring efforts

Barkley Creek Data Resources:

- Rockafellow, D. 2003. A biological survey of the Rogue River Watershed, Kent and Newaygo Counties, Michigan. August 1998. Michigan Department of Environmental Quality Water Division Staff Report No. MI/DEQ/WD-03/076.

"My biggest fear (after I die) is that my wife will sell my fishing equipment for what I told her I paid for it."

- Unknown



SCHREMS WEST MICHIGAN TU
COLDWATER INVENTORY

BARKLEY, BLAKESLEE, RUM AND SHAW CREEKS

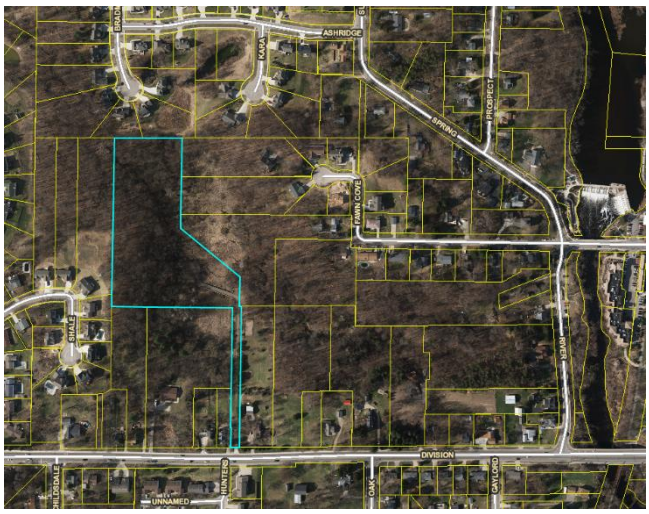
JUNE, 2012

FIGURE NO. 21

Blakeslee Creek

Background:
Blakeslee Creek is a small tributary, draining only 0.32 square miles, which enters the west side of the Rogue River just below the Rockford Dam (Figure 21).

Public Access:
Minor public access is available at the mouth of Blakeslee Creek where the City owns property. In 2012, the City acquired 6.3 acres of property with a large wetland complex and significant frontage on Blakeslsee Creek. Entrance to the property is on the north side of 10 Mile.



2011/2012 Data Collection:
Average July water temperature was 63.2°F in Blakeslee Creek, indicating that this is a Cold stream. The maximum recorded temperature was 72.1°F.

This stream is believed to have contained brook trout historically, but no longer supports populations due to impacts of development (personal communication, Dave Smith). Construction of a detention pond for a development near the headwaters in 2017 resulted in multiple observations of suspended fine sediment in Blakeslee Creek (personal communcation, Neil Blakeslee). In 2017, a local conservation group brought this to the attention of the DEQ, but it is unknown if DEQ investigated the issue.

Conservation & Restoration Efforts:
In 2013, the City of Rockford hired local firms South Peat Environmental, Streamside Ecological Services, and Feldpausch Excavators to restore the eroding mouth area of Blakeslee Creek. Once littered with broken concrete, tangled trees and eroding sand, this area is now stabilized and vegetated with many native trees, flowers, and shrubs. Salmon and steelhead can be seen travelling through here in spring and fall.

In 2014, Schrems West Michigan Trout Unlimited had several berms installed near a headwater wetland to reverse headcutting that threatened the level of the wetland. To date these have raised the level in the channel and stopped significant sediment from flowing downstream.

Blakeslee Mouth Before

Blakeslee Mouth After

In 2016, Schrems West Michigan Trout Unlimited's Kent County Brook Trout Project helped fund a study of Blakeslee Creek that focused on the three dams near the bottom. Included in this study was a permit draft for removal of the three dams. The permit was issued by MDEQ in 2017, and in July of 2017 the three dams in Blakeslee Creek were removed. The City of Rockford was a financial partner in the Kent County Brook Trout Project, helping leverage significant funding for the community. The City also paid to have the dams removed.

Blakeslee Middle Dam, Before

Blakeslee Middle Dam, After

Schrems Trout Unlimited worked with project partners South Peat Environmental, Streamside Ecological Services, and Deans Excavating on the dam removals. Trout Unlimited Home Rivers Initiative coordinated use of Green Team volunteers, who planted dozens of native wildflowers, shrubs, and trees in the restored area. The Kent Conservation District treated a patch of Japanese Knotweed, an invasive plant.

Published Studies:

Fongers (2001) conducted a hydrologic study of Blakeslee Creek and found significant land use changes, from natural area to residential. Field investigation found that the stream had been over-topping River Street; the reservoirs of the small dams were filled with sediment, many active streambank erosion sites and two detention ponds in the Rockford Highlands Subdivision. These detention ponds were reportedly filled with sediment. There appeared to be a significant continuing source of sediment from the eroding streambanks.

Results of the hydrologic modeling indicated that the detention ponds were attenuating the smaller flows, but flow regime of Blakeslee Creek had been significantly altered. Further, "Runoff volumes and channel-forming flows increased. Channel-forming flow is the flow that is most effective at shaping the channel. In a stable stream, the channel forming flow has a one to two year recurrence interval and is the bankfull flow. Runoff volumes to the stream just below the subdivision are projected to increase by 167 percent for the 50 percent chance 24-hour storm, to 30 percent for the 1 percent chance 24-hour storm. The 50 percent peak flow is projected to increase by 70 percent from 2.3 to 3.9 cubic feet per second (cfs). The stream channel will also be exposed to higher flows for a longer time. The combination of increased channel forming peak flow and extended duration of higher flows is morphologically destabilizing. The extensive erosion and downcutting we have observed in the channel are symptoms of this instability."

Recommendations:

1. Investigate altered flow regime and measure the extent of channel instability to determine the appropriate restoration practices for this stream.
2. Continue eradication of Japanese Knotweed and plantings of native trees, flowers and shrubs on the Napieralski property where the dams were removed.
3. Partner with the City of Rockford in their protection and improvement efforts
4. Support DNR/DEQ monitoring efforts
5. Continue to monitor for discharge of fine sediment from upstream detention pond

Blakeslee Creek Data Resources:

- Fongers, Dave, 2001. Interoffice Communication to Janice Tompkins, Nonpoint Source Unit, Land and Water Management Division, September 6, 2000.

"If fishing is interfering with your business, give up your business."

-Sparse Grey Hackle

Cedar Creek

Background:
Cedar Creek flows through the City of Cedar Springs on its way to join the Rogue River (Figure 22). The lower 2.3 miles of Cedar Creek is open to fish passage from the Rogue, except during times of low flow when manmade rock dams in the lower one half mile impede passage. The dam located south of 14 Mile and West of Algoma is a clear fish passage barrier between the upper 11.7 miles of stream (including Little Cedar Creek below Hoskins Lake) and the lower 2.3 miles. It is possible that large fish could pass over this dam during higher flows.

Public Access:
Public access is available in downtown Cedar Springs at several locations, including North Park, Veterans' Park, the library, and Riggle Park. The City has acquired three additional parcels for public access since 2014, with the help of the Community Building Development Team (CBDT), a citizen non profit organization formed to invest in Cedar Springs. Trout were collected near the library in 2011, and the site was improved using funds from Grand Rapids Community Foundation. Cedar Creek outlets to the Rogue River in the Rogue River State Game Area, where public the public can also access.

2011/2012 Data Collection:
The average July water temperature of Cedar Creek near the Rogue River was 69.0°F, with a maximum temperature of 80.8°F. The data suggests that this stream is Cool at this location. Data from 2010 indicate that the stream is also Cool in Cedar Springs, but Cold-transitional in between the two sites.

One large brook trout and many 8-12 inch brown trout were collected during 2011 electrofishing surveys in Cedar Springs. In 2012, in response to an alleged fuel spill in Cedar Springs, follow-up electrofishing was conducted on the same reach sampled in 2011. A total of 18 trout, including one brook trout, were captured, in addition to eight other species of fish.

Electrofishing surveys of Little Cedar Creek, in the Bigney property located below Hoskins Lake, revealed presence of a diverse fishery. The stream channel is very stable with gravel and cobble predominant, interspersed with organic matter substrate and a fair amount of woody debris. The following species were found in varying numbers, listed in order of prevalence: creek chub,

blacknose dace, bluntnose minnows, white suckers, rock bass, central stoneroller, bluegill, mudminnow and brown trout. Based on the fish assemblage, Little Cedar Creek was not meeting its coldwater designation at this location.

At US-131, fish survey found a healthy population of self-sustaining brook trout, with multiple age classes represented in the populations. Fish ranged in size from approximately 1.5 to 8 inches in length. Habitat at this location was noted to be impacted by sand, with little deep water available for cover.

Habitat & Conservation

Several fish migration barriers were identified in this watershed, including dams at 14 Mile and Algoma and at Hoskins Lake. In addition, road crossings are impacting migration at Algoma Ave. north of 13 Mile on both Cedar and Little Cedar, and at 14 Mile, Edgerton and Hoskins on Little Cedar.

The lower section of Cedar Creek, from the mouth upstream to Algoma Road, is characterized by high quality substrate, with cobble and gravel predominant, with sections of silt and organic material interspersed. Glen Blackwood from Great Lakes Fly Fishing Company reports excellent mayfly activity in this section (personal communication). Woody debris is present to some extent in isolated locations from Algoma Avenue downstream to the mouth, although this stretch could benefit from additional wood. Riparian land use issues in this lower stretch are relatively minor, with a buffer strip and erosion repair as potential improvements on the Powers (41-06-22-451-005) and Norman (41-06-22-401-002) properties, respectively (the two most downstream property owners). Within the stream, there are several manmade rock dams that could be easily altered to improve sediment and fish passage and to reduce erosion around the edges. The landowners at the Godfrey (41-06-22-100-007) home on Friske expressed an interest in future habitat work on their property, so long as it did not open it to public fishing. A site near the property boundary between their property and the Sjogren (41-06-22-100-048) property has problematic erosion on the west bank of the stream, where a steep hillside slopes to the stream and is calving significant sediment into the stream.

From 13 Mile upstream to Algoma Avenue, Cedar Creek is marked by private property owners hostile to fishermen or stream-based recreation of any kind, as they have allegedly experienced trespass and confrontational individuals. Neighbors here report that the DNR and the sheriff's office have had different opinions on the understanding of the fishing access/navigable stream law. Several rock dams in this stretch are causing significant erosion around the sides, in one case nearly doubling the stream width. These could be altered to better suit coldwater stream morphological ideals.

From Algoma Rd upstream to the dam there is excellent riparian cover to go with gravel and silt substrate. A half-acre island exists in this stretch, where it is shaded by heavy canopy. Immediately below the dam there is a tractor bridge, followed by two long, wide pools partially impounded by rock dams. Thermal inputs could be reduced easily by reducing the head on both rock dams.

The dam on the Gearhart prop (41-06-16-226-008) has two steps of about two feet of drop per step. Official measurements have not been taken. On the south end of the impoundment, a hydro-power house (currently unused) also drains water from the impoundment and, in previous years, has generated power. The landowners are currently not interested in pursuing dam removal options.

About one-half mile above the dam, Cedar Creek receives input from Little Cedar Creek. Little Cedar flows upstream for several miles and is impounded midway in Hoskins Lake. There are manmade rock dams in the lower Little Cedar that create fish passage barriers; these dams should be removed or modified.

Instream habitat upstream of 14 Mile is excellent with varied gravel/cobble. An erosion site between 14 Mile and Algoma should be investigated further for repair to reduce sediment inputs. The Davis property to the east of Algoma has several rock dams, including one large fish passage barrier that should be altered to reduce head and allow for fish passage (site 26, image #5263). Cedar Creek passes through the Bigney cattle pasture on the west side of Algoma Road, where cattle had degraded the banks and widened the stream. Prior to improving the pasture with access restrictions, a summer fish shocking event of this area was conducted by Kristin Thomas (Michigan TU) and Nichol DeMol (TU National) (Thomas 2011). Results found 21 yoy trout, both brook and brown, in the first pass, and 22 unmarked the next day (8/1/2011-8/2/2011). The trout population was estimated to be 1,860 fish per mile, with brown trout up to 14" being reported. Summer water temps in 2010 at this location reached a maximum of 72.5° F, but only peaked above 70°F for several days; averages were in the 60's. This


Livestock Pasture Before Improvements


Livestock Pasture After Improvements

was deemed an ideal place for improvement BMP's. In 2015, Trout Unlimited National partnered with local firms South Peat Environmental and Kanouse Outdoor Restoration and used United States Fish and Wildlife Service (USFWS) grant funds to fence off much of the pasture, install a cattle crossing, and plant native trees and shrubs. The results show significant improvements to the channel and to the riparian corridor. Aerial photographs show a restoration of the fenced-off portion of the channel.

At 15 Mile and directly above, Cedar Creek is gravel bottomed and signs of the previous season's spawning activity were abundant. The Clary property has several springs; in 2017, grant funds from the National Fish and Wildlife Foundation through Schrems Trout Unlimited were used to add large woody debris habitat features on the Clary property. Jack Clary mentioned that brook trout can be seen spawning in these areas (personal communication). There is one water withdrawal in this stretch, near Indian Lakes Road.

Above Indian Lakes, evidence of large spawning fish was observed. Here, portions of the stream flow through Consumer's Energy land, where proximal agricultural inputs from the north could be contained with the creation of one small adjacent wetland and another buffer strip. The stream channel in the Consumers meadow portion is stable with excellent gravel throughout. Southern exposure tree plantings could reduce thermal inputs substantially, however the utility keeps the stretch mowed. In 2016, Schrems TU had large woody debris habitat features installed in this stretch as well. Above 16 Mile, a large water withdrawal redirects stream flow.

Revegetated Cedar Creek w/ New Trees

Within the limits of the City of Cedar Springs, the stream is polluted with human refuse, but still home to both brook and brown trout, as evidenced by results of 2011 electrofishing by Josh Zuiderveen of South Peat Environmental and Aaron Snell of Streamside Ecological Services, Inc. Brook trout to 10 inches and brown to 15 inches were found in the downtown section, west of Main St. A 2011 habitat improvement project in this stretch added 29 submerged timbers in various arrangements, including four cross vanes. A 100 foot reach was narrowed with a false bank, twenty yards of fieldstone substrate was added, and a dozen mature trees (red maple, sugar maple, cedar) were planted on the southern bank for shade. To date, these trees are large and flourishing. In 2014, Riggle Park was cleaned up and large woody debris was installed to replace removed logjams. Significant refuse was removed as well. In 2014, Trout Unlimited installed a buffer strip along Cedar Creek at CS Manufacturing, with good results.

Before Buffer Strip

After Buffer Strip Plantings

Remnants of a railroad bridge (24 pylons) can still be seen in Cedar Creek between White Creek and 17 Mile Rds. The pylons are treated timber; their removal would increase aesthetics, narrow the channel, and remove possible chemical leaching. Cedar Creek in Riggle Park and through the upstream landowner (Fulbright) has large natural log jams. In summer of 2015, several large logjams and urban trash were cleaned up from the Riggle Park area, and over 2 dozen logs were installed at or below the water's surface for habitat.

Upstream of Cedar Springs, the entire reach of stream is shaded with alder and other riparian plants. The headwaters originate in a large wetland system at Bolthouse Farms on 17 Mile Road, where the Natural Resource Conservation Service (NRCS) restored wetlands within the decade. In 2016, the wetland on the north side of 17 Mile Road was donated to the Community Building Development Team (CBDT) of Cedar Springs. Trout Unlimited National completed a successful wetland restoration in the City of Cedar Springs along Cedar Creek at the new library, in the summer of 2018, thanks to the Department of Environmental Quality's 319 Program. A second wetland restoration is planned within the City Limits for summer of 2019, a project that will span two acres.

Library Wetland, Green Team Planting

Library Wetland, Summer 2018

Published Data:

In 1985, DNR found a declining brook trout population at Friske Road, with water withdrawal for irrigation on the rise. Habitat was good, but few trout were found. Brown trout (17) were thought to be limiting brook trout (2) numbers. Thirteen rainbow trout were also found during this survey.

In 1990, DNR conducted a biological survey of Cedar Creek at four locations (Jones 1991). Results of the study indicated that trout were numerous throughout the creek. Reduced

stream quality was noted at several locations, primarily a result of sedimentation and nutrient input.

A comprehensive DEQ survey of four sites on Cedar Creek and four sites on Little Cedar Creek was completed in 1993 using P51 (Wuycheck and Bonnette, 1999). The fish community was found to be meeting the coldwater designated use at all stations sampled. Sites within Cedar Creek contained between 19-71% salmonids in the collection, while the sites in Little Cedar contained between 1.4-9.8%. Brown trout dominated the trout population at most sites, with the highest number being collected at the 15 Mile Rd and Algoma Ave. sites on Cedar Creek, where habitat was rated as excellent. Moving upstream on Cedar Creek, brown trout were found to be smaller and younger, perhaps due to excessive sedimentation of the sites from cow pasture on the Bigney farm. The fewest brown trout were found at the downstream site on Little Cedar. The habitat was rated as excellent at this site, and it was speculated that a cow pasture located upstream may have been having detrimental effects on the trout population. Brook trout were found at all of the Little Cedar sites, and at the upstream-most sites on Cedar Creek, near 15 Mile Road. Brook trout were the only trout collected at the upstream sites on Little Cedar, and the trout community changed to brown trout dominated further downstream.

Numerous yoy brown and brook trout were found at sites within each creek, confirming natural reproduction and the importance of certain reaches as spawning and rearing habitat. The presence of several age classes indicates the existence of a healthy, self-sustaining trout population and diverse, high-quality stream habitats. Physical habitat was reported to vary from site to site in Cedar Creek, based upon the amount of sedimentation. The two middle sites had excessive sediment covering the stream bottom. Habitat conditions of Little Cedar Creek were also found to vary, based on the slope of the stream channel. High gradient reaches were of higher quality, while low gradient reaches had deposits of silt, muck and other organic debris.

Degradation of physical habitat was found to primarily be a result of cattle access to the streams. It was recommended that the cattle are removed and habitat improvement be undertaken at these sites.

The fish community was assessed at Algoma Ave and Friske Rd, resulting in scores of acceptable at each site. Brook and brown trout comprised 45% of the community at Algoma, and brown trout made up 15% of the community at Friske. The macroinvertebrate community was also acceptable at Algoma, with 26 taxa identified. At Friske Rd, 32 taxa of macroinvertebrates were found, resulting in a score of excellent. At that time, discharge from Cedar Springs was not negatively impacting Cedar Creek. The fish community collected from Cedar Creek downstream of Indian Lakes Road was attaining the coldwater designated use. Eight species of fish were collected and the catch was dominated numerically by brown trout (29%) followed by mottled sculpin (27%) and brook trout (21%).

In 2016, Grand Valley State University completed a study on Brook Trout in Cedar Creek, "Fine Scale Thermal Regulation and Bioenergetics of Brook Trout in Cedar Creek"

(Luttendon, Wegner & Zaparzynski, 2016). The study aimed to evaluate Brook Trout responses to stream temperature changes. Specific habitat use, as well as travel within the stream were tracked in relation to temperature changes.

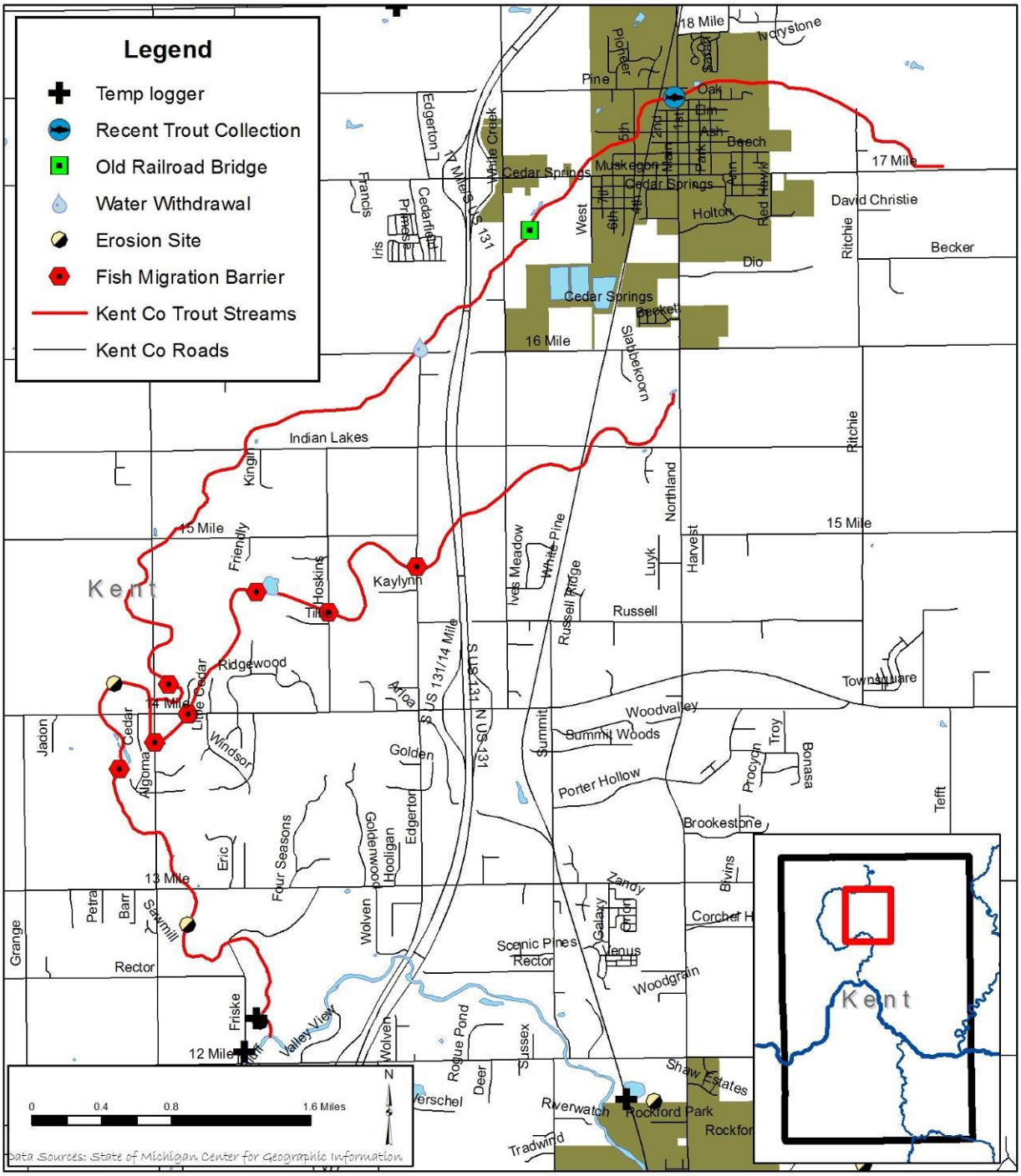
Known Threats or Impairments:
In 2008, a cattle access problem was observed by DEQ on Cedar Creek along Algoma Avenue. According to DEQ, "The site has been problematic for years (at least 10) and efforts to work with the land owner and the Michigan Department of Agriculture have reduced the extent of the problem, but the continued unlimited access by less than a dozen cows has destroyed the native riparian vegetation and caused the stream channel to become shallow, wide, and braided."

In 2015, the Trout Unlimited Home Rivers Initiative secured funding through United States Fish and Wildlife Service (USFWS) Cooperative Agreement #F14AC00004 to fence off much of the cattle and horse access at this site. A cattle crossing was installed, as were shade trees and native plants. The investment at this site has produced noticeable changes.

Recommendations:
1. Work to increase public fishing opportunities
2. A detailed record of water temperature should be established throughout Cedar Creek and its tributaries.
3. Habitat improvement in areas where habitat is sparse
4. Buffer strip and bank stabilization at Powers, Norman and Sjogren properties.
5. Work with riparian landowners to eliminate livestock access to the stream.
6. Instream habitat improvement, with emphasis on large woody debris
7. Reduce sediment input to both Cedar and Little Cedar Creeks
8. Work with riparian landowners to modify rock check dams for improved fish passage
9. Continue to work with Cedar Springs to improve stormwater issues, instream and riparian habitat on City property
10. Create one small adjacent wetland and another buffer strip above Indian Lakes
11. Investigate possible removal of dam with landowners
12. Habitat improvement at Godfrey property
13. Provide support to NRCS and other agencies implementing BMP's along Cedar Creek, in particular the Bolthouse Farms wetland restoration site
14. Support HRI and its partners in restoring and enhancing wetlands along Cedar Creek
15. Support additional land acquisitions and preservation opportunities along Cedar Creek

Cedar Creek Data Resources:
- Hanshue, S. K., and A. H. Harrington. 2011. Draft Grand River Assessment. Michigan Department of Natural Resources Fisheries Division, Special Report, Ann Arbor.

- Jones, R. 1991. A biological survey of Cedar Creek, Kent County, Michigan, August 1, 1990. Michigan Department of Natural Resources, Surface Water Quality Division Staff Report No. MI/DNR/SWQ-91/070.
- Luttendon, Wegner & Zaparzynski. "Fine Scale Thermal Regulation and Bioenergetics of Brook Trout in Cedar Creek."
- Michigan Department of Natural Resources, Fisheries Division Files. Contact: Scott Hanshue, Fisheries Biologist
- Rockafellow, D. 2003. A biological survey of the Rogue River Watershed, Kent and Newaygo Counties, Michigan. August 1998. Michigan Department of Environmental Quality Water Division Staff Report No. MI/DEQ/WD-03/076.
- Thomas, K. 2011. Fish survey results for the Bigney pasture. Michigan Trout Unlimited. Unpublished data.
- Walterhouse, M. 2009. A biological survey of sites in the Rogue River Watershed, Kent and Newaygo Counties, Michigan. July 2008. Michigan Department of Environmental Quality Water Bureau Staff Report No. MI/DEQ/WD-09/057.
- Wuycheck, J. and S. Bonnette. 1999. Biological survey of Cedar Creek and Little Cedar Creek, Kent County, Michigan, June 2-3, 1993. Michigan Department of Environmental Quality, Surface Water Quality Division Staff Report No. MI/DEQ/SWQ-99/007.



SCHREMS WEST MICHIGAN TU COLDWATER INVENTORY

CEDAR CREEK

JUNE, 2012

FIGURE NO. 22

Duke Creek

Background:

Duke Creek is a designated trout stream and Natural River that originates at Sand Lake and enters the Rogue River in Section 36 of Tyrone Township in the northwest corner of Kent County (Figure 23). It is 27.5 miles long, including length of tributaries, and contains no known fish passage barriers. White and Frost Creeks are the primary tributaries to Duke.

Public Access:

Duke Creek flows through the Rogue River State Game Area between 17 Mile and Division, and again south of Sherwin Road.

2011/2012 Data Collection:

Average July water temperature of Duke Creek was 68.0°F at Algoma Rd and 69.5°F at Montcalm Rd, suggesting that Duke Creek is a Cool stream at these locations. Average August water temperatures were 63.4°F at 17 Mile and 65.1°F at 18 Mile Rd.

A perched culvert on Frost Creek, at Algoma Rd, is a barrier to migrating fish.

The lower two miles of Duke Creek are marked by low floodplain and a winding passage and several seasonal channels. From 18 Mile Road upstream, the creek features mixed substrate, with cobble, gravel and organic matter well distributed throughout.

Over one mile of Duke Creek flows through State land bordered by 17 Mile Road, Division, Red Pine and 18 Mile Road in Tyrone Township. In early autumn of 2011, electrofishing surveys upstream of 17 Mile Road revealed healthy numbers of brown trout of various age classes, from six inches to well over 20 inches in length. Young-of-the-year and smaller trout were absent in the first 500 feet above 17 Mile Road during the survey. The mile of Duke through State land was assessed in the spring of 2012, and several potential sites for improvement were documented, including erosion sites of significant size. There are over a dozen log jams in this stretch that could present future problems; these could be altered and kept in the stream to improve aquatic habitat.

Duke Creek also flows through State land in the next section to the northeast, just inside Solon Township; 359 acres of State land along the southern edge of Sherwin, east of Division, contain nearly another mile of public access fishing in Duke Creek.

Autumn 2011 electrofishing surveys upstream of 18 Mile Road east of Hanna Lake found both brown and brook trout over a high quality substrate. Brook trout found here were in spawning colors. Young-of-the-year brown trout were found here as well. This area is downstream from the confluence with Frost Creek, a coldwater tributary. August 2011 temperature data from Frost Creek at Algoma Avenue revealed a temperature range from 55° F to 68.5° F, two degrees colder than the mainstem of Duke at 17 Mile. Comparatively, stream temperature data from Duke further upstream at 18 Mile east of Simmons revealed a range of 58° F to 71.6° F. Frost Creek has an apparent cooling influence on Duke.

At the Hanna Lake Road crossing, a potential site for a riparian buffer strip was noted from the road. At White Creek Road, Duke flows through a campground on the east side of the road. The owner of the campground allows anglers, and has himself caught both brook and brown trout on the property, including browns over 20 inches. The stream was surveyed through the campground and found to contain ideal cobble/gravel bottom, with a minimum of woody features. The campground owner is open to habitat improvement work.

Published Studies:

In 1992, DEQ found the macroinvertebrate community to be excellent at two stations and acceptable at another two stations (Rockafellow, 2003). Habitat was found to vary between fair and excellent. The major impairment in the watershed was identified as the predominance of sand and fine sediment covering more desirable substrate.

In 2008, DEQ found similar results. Macroinvertebrate communities were found to be diverse and well-balanced. The major factor impacting instream habitat was sand within the stream (Walterhouse, 2009). Woody debris was found to be prevalent and banks were stable and well vegetated. At Division, the fish community contained nine species of fish, including brown trout, which accounted for 7% of the collection.

Frost Creek originates from the outlet of No-Ko-Mos Lake and flows into Duke Creek. The macroinvertebrates and habitat in Frost Creek were found to be excellent, with an abundance of mayflies, caddisflies and stoneflies in the sample (Walterhouse, 2009).

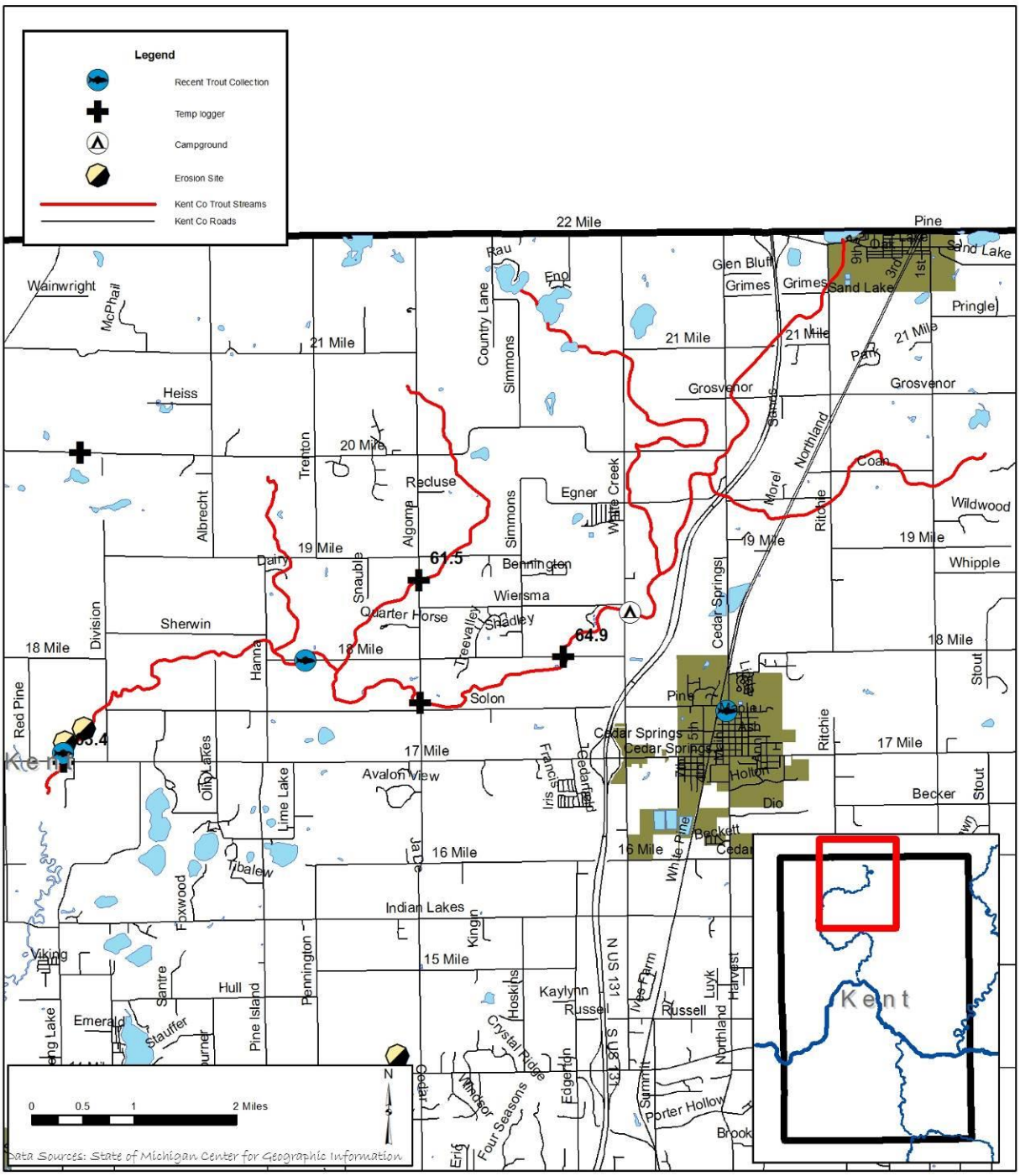
Recommendations:

1. Work to increase public fishing opportunities
2. A detailed record of water temperature should be established throughout Duke Creek and its tributaries.
3. Conduct an assessment of sediment loads and identify the highest priority sources and causes.
4. Erosion reduction measures on the State land north of 17 Mile and potential habitat improvements would be beneficial to the fishery.
5. Currently, there is limited parking along 17 Mile or Division for fishermen, despite more than a mile of publicly-accessible stream at this site.
6. Habitat improvements, particularly the addition of large woody features in the campground area should be explored, as the landowner is a willing cooperator and the stream conditions are otherwise ideal.
7. The middle section of Duke contains some land used for agricultural practices; these areas should be surveyed for possible impacts

Duke Creek Data Resources:

- Rockafellow, D. 2003. A biological survey of the Rogue River Watershed, Kent and Newaygo Counties, Michigan. August 1998. Michigan Department of Environmental Quality Water Division Staff Report No. MI/DEQ/WD-03/076.
- Walterhouse, M. 2009. A biological survey of sites in the Rogue River Watershed, Kent and Newaygo Counties, Michigan. July 2008. Michigan Department of Environmental Quality Water Bureau Staff Report No. MI/DEQ/WD-09/057.

"No life is so happy and so pleasant as the life of the well-govern'd angler." - Izaak Walton



SCHREMS WEST MICHIGAN TU COLDWATER INVENTORY

DUKE CREEK

JUNE, 2012

FIGURE NO. 23

Rum Creek

Background:
Rum Creek is a four mile long, second order tributary to the Rogue River (Figure 21). It joins the Rogue in downtown Rockford in the middle of the old Wolverine Worldwide Tannery. The tannery site and environs are the current focus of EPA investigation into possible ground and groundwater contamination from a century of tannery activity. The lower 480 feet of Rum Creek flows through this parcel, portions of which are covered with concrete. Several of the yards it flows through in downtown Rockford are mowed directly to the edge of the stream, lacking any desirable riparian vegetation.

Public Access:
The headwaters of Rum Creek flow through Luton County Park, a popular location for mountain biking and outdoor recreation. The stream here is small and generally unfishable. In October of 2017, Courtland Township acquired 16 acres bordering Rum Creek just downstream of Luton Park on 10 Mile, using North American Wetland Conservation Act (NAWCA) grant funds leveraged in part by Schrems Trout Unlimited. Josh Zuiderveen of South Peat Environmental assisted Schrems and Courtland Township in the acquisition, which consisted of 1,300 feet of streambank.


Rum Creek View in Courtland Township 16 Acre Parcel


Rum Creek Habitat @ Courtland Drive

A significant portion of lower Rum Creek flows through property owned by the City of Rockford, consisting of 650 feet between Northland Drive and Courtland Drive, as well as 2,000 feet between Northland Drive and Monroe, near the Rockford Community Cabin and Parkside Elementary. The property near Courtland Drive had log jams removed in 2016, and numerous large woody debris habitat features added, using grant funds from the National Fish and Wildlife Foundation (NFWF). Schrems Trout Unlimited was the grantee; South Peat Environmental and Kanouse Outdoor Restoration assisted onsite.

The property on Monroe has paved walking trails that parallel Rum Creek, making for easy fishing access. Stream width here averages 8-15 feet, with excellent gravel. A broken down dam, with dangerous angle-iron and jagged concrete, was an eyesore in this section for

decades. In September of 2016, United States Fish and Wildlife Service grant #F15AC01122 was used by Trout Unlimited to have the dam removed. In addition to improvements to aesthetics and safety, the removal of the dam opened up fish passage to approximately seven miles of Rum Creek and its tributaries. Local firms Streamside Ecological Services and South Peat Environmental assisted Dean's Excavating in the removal.

Rum Creek Dam (before removal)

Rum Creek Dam (after removal)

Other Conservation & Notes:
In 2015 and 2016, Trout Unlimited Home Rivers Staff worked with private landowners downstream from the City of Rockford Community Cabin property to install buffer strips of native plants on over 2,500 square feet of riparian habitat on Rum Creek.

In 2018, Trout Unlimited Home Rivers helped facilitate installation of a rain garden in the drop off area at Parkside School.

A proposed new condominium development along Rum Creek generated significant public discourse about stormwater runoff near Rum Creek, eventually leading to a change in the City's stormwater ordinances. New developments in the Rum Creek watershed, including the proposed condominiums, are now subject to much stricter stormwater treatment requirements, meaning less urban runoff into Rockford streams. As of spring of 2018, at least two projects are planned to route stormwater away from Rum Creek.

2011/2012 Data Collection:
Average July water temperature was 55.1°F upstream of Courtland Drive, ranging from 51.3 to 68.9°F. Rum Creek is a Cold stream, in fact, the second coldest in Kent County. August 2011 temperature data taken at Main Street in Rockford, 100 yards from the mouth, ranged from 55.6 F to 67.3 F, with a mean August temperature of 60.9 F. The substrate at Main, Monroe, and Courtland drive is dominated by gravel/cobble mix. Several sites with problematic erosion near Courtland Drive were photo documented.

Electrofishing surveys were conducted in 2012 to determine presence/absence of trout below the Rum Creek Dam site. Results revealed a fish population dominated by over 90% brown trout, with few mottled sculpins. Brown trout in the 4-11 inch range were found in decent numbers in this stretch; mayflies could be seen emerging from the water.

At Courtland Drive behind MVP Health Club, over 90% of the fish population consisted of brown trout between 4 and 12 inches, as well as mottled sculpin and two northern hog suckers. It was noted by Aaron Snell and Josh Zuiderveen that the trout in Rum Creek, especially above the dam (the dam has since been removed), were all thin and appeared underfed.

Rum Creek at the WWW Tannery Location

Rum Creek was surveyed in spring of 2012 from Herman's Boy upstream to Courtland Drive and beyond, and several significant erosion sites were identified near the Condominiums on Maple Shade and Castle Hill near Courtland Drive. Sediment was documented twice during rainstorms entering Rum at Courtland Drive (Arn McIntyre, Personal Communication; Josh Zuiderveen, Personal Communication) as a result of stormwater runoff on a gravel driveway along Courtland Drive. Rum Creek upstream of Courtland has excellent substrate and stable banks throughout; trout can be seen, especially in the few pools that exist. Further upstream Rum has much less gradient, and the substrate is predominantly sand, with overgrown alder as riparian vegetation. Between Courtland and 10 Mile Road, the stream is well buffered from any development or agriculture influences.

Several lakes around Kies Street have a large number of homes with manicured lawns to the edge of the water. As well, the lakes may impact water temperatures of Rum Creek.

Published Studies:

Fisheries Division fish survey cards from 1964 indicated the presence of 54 brown trout, 16 brook trout and 4 rainbow trout just upstream of the confluence with the Rogue River (Wuycheck, 1994).

In 1969, Department of Conservation found Rum Creek to be an excellent spawning creek, with trout in good physical condition. The brown trout were thought to be keeping the minnow population sharply cropped. Twenty-eight brown trout were collected, with many being young-of-the-year.

In response to urban development and the increased concern about soil erosion, sedimentation and altered hydrology in Rum Creek, the DNR completed an assessment in June 1992 (Wuycheck, 1994). Sampling results indicate that the first order headwaters are dominated by a self-sustaining brook trout population (87.5% of the fish community). Here, the stream is about four feet wide with a flow of 2.0 cfs. Downstream, in second order reaches, the fish community was dominated by a self-sustaining brown trout population, which comprises up to 93% of the fish community. These second order reaches are 8 to 12 feet wide with a flow of 8 to 15 cfs.

Habitat and macroinvertebrate communities were found to be good to excellent. Stream morphology indicated that flows were relatively stable. Typical stream problems such as upland or bank erosion, sedimentation, or extreme hydrologic fluctuations were not noted during this survey.

Recommendations:

1. Further investigate wetland restoration & invasive species control at the newly acquired "fish hatchery" site in Courtland Township & support acquisitions.
2. Determine possible impacts of lakes in upper watershed
3. Update fish and macroinvertebrate community data as available
4. Work with more landowners in city limits to institute BMP's for riparian plantings.
5. Work with condominium landowners to address erosion sites and plan for near-future repairs for long-term reduction of sediment.
6. Investigate stormwater/gravel/sediment runoff at Courtland Drive and document for future improvement measures.
7. Support any efforts to reduce urban stormwater runoff into Rum Creek
8. Support efforts to restore the tannery site

Rum Creek Data Resources:

- Michigan Department of Natural Resources, Fisheries Division Files. Contact: Scott Hanshue, Fisheries Biologist
- Wuycheck, J. 1994. A biological assessment of Rum Creek, Kent County, Michigan, 5 June 92. Michigan Department of Natural Resources, Surface Water Quality Division Staff Report No. MI/DNR/SWQ-94/036.

"Whether I caught fish or not, just the thrill of rolling out that line and watching my fly turn over has been good enough for me. That and the hundreds of treasured memories I have of this wonderful sport."

-Curt Gowdy

Shaw Creek

Background:
Shaw Creek is a first order tributary to the Rogue River with a 3.4 square mile drainage area (Figure 21). Shaw Creek's headwaters are in Courtland Township, in the section bordered on the North by 12 Mile Road, on the South by 11 Mile Road, on the West by Courtland Drive and on the East by Shaner Avenue.

Public Access:
Rockford Park provides access to a very short reach of Shaw Creek, near its confluence with the Rogue River. No other public access exists.

2011/2012 Data Collection:
Only August water temperature data was collected in 2011. Average monthly temperature was 59.4°F, ranging from 54.4 to 65.6°F. In 2010, average July water temperature was found to be 57.6°F, and extremely stable, ranging only from 53.3 to 59.1°F. Shaw Creek meets the criteria of a Cold stream.

Spring 2012 electrofishing surveys conducted below Courtland Dr. revealed an abundance of brown trout between one and five inches. Additionally, healthy numbers of brown trout up to nine inches were found, with one larger 13 inch brown present. Three small brook trout in the five inch range were found in this stretch as well. Trout were extremely healthy and numerous, and, with exception of one small bluegill, accounted for 100% of the fish in the sampled reach.

Multiple springs contribute to Shaw as it originates immediately west of Shaner; here, it is three feet wide and lined with watercress. Several culverts from the east of Shaner contribute to Shaw but are small enough so as to be almost seasonal. The stream bed is interspersed sand and gravel with occasional cobble in meander bends. Erosion is not a problem, as runoff and heavy flows are negligible in the headwaters (upstream of Courtland), and road crossings are few in the upper stretch.

A significant section of Shaw Creek is contained in a condominium/development/shared green area and is, thus, secure from further development. A twin culvert crossing at this

property is a potential fish passage barrier, especially the north culvert which has minimal drainage. Similarly, one very large rock dam was found that has 24 inches of head and could be modified to allow better sediment and fish passage. All land in this section is privately owned.

The instream habitat and riparian environs surrounding Shaw upstream of Courtland is excellent, with an abundance of natural forest buffer and adjacent wetlands. Many extended sections of Shaw throughout this reach have equal proportions of sand/gravel/cobble, with watercress in abundance and fish visibly moving about. Initial instream habitat assessments reveal a lack of deep holes, as well as some natural timber/log jams.

Shaw Creek downstream of Courtland Drive is privately owned on both sides, with the majority of length running through a large wooded tract owned by Wolverine Worldwide, Inc. Shaw flows downstream through this area and skirts the southern border of a relatively new development at Northland Drive, where a stormwater overflow pipe enters the stream; any potential impacts from this pipe are unknown. Within this reach, there are several natural and manmade rock dams and log jams, where sediment has visibly built up. Only one of these, located just downstream of Courtland, appears to be fish passage barrier, although all could be modified to provide sediment transport. Several foot bridges cross the stream in this section, and the last few hundred feet border a yard on the southern bank, up to Northland Drive.

Underneath the extra-wide Northland Drive overpass, sediment has accumulated, forming sediment bars and causing an extremely shallow flow.

Downstream of Northland Drive, Shaw flows through a cattle pasture (absent of cattle at the time of survey) for approximately 550 feet before passing through a fence and entering forest. It re-enters the pasture downstream for approximately 150 feet before flowing into the forest permanently. Where exposed to the pasture, Shaw's banks are beaten down by cattle traffic and the riparian environs are absent a buffer intermittently on one or both banks. In the forest, the riparian habitat is excellent, with only several natural log jams as potential problems. Improvement efforts, such as the modification of existing log jams into more long-term stable habitat features, would be easy and cost effective. Addressing the few erosion sites with natural fieldstone, as well

as localizing cattle access and increasing the riparian corridor with electric fence are also recommended.

Upstream of Northland Drive, a number of homeowners maintain their lawns to the edge of the stream, leaving no natural riparian buffer.

Published Studies:
Department of Conservation found very fine trout habitat with excellent spawning gravel in 1969. Thirty-one brown trout were collected, and it was stated that the trout were so numerous that they appeared to have eaten all of the minnows.

In 1992, DEQ assessed the fish and macroinvertebrate communities and habitat of Shaw Creek to determine if the stream supported its coldwater designated use (Wuycheck 1997). The study of three survey sites found the presence of trout throughout the stream and that Shaw Creek, at a minimum, was supporting its coldwater designation. Results indicated that all three sites contained four age classes of brown trout, with the highest density collected at Courtland Drive. Each site was dominated by young fish, indicating the streams importance for reproduction and juvenile fish development. Larger, more mature brown trout were nearly absent in Shaw Creek. One brook trout was found at the site downstream of Northland Drive.

Macroinvertebrate communities were found to be excellent at all three sites. The presence of stoneflies, several genera of mayflies and caddisflies were indicative of diverse habitat and high water quality.

Overall habitat results were found to be good at Courtland Dr. and downstream of Northland Ave., and excellent upstream of Northland. However, substantial areas of suitable, complex substrates were obscured by sand, especially at Courtland.

In 1998, the macroinvertebrate community was excellent and contained five taxa of caddisflies (Rockafellow, 2003). Physical habitat was rated as good, but the accumulation of sand had limited the amount of stable habitat. Streambanks were fully vegetated and

stable upstream of Courtland Drive, but flowed through a pasture downstream of Northland Drive. The streambanks in the pasture were unstable.

Conservation:
In 2015, Schrems West Michigan Trout Unlimited had habitat improvements completed in Shaw Creek between the White Pine Trail and the Rogue River. A large logjamb causing significant local erosion was removed, and several habitat features and logs were added, creating cover and pools.

Shaw Creek logjamb, before

Shaw Creek logjamb, after

Recommendations:

1. Work with riparian landowners to reduce livestock access to the stream.
2. Work with landowners to establish or improve riparian buffers.
3. Work with landowners to improve fish passage at problem culverts.
4. Remove excess logjambs and debris to improve flow and sediment transport.
5. Investigate possible impacts from stormwater pond near Northland Drive
6. Develop instream treatments to increase prevalence of deeper pools, and work with landowners for conservation partnerships.

Shaw Creek Data Resources:

- Michigan Department of Natural Resources, Fisheries Division Files. Contact: Scott Hanshue, Fisheries Biologist
- Rockafellow, D. 2003. A biological survey of the Rogue River Watershed, Kent and Newaygo Counties, Michigan. August 1998. Michigan Department of Environmental Quality Water Division Staff Report No. MI/DEQ/WD-03/076.
- Schrems. 2012. Field notes from assessment of select Kent County trout streams. Unpublished.
- Wuycheck, J. 1997. Biological survey of Shaw Creek, tributary to the Rogue River, Kent County, Michigan, 5 June 92. Michigan Department of Environmental Quality, Surface Water Quality Division Staff Report No. MI/DEQ/SWQ-97/060.

"Often I have been exhausted on trout streams, uncomfortable, wet, cold, briar scarred, sunburned, mosquito bitten, but never, with a fly rod in my hand have I been less than in a place that was less than beautiful."

-Charles Kuralt

Spring Creek

Background:
Spring Creek is located in northwest Kent County and enters the Rogue River in Section 14 of Tyrone Township (Figure 24).

Public Access:
A significant length of Spring Creek flows through the Christiansen Nature Center and the Rogue River State Game Area.

2011/2012 Data Collection:
The average August water temperature of Spring Creek was 61.5°F, with a minimum of 55.1°F and maximum of 69.0°F. Since no July data was collected, this stream was not classified, but appears to be Cold.

No fish migration barriers were identified in the Spring Creek Watershed.

Spring Creek is a tributary of the upper Rogue River. The confluence with the Rogue is approximately one half of a mile west of Red Pine Road. The morphology and aquatic habitats of Spring Creek essentially divide it into two sections, the upper and the lower.

The lower section of Spring Creek is entirely contained within land owned by the DNR, and access parking and paths are present. The lower 9,800 feet of the stream is located below Spring Lake, an apparently natural depression in the State Game Area. Several tributaries enter Spring in and below the lake. The stream width averages 35 feet in the lower stretch, with shallow flows and substrate predominantly made up of dark, organic matter typical of streams with low gradient and forest environs. Riparian habitat is good throughout this section, as it is entirely forested with no development or agriculture.

The upper portion of Spring Creek is about four miles long and is smaller, averaging four to nine feet in width at 20 Mile Road. It is contained within Solon Township. The substrate is almost entirely sandy material near 20 Mile, marked by sparse woody habitat, mostly from overgrown alder. Trout were readily observed upstream and downstream from 20 Mile Road, where a few habitat features, like wood and undercut banks, are present. The majority of the upper

portion's four miles is contained in forest, but there are some agricultural activities that come close to the stream. The substrate in upstream sections above 20 Mile contains cobble/gravel/sand mix.

The stretch below 20 Mile could be a good site for a future access site and habitat work, as it is public land. It is also recommended that a temperature logger be installed in the lower portion of Spring Creek at Red Pine Road, to check for temperature changes due to Spring Lake's thermal effects.

Published Studies:
In 1989, the DNR found habitat and the trout population to be excellent at Albrecht Rd, with 10 brook trout and 5 brown trout collected in the first 40 feet of stream; sampling was discontinued to protect the trout.

In 2008, fish sampling was conducted in the headwaters of Spring Creek, upstream of 20 Mile Road to determine if the coldwater designation was being attained (Walterhouse 2009). Brook trout accounted for 3% of the fish collected, indicative of attainment of the coldwater designation. Eight species were collected and three of the species are considered intolerant of degraded conditions. Numerically the catch was dominated by mottled sculpin, which accounted for more than 60% of the catch.

Recommendations:

1. Thermal classification of all stream reaches within the watershed
2. Improve public access
3. Instream habitat improvement
4. Support continued DNR/DEQ monitoring efforts

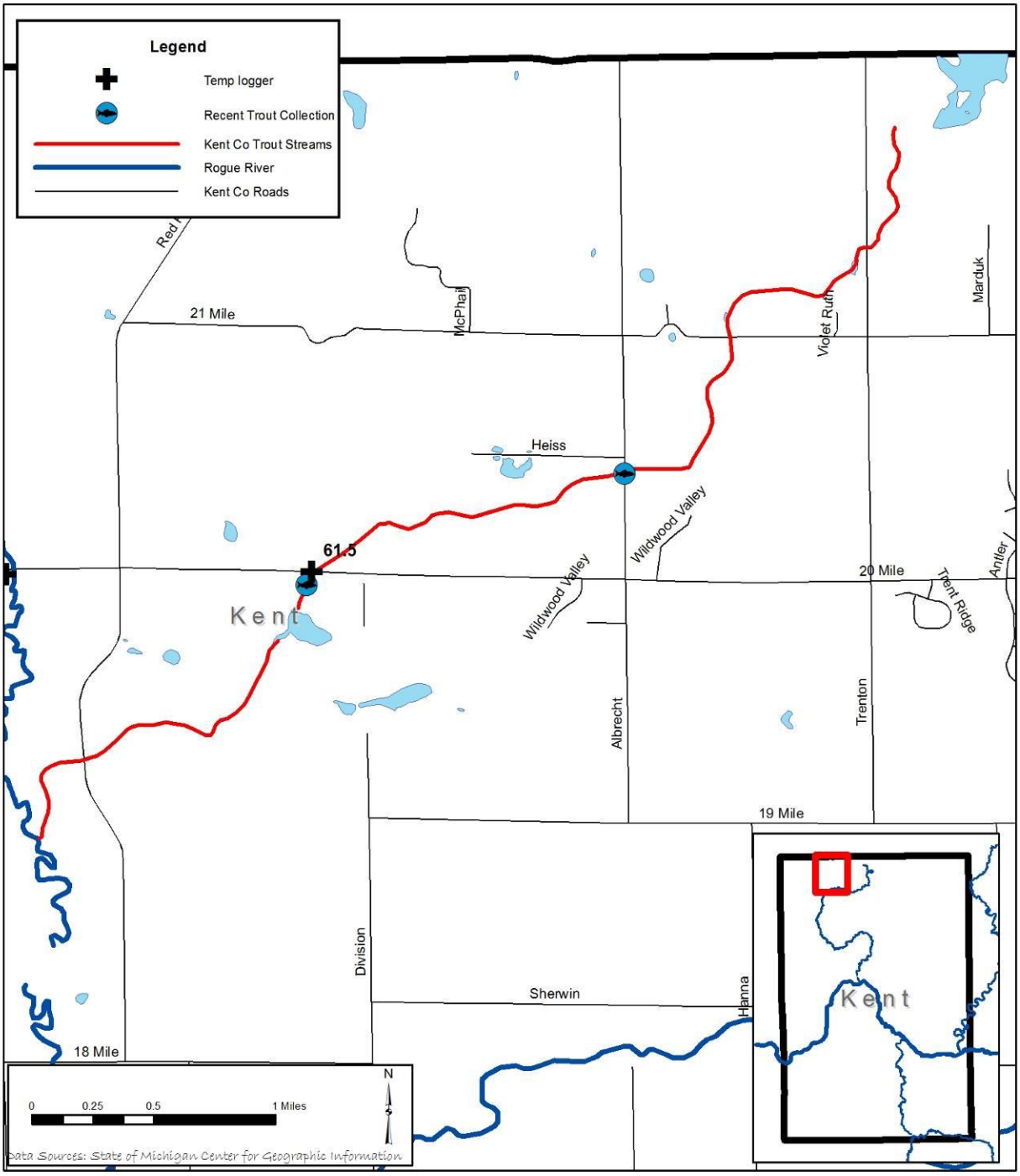
Spring Creek Data Resources:

- Michigan Department of Natural Resources, Fisheries Division Files. Contact: Scott Hanshue, Fisheries Biologist

- Walterhouse, M. 2009. A biological survey of sites in the Rogue River Watershed, Kent and Newaygo Counties, Michigan. July 2008. Michigan Department of Environmental Quality Water Bureau Staff Report No. MI/DEQ/WD-09/057.

"The finest gift you can give to any fisherman is to put a good fish back, and who knows if the fish that you caught isn't someone else's gift to you?"

-Lee Wulff



SCHREMS WEST MICHIGAN Environmentally Involved Since 1962 TROUT UNLIMITED	SCHREMS WEST MICHIGAN TU COLDWATER INVENTORY SPRING CREEK	JUNE, 2012 FIGURE NO. 24

Stegman Creek

Background:
Stegman Creek has an 11 square mile watershed and enters the Rogue River about 1.5 miles northwest of the City of Rockford in Section 23 of Algoma Township (Figure 25). Becker Creek is a primary tributary to Stegman. Stegman Creek has a length of about 8.5 miles and a gradient of about 25 feet per mile. Becker Creek is approximately 3.5 miles in length with and average slope of 38 feet per mile. These relatively high gradients typically enhance habitat and biological diversity. Generally, streams best suited for trout reproduction have a gradient ranging from 10 to 70 feet per mile (Hay-Chmielewski et al. 1985).

The Stegman Creek Watershed is dominated by sandy soils, which are important to the quality of a trout stream due to elevated infiltration rates, cooled groundwater recharge and reduced runoff rates. Stegman and Becker Creeks are groundwater dominated and exhibit relatively stable flow conditions. Observed rain events, even severe, rarely produce significantly elevated water levels for more than 24 hours. 2009 summer temperature data taken at Summit Court revealed a high temperature of 61.5°F, reached twice; daily temperatures remained otherwise in the 50's.

The lower two miles of Stegman are fully open to fish passage for upper Rogue River trout, and large brown trout have historically spawned in this stretch in the fall. A riparian owner has photo documentation of a spawning brown trout in the 30-inch range on his property (circa 2000). Recently, brown trout have been observed spawning along Summit Court, and beneath the Northland Drive road crossing. Remains of a mill dam at Summit and Porter Hollow are a fish passage barrier to small fish. There is currently a natural fish passage barrier just upstream of Northland Drive. The landowners here, the Veley and Bradley families, report that historically, large trout spawned at the confluence of Becker and Stegman in the fall, although they claim this number decreased near the time of large-scale rotenone treatments in the Rogue.

Public Access:
A short reach of Stegman Creek flows through the Rogue River State Game Area, near Rector Rd. Trestle Park, an Algoma Township Park on Summit Avenue, is also open to the public for fishing. The rest of Stegman is controlled by private access.

2011/2012/2018 Data Collection:
As part of an ongoing public education campaign by Trout Unlimited, continued insect monitoring and education has taken place at several locations within the Rogue River watershed, including Stegman Creek in Trestle Park. In October of 2010, Nichol DeMol and Kristin Thomas, Michigan TU, documented sensitive aquatic insects such as mayfly, caddisfly, and stonefly larvae in the Trestle Park stretch; total aquatic insect presence in this area garnered an "excellent" score, implying good water quality, among other things.

As a follow-up to initial DEQ road stream crossing erosion site locations, Josh Zuiderveen of South Peat Environmental performed a two-day field inventory of upper Stegman and portions of lower Stegman. Over two dozen potential sites for improvement were photo-documented with correlating GPS coordinates and landowner names. Of significant note, another apparent livestock access site near Tefft Avenue was noted, where a large volume of sediment appears to enter the stream; plans for future riparian BMP work have been discussed with TU Home Rivers and US Fish and Wildlife Service.

Published Studies:

In 1979, Department of Conservation found high-quality habitat in Becker Creek, with undercut banks, brush and logs and deep holes noted on the survey card. Stoneflies, mayflies and caddisflies were found in abundance. Becker Creek was described as an excellent brown trout stream with good nursery and spawning area. Brown trout were the only species of trout noted.

In 1992, a DEQ assessment showed that habitat was reasonably good, despite nearly the entire length of Stegman Creek being impacted by elevated bedloads of sand. A major source of sediment identified, at that time, was road runoff from the steep slope of Shaner Ave.

In 1995, the Water Resources Institute at GVSU completed a study on Stegman Creek that included an assessment of water quality and aquatic habitat, and recommendations for the protection and enhancement of the watershed (Cooper et al. 1995). Fish sampling resulted in a community dominated by brown trout with a few brook trout, among others. The study reported that the water quality and aquatic habitat of Stegman Creek was excellent, but threatened by nonpoint source pollution. Specifically, increased amounts of silt and sand was identified as the most significant pollutant.

In 1996, riffle habitats were found to be severely impaired by sedimentation, providing a minimum number of sites to support important populations of macroinvertebrates.

In 1998, Stegman Creek was assessed at Summit Avenue to determine the condition of the stream. The macroinvertebrate community was found to be excellent and the physical habitat was rated good. The upper portion of the surveyed reach had been impounded, and

impacts from sand and silt were obvious. The lower portion of the reach had accumulations of unconsolidated, moving sand. Lack of instream habitat was obviously impacted by sand. Streambanks were vegetated and stable.

The results of fish community sampling in 2000 indicated that Stegman and Becker Creeks are supporting their coldwater designations. Four or more age classes of brown trout were found at all five of the sites sampled. The abundance of yoy and Age I fish verified the importance of these creeks for reproduction and development.

As part of a DEQ, Land and Water Management Division and Office of Criminal Investigations assessment conducted on June 1, 2000, macroinvertebrate and fish communities were surveyed at three locations in an unnamed tributary to Stegman Creek (Hanshue 2000). In un-impacted reaches, the macroinvertebrate community was rated as excellent with diverse and high quality taxa present. Several stonefly, mayfly and caddisfly taxa were collected, which are representative of relatively undisturbed streams. DNR Fisheries also collected samples and found, in the undisturbed reach, 126 brown trout ranging from one to seven inches. These data suggest that the tributary is important for spawning and nursery habitat.

In 2007, electrofishing by Josh Zuiderveen and Amy Harrington (DNR Fisheries) found 294 brown trout and one rainbow trout in the lower 1000 feet of Stegman. Since then, tiger trout (a hybrid between a brook trout and brown trout), rainbows and brook trout have been caught in the area. Very large brown trout have also been seen, caught, and electrofished by Josh Zuiderveen and Dr. Neil McDonald of Grand Valley State University out of previously constructed habitat features.

In 2008, fish sampling at Tefft Avenue documented that the community is attaining its coldwater designation; 70% of the fish collected were brown trout.

Known Threats or Impairments:
Stegman Creek is experiencing development pressure and the effects of urbanization, resulting in modified drainage patterns, altered hydrology, streambank erosion and sediment input. Nearly all of the existing publications suggest that it is essential to protect gravel spawning beds from sedimentation and adverse impacts to water and stream quality. A housing development on both sides of Stegman Creek upstream of Northland Drive is suspected of contributing to significant sediment deposition into Stegman Creek over the last 20 years. Largescale construction and excavation on 14 Mile Road over Becker Creek is also suspected of contributing significant amounts of sediment.

In 1995, WRI identified poorly designed, improperly constructed and inadequatley maintained road/stream crossings were contributing to erosion and sedimentation at several sites. Siltation and lack of woody debris had contributed to loss of habitat. The greatest threat to Stegman Creek was identified as anticipated land use and development.

Past Projects:
Road crossings at Shaner and Teftt Avenues were repaired with CMI funds in 2001.

Initial inventory and multiple habitat improvements have been completed between 2005 and 2018, with help from GRCF, Frey Foundation, Michigan Wildlife Conservancy, Schrems, US Fish and Wildlife Service, and National Fish and Wildlife Foundation. Large woody debris habitat features have been installed, as well as brush and rock work. Several significant erosion sites have also been repaired, reducing sediment inputs into the lower stretch. Per recommendations of Chris Freiburger, DNR, a false bank was constructed beneath the Northland Drive overpass as well, to reduce the baseflow stream channel to its ideal width, resulting in the capture of a significant volume of loose sand. In September of 2015, Aaron Snell of Streamside Ecological Services and Josh Zuiderveen of South Peat Environmental conducted electrofishing efforts near the improved bridge crossing, and found an abundance of mature, large brown trout that were apparently staging to spawn. Large brown trout electrofished with Dr. McDonald from Grand Valley State University were found over the years in habitat features as well.

Mature Brown Trout Surveyed in Improved Habitat

Recommendations:
WRI recommended short term objectives of establishing and maintaining riparian buffers, stabilization of stream channels and improvement of road/stream crossings. Long term objectives included control of stormwater runoff through local zoning ordinances and master plans.

1. Streambank and channel stabilization
2. Minimize stormwater runoff with BMPs and buffer zones
3. Inventory upper stretch from Northland Drive to headwaters to locate specific locations where sediment is entering stream.
4. Possible investigation of water bottling draws on water upstream
5. Inventory of Becker Creek and brook trout electrofishing survey to confirm native fish populations.
6. Drainage turnouts, used to direct runoff volumes away from the stream should be considered by the Kent County Road Commission.

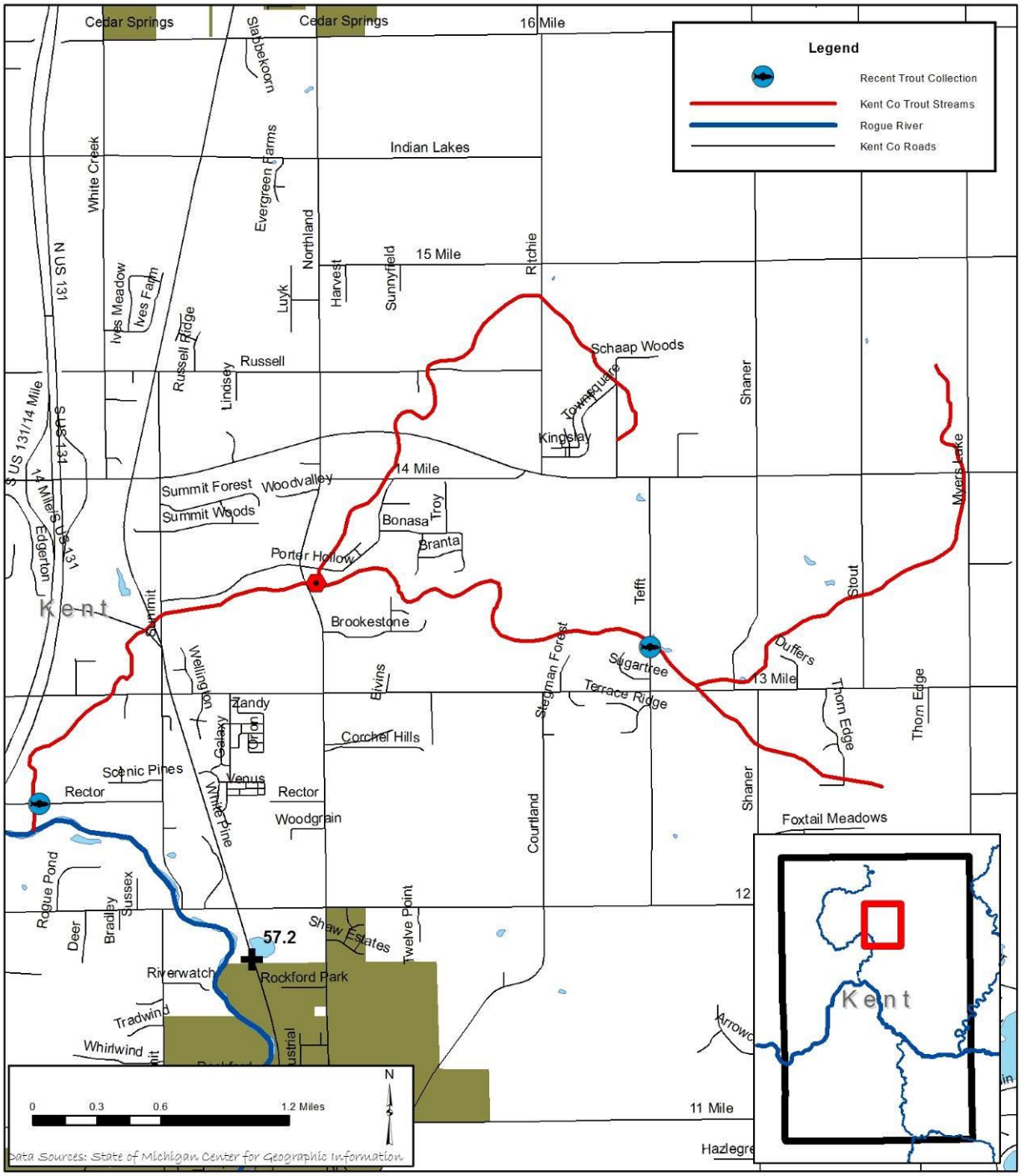
Stegman Creek Data Resources:

- Cooper, J., R. Denning, P. Fischer, J. Koches and K. Thompson. 1995. Grand Valley State University Water Research Institute. Pub. No. MR-95-9.

- Hanshue, S.K. 2000. Biological assessment of an unnamed tributary to Stegman Creek, Kent County, June 1, 2000. Michigan Department of Environmental Quality, Surface Water Quality Division Staff Report No. MI/DEQ/SWQ-00/063.
- Michigan Department of Natural Resources, Fisheries Division Files. Contact: Scott Hanshue, Fisheries Biologist
- Rockafellow, D. 2003. A biological survey of the Rogue River Watershed, Kent and Newaygo Counties, Michigan. August 1998. Michigan Department of Environmental Quality Water Division Staff Report No. MI/DEQ/WD-03/076.
- Walterhouse, M. 2009. A biological survey of sites in the Rogue River Watershed, Kent and Newaygo Counties, Michigan. July 2008. Michigan Department of Environmental Quality Water Bureau Staff Report No. MI/DEQ/WD-09/057.
- Wuycheck, J. 2002. Biological survey of Stegman Creek and Becker Creek, Tributary to the Rogue River, Kent County, Michigan, June 8, 1992 and August 28, 1996. Michigan Department of Environmental Quality, Surface Water Quality Division Staff Report No. MI/DEQ/WD-02/107.

"Fishing is not an escape from life, but often a deeper immersion into it..."

-Harry Middleton



SCHREMS WEST MICHIGAN TU COLDWATER INVENTORY

STEGMAN CREEK

JUNE, 2012

FIGURE NO. 25

Thornapple River and Tributaries

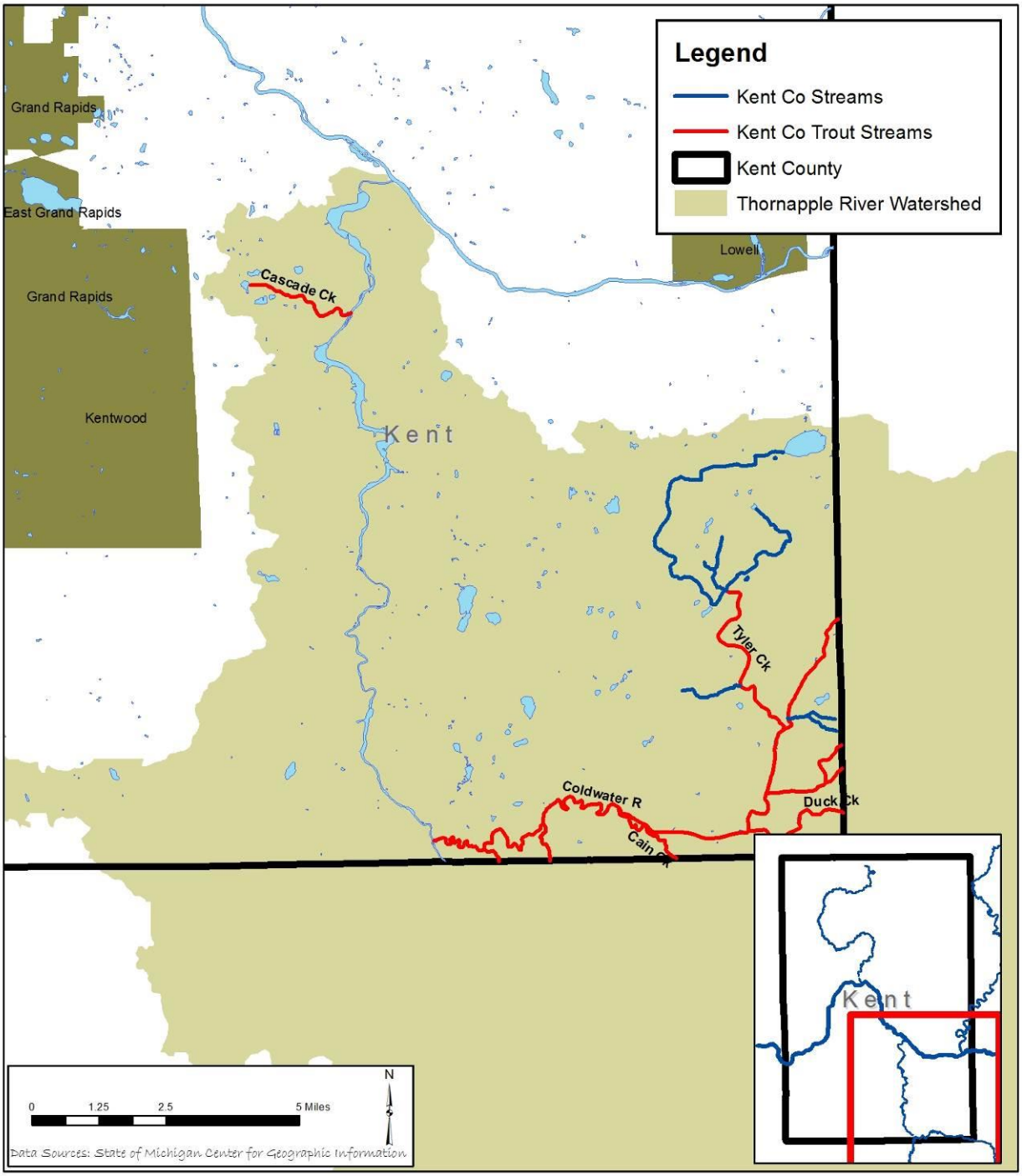
The Thornapple River originates east of the City of Charlotte in central Eaton County. Serving as one of the principal tributaries to the Grand River, the Thornapple River system drains approximately 540,000 acres. The Thornapple is roughly 78 miles long, with about 260 miles of tributaries (Thornapple River Watershed Council, 2001). The Coldwater River is a major tributary, and, the primary Thornapple tributary in Kent County that harbors coldwater communities (Figure 26). Cascade Creek, a small, direct tributary, is also listed as a designated trout stream.

The trout fisheries in the Coldwater River, and its tributaries Duck and Tyler Creeks are currently managed through stocking. Although natural recruitment has been documented in some of these tributaries, it is not sufficient to maintain the fisheries. Future management of the coldwater streams in the watershed will focus on maintaining the existing fisheries through annual stockings of yearling trout. The trout fisheries in Duck Creek, Tyler Creek, and the Coldwater River would benefit from additional stream corridor and channel rehabilitation projects (Hanshue 2011).

The Coldwater River Watershed Council is a very active partner with Schrems, and fully supports our mission. More information about the CRWC can be found on their website: http://www.coldwaterriver.org/index.php.

"There is pleasure in the pathless woods; There is rapture on the lonely shore; There is society, where none intrudes, by the deep sea and music in its roar: I love not man the less, but Nature more."

- Lord Byron



SCHREMS WEST MICHIGAN TU COLDWATER INVENTORY

THORNAPPLE RIVER

JUNE, 2012

FIGURE NO. 26

Cain Creek

Background:
Cain Creek is located in the southeast corner of Kent County (Figure 27). The stream is a tributary to the Coldwater River that enters near 108th St, about one half mile west of Baker Road. Much of the stream is protected in perpetuity due to its location within a nature preserve.

Public Access:
No public access is available in Kent County.

2011/2012 Data Collection:
Water temperature monitoring (2011) indicated an average July water temperature of 59.5°F, which is designated as Cold. The minimum recorded temperature was 54.2°F and the maximum was 67.2°F.

Brook and brown trout are known to occur within Cain Creek, though no surveys were completed.

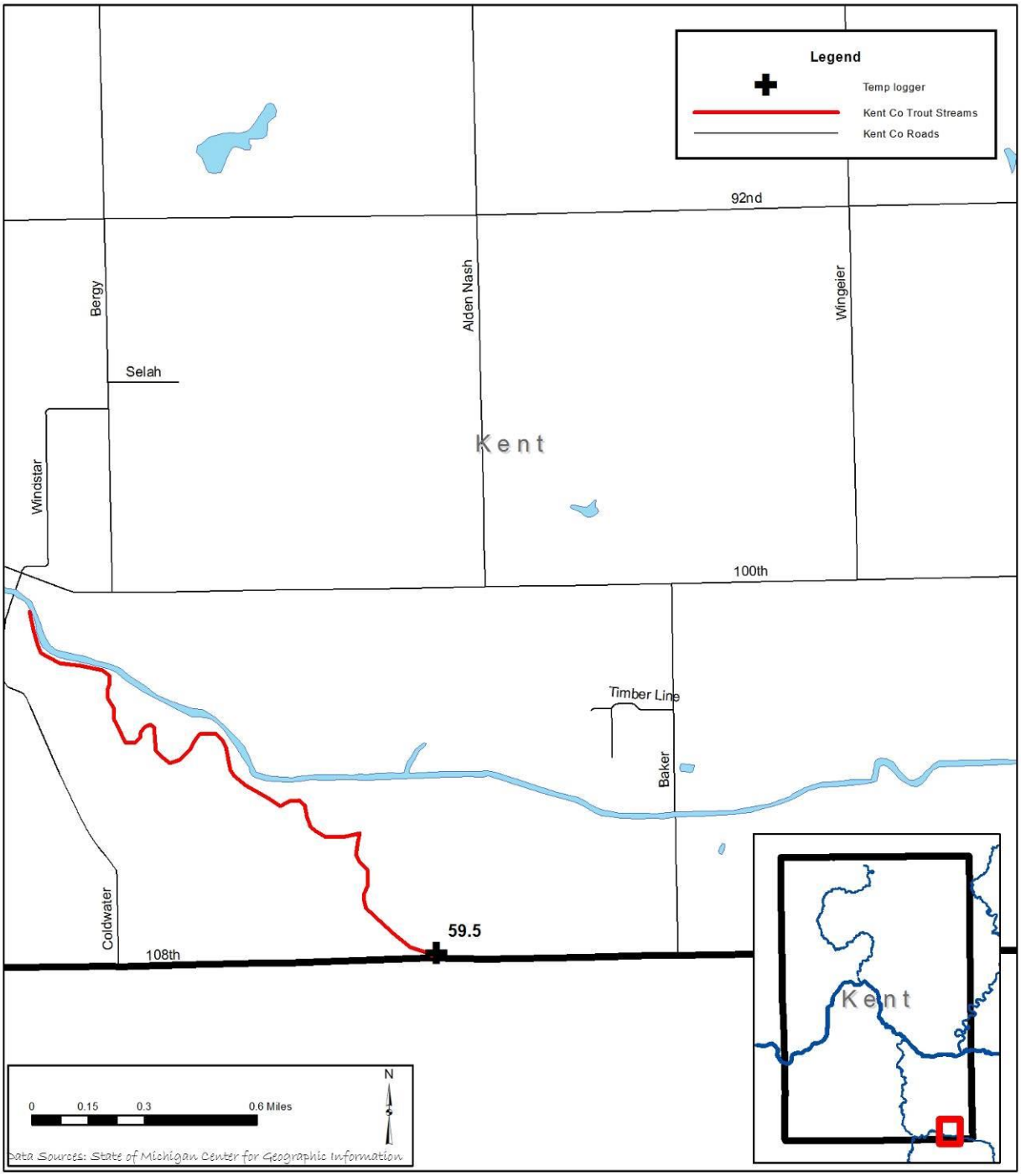
Published Studies:
None

Recommendations:
1. Support and encourage DNR/DEQ monitoring efforts

Cain Creek Data Resources:
None

"When you are on the river, ocean or in the woods, you are the closest to the truth you'll ever get"

- Jack Leonard



SCHREMS WEST MICHIGAN TU
COLDWATER INVENTORY

CAIN CREEK

JUNE, 2012

FIGURE NO. 27

Cascade Creek

Background:
Cascade Creek originates from Wood and Walden Lakes and enters the Thornapple River in Section 9 of Cascade Township (Figure 28). The stream flows through a large wetland complex before crossing Cascade Road, and then flowing through yards and church properties, where the riparian area is maintained nearly to the edge of the stream.

Public Access:
None

2011/2012 Data Collection:
Water temperature data was only collected in August. Average water temperature was found to be 62.7°F, with a range of 54.5 to 73.4°F. Based on this information, Cascade Creek would appear to be suitable for trout and other coldwater organisms.

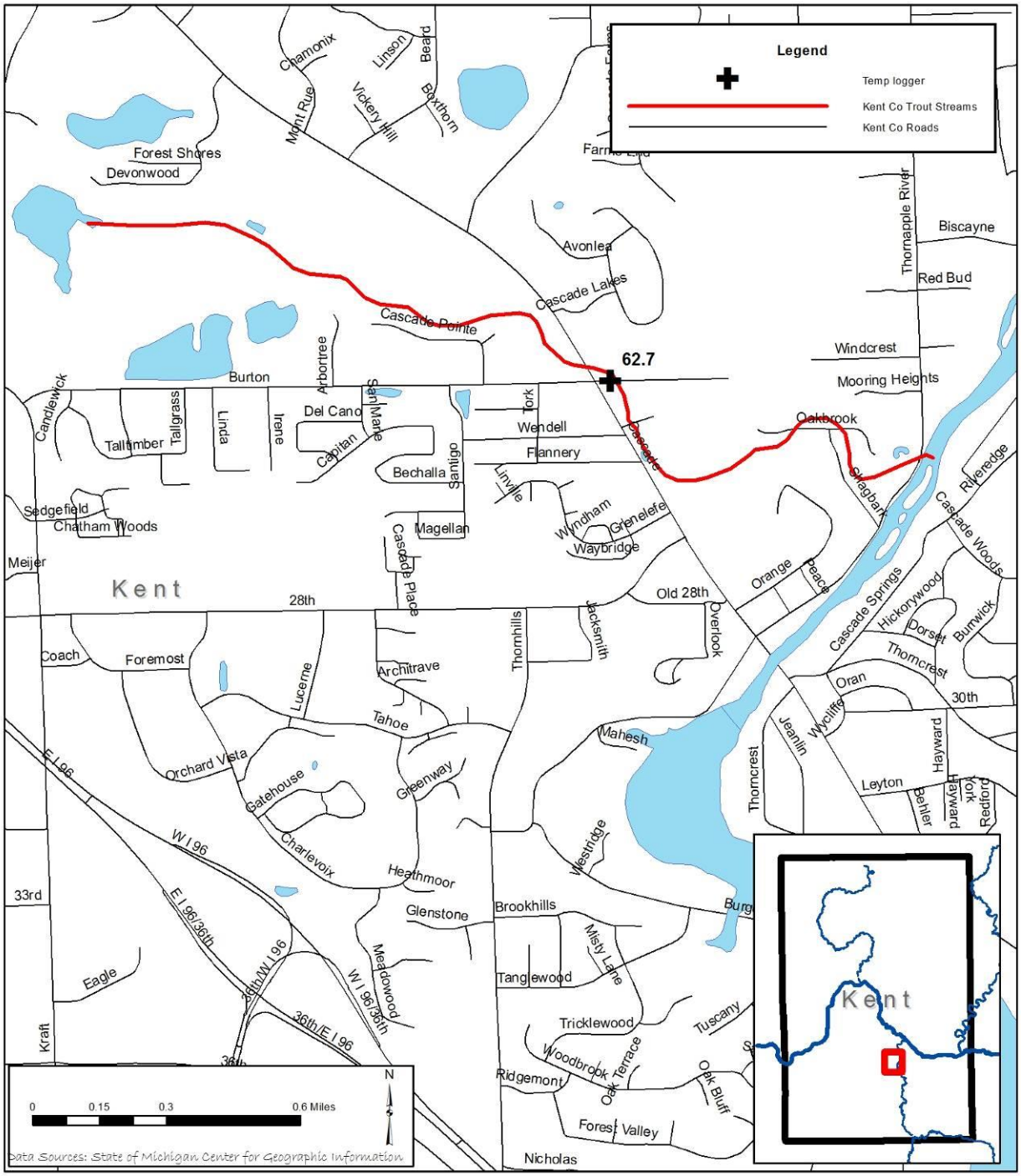
Published Studies:
In 1996, DNR conducted a fish survey and found small numbers of brook trout, along with bluegill, creek chub, pumpkinseed and mottled sculpin.

Recommendations:
1. Support and encourage DNR/DEQ monitoring efforts

Cascade Creek Data Resources:
- Michigan Department of Natural Resources, Fisheries Division Files. Contact: Scott Hanshue, Fisheries Biologist

"Eventually, all things merge into one, and a river runs through it. The river was cut by the world's great flood and runs over rocks from the basement of time. On some of the rocks are timeless raindrops. Under the rocks are the words, and some of the words are theirs. I am haunted by waters."

-Norman Maclean



SCHREMS WEST MICHIGAN TROUT UNLIMITED	SCHREMS WEST MICHIGAN TU COLDWATER INVENTORY CASCADE CREEK	JUNE, 2012 FIGURE NO. 28

Coldwater River

Background:
The Coldwater River is located southeast of the City of Grand Rapids in portions of Kent, Ionia and Barry Counties (Figure 29). The Coldwater is the largest tributary to the Thornapple River; they join in Section 35 of Caledonia Township. The Coldwater River begins as the outlet of Jordan Lake in Lake Odessa. From this point downstream to about Coldwater Road, the river is considered a designated county drain. The watershed covers approximately 120,737 acres and is dominated by agriculture (70.6%), forest (17.8%) and wetland (9%).

Trout management in the Coldwater River dates back to the initial stocking of brook trout in 1884, and since the mid-1970s, the river has been stocked with various strains of rainbow and brown trout. Management has also included chemical reclamation and several successful habitat improvement projects (Hanshue and Harrington, 2011).

Led by the Coldwater River Watershed Council, conservation partners have spent nearly a million dollars on protection and improvement of the Coldwater and its tributaries. Projects have included instream habitat improvements, bank stabilization, wetland restoration, stream buffer creation and protection, landowner education and dam removal, among others.

In 2010, Schrems obtained a grant from the National Fish and Wildlife Foundation to improve instream habitat at the Dolan Property. The award was used to install 45 woody habitat structures and had an immediate positive impact on the trout population. Prior to construction, trout population surveys resulted in an estimated 290 trout per mile. Over the five year post-construction monitoring period, the trout population varied between about 900 and 2,000 trout per mile. To this day, the work remains intact and has not resulted in any negative consequences.

In 2014, the Freeport Dam was removed using funds from the USFWS, National Fish Passage Program and Partners for Fish and Wildlife Program. Removal of this only barrier on the river now allows for free migration of all fish species from the Thornapple River upstream to the Jordan Lake Dam. As part of this project, eight woody habitat structures were also installed upstream of the former dam site, to improve instream habitat.

Later in 2014, the Little Thornapple River Intercounty Drain Drainage Board authorized work along the Little Thornapple River Intercounty Drain (aka Coldwater River) to alleviate flooding issues associated with dead trees and debris. Work began in late 2014 and continued through winter and into April 2015, when the DEQ issued a Violation Notice, under the Natural Resources and Environmental Protection Act ("NREPA"), 1994 PA 451, as amended. The alleged violations included illegal dredging of the stream channel and excavation and filling of wetlands. Due to the large-scale of tree removal and clearing of the adjacent lands, the conservation community dubbed the project "Disaster on the Coldwater". Just recently, in December of 2018, the DEQ and the Drainage Board reached an agreement as to how the alleged violations will be addressed. Nearly two miles of instream habitat restoration, about three acres of wetland will be restored or created and about 1,500 trees will be planted along the river banks.

Public Access:
Public Access to the Coldwater can be found at Coldwater River Park and the Michigan Nature Association's Dolan Property. Because the Coldwater is stocked with trout by the state, and is considered to be a navigable stream, fishing is allowed if access can be made from public lands.

Published Studies:
Thirty species of fish, most of them native, have recently been collected by DNR from the Coldwater River, including: American brook lamprey, blacknose dace, bluntnose minnow, bowfin, brook stickleback, brown trout, blackside darter, chestnut lamprey, creek chub, common shiner, central stoneroller, golden redhorse, greater redhorse, largemouth bass, logperch, mimic shiner, northern pike, rainbow trout, rock bass, rosyface shiner, sand shiner, shorthead redhorse, smallmouth bass, white sucker, green sunfish, johnny darter, mottled sculpin, central mudminnow, rainbow darter, and warmouth. Brook

trout have also been reported to occur in the Coldwater (personal communication).

In 2002, an angler survey conducted during the trout season estimated 2,144 angler trips were made on the river, with a catch of 9,025 brown trout (Hanshue and Harrington, 2011).

In 2009, DNR conducted fish surveys at two locations. At both sites, very high numbers of brown trout and small numbers of rainbow trout were collected.

Post-improvement fish population surveys were completed at the Dolan Property for five years following the 2010 project. Results showed an improvement in the trout population, from about 290 fish per mile before improvements, to as many as 2,000 fish per mile after improvements. Interestingly, a large number smaller, stocked and naturally reproduced fish were found within the project area, suggesting that the project offers high-quality rearing habitat.

Known Threats or Impairments:
The Coldwater River WMP, which was updated and approved to meet EPA's nine elements in 2009, lists the designated uses of partial and full-body contact recreation, coldwater fishery, and other indigenous aquatic life and wildlife as being impaired or threatened by *Escherichia coli* (E. coli) contamination, low DO levels, and anthropogenic and flow regime alterations. The WMP identified excessive phosphorus and sediment, and low dissolved oxygen as known or suspected of impacting the coldwater fishery. Schrems has recently received a grant to update this WMP.

In summer of 2018, a significant manure spill occurred on the Coldwater, when a valve was left open on an irrigation line adjacent the river. This pipe was carrying liquid manure from a nearby CAFO, across the river, and onto cropland. Intense monitoring was completed by volunteers, DEQ and DNR, and no fish kills were reported. However, this event was a reminder of the necessity of agricultural best management practices along this river.

Potential Partners: Coldwater River Watershed Council, Lansing "Perrin" Chapter of TU, Oakbrook-Illinois Chapter of TU, Tyler Creek Golf Course and Campground, Kent County Drain Commissioner, Kent and Barry Conservation Districts

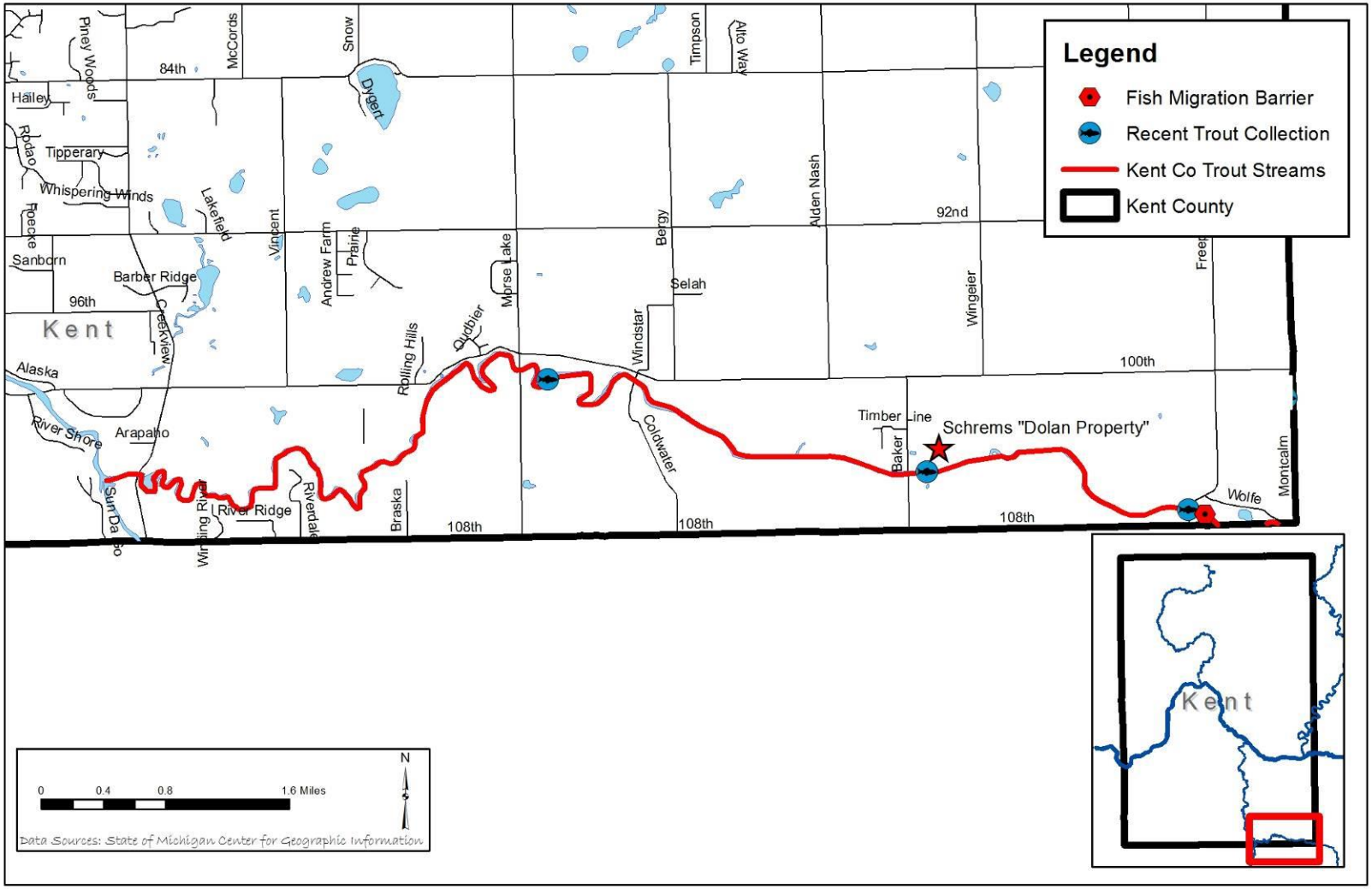
Recommendations:

1. Complete thermal classification of the entire mainstem and tributaries
2. Instream habitat improvement and bank stabilization projects
3. Wetland improvement or restoration projects

4. Support the Coldwater River Watershed Council on efforts for protection and improvement
5. Support restoration efforts in areas where excess clearing has damaged the banks

Coldwater River Data Resources:

- Coldwater River Watershed Management Plan (2009)
- Havemen, M. and J. Tompkins. 2004. Summary of Lower Coldwater River Watershed Assessment, Barry and Kent, Michigan. Michigan Department of Environmental Quality. Unpublished.
- Michigan Department of Natural Resources, Fisheries Division Files. Contact: Scott Hanshue, Fisheries Biologist
- Streamside Ecological Services, Inc. (SES). 2010. Habitat Improvement and Monitoring Project: Dolan Property; Coldwater River.



SCHREMS WEST MICHIGAN TROUT UNLIMITED	SCHREMS WEST MICHIGAN TU COLDWATER INVENTORY COLDWATER RIVER	JUNE, 2012 FIGURE NO. 29

Duck Creek

Background:
Duck Creek is one of the major tributaries to the Coldwater River, in the larger Thornapple River Watershed (Figure 30). Duck Creek is a designated county drain (only in Ionia County) and has a watershed that contains about 28 square miles of primarily agricultural land. It has been modified for drainage (dredged straight) from Lake Odessa Road downstream to Darby Road. The stream is also a designated coldwater stream (MDNR 2007) and is valued for its coldwater fishery in the downstream reaches. Unfortunately, Duck Creek is not supporting its designated uses, is impaired by altered morphology and hydrology, and has a threatened coldwater fishery and excessive *E. coli* contamination.

Public Access:
None

2011/2012 Data Collection:
Water temperature monitoring indicated an average July water temperature of 69.5°F, which is designated as Cool. Minimum and maximum water temperatures were 63.5 and 77.7°F, respectively. However, the 77.7°F reading is likely an anomaly related to the extreme heat and precipitation events of late July; in many years of measurement, Jim Bedford has never recorded a temperature higher than 69°F at M-50. The coldest portion of Duck Creek is said to be just above M-50, with a slow warming of the stream as it flows to the confluence with the Coldwater River (Jim Bedford, personal communication).

Fish sampling was conducted at the Montcalm and Hastings Road crossings. At Montcalm, ten brown trout were collected. A dozen brown trout, with many in the 10-14 inch range, were found at Hastings Rd.

No fish migration barriers were identified in Kent County.

A cow manure spill occurred in April, 2012 near Montcalm Rd, as a result of a breached dike at a manure lagoon. Investigation of the spill by DNR and DEQ found little to no impact to the aquatic community.

Published Studies:
A 1992 assessment of the Coldwater River Watershed included one sampling station on Duck Creek, at Montcalm Road, on the Ionia/Kent County line (Wuycheck and Synnestvedt, 1998). Results indicated that the stream was barely meeting its coldwater designation based on the fish community; only one brown trout was collected, along with nine other species. The macroinvertebrate community was found to be acceptable (3). Unlimited cattle access was observed at Campbell Rd, resulting in severe erosion and flattened banks.

In 1997, DEQ assessed Duck Creek to determine impacts from a manure spill and adjacent agricultural operation. The macroinvertebrate community was found to be excellent at Montcalm Rd (Heaton, 2000). The community was diverse and included mayflies, stoneflies and caddisflies, indicating high water quality. The physical habitat was determined to be good, with gravel and cobble substrate, submerged logs and woody debris. Near the spill, at Freeport Road, the macroinvertebrate community was rated as poor, and indicative of low water quality. The station was downstream of a ditch that transported milkhouse waste and manure from milking parlors, silage bunkers, manure pits and fields that had received an over-application of manure.

In 2008, as part of a biological survey of the Thornapple River Watershed, DEQ found the macroinvertebrate community to be acceptable (-3) and habitat to be marginal (moderately impaired) at Jackson Road, in Ionia County (Rippke 2009). This was the only site sampled on Duck Creek.

Recommendations:

1. Conduct a detailed water temperature study to classify the entire stream
2. Water chemistry and macroinvertebrate sampling to help identify level of water quality and possible impairments to coldwater fishery
3. Instream habitat improvement
4. Work with landowners to improve riparian area and instream habitat
5. Work with farmers to reduce nutrient and bacterial inputs, as well as potential for a catastrophic spill

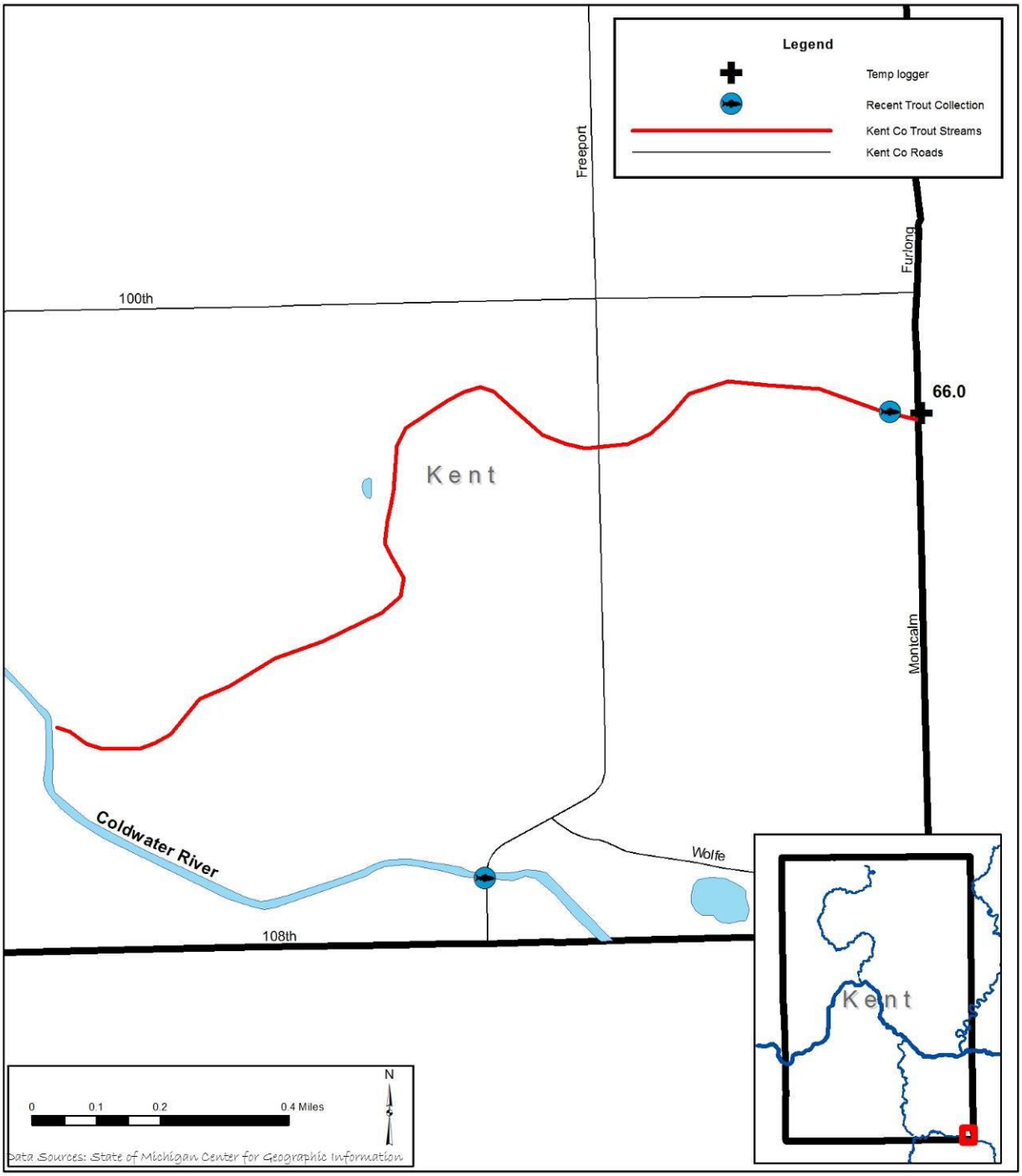
Duck Creek Data Resources:

- Coldwater River Watershed Management Plan. 2009.
- Havemen, M. and J. Tompkins. 2004. Summary of Duck Creek Watershed Assessment. Michigan Department of Environmental Quality. Unpublished.

- Heaton, S. 2000. A biological survey of Duck Creek and the Coldwater River, Kent County, June 17, 1997. Michigan Department of Environmental Quality, Surface Water Quality Division Staff Report No. MI/DEQ/SWQ-00/051.
- Michigan Department of Natural Resources, Fisheries Division Files. Contact: Scott Hanshue, Fisheries Biologist
- Rippke, M. 2009. A Biological Survey of the Thornapple River Watershed, Kent, Barry, Eaton, and Ionia Counties, Michigan. August-September 2008. Michigan Department of Environmental Quality, Water Bureau Staff Report No. MI/DEQ/WB-09/061.
- Wuycheck, J. and S. Synnestvedt. 1998. A Biological Assessment of Streams in the Coldwater River Watershed, Barry, Kent and Ionia Counties, Michigan, June 23, 1992 and July 2, 1992. Michigan Department of Environmental Quality, Surface Water Quality Division Staff Report No. MI/DEQ/SWQ-97/085.

"Never leave fish to find fish"

-Moses, 1200BC



SCHREMS WEST MICHIGAN Environmentally Involved Since 1962 TROUT UNLIMITED	SCHREMS WEST MICHIGAN TU COLDWATER INVENTORY DUCK CREEK	JUNE, 2012 FIGURE NO. 30

Tyler Creek

Background:
Tyler Creek is a tributary to the Coldwater River located in southeast Kent County (Figure 31). The Tyler Creek subwatershed covers 30,380 acres (Bear (18,943 acres) and Pratt Lake Creek (11,427 acres)) dominated by agriculture (70.6%), forest (17.8%) and wetland (9%). Tyler enters the Coldwater River in the Dolan Property, which is owned by Schrems, in Section 35 of Bowne Township. Tyler Creek and its tributaries are designated county drains.

Trout are known to occur from the mouth of Tyler Creek upstream to the second Wingeier Rd crossing on the Pratt Lake Drain (West branch) and Hastings Rd on the Bear Creek (East branch) (Jim Bedford, personal communication, 2011). George Krebs, now deceased, reported catching large brown trout on his property on Pratt Lake Drain beneath the second Wingeier crossing, throughout the 50 years he lived there (George Krebs, personal communication, 2000).

Public Access:
Access can be found at the Schrems TU Dolan Property and, with prior permission, the Tyler Creek Golf Course and Campground.

2011/2012 Data Collection:
Results of the fish migration barrier inventory indicate that all of the major public road crossings provide adequate passage for fish and other aquatic organisms.

The headwaters of Tyler Creek, on both the Pratt Lake Drain and Bear Creek, are heavily modified for agriculture. These stream channels essentially consist of open ditch bordered by agricultural fields. Riparian buffer is severely limited. The dominant substrate in Pratt Lake Drain, upstream of Wingeier Ave is sand, silt and fine organic debris. For the most part, the Bear Creek portion has a coarser substrate along its length.

In 2011 and 2012, the drain commissioners of both Kent and Ionia Counties have been active within the watershed. In Kent County, many of the tributaries and portions of the main stream have been improved for drainage, through a combination of vegetation removal and channel excavation. The KCDC has been receptive to conservation-oriented ideas and is careful, when possible, to leave vegetation on the south and/or west banks of the stream. In Ionia County, large sections of the stream have been dredged and nearly all trees removed from the top of the bank.

As part of an EPA Section 319 grant funded project, Schrems and other TU Chapters are assisting Timberland RC&D with an E. coli reduction project. This project will result in restoration of wetland, planting of nearly two miles of stream buffer with large trees, E. coli monitoring, and biological and temperature monitoring, among other tasks. Biological monitoring will include fish and macroinvertebrate studies at three sites, and water temperature monitoring at six sites. This information will be useful for directing future activities in the watershed.

Published Studies:

Pratt Lake Creek, a tributary to Tyler Creek, flows from Pratt Lake in a southerly direction for approximately seven miles before entering Tyler Creek. In 1995, DEQ conducted a study of the fish, macroinvertebrates and habitat at two sites in Pratt Lake Creek (Walterhouse 1997). At the upstream site, at Wingeier Road, no trout were collected and the majority of fish in the sample are considered tolerant of degraded conditions, even using warmwater standards. The macroinvertebrate score was at the low range of acceptable at this station. These ratings indicate moderate impairment of either water quality or habitat.

Approximately one mile downstream, at 84th Street, the fish community was meeting its coldwater designation based upon the percentage of trout (3%) in the sample. The capture of one large brown trout suggests the capacity for the stream to support long-term survival of trout. Numerically, the composition shifted from a dominance of blacknose dace at Wingeier to mottled sculpin and white suckers at 84th St. The macroinvertebrate score also improved at this downstream site, but was still negative and suggested at least moderate impairment of water quality or habitat.

Habitat at both sites was determined to be extremely impaired due to excessive deposition of fine sediment, past dredging of the channel and lack of cover. It was noted, however, that the stream appears to be recovering from past damage.

Fish species collected during a 2009 DNR survey included: black bullhead, bluegill, blacknose dace, brown trout, bowfin, creek chub, common shiner, white sucker, golden shiner, green sunfish, johnny darter, largemouth bass, mottled sculpin, central mudminnow and pumpkinseed. However, Tyler Creek is valued

for its coldwater fishery, and brown trout made up 27% of the sample. Rainbow and brook trout are also known to occur in Tyler Creek, in limited numbers.

Since the spring of 2009, Schrems has been monitoring temperature within the Tyler Creek watershed. Three temperature loggers were installed in May 2009 to record water temperatures in Pratt Lake Drain and Bear Creek, each near their confluence on the Tyler Creek Golf Course property. A third logger was installed on Tyler Creek just upstream of its mouth with the Coldwater River along the Dolan Nature Center. Pratt Lake Drain and Bear Creek were monitored until the fall of 2009, when the temperature loggers were removed. Pratt Lake Drain was slightly colder on average than Bear Creek, but was subject to wider swings in temperature than Bear Creek. The Tyler Creek logger was maintained in service until the fall of 2010, at which time it was removed.

Known Threats or Impairments:
The Coldwater River WMP, which was updated and approved to meet EPA's nine elements in 2009, lists the designated uses of partial and full-body contact recreation, coldwater fishery, and other indigenous aquatic life and wildlife as being impaired or threatened by *Escherichia coli* (E. coli) contamination, low DO levels, and anthropogenic and flow regime alterations. The WMP identified excessive phosphorus and sediment, and low dissolved oxygen as known or suspected of impacting the coldwater fishery.

A 2005 E. coli TMDL established by MDEQ covers 7.6 miles of Tyler Creek. The 2008 Integrated Report identified a longer reach, 11.5 miles of Tyler/Bear Creek as being impaired by E. coli, and the most recent 2010 Integrated Report lists 16 miles.

Conservation:
From 2005 – 2018, several successful habitat and conservation projects have been completed in Tyler Creek. In addition to the EPA 319 project mentioned above, several instream habitat projects have replaced woody debris in Tyler and Pratt Drain, using grant dollars from the United States Fish and Wildlife Service, and the National Fish and Wildlife Foundation. Monitoring at these sites has revealed positive changes not only to the streambed and channel, but to fish populations.

Pollution in Tyler Creek gained much attention in 2006, when a large fish kill made local headlines. An MSU laboratory found fecal matter in the gills of dead fish and later identified bovine feces as the primary source of E. coli bacteria.

Recommendations:

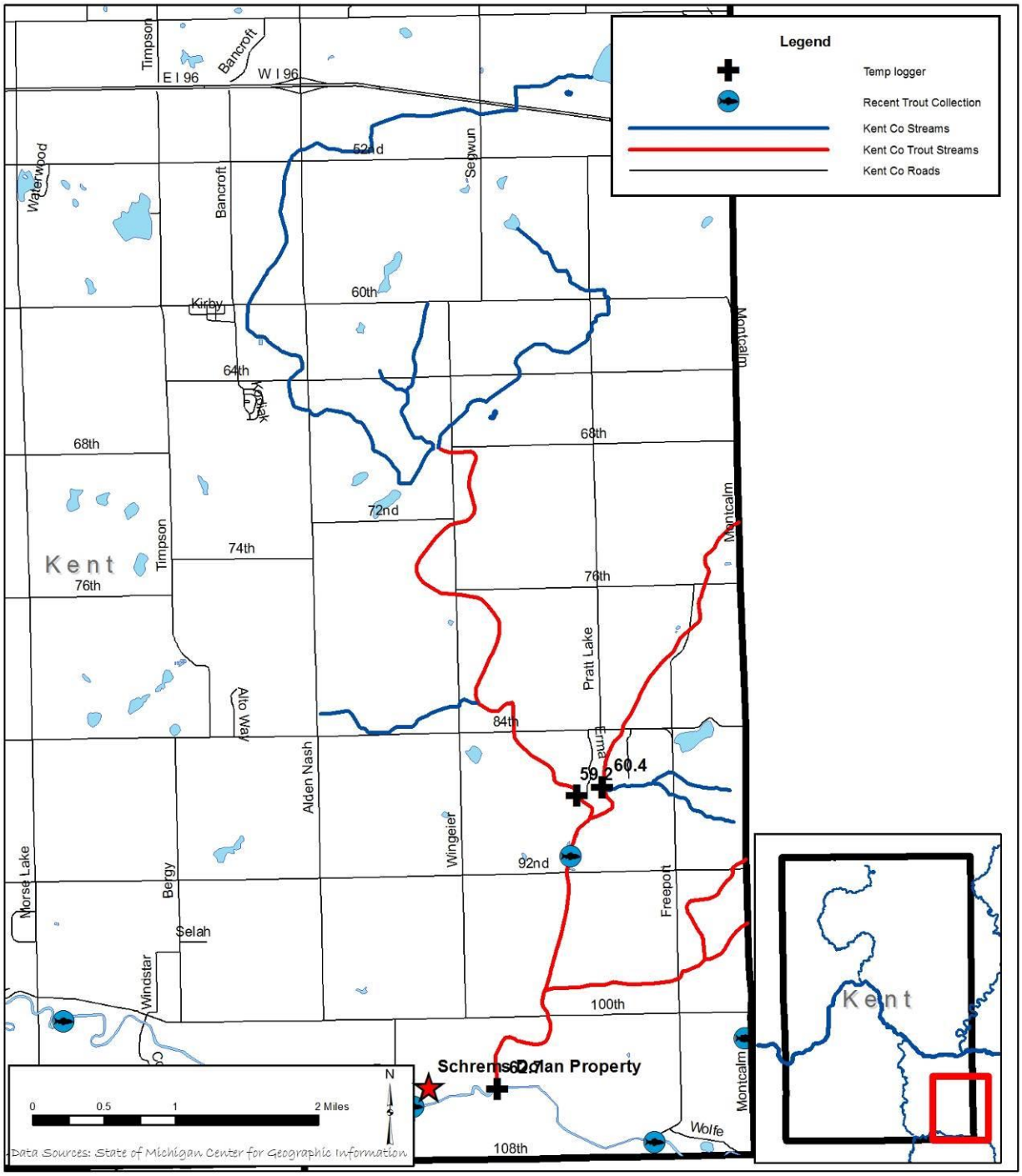
1. Detailed assessment of water temperature and complete thermal classification of Tyler Creek and its tributaries
2. Instream habitat improvement and bank stabilization
3. Restore/create wetlands
4. Work with landowners and county drain commissioners to improve stream buffer and adjacent land use
5. Support Timberland RC&D with the Tyler Creek E. Coli Reduction Project
6. Support the Coldwater River Watershed Council

Tyler Creek Data Resources:

- Coldwater River Watershed Management Plan. 2009.
- Havemen, M. and J. Tompkins. 2004. Summary of Tyler Creek Watershed Assessment. Kent and Ionia, Michigan. Michigan Department of Environmental Quality. Unpublished.
- Michigan Department of Natural Resources, Fisheries Division Files. Contact: Scott Hanshue, Fisheries Biologist
- Rose and Shibata, 2006

"Only when the last tree has been felled, the last river poisoned and the last fish caught, man will know, that he cannot eat money."

-Cree Indian saying



SCHREMS WEST MICHIGAN TU COLDWATER INVENTORY

TYLER CREEK

JUNE, 2012

FIGURE NO. 31

SUMMARY AND DISCUSSION

A vast amount of information has been compiled and summarized in this report. An attempt was made to present the information in a format that is not overwhelming and can lead to protection and measureable improvement of our coldwater resources.

Many of the small tributary streams to our larger rivers such as the Grand and Rogue flow through private land and are not necessarily fishable, but serve critical roles as nursery streams by providing a spawning and rearing habitat, and provide seasonal refuge for temperature sensitive fish. Streams such as Shaw, Stegman and Rum Creeks flow icy cold and are lifelines to the thermally-threatened mainstem of the Rogue River. Protection of these streams and their habitats for supporting early-life stages of coldwater fish are crucial.

Medium-sized streams, especially those that are blocked from migratory salmon and steelhead, support sustainable brown trout populations with various age-classes of trout. Bear, Cedar, Tyler and Duke Creeks are prime examples and all offer some degree of public access. Instream improvement and barrier removal projects would benefit the coldwater ecosystems.

A surprising number of Kent County streams harbor self-sustaining brook trout populations. While most of the populations are small and dominated by brown trout, a few places were found to exist where brook trout are the dominant species and the fish thrive in small, often overgrown and unfishable streams. Nearly all of these brook trout streams are blocked from anadromous fish. These small streams are true treasures and are very susceptible to impacts.

Urban streams such as Buck, Indian Mill and Mill Creeks and the lower Rogue River represent the last of our urban coldwater fisheries in Kent County. These streams offer unique recreational and educational opportunities to a large population. Based upon the data collected for this report, Indian Mill and Mill Creeks appear to serve as important nursery habitats for migratory trout and salmon. Buck Creek is unique to these three streams in that it contains trout populations near areas of significant public access.

Urban streams such as Buck, Indian Mill and Mill Creeks and the lower Rogue River represent the last of our urban coldwater fisheries in Kent County.

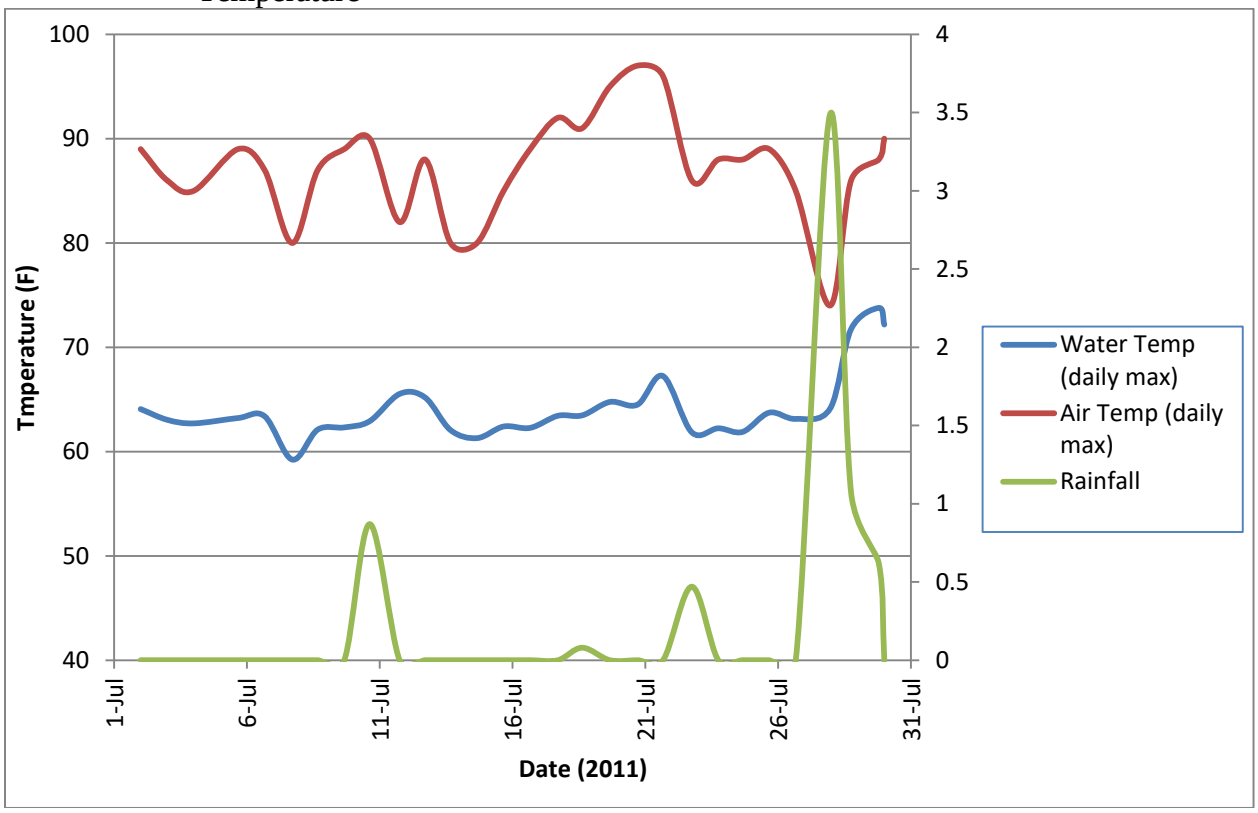
2011 July Weather and Impact on Water Temperature

The unusual weather experienced in 2011 needs to be discussed as part of this report, since, as mentioned earlier, water temperature is the most critical factor affecting trout distribution. According to Bill Steffen, local meteorologist for WOOD TV 8, 2011 was the warmest July since at least 1955, with 81% sunshine. It was the 5th warmest July and the 7th wettest, with the bulk of

the 6.87" of rain at the Gerald R. Ford International Airport coming from July 27-29, when the heaviest rain fell in the Grand River basin (personal communication, Bill Steffen 2011). The warm weather and, to a greater extent, the heavy rainfall, had obvious impacts on the water temperature of our coldwater streams. Figure 32 illustrates how heavy rain on warm ground overwhelmed the groundwater fed Cain Creek at the end of July.

Importantly, if the data from the last four days in July is discarded, the average water temperature decreases by one full degree. In this regard, designating streams according to their average July water temperature could be biased toward the warmer category in 2011 (e.g. a stream that would be considered Cold in most years could be Cold-transitional in 2011).

Figure 32. Effects of July Air Temperature and Precipitation on Cain Creek Water Temperature



Coldwater Threats and Impairments

As discussed previously in this report, urbanization and agriculture, among other land uses, can have a dramatic effect on the aquatic environment. Water quality impairments affect the aquatic organisms and terrestrial life that depends on cool, clean water, as well as our ability to enjoy the aesthetics of a natural stream, recreational activities such as fishing and swimming, and, in some cases, the water sources we need for drinking and household use. In Washington, the majority of the region's native fish and wildlife, including 85% of terrestrial wildlife species, are known to depend on riparian habitats for all or critical portions of their life histories. This rich biodiversity

of both plants and animals is the basis for much of that state's cultural heritage, economy, and quality of life (Cramer 2012). In this regard, Michigan is very much similar.

While at least portions of many of the coldwater streams in Kent County are in relatively good shape, and there remain to be a few very high quality waterways, the majority of our streams have been impacted to some extent. Through this project, we have found that it is nearly impossible to remove oneself from the realm of human refuse in the streams. Similarly, it is difficult to find a stream that has not had at least a portion of its length "improved" for drainage or agricultural development; straight, wide, shallow channels with no streamside vegetation and little attraction to our more sensitive, more desirable fauna.

Under Section 303(d) of the 1972 Clean Water Act, states are required to develop lists of impaired waters. These impaired waters do not meet water quality standards that states have set for them. The law requires that these jurisdictions establish priority rankings for waters on the lists and develop total maximum daily loads (TMDLs) for these waters. The streams highlighted in red in Table 5 appear on Michigan's list of impaired waters.

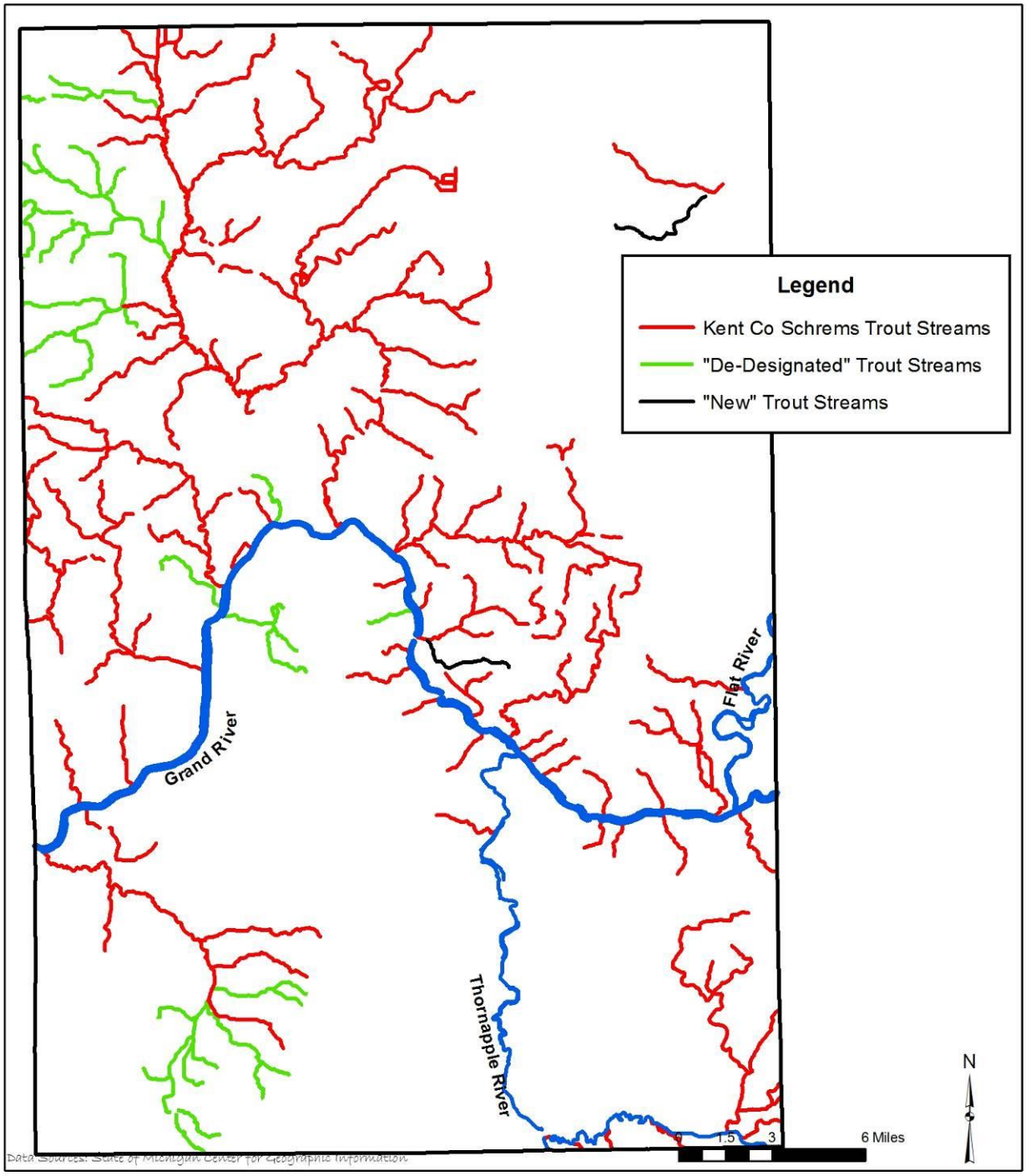
Table 5. Impaired Coldwater Streams in Kent County, MI (Impaired in red).

Flat River Tributaries
Butternut Creek
Coopers Creek
Page Creek
Grand River Tributaries
Bear Creek
Buck Creek
Cherry Creek
Egypt Creek
Honey Creek
Indian Mill Creek
Mill Creek
Portfleet Creek
Spring Brook
Stiles Creek
Trout Creek

Rogue River and Tributaries
Ball Creek
Barkley Creek
Blakeslee Creek
Cedar Creek
Duke Creek
Rum Creek
Shaw Creek
Spring Creek
Stegman Creek
Thornapple River Tributaries
Cain Creek
Cascade Creek
Coldwater River
Duck Creek
Tyler Creek

"De-Designated" Coldwater Streams

Unfortunately, since the last coldwater designations in 2007 (which are set to expire in 2012; see page 6 of this report), it appears that many miles of Kent County streams no longer meet the criteria for supporting this designation. Specifically, water temperatures and/or the aquatic communities supported in these streams are indicative of warmer classifications. Figure 33 illustrates the apparent loss of over 70 miles of stream that had previously been designated to be coldwater by the DNR. While portions of these streams may continue to support coldwater



SCHREMS WEST MICHIGAN Environmentally Involved Since 1962 TROUT UNLIMITED	SCHREMS WEST MICHIGAN TU COLDWATER INVENTORY	JUNE, 2012
	SCHREMS "DE-DESIGNATED" TROUT STREAMS	FIGURE NO. 33

species on a seasonal basis, classifications based upon average July water temperatures and fish survey indicate that they no longer support a coldwater designation.

Ball Creek

As previously mentioned in this report, the upper reaches of Ball Creek were described as being inappropriately classified as coldwater, based on site-specific assessments and other available information, as many as ten years ago (Wuycheck, 2001a). The fish communities were rated as poor at all five sites sampled during the 1993 survey work. None of the sites met their coldwater designation based upon P51, and only one brown trout was captured, at Sparta Ave. Intermittent flow conditions indicated that the three stations upstream of Peach Ridge Ave were noted to be the primary cause of habitat decline. Temperature monitoring and electrofishing conducted as part of the current study support these findings. Water temperatures were too warm to support long-term survival of coldwater communities, and trout were only found at the downstream-most crossing (Sparta Ave). It appears that the upper 19.5 miles, or about 85% of the total stream length, have become warmwater, most likely due to stresses related to land use. 2018 data revealed high temps.

Buck Creek

The Grand River Assessment indicates that it is possible that the stream quality has declined to a point where Buck Creek can no longer sustain a brown trout fishery, and that further evaluation of this management strategy should be conducted. However, personal communication with angler Jim Bedford indicates that portions of the stream continue to support a healthy population of large brown trout.

Water temperature monitoring conducted during this study indicates that Buck Creek is threatened by warm temperatures; the average July water temperature in 2011 was 68.8°F, with a maximum of 76.7°F. At least 29 miles of Buck Creek were found to be far too warm to support coldwater communities. As recommended in the 2011 version of this report, a complete thermal classification of Buck Creek was completed to identify coldwater areas. Regardless, restoring Buck Creek to the degree necessary to support self-sustaining trout populations will be extremely difficult and expensive, if not impossible. The stream, however, will likely continue to experience runs of anadromous fish and support small populations of trout and other coldwater fish.

Lamberton Creek

Lamberton Creek is a direct tributary to the Grand River, located on the northeast side of the City of Grand Rapids. The stream enters on the east bank of the Grant River just south of I-96. Total stream length, including tributaries, is about 7.5 miles. Point in time water temperature measurements from 2011 indicate that the stream is far too warm to support trout or other coldwater species. Inspection of Lamberton Creek revealed that it is highly impacted by a variety of human activities. Trash and debris are widespread, the bottom is covered by sand and fine sediment, and the stream appears to be very flashy. At Aberdeen Road, the bottom is silty and covered with algae. Floating mats of algae were observed in the spring of 2012. This is one of the worst appearing ‘coldwater’ streams observed during this study. Fish surveys conducted in 2012 resulted in collection of relatively few fish, all representative of highly degraded conditions.

Everyone reading this report should visit Lamberton Creek to observe how indifference has turned a once coldwater stream into, basically, an open sewer.

Nash Creek
Nash Creek is a designated county drain and appears as a straight ditch with little to no flow along most of its length. The stream was assessed by DEQ in 2008 and the macroinvertebrate score was found to be at the low end of acceptable, approaching poor. The 2011 July water temperature data indicate that the stream is Cool, with a temperature similar to many nearby streams that support trout. However, despite intensive effort, electrofishing surveys conducted for the current study did not result in the collection of any trout or other dominantly coldwater species. Most fish captured were representative of degraded stream conditions. The warming and physical degradation of this stream represents a loss of about 19 miles of coldwater-designated habitat.

Scott Creek
Scott Creek enters the north bank of the Grand River, just west of Mill Creek. The stream is a short (two mile long) direct tributary. Though listed as a designated trout stream, a 1999 DNR fish survey did not find any trout in the fish community. Species documented included blacknose dace, creek chub and green sunfish, which are all tolerant of degraded stream conditions. However, adult steelhead were observed spawning in this stream in 2012 (personal communication, George Zuiderveen).

Sunny Creek
Sunny Creek is a direct tributary that enters the Grand River near Grand River Drive, about one mile north of Knapp Street. The stream is approximately 1.5 miles long and begins in Ball Lake. In 1996, DNR conducted a fish survey in response to a request for stream relocation. Two brook trout were found along with several species of more tolerant fish. Steelhead were known to run this stream approximately ten years ago, but have vanished in the last few years (personal communication, Wendy Stock). Fish survey conducted as part of the present study did not result in the collection of any trout or other coldwater fish. However, the fish community is diverse and indicative of relatively high water quality. Water temperature during May 2012 electrofishing surveys exceeded 70°F at all road crossings.

Walter Creek
Walter Creek is a designated county drain located in the northwest corner of Kent County. In 2011, the average July water temperature was 67.7°F at 20 Mile Rd, with a minimum of 58.9°F and maximum of 79.3°F. Based on this information, Walter Creek is classified as a Cool stream. In a 2009 report, DEQ indicated that Walter Creek was dredged and stream

habitat was marginal at Sparta Road (Walterhouse, 2009). A significant length of Walter Creek was examined as part of the current study, and overall, the habitat is greatly impacted by sediment. The stream is uniformly shallow, with few deep holes. One higher quality stretch was observed parallel 20 Mile Rd; this stretch is steeper and contains substrate of gravel and cobble. Electrofishing was conducted at three sites, covering a significant length of stream over a variety of habitats. Only one trout was found, near the mouth of Walter Creek and the confluence with the Rogue River. Still, Walter Creek does not support its current designation as a coldwater fishery, representing a loss of about 6.6 miles of coldwater stream.

York Creek

Historic fisheries data indicates that York Creek was once a relatively high quality brook trout stream, of about 3.7 miles in length. In 1969, brook trout made up 22% of the fish community, which also included rainbow and brown trout. However, by 1991, no trout were found during fish surveys and it was determined by the DNR that the stream was no longer supporting its coldwater designation. It was stated that "Upland and stream channel erosion, sedimentation and extreme hydrologic fluctuations, due to excessive runoff, have degraded essential trout habitat and contributed to the loss of a, once, self-sustaining population" (Wuycheck 1993). Flow stabilization and physical habitat rehabilitation would be required to restore the coldwater fishery. But, changing land use and the high degree of development have led to severe impairments that will be extremely difficult to overcome. DNR Fisheries Biologist Scott Hanshue supported these conclusions in 2011 (personal communication, Scott Hanshue).

MOVING FORWARD

Many general recommendations exist for improvement of all of our aquatic resources, both warm and coldwater. There is no greater impact to our streams than increased magnitude, duration or frequency of flooding and the associated sediment and pollution. While development of infrastructure and similar progress is necessary and ingrained in our society, unmitigated impacts are often irreversible.

Activities such as wetland restoration, creation or protection have never been more important for addressing impacts such as thermal pollution, altered hydrology and impaired water quality.

During the length of time it took to complete this project, an astonishing number of wetlands have been filled, trees been removed and acres have been effectively drained with field tiles for agricultural production; this fact is obvious when driving our rural areas. With increased commodity prices and the associated excitement to clear more land, our streams and water quality have come under assault. Activities such as wetland restoration, creation or protection have never

been more important for addressing impacts such as thermal pollution, altered hydrology and impaired water quality. Many conservation-minded programs exist to allow farmers and anglers to coexist, and developing personal relationships with the producers of our food is key component to long-term, sustainable fisheries.

Similarly, under the Michigan Drain Code (see page 11 of this report), county drain commissioners have enormous power to impact our streams. Developing relationships and educating these officials on the importance of protecting our resources is critical. The recently completed habitat projects on the Coldwater River and Tyler Creek are great examples of successful coldwater improvement in designated county drains – two uses of a resource that have traditionally been conflicting.

As reinforced in the Grand River Assessment, urban development negatively impacts trout populations through increased delivery of storm water runoff and increased sediment loadings. Habitat protection through the implementation of stormwater best management practices and protection of the riparian corridors is critical. Watersheds such as Buck, Indian Mill and Mill Creeks and the lower Rogue River continue to support coldwater fisheries. However, especially in Buck Creek, the pressures of development are pushing the 'naturalness' to extinction. Everyone reading this report should visit Lamberton Creek to observe how indifference has turned a once coldwater stream into, basically, an open sewer.

Since the quality of the water in our streams is, ultimately, a function of the land it flows across to get there, every opportunity to manage at the watershed-scale should be explored and encouraged. Focusing only on instream aspects of coldwater habitat is futile if the land use doesn't support it. While there are always exceptions to the rule, Nash and Walter Creeks provide good examples of streams with cool water that no longer support trout due to water quality and habitat impairments related, in large part, to surrounding land use.

All news is not bad, however, as the residents of Kent County are fortunate to have a variety of trout fishing opportunities within a few minutes' drive of their home or office. There are few places in southern Michigan where one has the opportunity to catch rainbows, browns and our state fish, the brook trout, in one day, or even in one stream; not to mention the anadromous fish that ascend from Lake Michigan to spawn. Or, the peace of mind to know that there are places where trout can spawn future generations, without our help and despite our apathy.

The fact that we are apparently losing our "nonrenewable" coldwater resources at a fairly rapid rate simply highlights the TU mission, and should be justification in itself for immediate action to protect and improve.

It can be argued that our highest quality waters deserve the greatest amount of attention, since it is easier and less expensive to protect than to restore. According to Cramer (2012), "Protective measures voluntarily executed through fee simple acquisition or conservation easements are often more durable and effective than regulatory measures. Protective measures may also result in rapid stream corridor response if adequate evaluation of the watershed and treatment reach has been conducted. Additional protective measures include addressing watershed degradation in uplands, including land use, agricultural best management practices…and road building practices. The

importance of considering and addressing degraded conditions and ecological processes throughout the watershed cannot be overstated, and is critical to any stream habitat restoration design." From participation in local land use planning and ordinance development, to purchase of lands through grant programs, to working with NRCS to develop permanent protection measures through existing federal programs, a variety of resources exist for protection of our coldwater streams. Establishing or strengthening relationships with those who best understand, or are intimately involved in, these programs is an important initial step.

Successful improvement projects typically start with a sound, scientific approach to gathering high-quality background data and information, and having a clear vision of goals and objectives; this strategy also provides the information necessary to establish 'baseline' conditions and is indispensable in determining overall benefits of improvement projects. As such, many of the recommendations set forth in this report include data collection activities. It is also important to note, however, that collecting data for the sake of collecting data is counterproductive and will end up archived in a storage room. That is, all data collection should have a clear purpose and methods should be established to answer specific questions; questions relevant to the eventual improvement activities.

Ultimately, it is on-the-ground improvement that counts. The famous Edward Abbey may have said it best, "*I think it is far more important to save one square mile of wilderness, anywhere, by any means, than to produce another book on the subject".* A large number of improvement projects have already been identified and are presented in this report. Schrems has been very successful over the past several years in developing quality, meaningful projects and finding the resources to complete them. The work completed for, and compiled within, this report should serve as a foundation for future proposals and improvement projects. Numerous funding programs are available to leverage local resources to bring federal or other "outside" money into improvement of the natural community of Kent County. Continuing to work with local partners who understand these programs and taking individual responsibility to aggressively pursue opportunities, are essential for long-term sustainability of our coldwater fisheries.

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