



KIEFER CREEK SEPTIC FEASIBILITY STUDY

2022

Determining the feasibility of a septic repair, replace, connect program to reduce E. coli contamination near one of the St. Louis Region's most visited parks.

Prepared by,



EAST-WEST GATEWAY
Council of Governments

Creating Solutions Across Jurisdictional Boundaries

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Table of Contents

TABLE OF TABLES	3
TABLE OF FIGURES	3
LIST OF ACRONYMS	4
INTRODUCTION	5
1.0 WATERSHED BACKGROUND	6
1.1 CASTLEWOOD STATE PARK	11
2.0 METHODOLOGY	12
2.1 DATA SOURCES	12
2.2 STUDY AREA SELECTION AND SEPTIC SYSTEM LOCATIONS	13
2.3 SEPTIC COSTS	15
2.4 RESIDENT DEMOGRAPHICS	16
2.5 HOME INFORMATION	18
2.5.1 Home Age	18
2.5.2 Home Sale Date	19
2.5.3 Home and Lot Size	20
3.0 HOMEOWNER AND RESIDENT SURVEY	22
4.0 HOMEOWNER AND RESIDENT OUTREACH	23
5.0 FUNDING SEARCH	25
6.0 STUDY CONCLUSIONS	26
APPENDIX	29
A.1 HOMEOWNER SURVEY MAILING	30
A.2 KIEFER RESIDENT SEPTIC SURVEY	32
A.3 SEPTIC EDUCATION WEB PAGE, WWW.EWGATEWAY.ORG/SEPTICINFO	46
A.4 WWW.EWGATEWAY.ORG/SEPTICINFO WEB STATISTICS	47

Table of Tables

Table 1 - Kiefer watershed demographics _____	16
Table 2 - Kiefer watershed income, education, and home values _____	17
Table 3 - Kiefer watershed SOVI data _____	17
Table 4 - Kiefer Creek study area home age _____	18
Table 5 - Kiefer study area home sale dates and values _____	19
Table 6 - Kiefer home sizes _____	20
Table 7 - Kiefer lot sizes _____	21
Table 8 - Site Statistics - www.ewgateway.org/septicinfo _____	24
Table 9 - Documents Accessed - www.ewgateway.org/septicinfo _____	24

Table of Figures

Figure 1 - Lower Meramec River Watershed map, East-West Council of Governments, 2011 _____	6
Figure 2 - Kiefer Creek Watershed map, 2017 Lower Meramec Watershed Plan _____	7
Figure 3 - MSD Kiefer Creek E. coli sampling results _____	10
Figure 4 - Critical area map, Kiefer Creek 9-Element Plan, 2018 _____	13
Figure 5 - Kiefer sewer lines and septic locations _____	14
Figure 6 - Kiefer home age graph _____	19

List of Acronyms

ACS	American Community Survey
BA	Bachelor of Arts
BMP	Best Management Practices
CAFO	Concentrated Animal Feeding Operation
<i>E. coli</i>	<i>Escherichia coli</i>
EPA	United States Environmental Protection Agency
EWG	East – West Gateway Council of Governments
GI	Green Infrastructure
GIS	Geographic Information System
HUC	hydrologic unit code
HUD	United States Department of Housing and Urban Development
IDDE	Illicit Discharge Detection and Elimination
LEP	limited English proficiency
LID	Low Impact Development
MCE	Missouri Coalition for the Environment
MDC	Missouri Department of Conservation
mls	milliliters
MoDNR	Missouri Department of Natural Resources
MoDOT	Missouri Department of Transportation
MPN	most probable number
MS4	Municipal Separate Storm Sewer System
MSD	Metropolitan St. Louis Sewer District
NFIP	National Flood Insurance Program
NPDES	National Pollutant Discharge Elimination System
NPS	Nonpoint source
NRCS	National Resource Conservation Service
QR	quick response code
SOVI	Social Vulnerability Index
sq. ft.	square feet
SRLF	State Revolving Loan Fund
STL	St. Louis
TNC	The Nature Conservancy
USACE	United States Army Corps of Engineers
USDA	United States Department of Agriculture
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
USPS	United States Postal Service
WMP	Lower Meramec River Watershed Management Plan

Introduction

Kiefer Creek, located in southern St. Louis County, is a tributary of the Lower Meramec River, and flows directly through Castlewood State Park, the second most visited state park in Missouri. Because of Kiefer Creek's impaired waters and its importance to the waters of the Lower Meramec River, the impetus behind the Kiefer Creek Septic Feasibility Study project is to gain understanding that will contribute to the reduction of bacteria loads in Kiefer Creek due to malfunctioning or poorly maintained on-site wastewater systems (hereinafter referred to as septic systems) and sustain those reduced levels through homeowner education. Poorly maintained or undersized septic systems are thought to be the most significant cause of *E. coli* contamination in one of the St. Louis region's critical watersheds.

By focusing on failing and poorly maintained septic systems in the Kiefer Creek watershed, East-West Gateway Council of Government's (EWG) goal is to determine the viability of developing a program to assist homeowners in repairing or replacing their septic systems or connecting to an existing sewer line; a repair, replace, connect program.

This project used multiple methods to determine the number and condition of existing septic systems, homeowner enthusiasm for, and awareness of septic improvements, and potential funding sources. Additionally, this project created a web-based homeowner outreach component geared toward educating owners about proper septic system maintenance which can also serve as a point of reference for future septic programs. In all, the study is intended to aid in the protection of human health and improvement of water quality. Its methodology can also be used in other watersheds with similar impacts from septic systems.

Although EWG relied on many regional partners for information advising this study, the data, insight, and specific knowledge shared by staff at the Metropolitan St. Louis Sewer District was invaluable.

1.0 Watershed Background

The Meramec River watershed and tributaries are identified as one of the 19 Urban Waters Federal Partnership designated locations for restoration. It is home to six freshwater mussel species that are federally listed as endangered and is an important migratory bird corridor. The Nature Conservancy (TNC) designated the Meramec Watershed one of two most ecologically diverse watersheds in the Upper Mississippi River Basin. The Lower Meramec offers recreational boating and swimming opportunities within a 30-minute drive of nearly half of St. Louis area citizens and as a result, addressing non-point source pollution issues is a high priority for the region.

Lower Meramec River Watershed

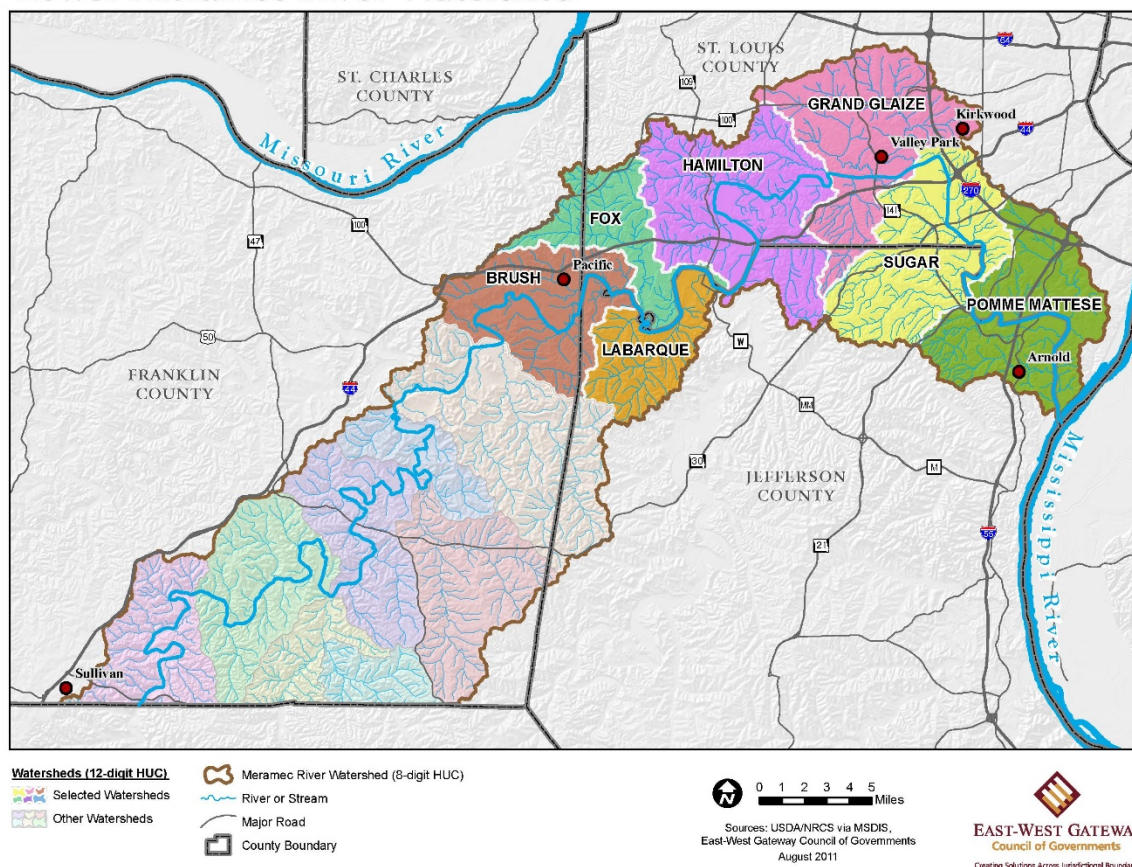


Figure 1 - Lower Meramec River Watershed map, East-West Council of Governments, 2011

The Lower Meramec River and Kiefer Creek have been the subject of several plans and studies by multiple agencies including the Missouri Coalition for the Environment (MCE) and East-West Gateway Council of Governments (EWG). In terms of serving as the genesis of this project and determining study area, the following are noteworthy:

- MCE's 2014 [Draft Kiefer Creek Watershed Restoration Plan](#);

- [Lower Meramec Watershed Management Plan 2017 Update: Including Mattese/Pomme, Sugar/Fenton, Grand Glaize/Fishpot/ Williams, Hamilton/Kiefer, Fox/LaBarque, and Brush Creeks](#) (2017 Update) (WMP), EWG; and
- Its Chapter 3, the EPA-accepted [Kiefer Creek Nine Element Plan for Bacteria](#) (2018).

Kiefer Creek is a 303(d) listed, *E. coli* impaired stream in the Hamilton Creek sub-watershed (HUC 071401021001), itself a tributary of the Meramec River. Kiefer Creek enters the Meramec River at Castlewood State Park, 24 miles upstream of the confluence with the Mississippi River.

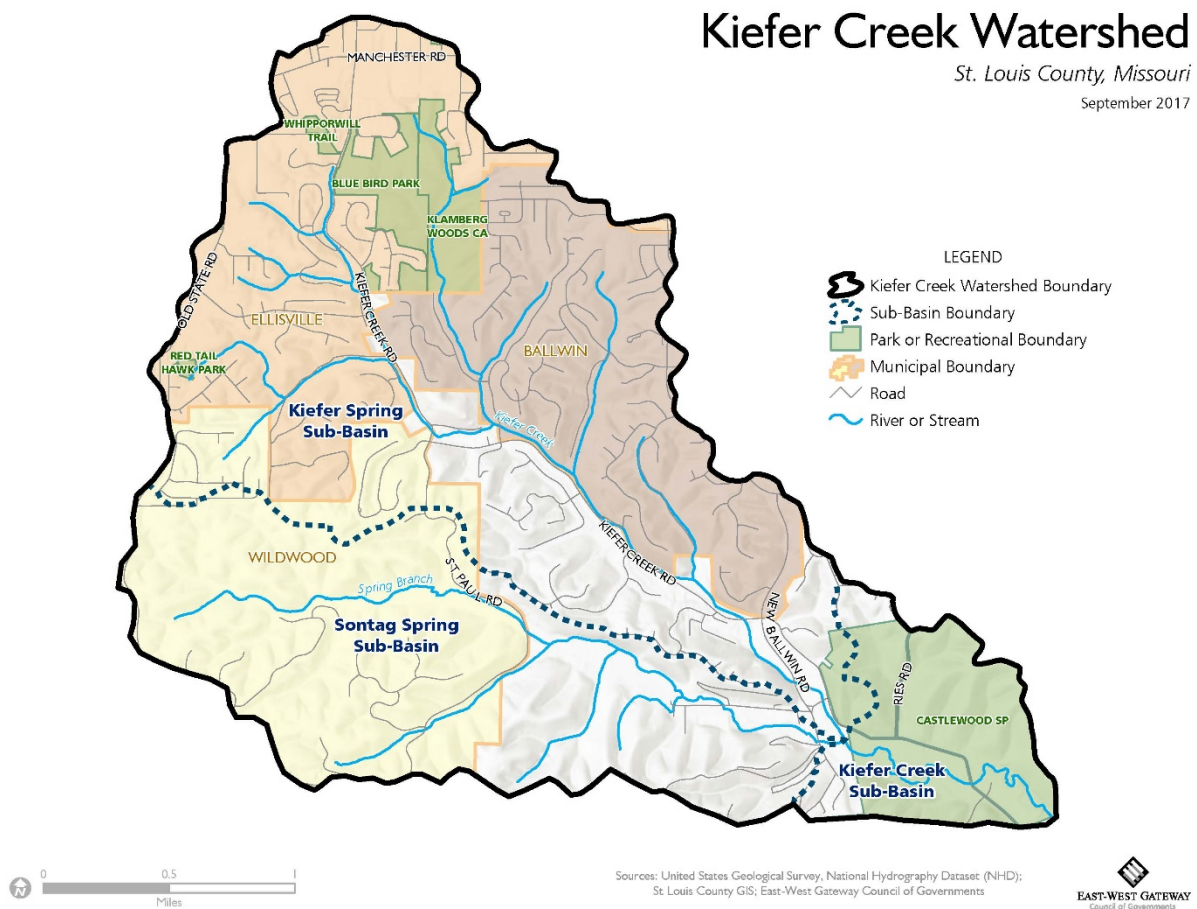


Figure 2 - Kiefer Creek Watershed map, 2017 Lower Meramec Watershed Plan

The Kiefer Creek watershed is wholly located within southern St. Louis County and includes the municipalities of Wildwood, Ellisville, and Ballwin, as well as a portion of unincorporated St. Louis County. Kiefer Creek itself runs through Castlewood State Park before flowing into the Meramec River.

Within the watershed are a large percentage of single-family homes, followed by vacant or agricultural lands and parks, and smaller portions of industrial, commercial, and institutional properties. The

Missouri Department of Natural Resources (MoDNR) classifies Kiefer Creek as a class P stream with permanent flow. The creek is a mix of high, moderately high, and moderately low runoff potential; due in large part to the underlying limestone and chert from the Mississippian, Osagean Series.

Specific soil characteristics affect the rate of infiltration of water into the soil, and conversely, the volume and velocity of stormwater runoff. Soils are classified by the Natural Resources Conservation Service (NRCS), into four hydrologic soil groups, A, B, C, D, based on the physical drainage properties of each soil series, including texture and permeability, as well as certain physiographic properties, such as depth to bedrock and water table. Soils are categorized in terms of their runoff potential, with Group A being well-drained and Group D being poorly drained. Group D soils have the highest runoff potential. They also have very low infiltration rates that when thoroughly saturated, and in combination with suburban development, will intensify runoff volumes and velocities which will increase streambank erosion and flash flooding. This group contains clay soils with a high swelling potential, soils with a permanent high-water table, soils with a claypan or clay layer at or near the surface and shallow soils over nearly impervious materials. Approximately 60% of the soil groups in the Hamilton Creek watershed, which includes Kiefer Creek, are the poorly draining groups C and D.

Additionally, Kiefer Creek is fed by at least six significant springs throughout the watershed, and major portions of the creek may



Seasonally low water levels and bank erosion are common for Kiefer Creek.
Photo courtesy Sean Stone, Metropolitan St. Lewis Sewer District, 2022

be categorized as losing streams. These two conditions mean the water quality of Kiefer Creek is dependent on the quality of the groundwater in addition to the quality of the runoff and drainage that reaches the stream bed. This makes Kiefer Creek highly susceptible to bacteria leaked from faulty septic systems or surface waste in the area.

Kiefer Creek has been acknowledged for decades as having high bacteria

levels and septic systems the leading suspected cause. As early as 1972, EWG in the *St. Louis County Water Pollution Control Study – Phase I – Areas Tributary to the Meramec River*, was looking at the issue of septic systems in the tributaries of the Lower Meramec River. As the regional planning agency, EWG recognized the population would inevitably expand into these areas and the existing wastewater infrastructure, or lack thereof, would be inadequate to handle the influx. Even then, data showed fluctuating levels of high bacteria in Kiefer Creek.

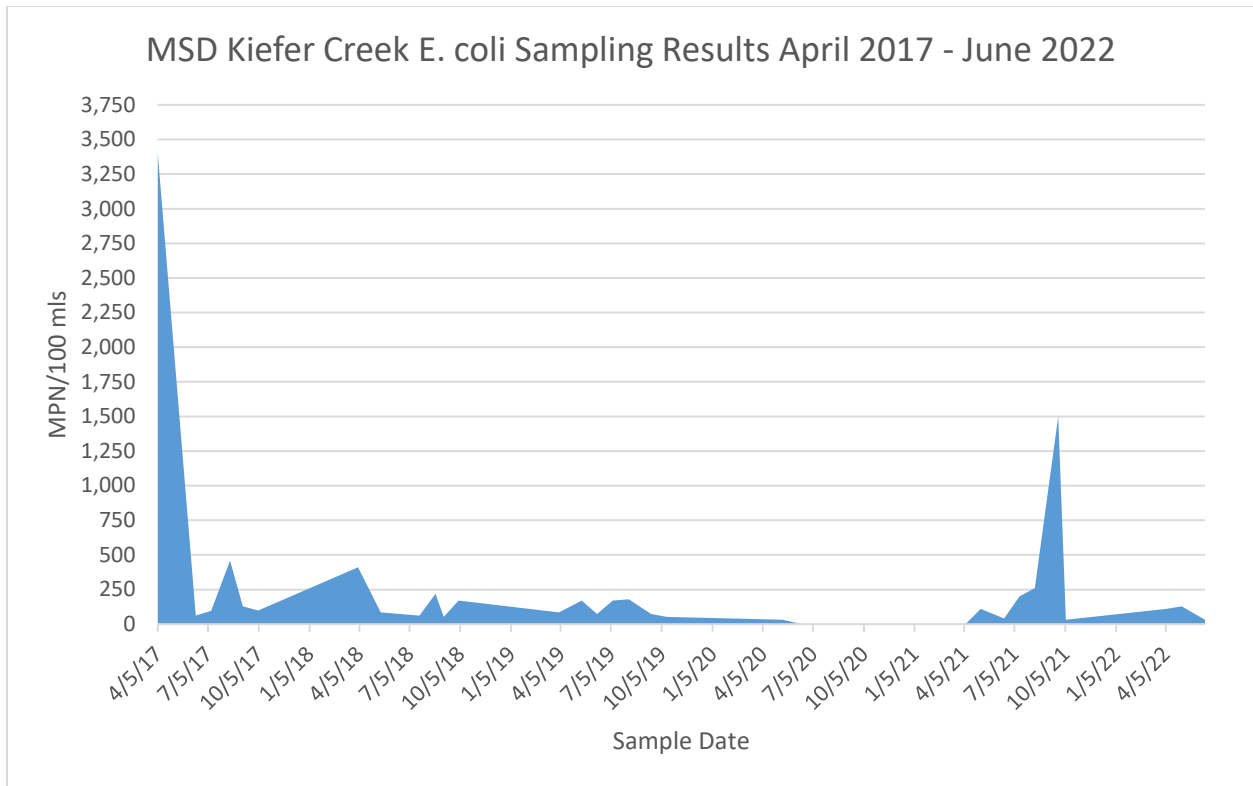
Over the past few decades point sources of pollution from wastewater treatment plants and industries have been regulated and now require permits to discharge into receiving waters. These permits specify effluent limits, so the discharge allows receiving waters to meet water quality standards. In non-rural settings, non-point source pollution is typically the result of stormwater runoff from urban and suburban development. Since 2000, cities with a population over 10,000 have been required to obtain National Pollutant Discharge Elimination System (NPDES) permits as part of their municipal separate storm sewer system (MS4) requirements (hereinafter referred to as MS4 permit).

The Metropolitan St. Louis Sewer District (MSD) and its 58 co-permittee partner cities in St. Louis County are responsible for meeting the requirements of the MS4 permit in St. Louis County. While regulations on point source discharges to waterbodies will continue to improve water quality over time, polluted runoff still makes its way into streams and rivers. Past development practices that were not subject to the permitting process, through overland flow outside of MS4 system, and failing septic systems remain contributors of pollutants.

MSD conducts regular water sampling in Kiefer Creek from April through October. Although some amount of *E. coli* is always present, levels in recent years continue to fluctuate. Overall trends are difficult to determine, however, *E. coli* numbers do not appear to be increasing. Notably, for the six samples with *E. coli* levels at or above 390 most probable number (MPN), each had a rain event on the day of or within 72 hours prior to the sample collection. Given this correlation, rain events in the watershed have the potential to be used to trigger additional warnings to people looking to wade or swim at Castlewood State Park. With the importance of springs in the Kiefer watershed, more study on the impact of rain events and duration of high *E. coli* levels in creek waters is also warranted.

The U.S. Geological Survey (USGS) is also currently conducting water sampling in the Kiefer Creek watershed as part of a study and is using microbial source tracking on some samples to identify any human or equine DNA. At this time, one sample indicated the presence of human DNA but neither quantity nor percent of total *E. coli* has been determined. Both measurements will be important in determining the severity of any human-caused bacteria contamination. Other source tracking sampling is taking place during summer 2022.

Figure 3 - MSD Kiefer Creek E. coli sampling results



In 2021, MSD staff walked Kiefer Creek as part of the Illicit Discharge Detection and Elimination (IDDE) requirement of their MS4 permit requirements. IDDE is intended to identify and eliminate inappropriate or illegal connections to the storm drain system by identifying illicit dry weather flows. A total of 66.45 miles were walked between May and September of 2021. During that time, no illicit discharges into Kiefer Creek were observed. This inspection would likely have noticed any direct sewage piping from homes along the creek or immediately adjacent septic discharges although none was found.

1.1 Castlewood State Park

Castlewood State Park started as a local swimming hole and by the early 1900s had developed into a recreation destination for middle-class citizens of the City of St. Louis and surrounding communities. The Missouri Pacific Railroad was instrumental in making the park accessible to city residents. The railroad even had special rail cars that could hold canoes in addition to their heat-stressed passengers, further enhancing accessibility to the area. By the end of World War II, the area had transitioned from resort destination to 'summer camp' style residences, some of which remain and are still in use as year-round, residential housing.

The neighborhoods around the park have become desirable places to live with easy access to the City of St. Louis and other more commercial suburbs, while maintaining a wilderness appeal.



Lincoln Beach along the Lower Meramec River in what is now Castlewood State Park, circa 1930. Photo courtesy of Missouri Historical Society

Castlewood State Park was formally established in 1974 and although the waters are listed for non-contact recreation, Kiefer Creek still serves as an area swimming hole for people and their pets much like it did 100 years ago. More than 750,000 people visit the park every year and as development continues to encroach on the watershed, making water quality improvements poses challenges.

While the Lower Meramec River is an important recreation resource in the St. Louis region, its size and currents can be dangerous for inexperienced boaters and swimmers. Castlewood State Park and Kiefer Creek provide recreation opportunities with lower water levels and designated access locations. Kiefer Creek remains a priority among the dozens not-for-profit regional environmental organizations, government entities such as St. Louis County and MSD, as well as federal partners such as the U.S. Geological Survey. In one of the largest scale projects, The Nature Conservancy is engaged in a major stream bank restoration project, partially funded by a Section 319 Nonpoint Source Implementation (NPS) Grant, that will address some of the significant erosion issues.

2.0 Methodology

At the onset, EWG gathered septic pricing data and septic permit data, explored funding options, researched residential and demographic data, and compared water and sewer bills for the residents of the Kiefer Creek Watershed.

While every attempt was made to collect data directly from primary sources, the limitations posed by the Covid pandemic provided challenges during the study period. Notably, the survey of septic system repair and installation companies yielded fewer than expected results, although those were bolstered by information gleaned from St. Louis County permit records.

The St. Louis County septic permit data was obtained using the [Acella Citizen Access Portal](#) rather than being supplied directly by the St. Louis County Public Health Department which has jurisdiction over septic system permitting. With county staff resources allocated to Covid pandemic response, their ability to conduct a septic permit search was deemed infeasible. Also due to Covid, the homeowner survey was limited to a single mailing requesting participation.

The search for funding sources was done online. Federal and state environmental agency web sites, in addition to multiple not-for-profit organizations sites, were searched for potential. The [Missouri Healthy Watershed Search Tool](#), developed by the Environmental Finance Center at Wichita State University, provided a particularly helpful starting point.

Due to the inability to confirm property records with on-the-ground research, some assumptions were made at the start. Recent home sale information was correlated to septic maintenance and inspection because home sales generally trigger inspections. Lot size was used as an indication of the effectiveness of a septic system's drain field because undersized drain fields can lead to poorly functioning septic systems. Also, home value was used to roughly estimate owner income level (buttressed by U.S. Census block group data).

2.1 Data sources

The data sources for this report includes information from: Missouri American Water (via MSD), which is the drinking water supplier in the Kiefer area, MSD, St. Louis County – both parcel data and citizen access portal, [Acella](#), the [U.S. Census American Community Survey](#), U.S. Environmental Protection Agency's [EnviroAtlas](#), U.S. Geological Survey (USGS), Missouri Department of Natural Resources (MoDNR), [Zillow.com](#), responding septic repair and replacement companies, and participating residents in the Kiefer Creek Watershed.

MSD provided customer billing information in addition to Missouri American Water bill data and stream sampling results. Sewer and water bill sources were paired to determine which homes received a water bill but not a sewer bill. St. Louis County parcel data was then used to determine the type of structure, if any, on the property. Properties without houses were eliminated, as were commercial and industrial zoned parcels. The county's citizen access portal, Acella, was also utilized to then search each of the remaining residential properties by parcel number to locate any permit data. Homes which had completed permits for sewer connections were eliminated. Repair and replacement costs were also noted for the cost evaluation and estimate portion of this study. Zillow.com was used to fill in information where county parcel data showed no lot size, yet parcel records indicated a lot.

EnviroAtlas and MoDNR's online data and records were used to confirm that there are no NPDES dischargers in the watershed. Likewise, there are no Concentrated Animal Feeding Operations (CAFO).

Septic repair and installation companies were contacted via phone for pricing, although there was general reluctance to provide details. One explanation for this is that from March 2020 – April 2022, EWG staff were working remotely and limited to calling from home and personal mobile phones which did not allow for caller ID to help a company determine if the call was from a legitimate source or was a competitor seeking a price advantage.

Lastly, the residents in the study area were contacted through the U.S. Postal Service (USPS) via a flyer requesting the resident complete a short online survey. The flyer contained a QR code that could be scanned via smart phone, with mobile-friendly survey interface. Also in the flyer was a web address for the survey for those who may have been suspicious of QR codes or did not have access to a smart phone, in addition to a phone number for anyone without access to a computer, tablet, or smart phone. The flyer and survey can be found in the appendix.

2.2 Study area selection and septic system locations

The study area was determined by the Kiefer Creek watershed and all the homes within it that have septic systems. Chapter 3 of the 2017 WMP highlighted specific areas of concern, however, it was

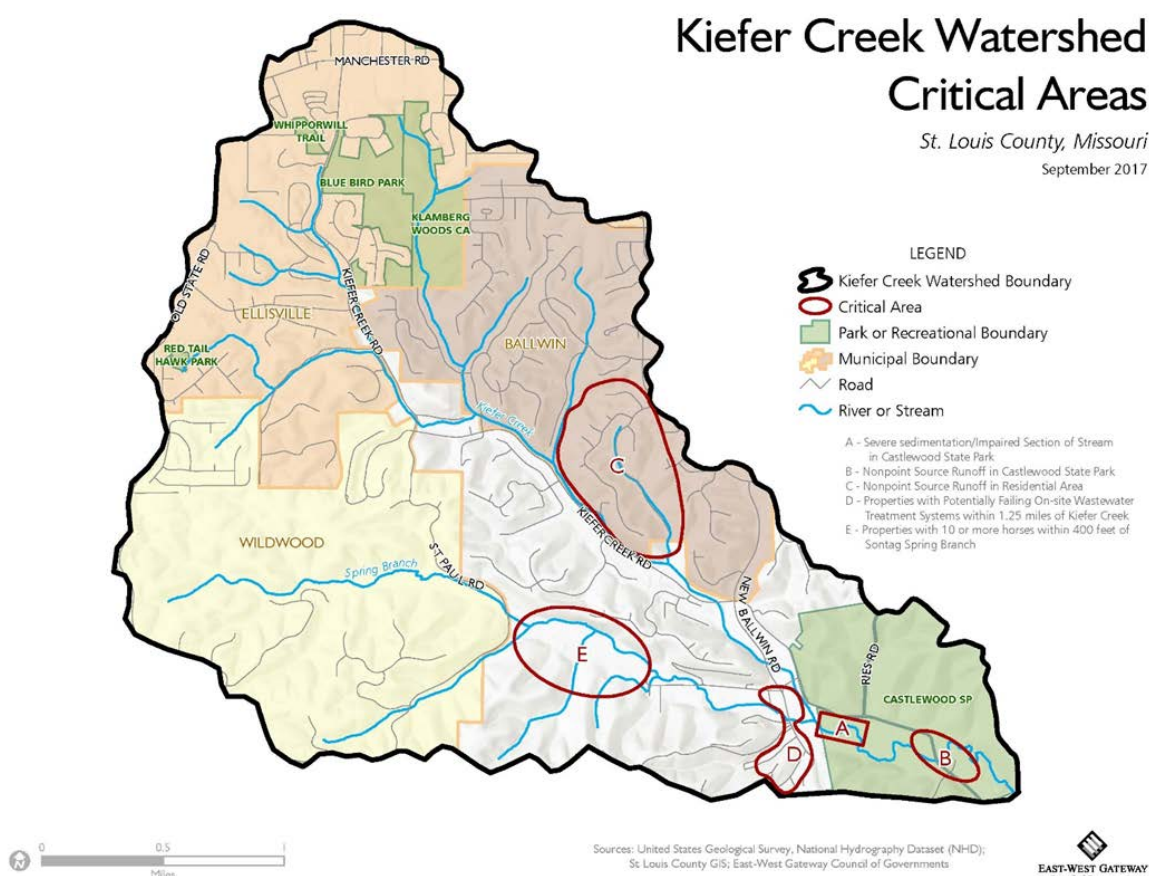


Figure 4 - Critical area map, Kiefer Creek 9-Element Plan, 2018

MSD's sewer line locations data layer was also used to map sewer lines and evaluate existing septic systems in relation to those sewer lines. According to *St. Louis County Code of Ordinances, Title XI – Public Works and Building Regulations, Chapter 1103 – Plumbing, Section 1103.45, chapter 22, section 22.1.3*, "Where a public sanitary sewerage system is legally and economically available to the building to be served, or within two hundred feet (200') of the property line, the Code Official shall require that sanitary sewage be discharged into that system." This 200' distance was used to find those properties that may be able to connect to sewer. It is important to note that the 200' requirement is from the property boundary, not the home. Depending on the distance of the home from the property line with



a sewer line, potential obstacles such as private property and underlying geology, connection may not be feasible, nor, as specified in the County's plumbing code, economically available.

Figure 5 identifies several categories of residential properties in the Kiefer study area. Residential parcels found in the active accounts table refers to MSD customers who receive a sewer bill and are assumed to not be on septic. Residential parcels identified by MSD as having septic but not within 200' of a sewer line comprise another category. The map also shows residential parcels that MSD has as on septic and within 200' of a sewer line. The last two categories for residential parcels show those not in MSD's active account table and further than 200' from a sewer line and those not active and within 200'. Non-residential parcels were not included in this study.

Thirty one percent of homes in the study area that are within 200' of a sewer line yet are on septic. A look at the map reveals many such properties would have to connect to sewer through another property, which may be among the reasons, economic or physical, the county has not required connection.

2.3 Septic costs

Septic cost estimates were achieved using two methods. Septic repair and installation companies located in the Greater St. Louis area were contacted and their responses documented. Additional cost information was gathered during the property search using St. Louis County's Acella Citizen Access portal (<https://aca.stlouisco.com/CitizenAccess/Default.aspx>). Each study area property was individually researched using the Property ID and any septic permit application information recorded.

Of the 25 septic and sewer companies that were contacted, five were able to answer most of the survey questions. The respondents indicated that drip irrigation systems are the most frequently installed leach or drain field type in the region. The cost of the drip irrigation systems starts at \$12,000 on the low end and can cost as much as \$25,000. This cost variance is based on several different factors: the size of the home and the number of bedrooms; the condition of the soil; if there is rock that needs to be broken up and removed; if there are trees that need to be cleared and removed; and if there are power lines that interfere with the installation process.

Tree removal can add several thousand dollars to the cost as well as soil amendments, which costs around \$800 per load of topsoil. Rock breaking and removal adds several thousand dollars ranging from \$2,000 - \$3,000. The costs of rock and tree removal as well as soil amendments are relatively high due to the rental equipment needed and the length of time it takes to complete the tasks. The companies that have done work in the Kiefer Creek watershed report that a permit for septic installation can cost between \$245 and \$300. There have not been any reported issues receiving a permit. Connecting to a sewer line in St. Louis County requires a licensed plumber, a permit from the county, and approval from MSD. The cost of connecting varies greatly depending on where a house is located or if the new line would have to go under a yard or road. Most respondents said that there are too many variables to be able to provide a cost estimate for sewer connection, although MSD indicated it may be as low at \$3,000 or as high as \$75,000, depending on underlying geology and elevation.

In terms of maintenance costs, septic systems should have their tanks pumped once every three to five years. The filters should be checked and cleaned every six months to one year. With training, willing owners can clean and change the filters themselves. Cleaning and changing filters costs about \$300 a

year while tank pumping costs \$300 and higher depending on the difficulty of the situation. The cost of repairing septic systems depends on the type of repair needed. Aerator motors cost about \$800, control panels cost about \$400, and new filters cost about \$700. These price estimates include parts and labor. Regular maintenance of septic systems is key to keeping the overall cost down. Drain fields cannot be fixed and must be replaced. Regarding equipment costs, the septic company surveys took place in 2021, before supply chain issues increased.

The estimates provided by responding septic repair and installation companies matches with information gathered from county records where replacement costs ranged from \$12,000 - \$25,000 and sewer connection costs were \$1,300 - \$12,000.

2.4 Resident demographics

There are six U.S. Census block groups that are wholly or mostly within the Kiefer Creek watershed. These block groups were used to determine sub-population and social vulnerability information (SOVI). There is not a 1:1 home correlation between U.S. Census American Community Survey (ACS) and county parcel data due to overlap with properties outside the watershed boundaries. For this reason, house-specific data is taken from county parcel records. The watershed is divided into approximately three census tracts that overlap to varying degrees with populations outside of the study area, which is why tract data was not used.

Table 1 - Kiefer watershed demographics

ACS Kiefer Creek Watershed Demographics

Block group	Total Population	White	% White	Black	% Black	Asian	% Asian	Hispanic	% Hispanic	Other	% Other
291892179211	1,235	964	78.1%	26	2.1%	39	3.2%	55	4.5%	151	12.2%
291892179212	2,132	1,833	86.0%	57	2.7%	157	7.4%	34	1.6%	51	2.4%
291892179213	1,471	1,203	81.8%	0	0.0%	135	9.2%	113	7.7%	20	1.4%
291892179233	1,148	968	84.3%	0	0.0%	14	1.2%	12	1.0%	154	13.4%
291892179441	2,303	1,932	83.9%	47	2.0%	154	6.7%	115	5.0%	55	2.4%
291892179443	2,565	2,105	82.1%	0	0.0%	368	14.3%	17	0.7%	75	2.9%
Total/Average	10,854	9,005	83.0%	130	1.2%	867	8.0%	346	3.2%	506	4.7%
STL County	996,179	645,623	64.8%	240,821	24.2%	44,312	4.4%	29,396	3.0%	36,027	3.6%
EWG Region	2,587,799	1,846,725	71.4%	500,165	19.3%	73,796	2.9%	82,195	3.2%	84,918	3.3%

Source: American Community Survey 5-Year Estimates (2016-2020)

As a demographic group, the Kiefer watershed is largely white, with small percentages of Black, Asian, Hispanic, and other. It is less diverse than St. Louis County as a whole and the EWG region, with the exception of Asian and people identifying as Other. It is neither economically disadvantaged nor an area with environmental justice concerns.

The median Kiefer watershed income is higher than the rest of St. Louis County and more people have attained a Bachelor of Arts (BA) degree or higher. ACS median home values are also higher than the county and regional values.

Table 2 - Kiefer watershed income, education, and home values

ACS Kiefer Creek Watershed Income, Education, Home Value			
Block Group	Median Income	Education*	Median Home Value
291892179211	Not available	47.70%	\$448,400
291892179212	\$154,815	70.30%	\$480,000
291892179213	\$109,528	71.10%	\$443,000
291892179233	\$155,789	81.00%	\$385,100
291892179441	\$105,656	61.20%	\$291,800
291892179443	\$123,807	71.30%	\$313,000
Average	\$117,692	65.40%	\$393,550
STL County	\$68,661	44.40%	\$206,700
EWG Region	\$65,666	36.70%	\$183,191

*Percent of residents 25 and older who have attained a BA or higher

Source: American Community Survey 5-Year Estimates (2016-2020)

Social Vulnerability Index (SOVI) numbers for Kiefer Creek also vary from county and regional averages, although not to the same extent as demographic information. The percentage of households with limited English proficiency (LEP) in the Kiefer watershed nearly matches that of the county as does the percentage of individuals 65 years of age and older. There are no known households in Kiefer Creek that do not have a vehicle, however, which is below averages for both the county and the region.

Table 3 - Kiefer watershed SOVI data

ACS Kiefer Creek Social Vulnerability Index					
Block Group	Percent 65 and over	Households with no car	Percent of households with no car	LEP households proficiency	Percent of LEP households
291892179211	25.9%	0	0.0%	0	0.0%
291892179212	18.6%	0	0.0%	0	0.0%
291892179213	16.0%	0	0.0%	23	4.8%
291892179233	9.8%	0	0.0%	0	0.0%
291892179441	31.1%	0	0.0%	0	0.0%
291892179443	8.3%	0	0.0%	23	2.5%
Total/Average	18.4%	0	0.0%	46	1.2%
STL County	18.1%	25,430	6.2%	5,501	1.3%
EWG Region	16.5%	76,195	7.2%	9,417	0.9%

Source: American Community Survey 5-Year Estimates (2016-2020); disability data unavailable

2.5 Home Information

Home ages and lot sizes have been thought to be particularly important for gaining an understanding of how septic systems are functioning in the Kiefer watershed. In addition to age and lot size, staff also considered whether the home was owner occupied or rented/occupied by non-owner as a potential avenue for determining the likelihood of regular septic maintenance or having knowledge of septic maintenance. Owner versus non-owner was determined by cross-referencing the home address and mailing address in county parcel data. Home sale dates were also evaluated to gain a better understanding of how recently a septic inspection may have taken place.

2.5.1 Home Age

In the study area, there are 262 residential homes; 35.5% of these were built between 1870 and 1949; 57.25% were built between 1950 and 1999; and 7.25% were built between 2000 and 2019. There are just 13 homes remaining built before the 1920s although a significant amount of those built prior to the mini-building boom in the 1950s are still in use. The 1970s, 80s, and 90s saw substantial development in the study area. Occupancy by owner or non-owner does not appear to have any meaningful correlation with home age.

Table 4 - Kiefer Creek study area home age

Kiefer Creek Study Area Home Age						
Years Built	# of Houses	Median Year	Median Age yrs.	Average Age yrs.	Owners	Renter/Other
1870 - 1879	1	1870	152	152	1	0
1900 - 1909	2	1902	120	120	2	0
1910 - 1919	10	1919	103	105	5	5
1920 - 1929	50	1924	98	99	23	27
1930 - 1939	21	1930	92	90	14	7
1940 - 1949	9	1946	76	77	5	4
1950 - 1959	20	1953	69	69	7	13
1960 - 1969	11	1967	55	56	9	2
1970 - 1979	35	1976	46	46	30	5
1980 - 1989	46	1985	37	37	44	2
1990 - 1999	38	1995	27	27	35	3
2000 - 2009	13	2004	18	19	9	4
2010 - 2019	6	2016	6	6	4	2
Total	262				188	74
				Percent:	72%	28%

Source: St. Louis County parcel data, 2020

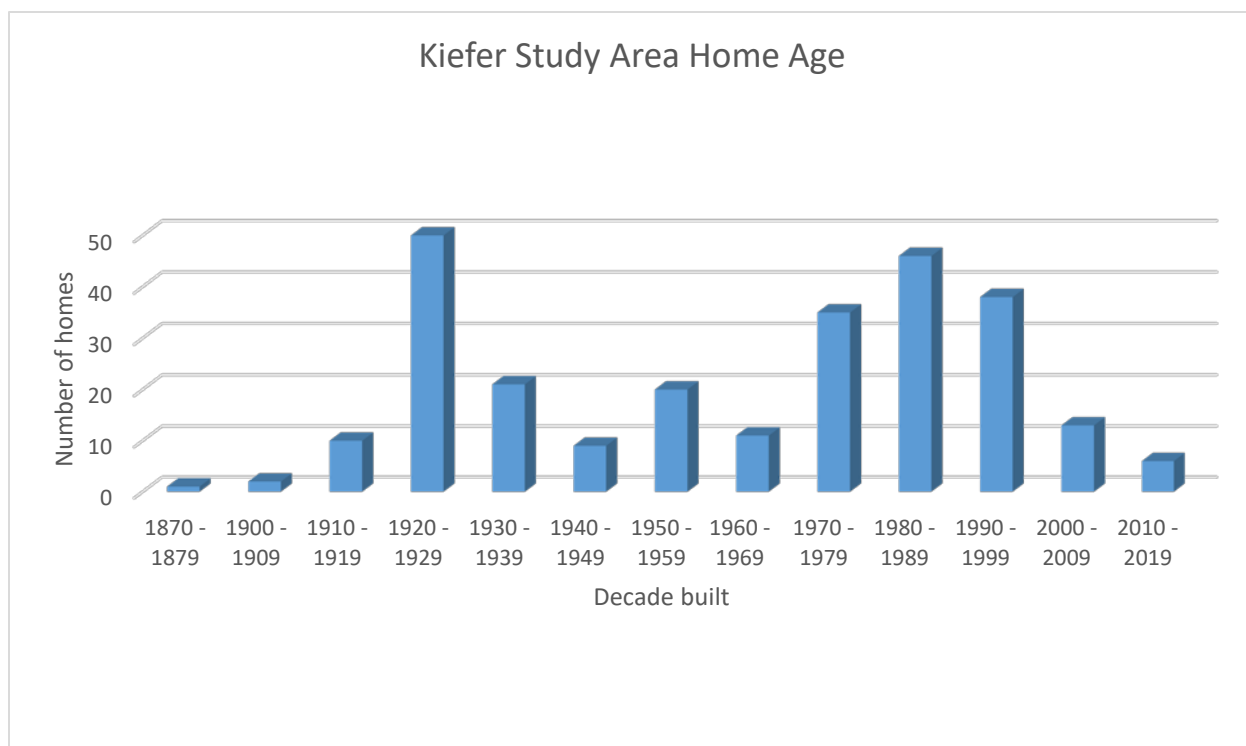


Figure 6 - Kiefer home age graph

2.5.2 Home Sale Date

More instructive than home age is sales information. It is notable that 69% of homes in the Kiefer watershed with sales data available have sold in the last 12 years. Just over 18% sold between 2000 and 2009 and less than 9% sold between 1990 and 1999. Only nine homes out of the 242 with sales data have not sold since 1989. The recent sales dates on Kiefer homes are a good indication that septic system inspections and pre- or post-sale repairs or replacements are taking place and that non- or poorly functioning septic systems are not likely to be systemic in the watershed.

Table 5 - Kiefer study area home sale dates and values

Kiefer Study Area Home Sale Dates and Values			
Year sold	*Number of homes sold	Current average appraised value	Range
1967 - 1989	9	\$351,344	\$104,000 - \$531,200
1990 - 1999	21	\$419,281	\$45,000 - \$1,211,600
2000 - 2009	44	\$262,093	\$55,200 - \$675,000
2010 - 2022	168	\$295,735	\$46,300 - \$1,105,500

*Number of homes does not equal 262, 20 homes did not have sale data

Sources: St. Louis County parcel data 2020; Zillow.com

2.5.3 Home and Lot Size

Despite handful of very large, high value homes, residences the Kiefer study area tend to have fewer than 4,000 square feet, with only 12% of homes being larger. Of the 262 houses in the study area, 16% of them are less than 1,000 square feet (sq. ft.) Homes between 1,000 and 2,000 sq. ft. make up 32% of the properties and homes between 2,000 and 3,000 sq. ft. make up 25%. The remaining 26% are between 3,000 and 7,000 sq. ft. Out of the 262 homes 188 are owned and 74 are not owned/rented. Most renters are in homes 2,000 sq. ft. or less.

Table 6 - Kiefer home sizes

Kiefer Creek Study Area Home Size						
Square Feet	Median sq. ft.	Average sq. ft.	# of Houses	% of Houses	Owner	Not Owner
0 - 999	804	767	41	16	20	21
1,000 - 1,999	1,325	1,393	85	32	45	40
2,000 - 2,999	2,562	2,542	67	25.5	60	7
3,000 - 3,999	3,326	3,355	38	14.5	35	3
4,000 - 4,999	4,462	4,445	18	7	16	2
5,000 - 5,999	5,421	5,469	10	4	10	0
6,000 - 6,999	6,381	6,381	2	0.7	1	1
7,000 <	7,531	7,531	1	0.3	1	0
Total			262	100	188	74

Source: St. Louis County parcel data, 2020; Zillow.com

In the study area, 14.5% of the 262 homes are on lots that are .25 acres or less; 8% of the lots are .26 - .33 acres; another 8% of homes are on lots that are .34 - .5 acres; 13% of the homes are on lots .51 - 1 acre; 19.84% of the lots are 1.01 - 3 acres; and 21.75% of the lots are 3.01 - 4 acres. The remaining 14.5% of the lots are between 4 and 88 acres. Of the most concern is lots smaller than .25 acres. Depending on home size, there may not be adequate space for a drain field. Noteworthy, however, is that 85.5% of homes in the Kiefer study area have lot sizes greater than .25 acres.

Table 7 - Kiefer lot sizes

Kiefer Study Area Lot Size						
Acres	Median Size	Average Size	# of Houses	Percentage	Owner	Not Owner
.01 - .25	0.175	0.18	38	14.50%	16	22
.26 - .33	0.3	0.29	21	8.02%	12	9
.34 - .5	0.41	0.41	21	8.02%	10	11
.51 - 1	0.72	0.75	35	13%	21	14
1.01 - 2	1.62	1.59	26	9.92%	22	4
2.01 - 3	3	2.77	26	9.92%	24	2
3.01 - 4	3.25	3.33	57	21.75%	54	3
4.01 - 5	4.41	4.37	12	4.60%	12	0
5.01 - 6	5.4	5.41	8	3.05%	7	1
6.01 - 7	6.36	6.36	1	0.38%	1	0
7.01 - 8	7.87	7.87	1	0.38%	0	1
8.01 - 9	8.82	8.82	1	0.38%	1	0
9.01 - 10	9.63	9.6	4	1.53%	1	3
10.01 - 20	13.86	13.36	5	1.91%	4	1
20.01 - 30	28.37	28.37	1	0.38%	1	0
30.01 - 40	0	0	0		0	0
40.01 - 50	41.71	41.71	2	0.76%	1	1
50.01 - 60	57.36	57.36	2	0.76%	1	1
60 <	88.88	88.88	1	0.38%	0	1
Total			262	100.00%	188	74

Sources: St. Louis County parcel data, 2020; Zillow.com

Lot size and home age do have a potential correlation. Of the homes on .25 acres or less, the average age is about 80 years and the square footage of the homes with the smallest lots, .07 to .14 acres is correspondingly small, about 672 square feet on average. The 80 year age average is about a decade more than the average age of all homes in the watershed. These homes also have just one or two bedrooms and one bathroom. St. Louis County septic installation permitting requires percolation and/or morphology tests, so it is not supported to assume that all older homes on smaller lots may be direct contributors of *E. coli* via their septic systems. Smaller lots tend to make neighbors closer, so it seems unlikely that a broken septic system would escape notice.

3.0 Homeowner and Resident Survey

In order to determine the feasibility of a repair, replace, connect program for septic systems in the Kiefer Creek watershed, it was essential to gauge homeowner interest. Using Survey Monkey, staff developed a series of questions to measure potential roadblocks for homeowners seeking to maintain, repair, or replace their septic systems. Staff also asked questions regarding septic age, repair history, and repair costs. Additionally, there were questions regarding household income and whether there was a need for financial assistance. The survey can be found in the appendix.

A flyer was developed with a QR code to allow a smart phone user to scan the image and load a mobile-friendly version of the survey. The flyer also had a web page for those who prefer that interface, and a phone number for anyone who may not have had access to a computer, tablet, or smart phone.

County parcel data was used to develop a mailing list. The list was based on home address rather than homeowner mailing address in order to reach renters in the watershed. Those 262 addresses received the flyer. Twelve individuals responded, although one indicated their home was on sewer and so did not complete the survey.

Of those responding, all but one was a homeowner. Septic age varied considerably between six and 40+ years and the majority had had their systems pumped in the last three years. The average cost for the pump outs was \$250, with \$100 and \$600 representing the extreme ends of the range. When asked how often systems are pumped, only one reported pumping annually, whereas every two to three years or as needed was more common. Of those responding, 71% did not consider costs when pumping their septic systems. Most respondents had repaired their systems within the last 10 years and costs varied from \$100 to \$3,000. One person responded that their system needed repairs but that costs were an issue. Most reported that their system did not need to be replaced, although one respondent indicated their system was not up to code and their lot size was too small for a new unit.

In terms of financial assistance, six people indicated that a rebate for pump outs would help them schedule that activity more regularly, however, five said that no assistance was necessary. One person expressed interest in a no- or low-interest loan for replacement. Under annual household income, no respondent listed their income as less than \$34,999, two selected \$35,000 - \$49,999, another two \$50,000 - \$75,999, one person listed \$75,000 - \$99,000, and the remaining six individuals indicated \$100,000 or more.

Those surveyed were also given an opportunity to add their own thoughts and six took the opportunity to do so. Half indicated interest in or preference for sewer service, although one was averse to sewer. The responses are quoted below:

- Septic system maintenance agreement are great way to keep on top of system conditions.
- Would be very receptive to a conventional sewer in our area
- Please keep up the good work of encouraging people to properly maintain their septic system so nature isn't polluted
- Need sewer line from MSD
- I would prefer to connect to a sewer but it is not available
- The output of Septic systems is MUCH clearer & better for the environment then sewer treatment plants.

4.0 Homeowner and Resident Outreach

Completing homeowner outreach grant requirements during the Covid pandemic proved challenging and the decision was made to focus on web-based outreach to make the resources available to the most people while protecting personal and public health and safety. This web resource page can also serve as starting point for future projects while remaining useful to the EWG region.

An online search for septic owner education materials was conducted and search results evaluated for appropriateness for the Kiefer watershed and the EWG region in general. Those resources selected were then categorized into three areas: Homeowner Tips, Technical Guides and Information, and Quick Print Guides. The quick print guides are to assist landlords, and perhaps parents, with educating renters or children who may be unfamiliar with septic systems.

Homeowner tips include links to:

- Homeowner's Guide to Septic System Maintenance Brochure - East-West Gateway Council of Governments
- Keeping Pollutants Out of Storm Water - A Homeowners Guide - Metropolitan St. Louis Sewer District
- New Homeowner's Guide to Septic Systems - U.S. Environmental Protection Agency (USEPA)
- Top 10 Ways to be a Good Septic Owner - SepticSmart, USEPA
- Do your part. Be SepticSmart! - SepticSmart, USEPA

Technical guides and information has:

- Guidance for Septic Systems Before, During and After a Flood – National Environmental Health Association
- Household Wastewater: Septic Systems and other Treatment Methods (Fact Sheet) – University of Missouri Extension
- Purdue University Extension Septic System Page

Quick print guides include:

- Top 10 Ways to be a Good Septic Owner - SepticSmart, USEPA
- Do Your Part, Be SepticSmart Bathroom Placecard - SepticSmart, USEPA
- Do Your Part, Be SepticSmart Kitchen Postcard - SepticSmart, USEPA
- Do your part. Be SepticSmart! - SepticSmart, USEPA
- SepticSmart: Rental Flyer - SepticSmart, USEPA

The newly created web page was given a 'short link' web address, www.ewgateway.org/septicinfo to make the page address easier to remember and encourage use. The true, or long web address, is <https://www.ewgateway.org/community-planning/environmental/water-resources/septic-sys-info/>. An image of the web page can be found in the appendix. To ensure the web page and online availability of septic education resources were promoted to residents in the study, the short link web address was included in the survey mail out. One of the comments collected from the survey indicates that at least one homeowner in the targeted area viewed the web page, although web site statistics indicate more use. Encouragingly, not only has the page been accessed, but the educational documents were downloaded as well. Original screen shots can be found in the appendix.

Table 8 – Site Statistics - www.ewgateway.org/septicinfo

Site Statistics - www.ewgateway.org/septicinfo		
Time range: 04/07/2022 - 06/22/2022		
Hits		
Total Hits		161
Visitor Hits		161
Spider Hits		0
Average Hits per Day		2
Average Hits per Visitor		3.29
Cached Requests		0
Failed Requests		0
Page Views		
Total Page Views		79
Average Page Views per Day		1
Average Page Views per Visitor		1.61
Visitors		
Total Visitors		49
Average Visitors per Day		0
Total Unique IPs		45

Source: WebLog Expert

Table 9 – Documents Accessed - www.ewgateway.org/septicinfo

Documents Accessed - www.ewgateway.org/septicinfo			
Time range: 04/07/2022 - 06/22/2022			
File	Hits	Incomplete Requests	Visitors
http://www.ewgateway.org/.../04/mu-household-wastewater-septic-systems.pdf	8	0	7
http://www.ewgateway.org/.../04/msd-homeowners-guide.pdf	8	0	7
http://www.ewgateway.org/.../04/ewg-septic-maint-brochure.pdf	8	0	7
http://www.ewgateway.org/.../04/septicsmart-rental-flyer.pdf	7	0	6
http://www.ewgateway.org/.../04/septicsmart-quick-guide.pdf	7	0	6
http://www.ewgateway.org/.../04/septicsmart-top-10-for-owners-flyer.pdf	6	0	5
http://www.ewgateway.org/.../04/septicsmart-kitchen-postcard.pdf	6	0	5
http://www.ewgateway.org/.../04/neha-septic-guidance-for-floods.pdf	6	0	5
http://www.ewgateway.org/.../04/new-homeowner-guide.pdf	6	0	5
http://www.ewgateway.org/.../04/septicsmart-bathroom-placard.pdf	6	0	5
Total	68	0	N/A

Source: WebLog Expert

5.0 Funding Search

EWG evaluated multiple government and not-for-profit sources to determine if there was funding for a repair, replace, connect program for the Kiefer watershed. One major starting point was the [Missouri Healthy Watershed Search Tool](#), developed by the Environmental Finance Center at Wichita State University. Although the search tool is not intended to find funding mechanisms for septic systems, the water-related programs highlighted numerous agencies and organizations for further research.

The search found that no local program to subsidize septic repair and replacement for homeowners currently exists in St. Louis County, nor does a program exist to financially assist the Kiefer watershed homeowners with sewer connection. While just over 30% of homes on septic in the study area are within 200' of sewer lines, the lack of a funding mechanism for these homes poses a tremendous impediment. There are councils of governments in Missouri that operate voucher programs to subsidize septic pump outs, however, EWG does not. On a larger scale, State Revolving Loan Fund (SRLF) resources could be leveraged by St. Louis County or the cities of Wildwood, Ballwin, or Ellisville to construct sewer lines to unsewered parcels, but individuals cannot directly access these loans.

While septic pump out and repair options are possible with grants under Section 319 of the Nonpoint Source Management Program (319 grants), replacement and tie ons pose more challenges due to cost and, in the case of sewer connection, not being covered. The 40% match required by 319 grants also poses challenges for some organizations.

Also confounding is related to the already-constructed nature of the homes on septic in the Kiefer watershed, as there is no mechanism to build new sewer lines, especially given that MSD does not construct sewer lines. Should enough residents wish to organize and form a sewer district, it is conceivable that they could then tax themselves to construct a lagoon-style sewage treatment facility or sewer lines, but that is not particularly feasible.

Although there are areas of the Kiefer watershed that feel quite remote, this portion of St. Louis County does not qualify as 'rural,' thus the U.S. Department of Agriculture's (USDA) Section 504 Home Repair Program is not available to these residents. Section 203(K) Rehab Mortgage Insurance Program through the U.S. Department of Housing and Urban Development (HUD) does cover reconditioning or replacing septic systems; however, this is a loan program directed toward low income individuals of which there are few in the study area.

6.0 Study Conclusions

This study was undertaken with the financial assistance of EPA and MoDNR to determine the possibility of establishing a repair, replace, connect program in the Kiefer Creek watershed. The waters of Kiefer Creek have historically shown high levels of *E. coli* and the creek is on the state's 303(d) list as impaired. Kiefer Creek runs through Castlewood State Park, which is one of the most visited parks in the State of Missouri and a valuable ecological resource. Those factors make it particularly important to identify both the sources of *E. coli* in Kiefer Creek and ways to mitigate them. As microbial source tracking becomes more affordable and more widespread, the ability to narrow down the causes, and perhaps even locations, triggering high *E. coli* levels in Kiefer Creek will become possible.

Septic systems in the watershed have long been thought of as a primary source of bacterial contamination in Kiefer waters and this will likely hold true as more sampling and source identification is completed. At this point IDDE tracking has not identified septic operation or malfunction as a leading cause. However, the results from the source identification study being done by USGS or others could prove informative and indicate further projects are warranted.

Additionally, in their current MS4 permit term, MSD will be initiating enhanced septic investigations as part of their IDDE program which could indicate a need for more involvement in the watershed. Not only will MSD staff be walking Kiefer Creek, but when the surveyors come across a parcel with a septic system, the surveyors will step out of the channel and look around the parcel for indications of a problem. They will be looking for issues such as algae blooms in nearby water that could indicate the presence of wastewater, unusual bright green grass as an indication of excessive nutrients, water being released in the drain field (a good indicator in August and September on unfertilized and non-irrigated parcels), and/or pooling water or dampness near the drain field that could indicate overloaded or failing system. Evidence of a septic failure will be turned over to St. Louis County or the appropriate municipality for enforcement.

In conducting the study, it became apparent that home age and lot size in the watershed do not correlate to likely bacteria sources from old and/or malfunctioning septic systems. Only 14.5% of homes in the watershed sit on .25 acres or less and while some homes in the watershed are over 100 years old, almost 70% of homes have been sold in the last 12 years, which would have triggered inspections – and awareness on the part of the new homeowner – making the case more problematic to make.

It is difficult to draw many conclusions from homeowner survey responses due to the small sample size, however, a few generalizations are possible based on supporting data from the American Community Survey and county home values. The Kiefer watershed is not an impoverished area, most residents have achieved a bachelor's degree or higher. Most live in homes that are worth more and have more household income than do those in the rest of the county and the EWG region. Based on income, a sizeable majority of residents are not in need of financial assistance regarding their septic systems, but there is a desire for more information about septic maintenance.

While several survey respondents mentioned a preference for being connected to sewer rather than septic, it is worth repeating that MSD does not build new sewer lines. As the sewage treatment provider for most of St. Louis County, the district treats wastewater and maintains services lines that are installed by others. Any expansion of sewer lines in the Kiefer watershed would have to be done by an entity other than MSD. At this time, none have come forward. Additionally, the geography of the area can

pose a prohibitively costly obstacle to sewer connection, even for those properties that would not have to run a sewer line through another person's yard.

After researching the homes in the Kiefer watershed, the makeup of the people living in them, as well as the lack of funding sources for a repair, replace, connect program, it is unsupported to assert this community needs such a program, even if one existed. A \$50 pump out voucher would reimburse a homeowner for 20% of the average, \$250 cost. Would that amount be significant enough to encourage regular pump outs where the average income level tops \$100,000 a year? It's very difficult to say. What would be more appropriate would be to continue outreach efforts providing information on septic system maintenance in Kiefer and all watersheds with significant numbers of unsewered homes. Future feasibility projects may benefit from selecting other watersheds with septic systems to study.

That the Kiefer Creek watershed does not yet prove to be an ideal location to pilot a repair, replace, connect program is not to say that no such program would find a worthy home elsewhere in St. Louis County and other areas in the EWG region as well. There are many communities outside of the Kiefer Creek watershed that also have septic systems and are low-income and have equity concerns. A voucher reimbursing 20% of the cost of a septic pump out could make a real impact in other areas. County-level entities, such as St. Louis County, are best situated to administer and offer rebate programs for pump outs and repairs and there are several areas in the county where such a program would be useful while also attracting the Kiefer watershed homeowners likely to participate.

The foundational knowledge gained through the Kiefer Creek Feasibility Study provides an excellent starting point to address septic issues not just in the Kiefer watershed, but in the EWG region as a whole. The methods for determine the presence of septic systems, while not foolproof, were effective and could be used again. A potential avenue worthy of exploration includes expanding homeowner education and outreach. The web page, links, and actions taken by survey respondents indicate more homeowner education on septic maintenance would be welcome and it seems likely this need extends wherever there are septic systems are present in significant numbers.



Castlewood State Park overlooking the Meramec River, courtesy Missouri State Parks

Appendix

Kiefer Creek Resident Septic Survey

East-West Gateway Council of Governments is conducting a survey to learn more about homeowner interest in and knowledge about septic systems in your neighborhood.

The survey should take 3 - 5 minutes to complete. Your response will remain anonymous and will be combined with other responses in a final report.

To take the survey, please follow the instructions below. Thank you!

To take the survey: Visit

<https://www.surveymonkey.com/r/KieferCreek>

or Scan the QR code



or Call 314-421-4220, ext. 218

For more information on septic system maintenance, visit

www.ewgateway.org/septicinfo



EAST-WEST GATEWAY
Council of Governments

One South Memorial Drive, Ste. 1600
St. Louis, MO 63102-2451

This project has been funded wholly or in part by the United States Environmental Protection Agency (EPA) and the Missouri Department of Natural Resources (MDNR) under assistance agreement C6007476-16 to East-West Gateway Council of Governments. It has been subjected to the EPA and the department's product and administrative review and has been approved for production. The contents of this document do not necessarily reflect the view and policies of the EPA or the department, nor does the EPA or the department endorse trade names or recommend the use of commercial products mentioned in this document.

EWG is committed to ensuring that this survey is accessible. To request a reasonable accommodation to participate in this survey please contact EWG's Title VI Coordinator at (314) 421-4220 or (618) 274-2750 or titlevi@ewgateway.org.



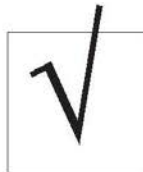
Printed on Recycled Paper

Kiefer Creek Resident Septic Survey



EAST-WEST GATEWAY
Council of Governments
One South Memorial Drive, Ste. 1600
St. Louis, MO 63102-2451

Take the Survey
Your Opinion Counts



A.2 Kiefer Resident Septic Survey

Kiefer Creek Septic Feasibility Study Homeowner Survey

Thank you for filling out our survey on septic systems in the Kiefer Creek watershed!

East-West Gateway Council of Governments is conducting a survey to learn more about homeowner interest in and knowledge about septic systems in your neighborhood. The survey should take 3 - 5 minutes to fill out. Your response will remain anonymous and will be combined with other responses in a final report. At the end, you will find a helpful link for information on maintaining septic systems.

This project has been funded wholly or in part by the United States Environmental Protection Agency (EPA) and the Missouri Department of Natural Resources (MDNR) under assistance agreement C6007476-16 to East-West Gateway Council of Governments. It has been subjected to the EPA and the department's product and administrative review and has been approved for production. The contents of this survey do not necessarily reflect the view and policies of the EPA or the department, nor does the EPA or the department endorse trade names or recommend the use of commercial products mentioned in this survey.

Kiefer Creek Septic Feasibility Study Homeowner Survey

1. Do you own or rent your home?

- ☐ Own
- ☐ Rent

2. Does your home currently have a septic system?

- ☐ Yes
- ☐ No
- ☐ Not sure

Kiefer Creek Septic Feasibility Study Homeowner Survey

3. What is the age of your septic system in years?

- ☐ 0 - 5 year
- ☐ 6 - 10 years
- ☐ 11 - 15 years
- ☐ 16 - 20 years
- ☐ 21 - 25 years
- ☐ 26 - 30 years
- ☐ 31 - 35 years
- ☐ 36 - 40 years
- ☐ 40+ years
- ☐ I don't know

4. Has your septic system been pumped out in the last 5 years?

- ☐ Yes
- ☐ No
- ☐ Not sure

Kiefer Creek Septic Feasibility Study Homeowner Survey

5. How much did the pump-out cost (approximately)?

6. How often do you pump-out your septic system?

- ☐ 3 or more times per year
- ☐ 1 to 2 times per year
- ☐ 1 time per year
- ☐ 1 time every 2 years
- ☐ 1 time every 3 years
- ☐ 1 time every 4 or more years
- ☐ As needed

7. Does the cost of pump-outs affect how often you clean out your septic system?

- ☐ Yes
- ☐ No

Kiefer Creek Septic Feasibility Study Homeowner Survey

8. Has your septic system been repaired in the last 10 years?

- ☐ Yes
- ☐ No
- ☐ Not sure

Kiefer Creek Septic Feasibility Study Homeowner Survey

9. What was the repair?

10. How much did it cost (approximately)?

Kiefer Creek Septic Feasibility Study Homeowner Survey

11. Does your septic system need to be repaired?

- ☐ Yes
- ☐ No
- ☐ Not sure

Kiefer Creek Septic Feasibility Study Homeowner Survey

12. What is causing the repair delay? Check all that apply.

- ☐ Costs too much
- ☐ No contractor available
- ☐ Contractor delays
- ☐ Can't get a permit
- ☐ Can't bring system up to code
- ☐ Other (please specify)

Kiefer Creek Septic Feasibility Study Homeowner Survey

13. Do you feel that your septic system needs to be replaced?

- ☐ Yes
- ☐ No
- ☐ Not sure

Kiefer Creek Septic Feasibility Study Homeowner Survey

14. Please give the reason the system needs replacing. Check all that apply.

- ☐ Too old
- ☐ Does not work
- ☐ Costs too much to repair
- ☐ Costs too much to maintain
- ☐ Not enough capacity
- ☐ Take advantage of new technologies
- ☐ Plans to sell home
- ☐ Other (please specify)

15. Will you be replacing your septic system in the next 5 years?

- ☐ Yes
- ☐ No
- ☐ Not sure

Kiefer Creek Septic Feasibility Study Homeowner Survey

14. Please give the reason the system needs replacing. Check all that apply.

- ☐ Too old
- ☐ Does not work
- ☐ Costs too much to repair
- ☐ Costs too much to maintain
- ☐ Not enough capacity
- ☐ Take advantage of new technologies
- ☐ Plans to sell home
- ☐ Other (please specify)

15. Will you be replacing your septic system in the next 5 years?

- ☐ Yes
- ☐ No
- ☐ Not sure

Kiefer Creek Septic Feasibility Study Homeowner Survey

16. Please provide a reason that your septic system will not be replaced. Check all that apply.

- ☐ Costs too much to replace
- ☐ Cannot meet building codes
- ☐ Lot size too small
- ☐ Required to connect to sewer
- ☐ Plan to connect to sewer
- ☐ Other (please specify)

Kiefer Creek Septic Feasibility Study Homeowner Survey

17. Which of the following would help you schedule more regular septic pump-outs and/or maintenance? Check all that apply.

- ☐ Rebate for pump-out
- ☐ Low or no interest loan for repair
- ☐ Low or no interest loan for replacement
- ☐ No type of assistance is needed
- ☐ Low or no interest loan for sewer tie on

Kiefer Creek Septic Feasibility Study Homeowner Survey

18. What is your annual household income?

- ☐ Less than \$25,000
- ☐ \$25,000 to \$34,999
- ☐ \$35,000 to \$49,999
- ☐ \$50,000 to \$74,999
- ☐ \$75,000 to \$99,999
- ☐ \$100,000 or more

19. What is your zip code?

20. Is there anything you would like to add regarding septic systems?

21. If you would like to receive updates regarding this study, please provide your email address.

Name

Email Address

Thank you for taking the time to fill out our survey! For more information on septic systems and septic system maintenance, please visit www.ewgateway.org/septicinfo.

A.3 Septic Education Web Page, www.ewgateway.org/septicinfo

Home > Community Planning > Environmental > Water Resources > [Septic System Information](#)

SEPTIC SYSTEM INFORMATION

Understanding and maintaining your home's septic system has multiple benefits.

- It saves you money! \$150 – \$300 for periodic pump outs is a bargain compared to the thousands needed to repair or replace your septic system.
- It protects your property value and can make it easier to sell your home. No one wants to buy a house with a failing septic system.
- It protects your health and the health of your family and neighbors. Household wastewater contains disease causing bacteria and viruses and high levels of nitrogen and phosphorus. If a septic system is well-maintained and working properly, it will remove most of these pollutants. Insufficiently treated sewage from septic systems can cause groundwater contamination, which can spread disease in humans and animals. Improperly treated sewage poses the risk of contaminating nearby surface waters threatening swimmers with various infectious diseases, from eye and ear infections to acute gastrointestinal illness and hepatitis.
- It protects the environment. In the U.S., more than four billion gallons of wastewater are dispersed below the ground's surface every day. Ground water contaminated by poorly or untreated household wastewater poses dangers to drinking water and to the environment. Malfunctioning septic systems release bacteria, viruses, and chemicals toxic to local waterways. When these pollutants are released into the ground, they eventually enter streams, rivers, lakes, and more, harming local ecosystems by killing native plants, fish, and shellfish.



- > Homeowner Tips
- > Technical Guides and Information
- > Quick Print Guides for Kitchens and Bathrooms

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A.4 www.ewgateway.org/septicinfo Web Statistics

Time range: 04/07/2022 06:53:13 - 06/22/2022 04:55:14

Report for Septic Info Hits www.ewgateway.org: General Statistics

Powered by Weblog Expert

Generated on Wed Jun 22, 2022 - 13:07:30

Summary	
Hits	
Total Hits	151
Visitor Hits	151
Spider Hits	0
Average Hits per Day	2
Average Hits per Visitor	3.20
Cached Requests	0
Failed Requests	0
Page Views	
Total Page Views	79
Average Page Views per Day	1
Average Page Views per Visitor	1.81
Visitors	
Total Visitors	49
Average Visitors per Day	0
Total Unique IPs	45
Bandwidth	
Total Bandwidth	0.8
Visitor Bandwidth	0.8
Spider Bandwidth	0.8
Average Bandwidth per Day	0.8
Average Bandwidth per Hit	0.8
Average Bandwidth per Visitor	0.8



Report for Septic Info Hits www.ewgateway.org: Access Statistics

Powered by
WebLog Expert

Time range: 04/07/2022 08:53:13 - 08/22/2022 04:55:14

Generated on Wed Jun 22 2022 - 13:07:50

Files

Most Downloaded Files

	File	Hits	Incomplete Requests	Visitors	Bandwidth (KB)
1	http://www.ewgateway.org/wp-content/uploads/2022/04/mu-household-wastewater-septic-systems.pdf	8	0	7	0
2	http://www.ewgateway.org/wp-content/uploads/2022/04/misd-homeowner-guide.pdf	8	0	7	0
3	http://www.ewgateway.org/wp-content/uploads/2022/04/new-septic-manual-structure.pdf	8	0	7	0
4	http://www.ewgateway.org/wp-content/uploads/2022/04/septicman-venti-flyer.pdf	7	0	6	0
5	http://www.ewgateway.org/wp-content/uploads/2022/04/septicman-quick-guide.pdf	7	0	6	0
6	http://www.ewgateway.org/wp-content/uploads/2022/04/septicman-top-10-for-owners-flyer.pdf	6	0	5	0
7	http://www.ewgateway.org/wp-content/uploads/2022/04/septicman-kitchen-postcard.pdf	6	0	5	0
8	http://www.ewgateway.org/wp-content/uploads/2022/04/new-septic-guidance-for-floods.pdf	6	0	5	0
9	http://www.ewgateway.org/wp-content/uploads/2022/04/new-homeowner-guide.pdf	6	0	5	0
10	http://www.ewgateway.org/wp-content/uploads/2022/04/septicman-bath-room-placard.pdf	6	0	5	0
Total		68	0	N/A	0

Images

Most Requested Images

	Image	Hits	Incomplete Requests	Visitors	Bandwidth (KB)
1	http://www.ewgateway.org/wp-content/uploads/2022/04/top-img-on-septic-page.png	14	0	13	0
Total		14	0	N/A	0