Kenai Watershed Forum

Water Quality Assessment of the Kenai River Watershed from July 2000 to July 2014

By Edgar Guerron Orejuela **Water Quality Report**

Updated November 2, 2016 with Appendix: *Supplemental Analysis of Recent Zinc and Copper Concentrations in the Kenai River Watershed*

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Conversions:
1 gram = 1000 micrograms
°F = 9/5(°C) + 32

Unit Abbreviations:
mg/L = milligrams per liter
μg/L = micrograms per liter
CFU/100m = coliform forming units per 100 milliliters
μS/cm = microsiemens per centimeter
NTU= nephelometric turbidity unit

Acronyms:
USEPA (United States Environmental Protection Agency)
ADEC (Alaska Department of Environmental Conservation)
DRO (Diesel Range Organics)
GRO (Gasoline Range Organics)
RRO (Residual Range Organics)
BTEX (Benzene, Toluene, Ethylbenzene, and Xylenes)

Abstract

The Kenai Watershed Forum and several governmental agencies formed a cooperative partnership to collect and analyze water samples from 13 locations along the Kenai River mainstem and from eight of its tributaries every spring and summer from 2000 to 20014. Laboratory analysis was conducted on dissolved metals, total metals, nutrients, hydrocarbons, fecal coliform bacteria, and several other parameters. These results are herein compared to Alaska and federal water quality standards for freshwater aquatic life. Total metals had relatively few exceedances, excluding zinc levels in Slikok Creek and Soldotna Creek. Iron levels consistently exceeded the standard, especially in the Kenai River estuary and in the tributaries. Calcium and magnesium do not have applicable Alaska or federal standards; however, they were highest in the estuary and in Soldotna Creek. Nitrate concentrations decreased from Kenai Lake to the estuary while phosphorus increased. In the lower river, median hydrocarbon concentrations exceeded the Alaska standard during the summer. Total suspended solids and turbidity levels were highest in the estuary and in the Killey River. Water temperatures exceeded several standards in the summer, especially in the Moose River and other tributaries. Further study and any necessary restoration should be considered for locations with exceedances of zinc, hydrocarbons, iron, and water temperature.

Introduction

This report summarizes water quality data collected between summer 2000 and summer 2014 from 21 sampling locations in the Kenai River mainstem and its tributaries. Local, state, federal, and tribal government entities, as well as several local area non-profits, formed a cooperative partnership so that sampling teams from various agencies were able to collect water samples twice per year, once in the spring and once in the summer, and this effort continues beyond the publication of this report. The locations of the sampling sites are identified with maps, GPS coordinates, and photographs. Trends in the data are highlighted, and the results are compared to the Alaska and federal water quality standards for freshwater aquatic life.

The water quality data focuses on metals, nutrients, hydrocarbons, fecal coliform bacteria, and various field parameters. Arsenic, cadmium, chromium, copper, lead, and zinc are the dissolved metals that have been analyzed, and calcium, iron, and magnesium were reported as total metals. Additionally, the report focuses on the nutrients nitrate and phosphorus. Specifically, the hydrocarbons that were collected and analyzed include diesel range organics, gasoline range organics, residual range organics, benzene, toluene, ethylbenzene, m,p-xylene, and o-xylene. Fecal coliform bacteria, pH, specific conductance, total suspended solids, turbidity, and water temperature are the remaining parameters that have been included in the analysis.

The results are displayed in graphs with associated written analyses and tables. The graphs display the median and variance for each parameter at a specific location, and these graphs are separated depending on whether the data was collected in the spring or in the summer. In some cases, parameters were present in levels that could not be detected by current laboratory analysis, and when this occurred with over 80% of the samples, scatter plots have been displayed omitting the unknown low levels. A trend analysis was conducted for the following parameters: Lead, Zinc and BTEX; based on the nature of the data, a polynomial line was used because it is the best way to capture and represent the fluctuations in the data. No trend analysis was conducted at sampling stations that had less than four detection instances during the fourteen years.

Complete data tables can be found in Appendix 1 and 4, which are organized by parameter and site location, respectively.

Description of the Study Area

Located in southcentral Alaska, the Kenai River is part of the Cook Inlet Basin and is intricately linked to the surrounding communities through sport and commercial fishing, tourism, recreation, and the propagation of fish and wildlife (see Figure 1). Five species of Pacific salmon flourish in the Kenai River Watershed, comprising 30% of the commercial Chinook harvest and 40% of the commercial sockeye harvest (Glass, 1999). Surface runoff, groundwater composition, natural minerals, aquatic plants and animals, and human activities can affect water quality in this area (Glass, 1999). Potential sources of pollution from humans include gasoline powered boat engines, agriculture, mining, street runoff, and perforated septic tanks.

Acknowledgements

This study could not have been completed without the assistance and cooperation of many state agencies including the Alaska Department of Environmental Conservation (ADEC), the Alaska Department of Natural Resources, and the Alaska Department of Fish and Game. The Kenaitze Indian Tribe, Cook Inlet Aquaculture Association, the Nature Conservancy, Analytica Laboratories, Kenai Peninsula Trout Unlimited and Taurianen Engineering and Testing (previously known as Northern Testing Laboratories) also supported this project. Additional cooperation transpired with the United States Forest Service, the United States Fish and Wildlife Service through the Kenai National Wildlife Refuge, the Kenai Peninsula Borough, the City of Soldotna, and the City of Kenai. Finally, many landowners graciously allowed access to the Kenai River and its tributaries from their property.

Thank you to all the staff at the Kenai Watershed Forum that made this project possible. Special thanks to Robert Ruffner, Branden Bornemann, Grant Humphreys and Shannon Dillard who where very involved in the collection of data and completion of this report.

Methods

Water samples were collected at 13 locations along the Kenai River mainstem and from eight tributaries near their confluence points (see Figure 2). These locations were chosen by dozens of participants in order to accurately represent the Kenai River Watershed's ambient water quality conditions (Ashton, 1998). Sampling occurred in the spring and the summer each year beginning in summer 2000.

After a half-day training session, staff from governmental and non-governmental agencies dispersed to sampling locations in teams of two or more to collect samples. All samples were collected on the same day, and the timing of the sampling coincided with an outgoing tide, near low tide, to reduce the potential of collecting water from Cook Inlet. Typically, the individual collecting the sample waded into the water until the water level was around two feet deep, and the sample was collected while facing upstream. If the individual collected the sample using a boat, the samples were collected from the bow while the boat faced upstream. The bottles were placed approximately one foot below the surface to collect the water samples and then preserved for transportation to the laboratory. Beginning in spring 2002, two duplicate samples were collected for quality control. These procedures follow the protocols established in a Quality Assurance Project Plan that was originally approved by the ADEC in 2001 and later revised and approved by ADEC again in 2013.

The software used for the analysis is "R"and Microsoft Excel. In instances where data was reported as not detected the half of the MDL or MRL was used to estimate the values and run the analysis. The MRL was used because during the early years of the project, the lab only provided this information and not the MDL.

Maps of the Kenai River Watershed

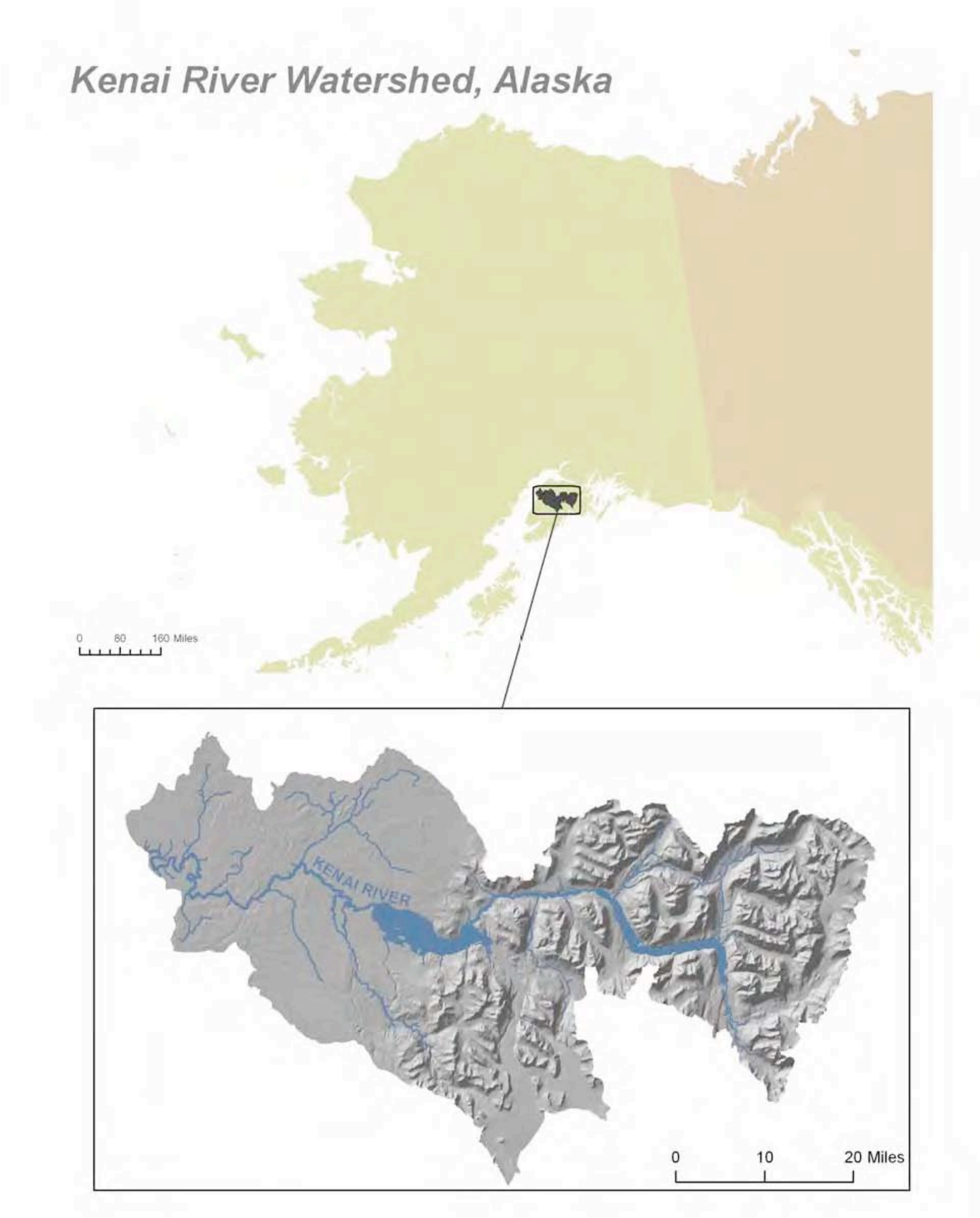

Figure 1: Location of Kenai River Watershed

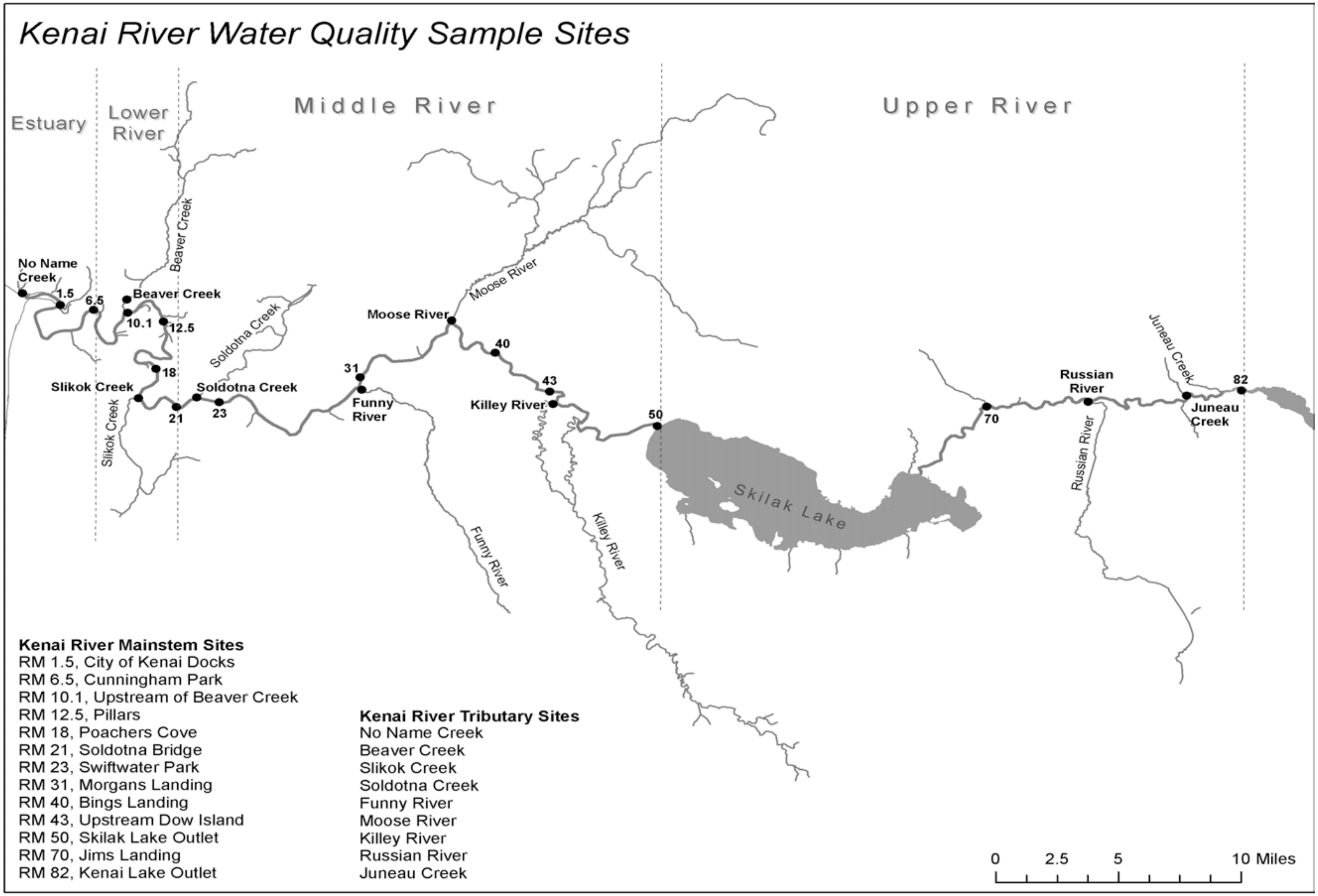

Figure 2: Kenai River Water Quality Sample Sites

Sampling Site Description and Photograph

Kenai River Mainstem Sites

Kenai River Mile 82
This site is near the Kenai Lake Outlet and Kenai Lake Bridge and is located at 60.492007 N and -149.810844 W. Samples are typically collected downstream of the boat launch.

Figure 3: Kenai River Mile 82 (Kenai Lake Outlet) on 07/26/05.

Kenai River Mile 70
This site is near Jim's Landing and is located at 60.481392 N and -150.115020 W. The sample is typically collected 40 feet downstream of the boat launch.

Figure 4: Kenai River Mile 70 (Jim's Landing) upstream on 07/22/14.

Kenai River Mile 50
This site is near the Skilak Lake Outflow and is located at 60.467517N and -150.507789 W.Samples are typically collected between the swan signs off of the south bank.

Figure 5: Kenai River Mile 50 (Skilak Lake Outflow) on 04/22/08.

Kenai River Mile 43
This site is upstream of Dow Island and is located at 60.489844 N and -150.636905 W. The samples are typically collected 100 feet upstream of the point of Dow Island.

Figure 6: Kenai River Mile 43 (upstream of Dow Island) on 07/22/14.

Kenai River Mile 40
This site is near Bings Landing and is located at 60.515441 N and -150.702069 W. Samples are typically collected in front of the boat launch near the center of the river.

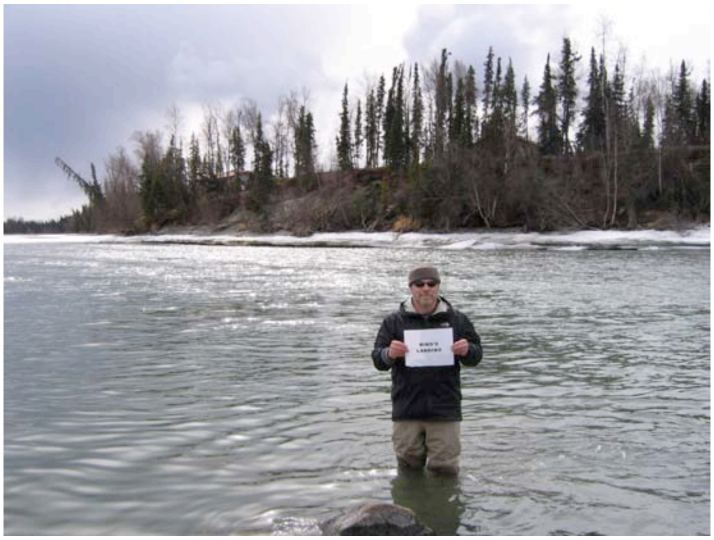

Figure 7: Kenai River Mile 40 (Bings Landing) on 04/26/11.

Kenai River Mile 31
This site is near Morgan's Landing and is located at 60.498284 N and -150.863121 W. Sampling typically occurs down the abandoned steep road behind the headquarters building.

Figure 8: Kenai River Mile 31 (Morgan's Landing) on 05/01/12.

Kenai River Mile 23
This site is near Swiftwater Park and is located at 60.480338 N and -151.030847 W. Samples are typically collected mid-channel in front of the ramp.

Figure 9: Kenai River Mile 23 (Swiftwater Park) on [no date].

Kenai River Mile 21
This site is near the Soldotna Bridge and is located at 60.476634 N and -151.082099 W. Samples are typically collected 20 feet downstream of the bridge on the south bank.

Figure 10: Kenai River Mile 21 (Soldotna Bridge) on 07/26/05.

Kenai River Mile 18
This site is near Poacher's Cove and is located at 60.502005 N and -151.106973 W. Samples are typically collected mid-channel just downstream of an island.

Figure 11: Kenai River Mile 18 (Poacher's Cove) on 07/17/07.

Kenai River Mile 12.5
This site is near the Pillars Boat Launch and is located at 60.533743 N and -151.099258 W. Samples are typically collected toward the center of the river across from the dock.

Figure 12: Kenai River Mile 12.5 (Pillars Boat Launch) on 07/17/07.

Kenai River Mile 10.1
This site is upstream of Beaver Creek and is located at 60.539279 N and -151.142263 W. Samples are typically collected 200 yards upstream of the Beaver Creek and Kenai River confluence. During July 2000, April 2001, and July 2001, samples were collected downstream of the Kenai River and Beaver Creek confluence, and no samples were collected from this site in April 2002.

Figure 13: Kenai River Mile 10.1 (upstream of Beaver Creek on 07/17/07

Kenai River Mile 6.5
This site is near Cunningham Park and is located at 60.5408100 N and -151.182780 W. Sampling typically occurs straight out from the public-use boardwalk and can vary due to the
tidal stage.

Figure 14: Kenai River Mile 6.5 (Cunningham Park) on 07/26/05.

Kenai River Mile 1.5
This site is near the City of Kenai Dock and is located at 60.543680 N and -151.222940 W.
Samples are typically collected at the north end of the public fueling dock.

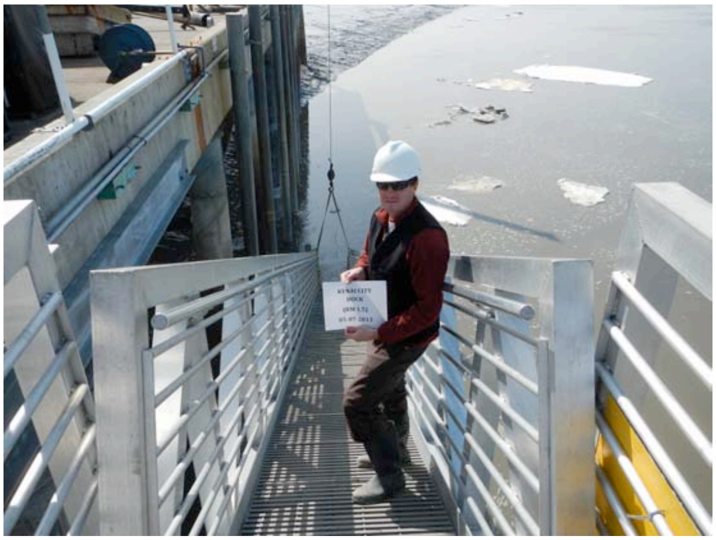

Figure 15: Kenai River Mile 1.5 (Kenai City Dock) on 05/02/13.

Kenai River Tributary Sites

Juneau Creek

This site is located at 60.481392 N and -150.115020 W. The sample is typically collected 40 feet downstream of the boat launch at Alaska Wildlands.

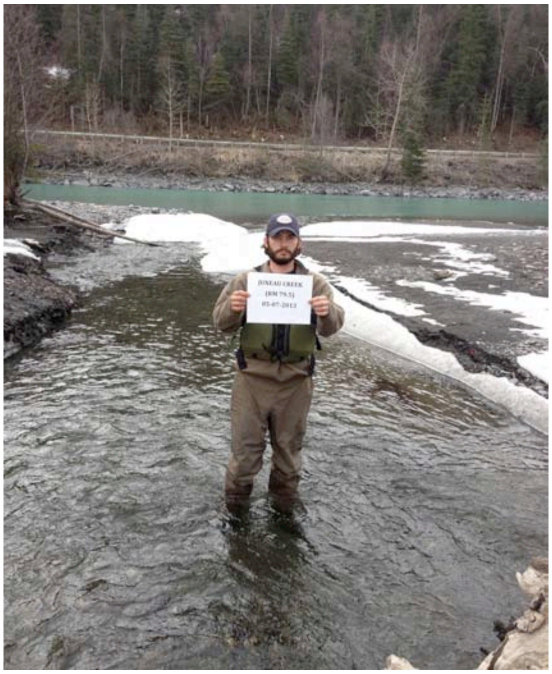

Figure 16: Juneau Creek looking downstream on 05/07/13.

Russian River

This site is a Kenai River tributary and is located at 60.484622 N and -149.993955 W. Samples are typically collected 90 feet upstream of the sanctuary sign.

Figure 17: Russian River looking upstream on 07/26/05.

Killey River
This site is a Kenai River tributary and is located at 60.481518 N and -150.632498 W. Sampling typically occurs 100 yards upstream from the Kenai River confluence across from the fish table.

Figure 18: Killey River on 04/29/14.

Moose River
This site is a Kenai River tributary and is located at 60.536870 N and -150.754724 W. Sampling typically occurs upstream of the parking area.

Figure 19: Moose River on 04/26/05.

Funny River
This site is a Kenai River tributary and is located at 60.489963 N and -150.860982 W. Samples are typically collected 75 feet downstream of the bridge.

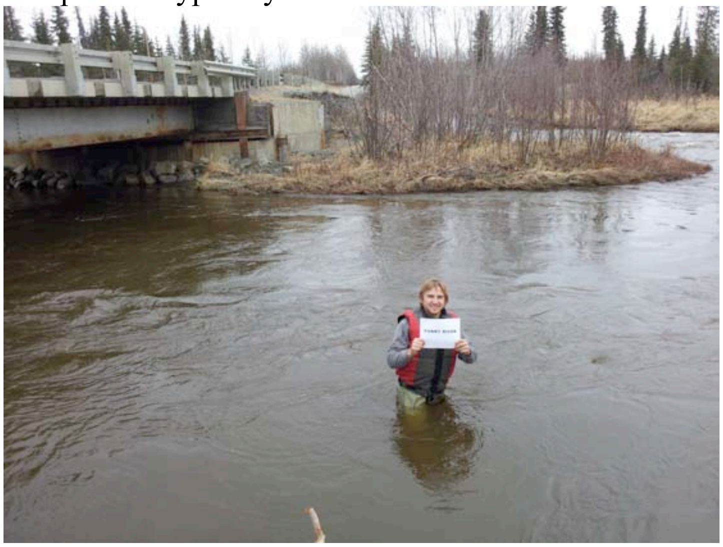

Figure 20: Funny River on05/01/12.

Soldotna Creek
This site is a Kenai River tributary and is located at 60.483364 N and -151.057656 W. Sampling typically occurs mid-channel.

Figure 21: Soldotna Creek on 07/17/07.

Slikok Creek
This site is a Kenai River tributary and is located at 60.482318 N and -151.127053 W. Samples are typically collected in the mid-channel of Slikok Creek.

Figure 22: Slikok Creek on 05/07/13.

Beaver Creek
This site is a Kenai River tributary and is located at 60.548029 N and -151.143240 W.

Figure 23: Beaver Creek on 04/28/09.

No Name Creek
This site is a Kenai River tributary and is located at 60.550888 N and -151.268417 W. Samples are typically collected approximately 500 feet upstream of the confluence with the Kenai River, just upstream of the footbridge.

Figure 24: No Name Creek on 07/22/09.

Parameters and Graphs

Interpreting Box Plots

Each of the following graphs display the sampling results for a specific parameter, like arsenic. Within these graphs, a box and extending lines represent the results reported at each sampling site. A horizontal line within the box corresponds to the median of the data. The box contains 50% of the data and the vertical lines display the minimum and maximum values. Any data points that fall outside of the acceptable range are outliers and are portrayed as small circles.

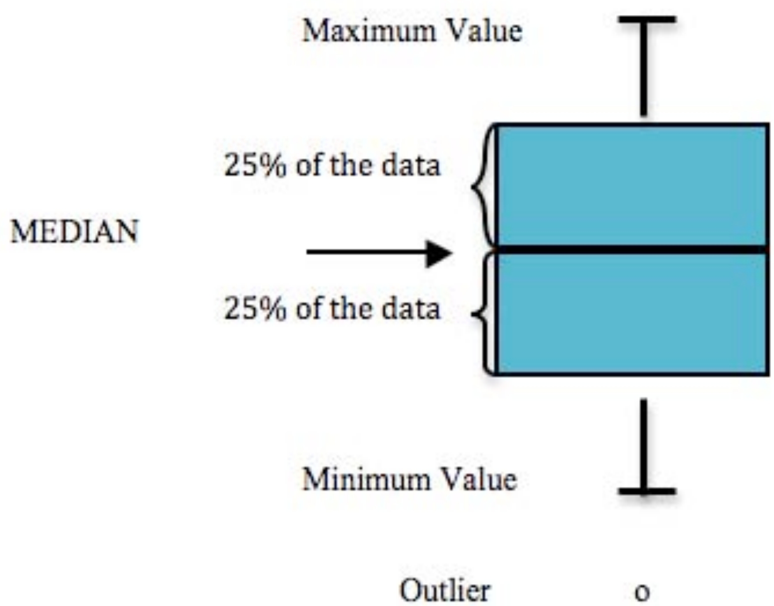

Figure 25: Diagram of the components of a box plot

Arsenic

Natural sources of arsenic in the Cook Inlet Basin include volcanic ash, glaciation, and mineral deposits. Only a minimal contribution of arsenic results from human activities like wood preservation (Glass and Frenzel, 2001). Arsenic is naturally present as a compound in rocks within the Kenai River Watershed, and as a dissolved metal, it can be acutely or chronically toxic to fish (Glass, 1999). The Alaska Department of Environmental Conservation (ADEC) and the United States Environmental Protection Agency (USEPA) have set the standard at 150 micrograms per liter (µg/L) for freshwater aquatic life chronically exposed to arsenic and 10 micrograms per liter (µg/L) for drinking water (Appendix 2) (USEPA, 2014; ADEC, 2008).

None of the samples exceeded the Alaska or federal standard for freshwater aquatic life at any sampling location in spring or summer. The highest level detected in the mainstem was 46.5 µg/L at Mile 1.5 in May 2007, and arsenic was not detected on many occasions below the method detection limit (MDL) of 0.25 µg/L (Table 6). In the Kenai River mainstem, Mile 1.5 had the highest median level in the spring event and summer monitoring event, followed by Mile 6.5 in the spring event and Mile 23 during the summer monitoring event (figures 26 & 28). In the mainstem, higher arsenic levels occurred in the spring samples, while the tributaries levels were higher during the summer with more detected levels between the years 2007-2014 than any of the previous years. (Tables 6 & 32)

The highest concentration on the mainstem occurred at Mile 1.5 where arsenic was detected on every sampling event after 2005, while arsenic was detected on all sampling dates at Beaver Creek, Soldotna Creek, and Moose River. The concentrations of arsenic ranged from a high of 12.8 µg/L in Soldotna Creek in summer 2014 to below the MDL of 0.25 µg/L in many locations. Of the tributaries, Soldotna Creek had the highest median level, followed by Moose River and then Beaver Creek in summer and Soldotna, Beaver and Moose in spring. No Name Creek had the fewest incidences of arsenic detection of all the tributaries. (Tables 6 & 32)

When comparing the arsenic levels to the Alaska Department of Environmental Conservation standards for drinking water, the main stem at Mile 1.5 is the only station that presents multiple exceedances. All exceedances took place during the spring sampling events. (Tables 6 & 32)

Concentrations of arsenic are generally lower in surface streams than in groundwater, which is typically the source of drinking water (Glass and Frenzel, 2001). The USEPA set the criterion for arsenic in drinking water at 10 µg/L because arsenic has been linked to cancer, skin damage, and circulatory problems (USEPA, 2003). Although the levels of arsenic reported in this study do not exceed the national criterion for the health of an aquatic community in freshwater, groundwater may contain concentrations that are hazardous to human health, and all sources of drinking water should be tested for arsenic.

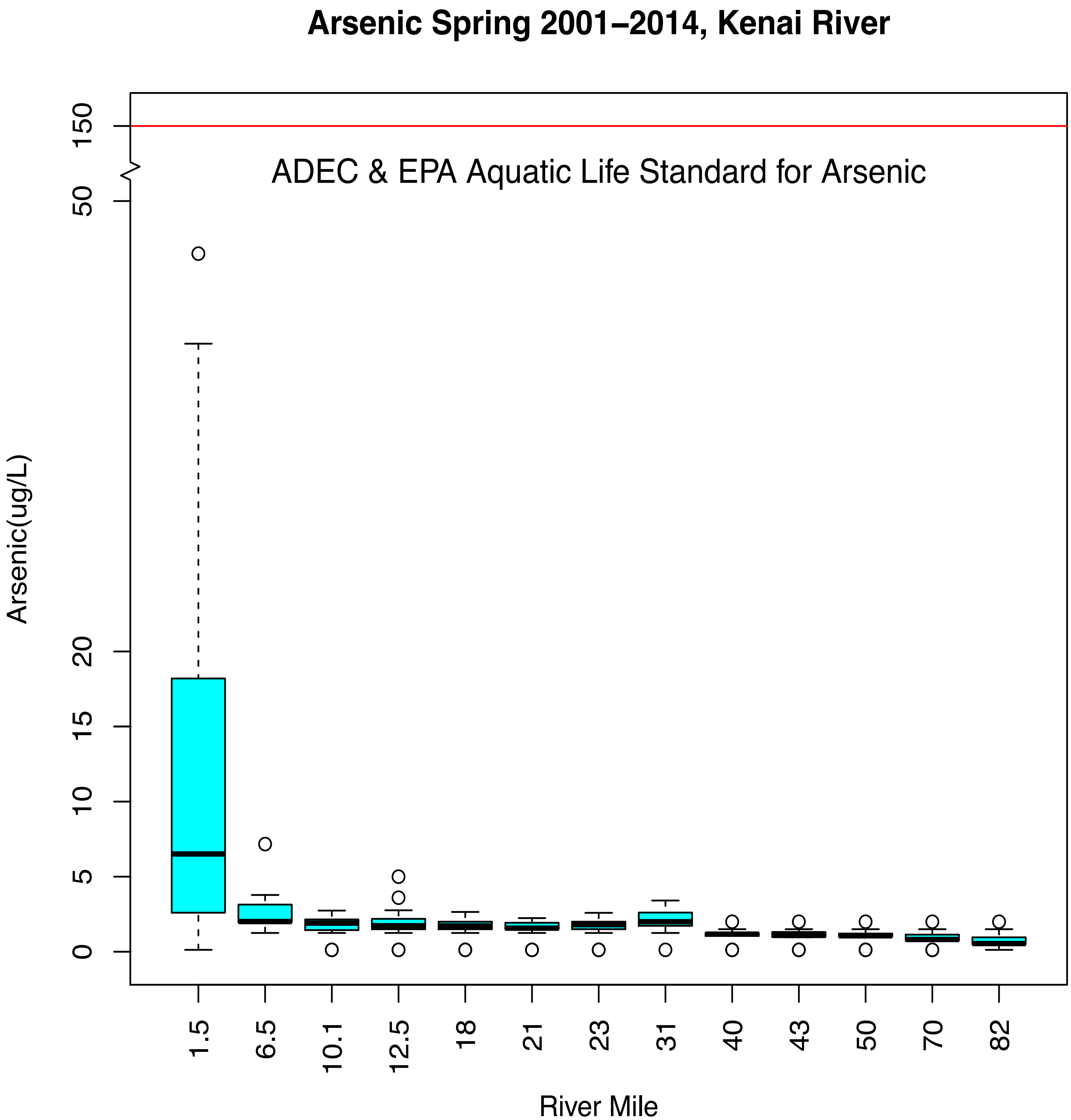

Figure 26: Arsenic Sampled at the Kenai River mainstem during spring 2001 to 2014. Since 36% of the samples are reported as below the MRL or MDL, these values have been estimated using values that are half of the MRL or MDL.

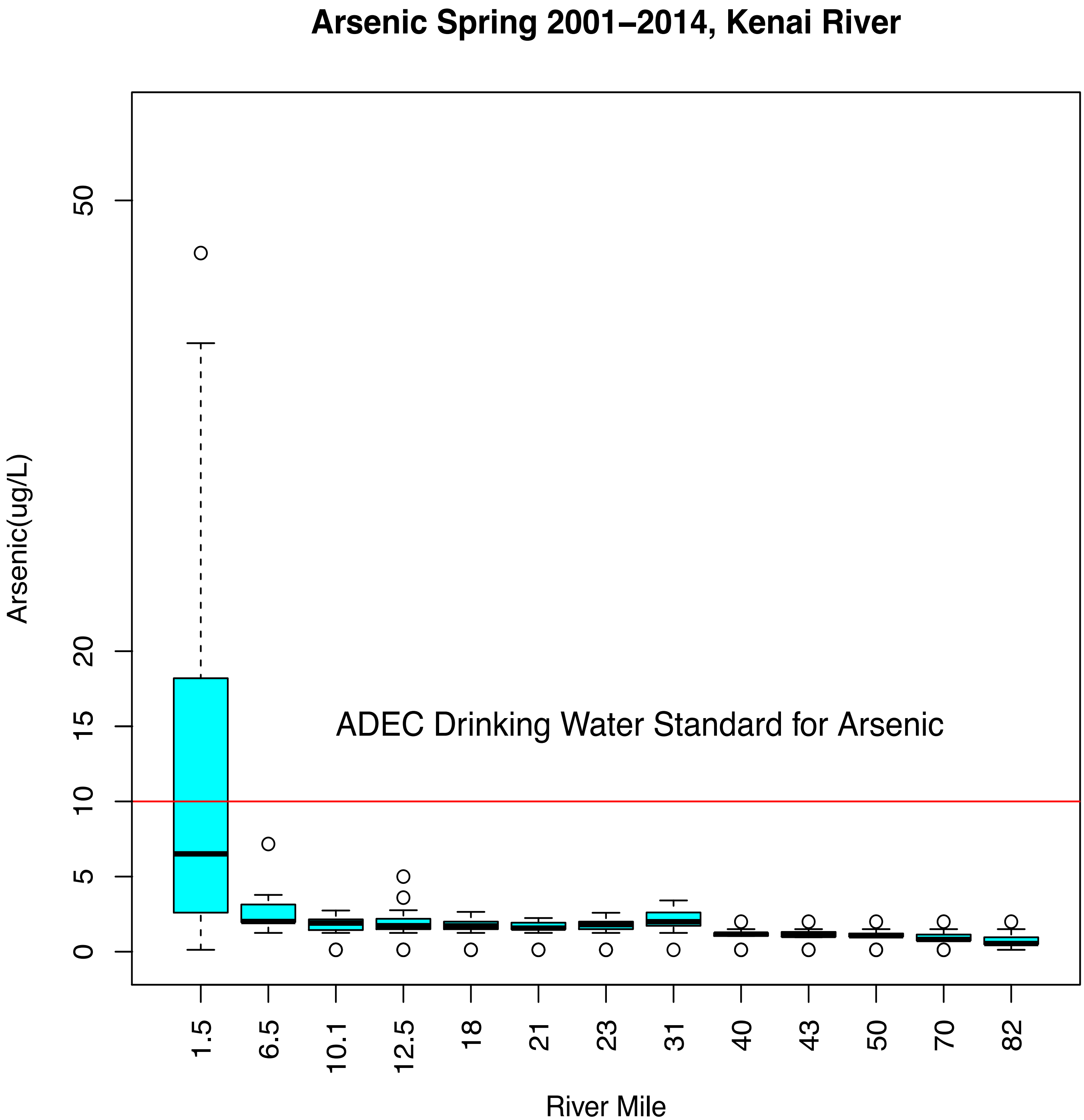

Figure 27: Arsenic sampled in the Kenai River mainstem during spring 2001 to 2014 compared to ADEC drinking water standards.
Since 36% of the samples are reported as below the MRL or MDL, these values have been estimated using values that are half of the MRL or MDL.

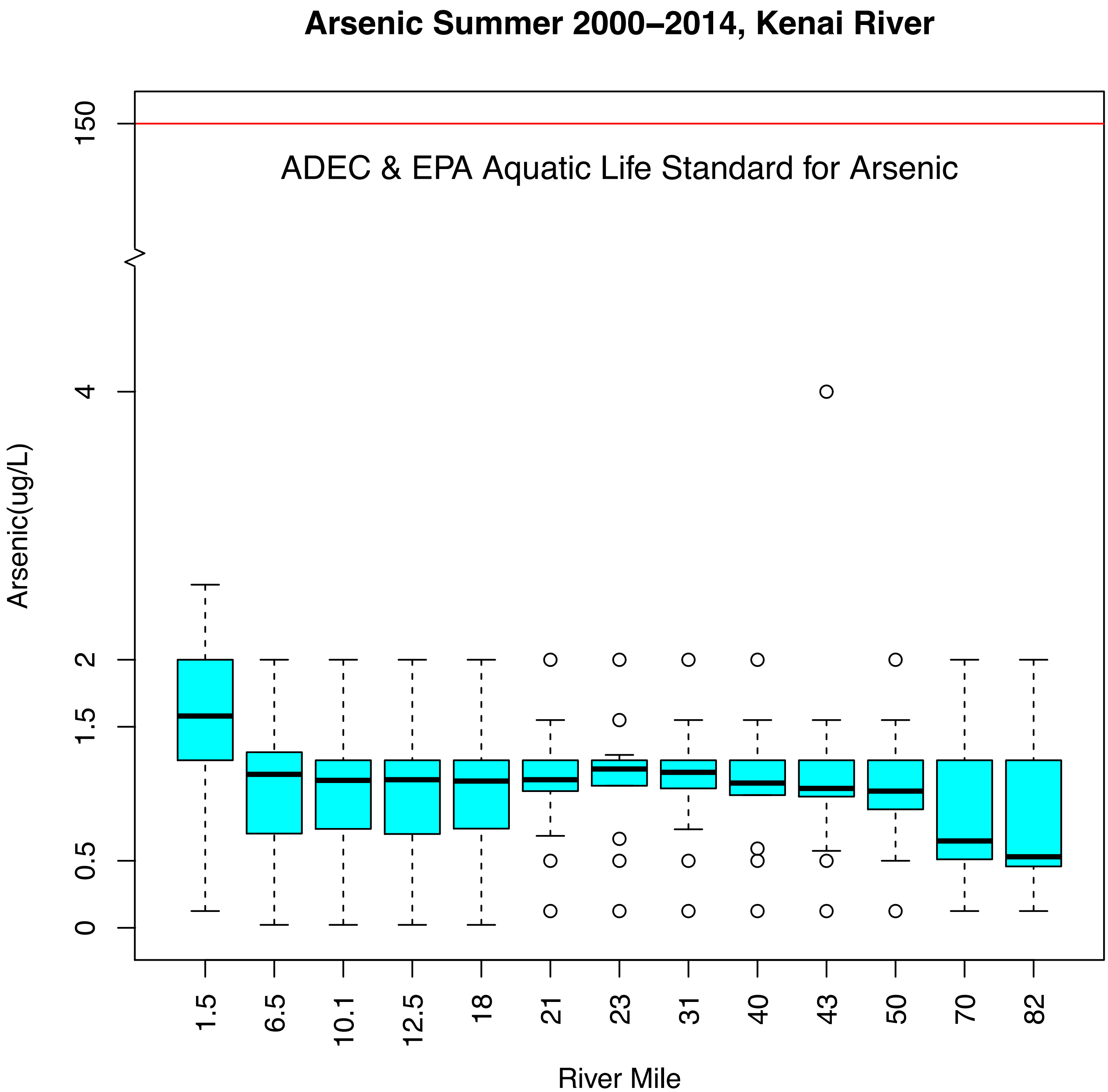

Figure 28: Arsenic sampled in the Kenai River mainstem during summer 2000 to 2014. Since 45% of the samples are reported as below the MRL or MDL, these values have been estimated using values that are half of the MRL or MDL.

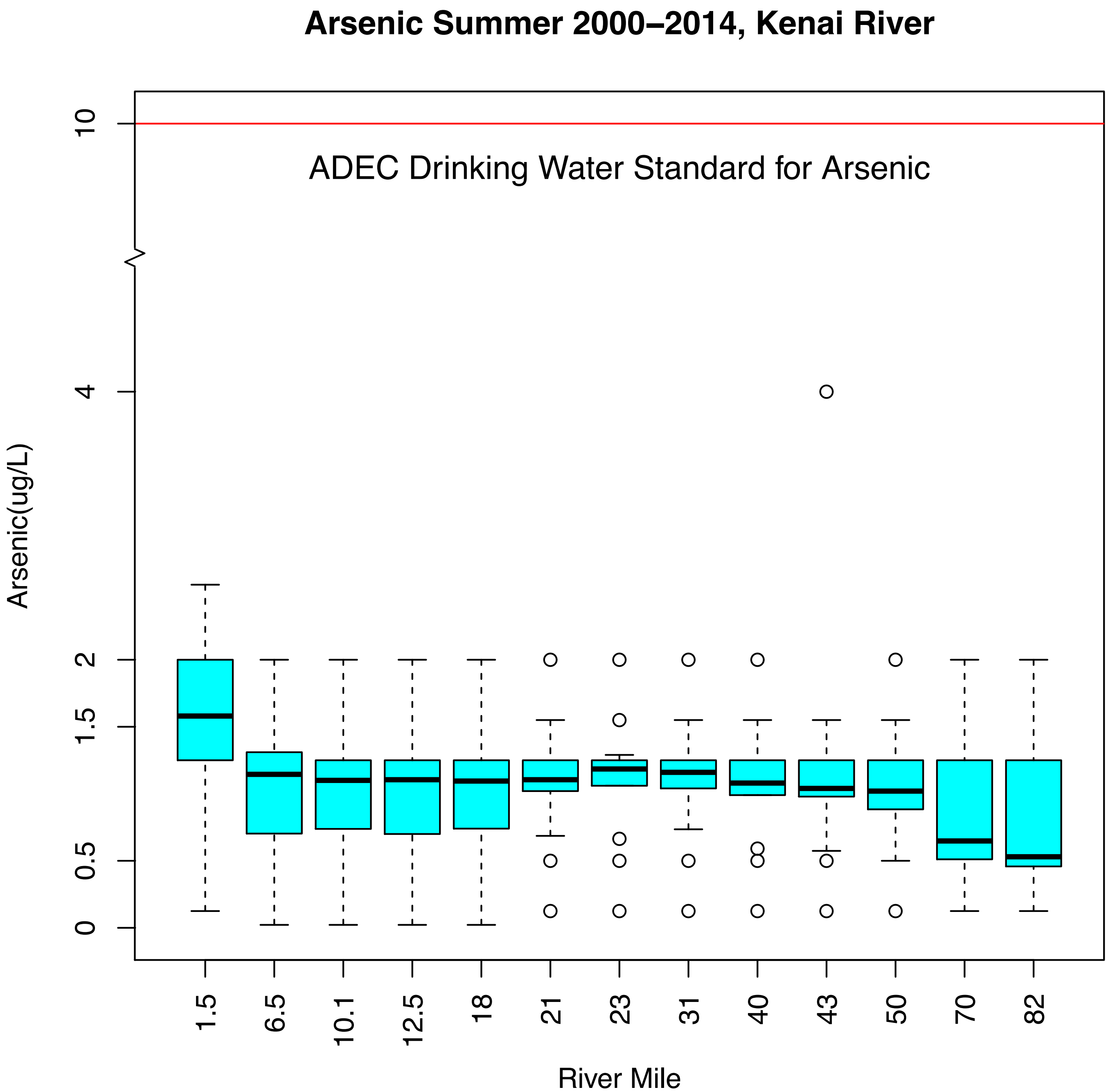

Figure 29: Arsenic sampled in the Kenai River mainstem during summer 2000 to 2014 compared to ADEC drinking water standards.
Since 45% of the samples are reported as below the MRL or MDL, these values have been estimated using values that are half of the MRL or MDL.

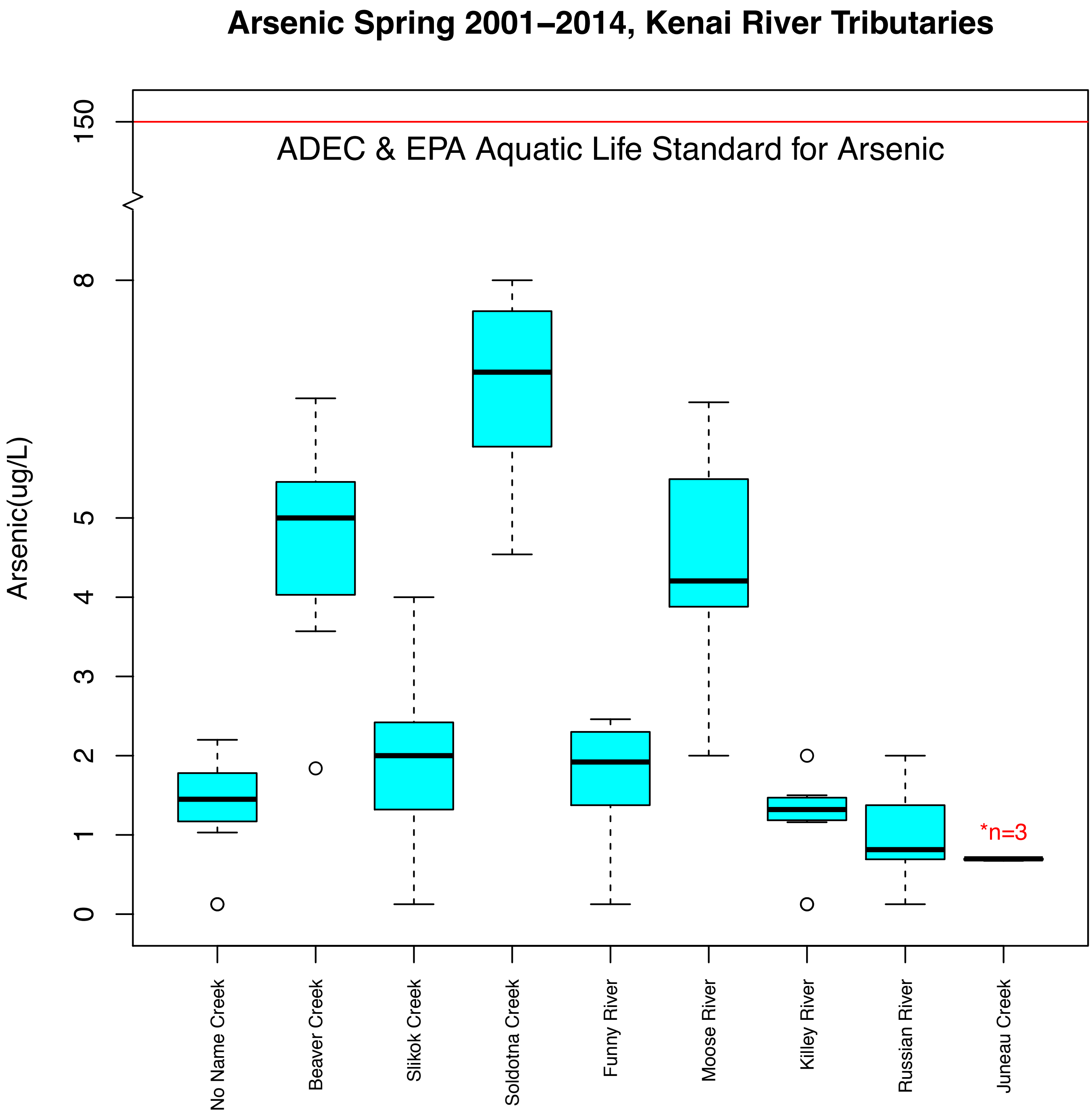

Figure 30: Arsenic sampled in Kenai River tributaries during spring 2001 to 2014. Since 25% of the samples are reported as below the MRL or MDL, these values have been estimated using values that are half of the MRL or MDL.

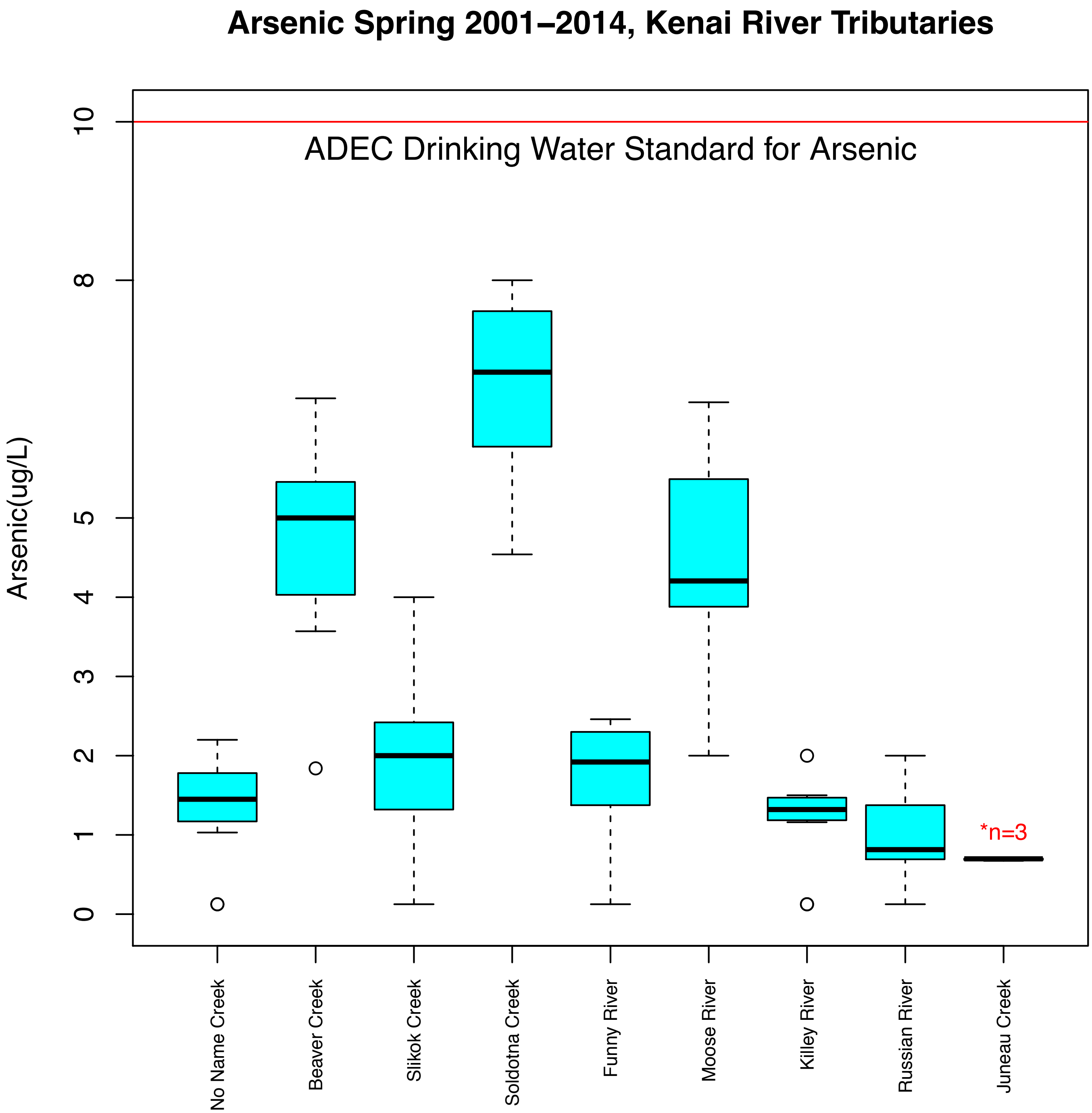

Figure 31: Arsenic sampled in Kenai River tributaries during spring 2001 to 2014 compared to ADEC drinking water standards.
Since 25% of the samples are reported as below the MRL or MDL, these values have been estimated using values that are half of the MRL or MDL.

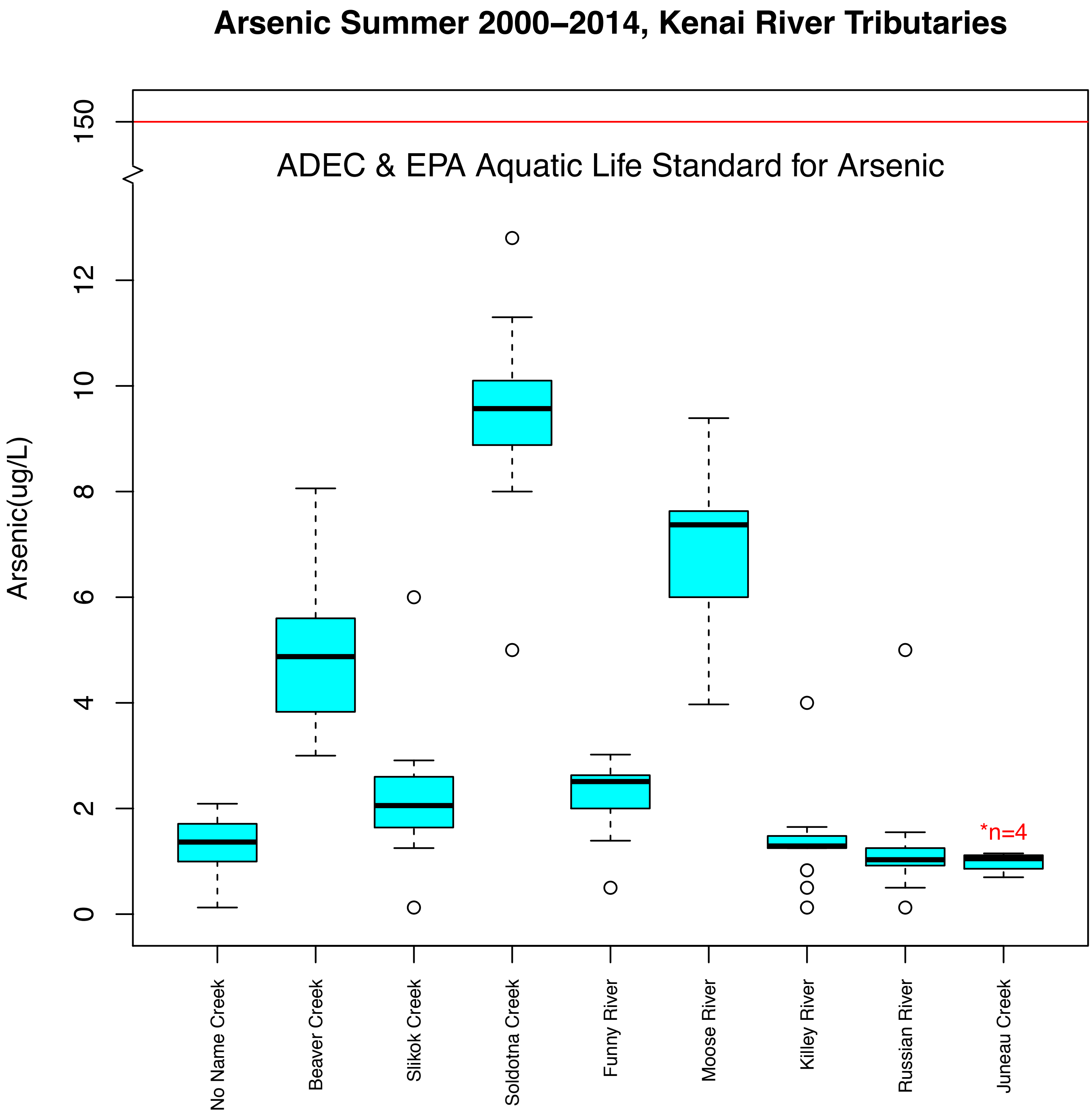

Figure 32: Arsenic sampled in Kenai River tributaries during summer 2000 to 2014. Since 20% of the samples are reported as below the MRL or MDL, these values have been estimated using values that are half of the MRL or MDL.

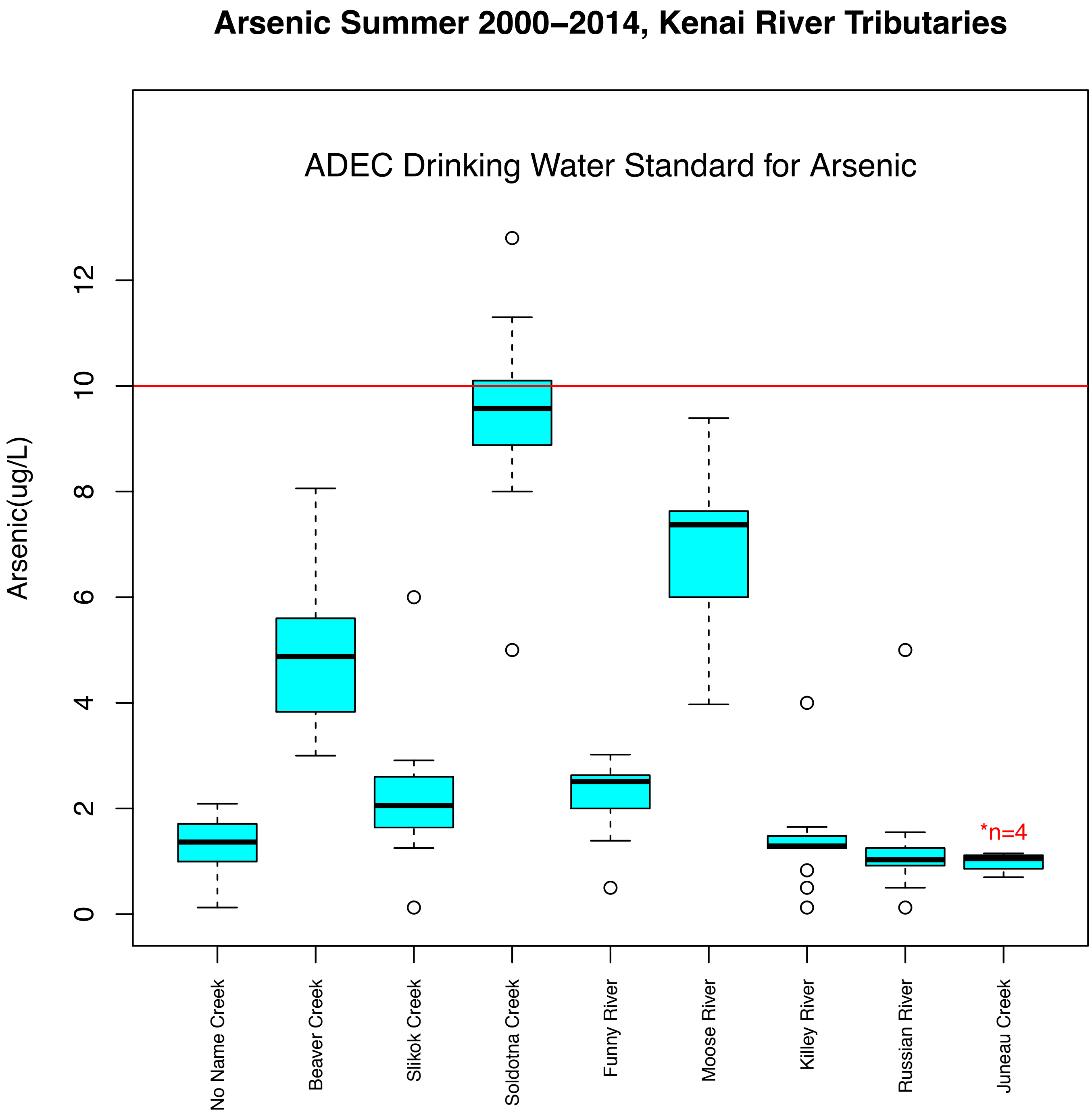

Figure 33: Arsenic sampled in Kenai River tributaries during summer 2000 to 2014 compared to ADEC drinking water standards.
Since 20% of the samples are reported as below the MRL or MDL, these values have been estimated using values that are half of the MRL or MDL.

Cadmium

Cadmium is a rare elemental metal that can occur naturally in freshwater at concentrations of less than 0.1 µg/L, but at slightly increased concentrations, it can be toxic to aquatic life (USEPA, 2001). Additional cadmium can enter the hydrologic cycle as a component of fertilizer, pesticide, pigment, and as a result of iron and steel production, coal combustion, and mining waste (USEPA, 2001). The ADEC and the USEPA have set the standard for cadmium at a range of 0.0650 µg/L to 0.64 µg/L, depending on hardness, for chronically exposed freshwater aquatic life (Appendix 2) (USEPA, 2014; ADEC, 2008).

In the mainstem, concentrations of cadmium ranged from a high of 8 µg/L at Mile 21 in summer 2000 to the lowest levels that were below the MDL of 0.062 µg/L that occurred in multiple locations. In the Kenai River mainstem, cadmium samples at Mile 21 and Mile 82 exceeded the standard on one occasion each. (Table 7)

The highest level of cadmium ever detected in the tributaries was 63 µg/L at Soldotna Creek in summer 2002, and the lowest was below the MDL of 0.062 µg/L. Cadmium was detected once above the standard in Soldotna Creek and Slikok Creek, and all other tributary samples did not exceed the standard. (Table 33)

Since so few cadmium samples were detected, trends were difficult to determine and should be interpreted with caution. In spring, cadmium was only reported four times, in contrast to summer samples in which it was reported ten times. In April of 2001, 2002, 2003, 2004, 2005 and summer 2001 through 2005, the method reporting limits (MRL) were mainly higher than the standard, so it is unknown whether these samples exceeded the standard. (Tables 7 & 33)

Site	Date	Hardness (mg/L)	Standard ((µg/L)	Result Value (µg/L)
Mile 21	7/18/00	29.45	0.11	8
Mile 82	7/20/04	35.91	0.12	1
Soldotna Creek	7/16/02	79.51	0.25	63
Slikok Creek	7/31/12	62.13	0.21	0.501

Table 1: Summary table of hardness-dependent exceedances for cadmium.

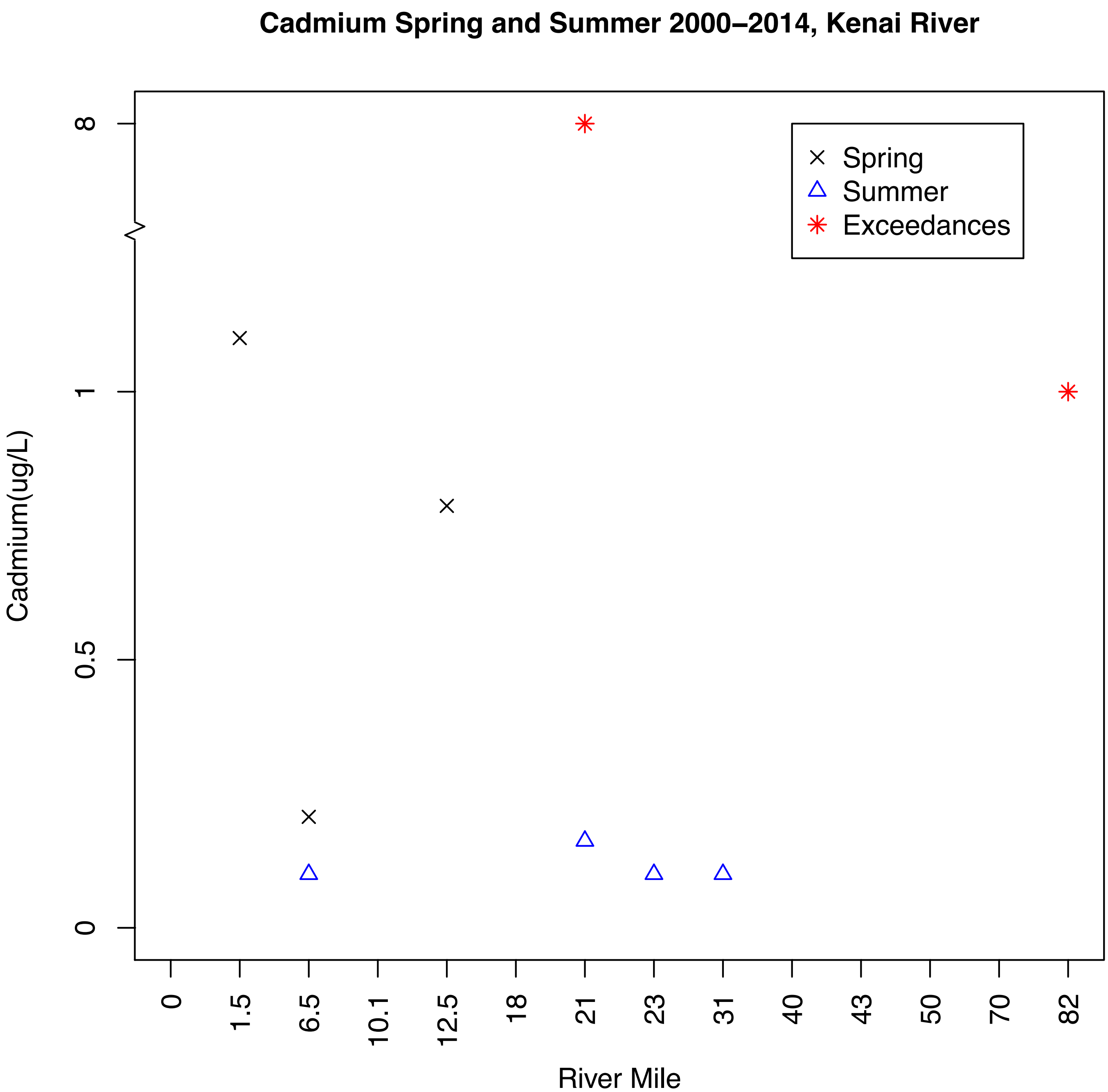

Figure 34: Cadmium sampled in the Kenai River mainstem during spring 2001 to 2014 and summer 2000 to 2014 with hardness-dependent standards and exceedances.
94% of the samples had results below the MRL or MDL, those results are not included in the graph.

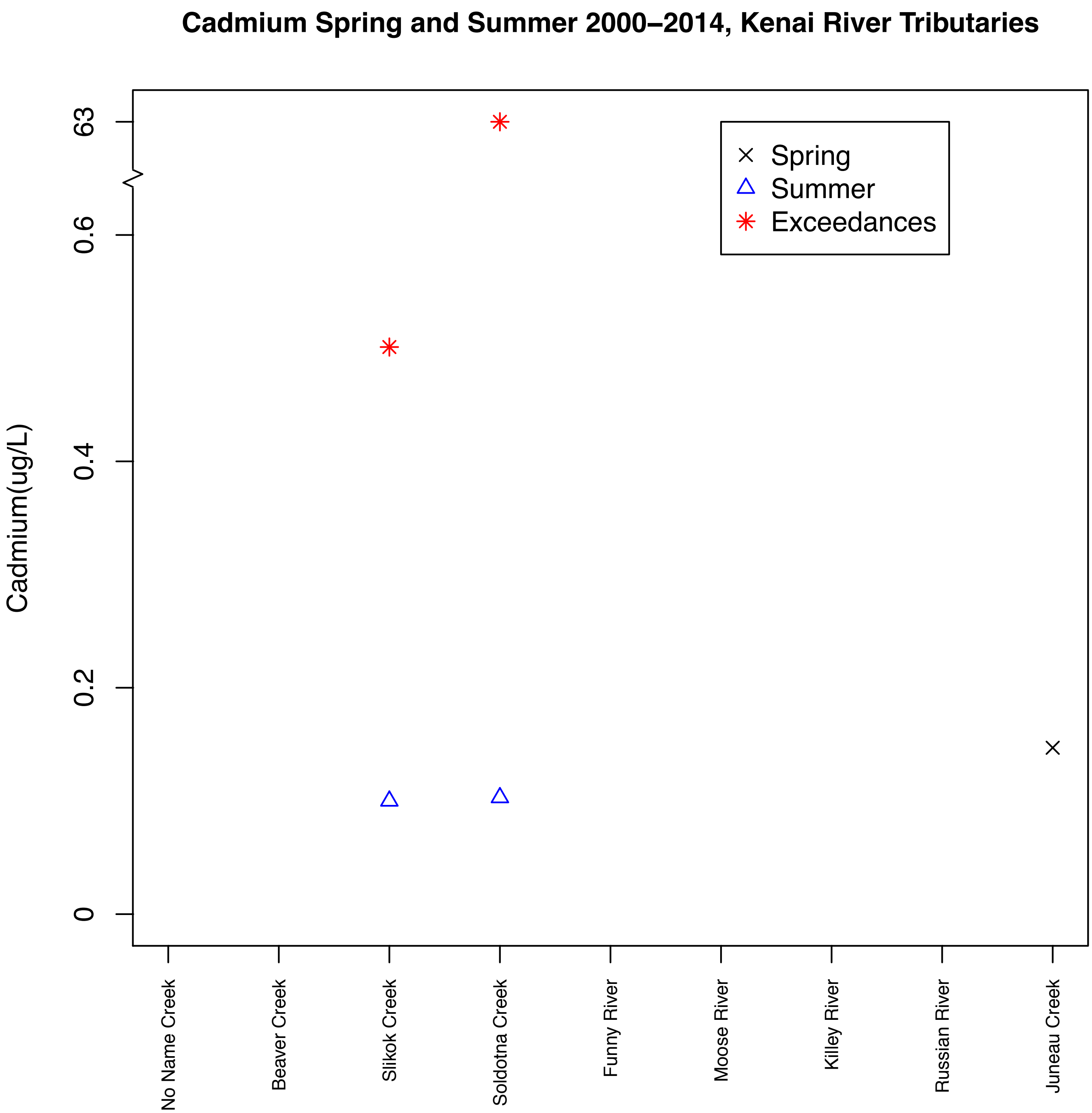

Figure 35: Cadmium sampled in Kenai River tributaries during spring 2001 to 2014 and summer 2000 to 2014 with hardness-dependent standards and exceedances.
98% of the samples had results below the MRL or MDL, those results are not included in the graph.

Chromium

In rivers and streams, chromium is an elemental metal that typically exists as hexavalent or trivalent chromium (USEPA, 1980a). Non-natural sources of chromium salts include the metal finishing industry, textile manufacturing, leather tanning, paint, fungicides, and wood preservatives (USEPA, 1980a). At a concentration of 21 µg/L of hexavalent chromium, river algae cannot photosynthesize, and the growth in weight of Chinook salmon can be reduced by approximately ten percent at a concentration of 16 µg/L (USEPA, 1980a). Consequently, the ADEC and the USEPA have set the standard for hexavalent chromium at 11 µg/L and at a range of 15.52 µg/L to 230.67 µg/L for trivalent chromium, depending on hardness, for chronically exposed freshwater aquatic life (Appendix 2) (USEPA, 2014; ADEC, 2008). The standard for hexavalent chromium is not displayed on the following graphs because the analysis did not distinguish between trivalent and hexavalent chromium.

None of the medians for the mainstem or the tributaries exceeded the freshwater aquatic life standard for hexavalent or trivalent chromium, although single samples did detect concentrations above the hexavalent chromium standard at Mile 6.5, Mile 10.1, Mile 21, and Beaver Creek. The standard for trivalent chromium was not exceeded at any site along the mainstem or tributaries during any sampling event. The highest concentration of chromium in the mainstem was 25 µg/L at Mile 21 in summer 2000, and the lowest levels occurred below the MDL of 0.36 µg/L. In the mainstem the locations with a median above 1 µg/L where Mile 1.5 both in spring and summer and Mile 6.5 in spring only. (Tables 8 & 34)

Chromium concentrations in the tributaries ranged from a high of 16.4 µg/L at Beaver Creek in summer 2006 to less than the MDL of 0.36 µg/L. The medians of chromium in the tributaries during both the spring and summer events were all below 1 µg/L. In the tributaries, higher levels of chromium were reported in the summer compared to the spring, while a seasonal trend was difficult to distinguish in the mainstem. (Figure 36-39)

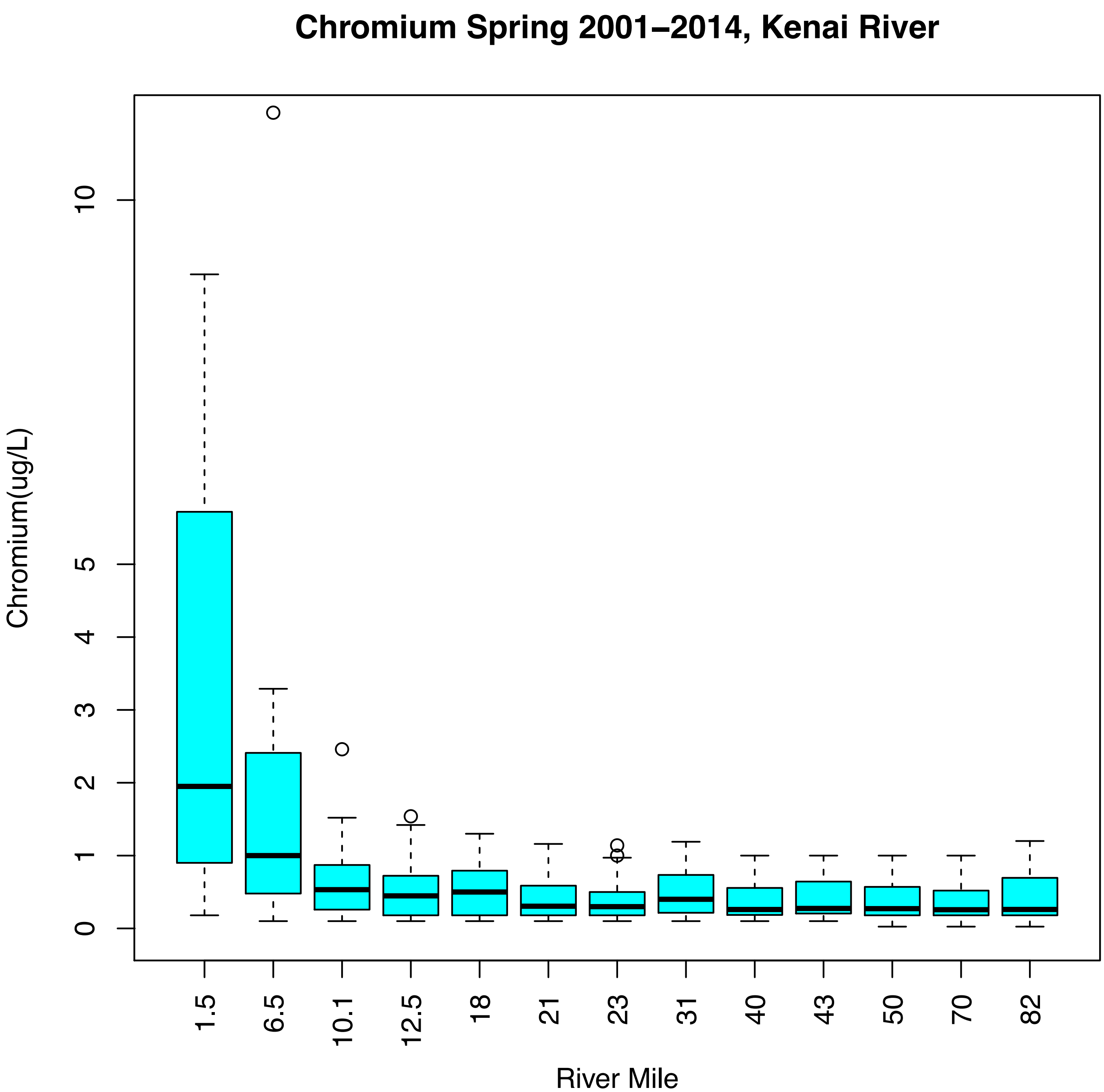

Figure 36: Chromium sampled in the Kenai River mainstem during spring 2001 and 2014. Since 49% of the samples are reported as below the MRL or MDL, these values have been estimated using values that are half of the MRL or MDL.

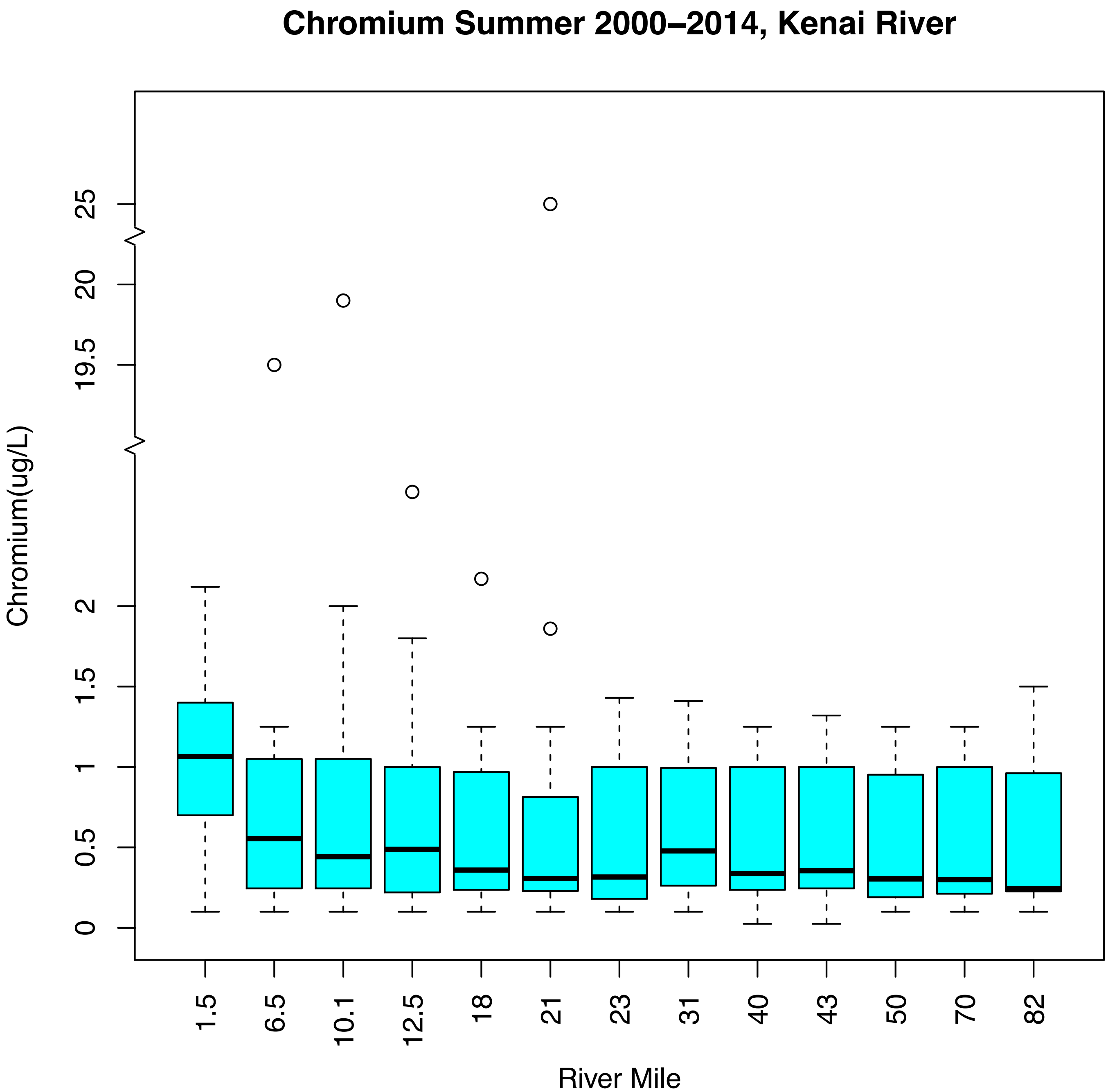

Figure 37: Chromium sampled in the Kenai River mainstem during summer 2000 to 2014. Since 51% of the samples are reported as below the MRL or MDL, these values have been estimated using values that are half of the MRL or MDL.

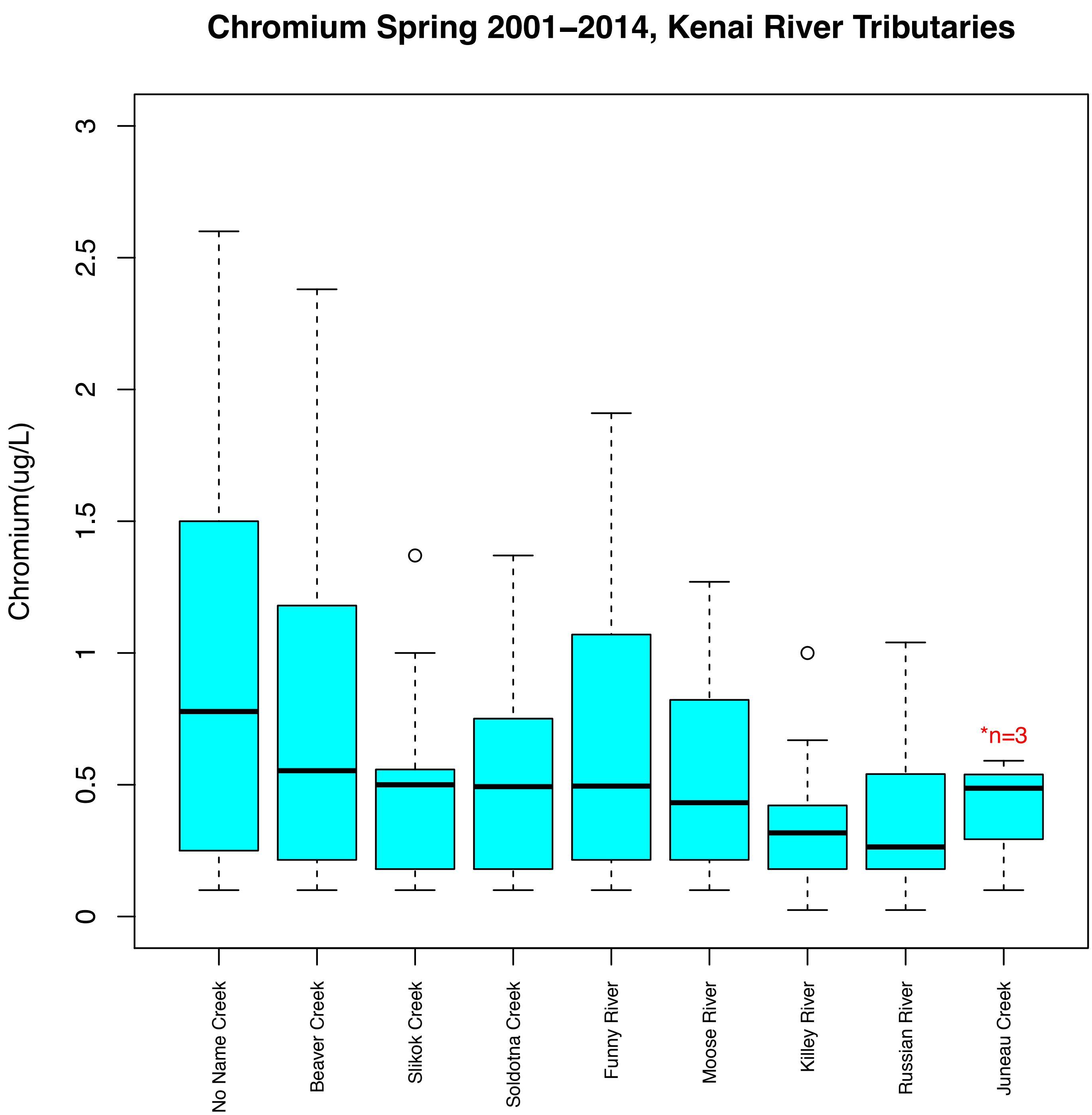

Figure 38: Chromium sampled in Kenai River tributaries during spring 2001 to 2014
Since 51% of the samples are reported as below the MRL or MDL, these values have been estimated using values that are half of the MRL or MDL.

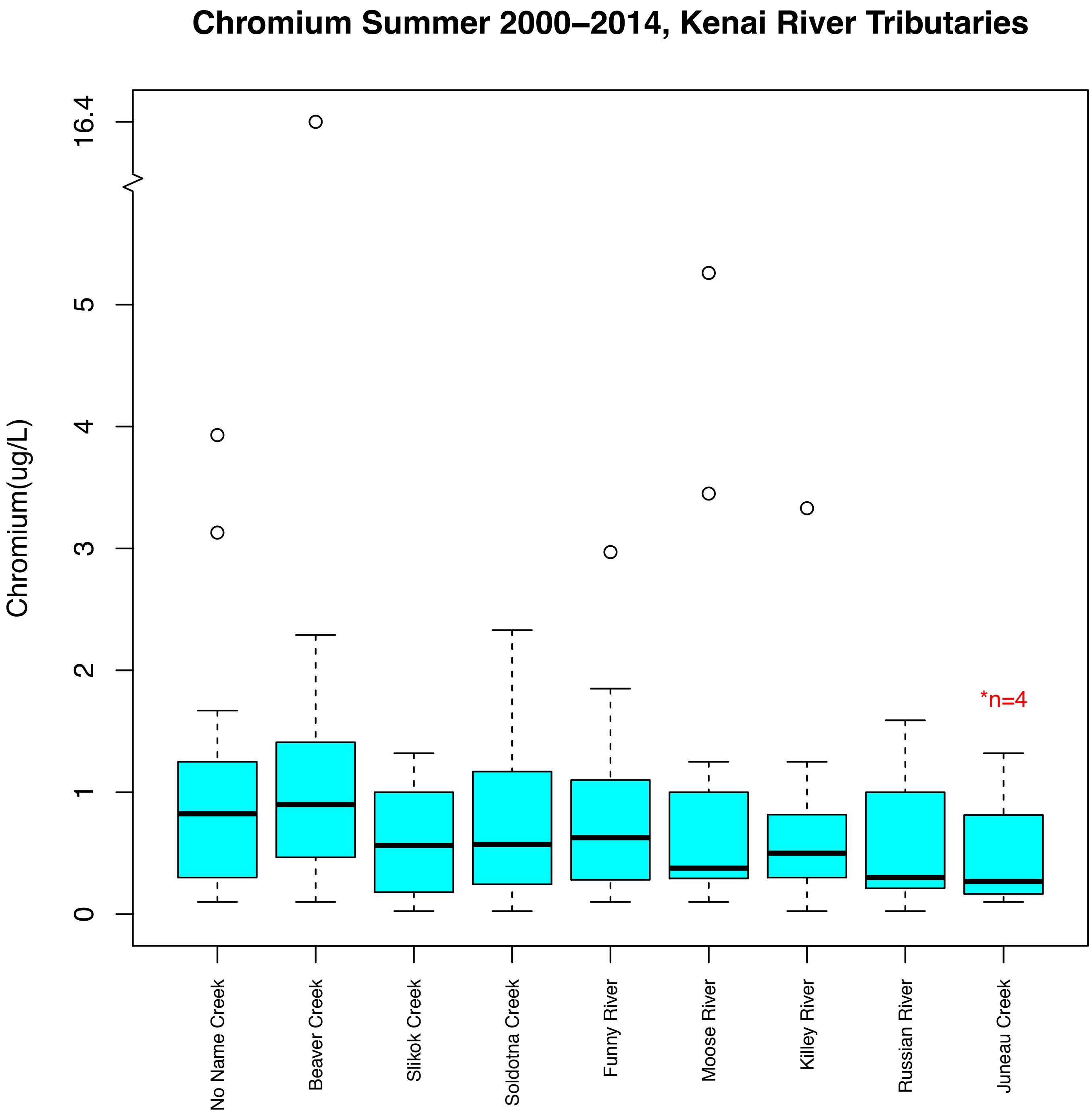

Figure 39: Chromium sampled in Kenai River tributaries during summer 2000 to 2014. Since 48% of the samples are reported as below the MRL or MDL, these values have been estimated using values that are half of the MRL or MDL.

Copper

Typically present in surface waters, naturally low concentrations of copper are essential as micronutrients for plants and animals, but elevated levels can be toxic to certain aquatic species (USEPA, 2007). Concentrations of copper can increase in surface waters due to discharges from mining, the leather industry, electrical equipment, and fabricated metal products (USEPA, 2007). Copper is present in the brakepadss of vehicles and can enter surface waters in storm water runoff (USEPA, 2015). The standard for copper set by the ADEC, ranges from 1.75 µg/L to 29.28 µg/L, depending on hardness, for chronic exposure to aquatic life in freshwater (see Appendix 2) (ADEC 2008).

The highest concentration of copper in the mainstem was reported at 443 µg/L at Mile 21 in summer 2000, and the lowest levels were below the MDL of 0.12 µg/L. In the summer, two exceedances occurred at Mile 10.1 and Mile 31, and copper concentrations exceeded the criteria once during individual sampling dates at Mile 1.5, Mile 6.5, Mile 18, Mile 21, Mile 70, and Mile 82. Higher levels occurred in the estuary, while the lowest concentrations were detected at Mile 40, Mile 43, and Mile 50. No exceedances were recorded for the mainstem during the sampling events in spring (Table 9).

Copper concentrations in the tributaries ranged from 13 µg/L in the Killey River in spring 2002 to below the MDL of 0.12 µg/L that occurred in many locations during this project. Exceedances in the spring occurred two times at the Killey River and once at No Name Creek and Beaver Creek. Exceedances in the summer occurred once during individual sampling dates at Slikok Creek, Killey River, and Russian River (Table 35).

Median concentrations and the number of exceedances were generally higher in the summer than in the spring in the tributaries and the mainstem. More detected concentrations occurred in sampling events after 2005, but this may be partially due to the large fluctuation in MDLs and MRLs. From summer 2000 to summer 2003, the MDLs or MRLs were higher than the standard, so it is unknown if many of these samples exceeded the standard (Figure 40-43).

Site	Date	Hardness (mg/L)	Standard (µg/L)	Result Value (µg/L)
Mile 1.5	7/26/05	43.74	4.42	8.44
Mile 6.5	7/25/06	34.12	3.57	4.84
Mile 10.1	7/25/06	29.95	3.2	3.29
	7/22/14	28.76	3.08	3.2
Mile 18	7/22/14	28.89	3.1	3.7
Mile 21	7/18/00	29.45	3.15	443
Mile 31	7/18/00	30.07	3.21	9
	7/26/05	28	3.02	21.1
Mile 70	7/18/00	47.8	4.76	6
Mile 82	7/18/00	33.92	3.56	5
No Name Creek	4/26/05	16.96	1.97	8.21
Beaver Creek	5/07/13	23.22	2.57	3.28
Slikok Creek	7/20/04	49.6	4.92	12.1
Killey River	4/10/02	26.51	2.88	13
	7/20/04	14.9	1.76	8.42
Russian River	7/18/00	39.41	4.04	7

Table 2: Summary of hardness-dependent exceedances for copper.

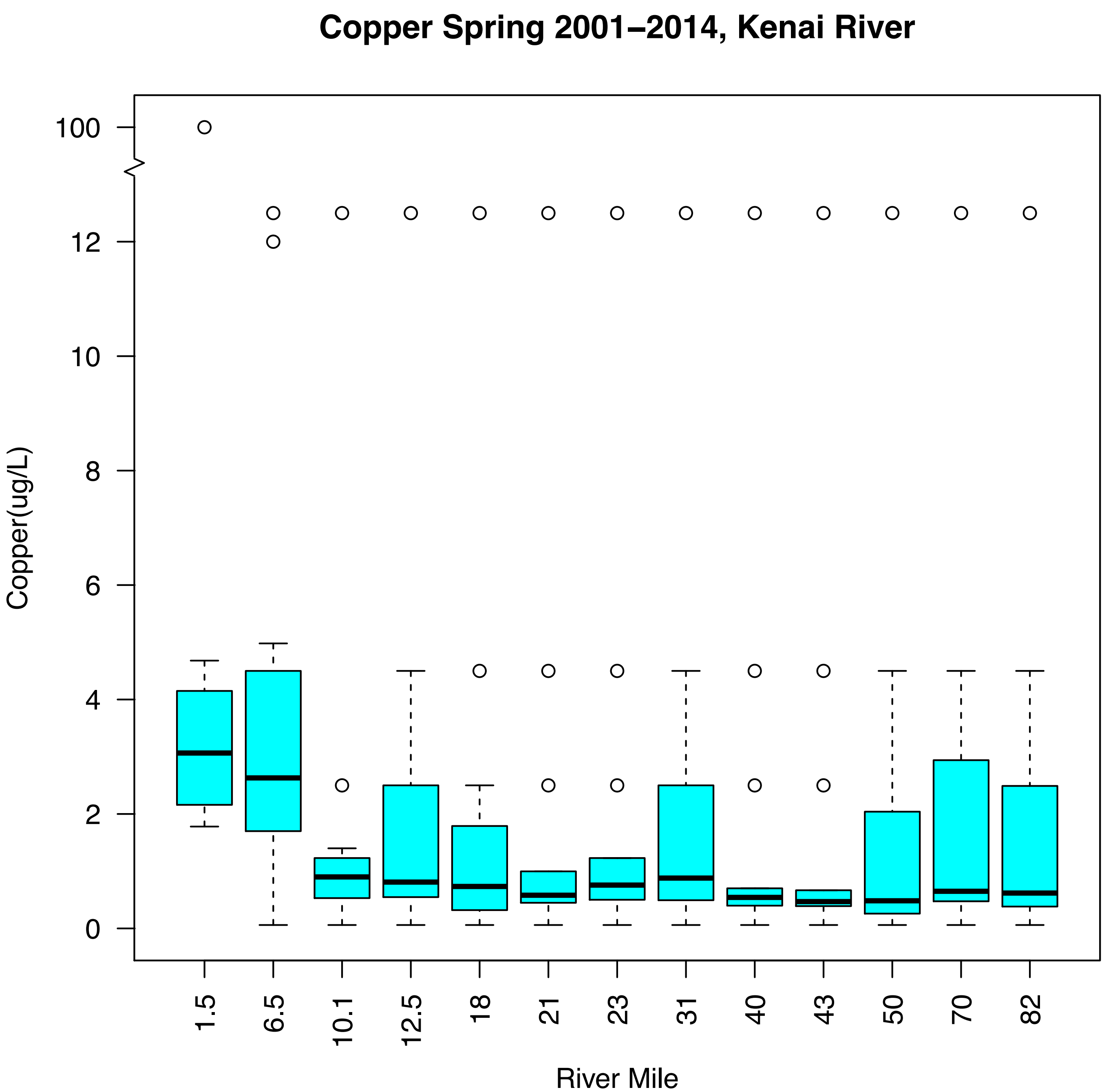

Figure 40: Copper sampled in Kenai River mainstem during spring 2001 to 2014 with hardness-dependent standards and exceedances.
Since 33% of the samples are reported as below the MRL or MDL, these values have been estimated using values that are half of the MRL or MDL.

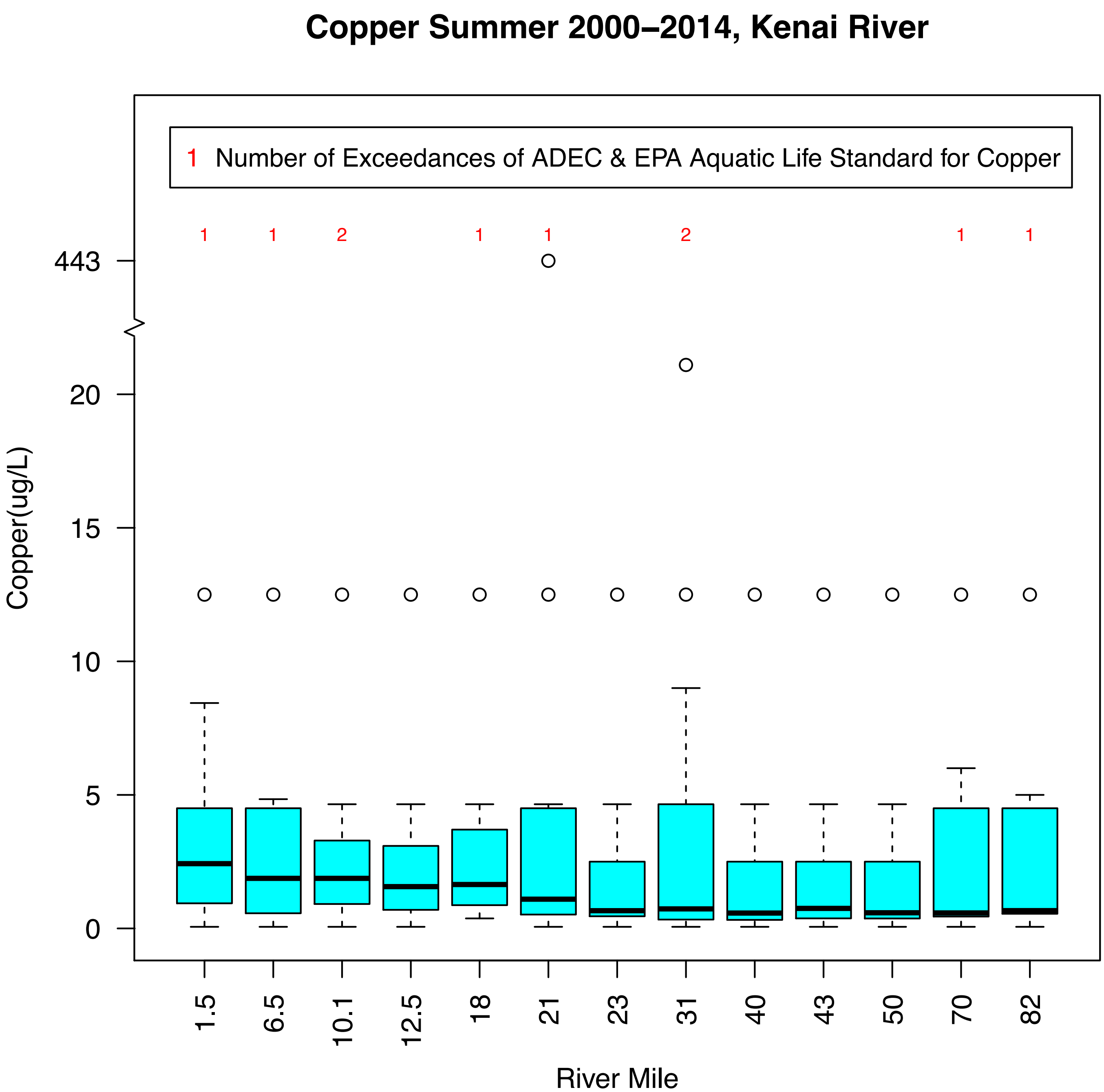

Figure 41: Copper sampled in the Kenai River mainstem during summer 2000 to 2014 with hardness-dependent standards and exceedances.
Since 40% of the samples are reported as below the MRL or MDL, these values have been estimated using values that are half of the MRL or MDL.

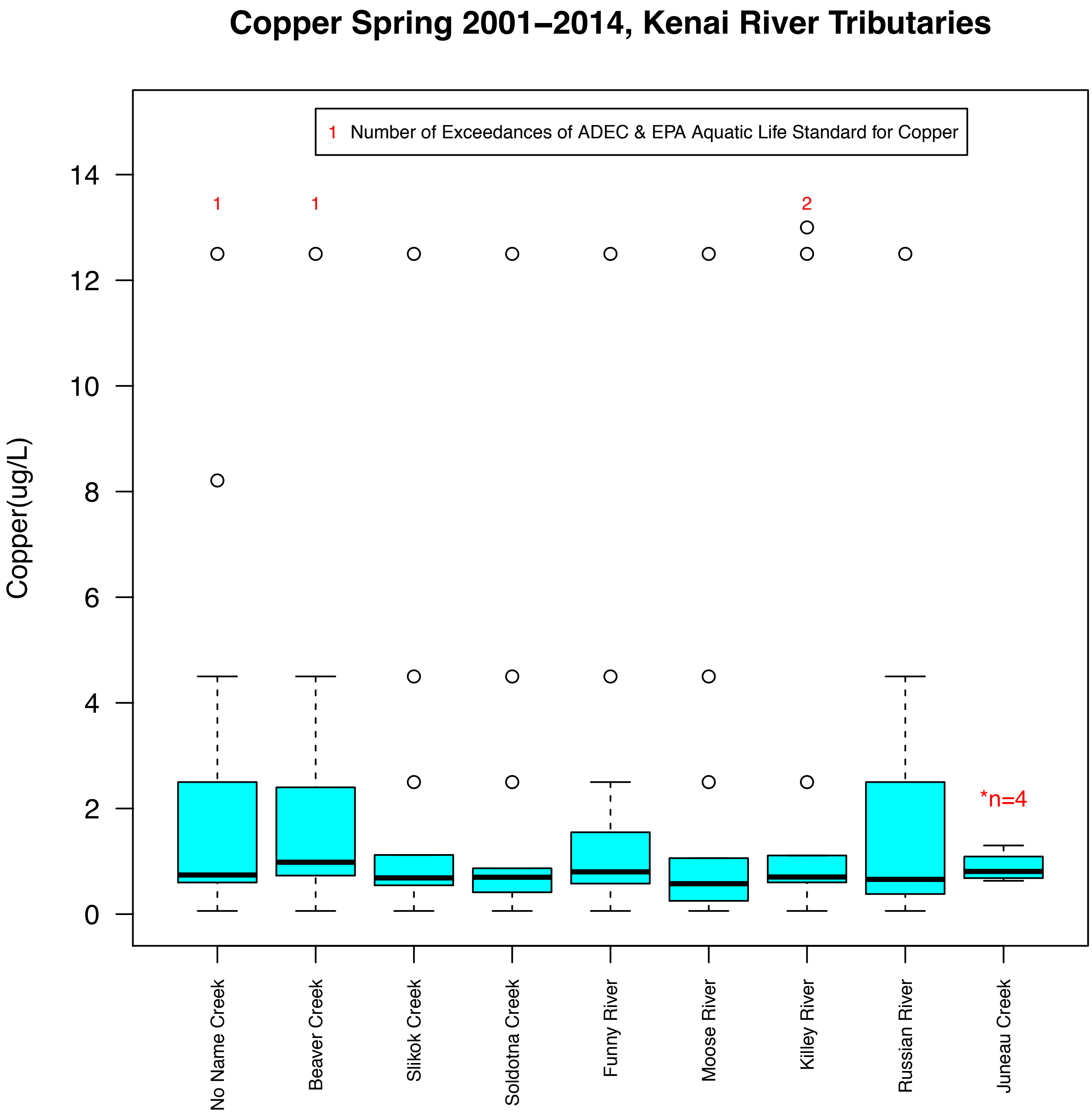

Figure 42: Copper sampled in Kenai River tributaries during spring 2001 to 2014 with hardness dependent standards and exceedances.
Since 32% of the samples are reported as below the MRL or MDL, these values have been estimated using values that are half of the MRL or MDL.

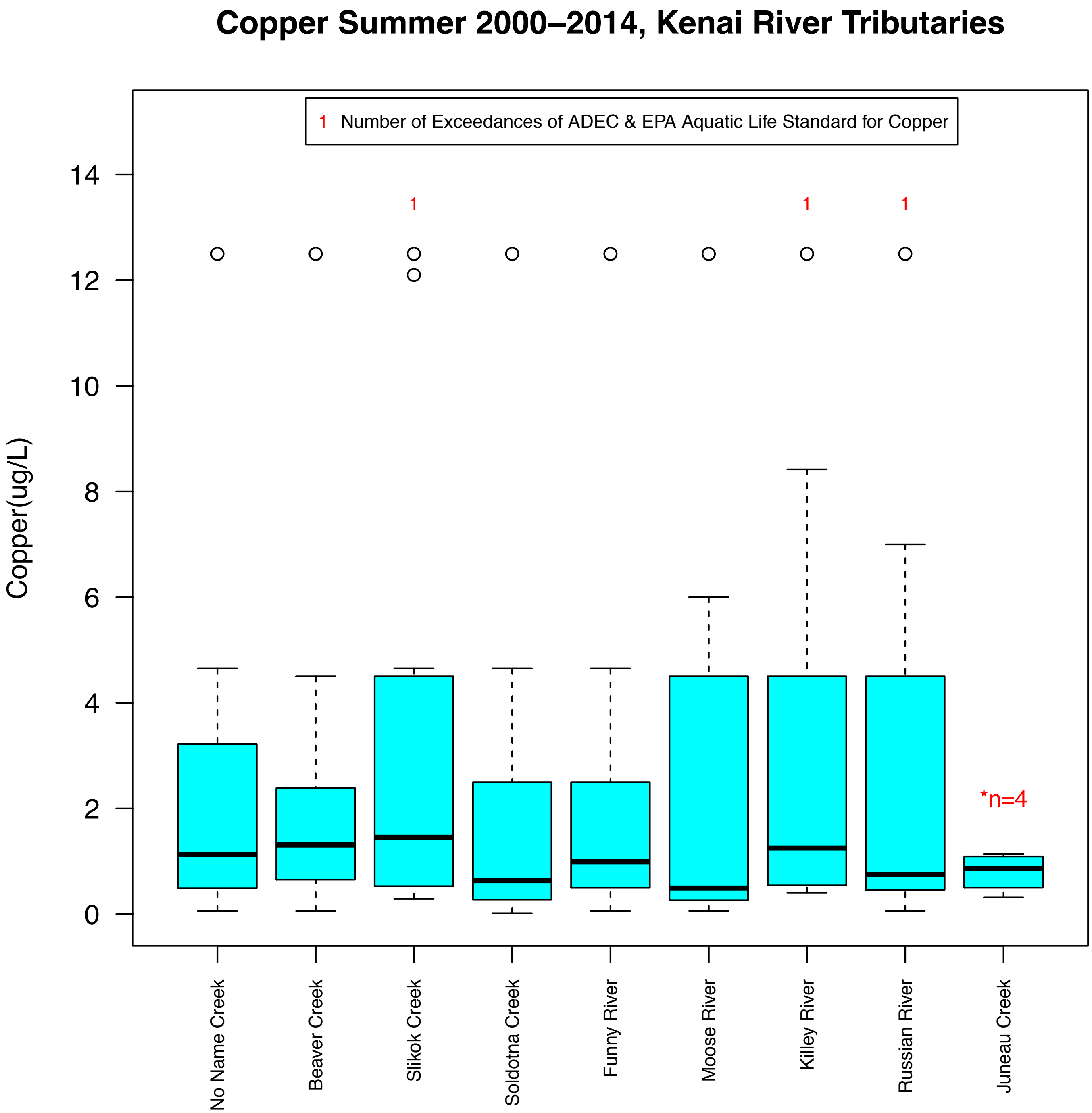

Figure 43: Copper sampled in Kenai River tributaries during summer 2000 to 2014 with hardness-dependent standards and exceedances.
Since 39% of the samples are reported as below the MRL or MDL, these values have been estimated using values that are half of the MRL or MDL.

Lead

Metallic lead and lead minerals are not classified as soluble in water, but they can be solubilized by certain acids, and a selection of industrial lead compounds are water soluble upon production (USEPA, 1980b). Lead is a component in electroplating, metallurgy, construction materials, plastic, and electronic equipment, and it can enter surface water through precipitation, dust, street runoff, and wastewater discharges (USEPA, 1980b). Exposure to lead can cause delayed embryonic development, reduced growth, and suppressed reproduction in fish, and spinal deformities in rainbow trout fry (USEPA, 1980b). Determined by the ADEC and the USEPA, the standard for lead ranges from 0.300 to 10.94 µg/L, depending on hardness, for the chronic exposure of aquatic life in freshwater (Appendix 2) (ADEC, 2008; USEPA, 2014).

The highest concentration of lead in the mainstem was 468 µg/L and was sampled at Mile 31 during summer 2005, and the lowest levels occurred below the MDL of 0.030 µg/L at many locations in the spring and the summer of the sampling years. Exceedances occurred mainly in the summer, when lead exceeded the criteria twice at Mile 21, and once at Mile 1.5, Mile 6.5, Mile 10.1, Mile 12.5, Mile 31, and Mile 82, Mile 1.5 and Mile 6.5 exhibited the most instances of detection in the spring and the summer. At Mile 40, Mile 43 and Mile 74 (Russian River) no concentrations of lead were ever reported. Only two exceedances where recorded during the spring sampling events, once at Mile 6.5 and once at Mille 10 (Beaver Creek) (Table 3).

The concentration of lead in the tributaries ranged from a high of 3.92 µg/L at Beaver Creek in summer 2006, and the lowest levels were below the MDL of 0.030 µg/L at many locations in the spring and summer sampling events. The Killey River and Juneau Creek each exceeded the criteria on one occasion in the summer of 2004 and 2013 respectively. Beaver Creek had two exceedances, one in the spring of 2011 and one in the summer of 2006. No lead was ever reported in Russian River. The MDLs were higher than the standard from summer 2000 through summer 2003 and summer 2005, so it is unknown whether exceedances occurred in many of these samples (Table 3).

A trend analysis was conducted using the average and median values for all data collected during the time period between years 2000-2014. The concentrations of lead throughout the entire Kenai River are relatively high in the lower river and decrease as you move towards the upper river (Figure 46 and Figure 47). A similar analysis was done for each sampling station at the Kenai River with results showing that no lead was found in most of the sampling stations before year 2005, after year 2005 when lead has been found it shows a decrease in concentration through time. It is important to note that not every station has an actual reading and in many cases there are very few readings or non-at all (Figures 46-68).

Site	Date	Hardness (mg/L)	Standard (µg/L)	Result Value (µg/L)
Mile 1.5	7/26/05	43.74	1.01	2.73
Mile 6.5	7/25/06	34.12	0.77	19
	4/26/11	40.39	0.93	3.3
Mile 10.1	7/25/06	29.95	0.66	1.65
Mile 21	7/18/00	29.45	0.65	106
	7/25/06	29.95	0.66	1.93
Mile 31	7/26/05	28	0.61	468
Mile 40	7/24/01	28.87	0.64	1.5
Mile 82	7/16/02	31.12	0.69	4
Beaver Creek	7/25/06	67.04	1.62	3.92
	4/26/11	46.76	1.09	2.7
Killey River	7/20/04	14.89	0.30	1.21
Juneau Creek	07/30/13	41.77	0.96	1.15

Table 3: Summary of hardness-dependent exceedances for lead.

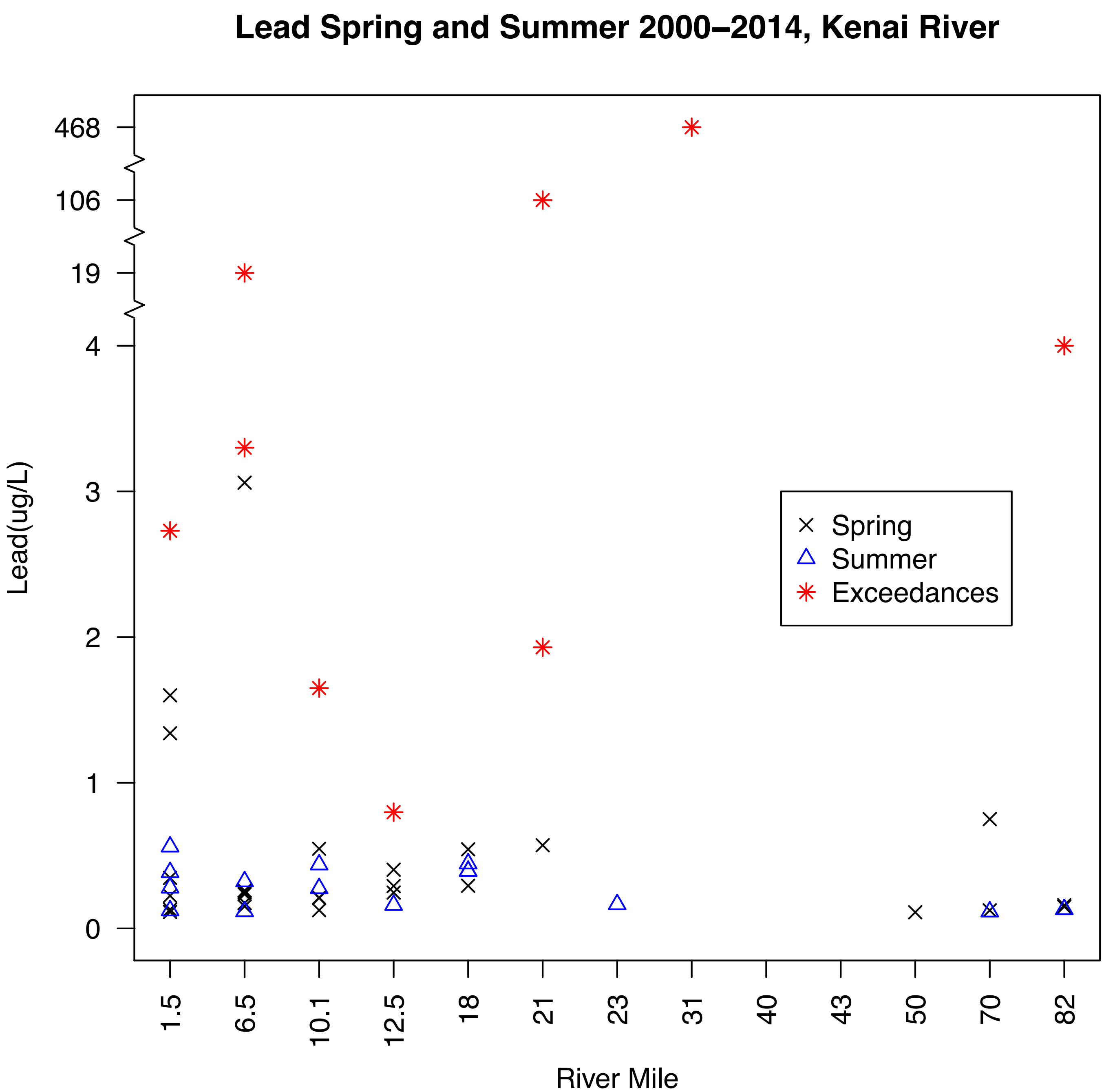

Figure 44: Lead sampled in the Kenai River mainstem during spring 2001 to 2014 and summer 2000 to 2014 with hardness-dependent standards and exceedances.
82% of the samples had results below the MRL or MDL, so those results are not included in the graph.

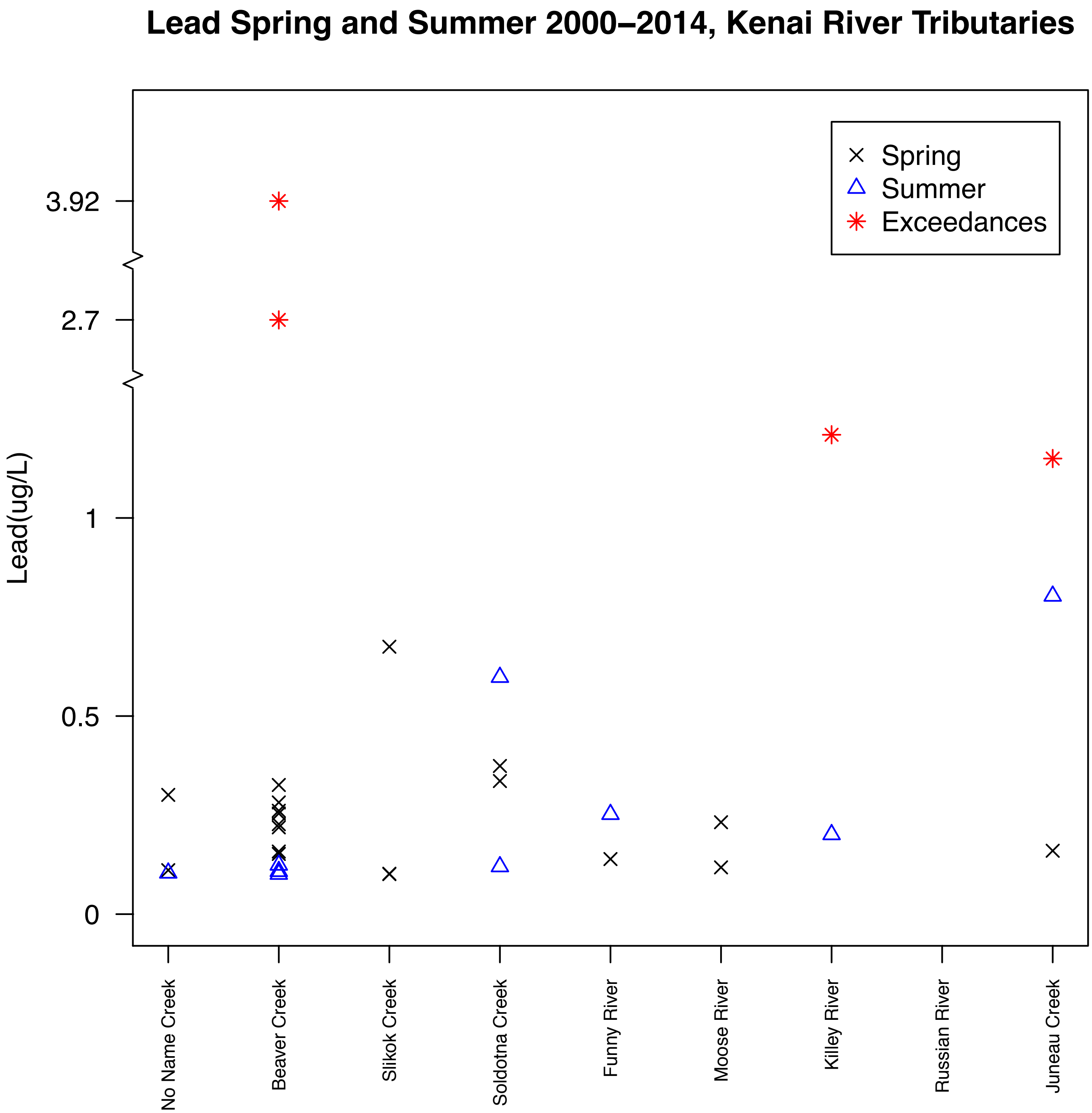

Figure 45: Lead sampled in the Kenai River tributaries during spring 2001 to 2014 and summer 2000 to 2014 with hardness-dependent standards and exceedances.
86% of the samples had results below the MRL or MDL, so those results are not included in the graph.

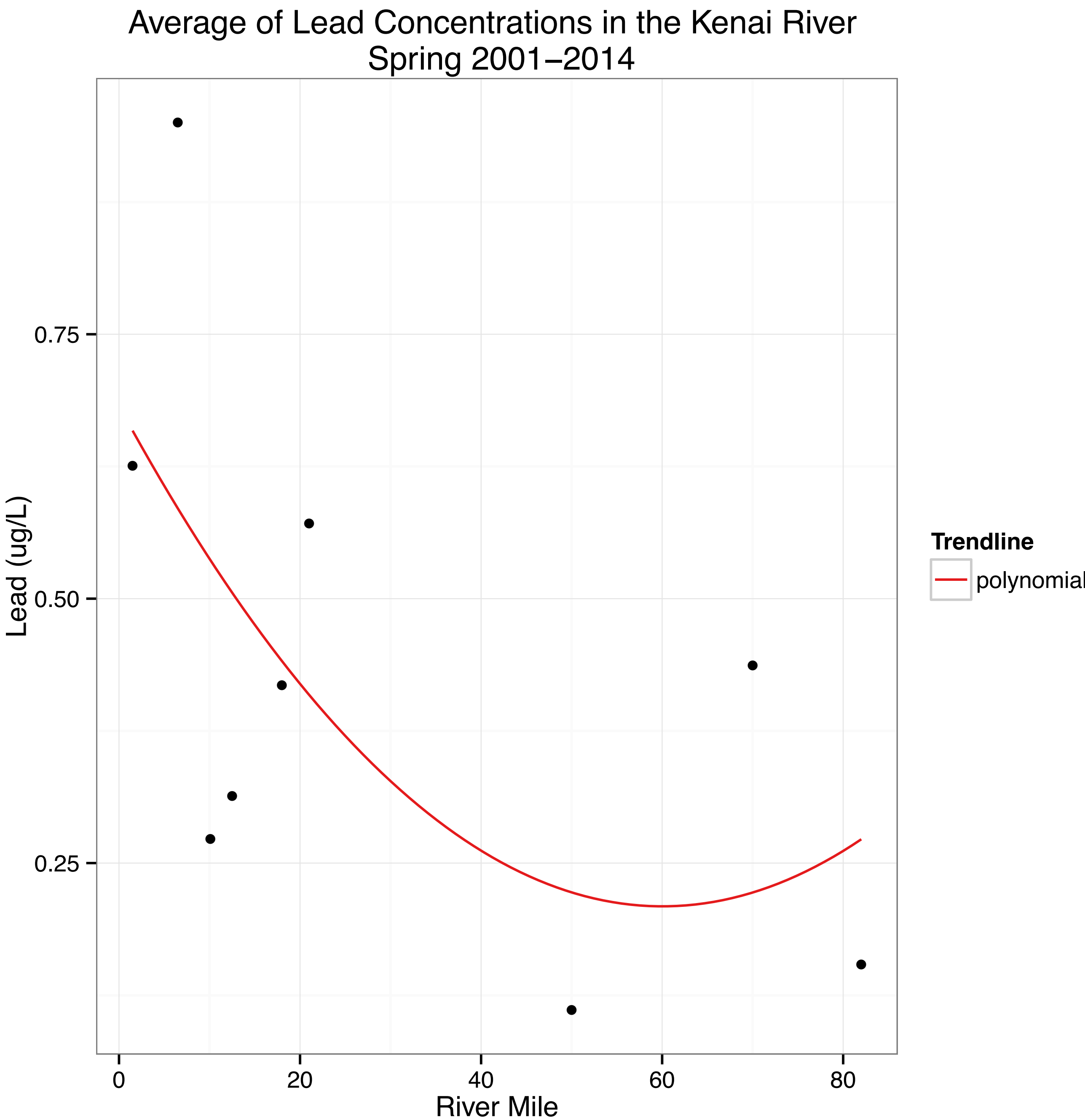

Figure 46: Trend analysis using the average lead sampled from spring 2001 to 2014 in the Kenai River. Not detected values are not taken into account in the analysis and therefore are not shown in this graph.

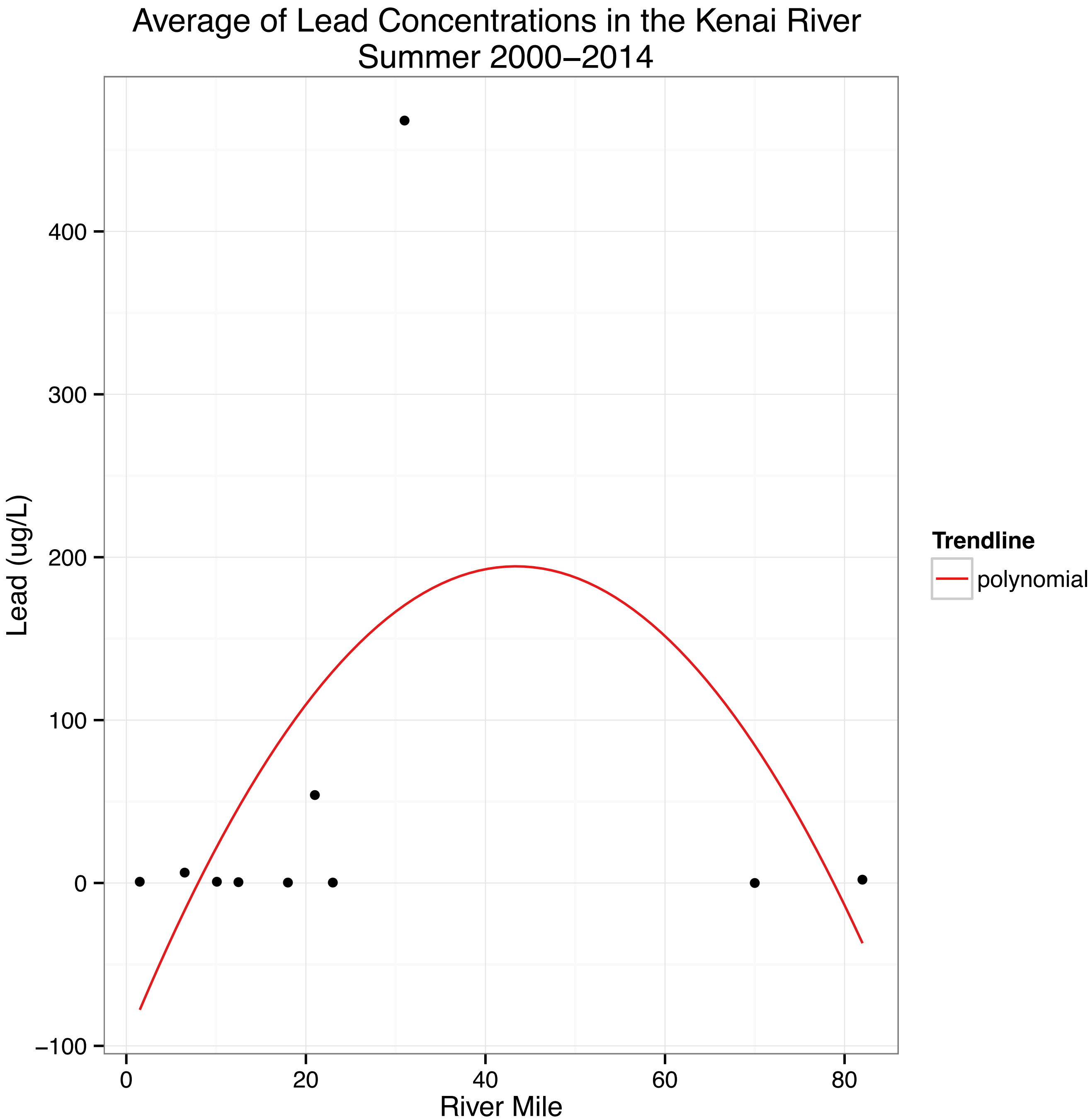

Figure 47: Trend analysis using the average lead sampled from summer 2000 to 2014 in the Kenai River. Not detected values are not taken into account in the analysis and therefore are not shown in this graph.

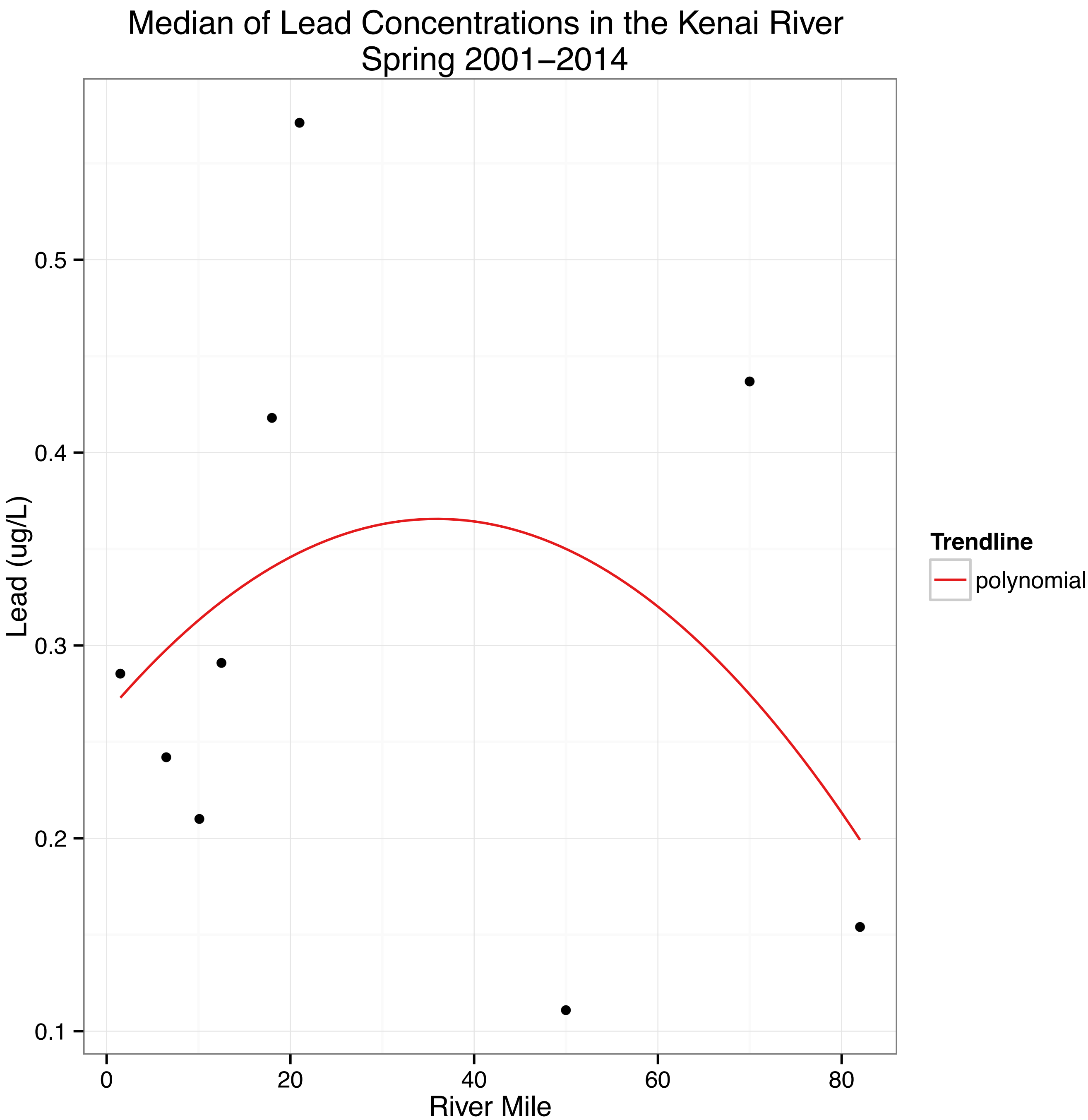

Figure 48: Trend analysis using the median for lead sampled from spring 2001 to 2014 in the Kenai River. Not detected values are not taken into account in the analysis and therefore are not shown in this graph.

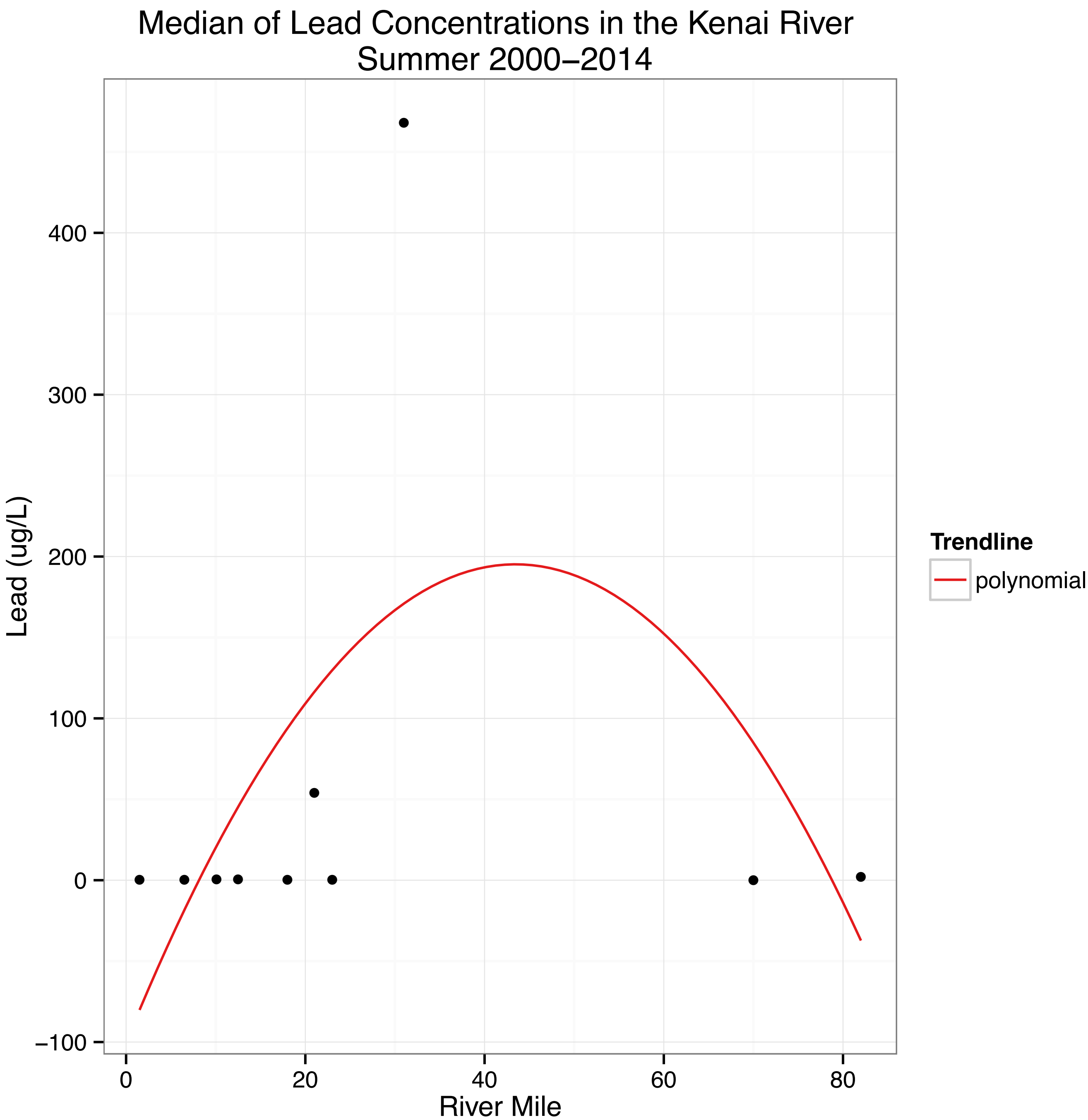

Figure 49: Trend analysis using the median for lead sampled from summer 2000 to 2014 in the Kenai River. Not detected values are not taken into account in the analysis and therefore are not shown in this graph.

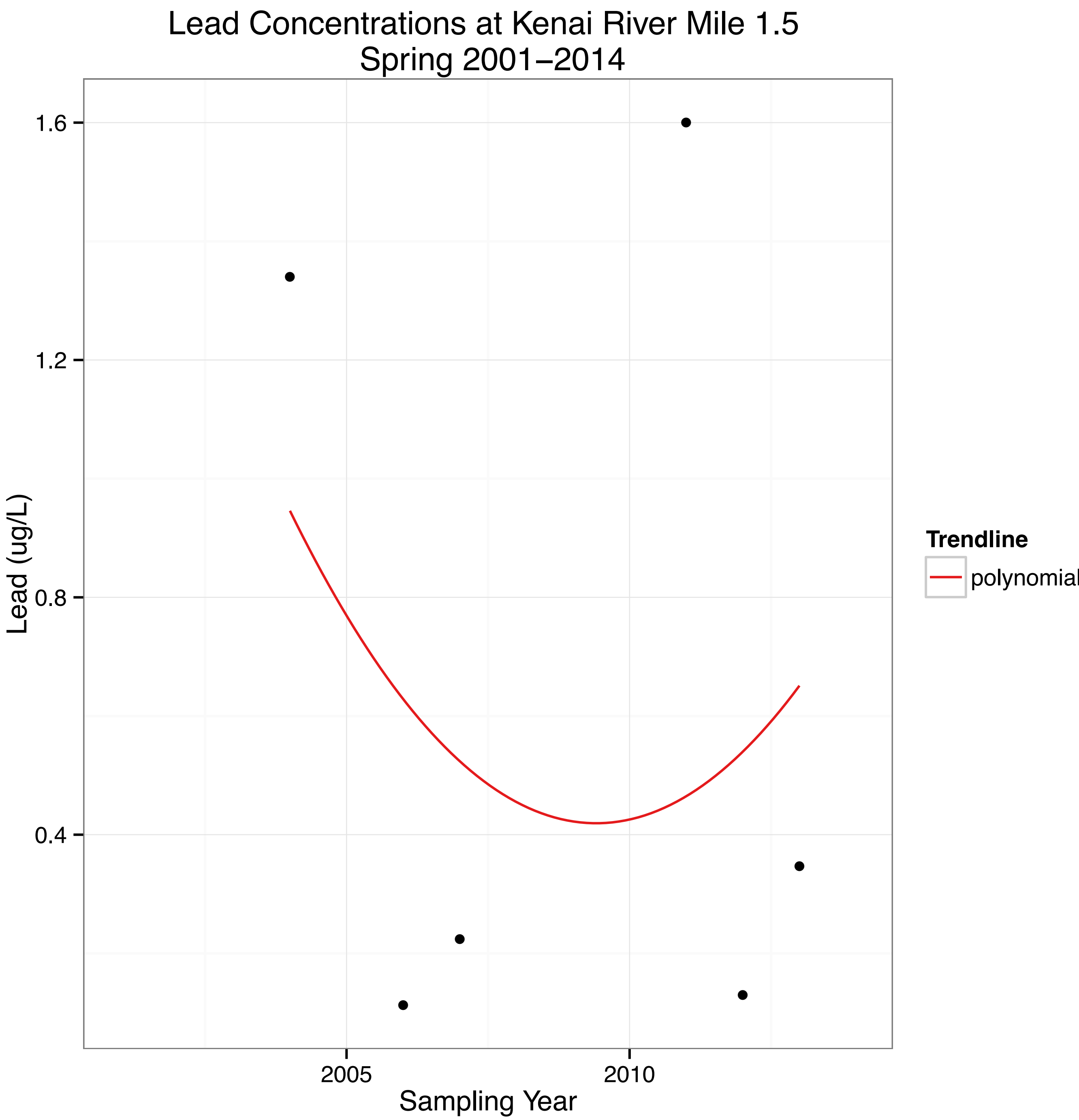

Figure 50: Trend analysis for lead sampled at Mile 1.5 from spring 2001 to 2014, Kenai River. Not detected values are not taken into account in the analysis and therefore are not shown in this graph.

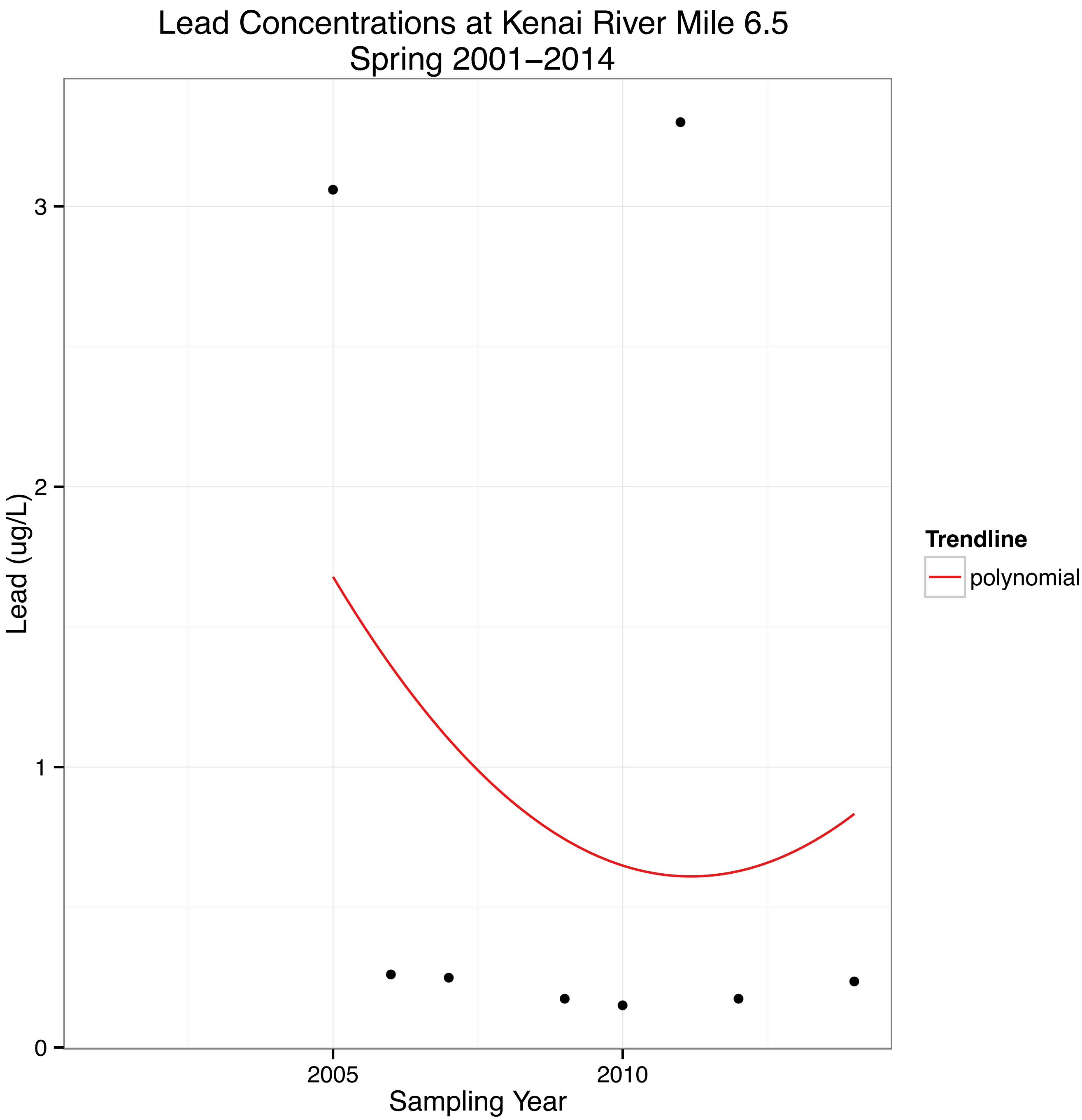

Figure 51: Trend analysis for lead sampled at Mile 6.5 from spring 2001 to 2014, Kenai River. Not detected values are not taken into account in the analysis and therefore are not shown in this graph.

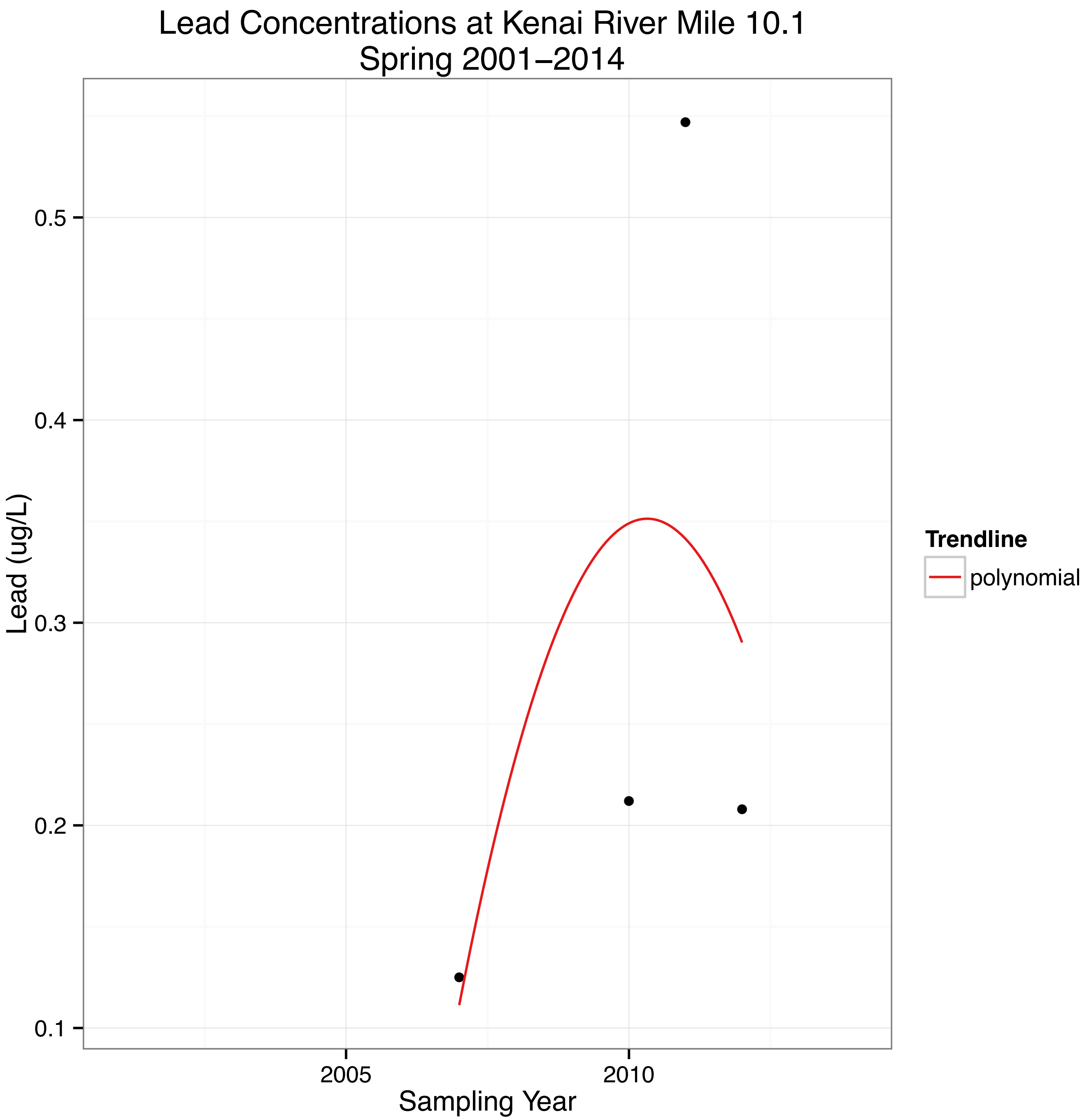

Figure 52: Trend analysis for lead sampled at Mile 10.1 from spring 2001 to 2014, Kenai River. Not detected values are not taken into account in the analysis and therefore are not shown in this graph.

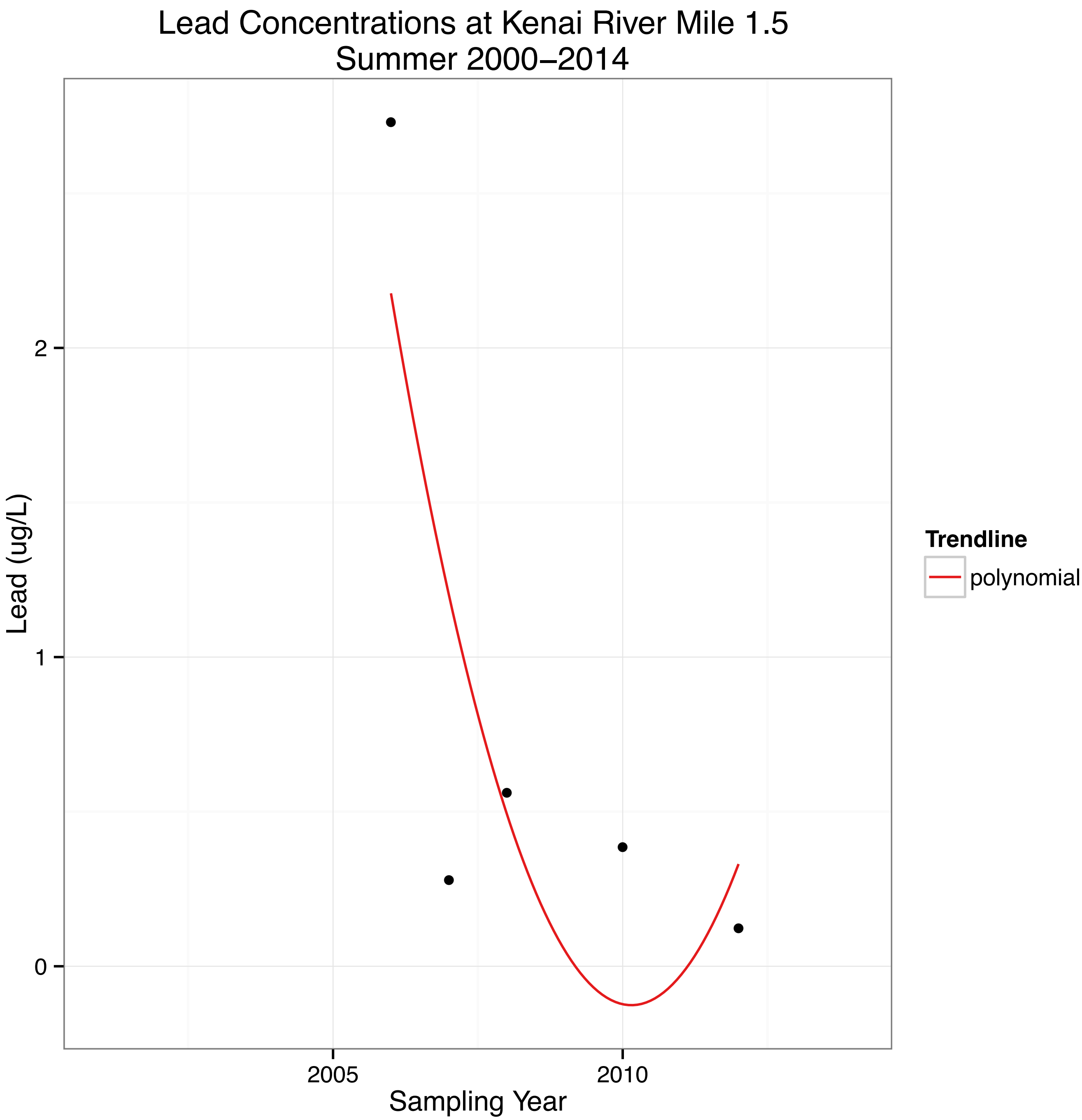

Figure 53: Trend analysis for lead sampled at mile 1.5 from summer 2001 to 2014, Kenai River. Not detected values are not taken into account in the analysis and therefore are not shown in this graph.

Zinc

Zinc enters surface water naturally through the weathering of bedrock and is an essential micronutrient for all plants and animals (USEPA, 1987). Additional zinc can enter surface water because it is widely used for galvanizing steel, as an alloy, in rubber, and in paint (USEPA, 1987). More recent studies suggest that higher concentrations of Zinc in suburban areas can be caused by tire wear (USGS, 2012). The ADEC and the USEPA have set the standard for zinc ranging from 23.4 to 382.4 µg/L, depending on hardness, for the chronic exposure of freshwater aquatic life (see Appendix 2) (ADEC, 2008; USEPA, 2014).

The highest level recorded in the mainstem was 2900 µg/L in summer 2000 at Mile 21, and the lowest level occurred at Mile 31 in summer 2006 with a concentration of 0.521 µg/L. In the spring, exceedances occurred at every sampling station except Mile 40 and Mile 50. More exceedances in the mainstem occurred during the summer with eight exceedances at Mile 10.1, seven exceedances at Mile 18, five exceedances at both Mile 6.5 and Mile 12.5. Mile 21 and Mile 23 present four exceedances. Mile 1.5 and Mile 31 present three exceedances. Miles 40, 50, 70 and 82 all present two exceedances. Mile 40 one exceedance (Table 11). The Kenai River estuary had higher median concentrations than the rest of the river in spring, during the summer events this pattern was not clear. Relatively higher medians also occurred at Mile 31, Mile 21, and Mile 10.1 in the summer (Figure 54 & 55).

Zinc concentrations in the tributaries ranged from a high of 247 µg/L in Beaver Creek during spring 2011 to a low of 0.462 µg/L in Russian River during spring 2009. In the spring, exceedances of the criteria occurred eight times at No Name Creek, Beaver Creek and Slikok Creek. Seven times at Funny River, four at Soldotna Creek And Killey River one at Moose River and Russian River. In the other tributaries, exceedances occurred twice at Beaver Creek and Funny River and once at Soldotna Creek and the Killey River during the spring. In the summer, exceedances occurred six times at Killey River, four times at No Name Creek and Beaver Creek, once at Slikok Creek, Russian River and Juneau Creek. Beaver Creek had the highest median of all the tributaries, with No Name Creek and Funny River close behind in the spring (Table 37). In the summer No Name Creek had the highest median of all the tributaries, with Beaver Creek and Soldotna Creek close behind. In the tributaries, zinc concentrations and the number of exceedances were greater in the spring. In the spring and the summer of 2003, the MRL of 50 µg/L was higher than most of the standards, so incidences of exceedance are unknown in many of these samples (Figure 56 & 57).

A trend analysis was conducted using the average and median values for all data collected during the time period between years 2000-2014. The concentrations of zinc throughout the entire Kenai River show a relative decrease from Mile 1.5 to Mile 50 and a relative increase at Mile 70 and Mile 82. This pattern is visible during both the spring and summer sampling events (Figure 58-61). A similar analysis was run for each sampling station at the Kenai River. During the spring all the stations present a relative decrease in zinc concentrations until year 2008, after that a low increase is apparent at all stations. For the summer the same general trend is visible, with a stronger increase pattern after year 2008 (Figure 75-87).

Site	Date	Hardness (mg/L)	Standard (µg/L)	Result Value (µg/L)
Mile 1.5	4/29/14	135.72	153.03	154
	7/22/03	35.68	49.33	65
	7/31/12	54.35	70.45	106
	7/30/13	36.08	49.8	50
Mile 6.5	5/1/12	30	42.6	124
	4/29/14	76.37	94.02	164
	7/22/03	32.79	45.93	55
	7/25/06	34.12	47.5	52.1
	7/21/09	32.66	45.78	73.9
	7/26/11	34.64	48.12	60.2
	7/22/14	28.89	41.26	56.4
Mile 10.1	5/1/07	28.96	41.34	58.6
	4/28/09	31.97	44.95	46.2
	5/1/12	30.08	42.7	117
	5/7/13	31.08	43.89	59.9
	4/29/14	43.41	58.26	83.8
	7/22/03	28.5	40.78	51
	7/25/06	29.95	42.53	60
	7/21/09	31.79	44.74	78.2
	7/27/10	27.87	40.02	72
	7/26/11	32.7	45.82	58.8
	7/31/12	29.62	42.14	54.4
	7/30/13	32.29	45.33	73.1
	7/22/14	28.76	41.1	54.3
Mile 12.5	4/27/10	34.18	47.58	84.2
	4/29/14	34.39	47.82	76.6
	7/20/04	29.3	41.76	55.7
	7/21/09	30.63	43.35	49.3
	7/26/11	32.7	45.83	49.7
	7/31/12	29.7	42.24	66.1
	7/30/13	32.54	45.63	50.4
	7/22/14	28.82	41.18	58.7
Mile 18	4/26/05	35.17	48.73	51.1
	4/27/10	36.26	50.01	70.3
	5/1/12	30.34	43.01	110
	7/20/04	29.74	42.28	59.4

Site	Date	Hardness (mg/L)	Standard (µg/L)	Result Value (µg/L)
Mile 18	7/21/09	30.67	43.4	50.2
	7/27/10	26.99	38.95	59
	7/26/11	29.34	41.79	55.9
	7/31/12	30.31	42.97	69
	7/30/13	32.62	45.73	51.5
	7/22/14	28.89	41.26	64.3
Mile 21	5/1/12	29.43	41.91	62.9
	7/18/00	29.45	41.93	2900
	7/26/11	29.58	42.09	51.9
	7/31/12	30.15	42.78	59.9
	7/30/13	32.24	45.28	51.1
Mile 23	4/27/04	30.75	43.49	45.2
	5/1/07	28.28	40.51	47
	5/1/12	32.35	45.41	70.2
	7/21/09	31.25	44.09	55
	7/26/11	30.17	42.8	56
	7/31/12	30.32	42.98	45.5
	7/30/13	31.58	44.49	47.5
Mile 31	4/27/04	30.82	43.57	45.7
	5/1/12	33.64	46.94	124
	7/20/04	29.86	42.43	44.1
	7/26/05	28	40.18	51.2
	7/26/11	30.45	43.14	57.9
Mile 40	7/26/11	28.8	41.14	50.6
Mile 43	4/27/04	28.68	41.01	42.3
	7/26/02	27.13	39.11	40
	7/26/11	28.59	40.89	59.1
Mile 50	7/24/01	27.97	40.14	48.5
	7/26/11	30	42.61	59.9
Mile 70	5/1/12	39.16	53.38	71
	7/16/02	31.58	44.48	50
	7/26/11	34.86	48.37	56.5
Mile 82	5/1/12	35.46	49.08	54.5
	7/26/11	33.56	46.84	56.5
	7/30/13	38.03	52.08	52.1

Site	Date	Hardness (mg/L)	Standard (µg/L)	Result Value (µg/L)
No Name Creek	4/11/01	35.01	48.55	84
	4/10/02	42.03	56.68	122
	4/27/04	28.84	41.2	61.9
	4/26/05	16.96	26.27	63.3
	4/25/06	33.29	46.52	52.2
	5/1/12	28.31	40.55	115
	5/7/13	11.61	19.05	113
	4/29/14	27.03	39	97.8
	7/22/03	50.58	66.31	75
	7/26/11	48.64	64.15	148
	7/31/12	50.87	66.64	86.1
	7/22/14	44.31	59.28	67.1
Beaver Creek	4/26/05	32.38	45.44	59.1
	4/25/06	31.67	44.59	46.4
	5/1/07	49.01	64.56	108
	4/28/09	38.28	52.37	84.8
	4/26/11	46.76	62.04	247
	5/1/12	23.26	34.33	196
	5/7/13	23.22	34.28	87.6
	4/29/14	33.52	46.79	111
	7/21/09	55.16	71.36	110
	7/26/11	68.87	86.13	114
	7/31/12	56.45	72.78	85.7
	7/30/13	73.06	90.55	99.6
Slikok Creek	4/11/01	18.74	28.59	41
	4/29/03	41.47	56.04	69
	4/27/04	23.49	34.62	39.5
	4/26/05	25.11	36.64	47.9
	5/1/07	29.51	42.01	78.6
	5/1/12	22.77	33.72	116
	5/7/13	23.22	34.28	105
	4/29/14	31.79	44.74	56.3
	7/24/01	47.29	62.63	69.4

Site	Date	Hardness (mg/L)	Standard (µg/L)	Result Value (µg/L)
Soldotna Creek	4/26/05	38.4	52.51	58.6
	4/28/09	35.96	49.67	51.4
	4/26/11	38.4	52.51	61.8
	5/1/12	33.02	46.2	94.6
Funny River	4/10/02	43.05	57.84	70
	4/29/03	31.58	44.49	52
	4/26/05	21.61	32.26	46.8
	5/1/07	31.14	43.96	51.9
	4/27/10	30.82	43.58	48
	4/26/11	25.2	36.75	45.6
	5/1/12	27.28	39.29	66.1
	7/16/02	31.93	44.91	51
	7/20/04	37.39	51.34	59.1
	7/26/11	40.38	54.79	56.7
Moose River	5/1/12	70.59	56.28	120
Killey River	4/27/04	25.79	37.48	37.9
	4/26/11	23.25	34.32	40
	5/1/12	26.32	38.12	60.7
	5/7/13	19.1	29.05	57.4
	7/24/01	15.25	24.01	34.4
	7/20/04	14.9	23.54	49.5
	7/21/09	16.01	25.01	44.4
	7/26/11	17.51	26.99	57.8
	7/31/12	15.28	24.04	57.5
	7/30/13	15.56	24.42	41.5
Russian River	5/1/12	37.33	51.27	52.8
	7/26/11	40.41	54.82	55
Juneau Creek	7/26/11	37.78	51.79	56.7

Table 4: Summary of hardness-dependent exceedances for zinc.

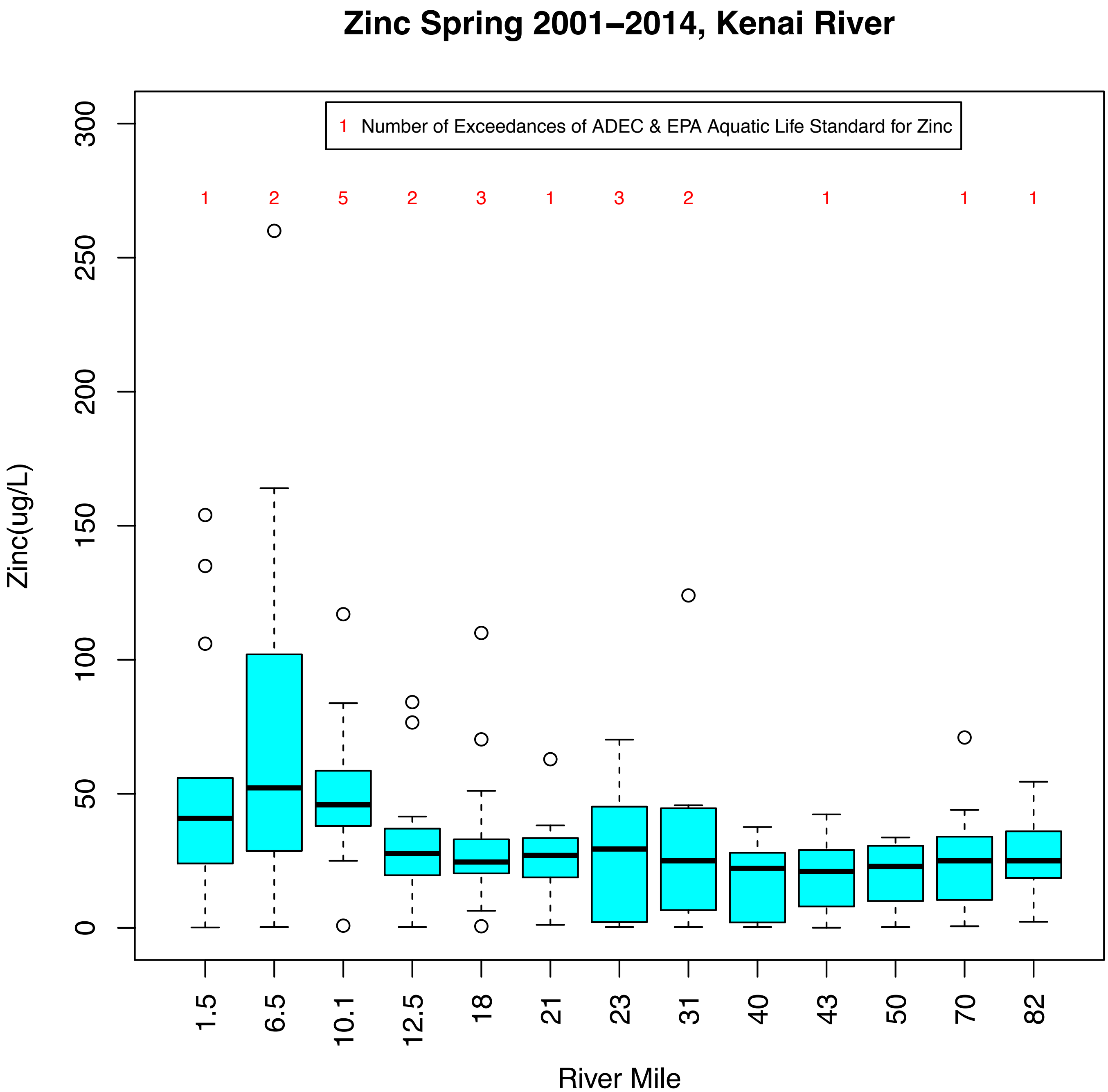

Figure 54: Zinc sampled in the Kenai River mainstem during spring 2001 to 2014. Since 12% of the samples are reported as below the MRL or MDL, these values have been estimated using values that are half of the MRL or MDL.

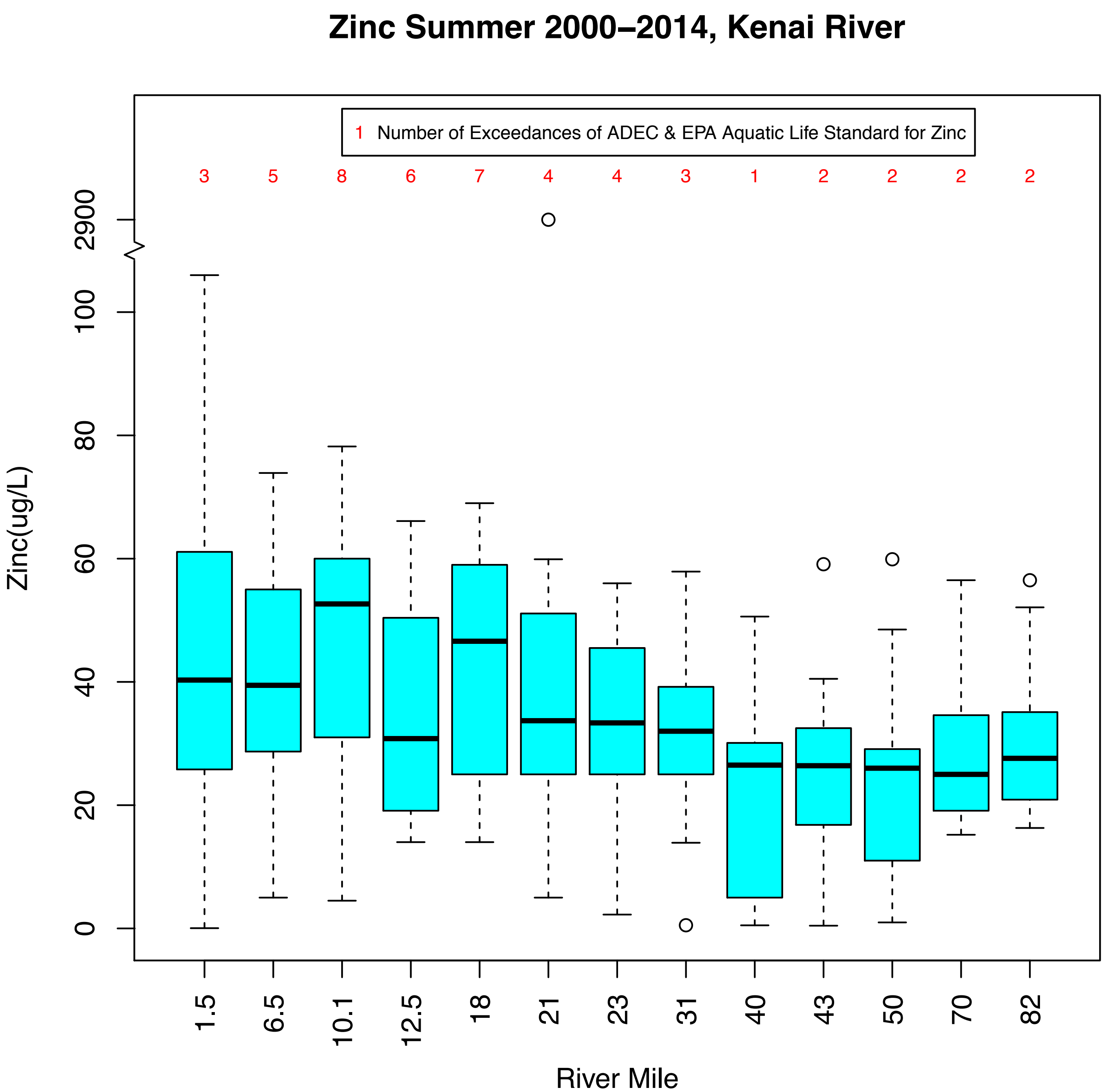

Figure 55: Zinc sampled in the Kenai River mainstem during summer 2000 to 2014. Since 10% of the samples are reported as below the MRL or MDL, these values have been estimated using values that are half of the MRL or MDL.

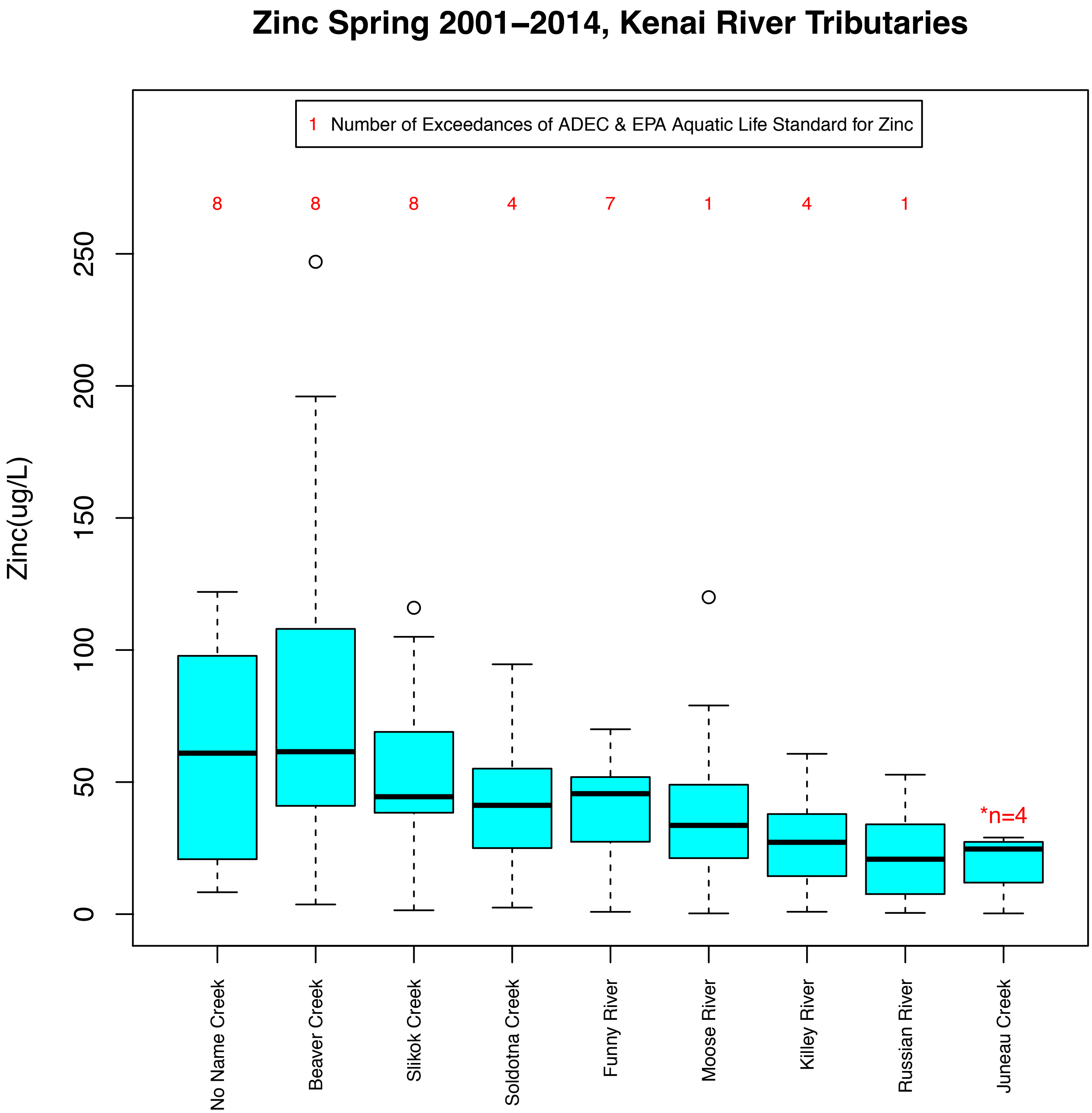

Figure 56: Zinc sampled in Kenai River tributaries during spring 2001 to 2014. Since 5% of the samples are reported as below the MRL or MDL, these values have been estimated using values that are half of the MRL or MDL.

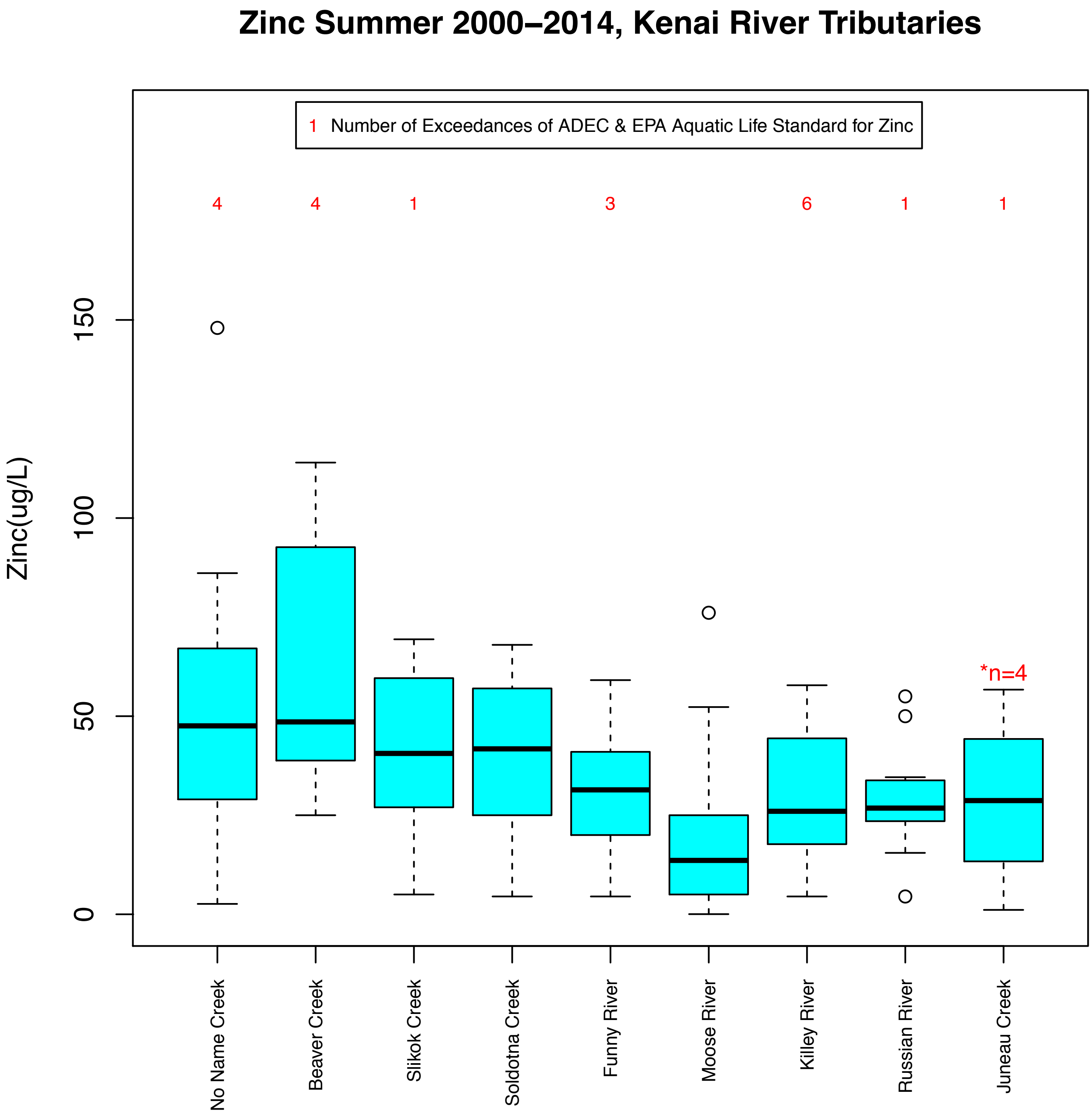

Figure 57: Zinc sampled in Kenai River tributaries during summer 2000 to 2014. Since 14% of the samples are reported as below the MRL or MDL, these values have been estimated using values that are half of the MRL or MDL.

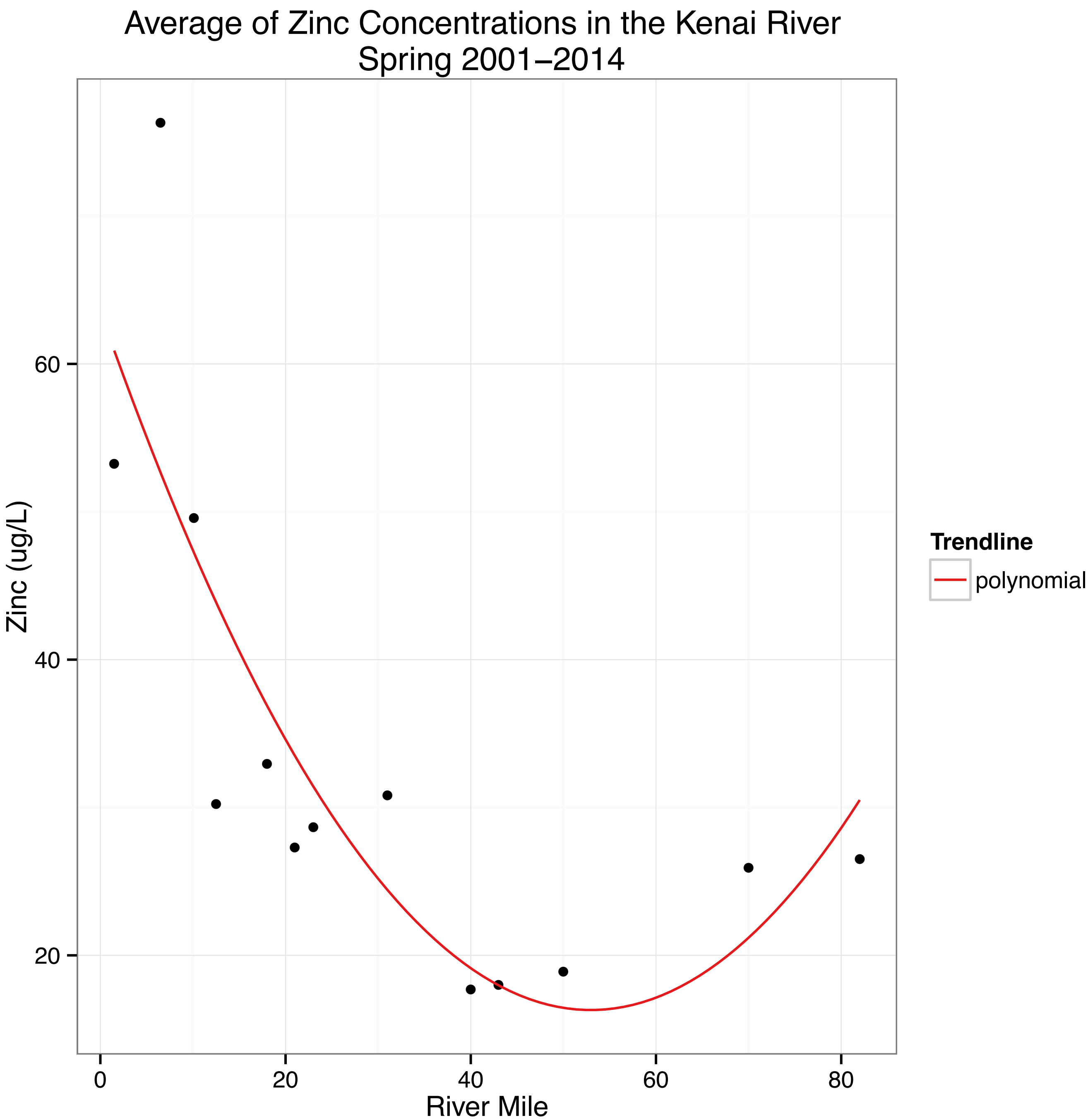

Figure 58: Averages of Zinc values sampled from spring 2001 to 2014, Kenai River. Not detected values are not taken into account in the analysis and therefore are not shown in this graph.

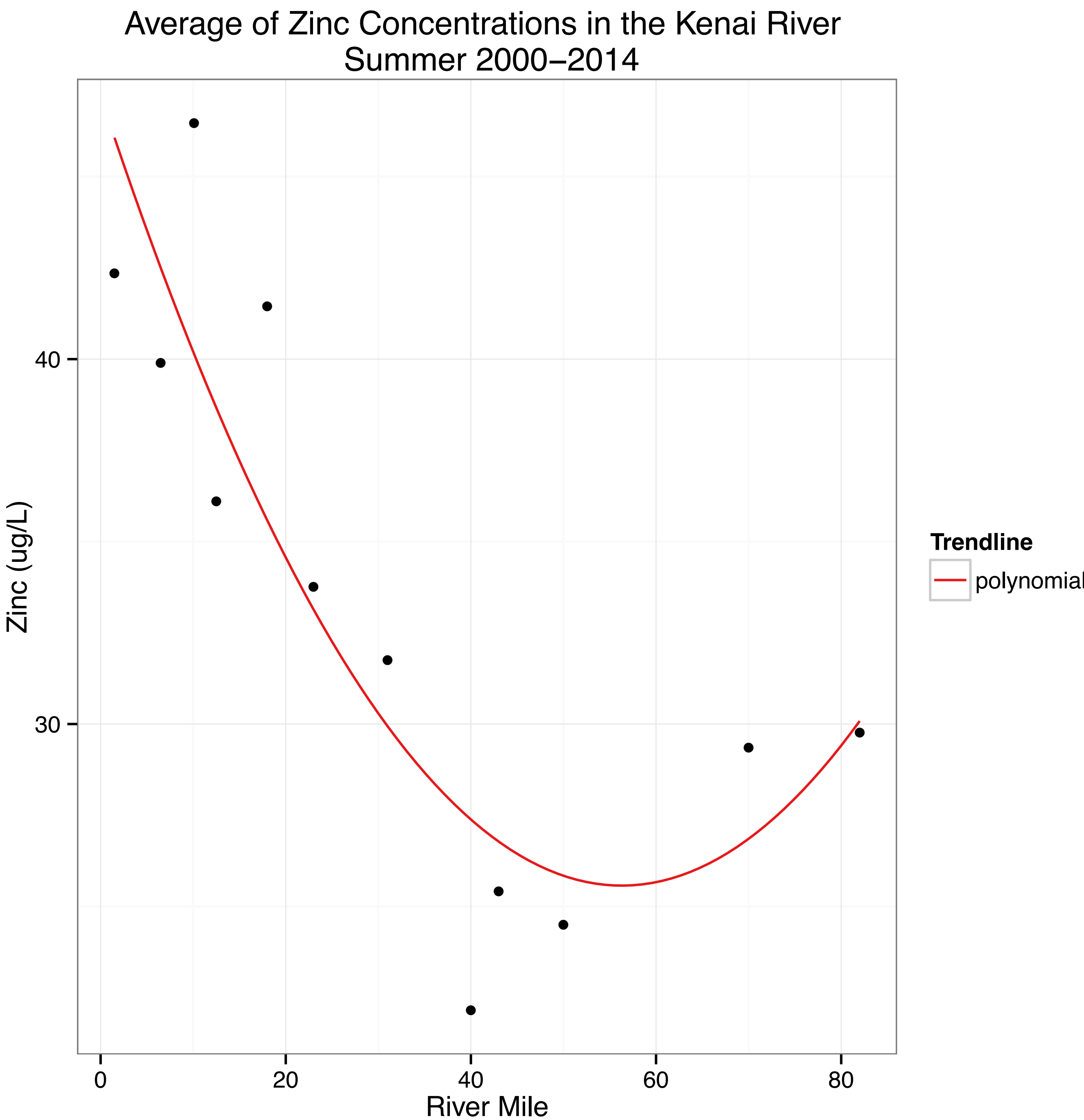

Figure 59: Averages of zinc values sampled from summer 2000 to 2014, Kenai River. Not detected values are not taken into account in the analysis and therefore are not shown in this graph.

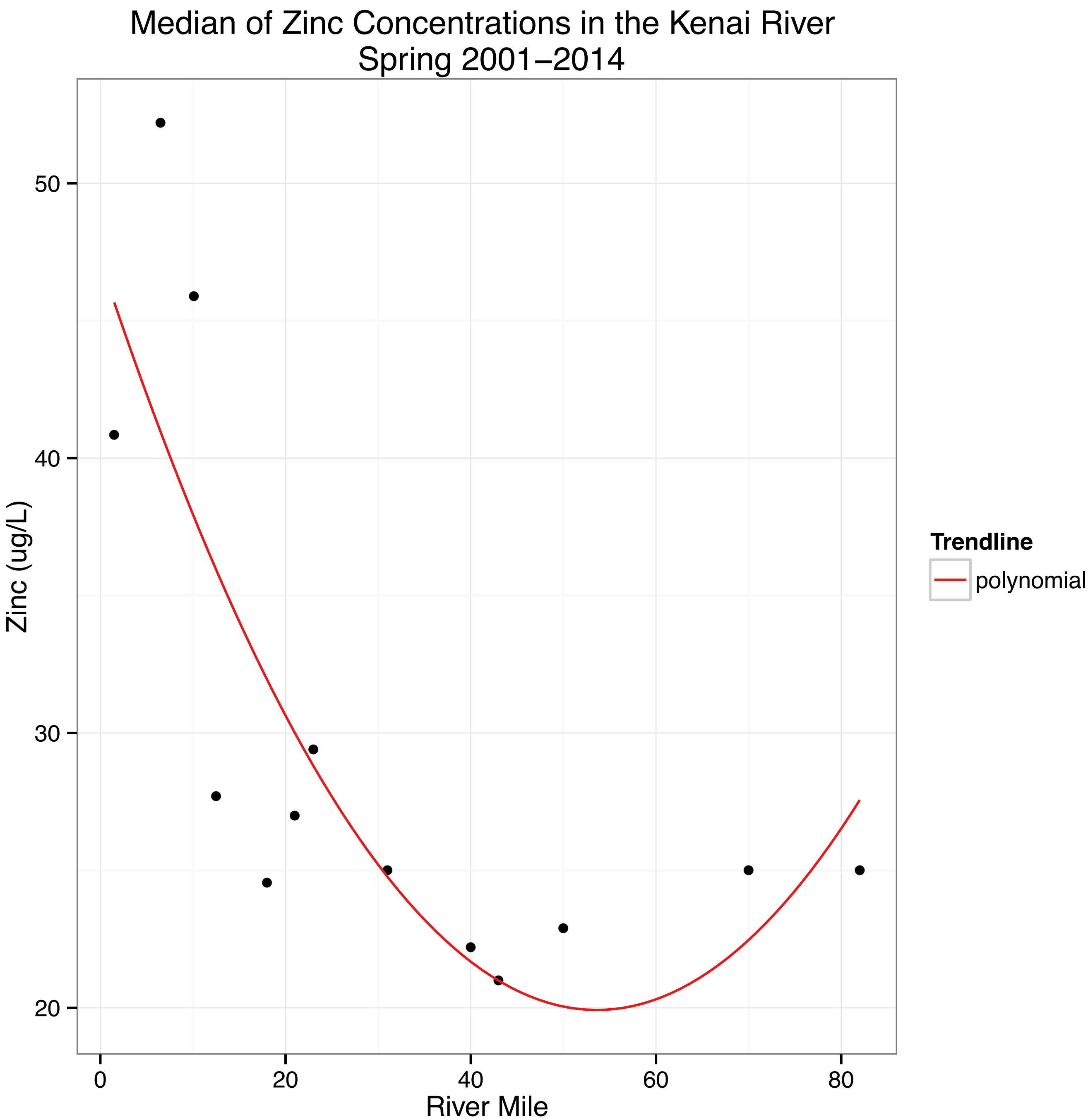

Figure 60: Median of zinc values sampled from spring 2001 to 2014, Kenai River. Not detected values are not taken into account in the analysis and therefore are not shown in this graph.

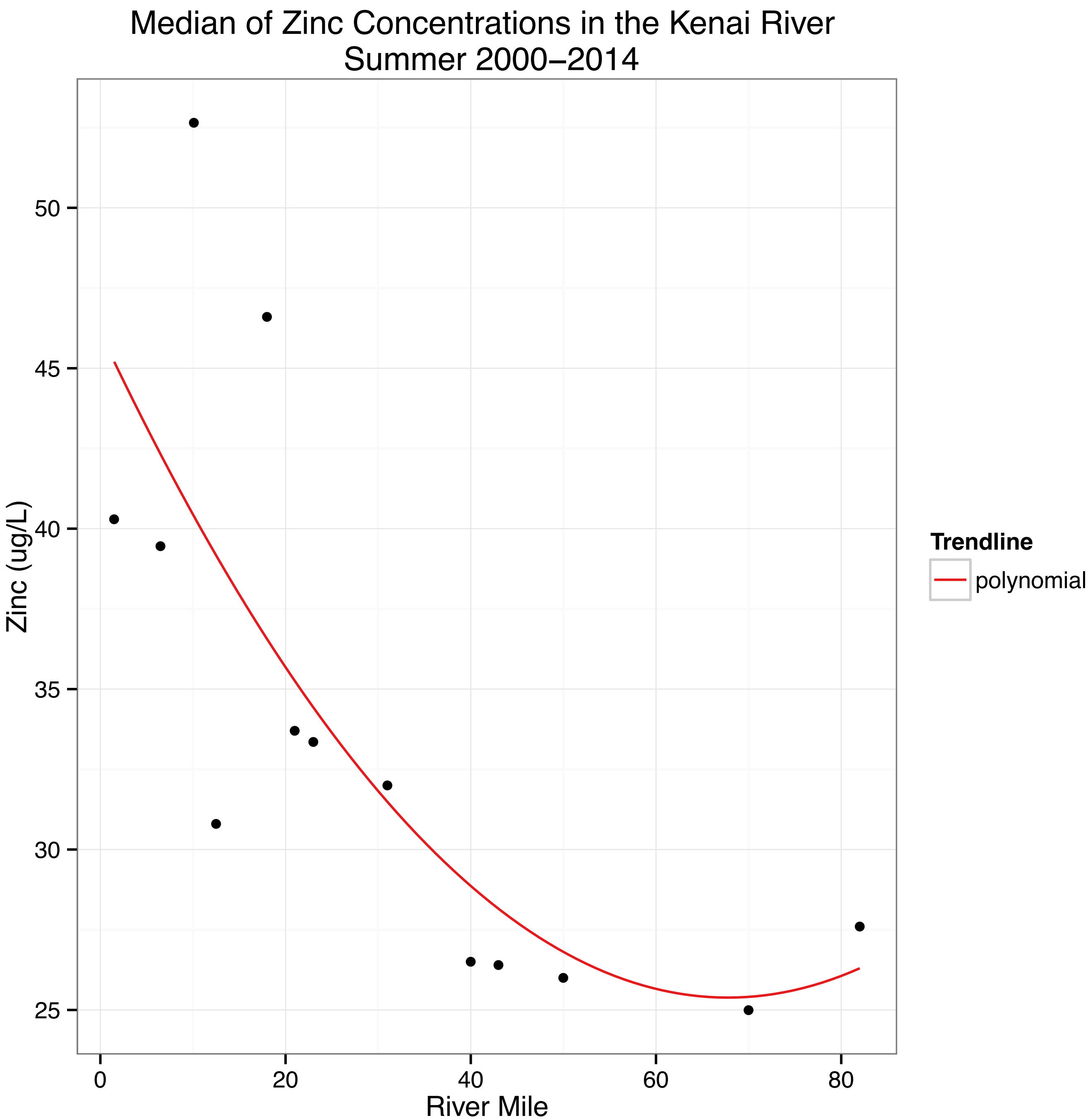

Figure 61: Median of zinc values sampled from summer 2000 to 2014, Kenai River. Not detected values are not taken into account in the analysis and therefore are not shown in this graph.

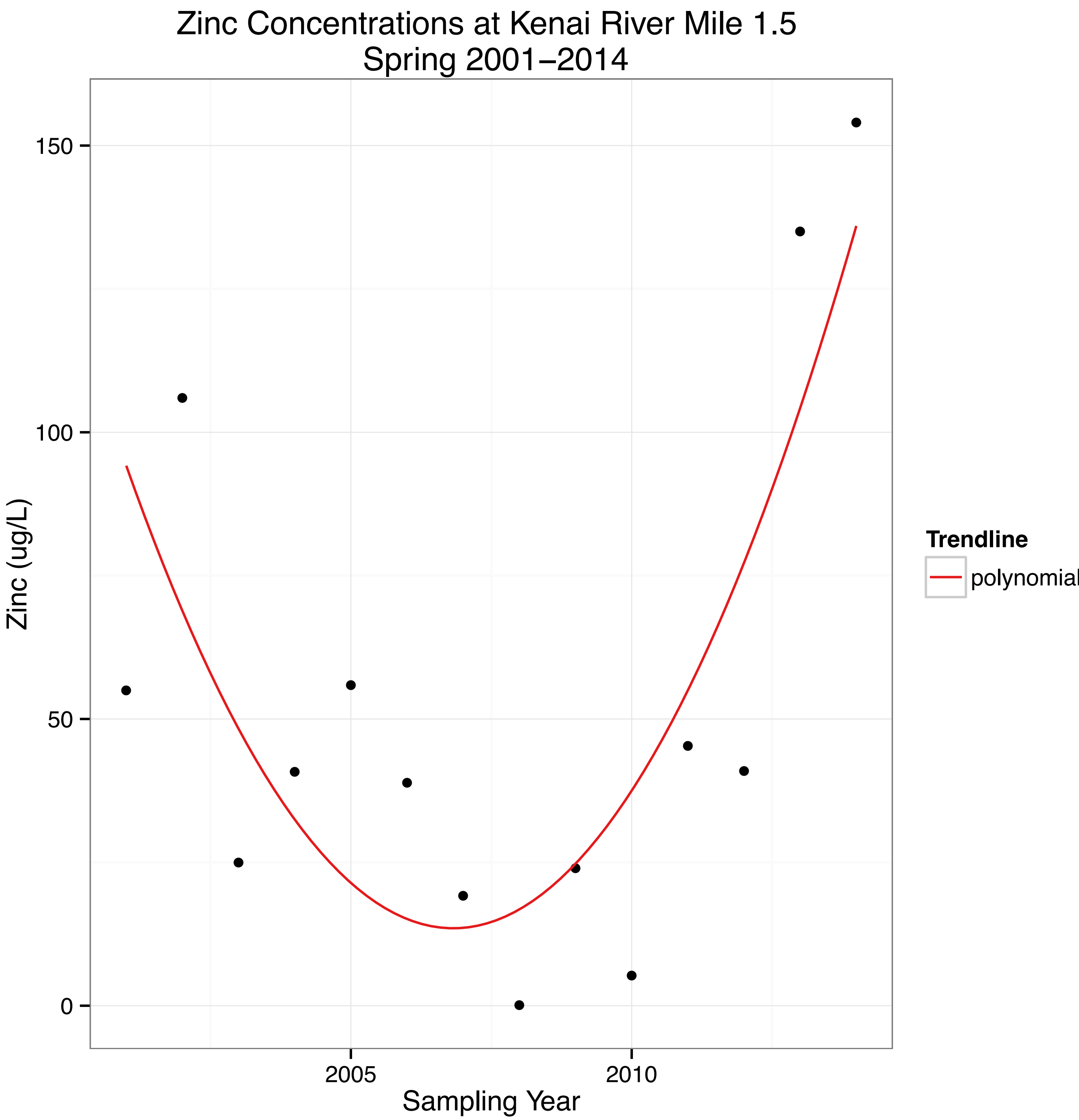

Figure 62: Trend analysis for zinc sampled at Mile 1.5 from spring 2001 to 2014. Not detected values are not taken into account in the analysis and therefore are not shown in this graph.

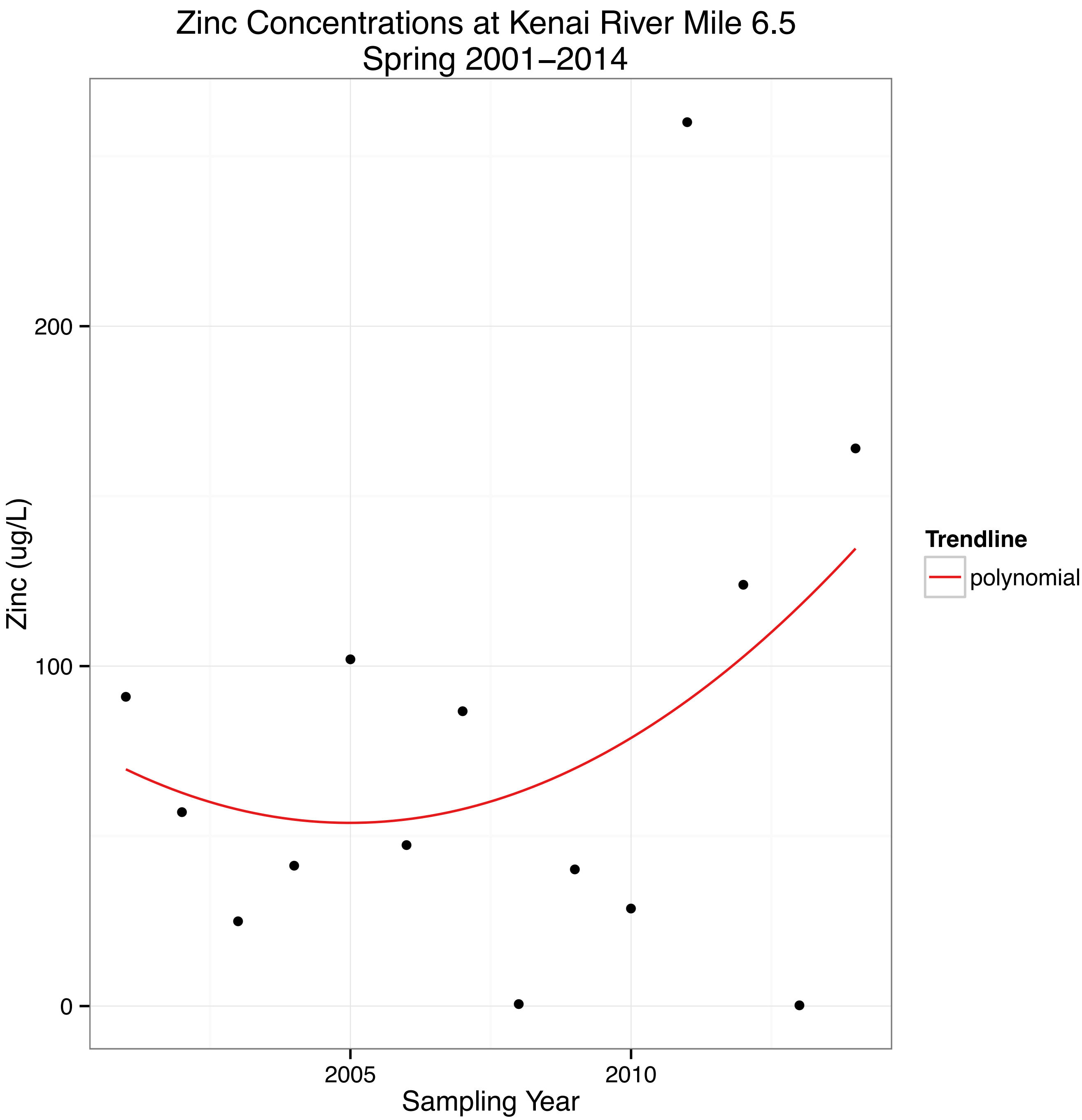

Figure 63: Trend analysis for zinc sampled at Mile 6.5 from spring 2001 to 2014. Not detected values are not taken into account in the analysis and therefore are not shown in this graph.

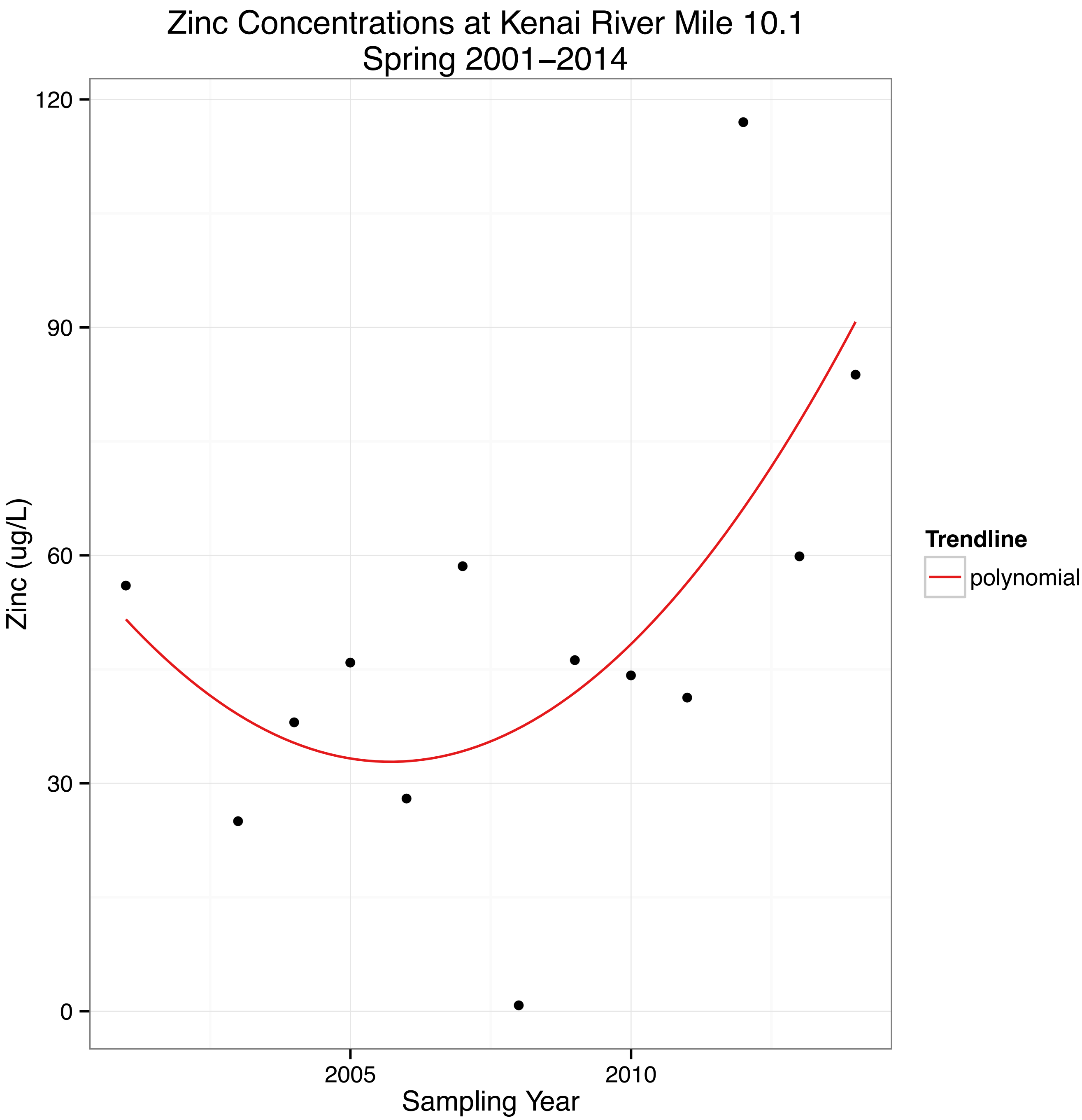

Figure 64: Trend analysis for zinc sampled at Mile 10.1 from spring 2001 to 2014. Not detected values are not taken into account in the analysis and therefore are not shown in this graph.

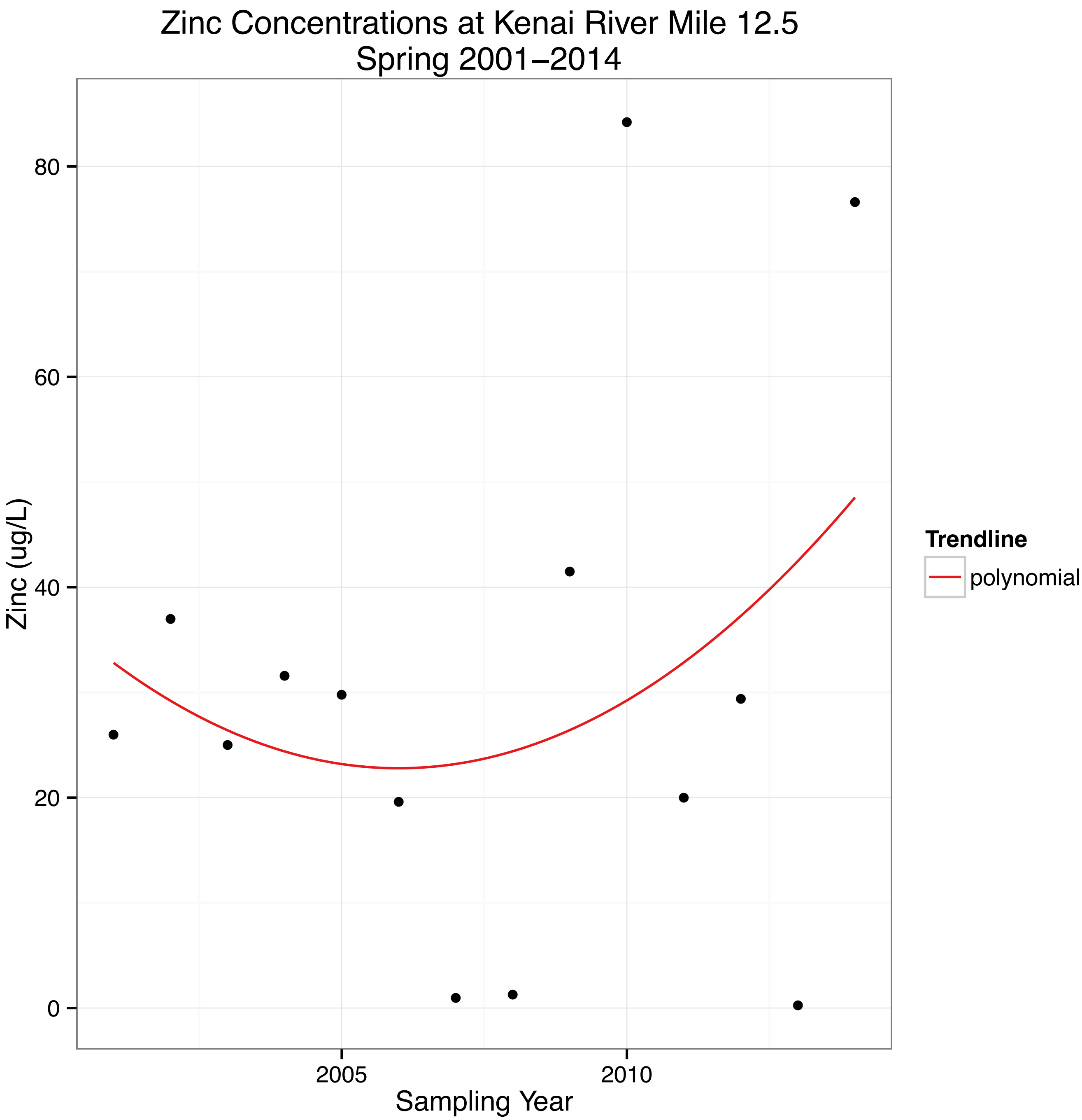

Figure 65: Trend analysis for zinc sampled at Mile 12.5 from spring 2001 to 2014. Not detected values are not taken into account in the analysis and therefore are not shown in this graph.

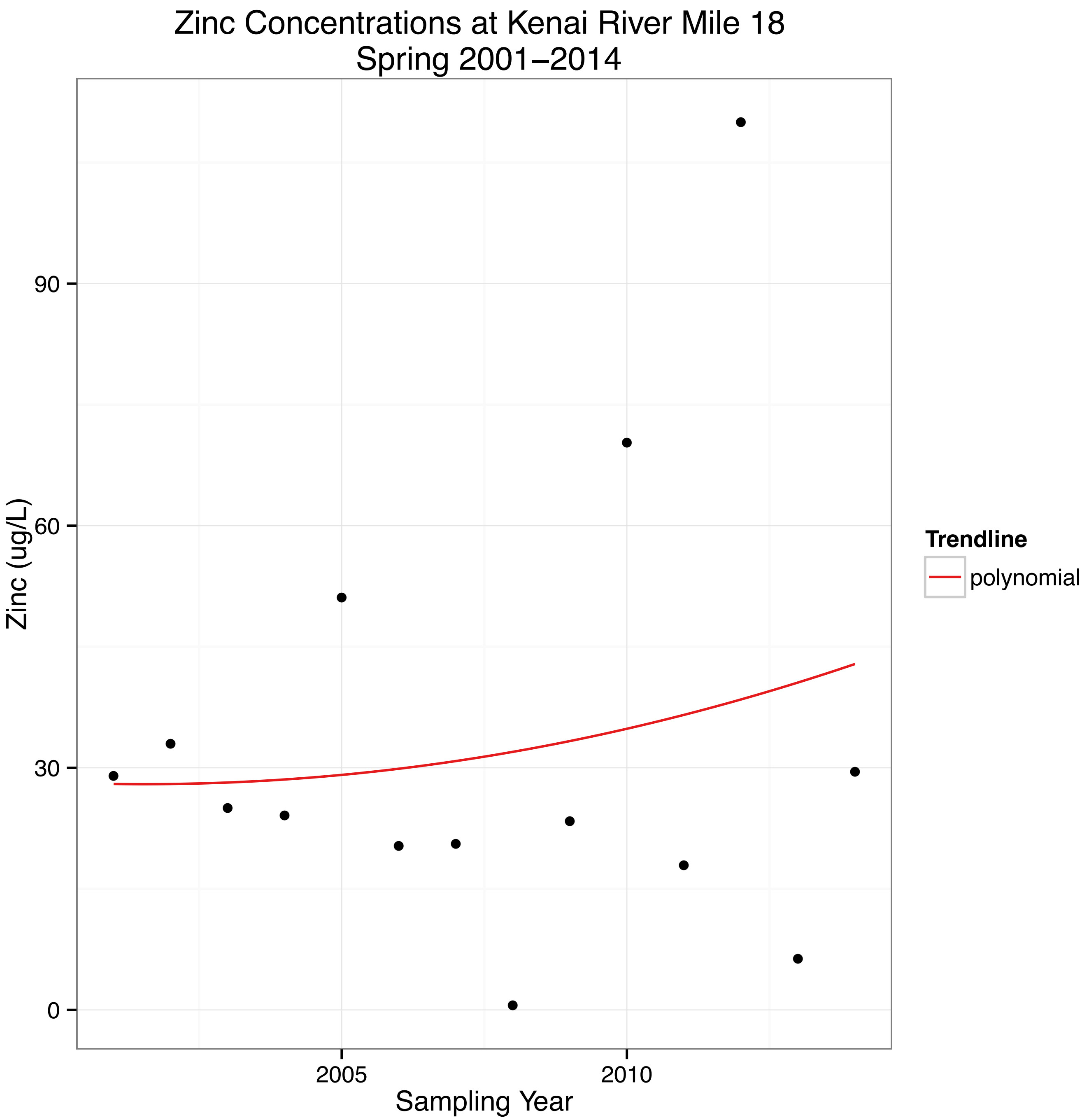

Figure 66: Trend analysis for zinc sampled at Mile 18 from spring 2001 to 2014. Not detected values are not taken into account in the analysis and therefore are not shown in this graph.

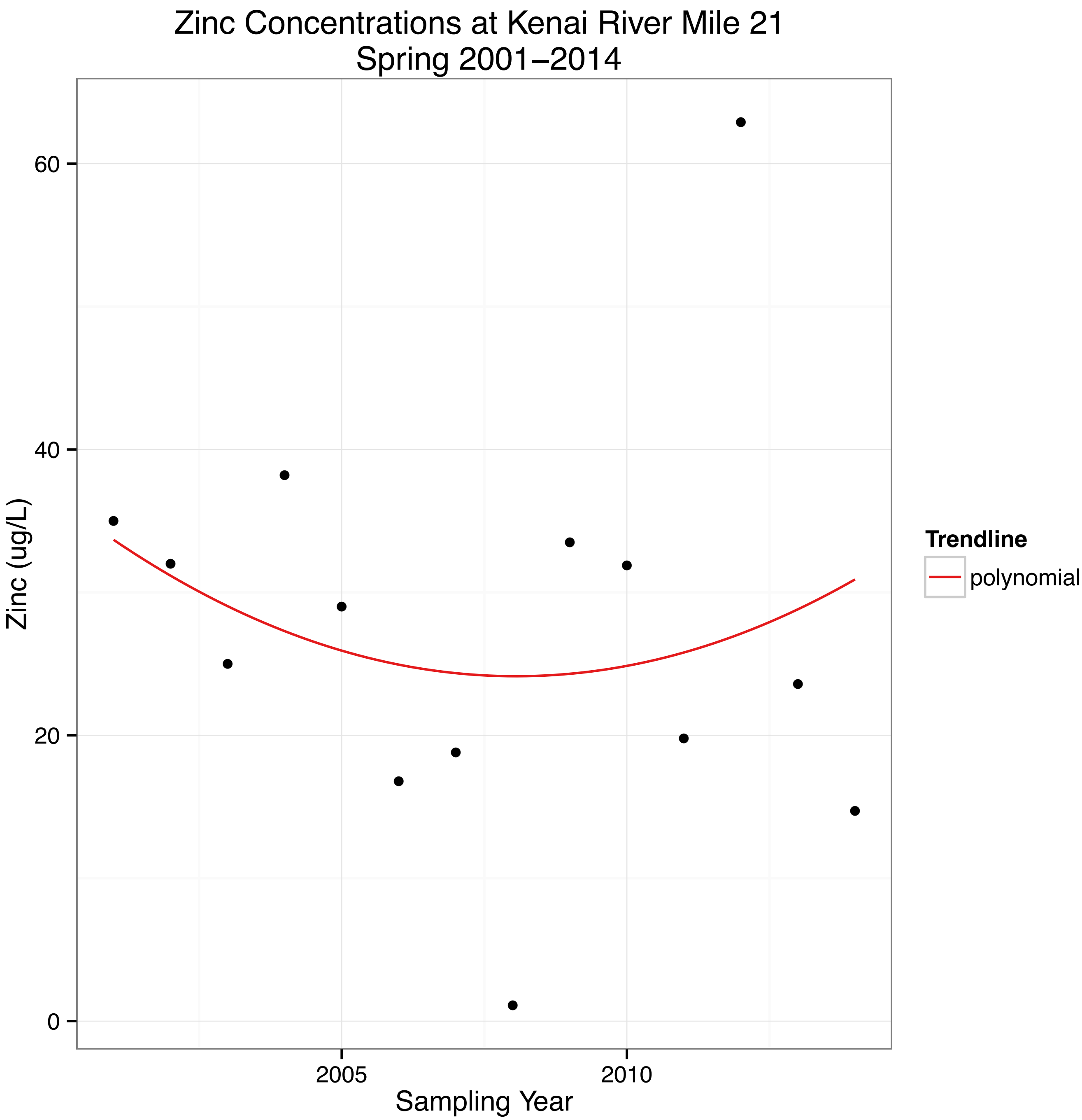

Figure 67: Trend analysis for zinc sampled at Mile 21 from spring 2001 to 2014. Not detected values are not taken into account in the analysis and therefore are not shown in this graph.

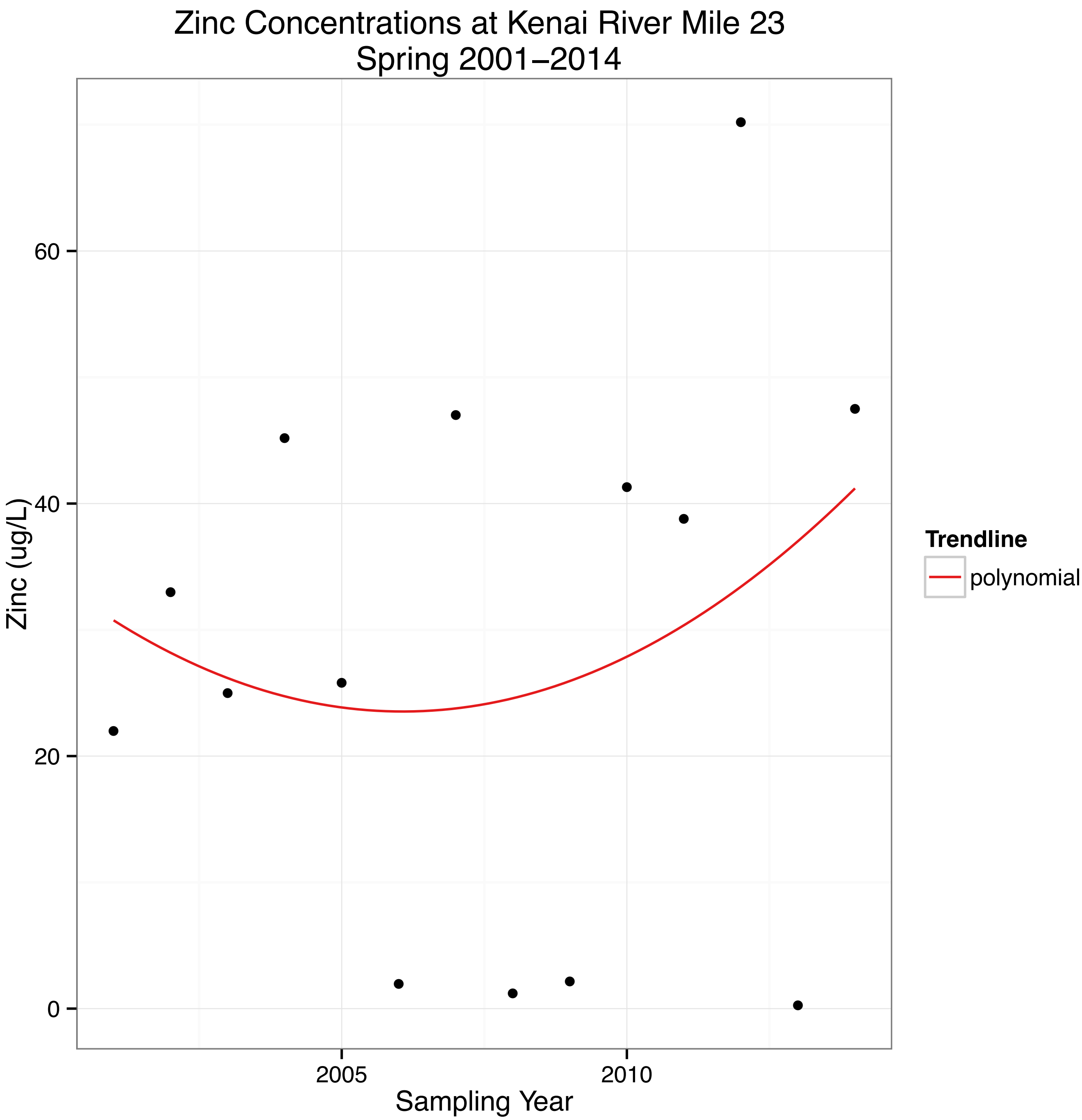

Figure 68: Trend analysis for zinc sampled at Mile 23 from spring 2001 to 2014. Not detected values are not taken into account in the analysis and therefore are not shown in this graph.

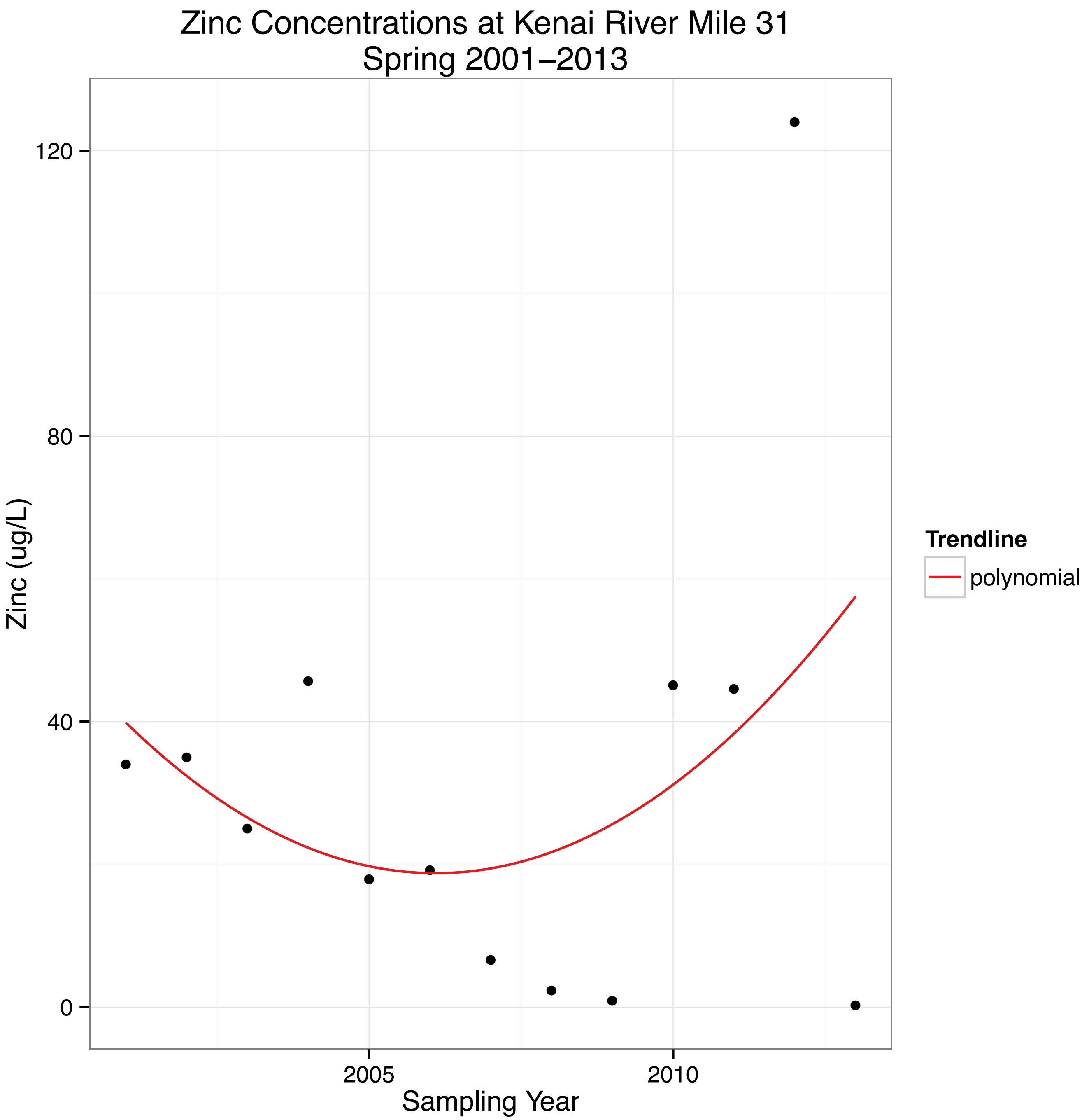

Figure 69: Trend analysis for zinc sampled at Mile 31 from spring 2001 to 2014. Not detected values are not taken into account in the analysis and therefore are not shown in this graph.

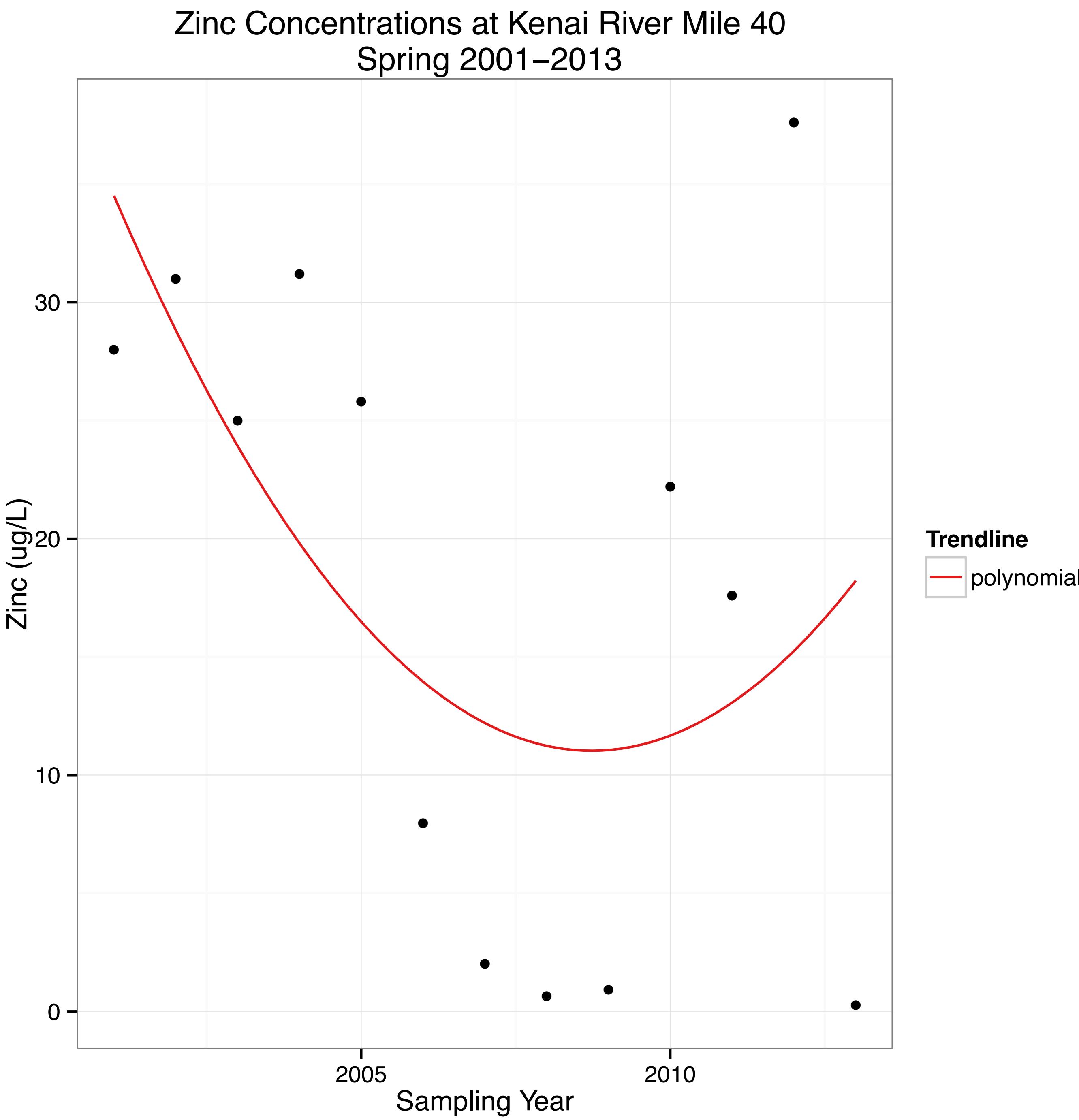

Figure 70: Trend analysis for zinc sampled at Mile 40 from spring 2001 to 2014. Not detected values are not taken into account in the analysis and therefore are not shown in this graph.

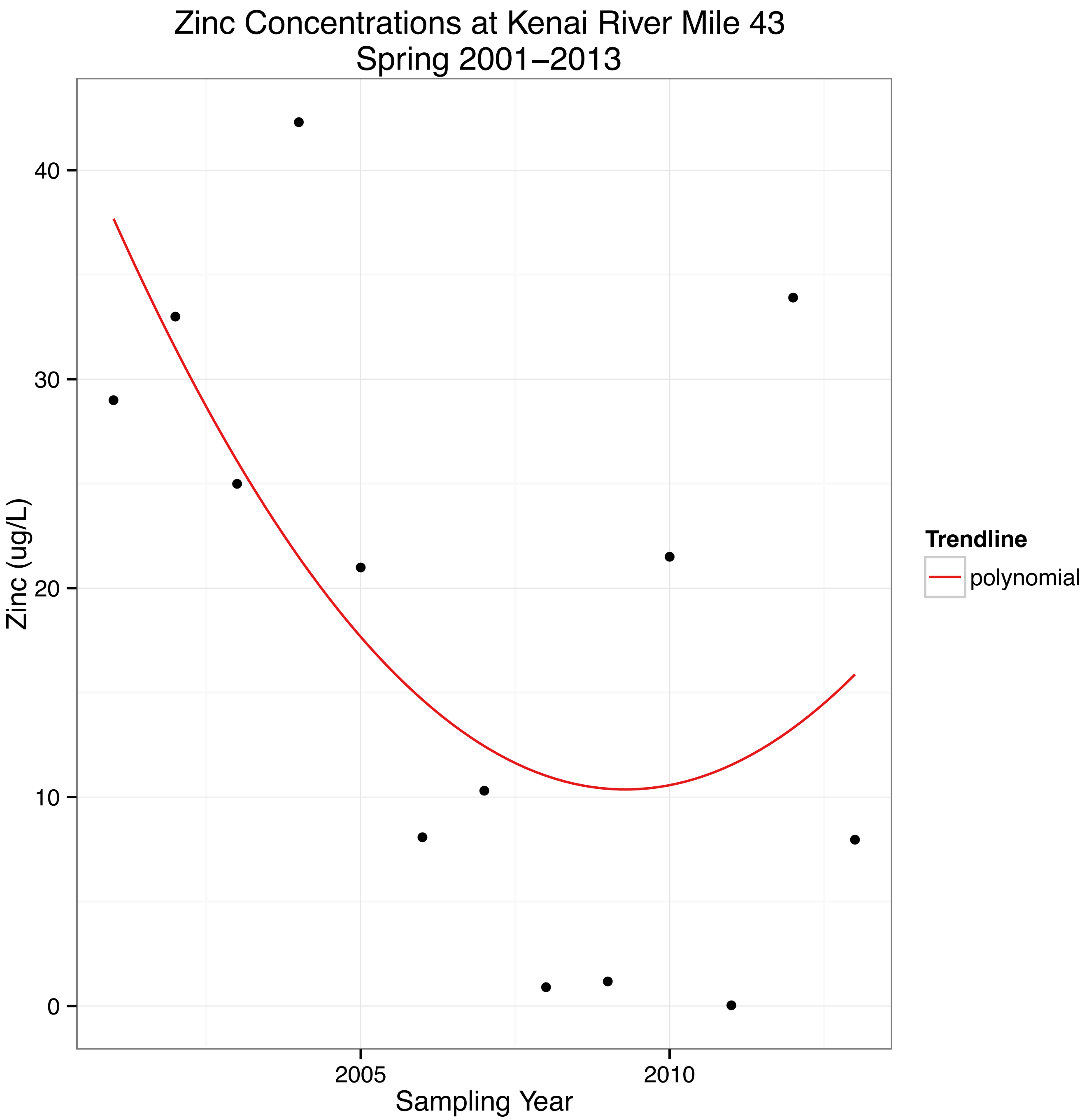

Figure 71: Trend analysis for zinc sampled at Mile 43 from spring 2001 to 2014. Not detected values are not taken into account in the analysis and therefore are not shown in this graph.

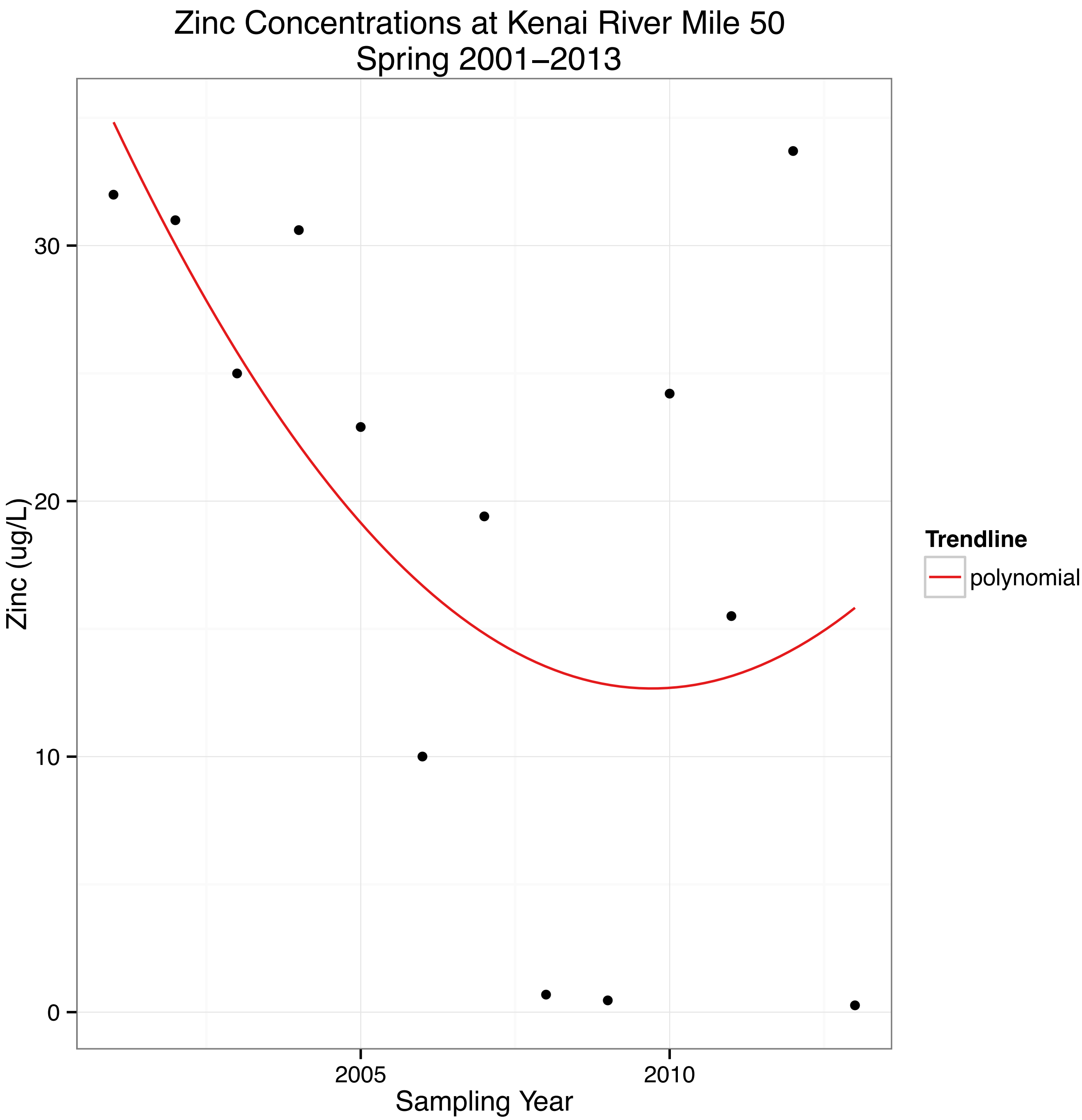

Figure 72: Trend analysis for zinc sampled at Mile 50 from spring 2001 to 2014. Not detected values are not taken into account in the analysis and therefore are not shown in this graph.

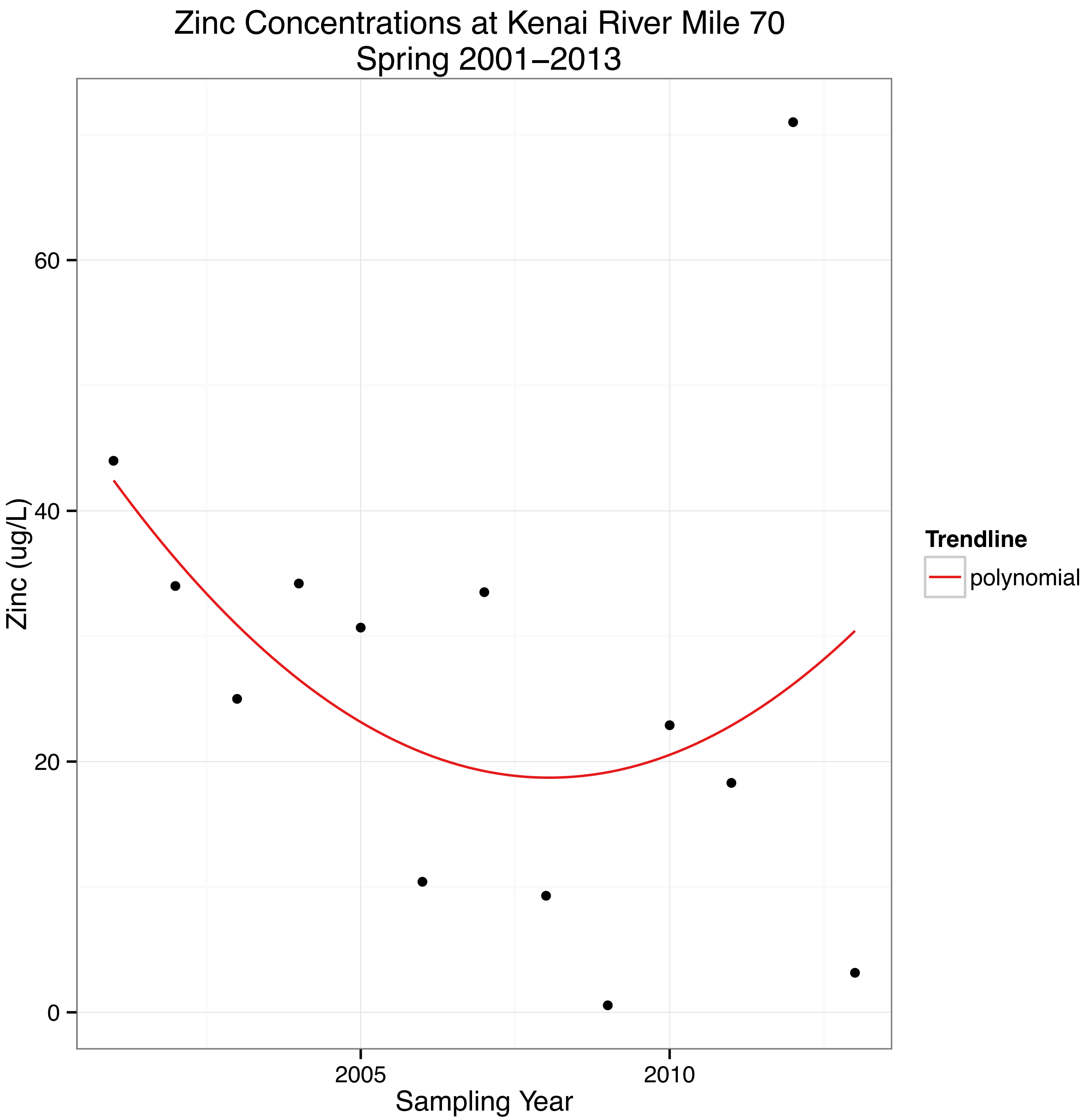

Figure 73: Trend analysis for zinc sampled at Mile 70 from spring 2001 to 2014. Not detected values are not taken into account in the analysis and therefore are not shown in this graph.

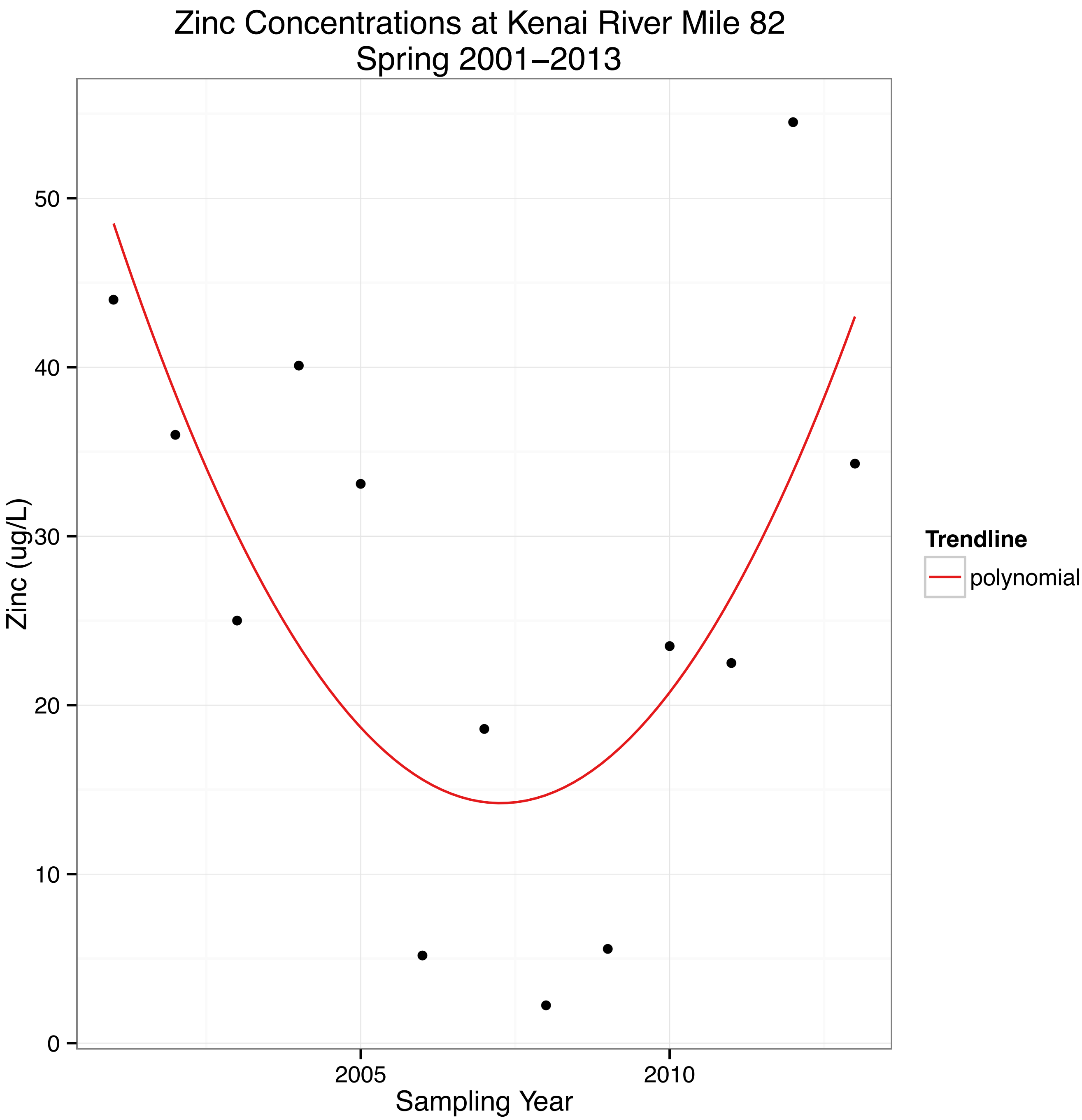

Figure 74: Trend analysis for zinc sampled at Mile 82 from spring 2001 to 2014. Not detected values are not taken into account in the analysis and therefore are not shown in this graph.

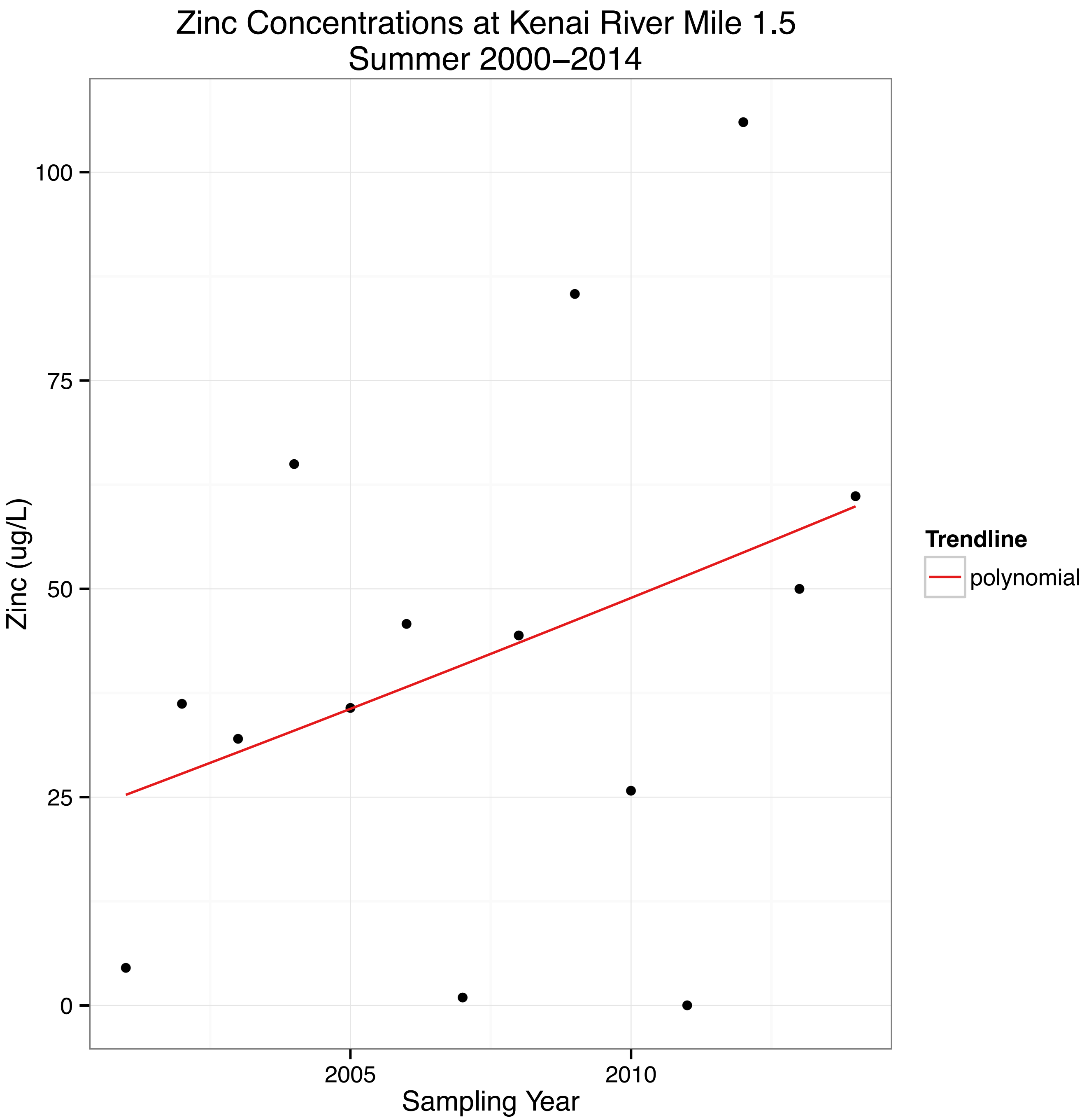

Figure 75: Trend analysis for zinc sampled at Mile 1.5 from summer 2000 to 2014. Not detected values are not taken into account in the analysis and therefore are not shown in this graph.

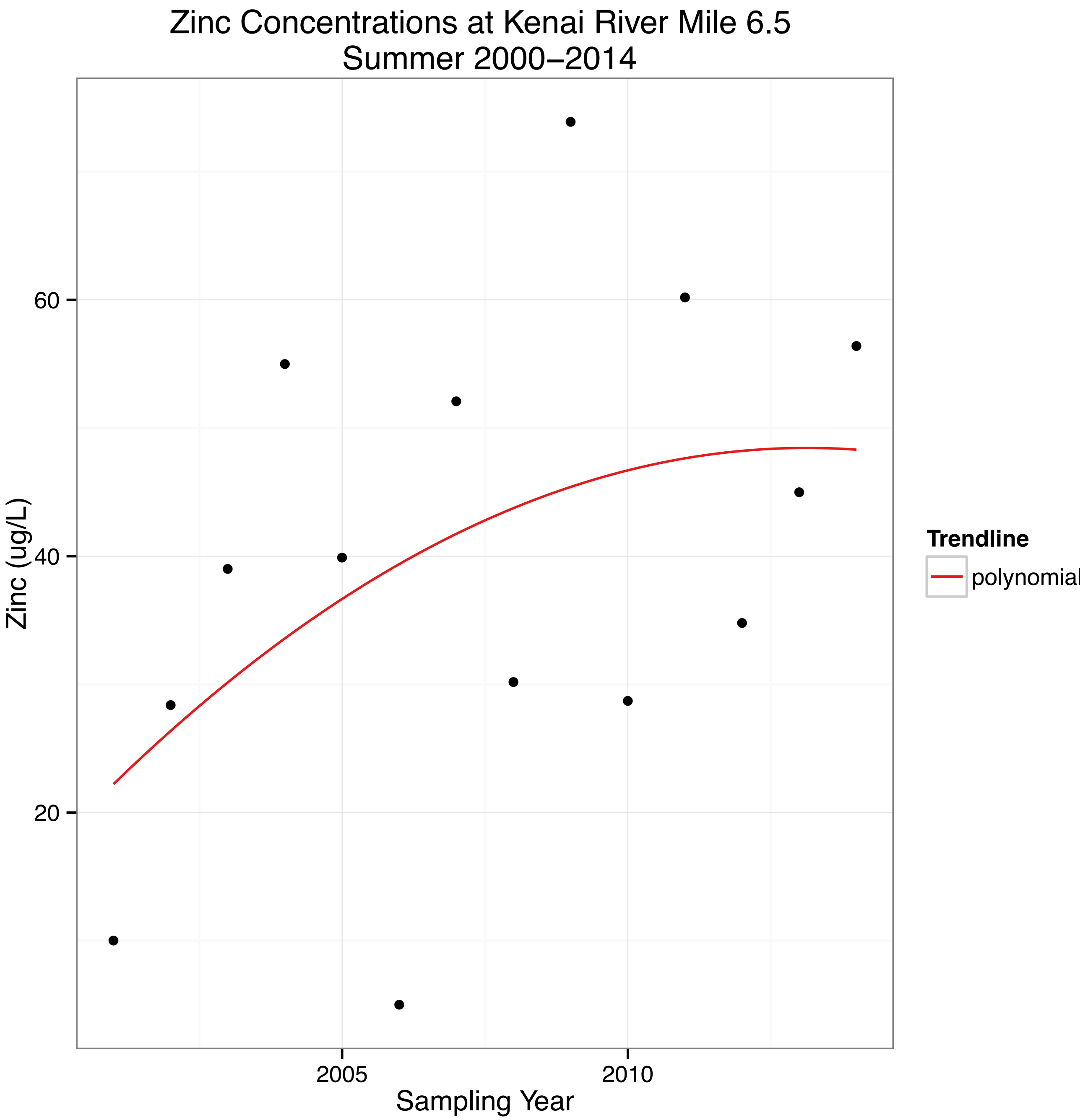

Figure 76: Trend analysis for zinc sampled at Mile 6.5 from summer 2000 to 2014. Not detected values are not taken into account in the analysis and therefore are not shown in this graph.

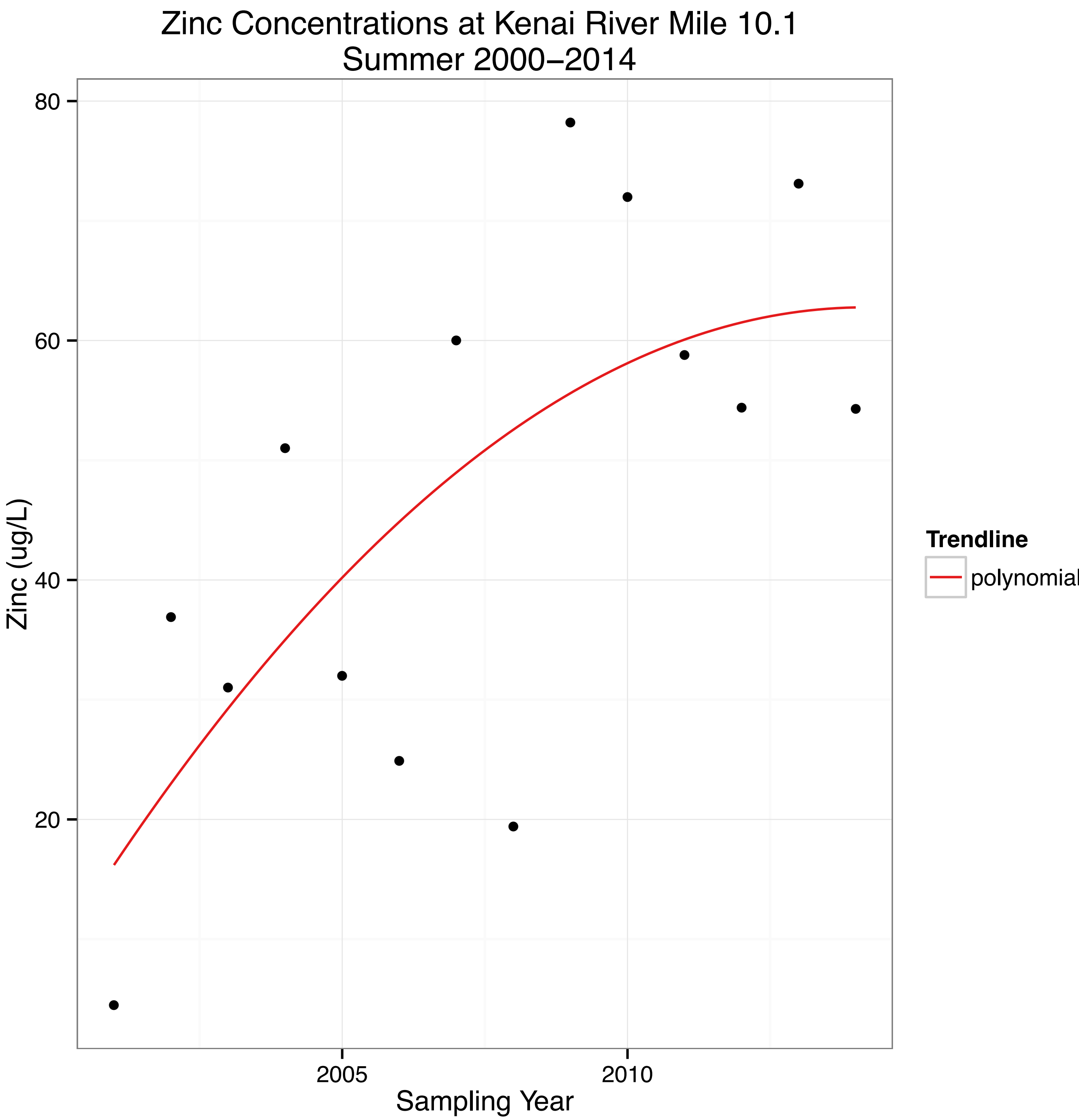

Figure 77: Trend analysis for zinc sampled at Mile 10.1 from summer 2000 to 2014. Not detected values are not taken into account in the analysis and therefore are not shown in this graph.

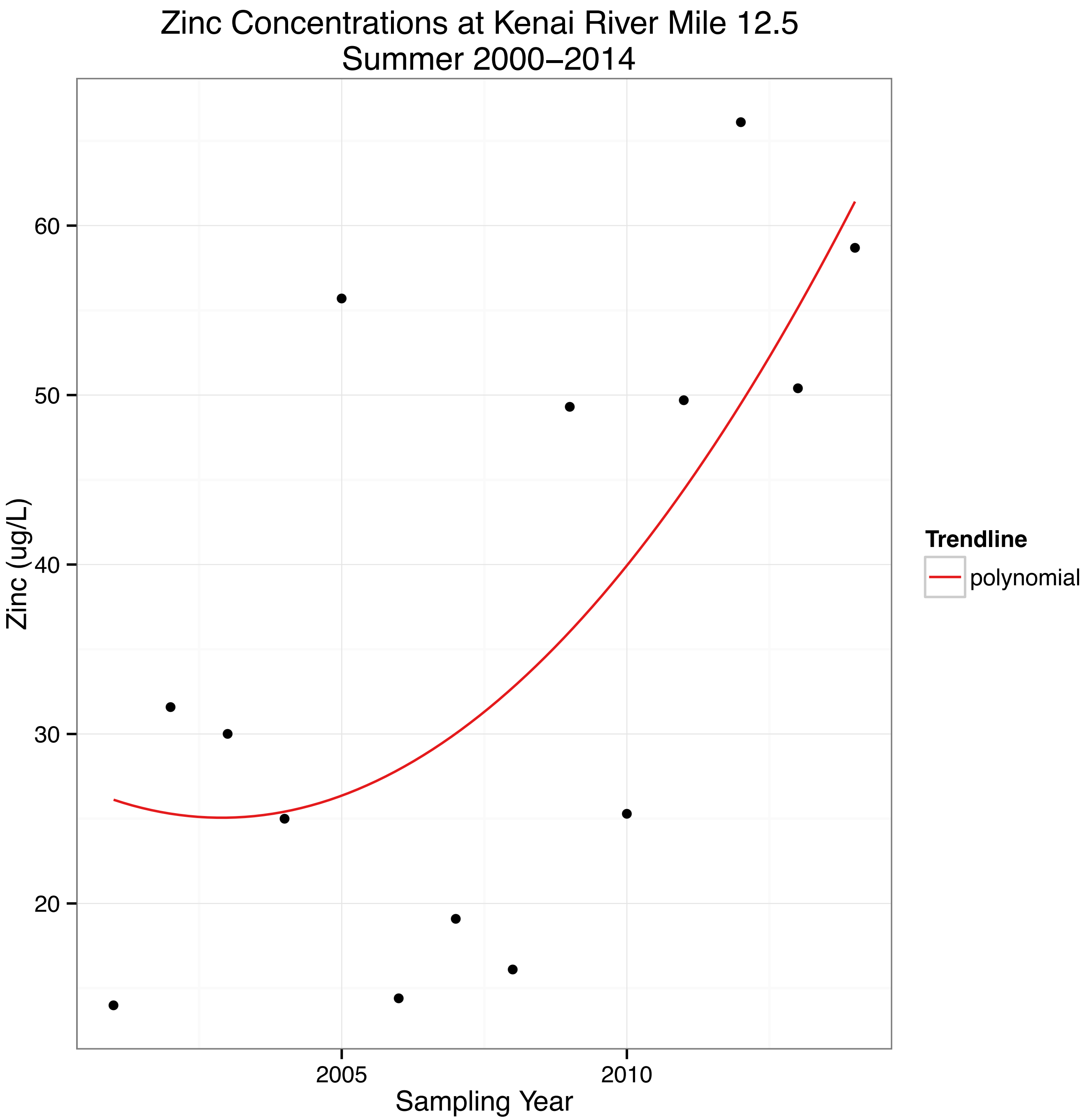

Figure 78: Trend analysis for zinc sampled at Mile 12.5 from summer 2000 to 2014. Not detected values are not taken into account in the analysis and therefore are not shown in this graph.

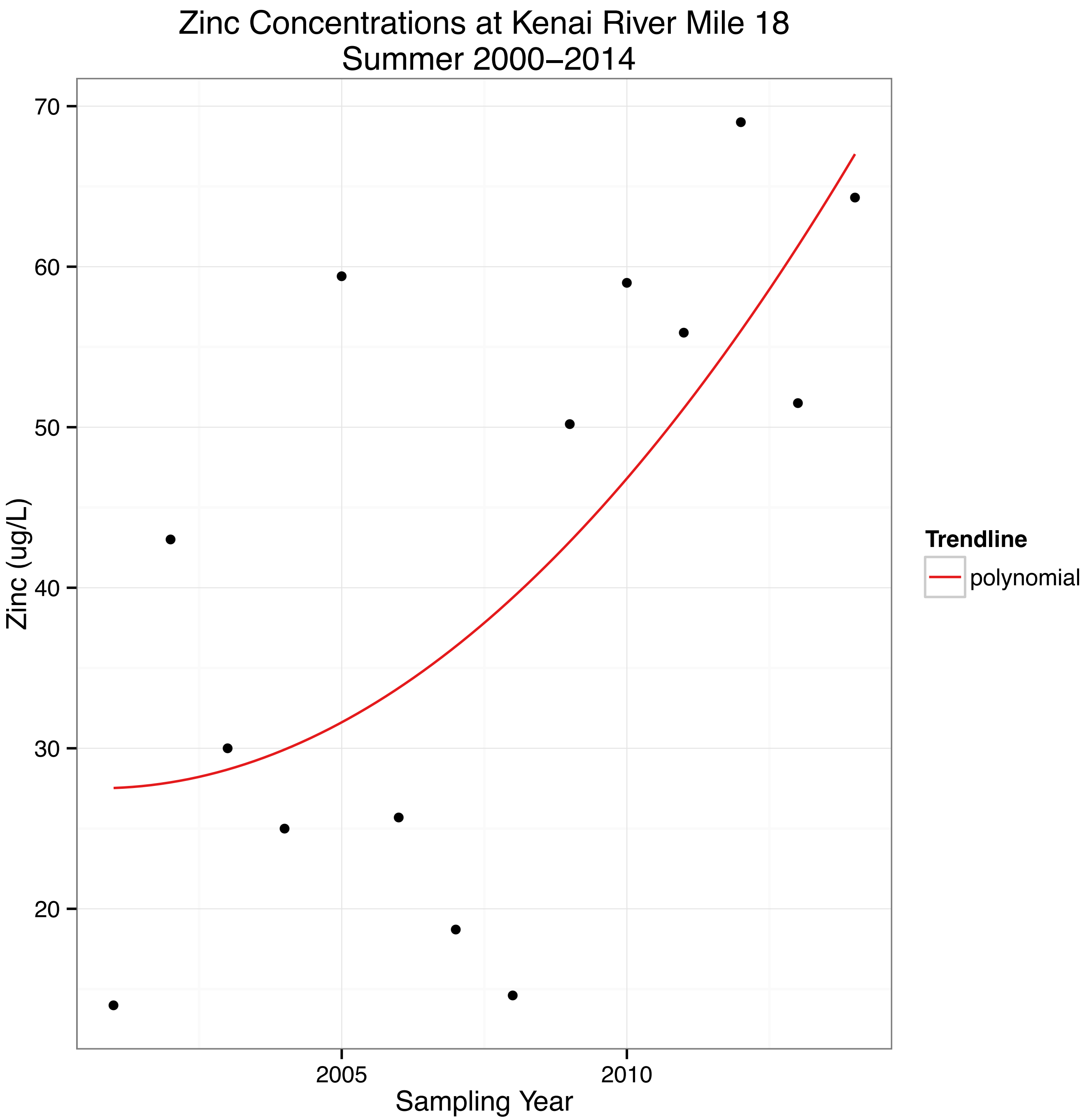

Figure 79: Trend analysis for zinc sampled at Mile 18 from summer 2000 to 2014. Not detected values are not taken into account in the analysis and therefore are not shown in this graph.

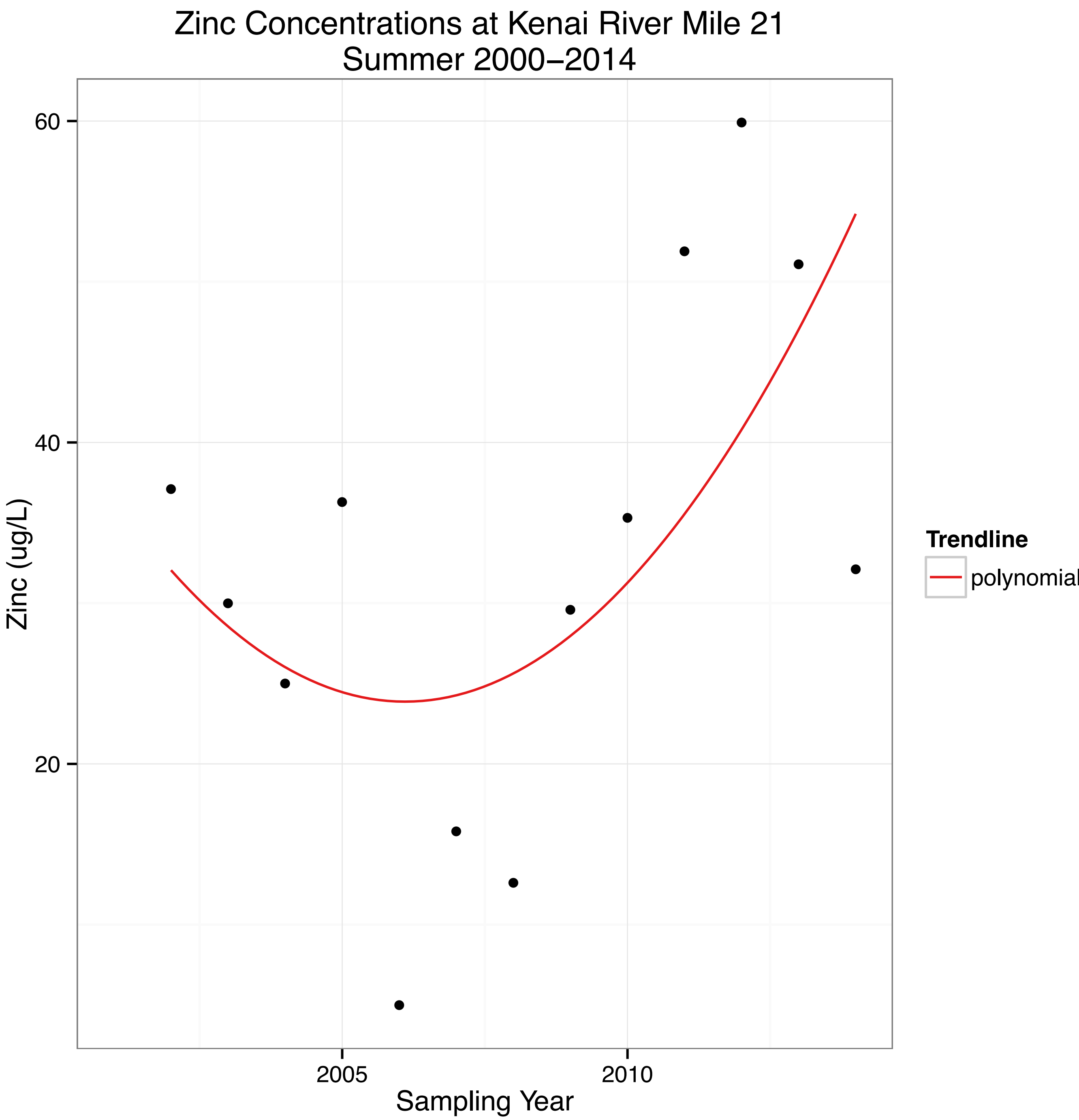

Figure 80: Trend analysis for zinc sampled at Mile 21 from summer 2000 to 2014. Not detected values are not taken into account in the analysis and therefore are not shown in this graph.

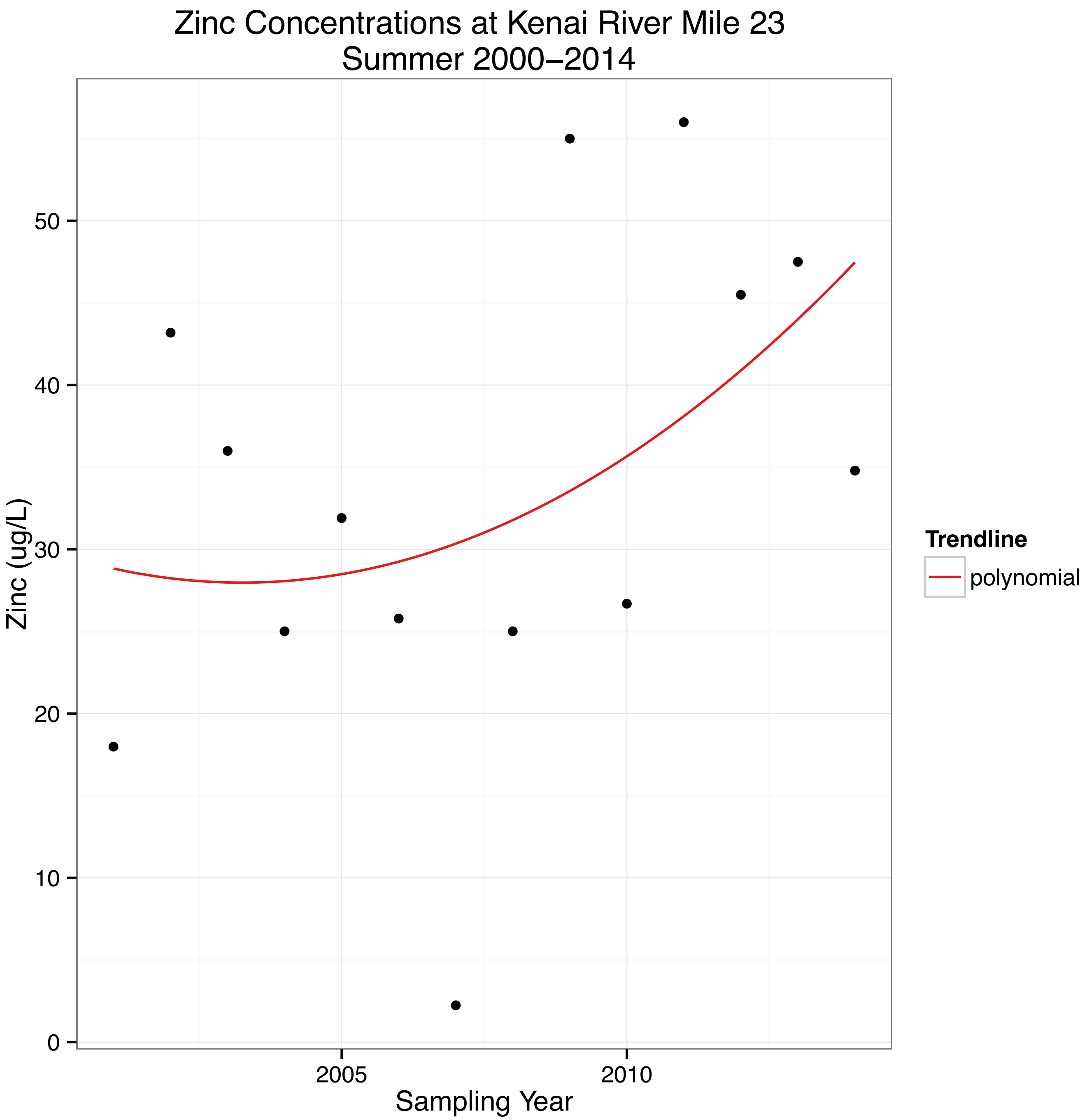

Figure 81: Trend analysis for zinc at Mile 23 from summer 2000 to 2014. Not detected values are not taken into account in the analysis and therefore are not shown in this graph.

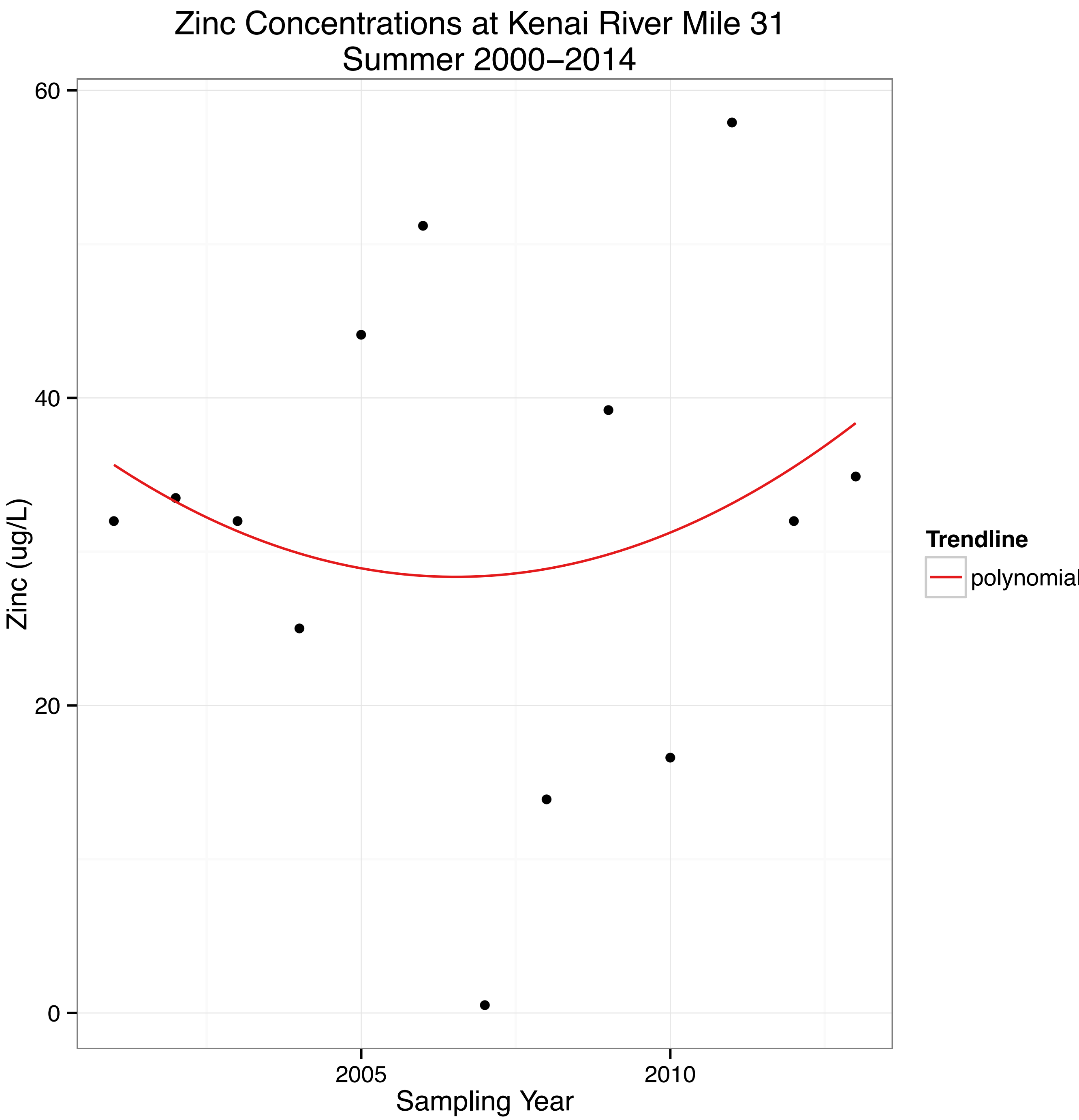

Figure 82: Trend analysis for zinc sampled at Mile 31 from summer 2000 to 2014. Not detected values are not taken into account in the analysis and therefore are not shown in this graph.

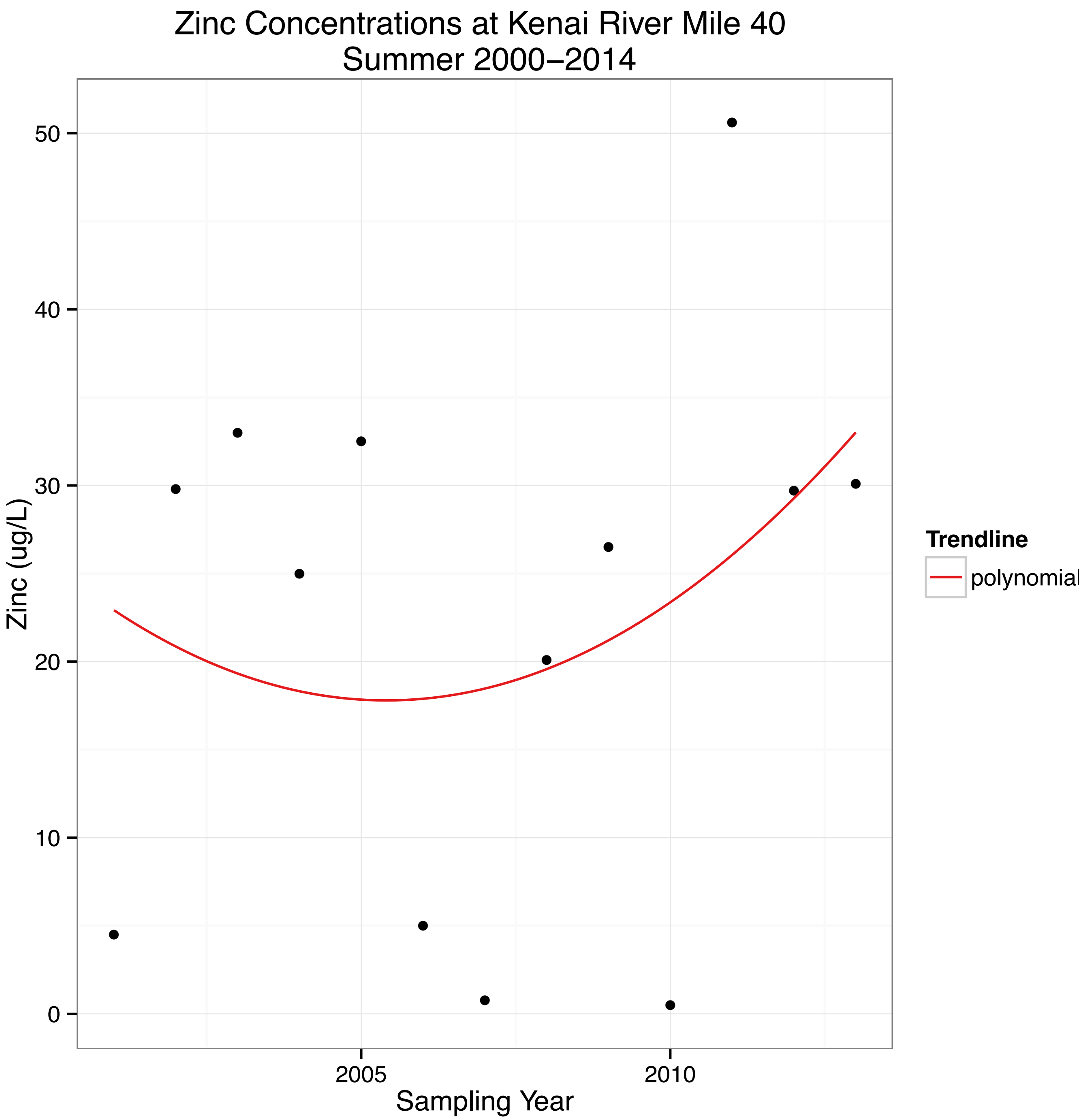

Figure 83: Trend analysis for zinc sampled at Mile 40 from summer 2000 to 2014. Not detected values are not taken into account in the analysis and therefore are not shown in this graph.

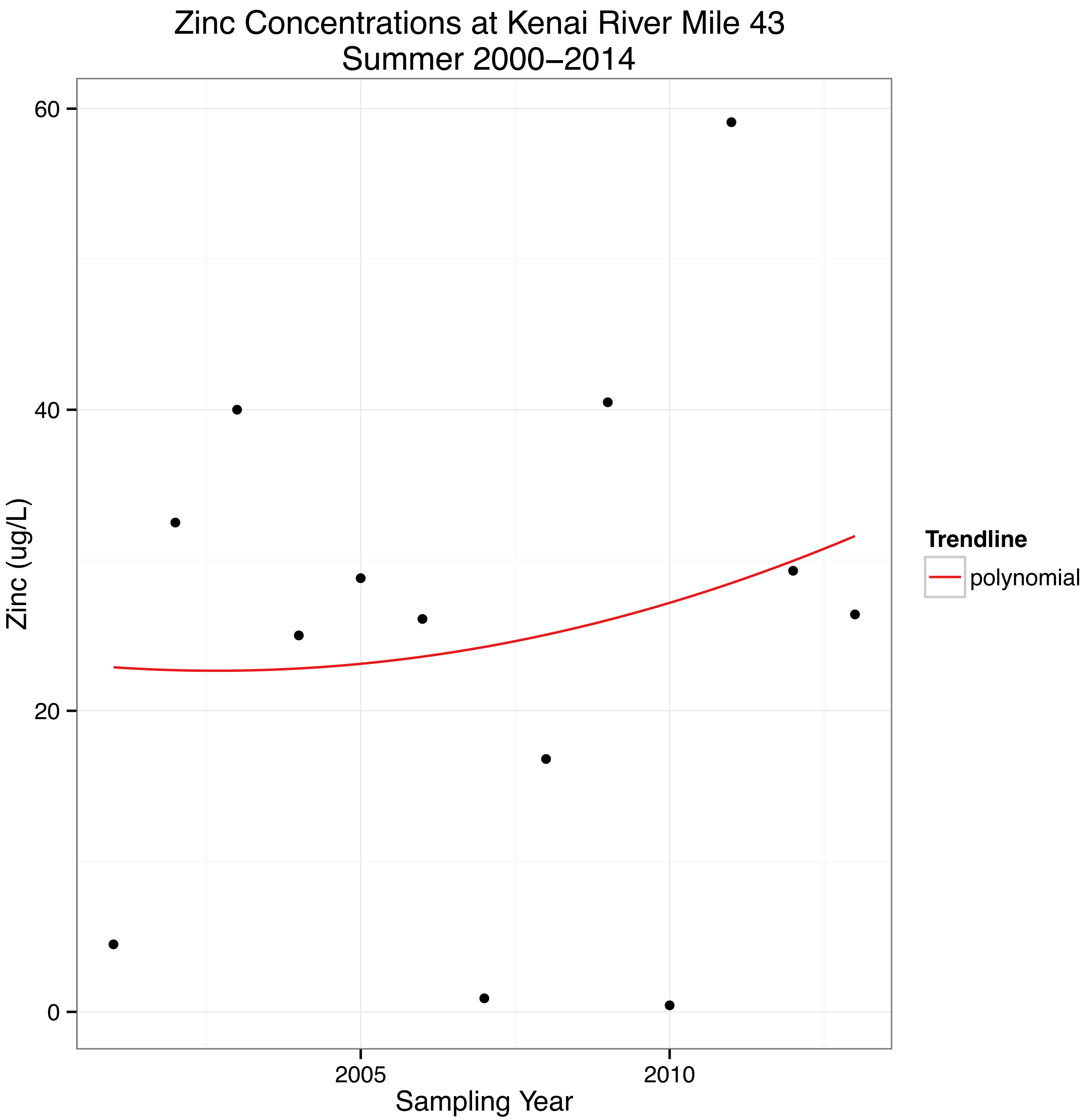

Figure 84: Trend analysis for zinc sampled at Mile 43 from summer 2000 to 2014. Not detected values are not taken into account in the analysis and therefore are not shown in this graph.

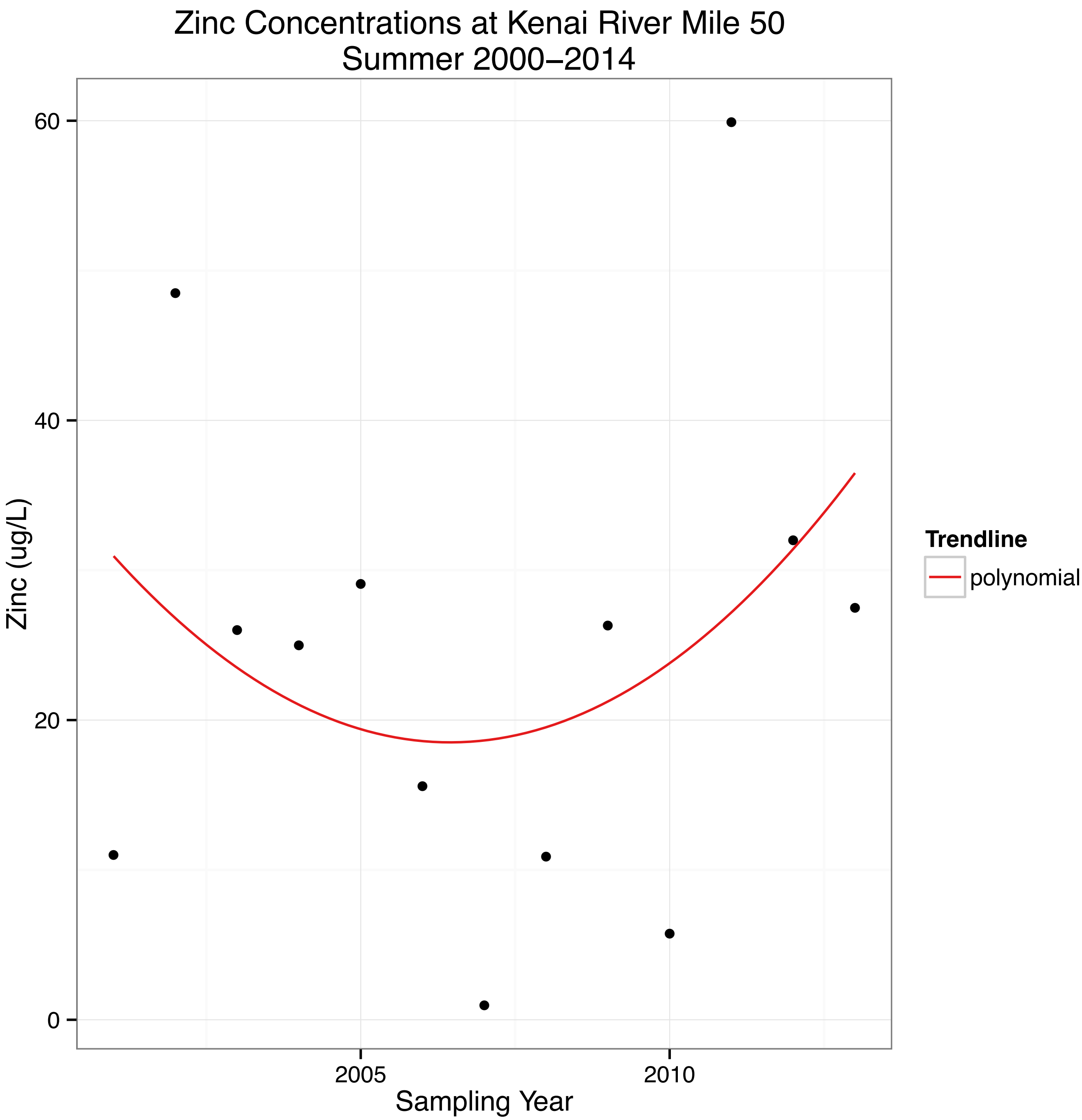

Figure 85: Trend analysis for zinc sampled at Mile 50 from summer 2000 to 2014. Not detected values are not taken into account in the analysis and therefore are not shown in this graph.

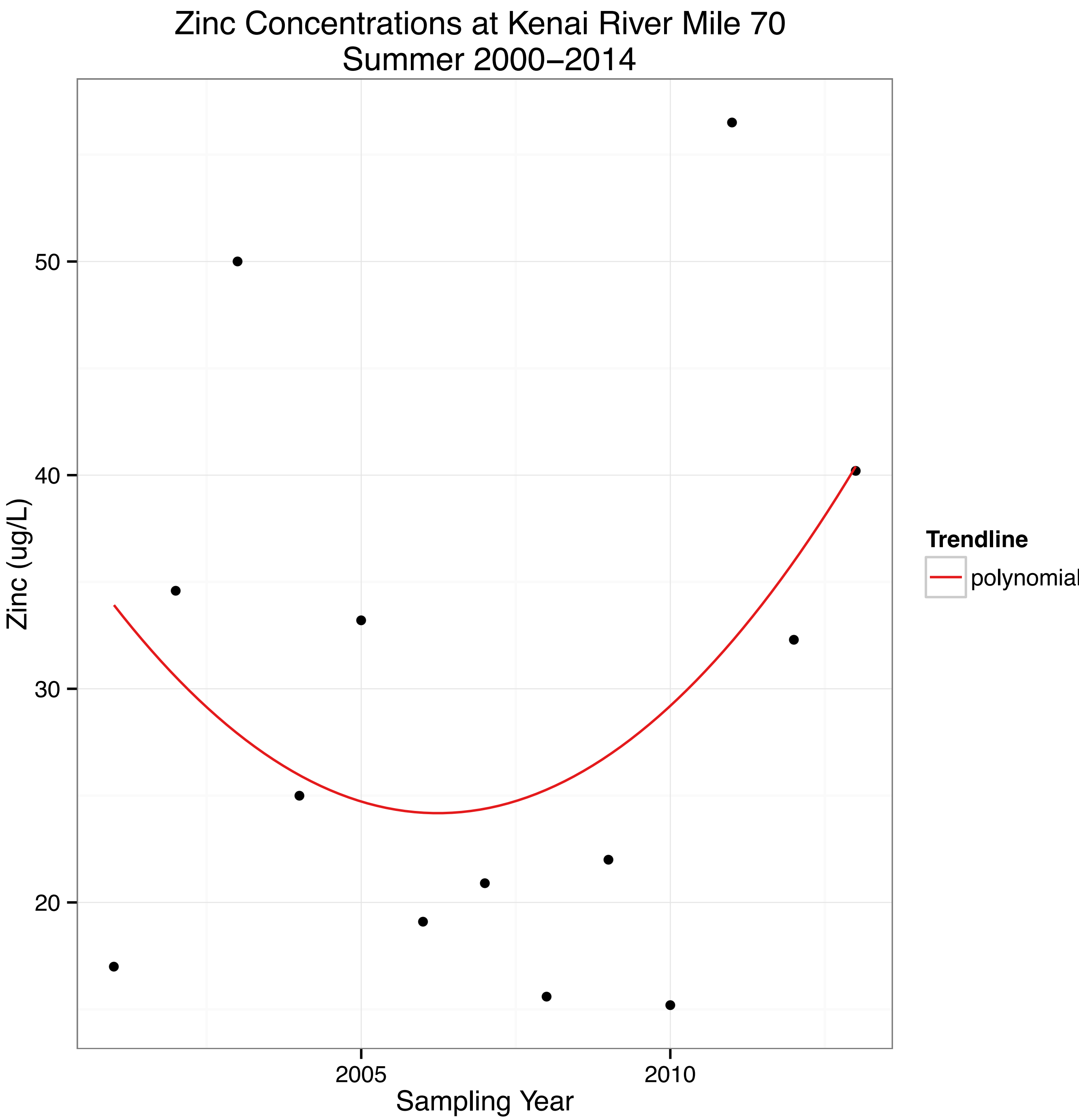

Figure 86: Trend analysis for zinc sampled at Mile 70 from summer 2000 to 2014. Not detected values are not taken into account in the analysis and therefore are not shown in this graph.

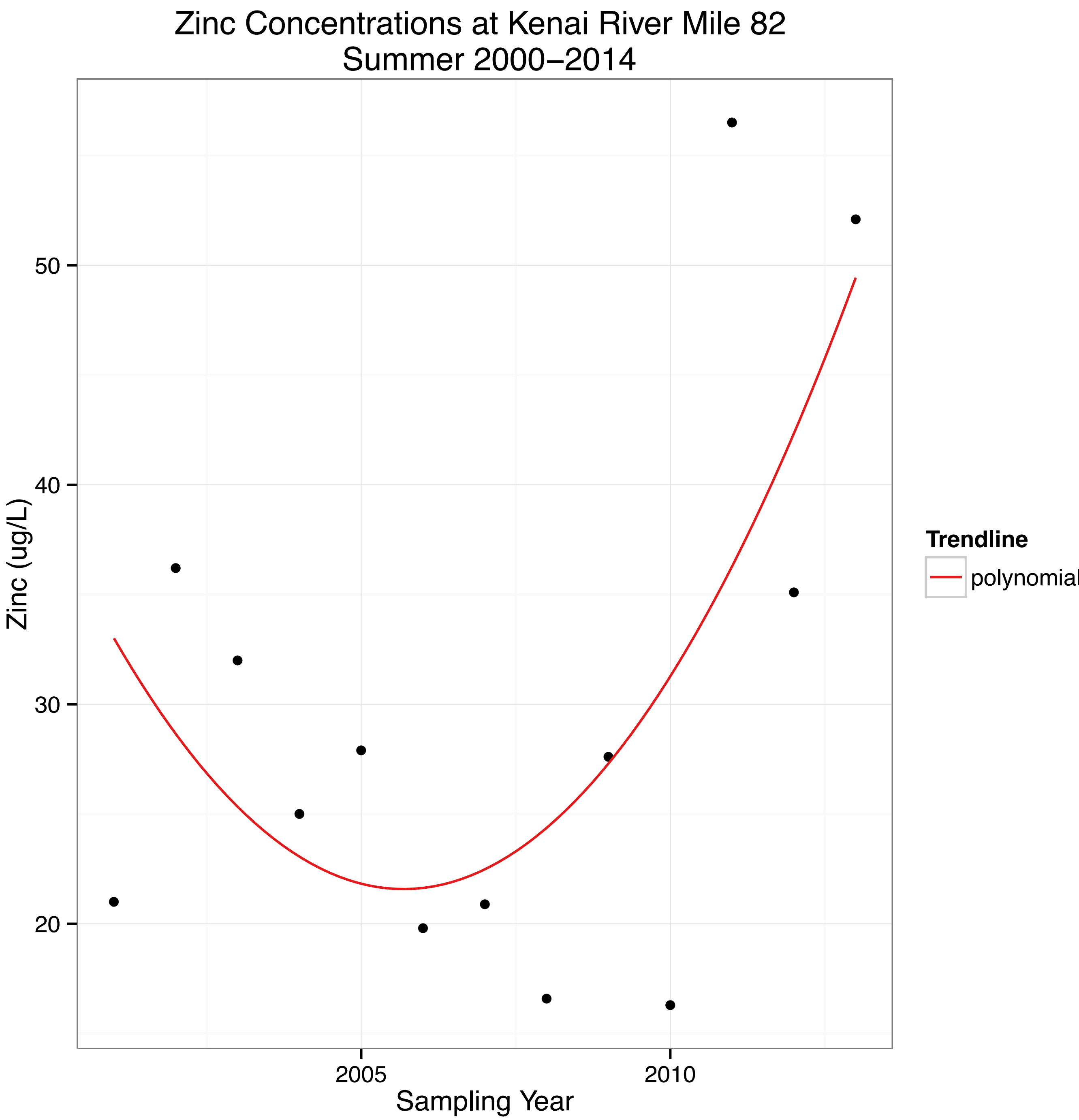

Figure 87: Trend analysis for zinc sampled at Mile 82 from summer 2000 to 2014. Not detected values are not taken into account in the analysis and therefore are not shown in this graph.

Calcium

Both plants and animals require calcium as an essential element, and calcium is important to water quality because it is directly linked to the hardness of water (Glass, 2001). There is not an ADEC or USEPA standard for the chronic exposure of freshwater aquatic life to calcium.

The highest value in the mainstem occurred during spring 2002 at Mile 1.5 with a concentration of 174 mg/L, and the lowest value was 0.447 mg/L at Mile 43 in summer 2010 (Table 12). Relatively high medians in the spring and the summer occurred at Mile 1.5, Mile 6.5, Mile 70, and Mile 82. In the spring and in the summer, the low median at Mile 43 may be linked to the low calcium concentration in the Killey River. Russian River had high levels of calcium and could be the cause of elevated concentrations at Mile 70. In the mainstem, calcium levels were relatively higher in spring than in summer (Figures 88 & 89).

In the tributaries, the lowest concentration was 3 mg/L sampled from the No Name Creek during May 2013, and the highest concentration occurred in the Moose River at 25.7 mg/L during summer 2004 (Table 38). In the spring, the Russian River, Moose River and Juneau Creek had relatively high medians, and Slikok Creek had a relatively low median (Figure 90). In the summer, the Moose River, Soldotna Creek and Beaver Creek had relatively high medians, and the Killey River had a relatively low median (Figure 91). In the spring, most of the tributaries had concentrations lower than the mainstem, but during the summer, most of the tributaries had higher levels of calcium than the mainstem. The tributaries had higher levels of calcium in the summer than in the spring, excluding Russian River, the Killey River and Juneau Creek. Beaver Creek exhibited the largest seasonal difference in medians, changing from 9.25 mg/L in the spring to 18.6 mg/L in the summer (Figures 90 & 91).

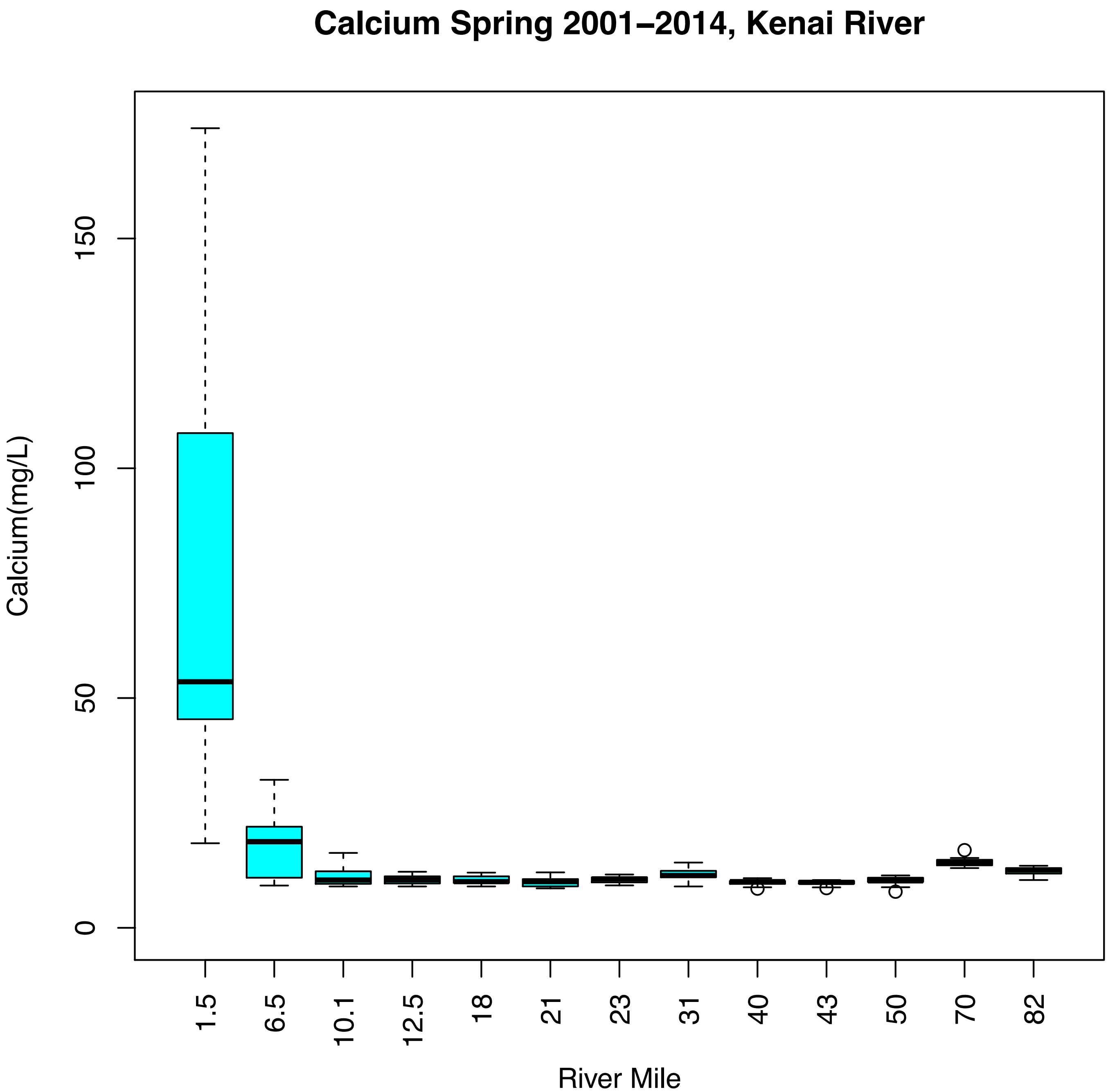

Figure 88: Calcium Sampled in the Kenai River mainstem during spring 2001 to 2014.

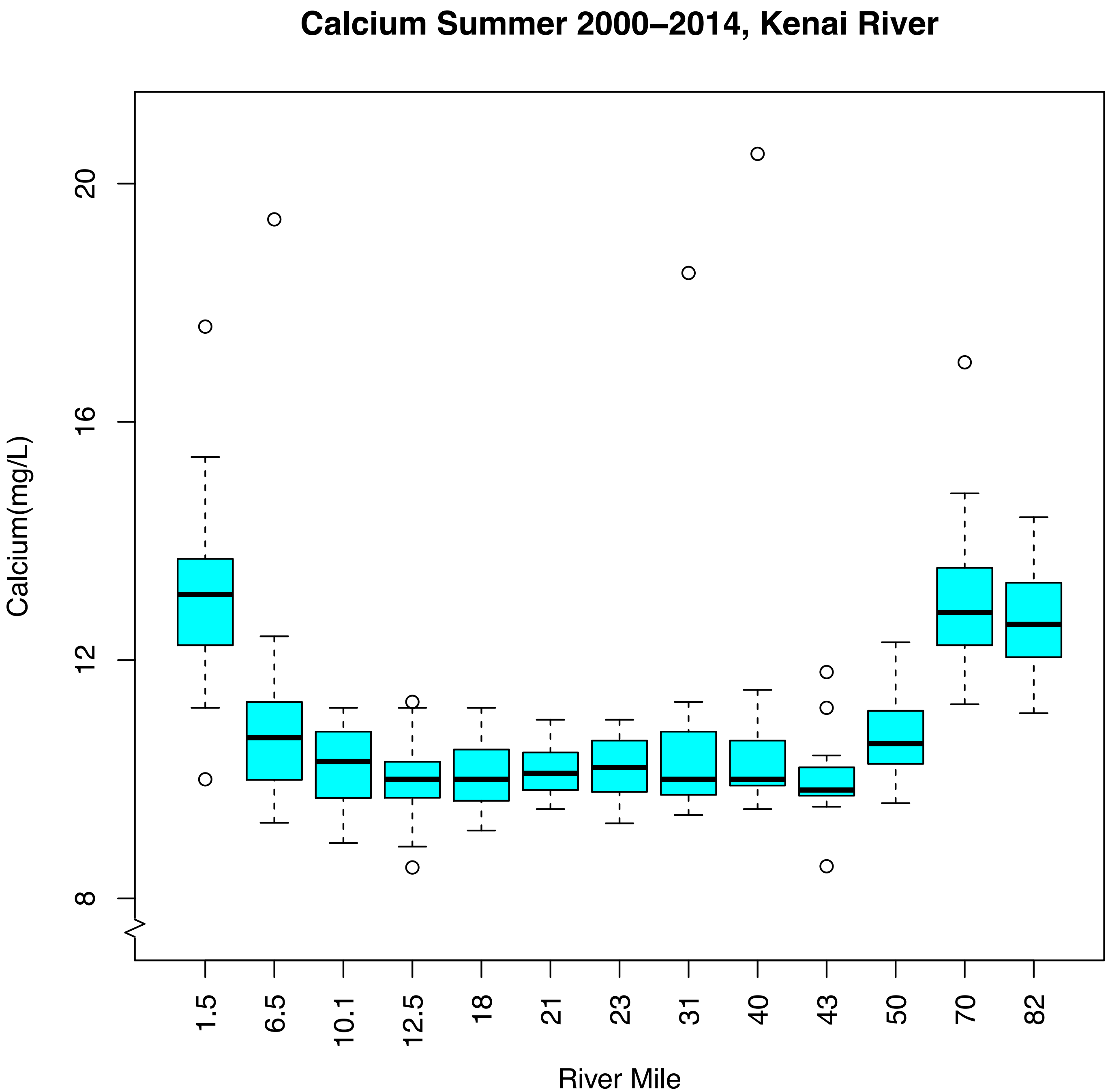

Figure 89: Calcium sampled in the Kenai River mainstem during summer 2000 to 2014.

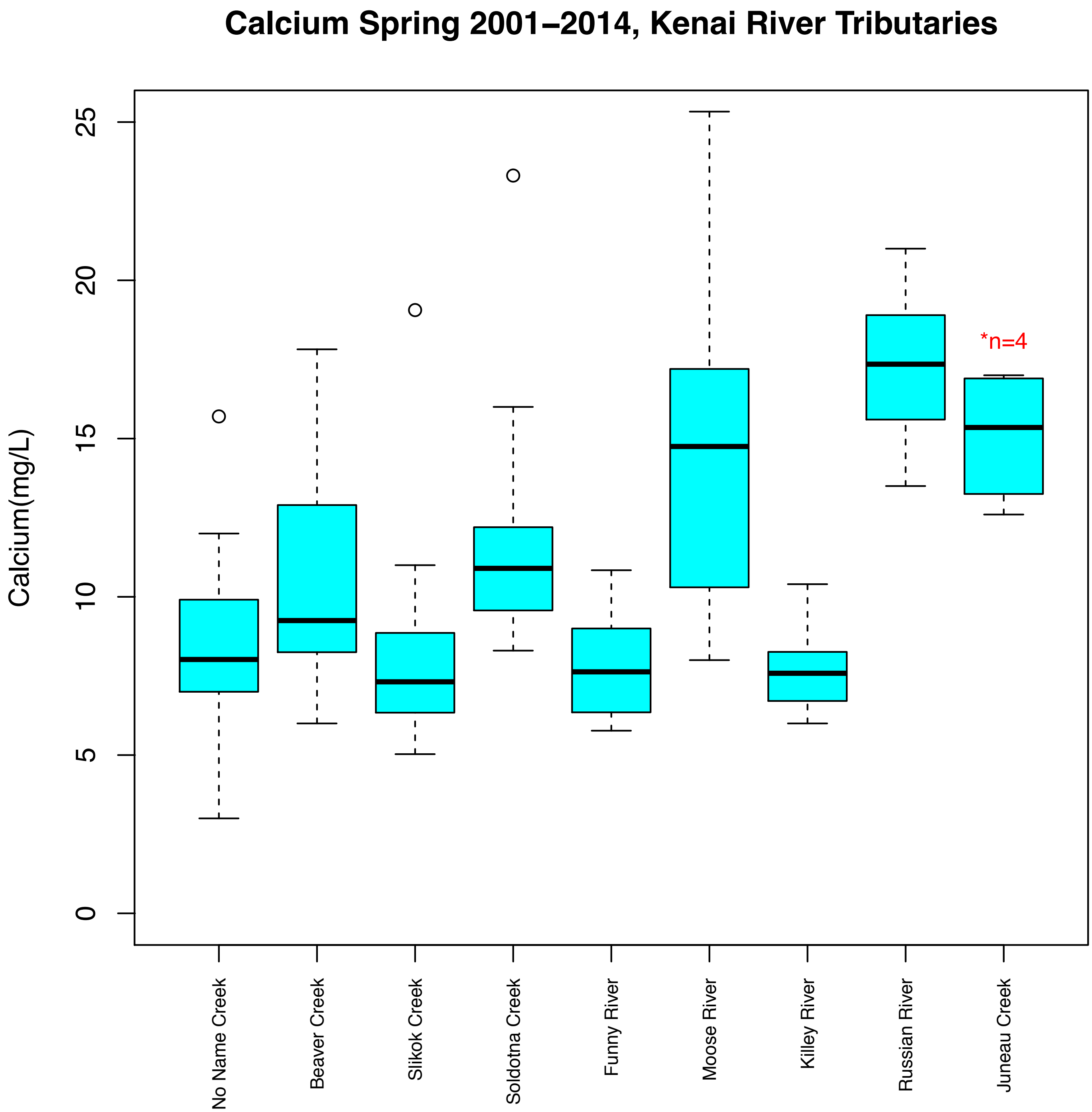

Figure 90: Calcium sampled in the Kenai River tributaries during spring 2001 to 2014.

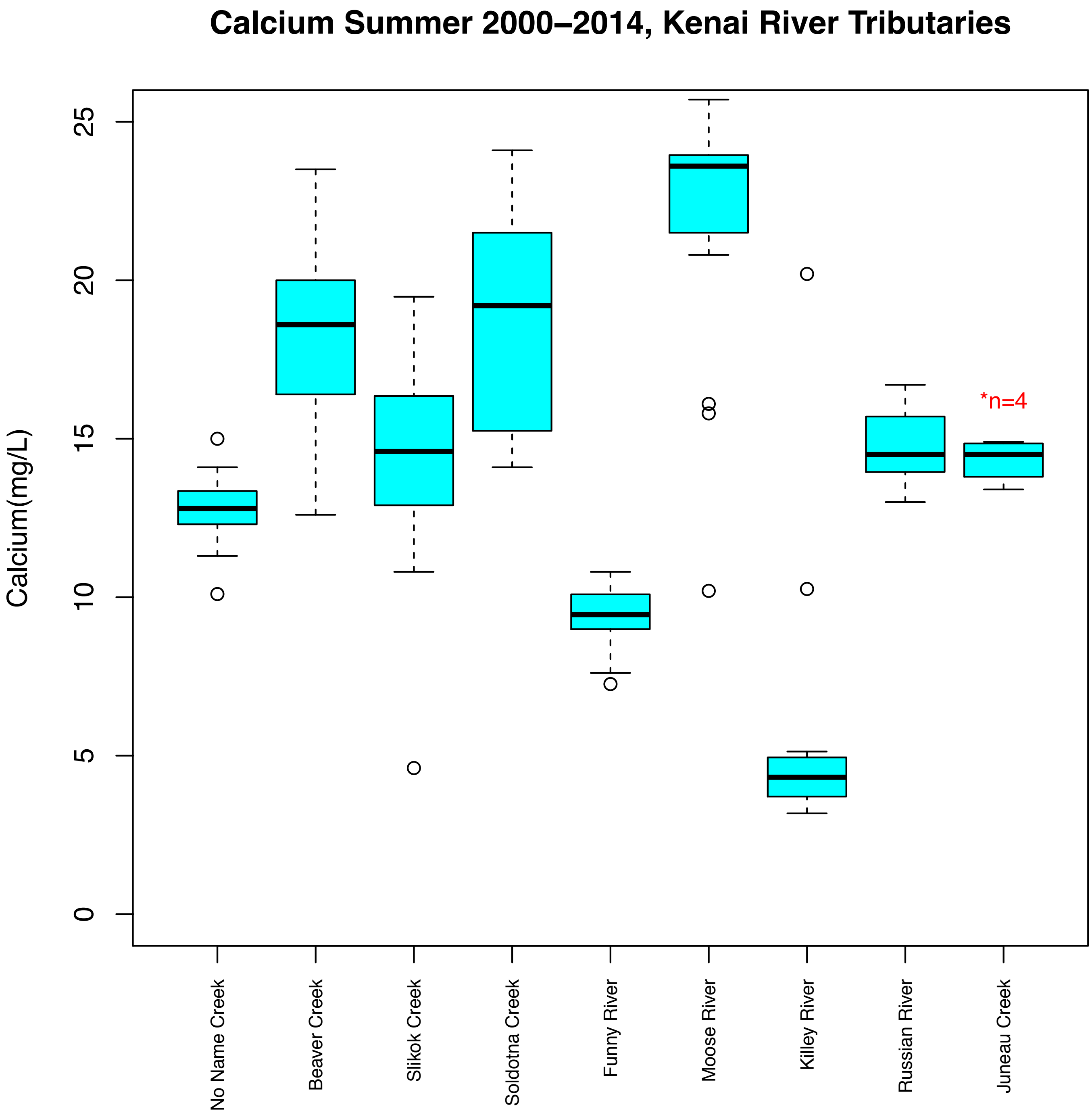

Figure 91: Calcium sampled in the Kenai River tributaries during summer 2000 to 2014.

Iron

Naturally present in many rocks and soils, iron is required by plants and animals for metabolism (Glass, 2001). Sources of detrimental levels of iron are industrial waste, mining, and iron-rich groundwater, and when high concentrations of iron react with dissolved oxygen, precipitates form that can harm salmon eggs and other aquatic life (USEPA, 1976). The ADEC and the USEPA have set the iron standard for the chronic exposure of freshwater aquatic life at 1 mg/L (see Appendix 2) (ADEC, 2008; USEPA, 2014).

In the mainstem, the highest concentration of iron was 128 mg/L, which occurred at Mile 6.5 during spring 2006, and 0.03 mg/L was the lowest concentration that occurred at Mile 70 during spring 2013 (Table 13). Mile 1.5 and Mile 6.5 had the highest medians during the spring and the summer (Figures 92 & 93). Mile 1.5 and Mile 6.5 both exceeded the standard in the majority of samples (Table 13). In the spring, the median at Mile 10.1 also exceeded the standard, but the medians from all other mainstem locations were below the standard in both the spring and the summer (Figures 92 & 93). There was a general upward trend in iron concentration from Kenai Lake to the estuary, especially in the summer.

The concentrations in the tributaries ranged from a high of 20.5 mg/L in Beaver Creek in spring 2006 to Russian River, which had the lowest concentration at below the MDL of 0.0027 mg/L (Table 39). No Name Creek, Beaver Creek, Slikok Creek, Soldotna Creek, Funny River and Moose River all had medians exceeding the standard in Spring (Figure 94). No Name Creek and Beaver Creek had medians exceeding the standards during summer (Figure 95). Russian River had the lowest iron levels with most of the samples reported below the MDL or MRL. In both the tributaries and the mainstem, iron levels were higher in the spring than in the summer (Figures 92-95).

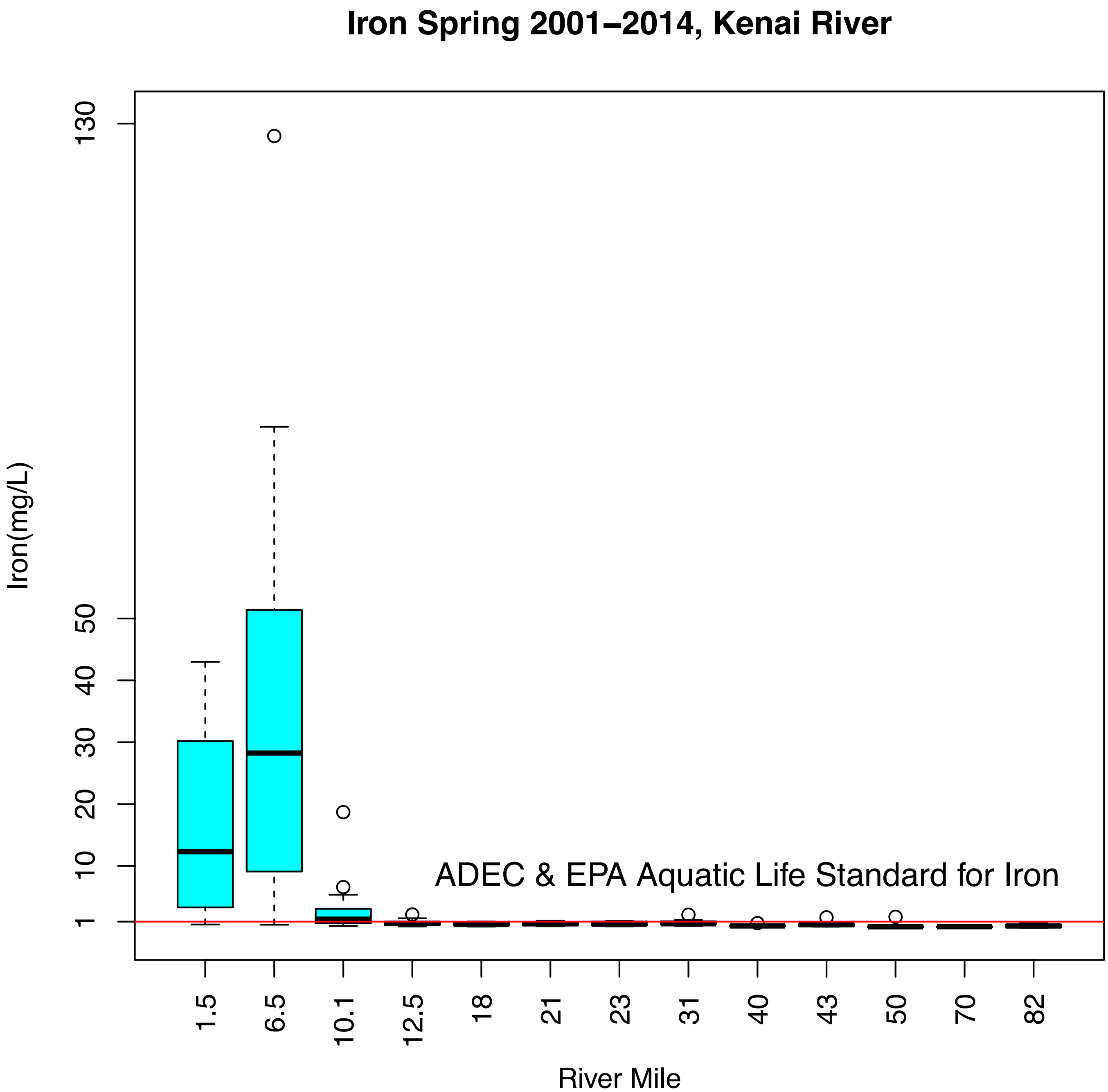

Figure 92: Iron Sampled in the Kenai River mainstem during spring 2001 to 2014.

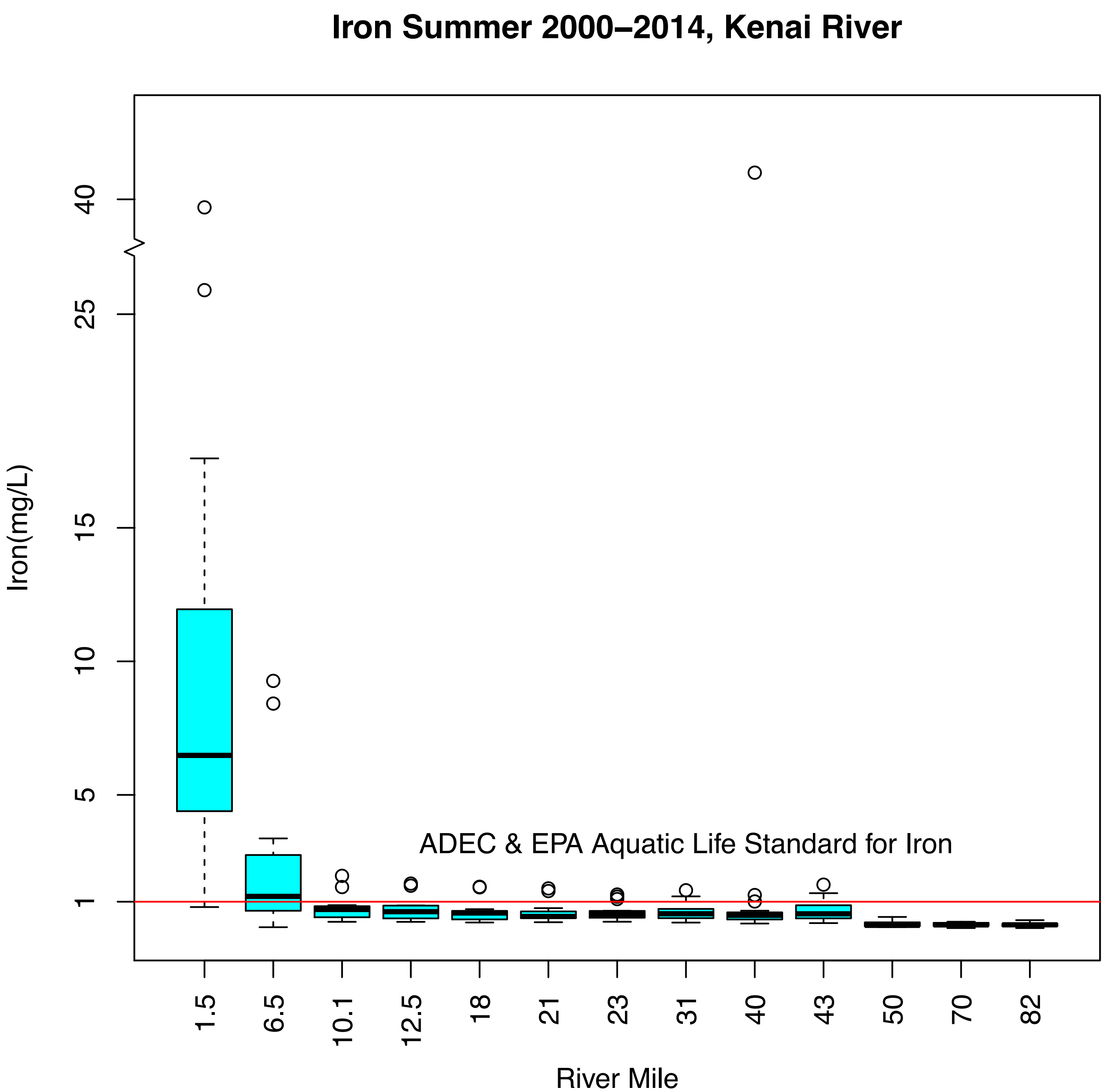

Figure 93: Iron sampled in the Kenai mainstem during summer 2000 to 2014.

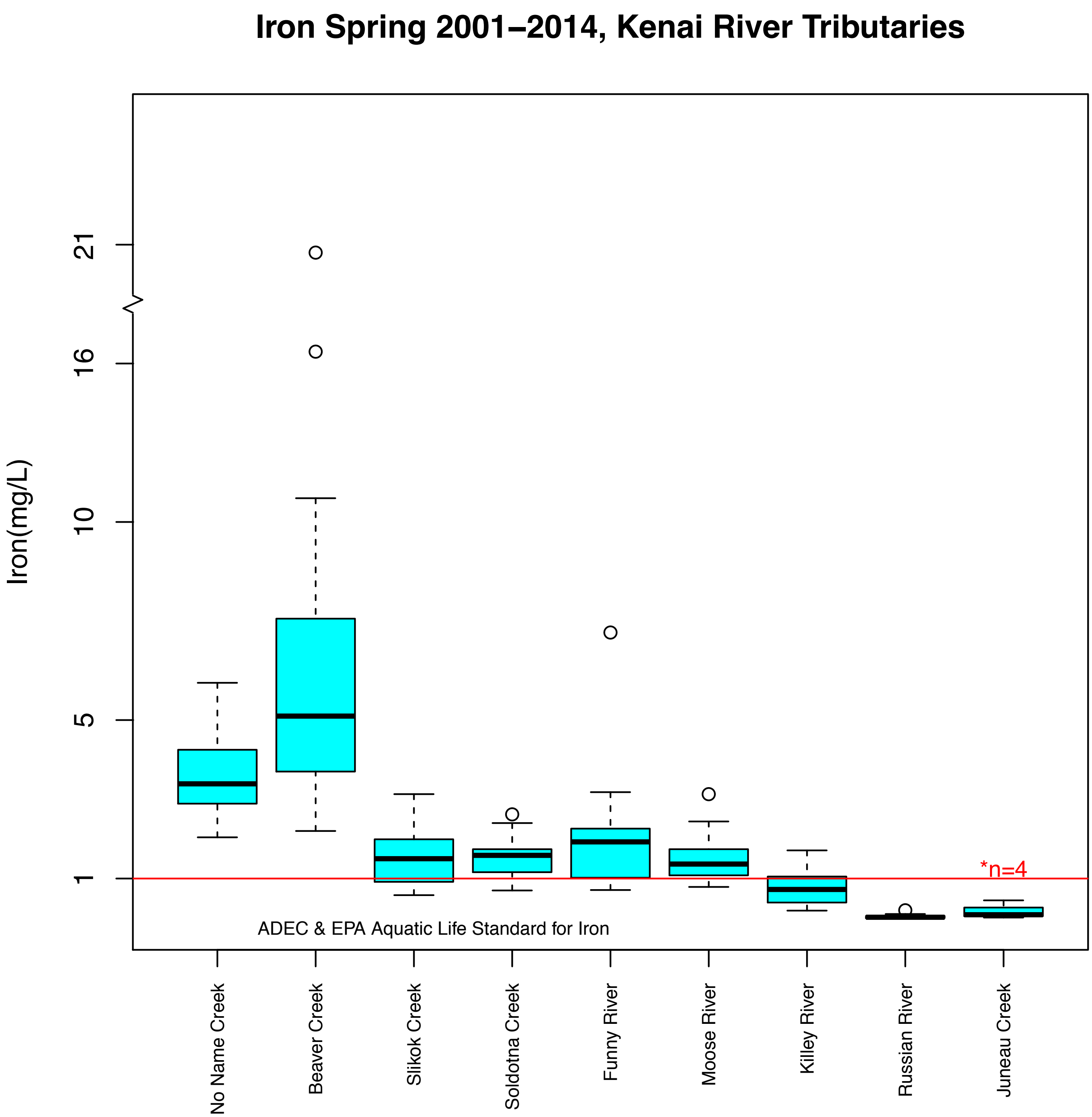

Figure 94: Iron sampled in Kenai River tributaries during spring 2001 to 2014.
Since 9% of the samples are reported as below the MRL or MDL, these values have been estimated using values that are half of the MRL or MDL.

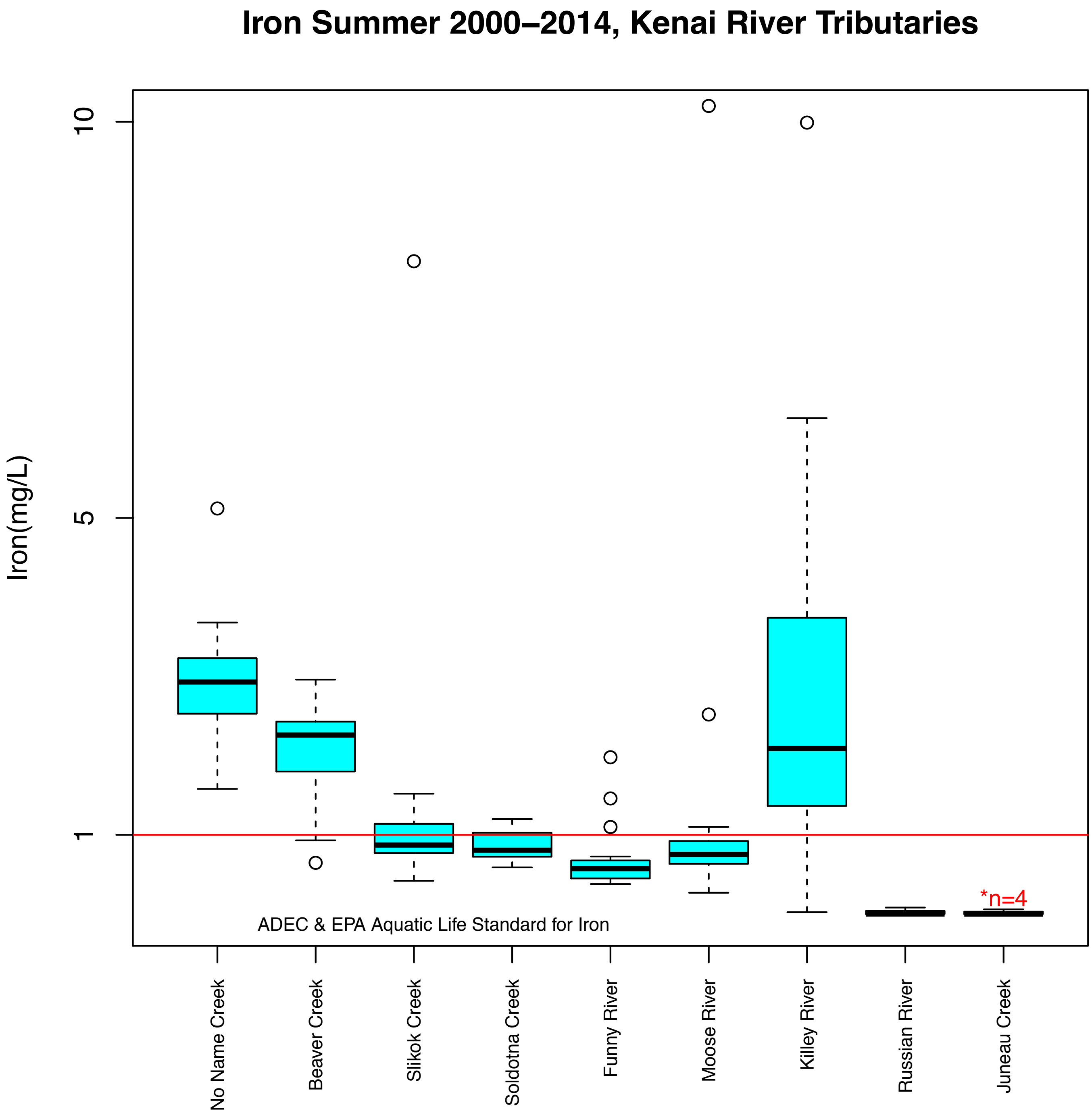

Figure 95: Iron sampled in the Kenai River tributaries during summer 2000 to 2014. 13% of the samples are reported as below the MRL or MDL, these values have been estimated using values that are half of the MRL or MDL.

Magnesium

As an essential element, magnesium concentrations can significantly impact plants and animals, and magnesium also influences water quality because it contributes to hardness (Glass, 2001). Neither the USEPA nor the ADEC has set a water quality standard for magnesium concentrations in freshwater for chronically exposed aquatic life.

In the mainstem, the highest concentration of magnesium was 582 mg/L and occurred at Mile 1.5 during spring 2011, while the lowest level was 0.729 mg/L at Mile 50 in summer 2001 (Table 14). In both the spring and the summer, Mile 1.5 had the highest median followed by Mile 6.5. There was a general upward trend in magnesium levels from Kenai Lake to the estuary in both the spring and the summer. Magnesium levels were higher upstream of Skilak Lake, and at the outlet, magnesium dropped to the lowest levels recorded in the watershed. In the mainstem, magnesium concentrations were higher in the spring than in the summer (Figures 96 & 97).

The concentrations in the tributaries ranged from the high of 21.4 mg/L in spring 2010 at No Name Creek to 0.746 mg/L in spring 2004 at the Killey River (Table 40). The Killey River, Russian River and Juneau Creek had low medians in comparison to the other tributaries like Soldotna Creek, which had the highest median during the summer. Excluding the estuary, the tributaries generally had higher levels of magnesium than the mainstem. In the tributaries, median concentrations were higher in the summer than in the spring, excluding Beaver Creek and Russian River (Figures 98 & 99).

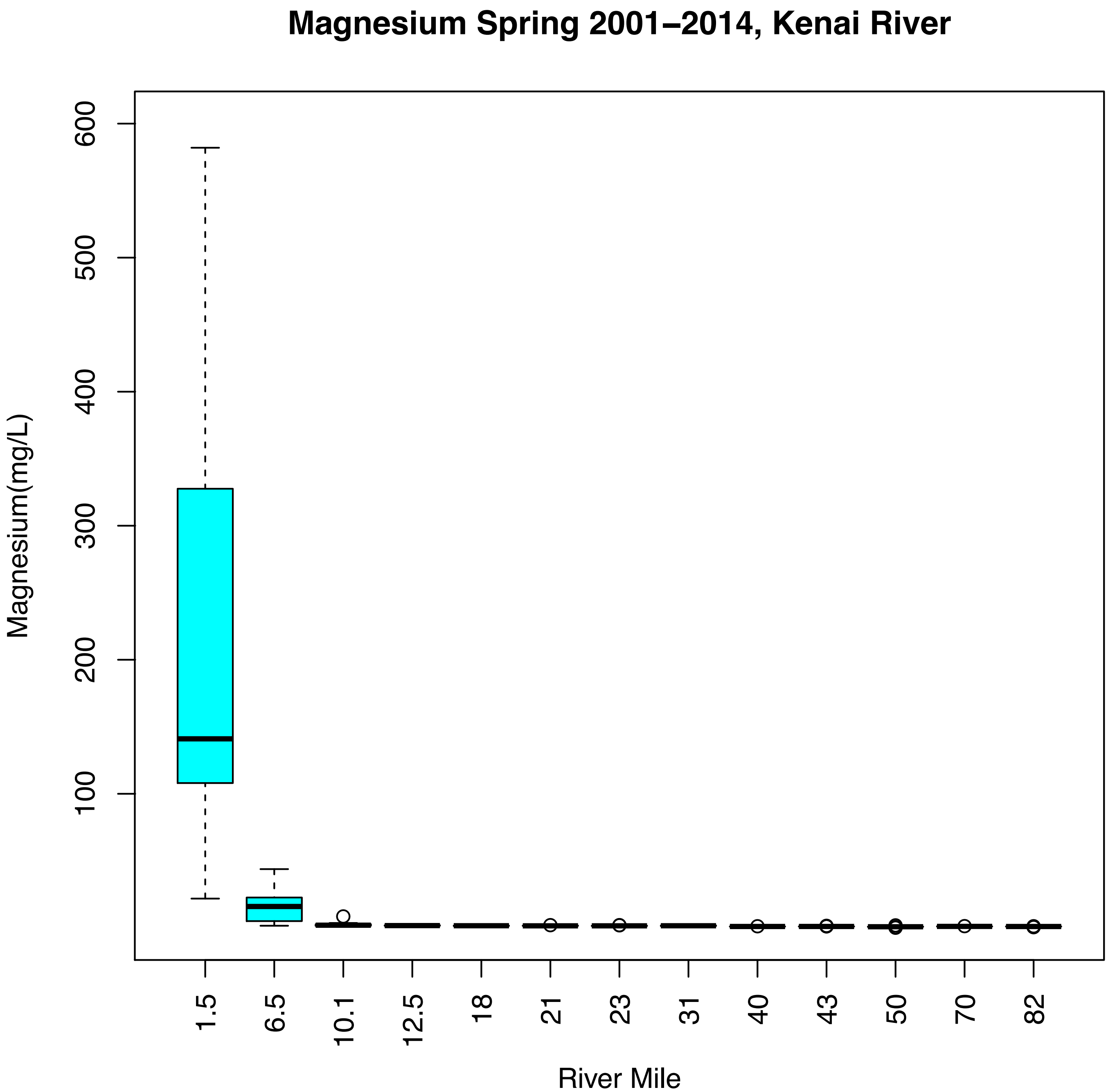

Figure 96: Magnesium sampled in the Kenai River mainstem during spring 2001 to 2014. Since 1% of the samples are reported as below the MRL or MDL, these values have been estimated using values that are half of the MRL or MDL.

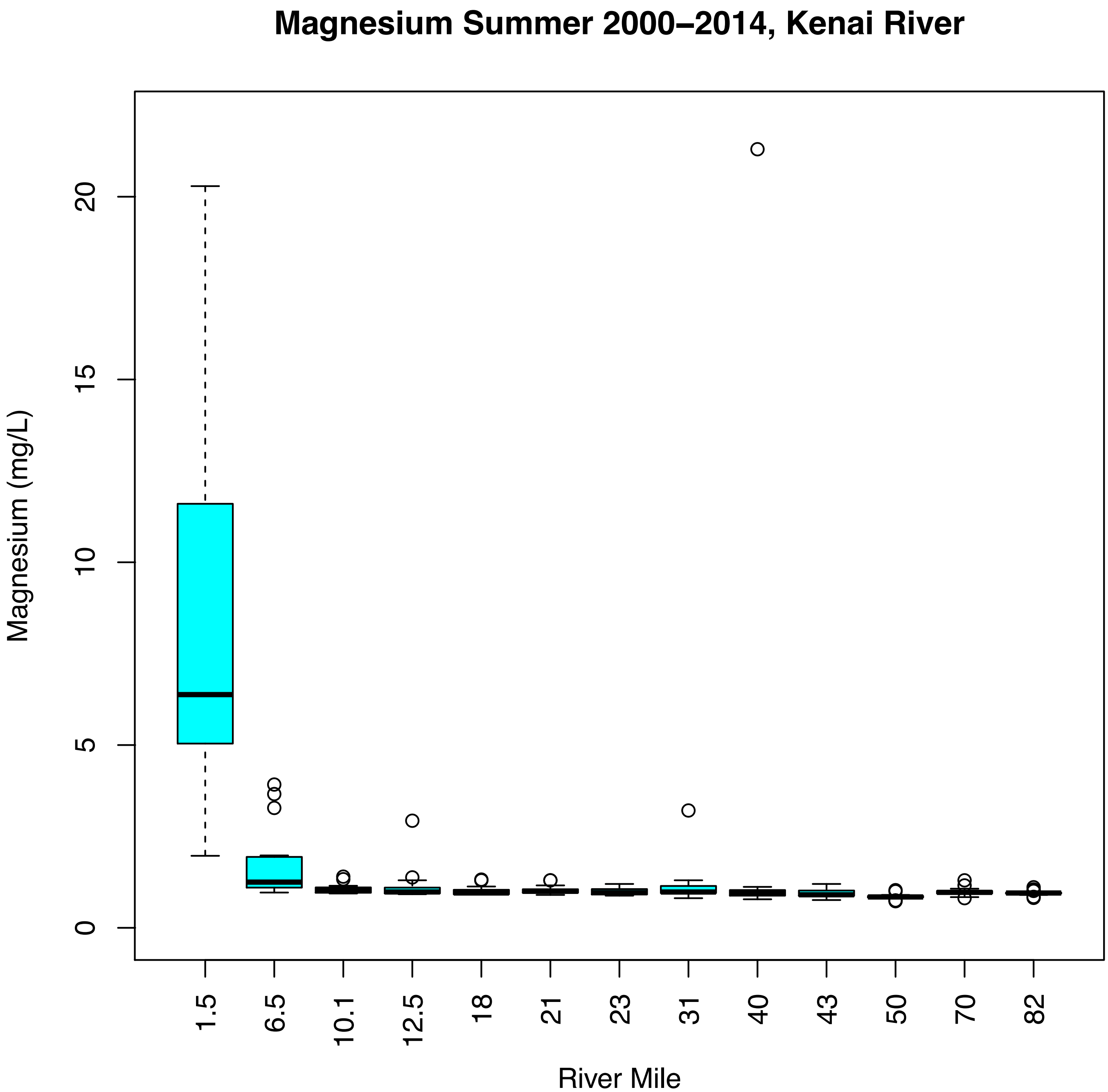

Figure 97: Magnesium sampled in the Kenai River mainstem during summer 2000 to 2014.

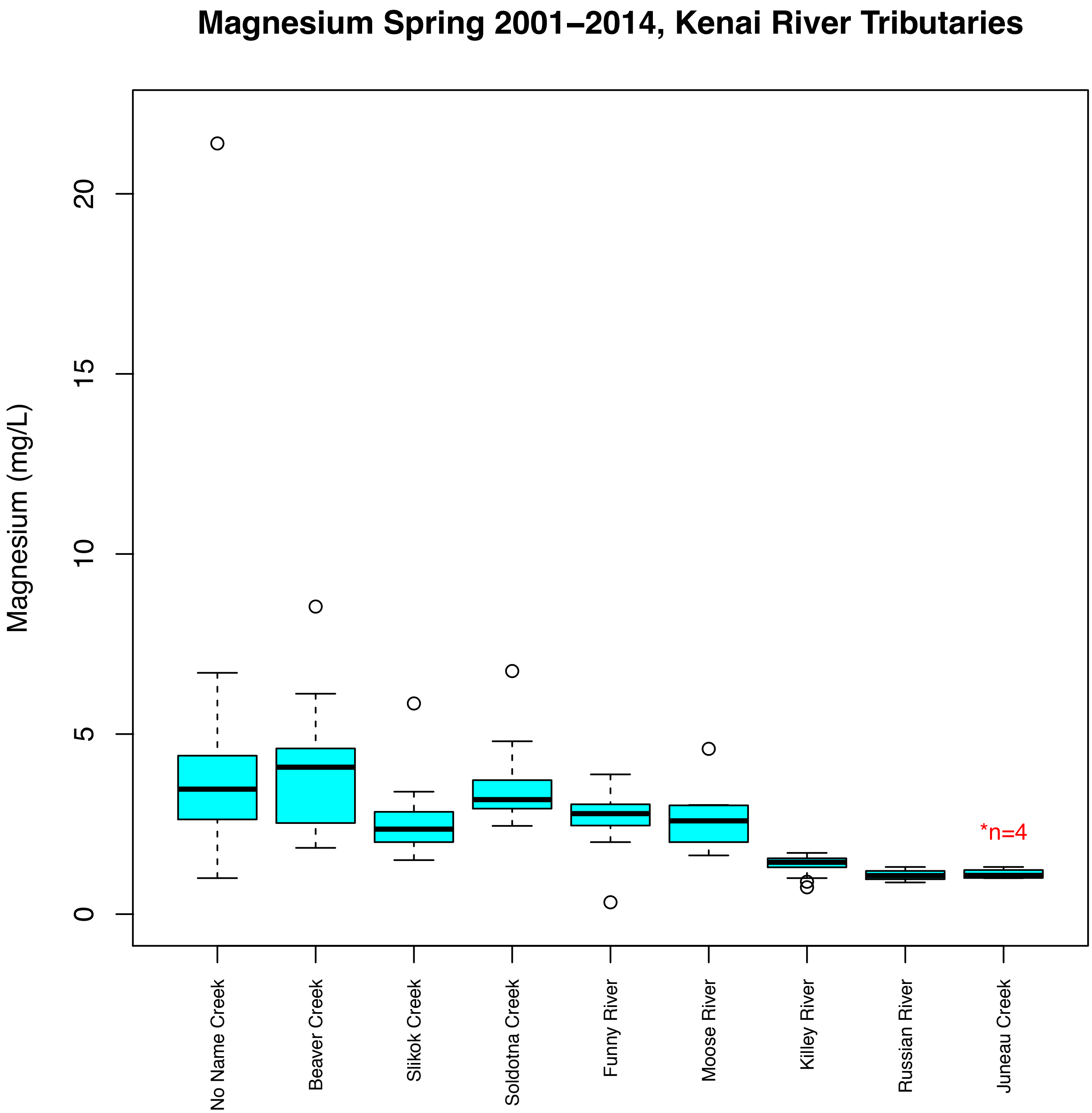

Figure 98: Magnesium sampled in the Kenai River tributaries during spring 2001 to 2014.

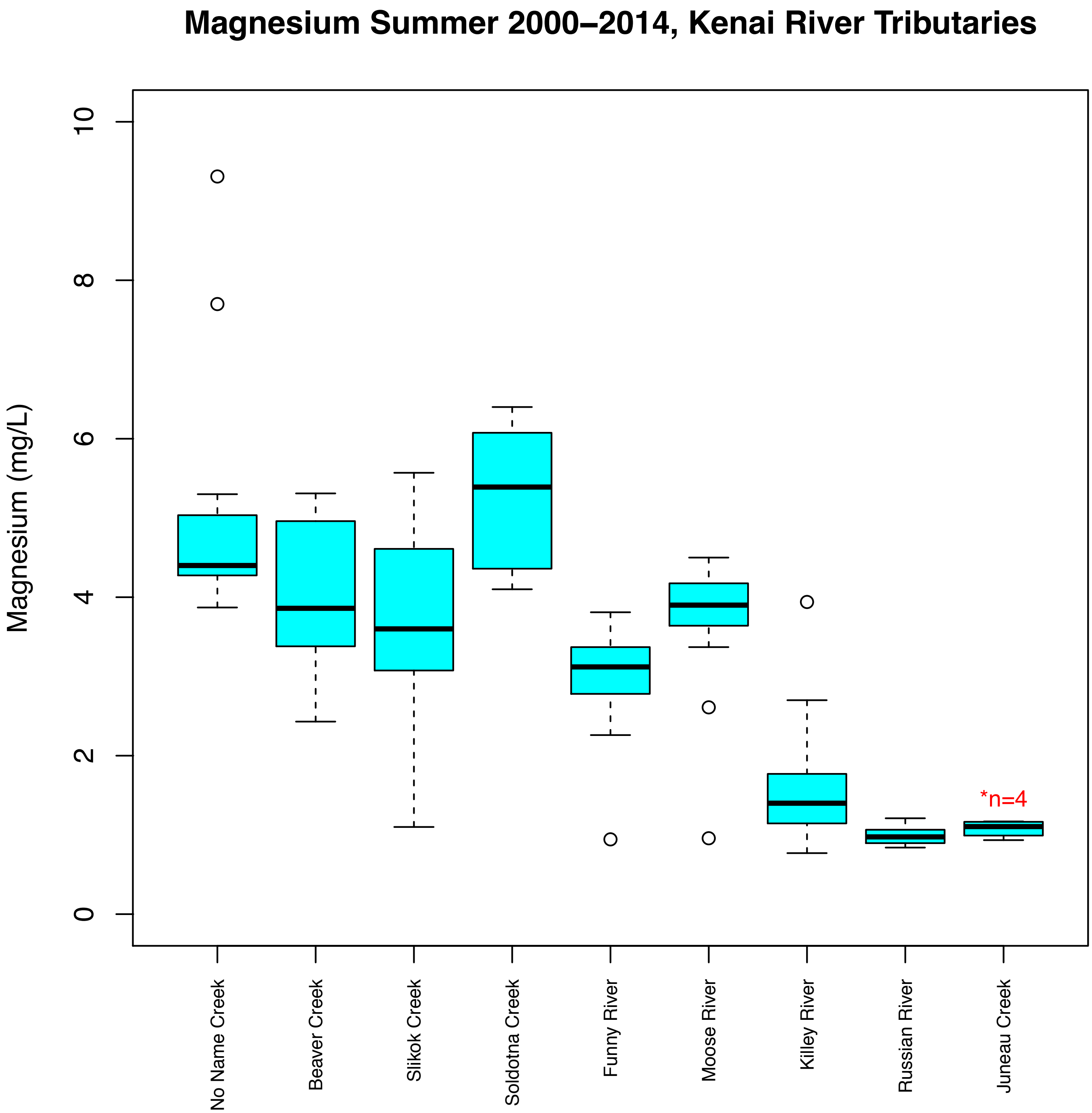

Figure 99: Magnesium sampled in Kenai River tributaries during summer 2000 to 2014.

Nitrate

Inorganic nitrogen is generally present in well-aerated, natural streams in the form of nitrate (Glass, 1999). Nitrate enters the hydrologic cycle as a result of precipitation, plant residue, natural minerals, fertilizer, and septic tanks (Glass, 2001). Neither the USEPA nor the ADEC have set a nitrate standard for chronically exposed freshwater aquatic life.

In the mainstem, the highest concentration of nitrate was 0.706 mg/L at Mile 70 during spring 2005, and in many instances, nitrate levels were below the MDL of 0.015 mg/L (Table 15). In the spring, the mainstem had a general downward trend from Kenai Lake to the estuary, excluding the higher medians at Mile 70 and Mile 1.5. The medians in the summer had a downward trend from Mile 82 through Mile 40, but then the medians hovered around 0.15 mg/L through the Lower Kenai River and dropped in the estuary. Overall, nitrate levels were slightly lower in the spring than in the summer for the mainstem (Figures 100 & 101).

The tributaries generally had lower levels of nitrate than the mainstem, with the exception of Russian River. The highest level of nitrate in the tributaries occurred at Russian River with a concentration of 1.11 mg/L during spring 2005, and the lowest levels occurred at many locations below the MDL of 0.015 mg/L (Table 41). Of the tributaries, Russian River had the highest medians in the summer and especially in the spring, which may explain the high median at Mile 70 in the mainstem. Juneau Creek in the spring and Slikok Creek in the summer had the next highest medians. Russian River had a higher median in the spring than the summer, while the other tributaries had too many values below the MDL and MRL to establish a clear seasonal trend (Figures 102 & 103).

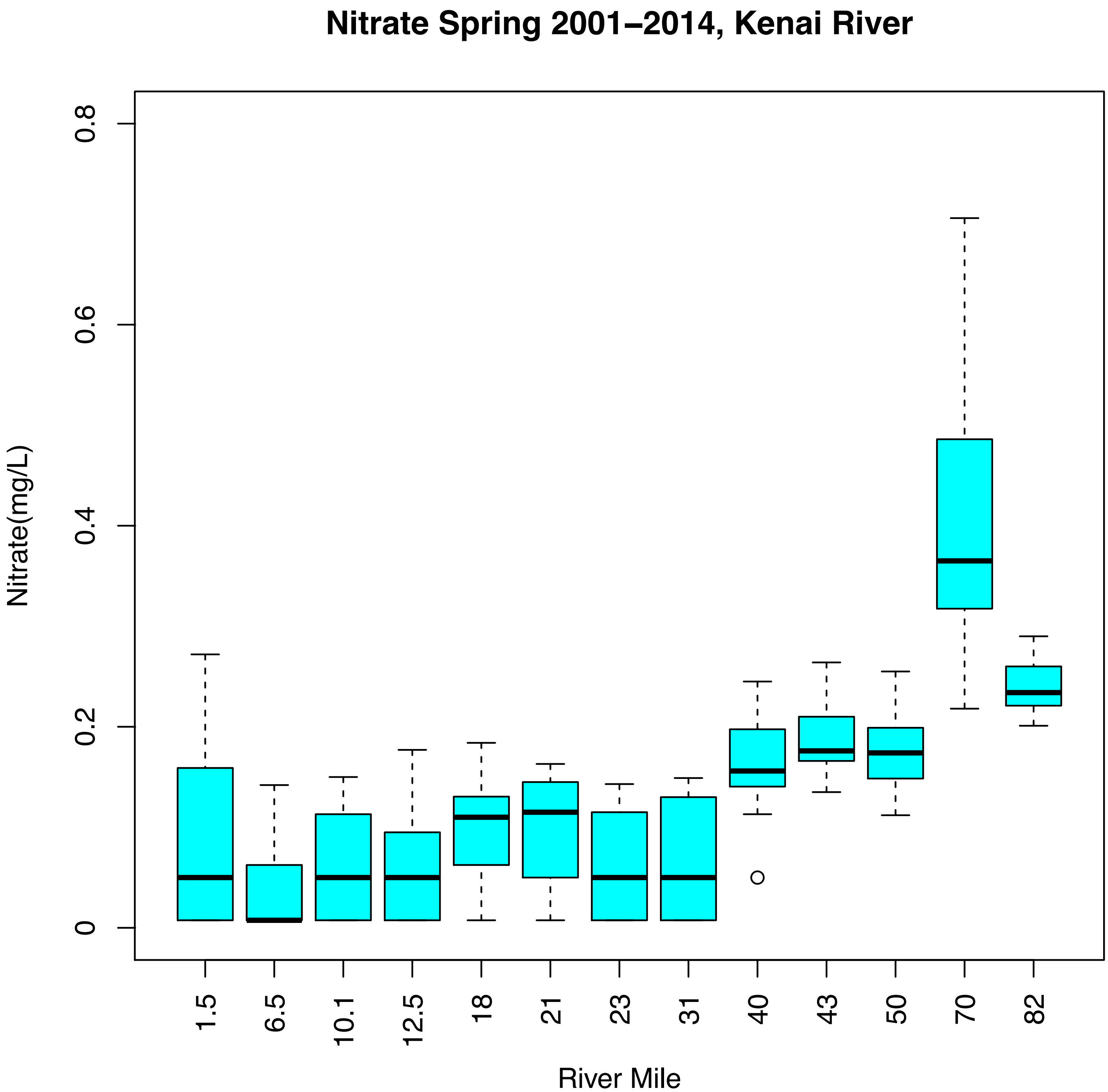

Figure 100: Nitrate sampled in the Kenai River mainstem during spring 2001 to 2014. Since 37% of the samples are reported as below the MRL or MDL, these values have been estimated using values that are half of the MRL or MDL.

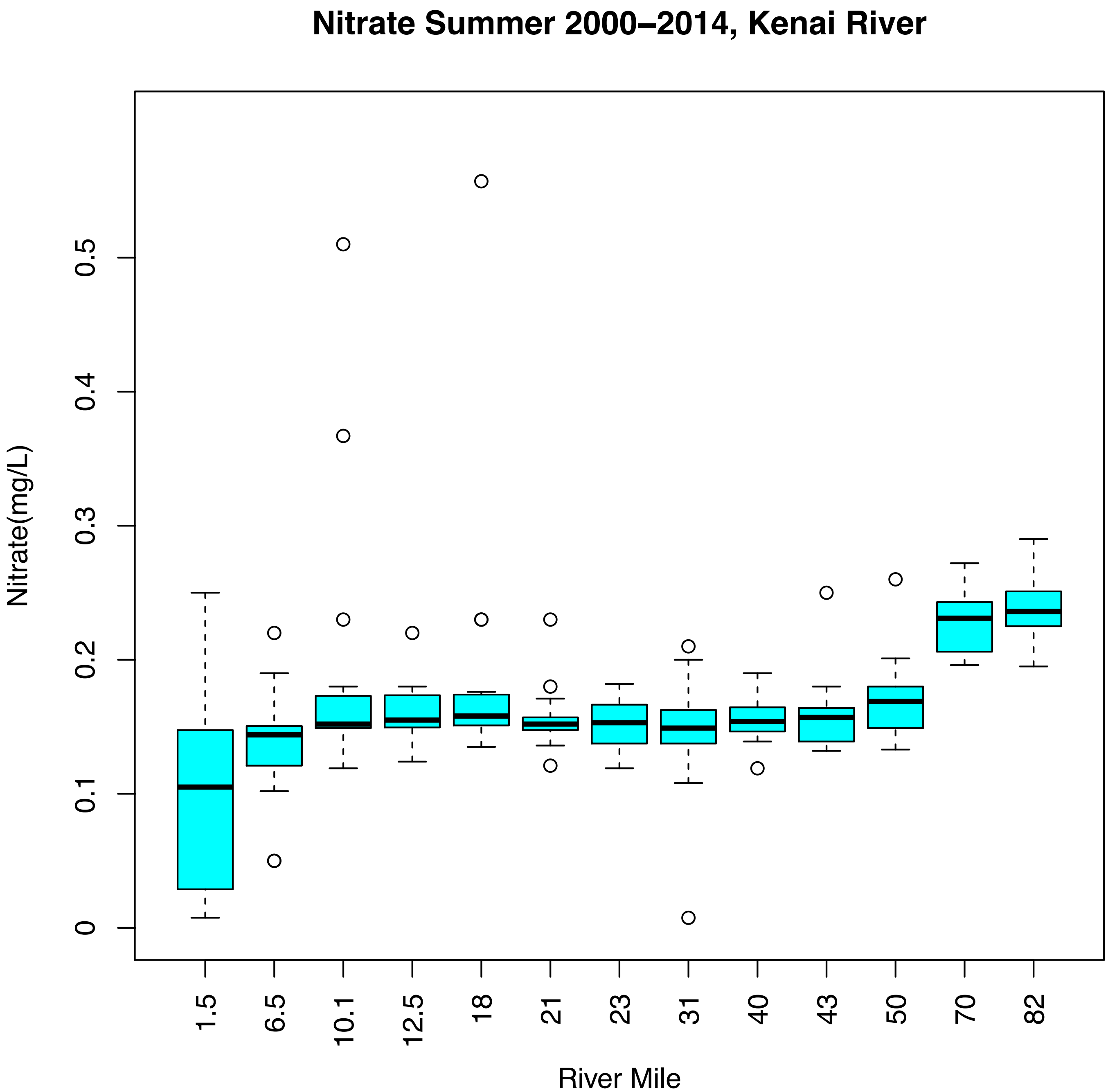

Figure 101: Nitrate sampled in the Kenai River mainstem during Summer 2000 to 2014. Since 4% of the samples are reported as below the MRL or MDL, these values have been estimated using values that are half of the MRL or MDL.

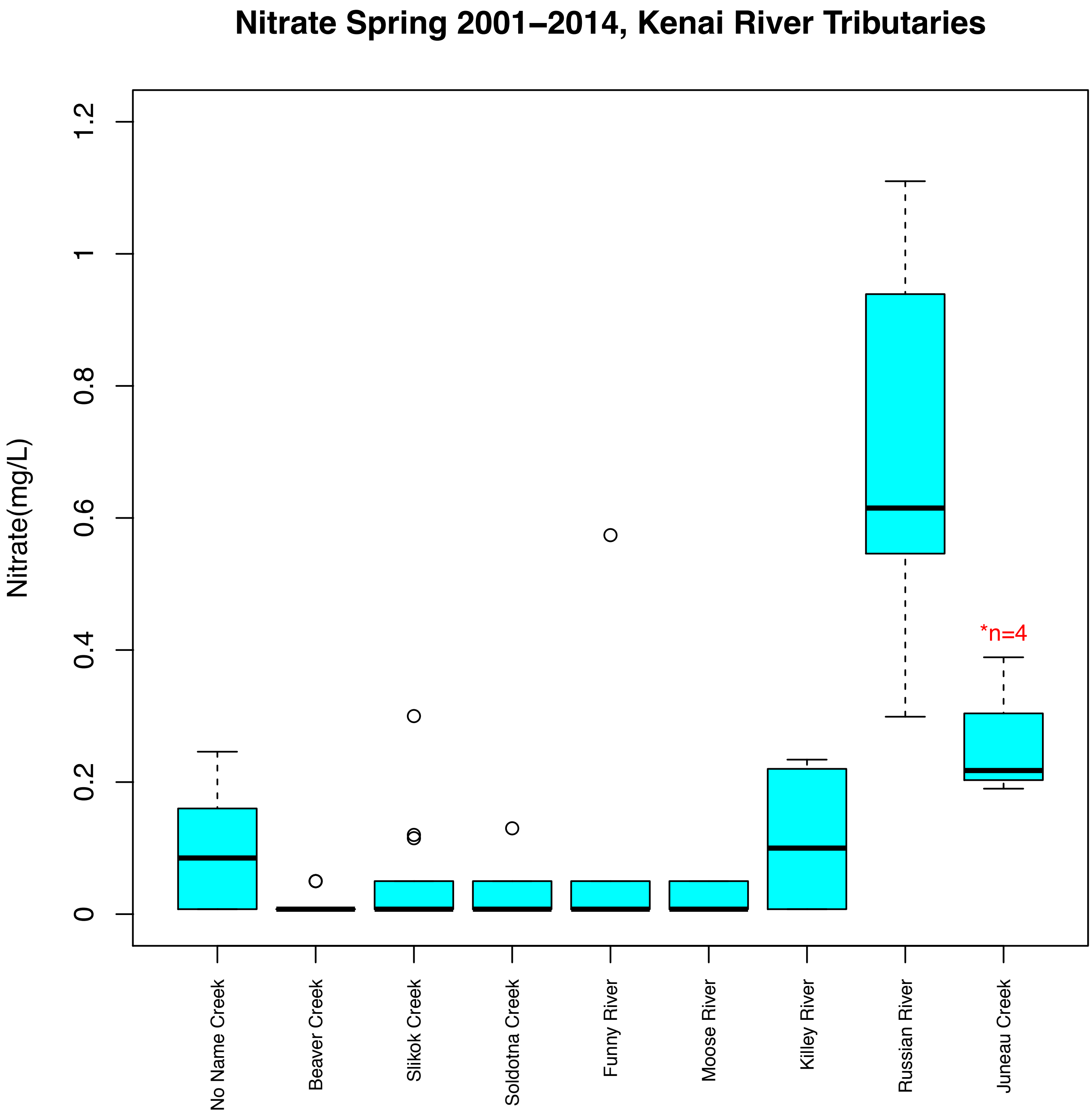

Figure 102: Nitrate sampled in the Kenai River tributaries during spring 2001 to 2014. Since 66% of the samples are reported as below the MRL or MDL, these values have been estimated using values that are half of the MRL or MDL

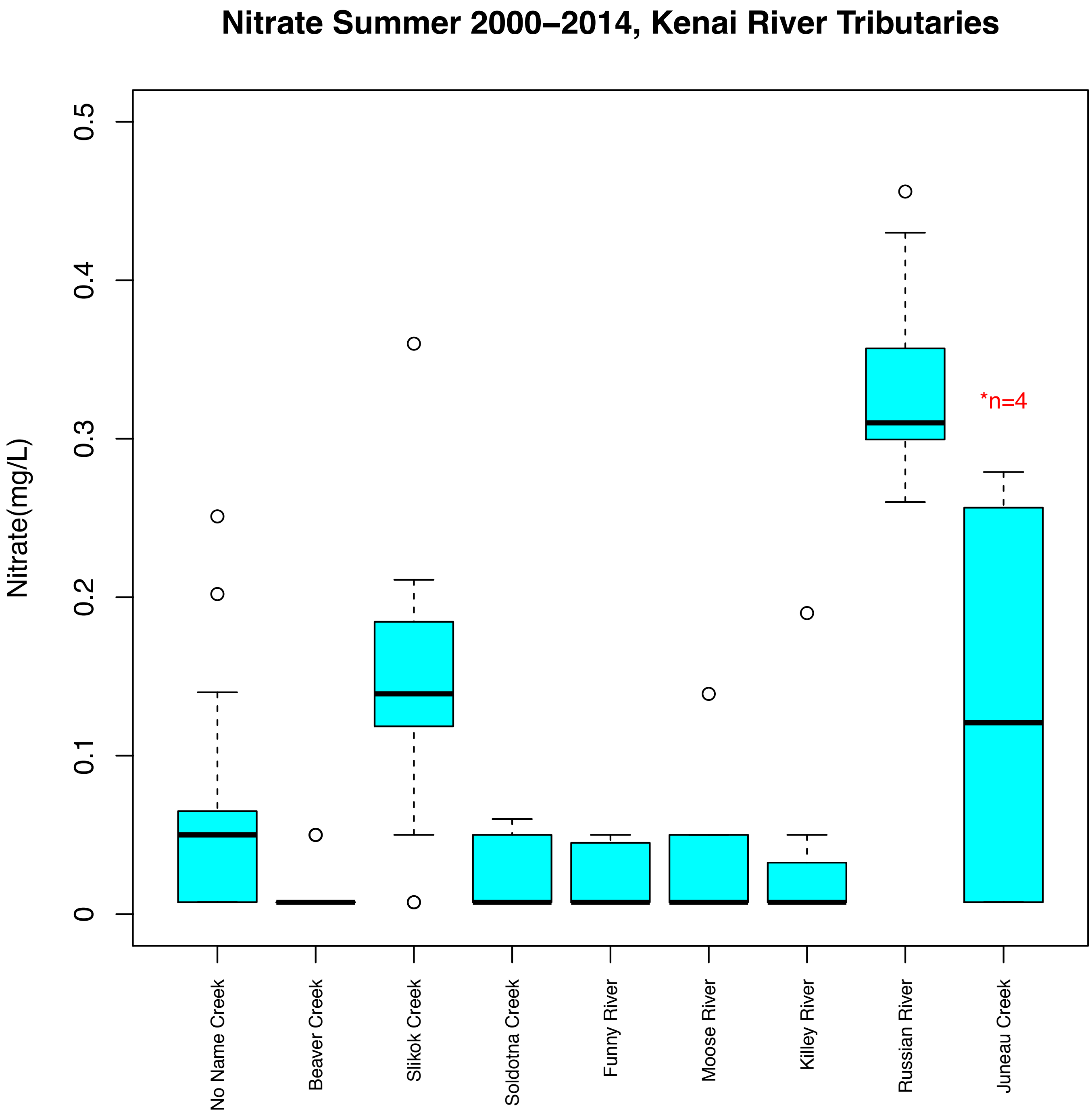

Figure 103: Nitrate sampled in Kenai River tributaries during summer 2000 to 2014. Since 70% of the samples are reported as below the MRL or MDL, these values have been estimated using values that are half of the MRL or MDL.

Phosphorus

Plants and animals require the essential element phosphorus for growth, and most concentrations are not toxic to aquatic or human life (Glass, 1999). As a nutrient, phosphorus is significant to water quality because in high concentrations, it can lead to excessive algal growth and eutrophic conditions (Glass, 1999). The ADEC and the USEPA do not have a standard for phosphorus for chronic exposure to aquatic life in freshwater.

The highest level of phosphorus ever recorded occurred at Mile 1.5 in springspring 2005 with a concentration of 4 mg/L, and the lowest levels occurred on many occasions below the MDL of 0.0020 mg/L in the spring and the summer (Table 16). The estuary had significantly higher medians and variance than the rest of the mainstem in the summer and the spring. The lowest concentrations of phosphorus occurred between Mile 40 and Mile 82. In the mainstem, there was a general upward trend in phosphorus concentration from Kenai Lake to the estuary (Figures 104 & 105).

In the tributaries, phosphorus ranged from 64 mg/L in Slikok Creek during May 2013 to below the MDL of 0.0020 mg/L at many locations in the spring and the summer (Table 42) Beaver Creek had the highest median in the spring but dropped to the second highest in the summer, after the Killey River. Funny River had relatively high medians during both the spring and the summer. In contrast, Russian River displayed the lowest median in both the spring and the summer (Figures 106 &107).

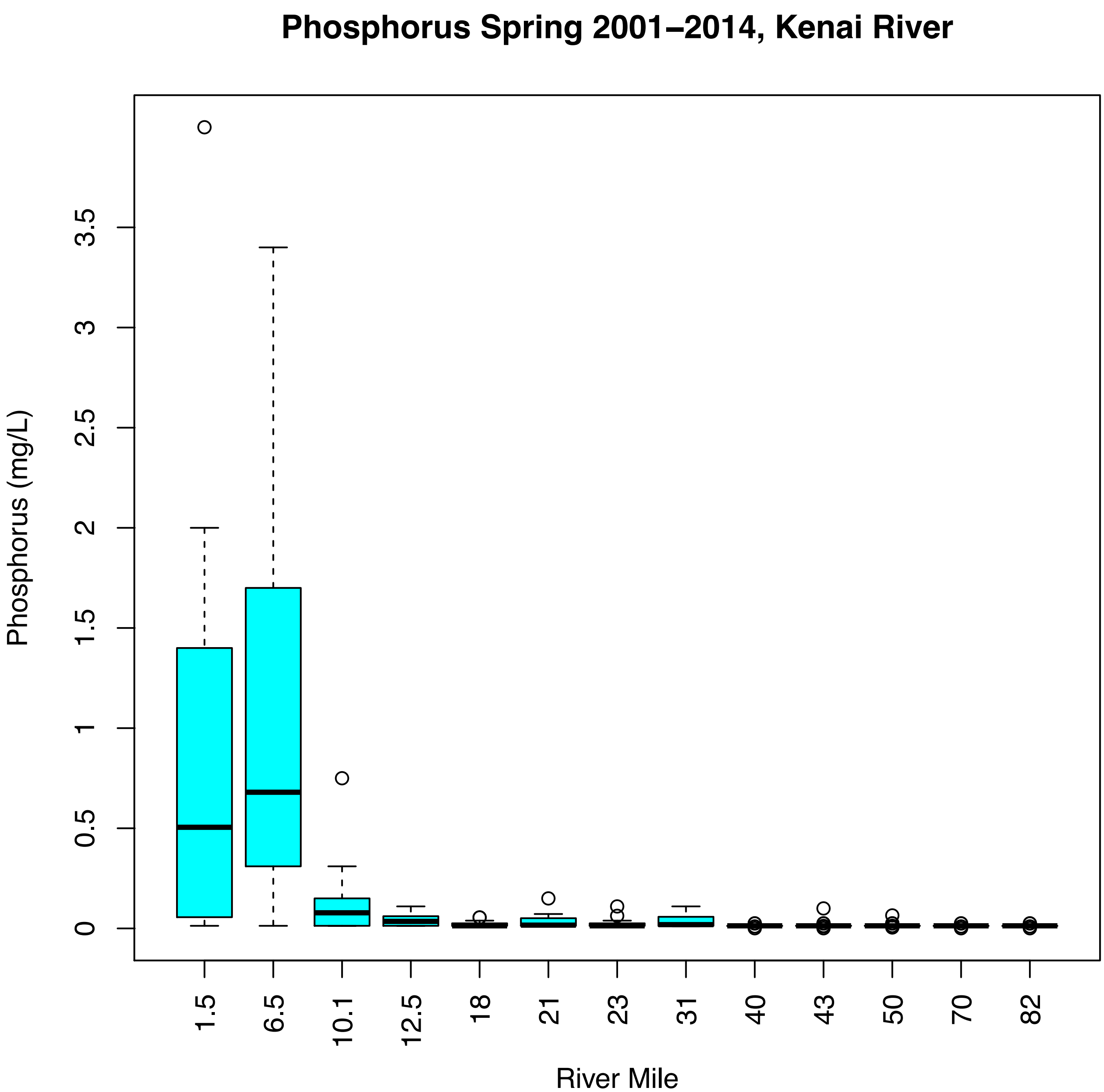

Figure 104: Phosphorus sampled in the Kenai River mainstem during spring 2001 to 2014. Since 57% of the samples are reported as below the MRL or MDL, these values have been estimated using values that are half of the MRL or MDL.

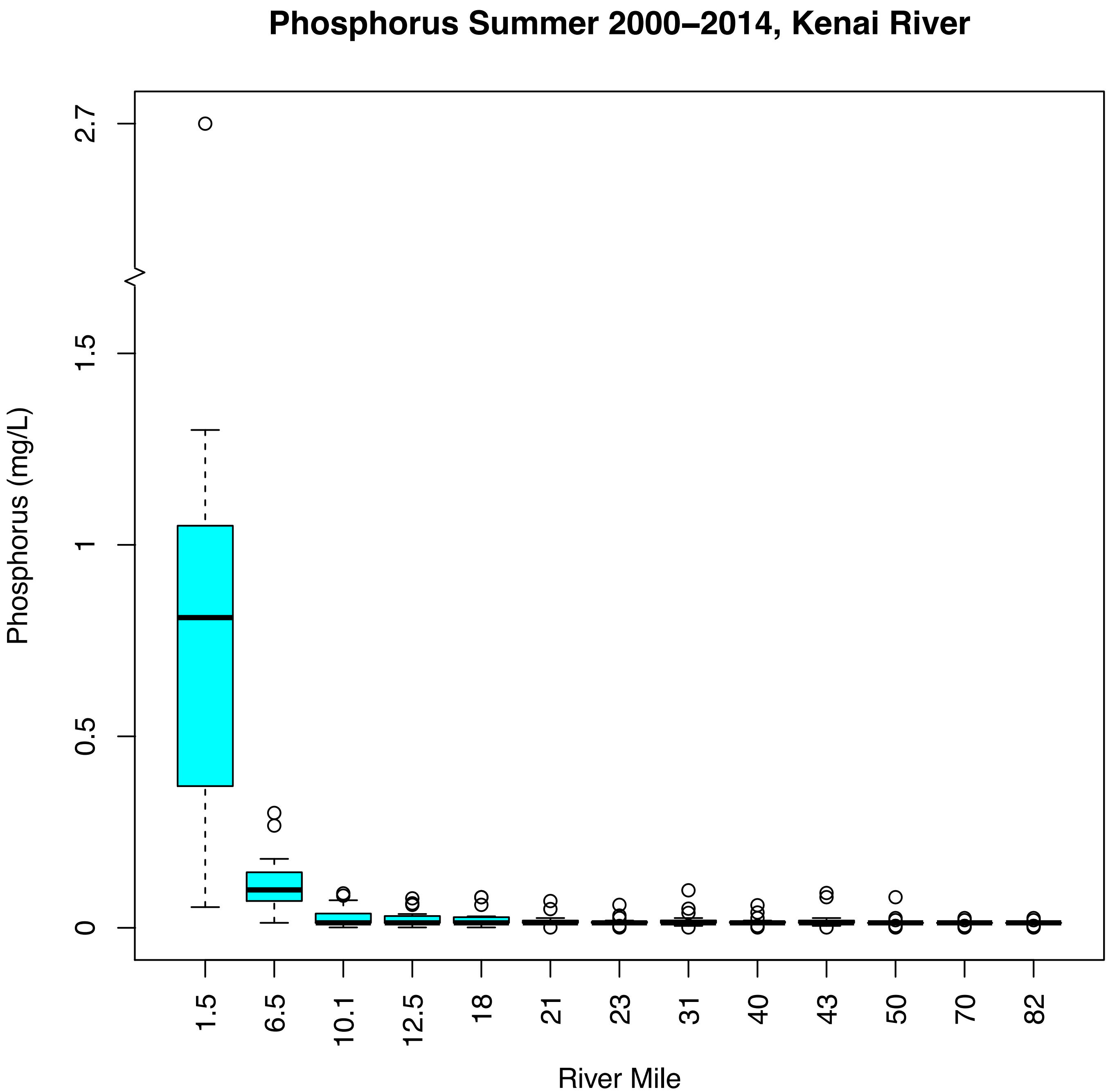

Figure 105: Phosphorus sampled in the Kenai River mainstem during summer 2000 to 2014. Since 69% of the samples are reported as below the MRL or MDL, these values have been estimated using values that are half of the MRL or MDL.

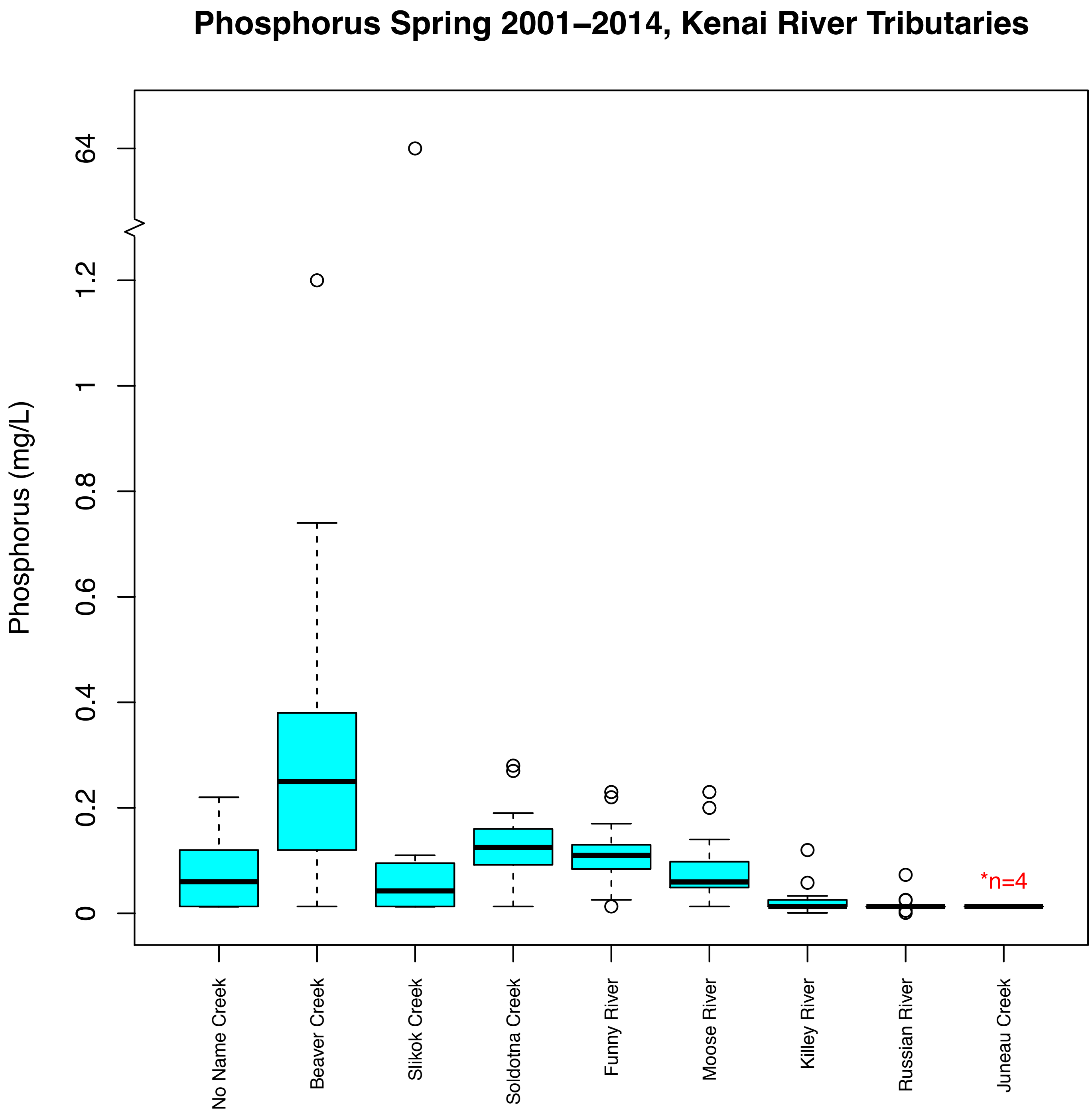

Figure 106: Phosphorus sampled in Kenai River during spring 2001 to 2014.
Since 33% of the samples are reported as below the MRL or MDL, these values have been estimated using values that are half of the MRL or MDL.

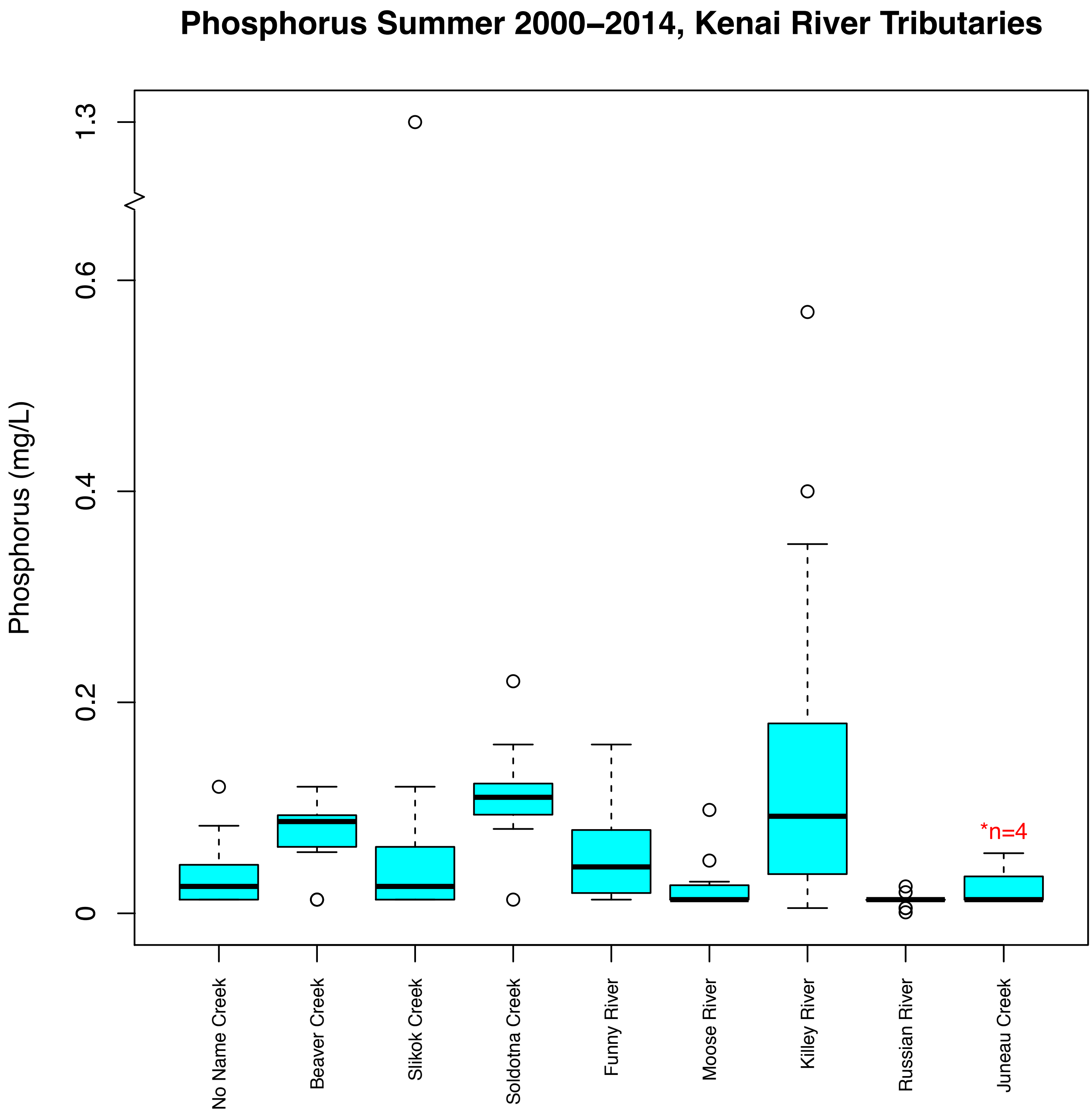

Figure 107: Phosphorus sampled in Kenai River tributaries during summer 2000 to 2014. Since 44% of the samples are reported as below the MRL or MDL, these values have been estimated using values that are half of the MRL or MDL.

Diesel Range Organics

Diesel range organics (DRO) consist of diesel fuels and associated byproducts, and include the n-alkane range from C_{10} to C_{25} (ADEC, 2007). Although the ADEC and the USEPA do not have a standard for the chronic exposure of freshwater aquatic life to DRO, it was included in this study to cover a broad range of hydrocarbons and narrow down potential sources.

In the mainstem, DRO concentrations ranged from a high of 0.29 mg/L that occurred at Mile 1.5 and Mile 31 during spring 2001 to the lowest levels that occurred at multiple locations at concentrations below the MDL of 0.0060 mg/L (Table 17). In the spring, DRO was reported only in 2001 at Mile 1.5, Mile 10.1, and Mile 31, and the reported levels were only slightly higher than the MRLs. The summer samples in the mainstem were all below the MDL or MRL, and therefore, more DRO was detected in the spring than in the summer (Figure 108).

The highest level of diesel range organics was 0.37 mg/L at Soldotna Creek in summer 2000, and the lowest levels occurred in multiple instances below the MDL of 0.0060 mg/L (Table 43). In the spring, DRO was reported only in 2001 at Slikok Creek, Soldotna Creek, and Moose River, while during the summer, the only tributary to report DRO was Soldotna Creek in 2000. In the tributaries, there were also more instances of detection in the spring than in the summer. The concentrations observed in the tributaries were higher than those detected in the mainstem (Figure 109).

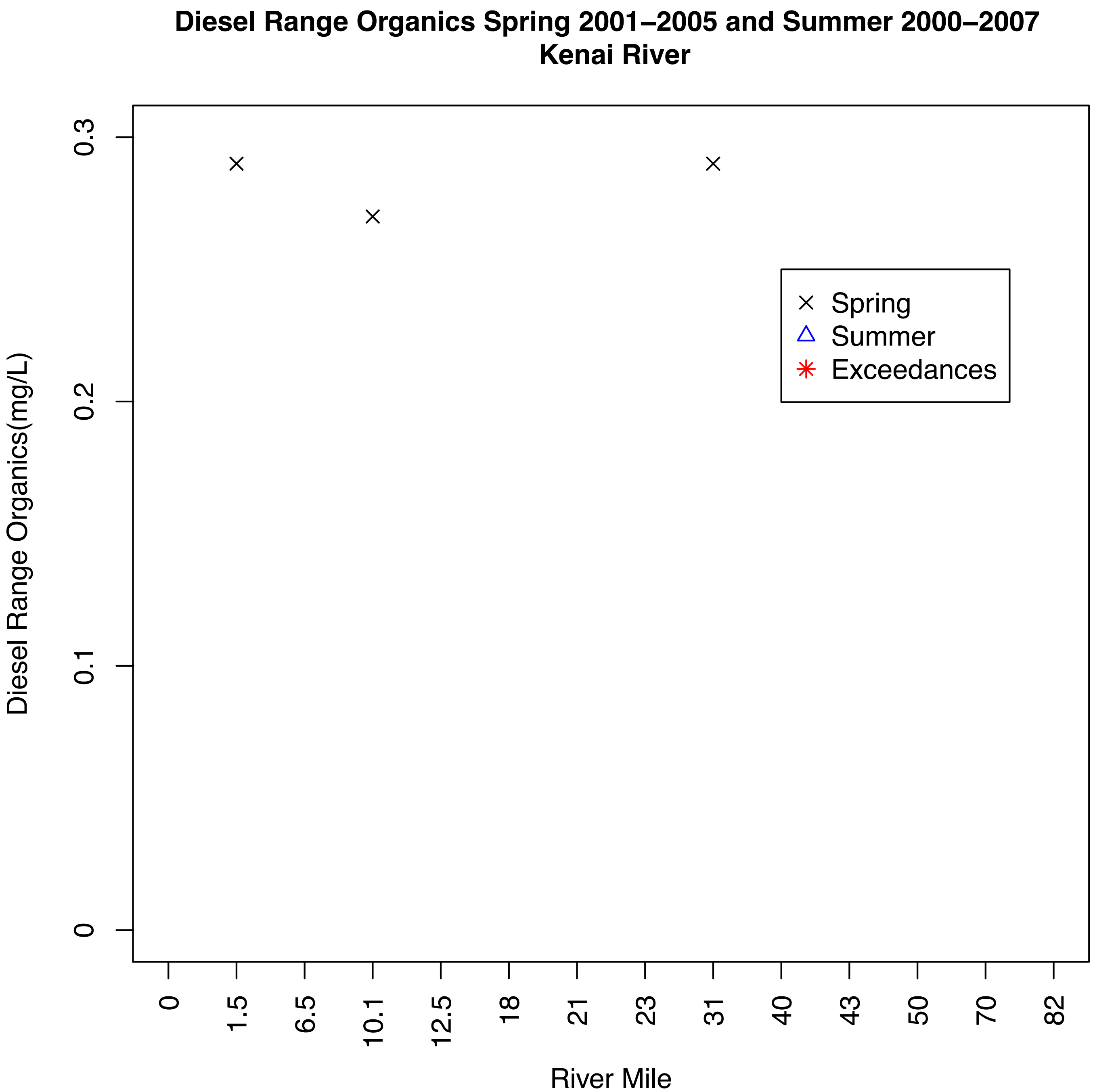

Figure 108: Diesel Range Organics sampled in the Kenai River mainstem during spring 2001 to 2005 and summer 2000 to 2007
99% of the samples had results below the MRL or MDL, so those results are not included in the graph.

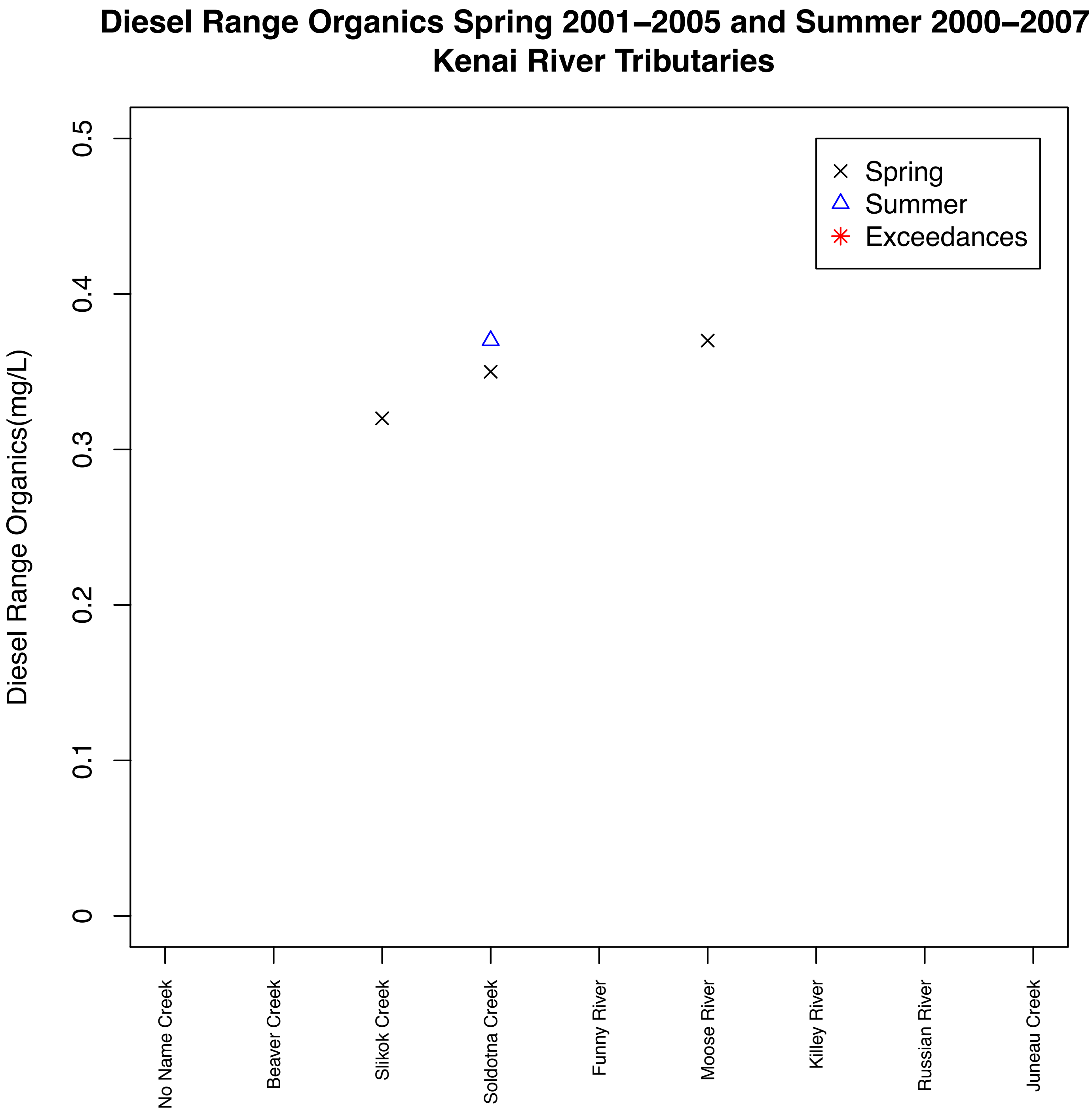

Figure 109: Diesel Range Organics sampled in Kenai River tributaries during spring 2001 to 2005 and summer 2000 to 2007.
96% of the samples had results below the MRL or MDL, so those results are not included in the graph.

Gasoline Range Organics

Gasoline Range Organics (GRO) are comprised of gasoline fuels and by-products, including benzene, toluene, ethylbenzene, and xylene (BTEX), and GRO corresponds to the nalkane range of C_6 to C_{10} (ADEC, 2007). Although there is an ADEC standard specifically for BTEX, there is not an ADEC or USEPA standard applicable to GRO as a whole for the chronic exposure of freshwater aquatic life.

The highest level of gasoline range organics was 38.3 μg/L at Mile 1.5 in summer 2002, and many samples were below the MDL of 3.0 μg/L. Gasoline range organics have only been detected in the summer at Mile 1.5, Mile 6.5, and Mile 10.1 in the mainstem and were never detected in the tributaries (Tables 18 & 44). Although no concentrations were reported in summer 2005, this may be due to the exceptionally high MRL of 100 μg/L. More gasoline range organics were detected in the summer since none were reported in the spring (Figures 110 & 111).

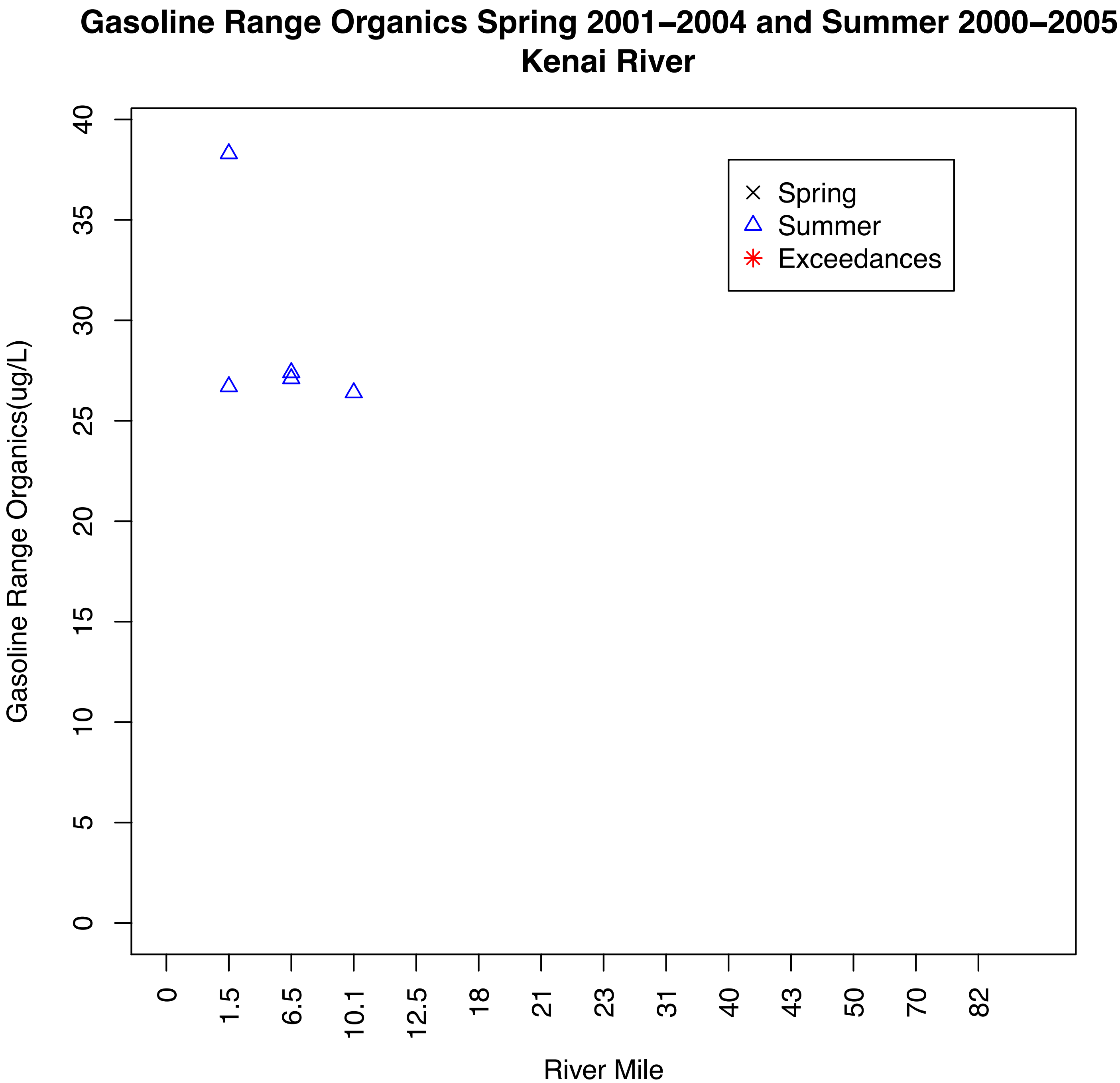

Figure 110: Gasoline Range Organics sampled in the Kenai River mainstem during spring 2001 to 2004 and summer 2000 to 2005.
96% of the samples had results below the MRL or MDL, so those results are not included in the graph.

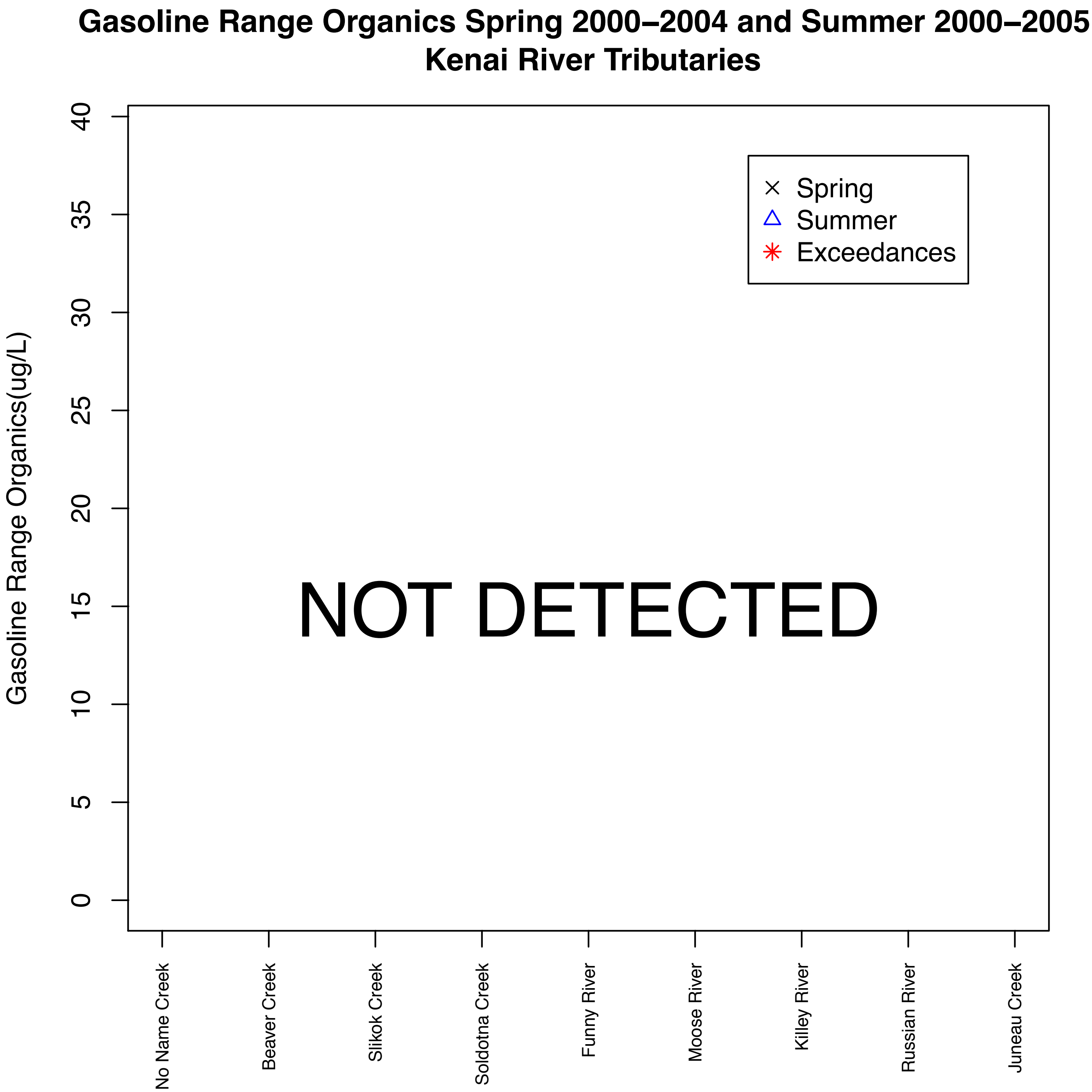

Figure 111: Gasoline Range Organics sampled in Kenai River tributaries during spring 2001 to 2004 and summer 2000 to 2005.
All of the samples are reported as below the MRL or MDL.

Residual Range Organics

Heavy fuel products, like asphalt or Bunker C fuel, are referred to as residual range organics (RRO) and include the n-alkane range of C_{25} to C_{36} (ADEC, 2007). RRO was included in this study to cover a broad range of hydrocarbons, however, there is no ADEC or USEPA standard for freshwater aquatic life chronically exposed to RRO.

The only instance of detection in the mainstem occurred at Mile 23 with a concentration of 4.75 mg/L during summer 2000, and the lowest levels were reported in numerous locations below the MDL of 0.032 mg/L in the spring and the summer (Table 19). The highest concentration of RRO ever detected was 5.67 mg/L in Soldotna Creek during the summer of 2000, and the lowest levels in the tributaries occurred in multiple instances below the MDL of 0.032 mg/L (Table 45). In the spring, No Name Creek was the only location that reportedly contained RRO, and in summer 2004, No Name Creek also contained RRO. The only other tributary to report RRO was Soldotna Creek in summer 2000. In the summer, there were two detected concentrations compared to one in the spring, and more detected levels occurred in the tributaries than the mainstem (Figures 112 & 113).

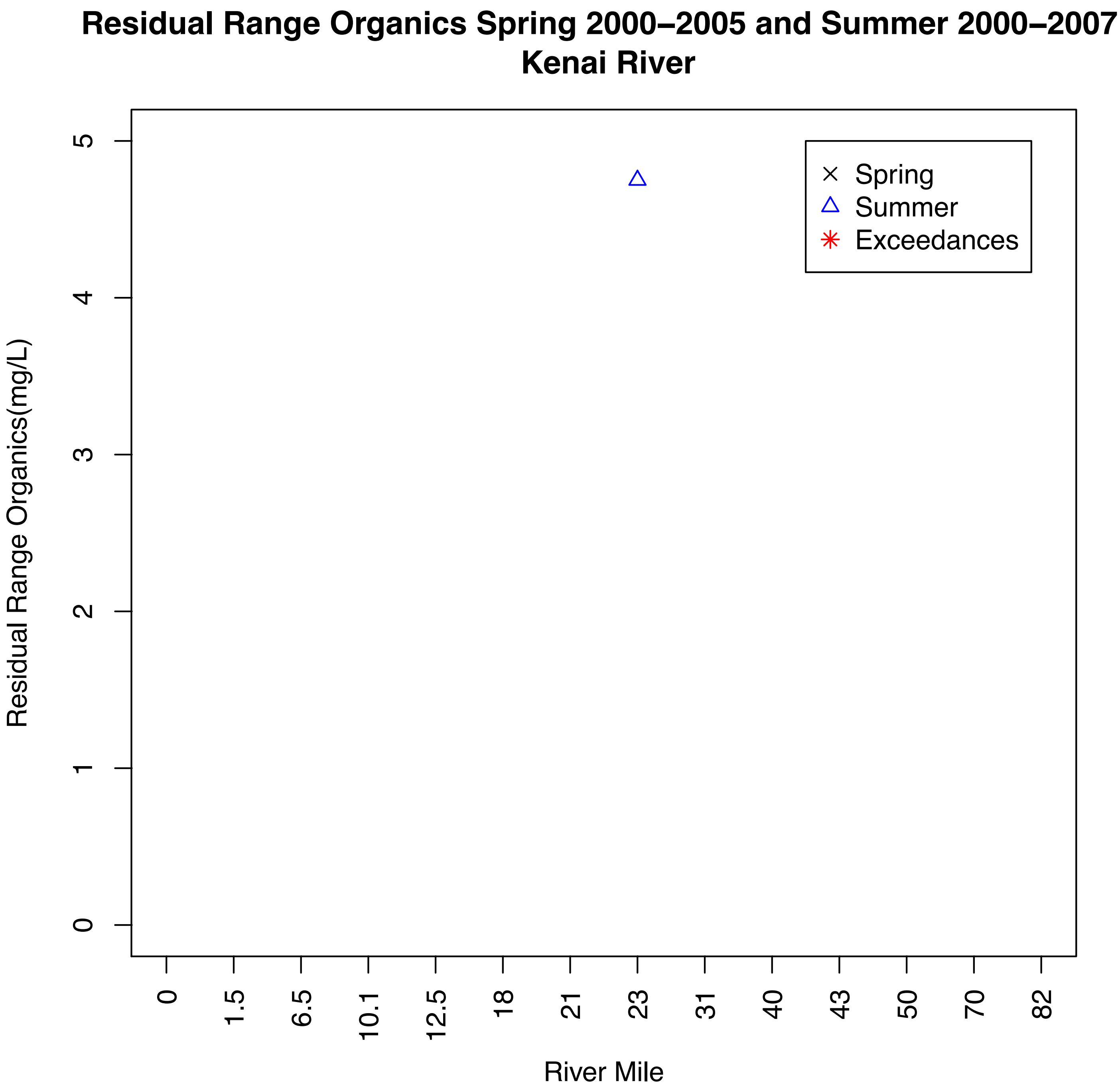

Figure 112: Residual Range Organics sampled in the Kenai River mainstem during spring 2001 to 2005 and summer 2000 to 2007.
99% of the samples had results below the MRL or MDL, so those results are not included in the graph.

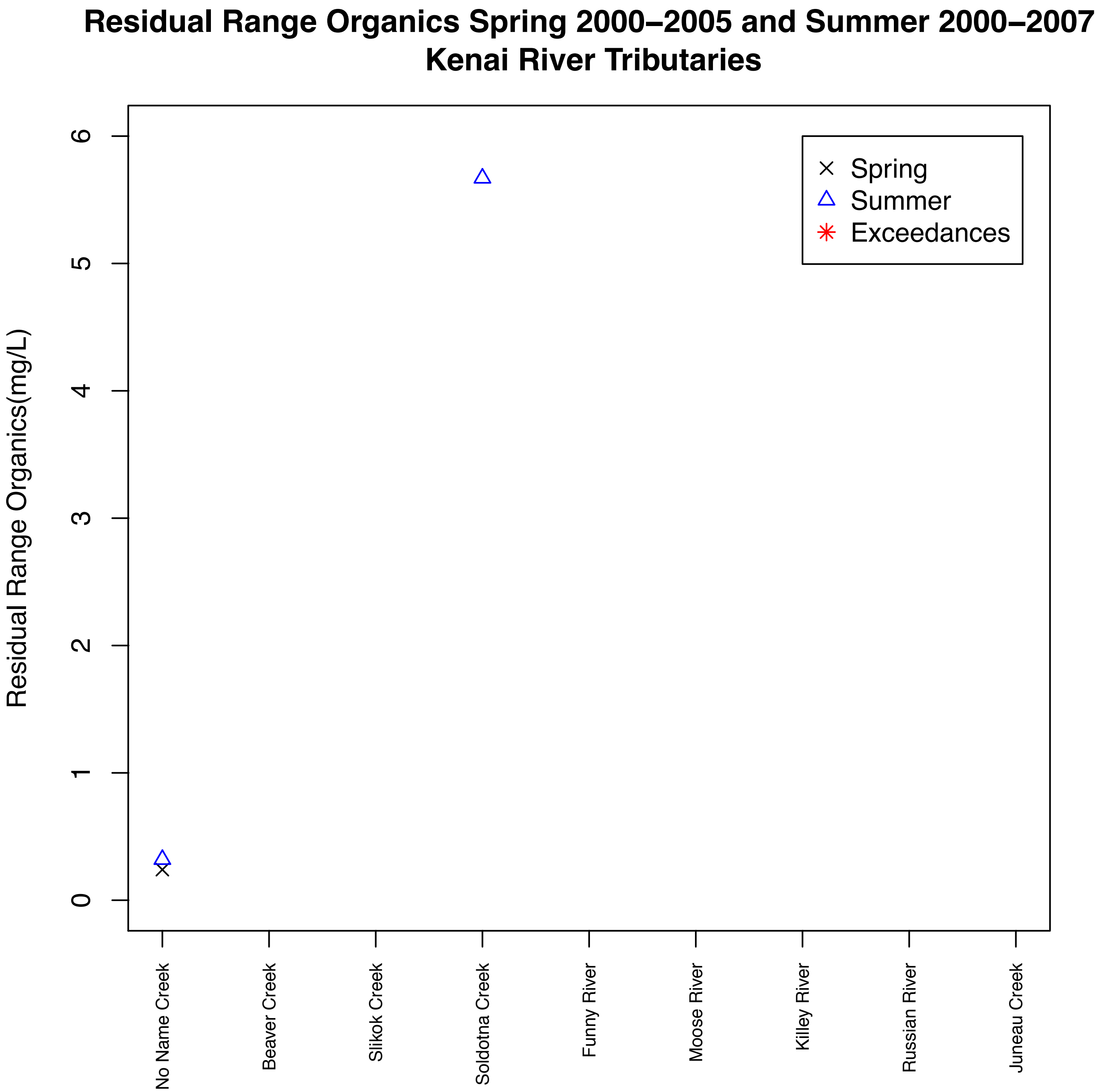

Figure 113: Residual Range Organics sampled in Kenai River tributaries during spring 2001 to 2005 and summer 2000 to 2007.
Since 97% of the samples are reported as below the MRL or MDL, these values have been estimated using values that are half of the MRL or MDL.

Total BTEX

Benzene, toluene, ethylbenzene, m,p-xylene, and o-xylene are the aromatic hydrocarbons that are commonly referred to as BTEX. Volcanoes and forest fires are natural sources of benzene, and benzene is also a component in cigarette smoke, crude oil, and gasoline (ATSDR, 2005a). Benzene breaks down slowly in water and soil, but concentrations do not build up in plants and animals (ATSDR, 2005a). A natural part of crude oil, toluene is used to produce gasoline, paint, paint thinner, lacquer, and adhesives (ATSDR, 2001). Toluene can enter surface water due to petroleum or solvent spills and engine exhaust, but does not buildup to high concentrations in animals (ATSDR, 2001). Ethylbenzene is a colorless liquid found naturally in coal tar and petroleum, and is often used as a solvent and as a component in fuel, ink, insecticide, and paint (ATSDR, 1999). Xylene has three forms or isomers called meta-xylene, para-xylene, and ortho-xylene, which are reported in this study as m,p-xylene and o-xylene. As a natural part of petroleum and coal tar, xylene has many uses as a solvent, cleaner, paint thinner, and a small component of gasoline (ATSDR, 2005b). Once xylene enters surface water, it evaporates quickly into the air, but a small amount can concentrate in aquatic life (ATSDR, 2005b). The ADEC standard is 10 **μ**g/L for total aromatic hydrocarbons in freshwater for the growth and propagation of fish, shellfish, other aquatic life, and wildlife (see Appendix 2) (ADEC, 2012). Additionally, the ADEC requires that surface waters do not have any floating oil, film, sheen, or discoloration due to hydrocarbons and that in shoreline or bottom sediments, there cannot be any concentration of petroleum hydrocarbons that cause deleterious effects to aquatic life (ADEC, 2012).

The highest level of BTEX in the mainstem occurred at Mile 1.5 at a level of 15.2 **μ**g/L in summer 2002, and the lowest levels were reported as non-detect because they were below the MDLs and MRLs. No BTEX was reported in any of the spring samples, but high levels were detected in the lower river during the summer (Table 25). No median of BTEX exceeded the Alaska standard, but individual samples from Mile 1.5 and 6.5 exceeded the standard during the summer of 2000, 2001, 2002 and 2003. A clear upward trend is evident from Mile 23 to Mile 1.5, and Mile 40 and Mile 43 show BTEX medians above the next two downstream sites. No BTEX was ever detected at Mile 70 (Figures 114 &115).

In the tributaries, concentrations ranged from 6.65 **μ**g/L in the Moose River in summer 2002 to non-detects reported in many instances. None of the tributaries had reported levels above the standard (Table 51). However, Beaver Creek, Soldotna Creek, the Moose River, the Killey River each had multiple instances of detection, and the Russian River reported one occasion of detection in summer 2008 (Figures 116 &117).

A trend analysis was conducted using the average and median values for data collected during the summer 2000-2013. The concentrations of BTEX throughout the entire Kenai River show higher levels of BTEX in the lower part of the Kenai River and very low concentrations in the headwaters (Figure 114 and Figure 115). The same analysis was done for each sampling station at the Kenai River; all but three stations show a decrease in BTEX concentration over time. Station at Mile 10.1 shows a decreasing trend until 2010. A Sampling event in 2012 starts an upward trend in the BTEX concentration (Figures 118-125).

All of the aromatic hydrocarbons of BTEX are typically associated with gasoline (Oasis Environmental, Inc., 2004). Litchfield and Kyle suggest that motorized boats could be the primary contamination source since peak times of outboard motor use coincided with peak concentrations of BTEX (1992). In 2003, the Kenai Watershed Forum determined that the majority of hydrocarbon contamination resulted from unburned refined gasoline product with outboard motors as the most likely source. In March 2008, the Alaska Department of Natural Resources Division of Parks and Recreation banned the use of two-stroke engines, with the exception of direct fuel injected (DFI) engines, within the Kenai River Special Management Area.

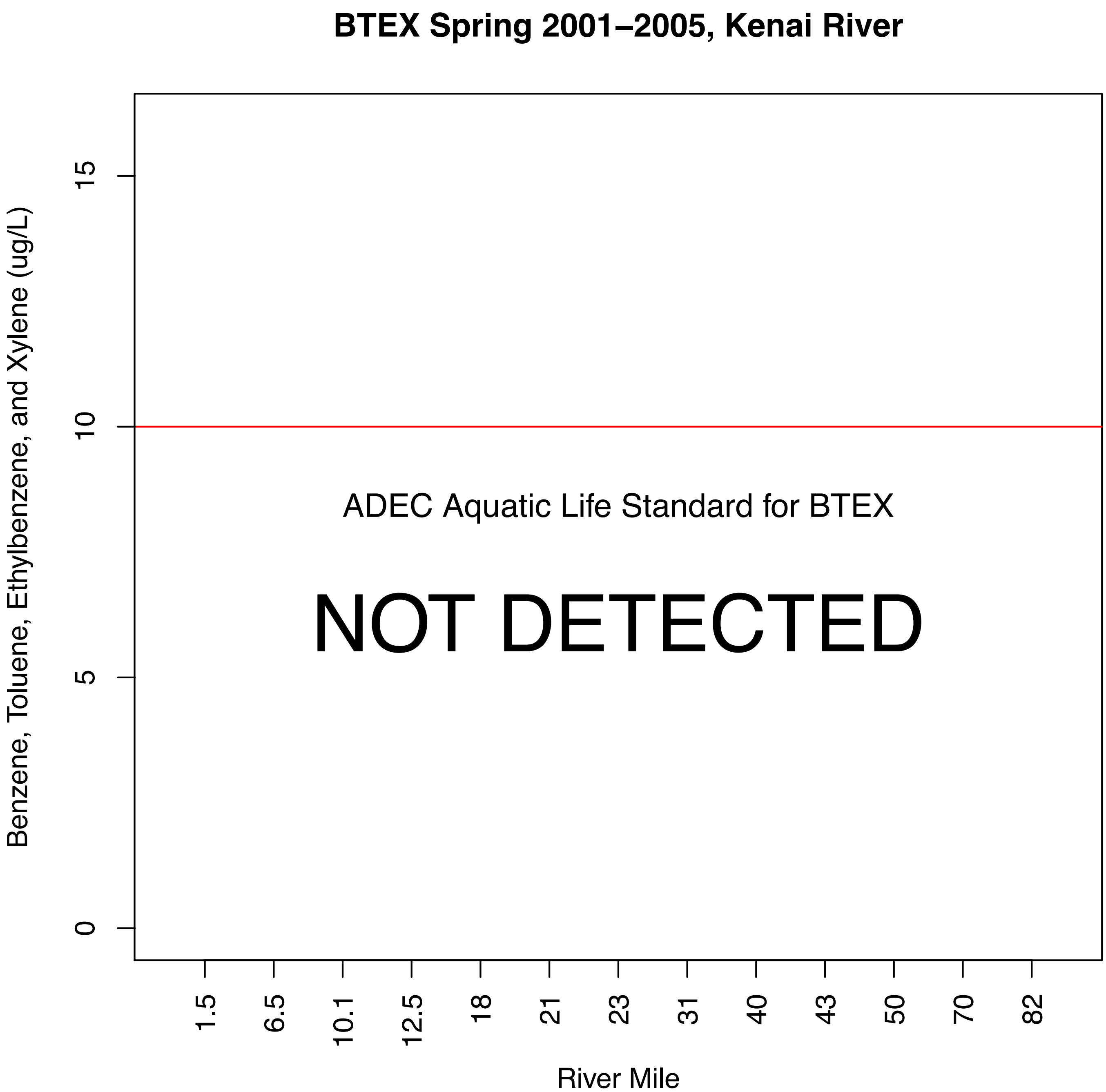

Figure 114: BTEX sampled in the Kenai River mainstem during spring 2001 to 2005. All of the samples are reported as below the MRL or MDL.

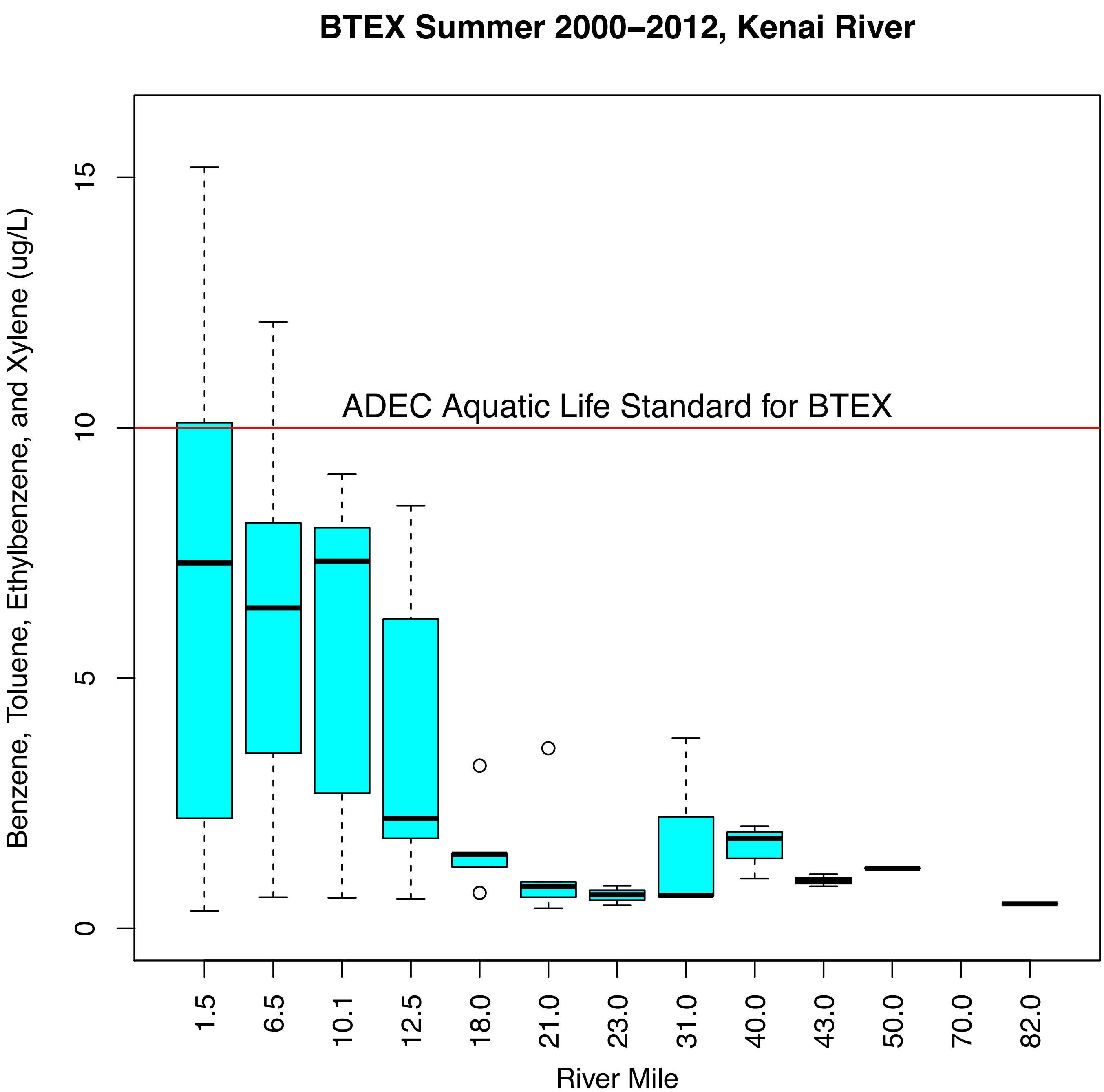

Figure 115: Total BTEX sampled in the Kenai River mainstem during summer 2000 to 2012. Miles 1.5, 6.5, 40 and 43 were also sampled during the 2013 event and that data was used to produce this graph.
This graph does not include instances of non-detect, in which all of the BTEX samples were reported as below the MRL or MDL.

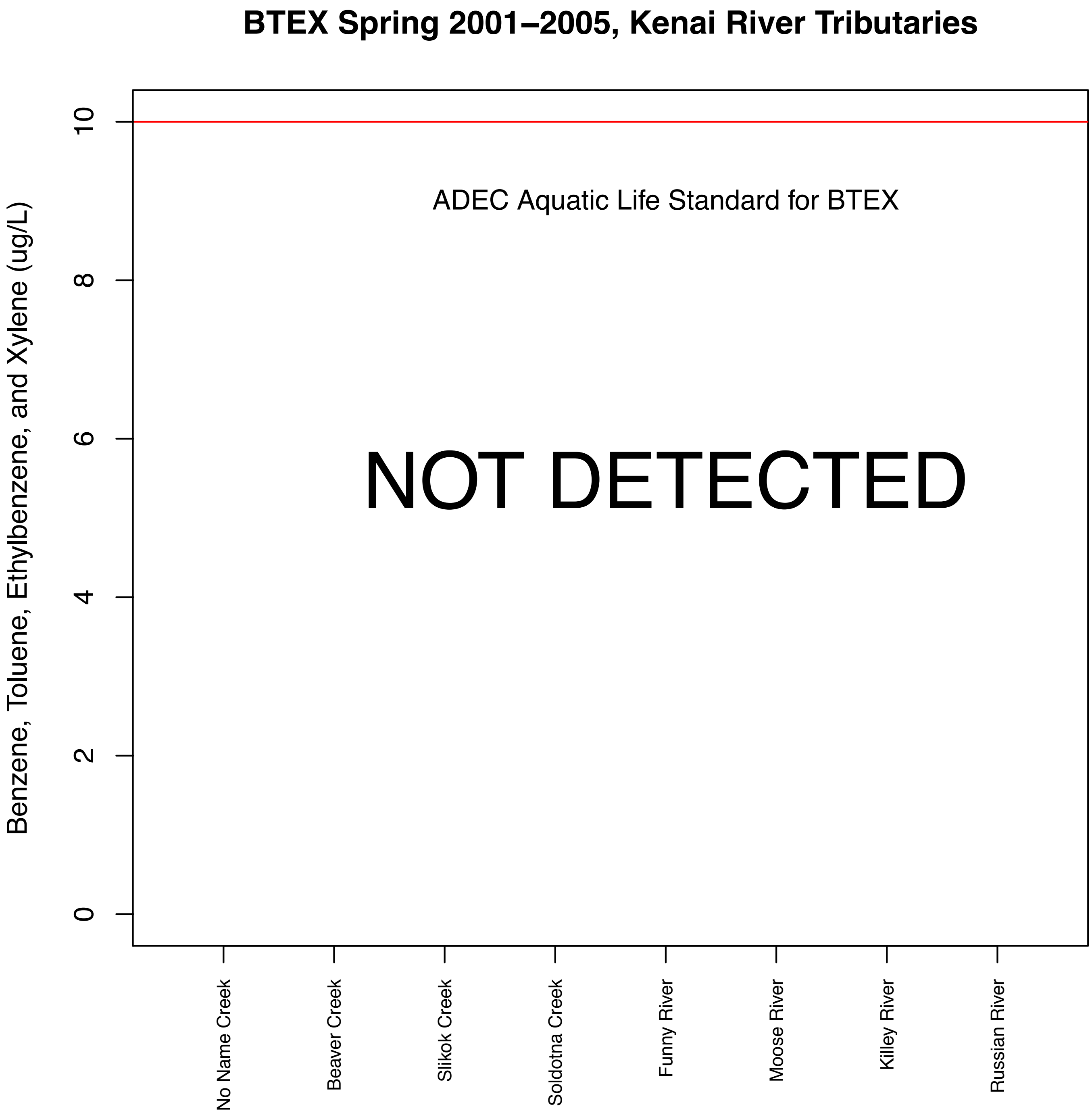

Figure 116: BTEX sampled in Kenai River tributaries during spring 2001 to 2005. All of the samples are reported as below the MRL or MDL.

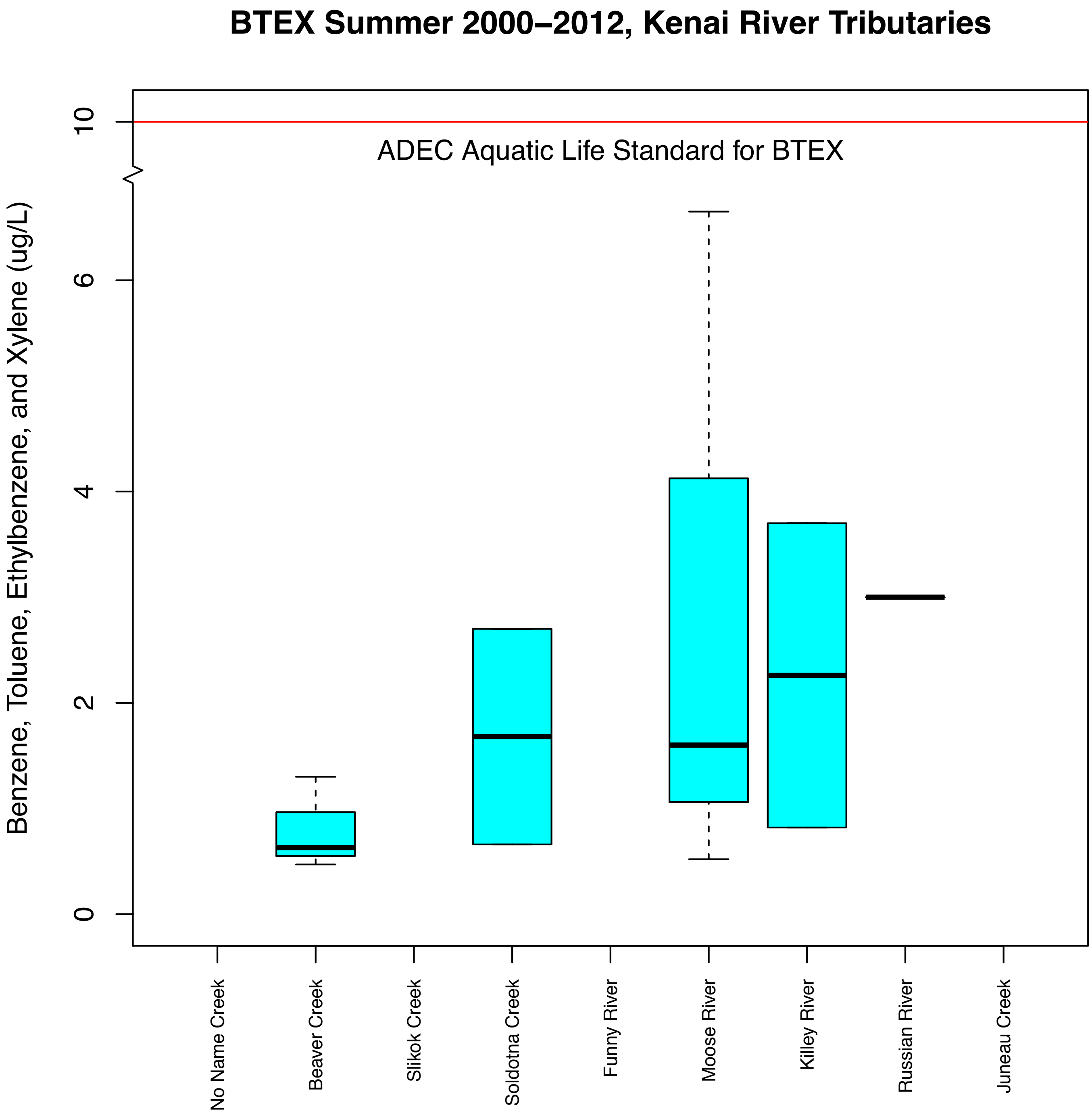

Figure 117: Total BTEX sampled in Kenai River tributaries during summer 2000 to 2012. Miles 1.5, 6.5, 40 and 43 were also sampled during the 2013 event and that data was used to produce this graph.
This graph does not include instances of non-detect, in which all of the BTEX samples were reported as below the MRL or MDL.

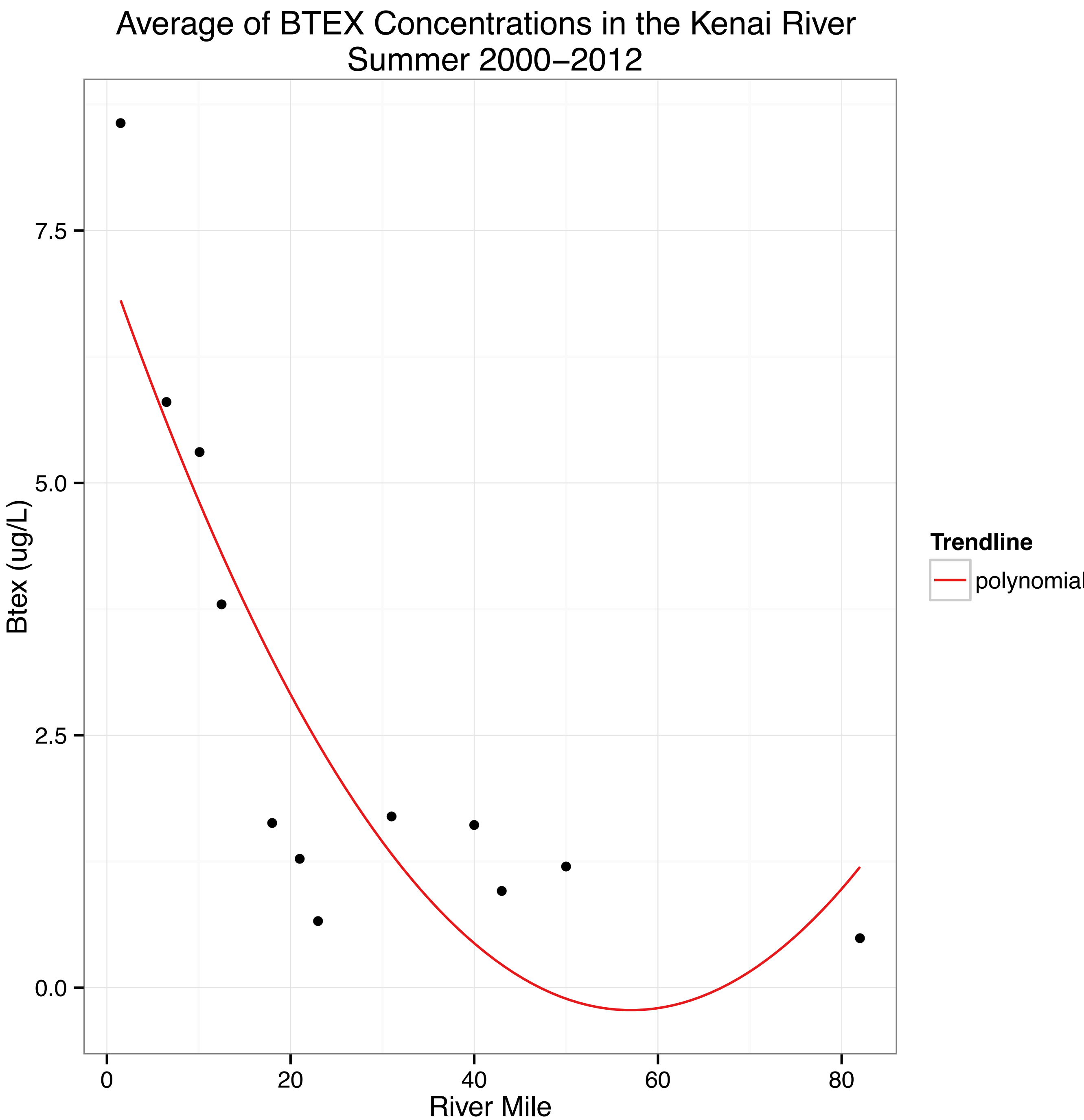

Figure 118: Average of BTEX values sampled from summer 2000 to 2012, Kenai River. Miles 1.5, 6.5, 40 and 43 were also sampled during the 2013 event and that data was used to produce this graph. Not detected values are not taken into account in the analysis and therefore are not shown in this graph.

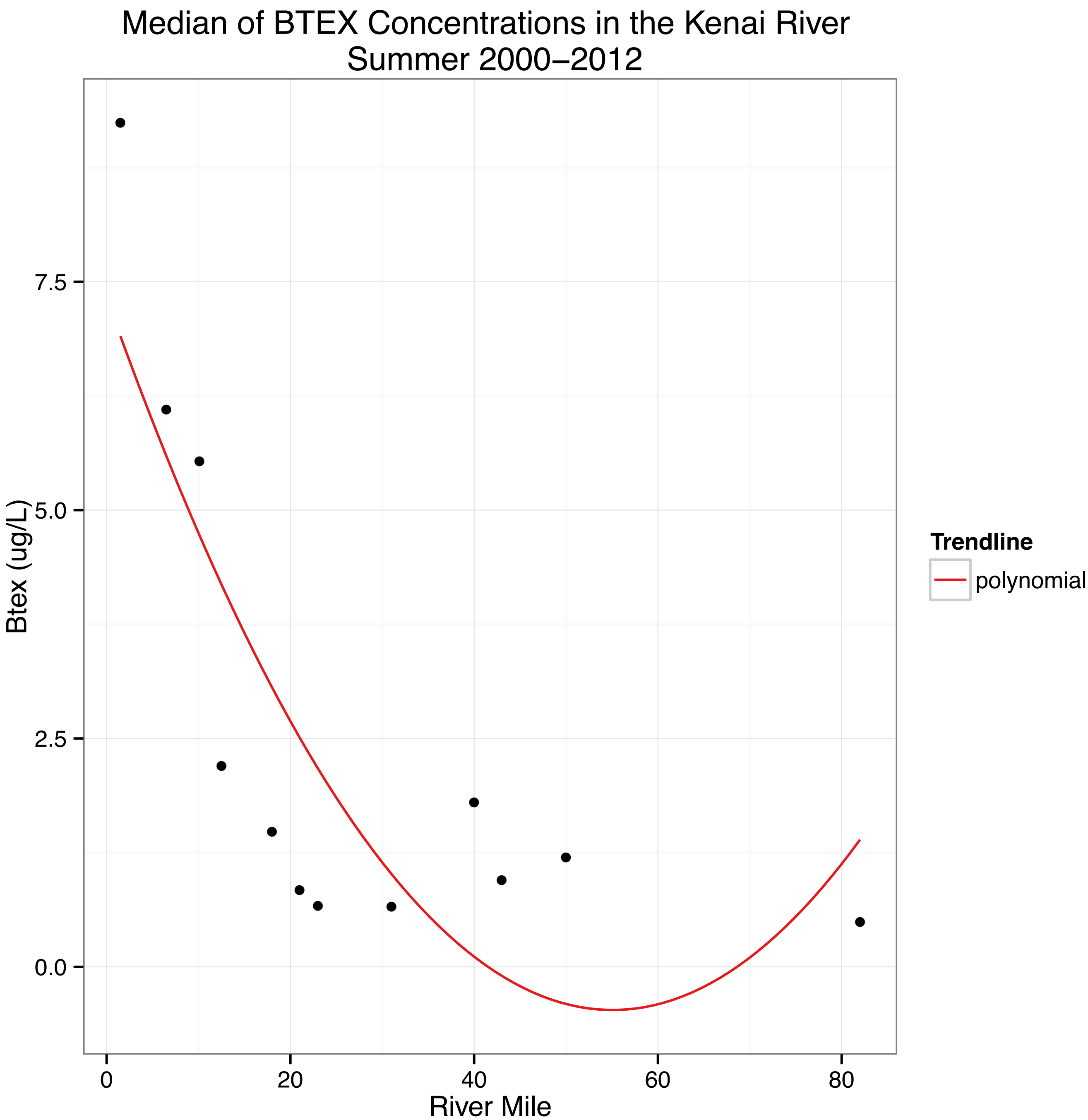

Figure 119: Median of BTEX values sampled from summer 2000 to 2012, Kenai River. Miles 1.5, 6.5, 40 and 43 were also sampled during the 2013 event and that data was used to produce this graph. Not detected values are not taken into account in the analysis and therefore are not shown in this graph.

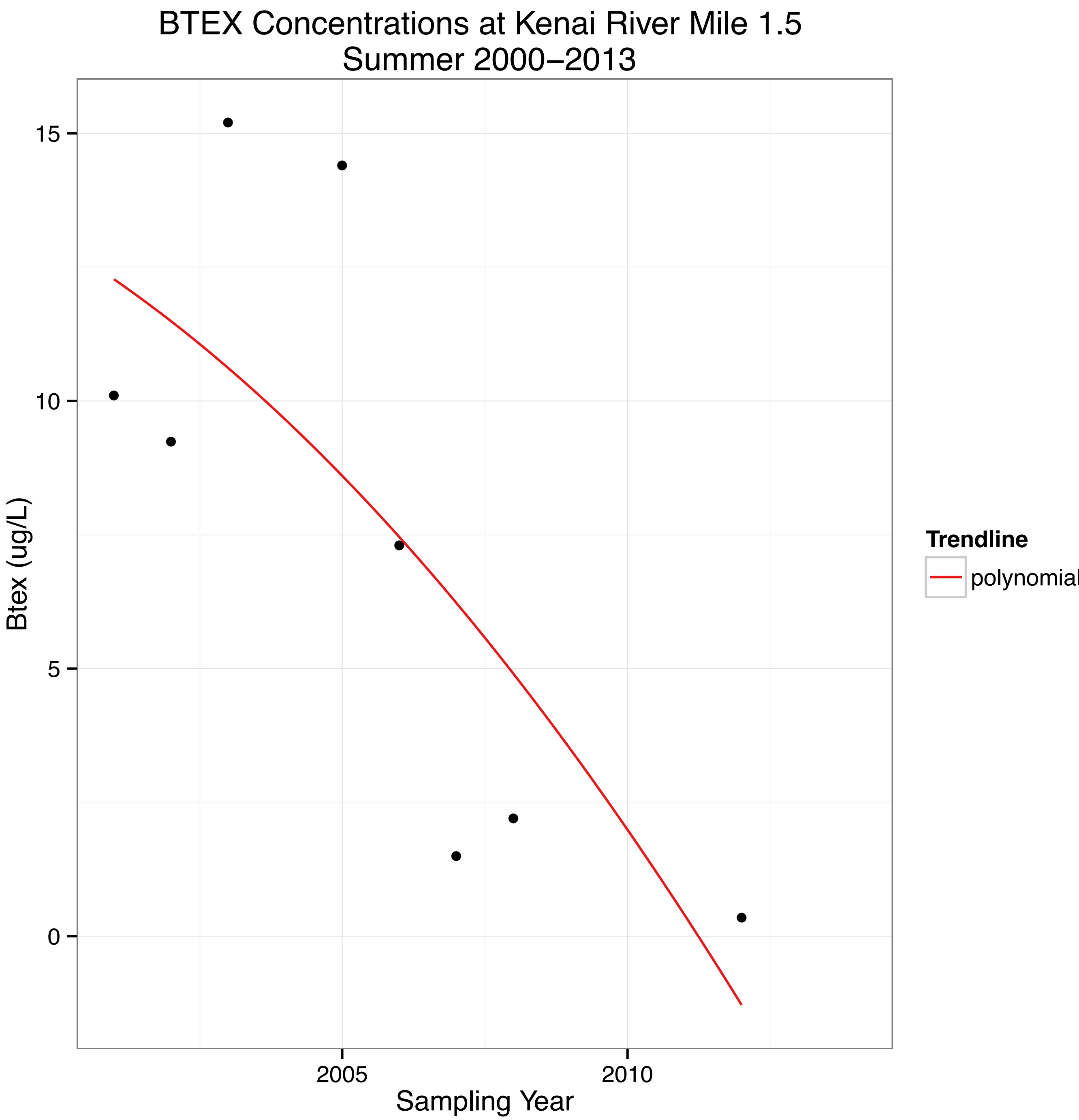

Figure 120: Trend analysis for BTEX sampled at Mile 1.5 from summer 2000 to 2013. Not detected values are not taken into account in the analysis and therefore are not shown in this graph.

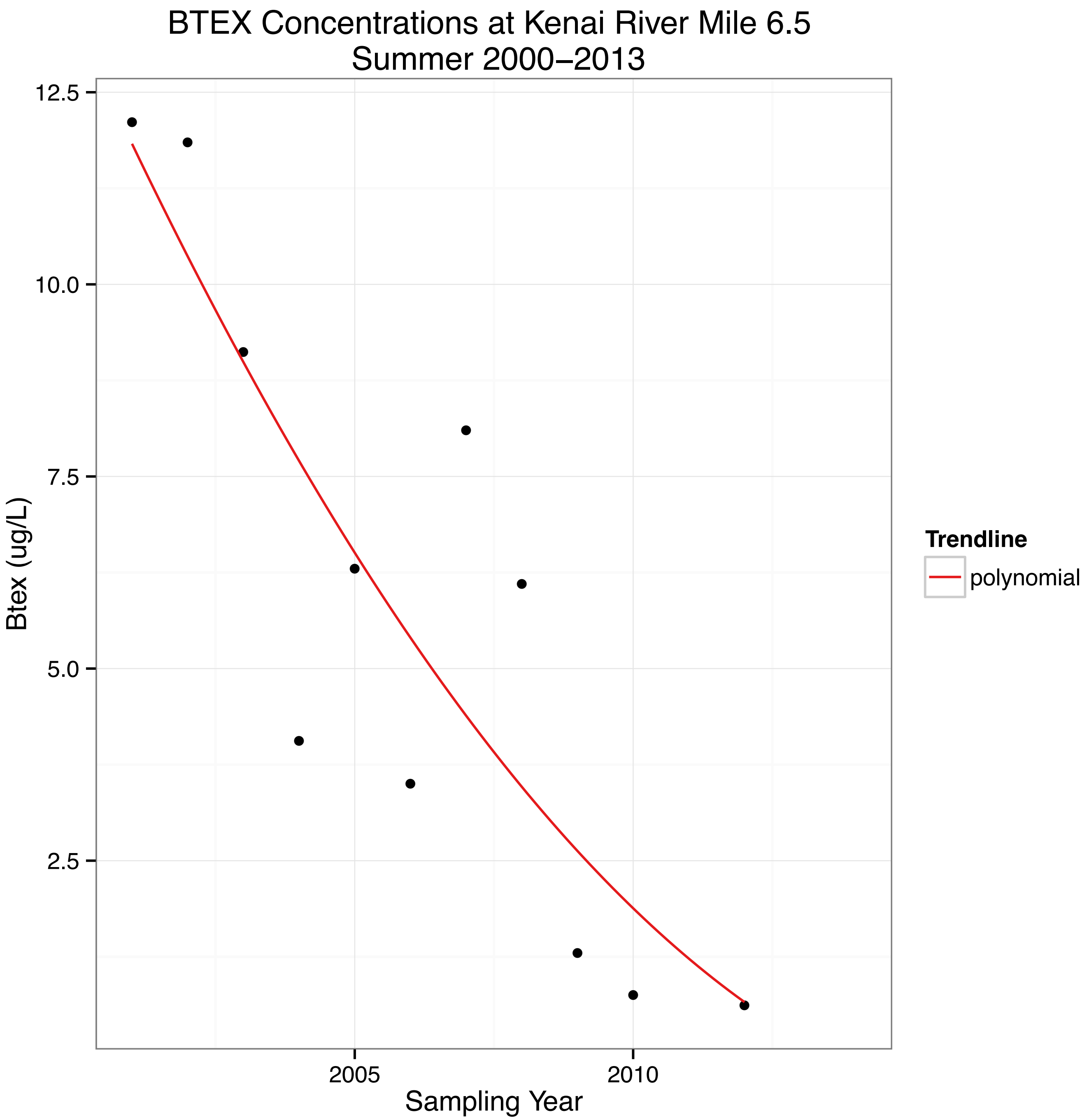

Figure 121: Trend analysis for BTEX sampled at Mile 6.5 from summer 2000 to 2013. Not detected values are not taken into account in the analysis and therefore are not shown in this graph.

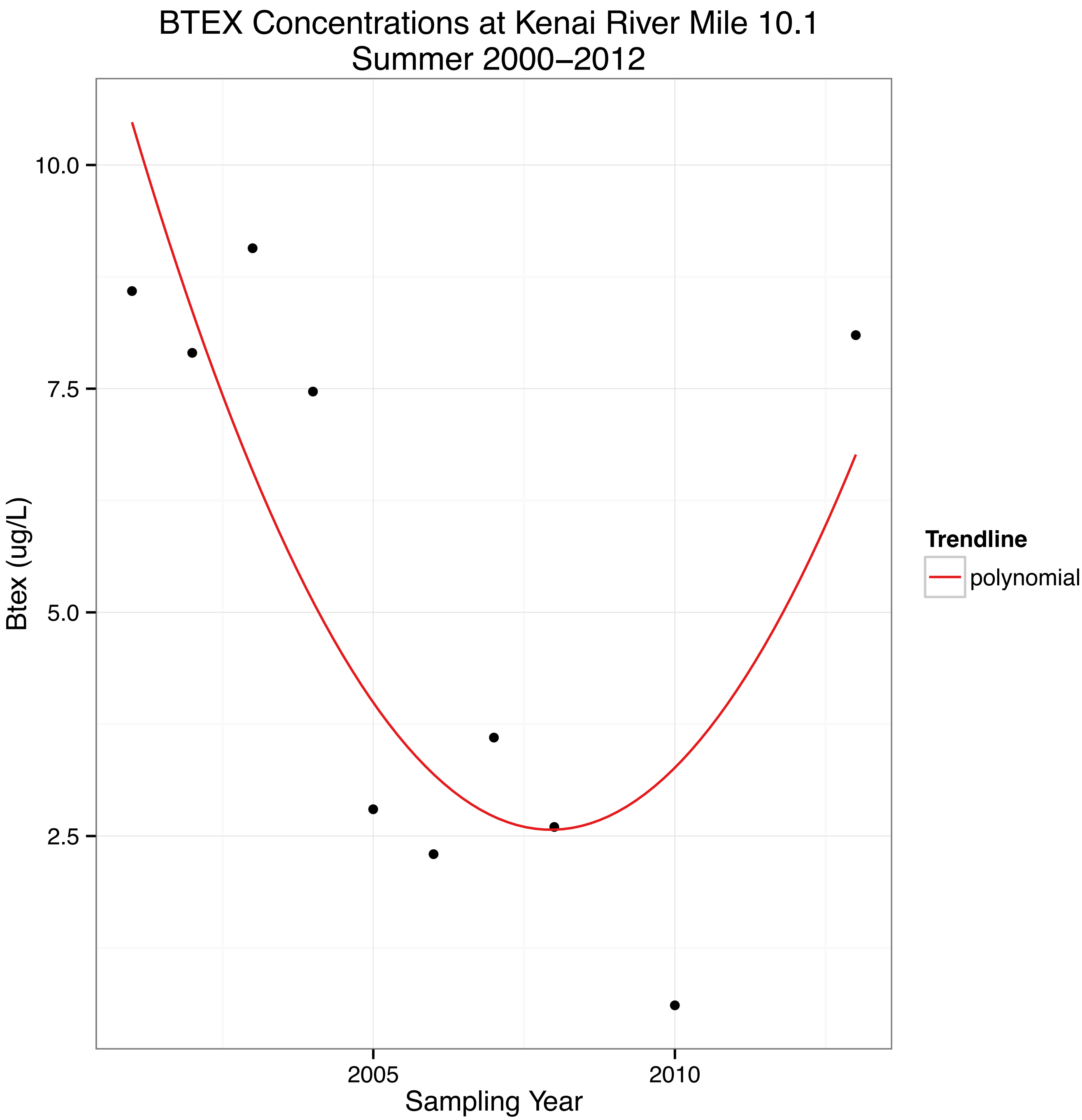

Figure 122: Trend analysis for BTEX sampled at Mile 10.1 from summer 2000 to 2012. Not detected values are not taken into account in the analysis and therefore are not shown in this graph.

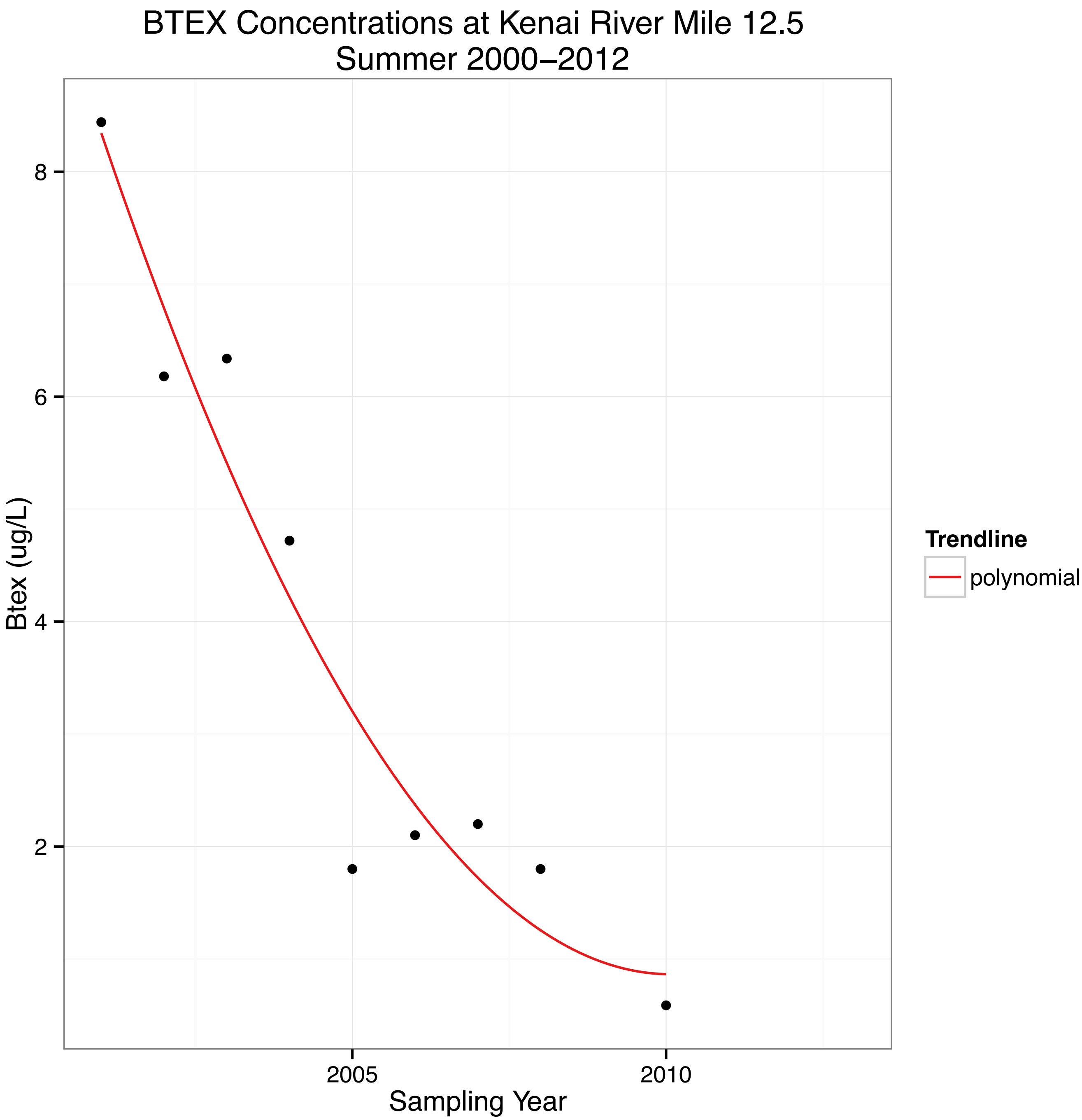

Figure 123: Trend analysis for BTEX sampled at Mile 12.5 from summer 2000 to 2012. Not detected values are not taken into account in the analysis and therefore are not shown in this graph.

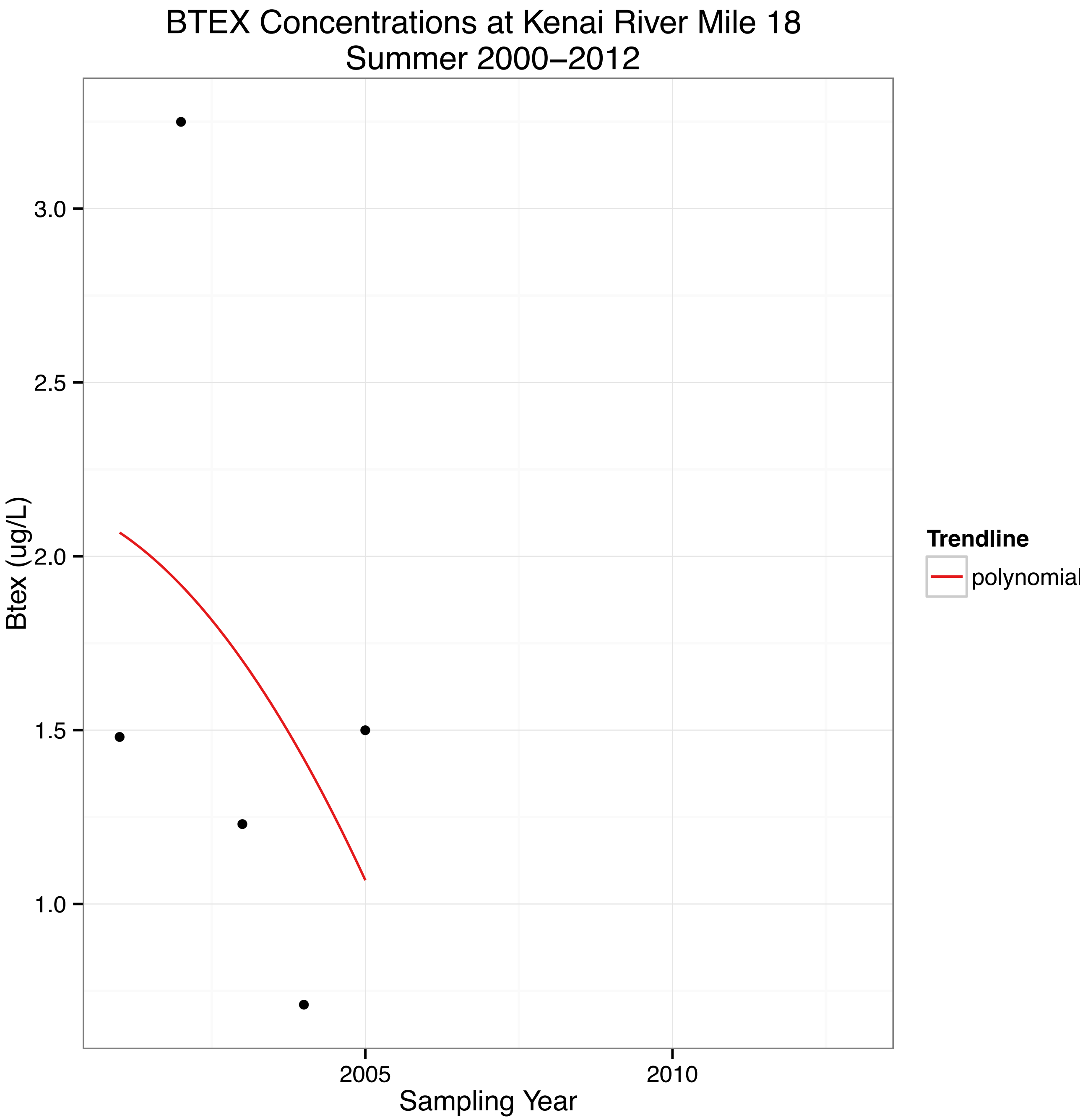

Figure 124: Trend analysis for BTEX sampled at Mile 18 from summer 2000 to 2012. Not detected values are not taken into account in the analysis and therefore are not shown in this graph.

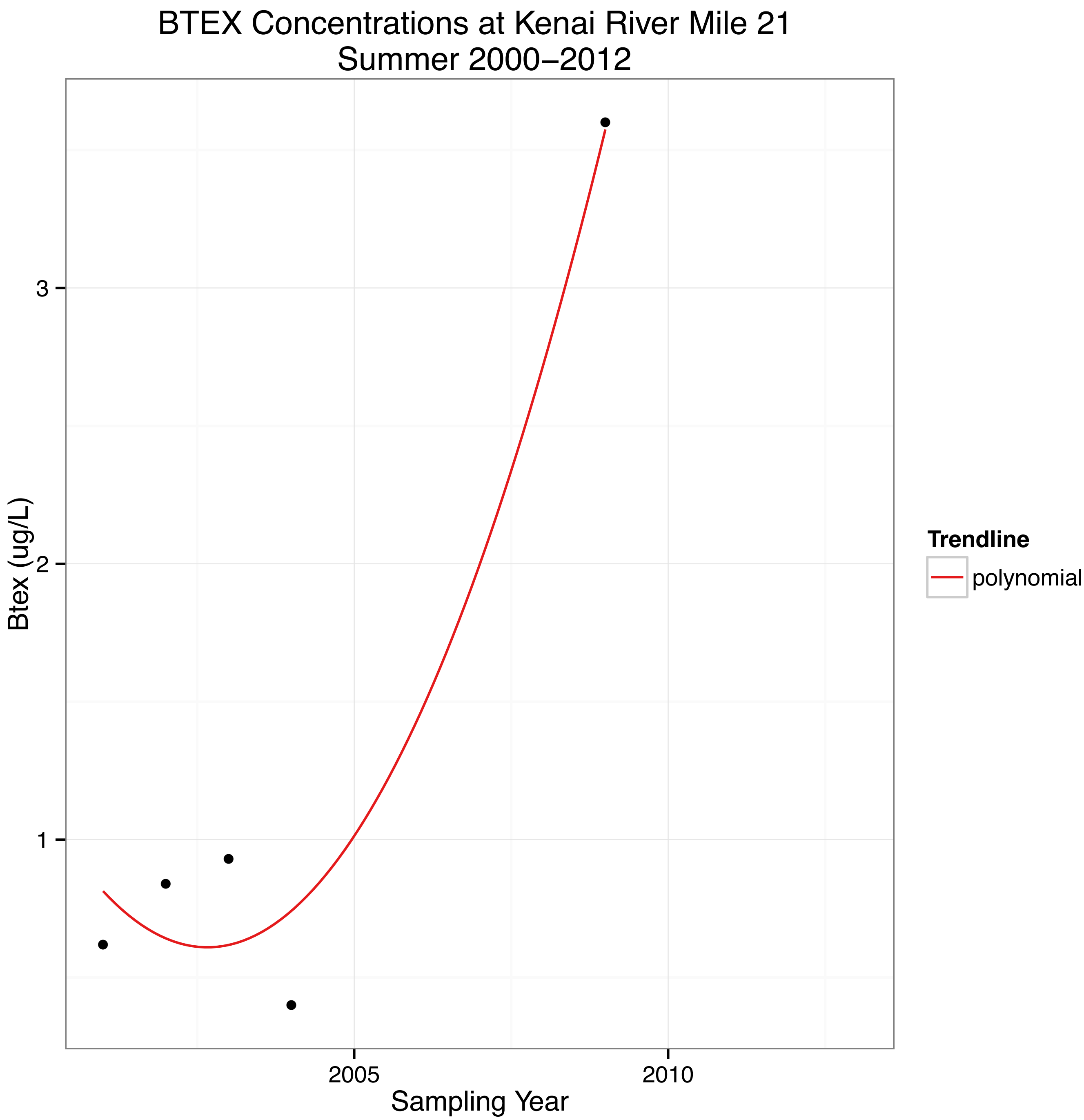

Figure 125: Trend analysis for BTEX sampled at Mile 21 from summer 2000 to 2012. Not detected values are not taken into account in the analysis and therefore are not shown in this graph.

Fecal Coliform Bacteria

The presence of fecal coliform bacteria in surface water indicates fecal contamination from warm-blooded animals, which is linked to disease-causing viruses and bacteria (Glass, 1999). Sources of fecal coliform bacteria include waste from septic systems, domestic animals, waterfowl, and other wildlife (Glass, 1999). The ADEC and USEPA standards for fecal coliform bacteria have two types of critera, a 30-day geometric mean and a no more than 10% of the samples can exceed a specified value criteira. The geometric mean criterian was not evaluated in this study because not enough samples were collected during any 30-day period. For reference, the ADEC fecal coliform drinking water standard states that in a 30-day period, the geometric mean of samples may not exceed 20 CFU/100ml and not more than 10% of the total samples may exceed 40 CFU/100ml (ADEC's single sample limit). The ADEC fecal coliform secondary recreation standard states that in a 30-day period, the geometric mean of samples may not exceed 200 CFU/100ml and not more than 10% of the total samples may exceed 400 CFU/100ml (see Appendix 2) (ADEC, 2002).

The highest level of fecal coliform recorded was 2980 CFU/100ml at Mile 6.5 during the summer 2002, however this sample may be unreliable because the duplicate sample was below the MDL of 1 CFU/100ml. The next highest recorded concentration in the mainstem was 580 CFU/100ml at Mile 6.5 during the summer of 2003, and the lowest levels were 0 CFU/100ml at several locations (Table 26). The highest median in the mainstem occurred at Mile 6.5 in the spring and at Mile 1.5 in the summer. The other medians along the mainstem were all below 10 CFU/100ml for the summer and the spring. The concentration of fecal coliform was generally higher in the summer than in the spring in the mainstem and the tributaries (Figures 126- 129).

In the tributaries, the concentration of fecal coliform ranged from a high of 520 CFU/100ml in Soldotna Creek during spring 2001 to 0 CFU/100ml at multiple sites (Table 52). During the spring, Beaver Creek had the highest median, and during the summer, No Name Creek had the highest median. In the summer, the median concentrations were relatively high in Slikok Creek and Beaver Creek, in addition to No Name Creek. Juneau Creek, Russian River, Killey River, and Moose River all had relatively low medians during the spring and the summer. In the summer, the tributaries had higher median concentrations of fecal coliform than the mainstem, but in the spring, the levels in the tributaries and the mainstem were more similar. (Figures 130-133)

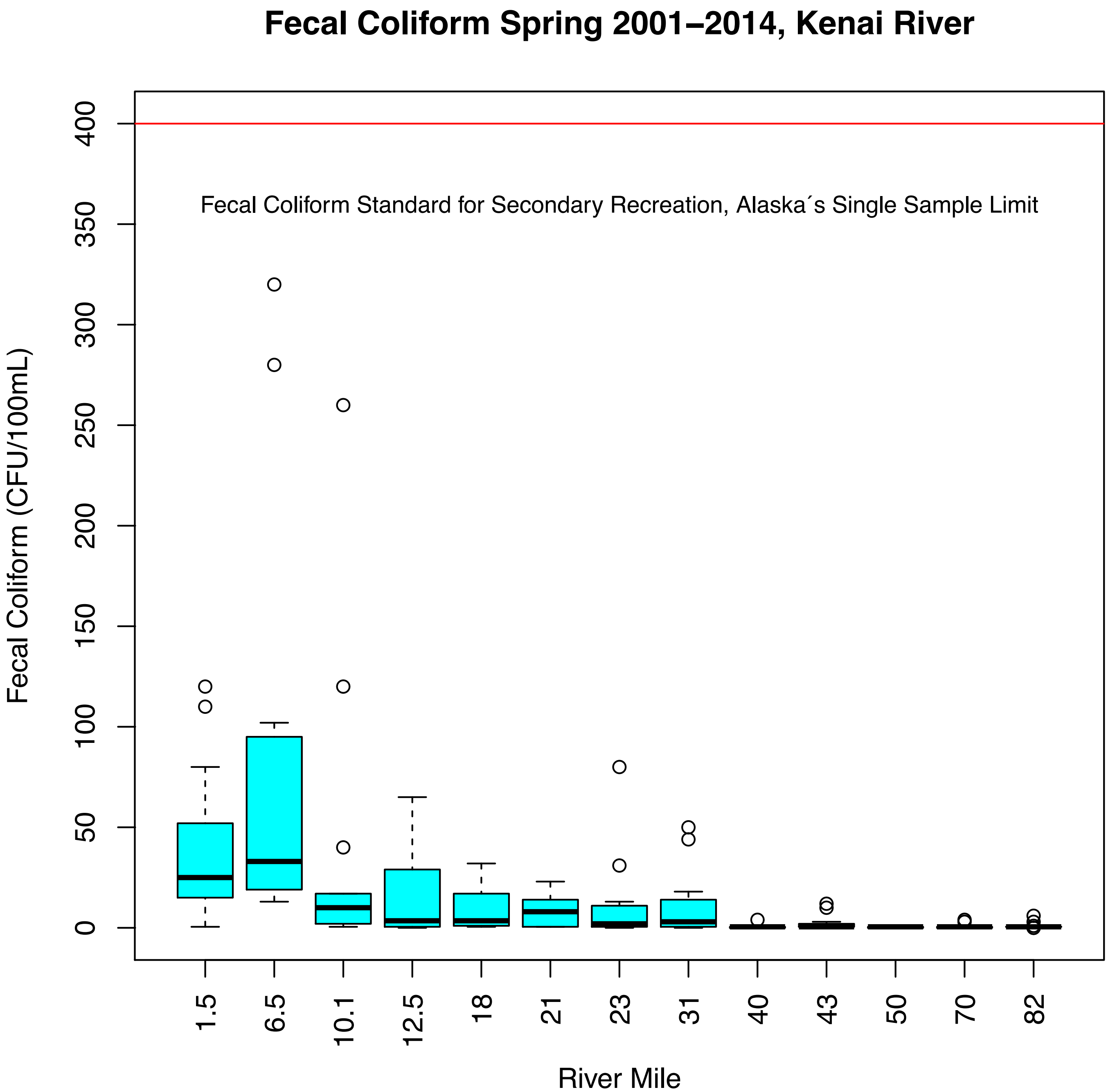

Figure 126: Fecal Coliform Bacteria sampled in the Kenai River mainstem during spring 2001 to 2014.
Since 34% of the samples are reported as below the MRL or MDL, these values have been estimated using values that are half of the MRL or MDL.

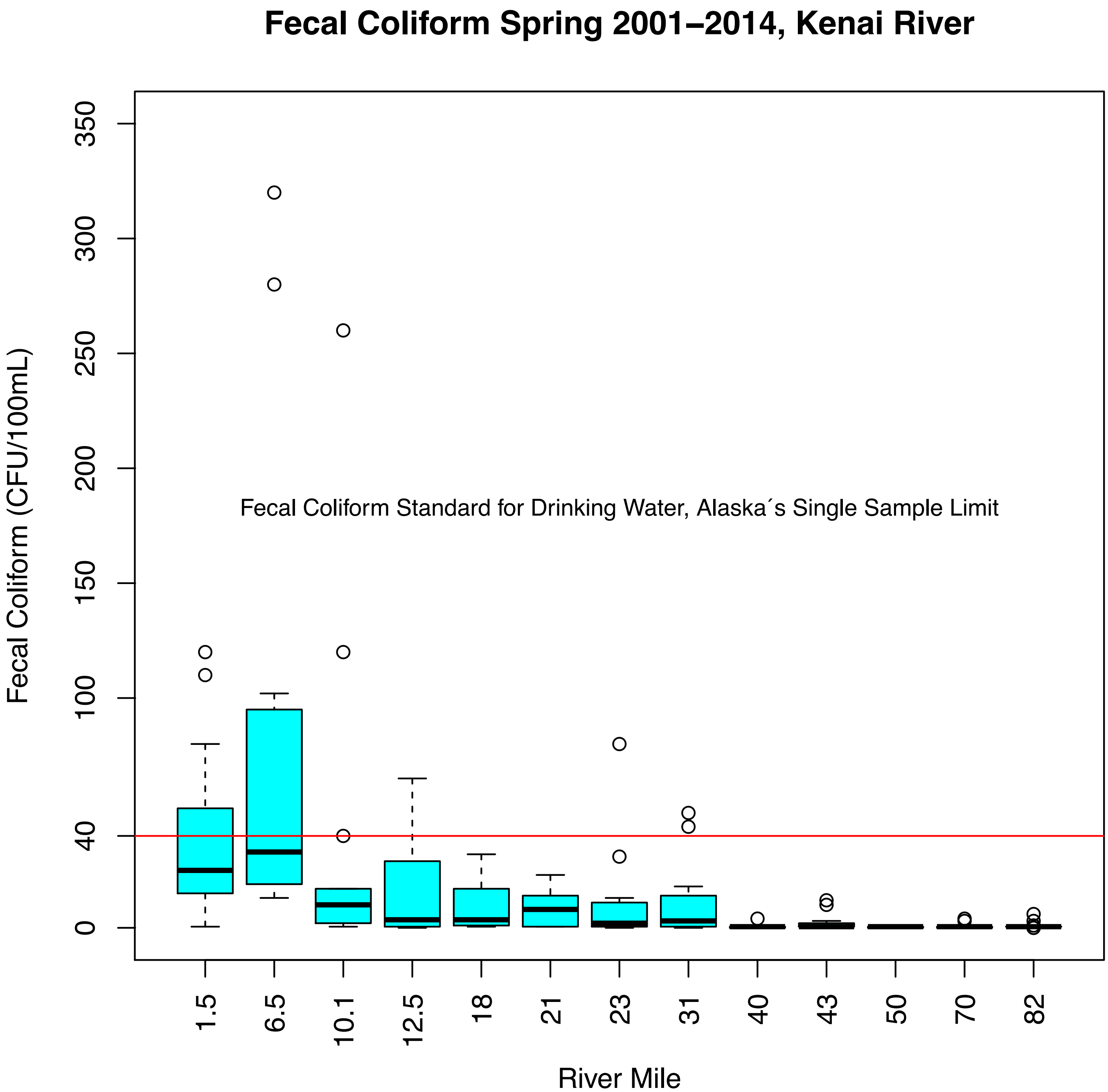

Figure 127: Fecal Coliform Bacteria sampled in the Kenai River mainstem during spring 2000 to 2014 compared to ADEC standards.
Since 34% of the samples are reported as below the MRL or MDL, these values have been estimated using values that are half of the MRL or MDL.

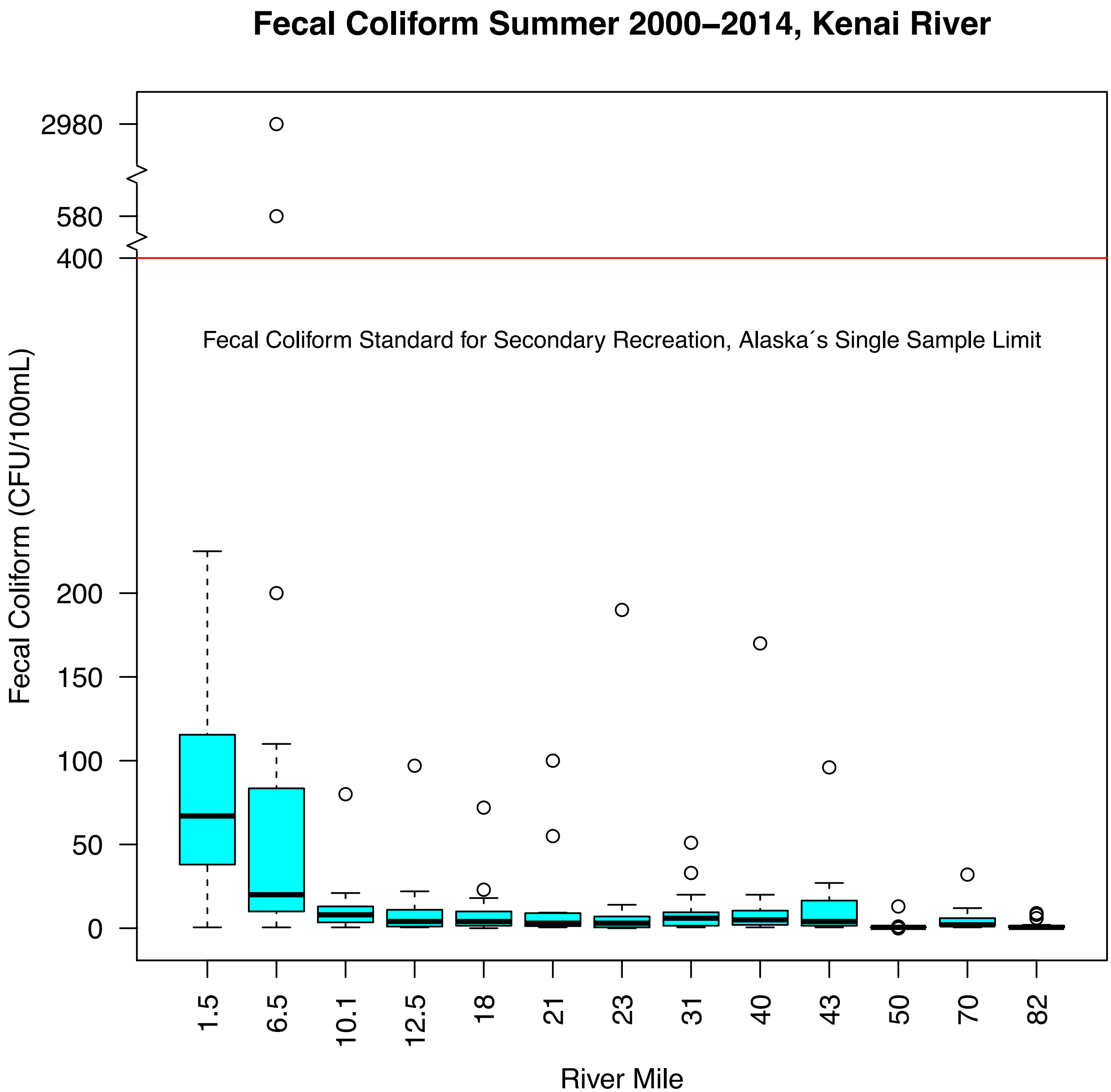

Figure 128: Fecal Coliform Bacteria sampled in the Kenai River mainstem during summer 2000 to 2014.
Since 23% of the samples are reported as below the MRL or MDL, these values have been estimated using values that are half of the MRL or MDL.

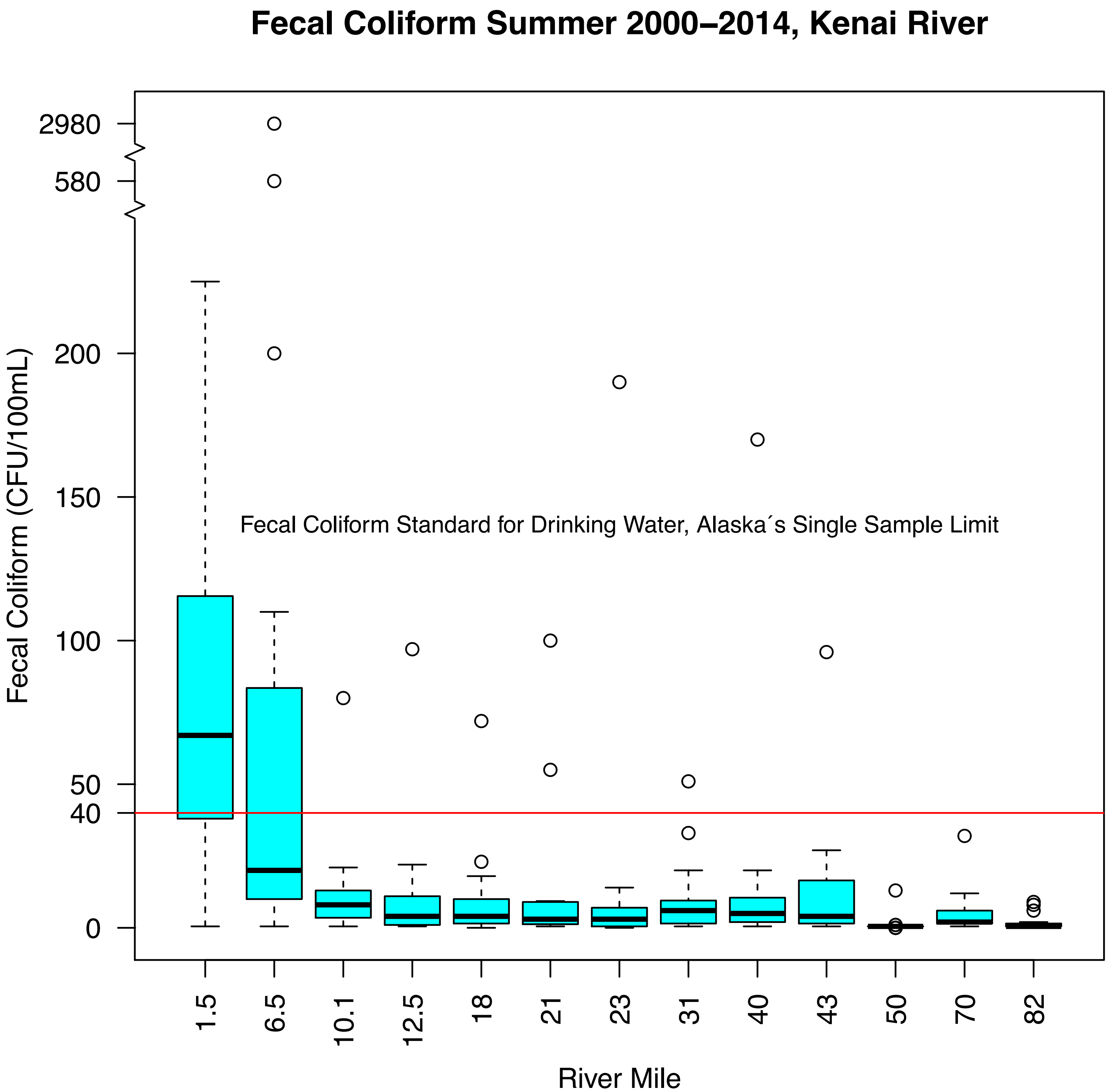

Figure 129: Fecal Coliform Bacteria sampled in the Kenai River mainstem during summer 2000 to 2014 compared to ADEC standards.
Since 23% of the samples are reported as below the MRL or MDL, these values have been estimated using values that are half of the MRL or MDL.

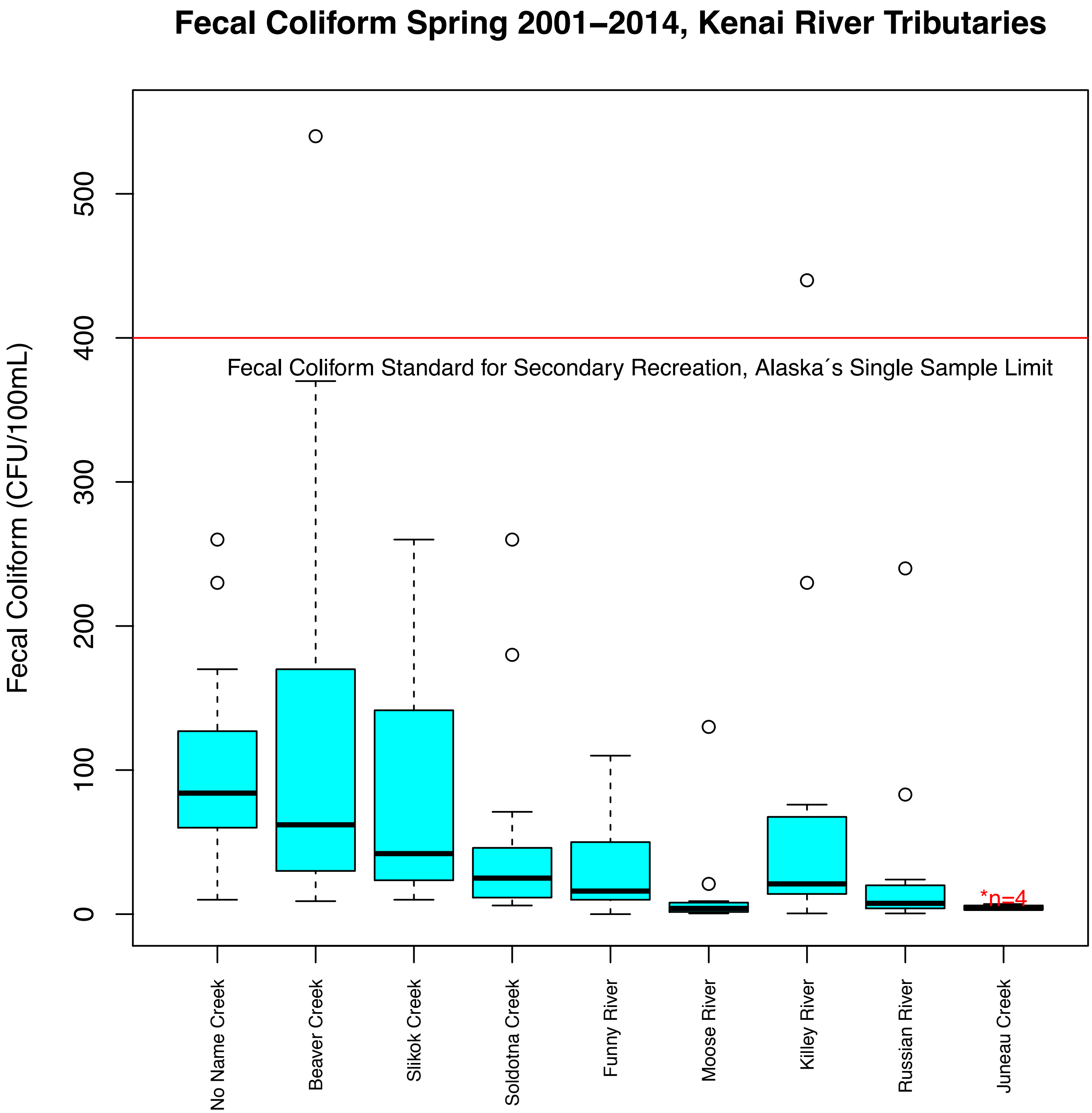

Figure 130: Fecal Coliform Bacteria sampled in Kenai River tributaries during spring 2001 to 2014.
Since 26% of the samples are reported as below the MRL or MDL, these values have been estimated using values that are half of the MRL or MDL.

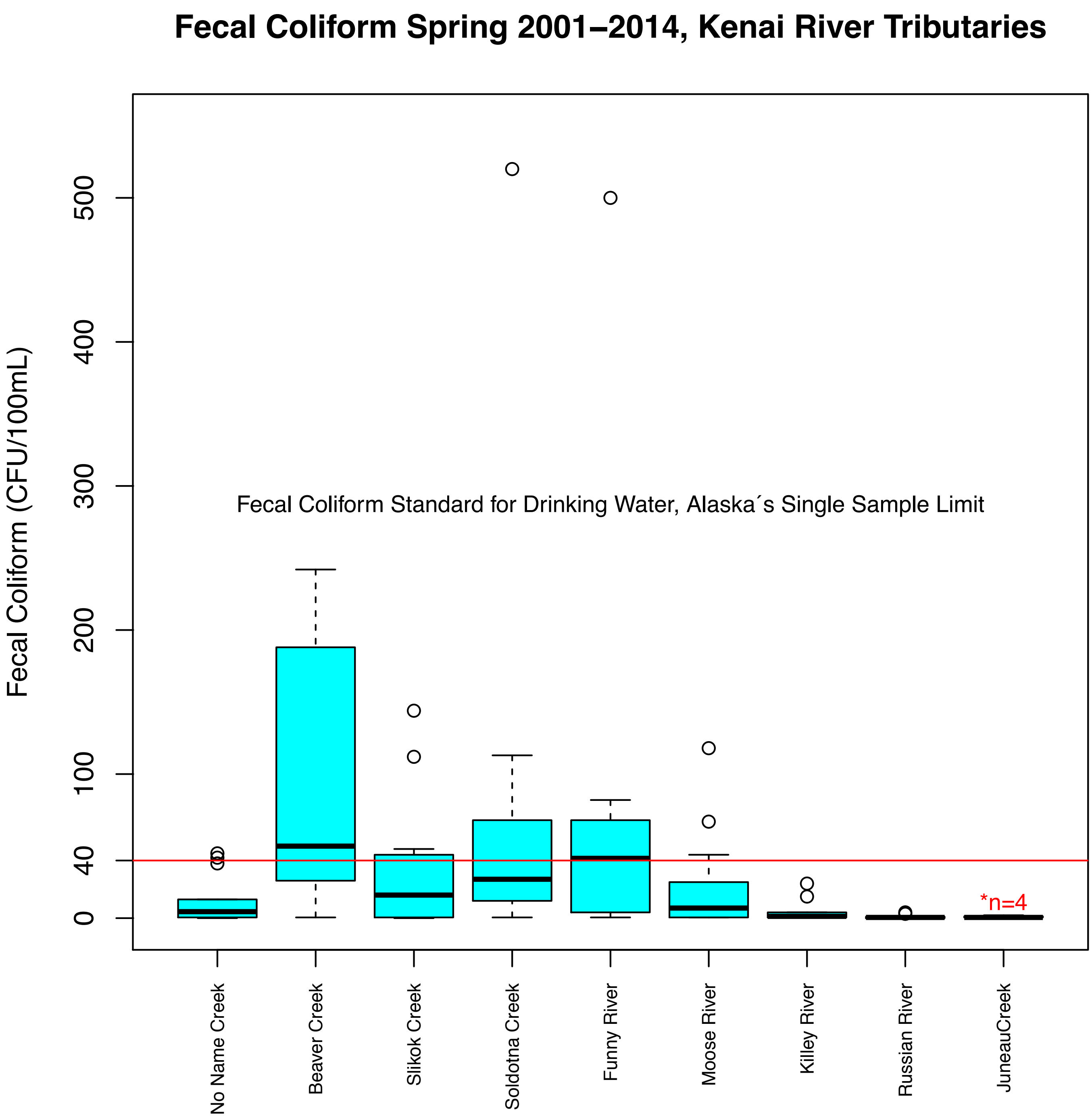

Figure 131: Fecal Coliform Bacteria sampled in Kenai River tributaries during summer 2000 to 2014 compared to ADEC standards.
Since 26% of the samples are reported as below the MRL or MDL, these values have been estimated using values that are half of the MRL or MDL.

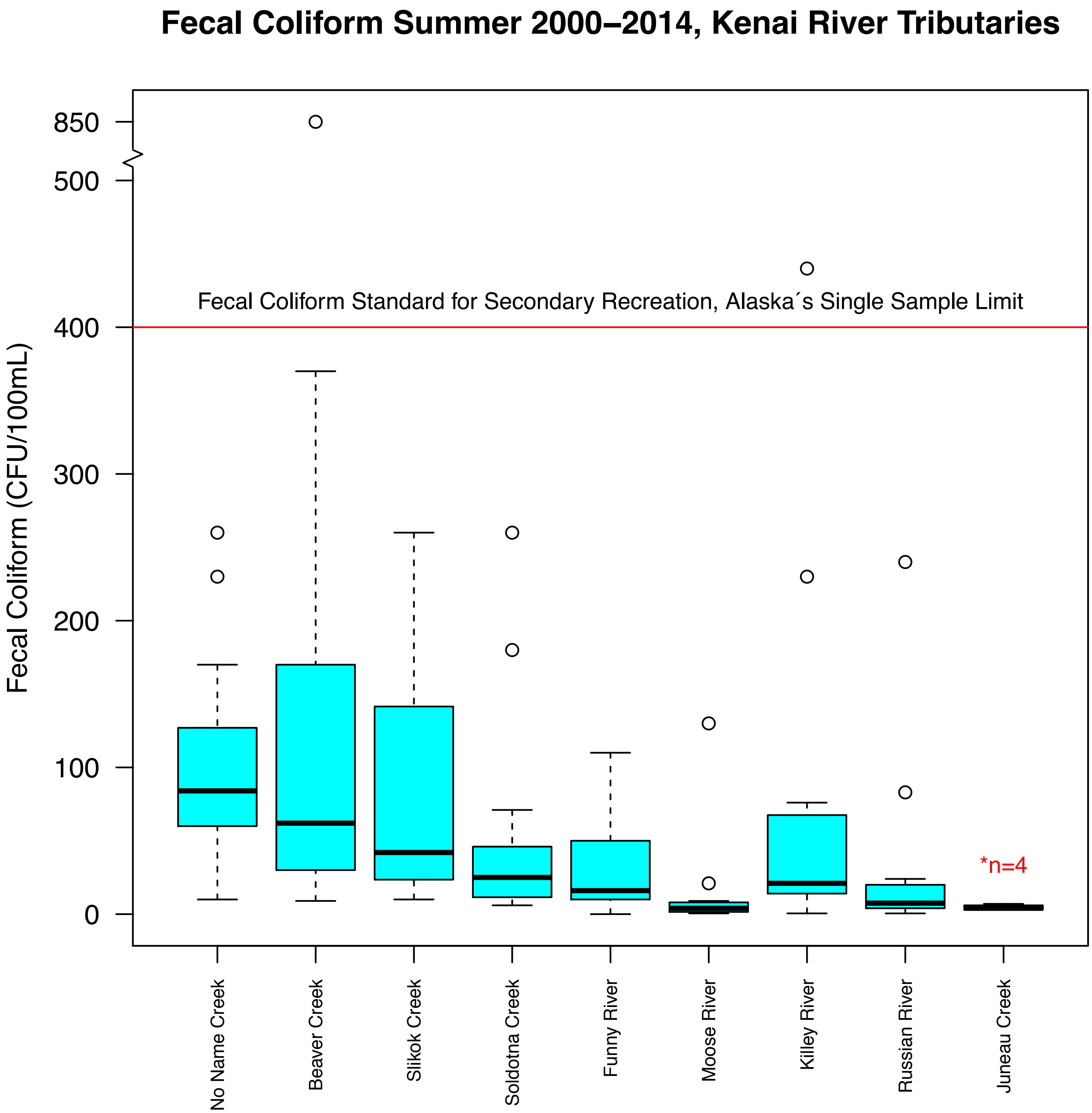

Figure 132: Fecal Coliform Bacteria sampled in Kenai River tributaries during summer 2000 to 2014.
Since 6% of the samples are reported as below the MRL or MDL, these values have been estimated using values that are half of the MRL or MDL.

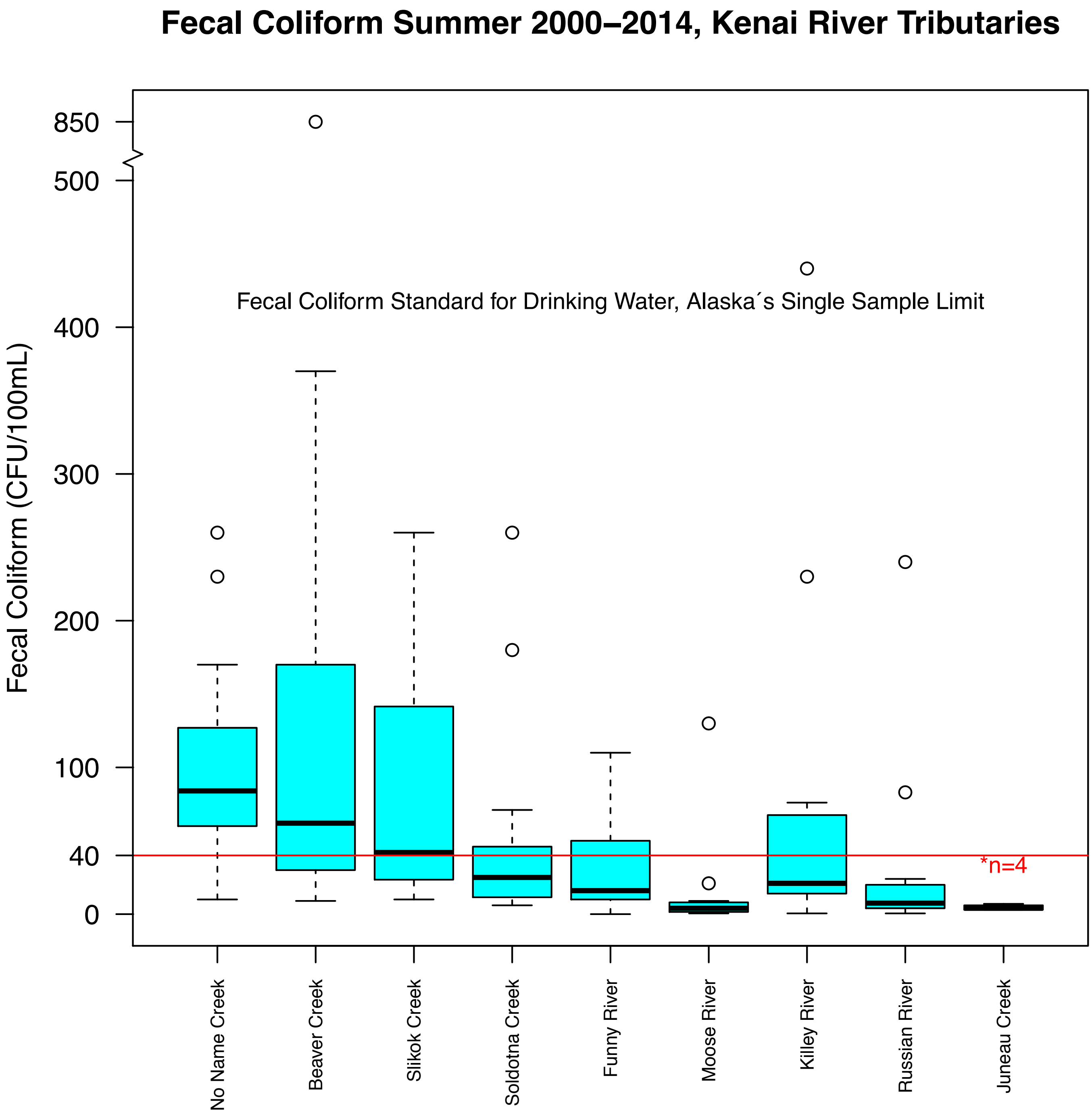

Figure 133: Fecal Coliform Bacteria sampled in Kenai River tributaries during summer 2000 to 2014 compared to ADEC standards.
Since 6% of the samples are reported as below the MRL or MDL, these values have been estimated using values that are half of the MRL or MDL.

pH

The concentration of hydrogen-ion activity is represented by a pH measurement on a logarithmic scale ranging from 0 to 14 with acidic conditions closer to 0 and alkaline conditions closer to 14 (Glass, 1999). Values of pH ranging from 6.5 to 8.0 are typical in unpolluted river water, and these values can be affected by both natural and human processes (Glass, 1999). The ADEC standard for pH maintains that freshwater may not have a pH less than 6.5 or greater than 8.5 for the growth and propagation of fish, shellfish, other aquatic life and wildlife (see Appendix 2) (ADEC, 2012). Additionally, the standard stipulates that the pH may not vary more than 0.5 pH units from natural conditions and that in any water with a pH naturally outside the specified range, variation of pH must be toward the specified range (ADEC, 2012).

In the mainstem, the pH ranged from a high of 8.52 at Mile 50 in summer 2002 to a low of 6.16 at Mile 10.1 in summer of 2010 (Table 27). All the medians along the mainstem were between 7 and 8 for the spring and the summer, so they did not exceed the upper and lower limits. Individual samples exceeded the lower limit once at Mile 12.5 and Mile 43 in the spring and Mile 10.1 in the summer, and the upper limit was exceeded by a single sample at Mile 50 in the summer. The pH was generally lower in the spring in comparison to the summer in both the mainstem and the tributaries (Figures 134 & 135).

The highest pH ever sampled was 9.03 at Moose River during summer 2002, and the lowest was 6.2 at No Name Creek in spring 2005 (Table 53). The medians of the tributaries did not exceed either the upper or lower pH limit. The lower limit was exceeded on one occasion each in No Name Creek, Beaver Creek, and Slikok Creek in the spring, and three samples from the Moose River exceeded the upper limit in the summer. The Moose River had the highest median pH in the summer, followed by the Russian River. From spring to the summer, the Killey River median remained near 7, while the other tributaries increased toward 7.5. Excluding the Moose River, the spring samples from the tributaries and the mainstem displayed greater variability than the summer samples (Figures 136 & 137).

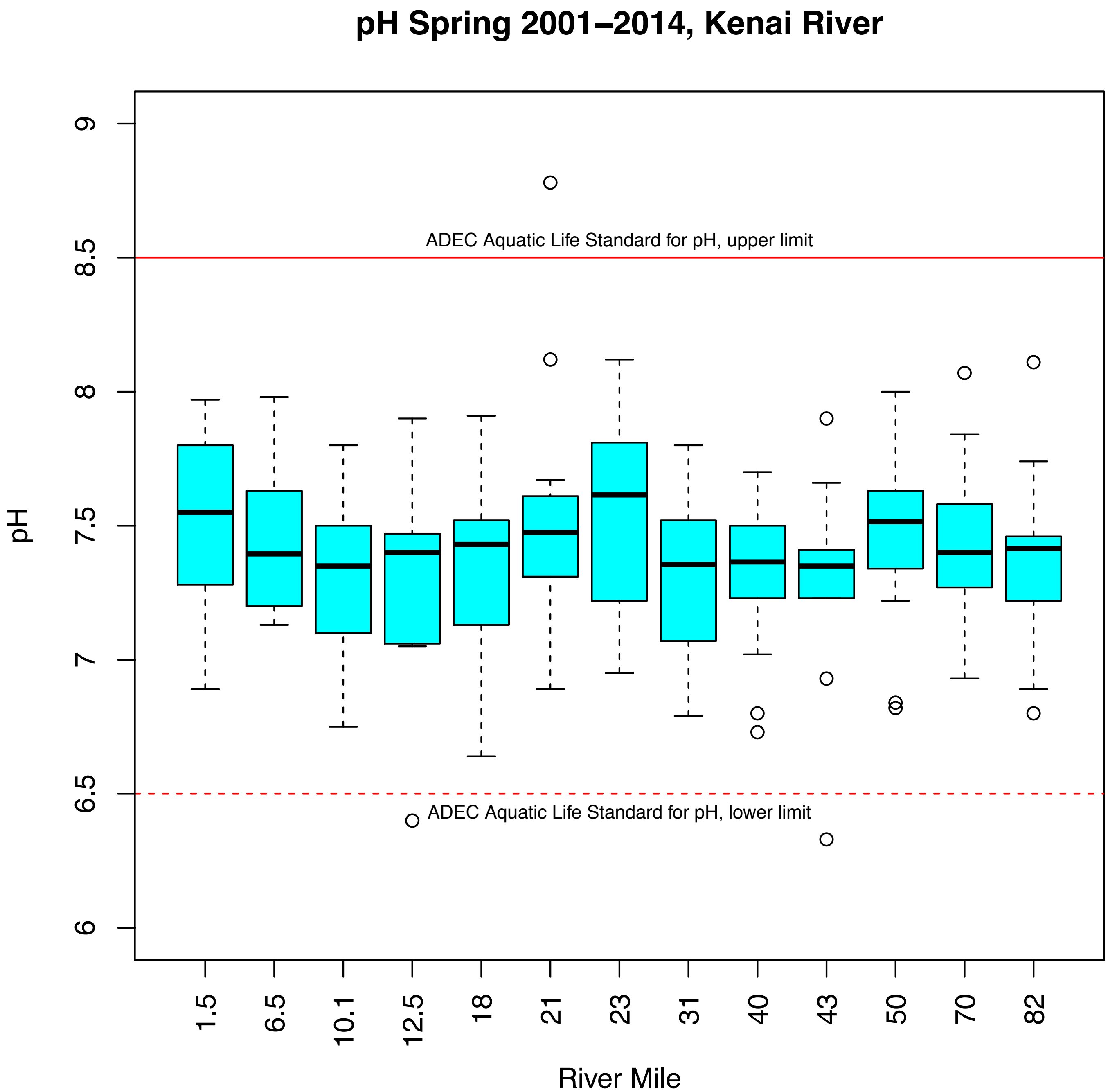

Figure 134: pH sampled in the Kenai River mainstem during spring 2001 to 2014.

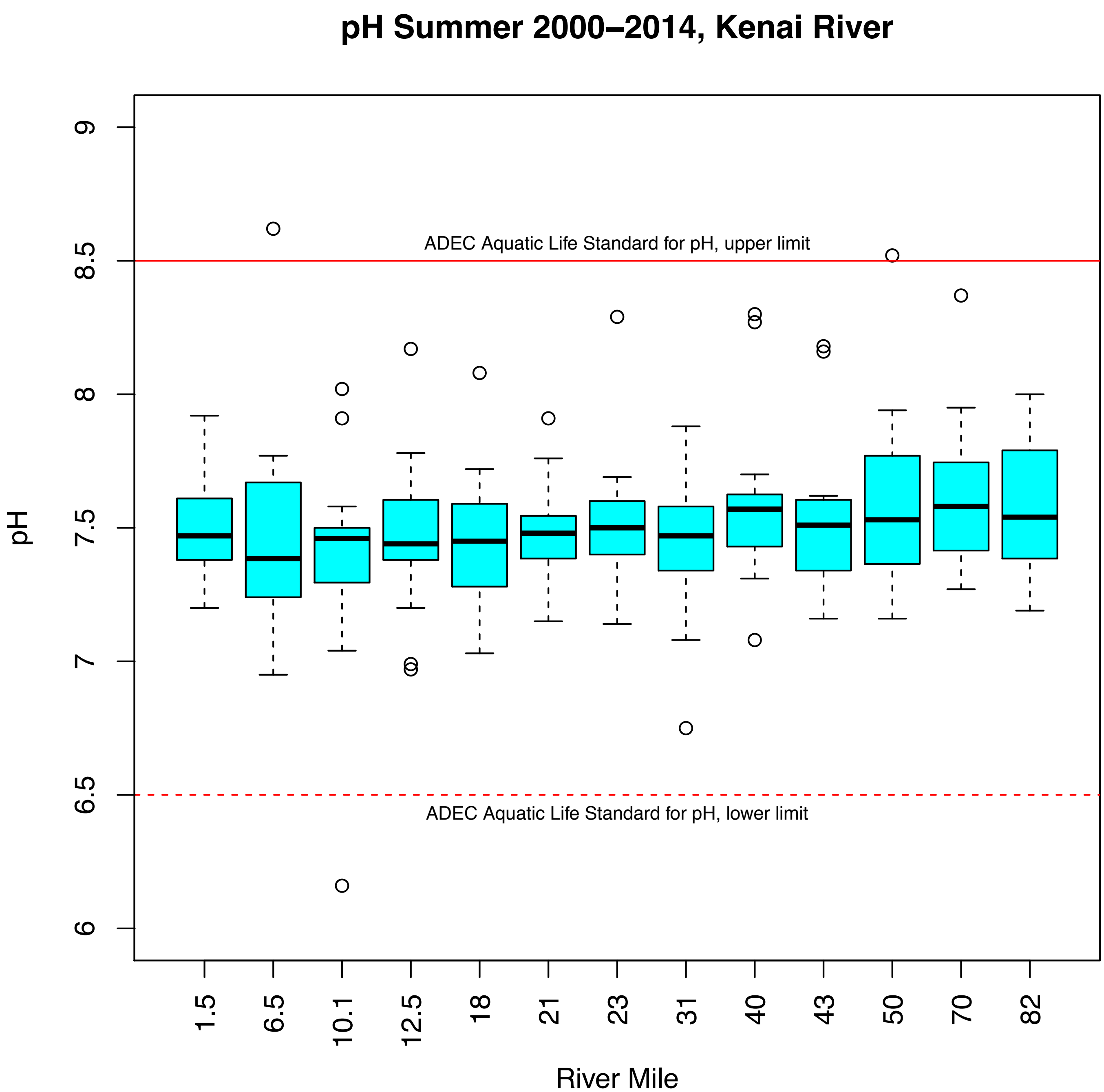

Figure 135: pH sampled in the Kenai River mainstem during summer 2000 to 2014.

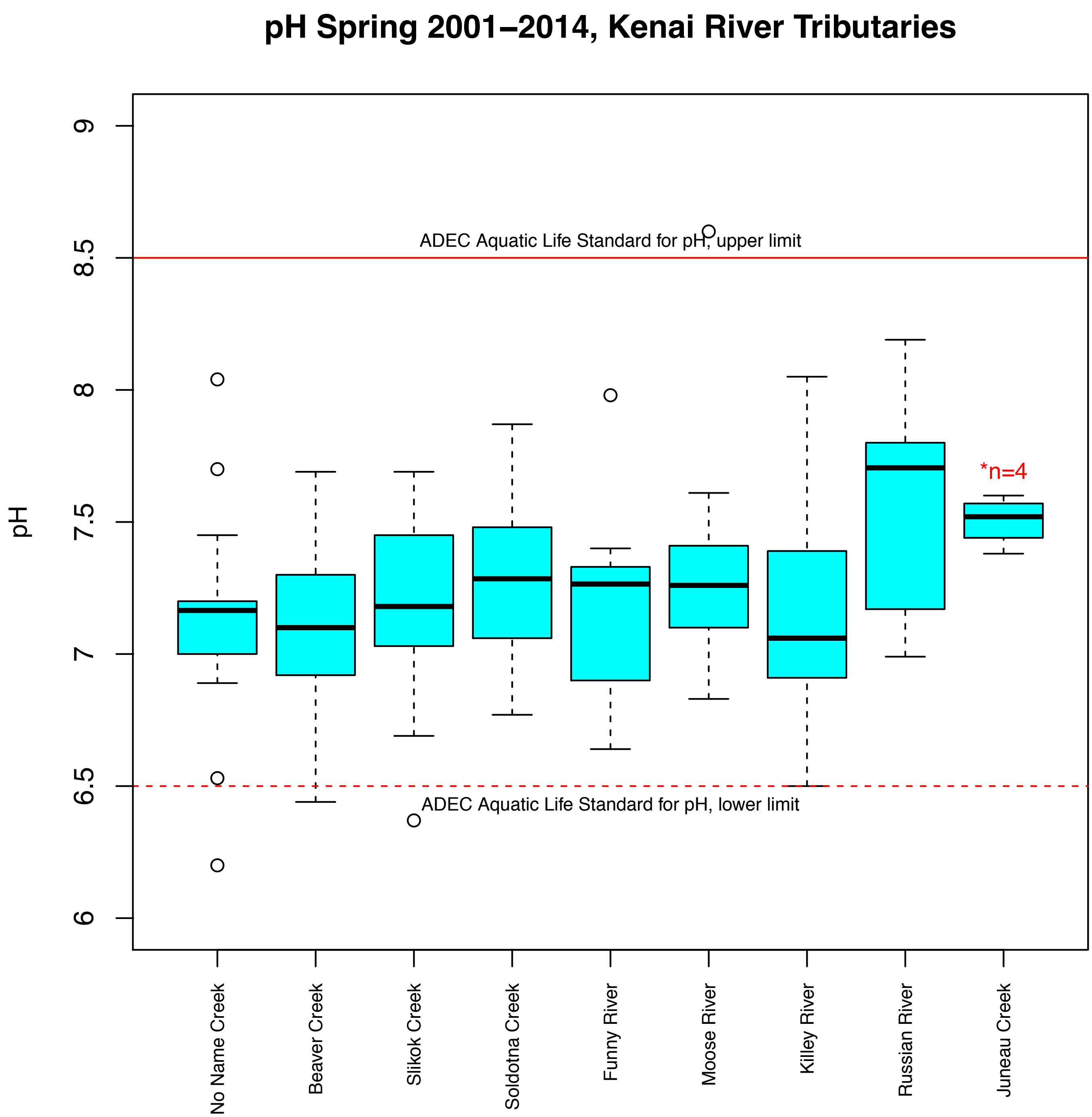

Figure 136: pH sampled in Kenai River tributaries during spring 2001 to 2014.

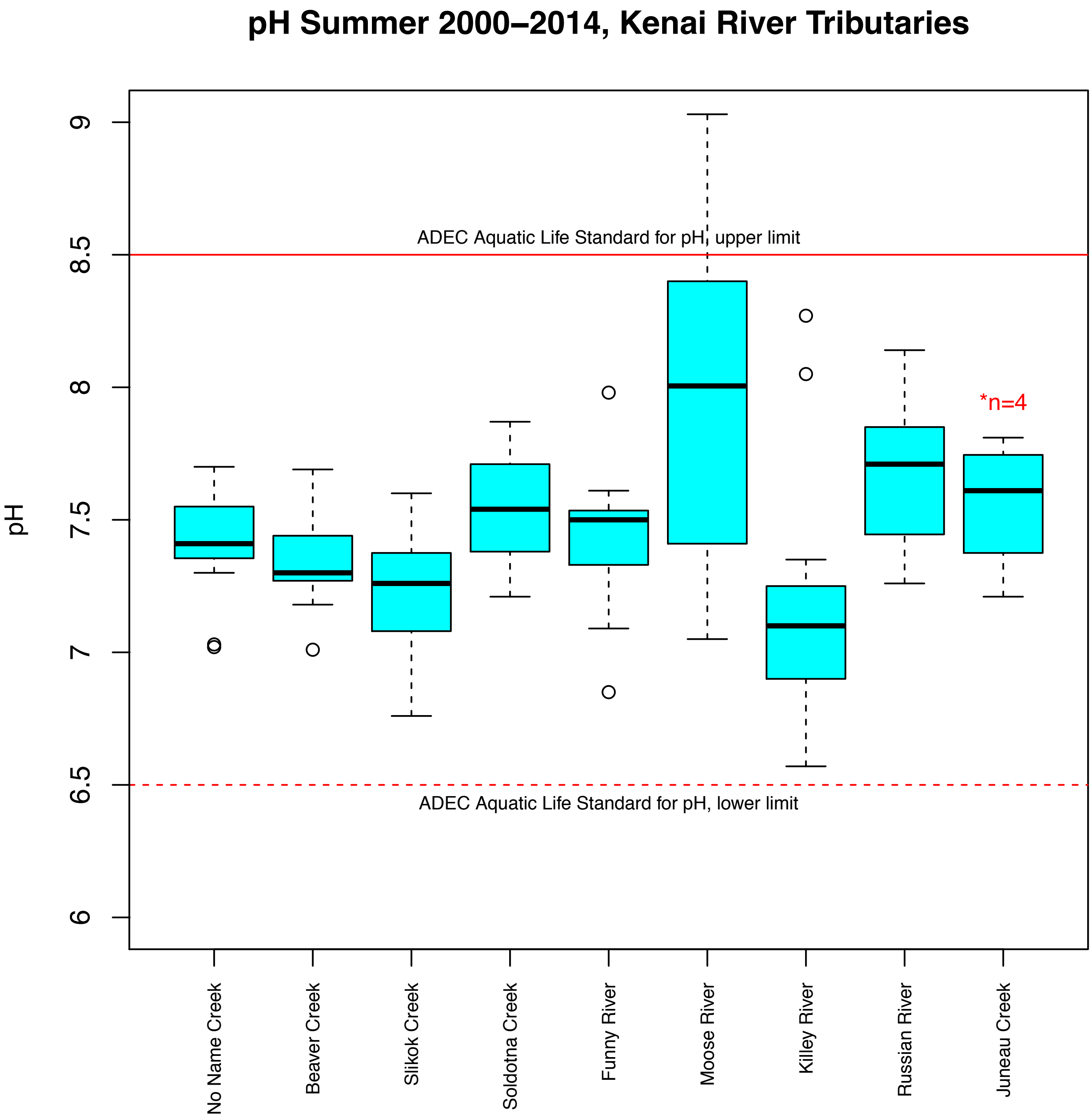

Figure 137: pH sampled in Kenai River tributaries during summer 2000 to 2014.

Specific Conductance

The capacity of water to conduct electricity is measured by specific conductance, and the level of specific conductance also correlates with the concentration of calcium, dissolved solids, and the water's hardness (Glass, 1999). There is not currently an ADEC or USEPA standard for specific conductance for aquatic life in freshwater.

The highest level of specific conductance in the mainstem was 29398 **μ**S/cm, which was sampled at Mile 1.5 in spring 2011, and the lowest level was 37.7 **μ**S/cm at Mile 50 in spring 2004 (Table 28). Mile 1.5 had the greatest variance and the highest median in both the spring and the summer, followed by Mile 6.5 in the spring and Mile 70 in the summer. From Mile 10.1 to Mile 50, the specific conductivity medians only varied within a span of 15 **μ**S/cm in both spring and summer, with the lowest median at Mile 43. Above Skilak Lake at Mile 70 and Mile 80, specific conductivity was higher relative to the rest of the mainstem, excluding the estuary. Specific conductivity was higher in the spring than in the summer throughout the mainstem, except at Mile 50 where specific conductance was higher during the summer (Figures 138 & 139).

In the tributaries, specific conductance ranged from a high of 1088 **μ**S/cm in No Name Creek during spring 2010 to the lowest level of 18 **μ**S/cm in the Killey River during summer 2004 (Table 54). The Killey River maintained the lowest median during the spring and the summer, while the highest median was in No Name Creek for both the spring and Soldotna Creek for the summer. The tributaries had higher levels of specific conductance in the summert, except for the Killey River, Russian River and Juneau Creek. In the summer, the tributaries generally had higher medians than the mainstem, but a corresponding trend was not apparent in the spring data (Figures 140 & 141).

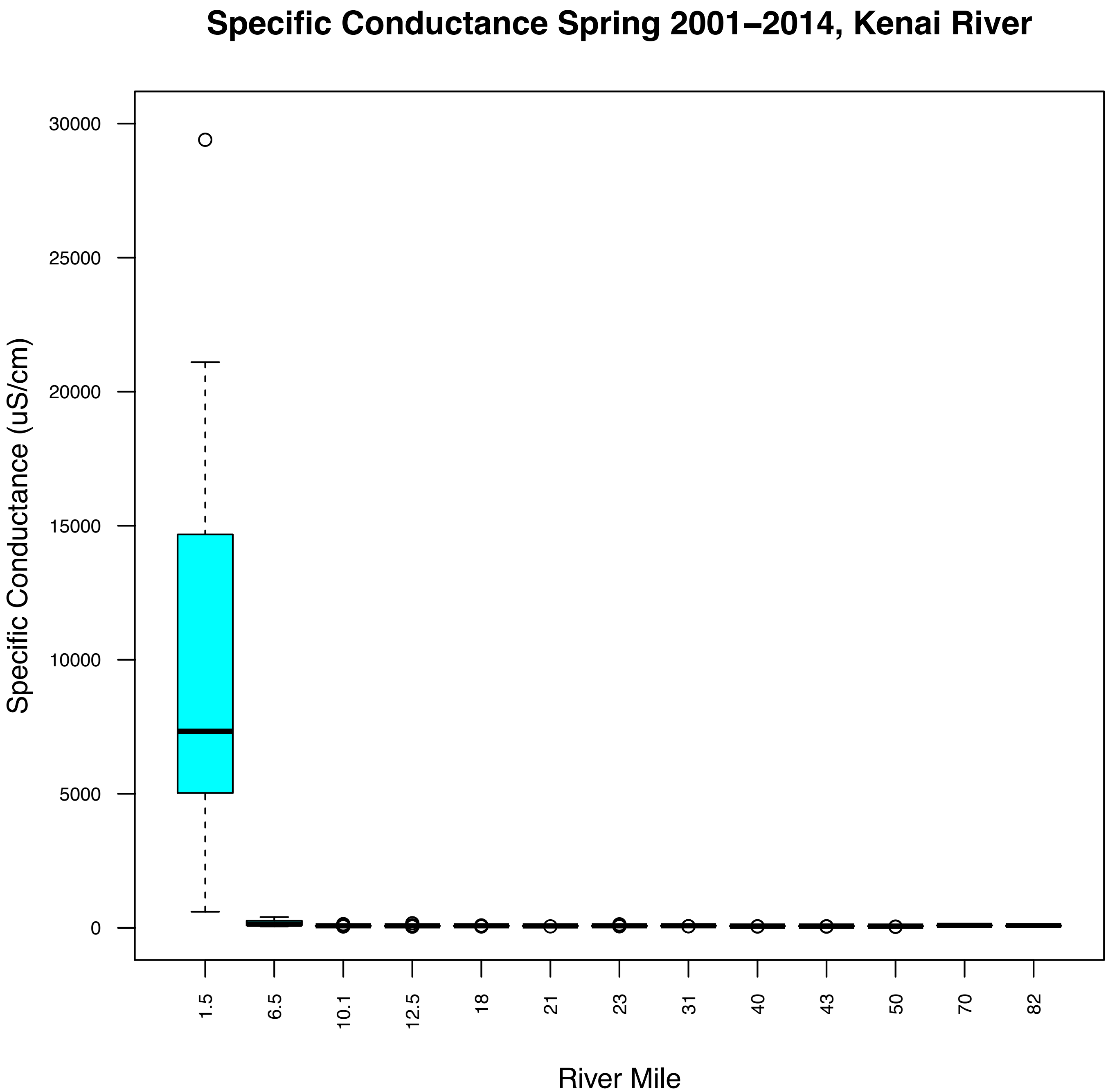

Figure 138: Specific Conductance sampled in the Kenai River mainstem during spring 2001 to 2014.

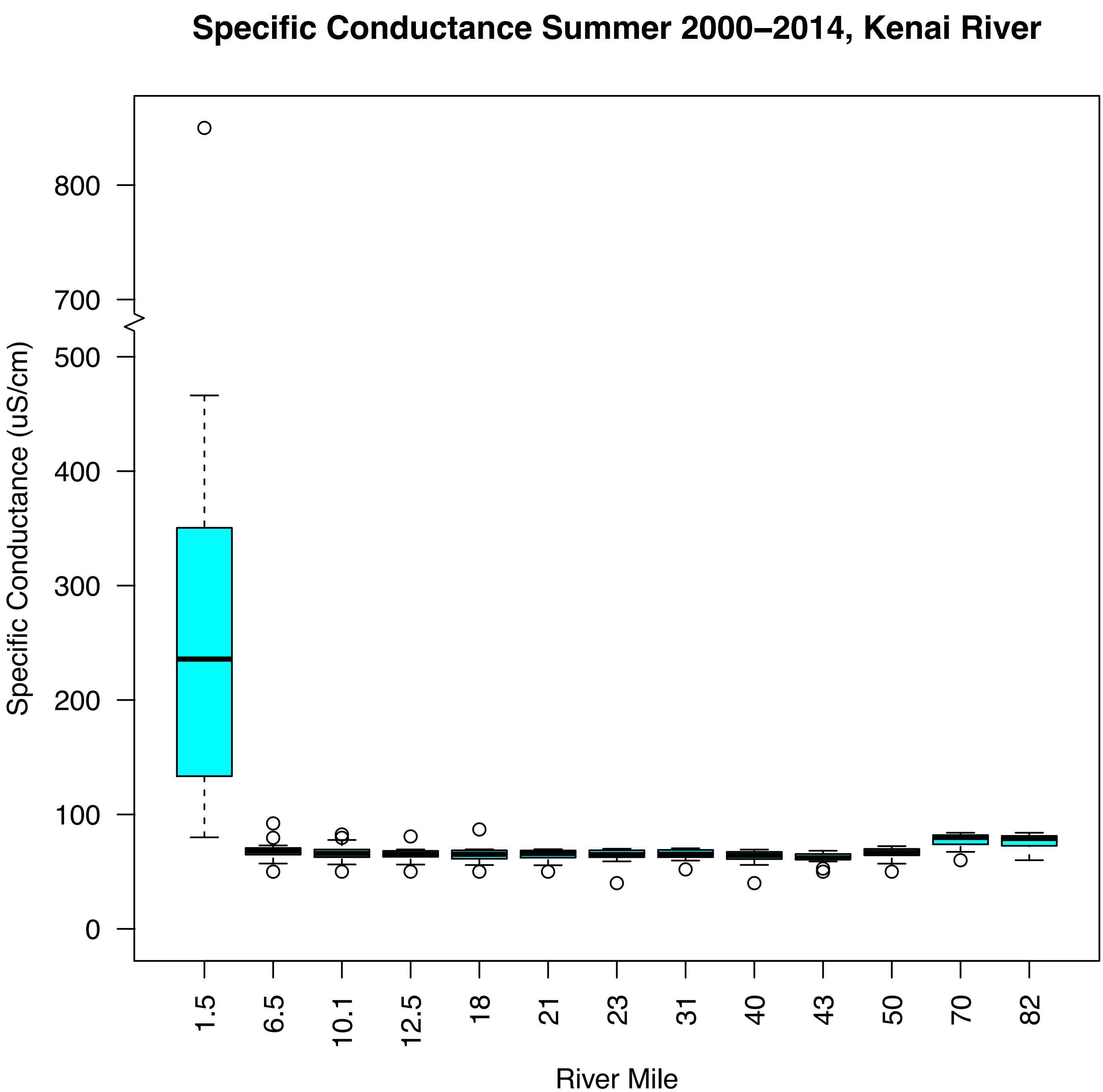

Figure 139: Specific Conductance sampled in the Kenai River mainstem during summer 2000 to 2014.

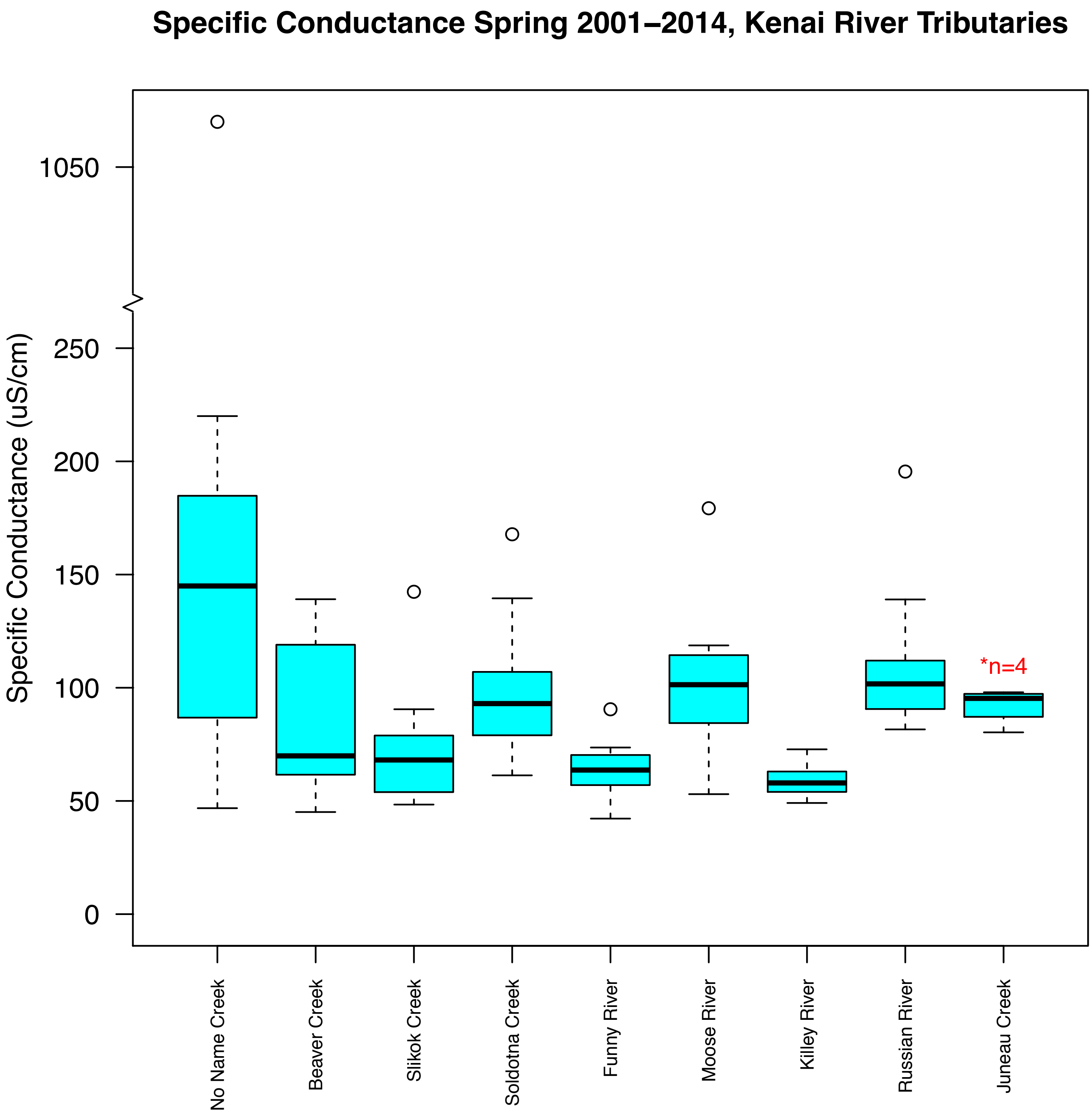

Figure 140: Specific Conductance sampled in Kenai River tributaries during spring 2001 to 2014.

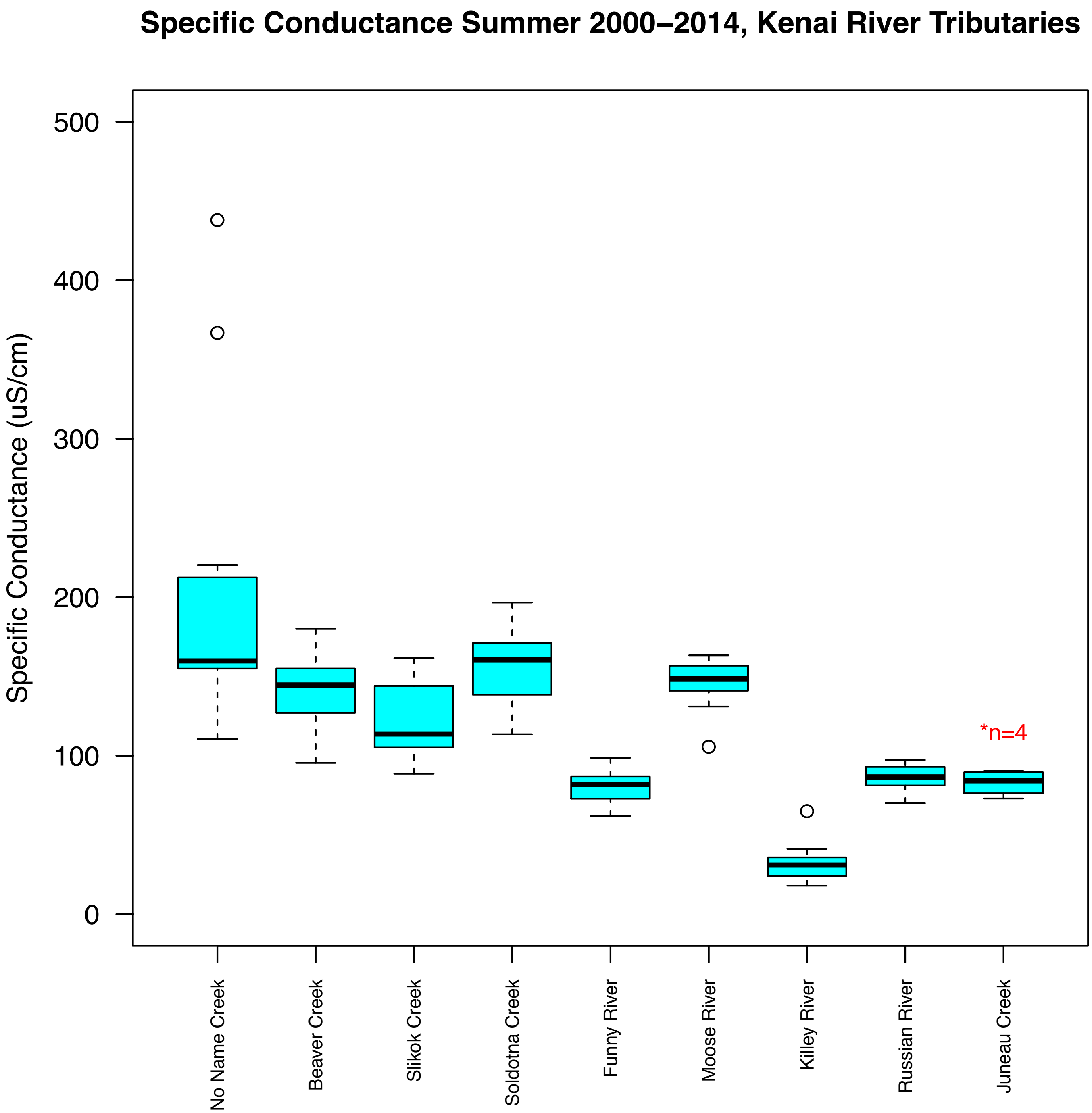

Figure 141: Specific Conductance sampled in Kenai River tributaries during summer 2000 to 2014.

Total Suspended Solids

The concentration of total suspended solids is a way of measuring the amount of mineral and organic particles that are transported in the water column (Bash and others, 2001). Erosion increases the amount of suspended sediment in surface water and can be naturally caused by glaciers, fires, and floods (Glass, 1999). In the Cook Inlet Basin, glaciers are the main cause of erosion, but mining, logging, construction, and recreation can also contribute to elevated levels of suspended sediment (Glass, 1999). High concentrations of suspended sediment can be lethal to post-larval fish, and incubating eggs can suffer severe mortality rates because settled sediment prevents the exchange of oxygen (Glass, 1999). As such, the ADEC standard requires that fine sediment in the range of 0.1 mm to 4.0 mm cannot increase over 5% by weight higher than natural conditions in gravel beds used by anadromous or resident fish for spawning, and the sediment can never exceed a maximum of 30% by weight in freshwater for the growth and propagation of fish, shellfish, other aquatic life, and wildlife (see Appendix 2) (ADEC, 2012). More generally, the ADEC standard also states that the amount of deposited or suspended sediment cannot cause adverse effects on aquatic life, including their habitat and reproduction (ADEC, 2012).

The concentration of 2073 mg/L at Mile 6.5 during spring 2006 was the highest level of total suspended solids recorded in the mainstem, and the lowest concentration was less than the MDL of 0.48 mg/L during spring and summer sampling events (Table 29). The estuary had much higher medians than the rest of the mainstem in both the summer and the spring. The medians were lowest in the spring and the summer in the Upper River from Mile 82 to Mile 50. Between Mile 50 and Mile 43, the concentration of total suspended solids increased, possibly due to the influence of the Killey River, which had higher levels of total suspended solids than the mainstem, especially in the summer. From Mile 43 to Mile 18, the medians in the spring and the summer for total suspended solids decreased relatively, and then there was an increase in the medians from Mile 12.5 to the estuary. During the spring, the concentrations in the estuary were significantly higher than in the summer, but this pattern was not as clear in the remainder of the mainstem (Figures 142 & 143).

In the tributaries, the concentration of total suspended solids ranged from a high of 748 mg/L in Beaver Creek in spring 2009 to a low of less than the MDL of 0.48 mg/L (Table 55). The Killey River had the highest median and largest variance by far in the summer. Funny River also had a relatively large degree of variance, but had a similar median to the other tributaries, excluding the Killey River in the summer. During the spring, Beaver Creek had the highest median and a relatively large degree of variance. Russian River had the lowest median of total suspended solids in the spring and Juneau Creek in the summer. Excluding Russian River and Killey River, the tributaries had higher medians during the spring rather than the summer. (Figures 144 & 145)

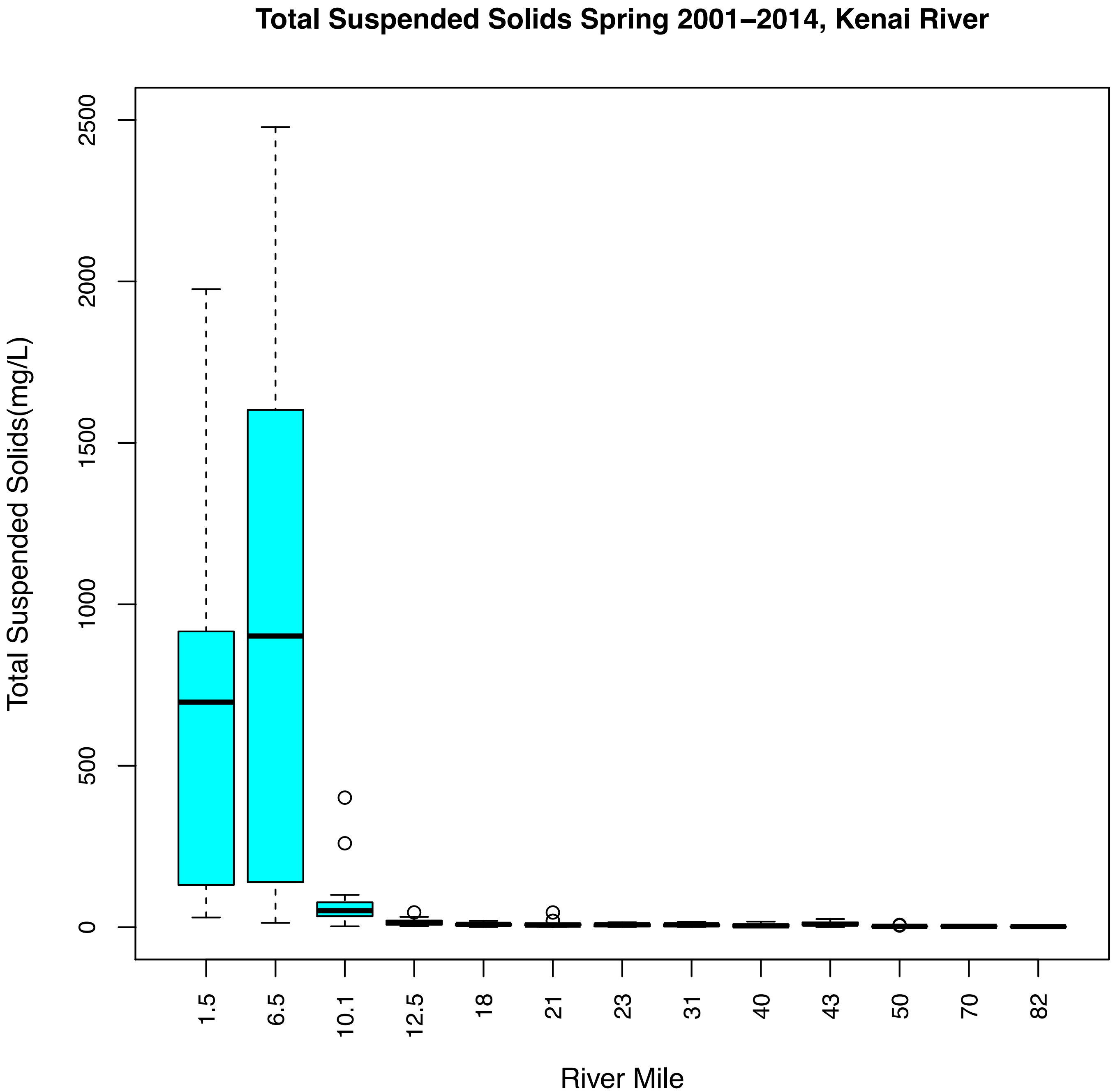

Figure 142: Total Suspended Solids sampled in the Kenai River mainstem during spring 2001 to 2014.
Since 2% of the samples are reported as below the MRL or MDL, these values have been estimated using values that are half of the MRL or MDL.

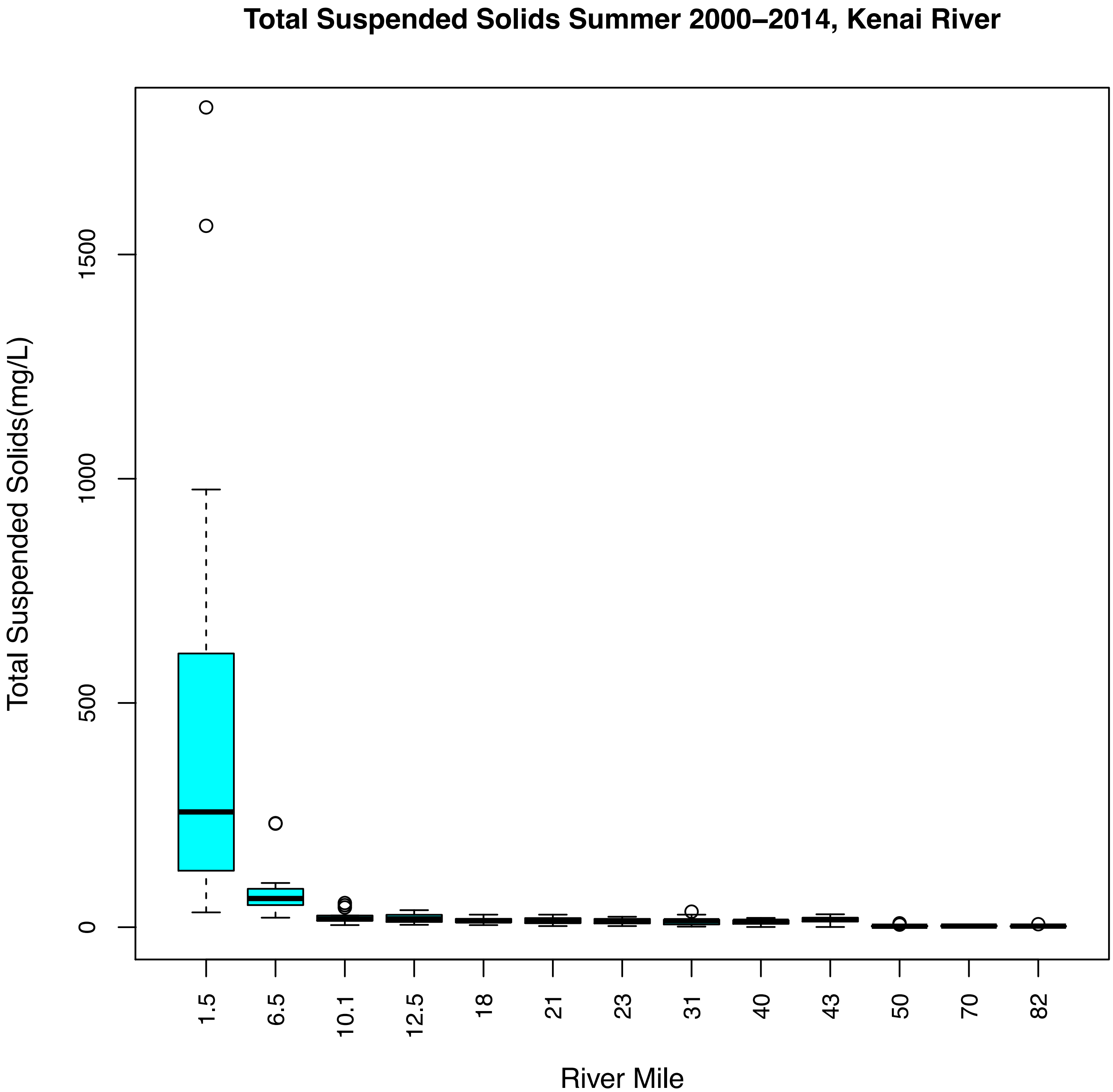

Figure 143: Total Suspended Solids sampled in the Kenai River mainstem during summer 2000 to 2014.
Since 8% of the samples are reported as below the MRL or MDL, these values have been estimated using values that are half of the MRL or MDL.

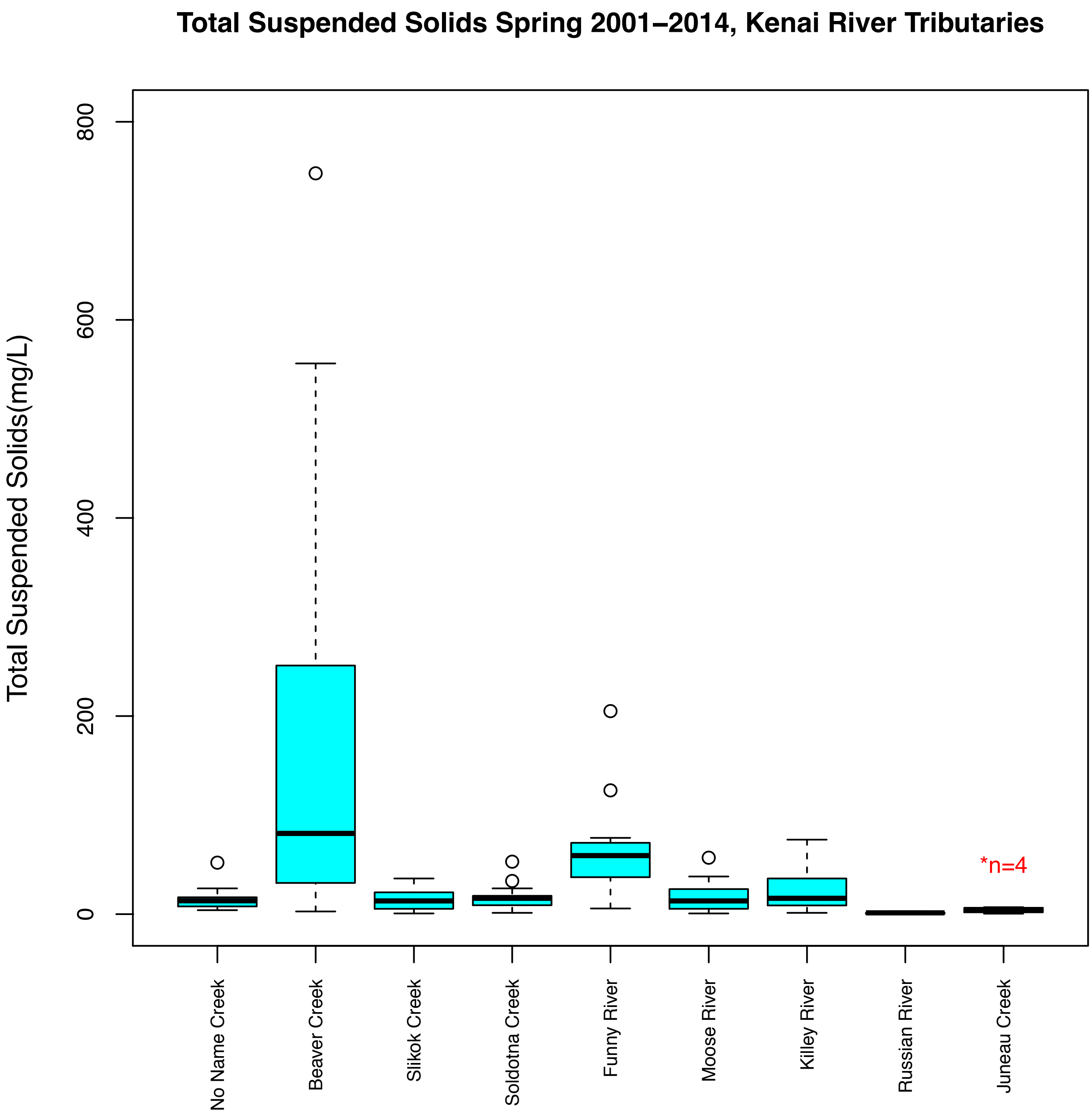

Figure 144: Total Suspended Solids sampled in Kenai River tributaries during spring 2001 to 2014.
Since 4% of the samples are reported as below the MRL or MDL, these values have been estimated using values that are half of the MRL or MDL.

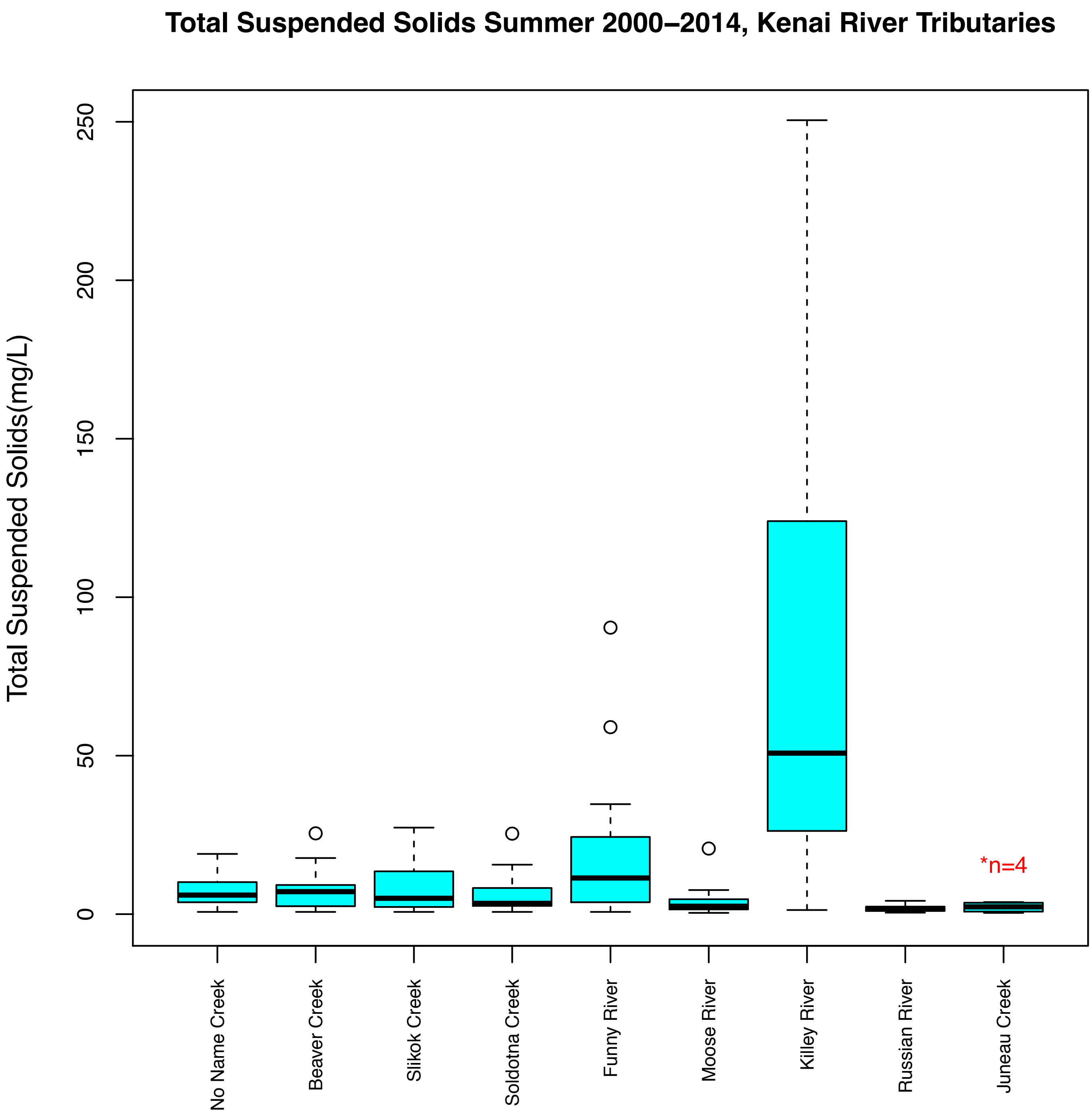

Figure 145: Total Suspended Solids sampled in Kenai River tributaries during summer 2000 to 2014.
Since 12% of the samples are reported as below the MRL or MDL, these values have been estimated using values that are half of the MRL or MDL.

Turbidity

Turbidity measures the degree to which suspended and dissolved materials cause light to scatter instead of being transmitted in straight lines, and these materials consist of silt, clay, chemicals, microscopic organisms, and fine organic or inorganic matter (Bash and others, 2001). Turbidity varies naturally; higher turbidities are typically found in watersheds fed by glacial melt water, and turbidity generally increases from headwater tributaries to mainstems and estuaries (Bash and others, 2001). Even though salmonids can naturally live in turbid water systems, they do not always cope well with increases in suspended sediments, and these high levels in suspended sediments can cause fatalities, while lower levels can result in difficulty finding food, reduced growth, increased stress, and difficulty migrating (Bash and others, 2001). The ADEC standard states that turbidity may not exceed 25 NTU above natural conditions in freshwater or 5 NTU above natural conditions in lakes for the growth and propagation of fish, shellfish, other aquatic life, and wildlife (see Appendix 2) (ADEC, 2012).

The highest level of turbidity occurred at Mile 6.5 in spring 2006 and was detected at 3200 NTU, and the lowest level in the mainstem was 1 NTU at Mile 70 in spring 2009 (Table 30). The highest medians and degree of variance for turbidity were in the estuary for both the spring and the summer, and the lowest median occurred at Mile 50. In the summer, from Mile 43 to Mile 1.5, the median level of turbidity generally increased. The spring medians in the estuary and Upper River were higher than the summer medians, but the rest of the mainstem had higher medians in the summer (Figures 146 & 147).

In the tributaries, the highest level of turbidity was 336 NTU at Beaver Creek in spring 2010, and the lowest level was at Russian River with the level of 0.02 NTU from summer 2006 (Table 56). During the summer, the Killey River had the highest median at 41 NTU, while the other tributaries all had medians less than 20 NTU. In the spring, Beaver Creek had the highest median, followed by No Name Creek and then Funny River. Russian River had the lowest turbidity median in both the summer and the spring. Killey River exhibited the largest seasonal difference in medians by increasing around 35 NTU from the spring to the summer. In contrast, Beaver Creek decreased approximately 13.3 NTU during the summer. The tributaries did not display a clear seasonal trend for increased or decreased turbidity (Figures 148 & 149).

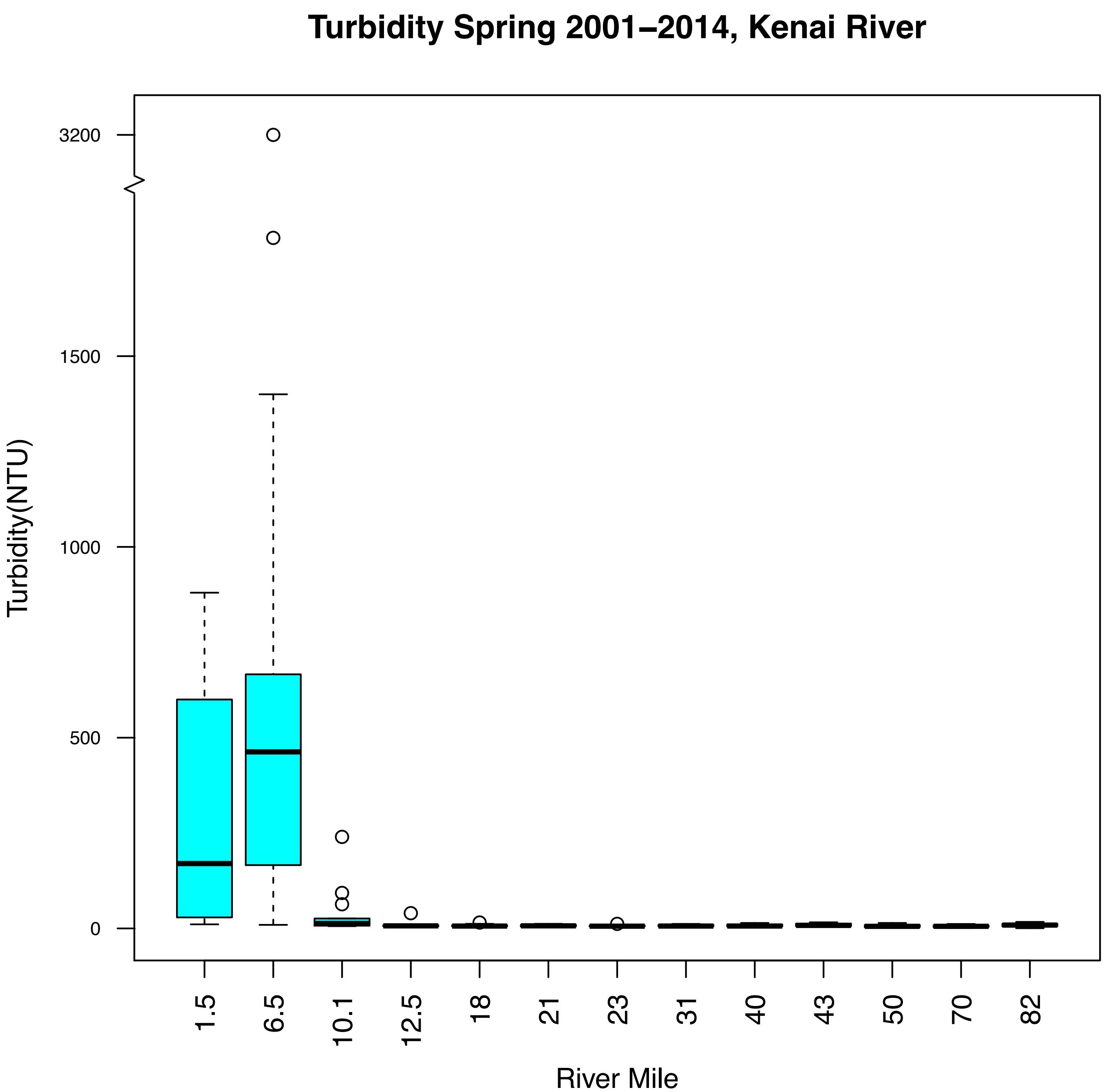

Figure 146: Turbidity sampled in the Kenai River mainstem during spring 2001 to 2014.

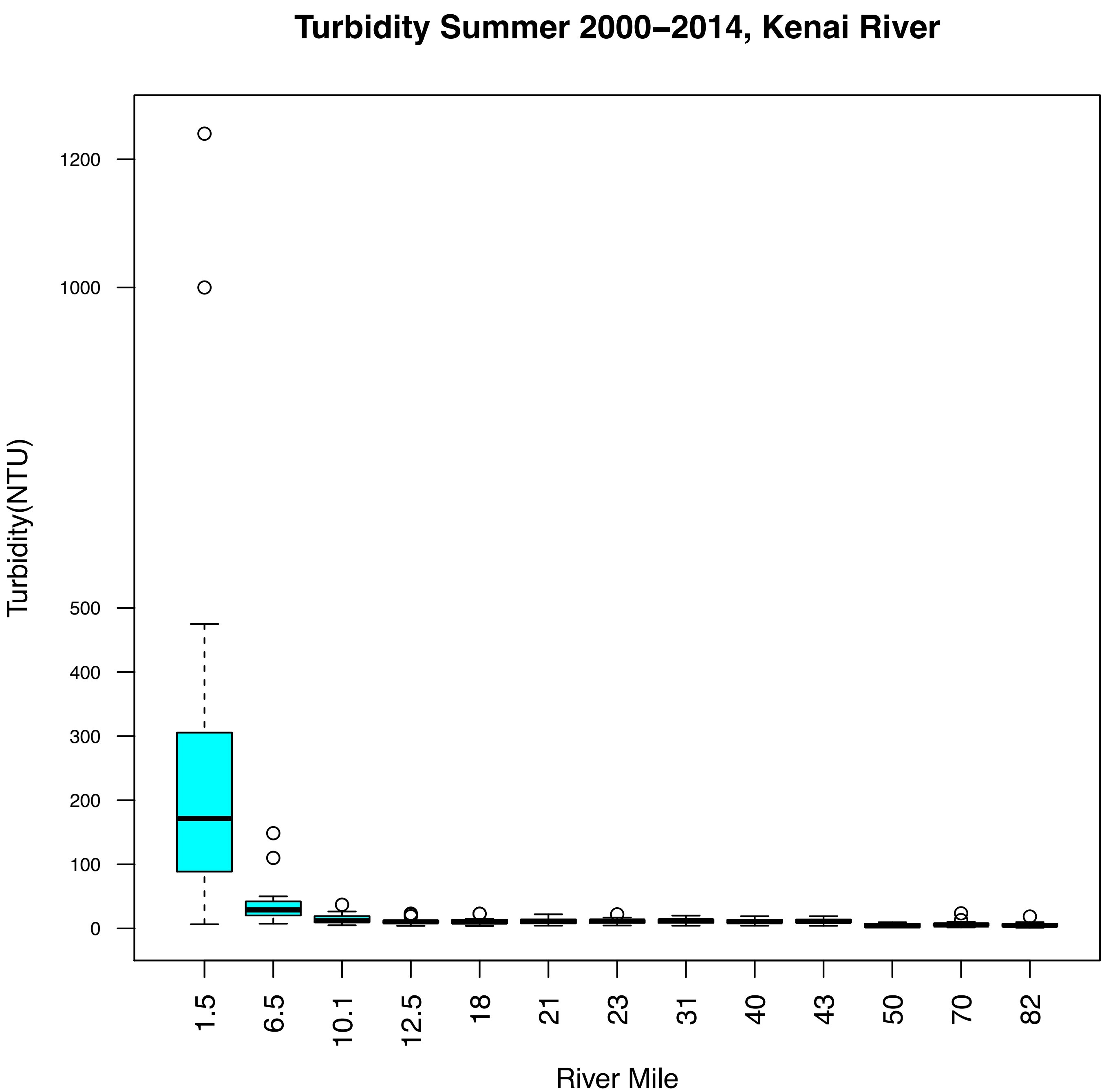

Figure 147: Turbidity sampled in the Kenai River mainstem during summer 2000 to 2014.

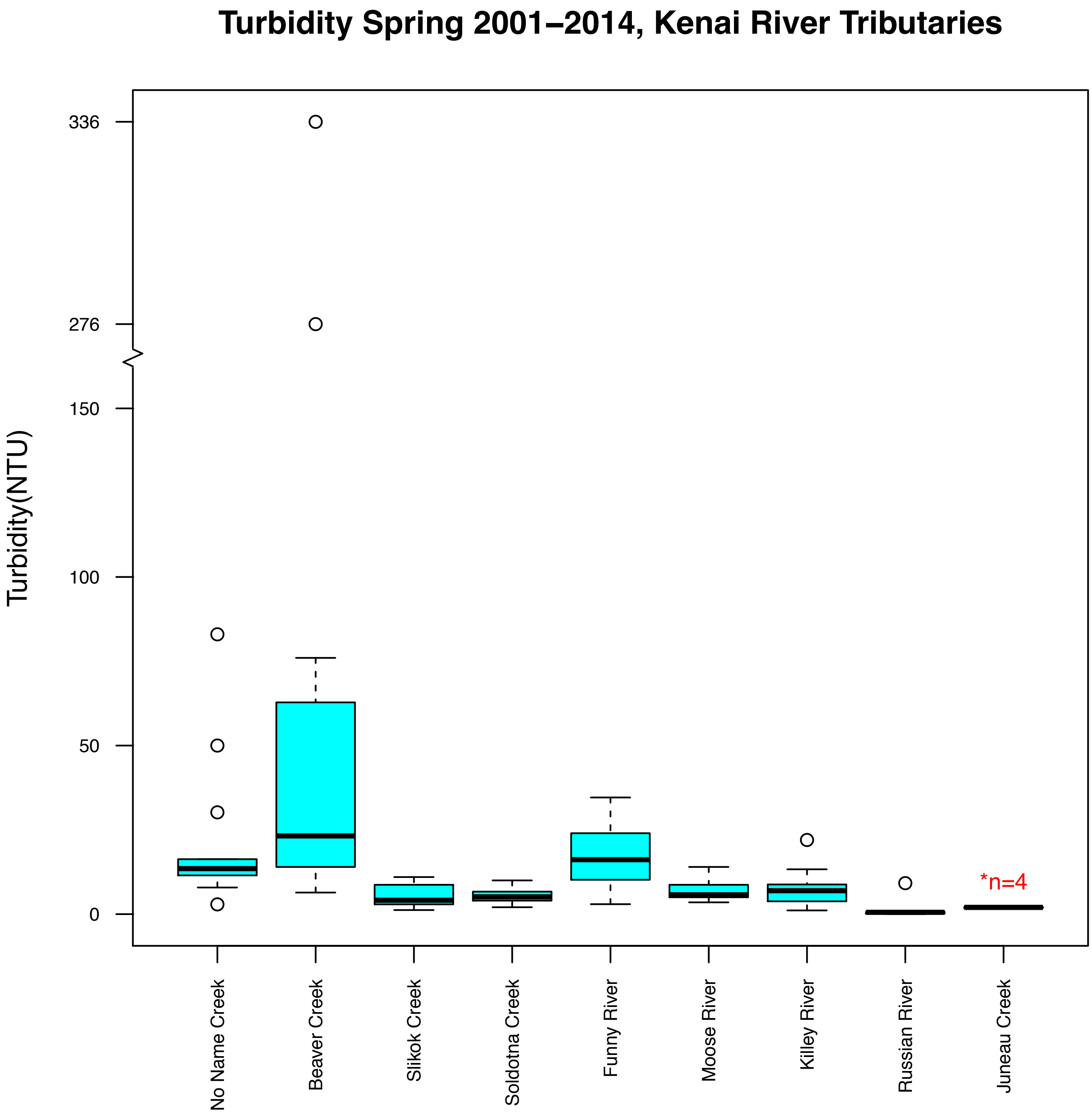

Figure 148: Turbidity sampled in Kenai River tributaries during spring 2001 to 2014.

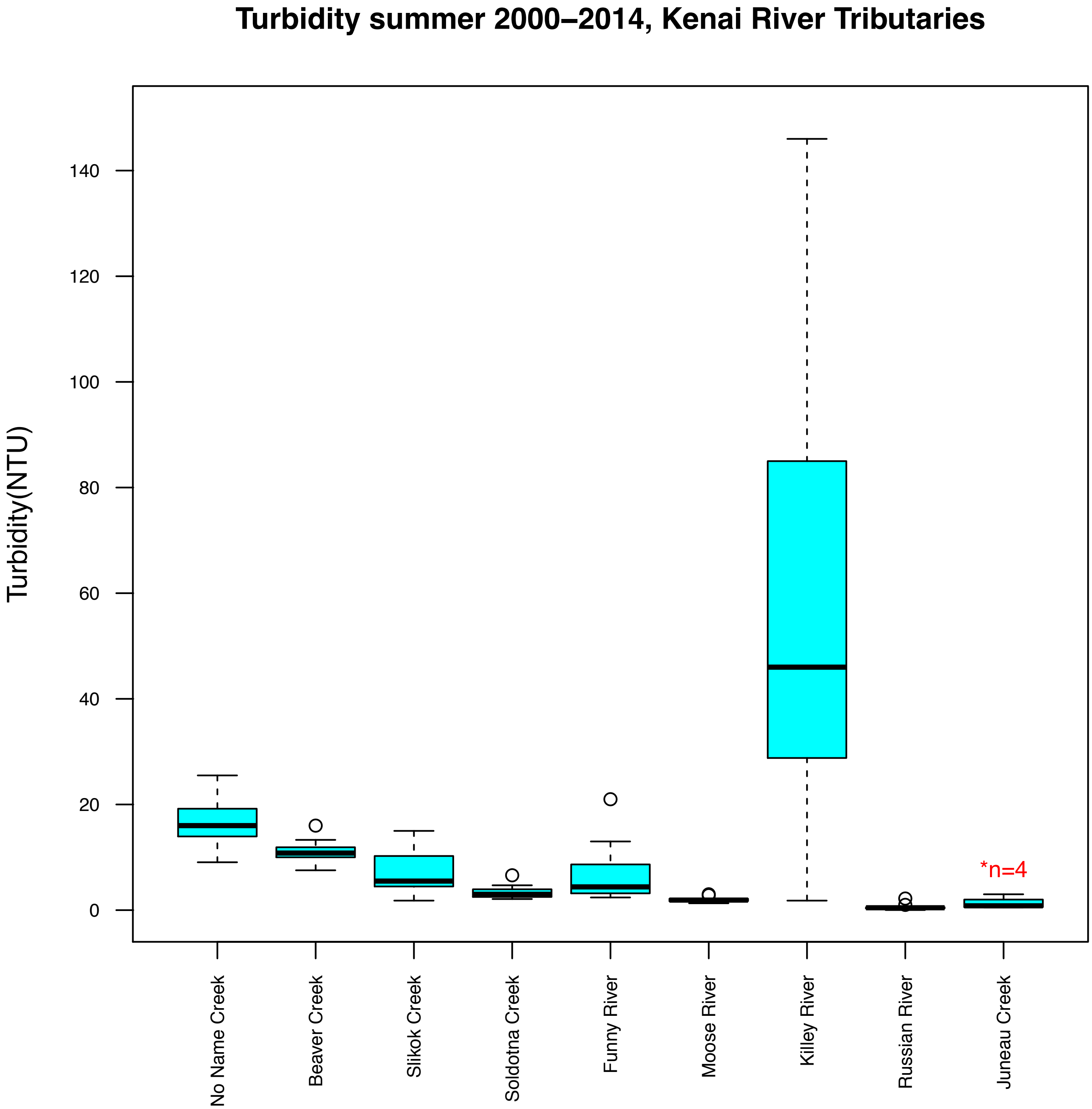

Figure 149: Turbidity sampled in Kenai River tributaries during summer 2000 to 2014.

Water Temperature

Water temperature varies seasonally and as a result of glacial activity and anthropogenic sources. Low water temperatures between 0°C and 4°C can result in low growth rates for fish, but much higher water temperatures can encourage disease, competitors, predators, mortality, and an oxygen-deprived habitat (Kyle and Brabets, 2001). The ADEC has five temperature standards for the growth and propagation of fish, shellfish, other aquatic life, and wildlife in freshwater; the water temperature must remain below 20°C in all areas, below 15°C in rearing areas and migration routes, and below 13°C in egg and fry incubation and spawning areas (see Appendix 2) (ADEC, 2012).

The highest temperature recorded on the mainstem occurred at Mile 1.5 in the summer of 2014 with a value of 17.02°C, and the lowest recorded temperature along the mainstem was –0.15°C at Mile 12.5 in spring 2002 (Table 31). In the spring, two of the temperatures exceeded the standard for rearing areas and migration routes. There was a general upward trend from Mile 82 to Mile 1.5. It is important to notice that during the sampling event of the spring 2014, twelve out of thirteen sites exceeded the standard for egg and fry incubation and spawning areas. During the summer, the medians at Mile 1.5, Mile 6.5 and Mile 50 were very close to exceeding the standards for egg and fry incubation and spawning areas, and no medians exceeded the other standards. There was a general upward trend from Mile 82 to Mile 1.5, with an upward jump in the median at Mile 50, the outlet of Skilak Lake (Figures 150 & 151).

In the tributaries, the highest temperature was 19°C in the Moose River during summer 2003, and the lowest temperature was –0.21°C in the Killey River during spring 2002 (Table 57). In the spring, No Name Creek, Soldotna Creek and Russian River exceeded the standards for rearing areas and migration routes. Also, Slikok Creek, Funny River and Moose River exceeded the standard for egg and fry incubation and spawning areas. All tributaries had medians below 5°C, with the highest at Russian River and the lowest at Funny River. During the summer, the medians of Beaver Creek, Soldotna Creek, and Moose River exceeded the standards for egg and fry incubation and spawning areas, and the median at Moose River also exceeded the standards for rearing areas and migration routes. The coldest tributary in the summer was the Killey River, followed by Juneau Creek, Funny River and then Slikok Creek. The median water temperatures were higher in the summer than in the spring for all sampling locations in both the mainstem and the tributaries. For this analysis there were no values available for temperature during the sampling event of spring 2012 (Figures 152 & 153).

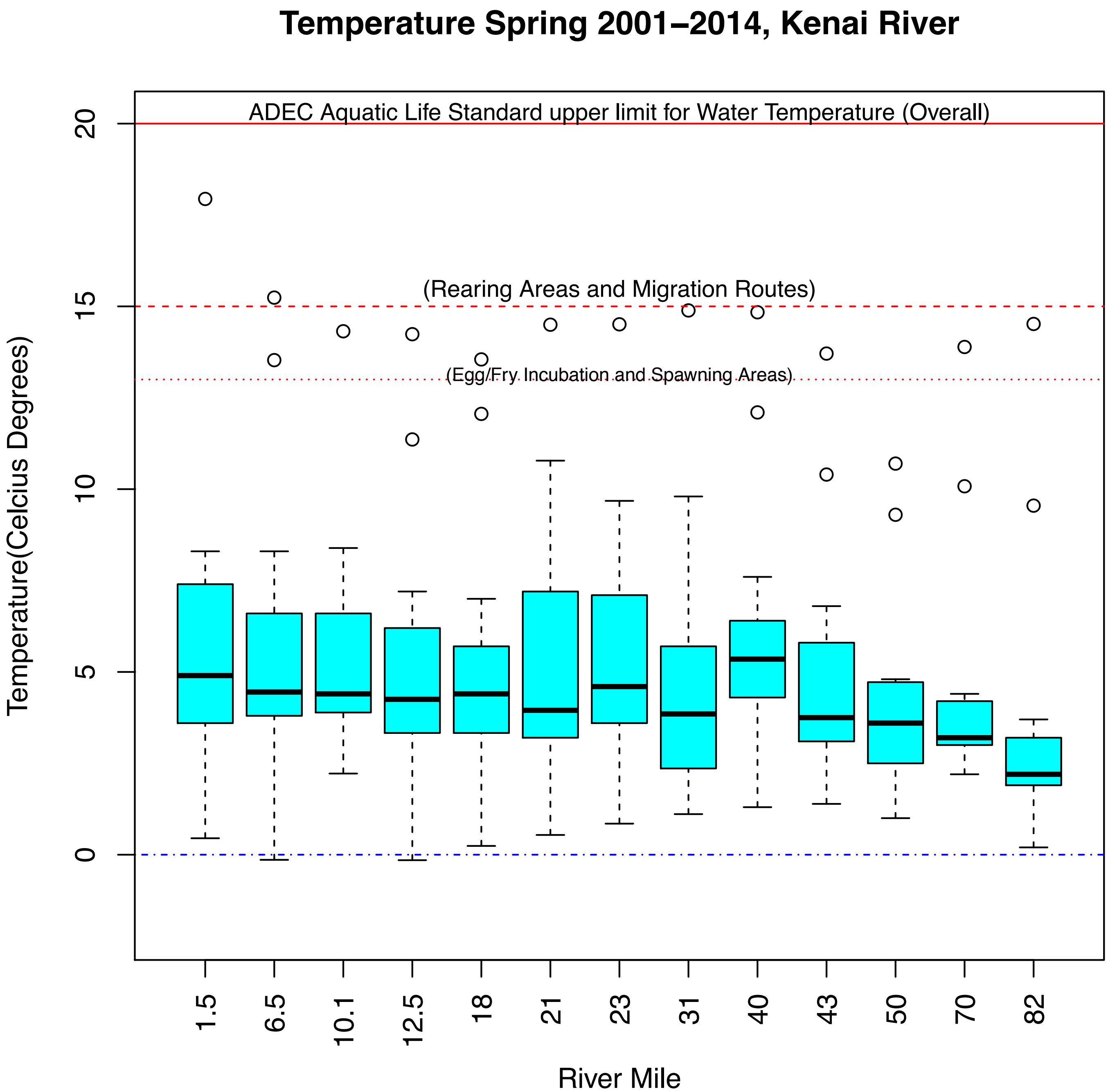

Figure 150: Water Temperature sampled in Kenai River mainstem during spring 2001 to 2014.

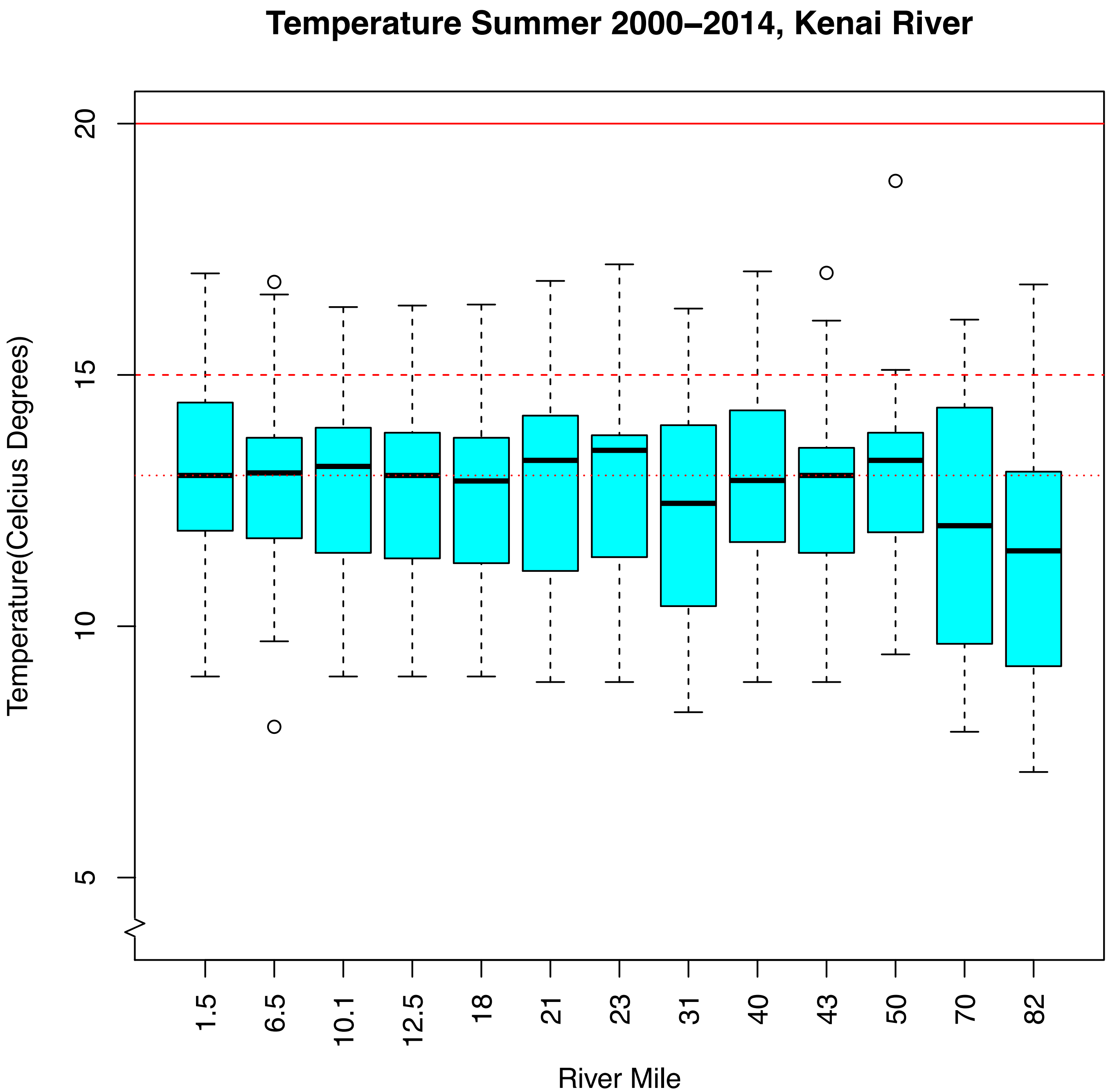

Figure 151: Water Temperature sampled in the Kenai River mainstem during summer 2000 to 2014.

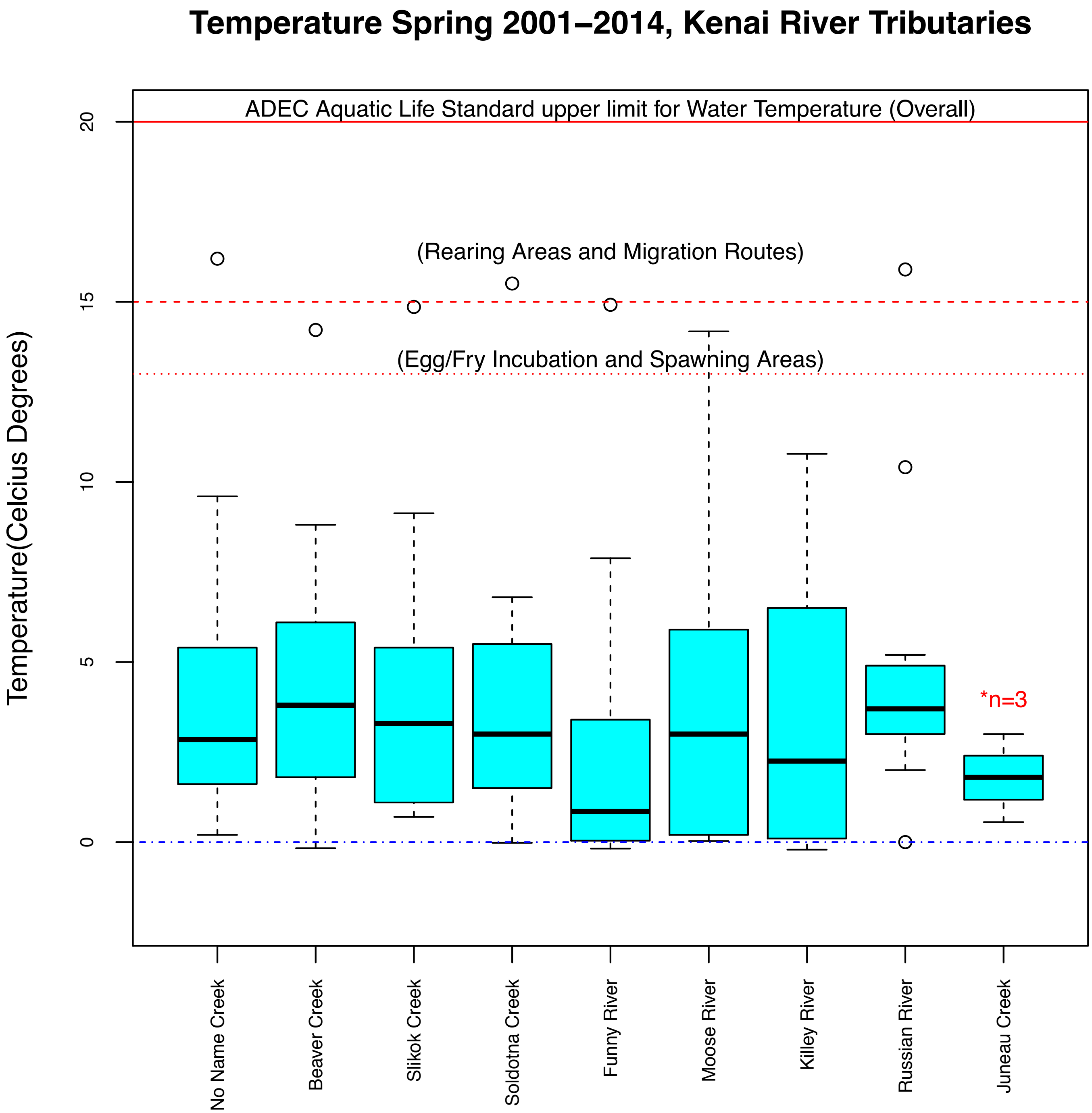

Figure 152: Water Temperature Sampled in Kenai River tributaries during spring 2001 to 2014.

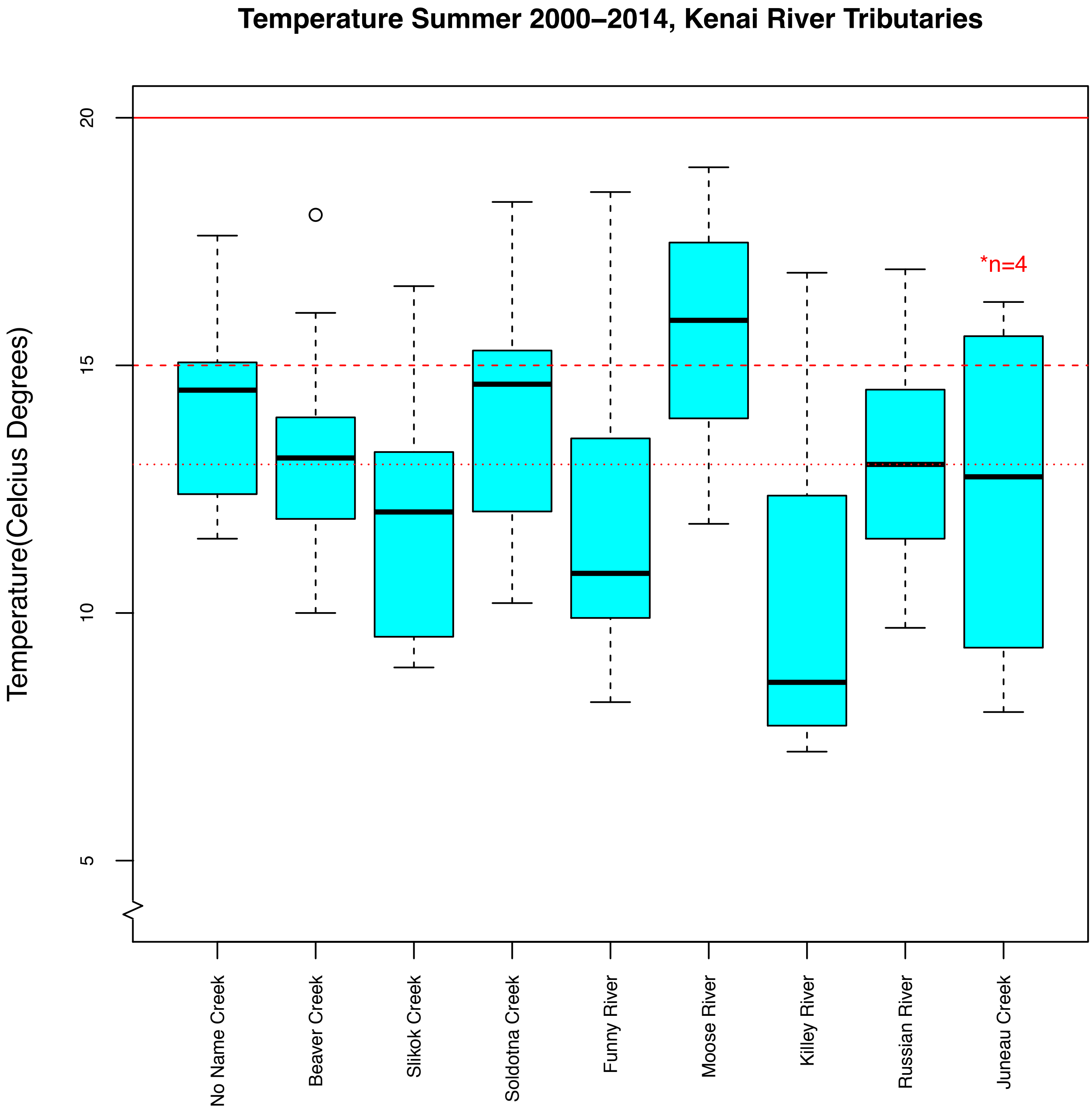

Figure 153: Water Temperature sampled in Kenai River tributaries during summer 2000 to 2014.

Data Quality Analysis

Beginning in spring 2002, duplicate samples were collected at two sites immediately after the normal samples using the same collection, preservation, transportation, and laboratory procedures. The results from the normal sample and the duplicate sample were compared to determine the accuracy and quality control of the sampling effort. The following chart displays a summary of the amount of incidences when the normal and duplicate sample results differed by more than 10% (see Appendices 5 and 6 for full data set).

In the spring, all of the parameters, except copper, zinc and total suspended solids, had fewer than ten incidences where the normal and duplicate sample results differed by over 10%. Cadmium, pH and hydrocarbons had the best quality control comparisons, while copper, zinc and total suspended solids had the highest amount of differences in the spring. During the summer, zinc, iron, magnesium, phosphorus, fecal coliform bacteria, total suspended solids, and turbidity had incidences where the normal and duplicate samples differed by greater than 10%, and the other parameters had better quality control results, especially the pH and cadmium samples.

Parameter	Number of Spring duplicate samples that have relative percentage differences greater than 10%	Number of summer duplicate samples that have relative percentage differences greater than 10%
Arsenic	4	4
Cadmium	0	0
Chromium	6	6
Copper	13	9
Lead	2	3
Zinc	13	13
Calcium	1	7
Iron	7	17
Magnesium	3	11
Nitrate	1	5
Phosphorus	8	11
Diesel Range Organics	0	0
Gas Range Organics	0	0
Residual Range Organics	0	0
Benzene	0	1
Ethylbenzene	0	1
Toluene	0	3
M,P-Xylene	0	1
O-Xylene	0	1
Conductivity	1	4
Fecal Coliform	9	18
pH	0	0
TSS	13	13
Turbidity	7	13
Water Temperature	1	1

Table 5: Summary of data quality analysis for spring and summer for all parameters.

Report Summary

Water quality data was collected from the Kenai River and its tributaries from summer 2000 through summer 2014, and sampling efforts continue past the completion of this report. Several local non-profit organizations, along with local, state, federal, and tribal governments contributed to the sampling effort by providing teams to collect samples at 13 mainstem and 8 tributary sites (Juneau Creek was sampled on four occasions). Samples were analyzed for metals, nutrients, hydrocarbons, and several other water quality parameters. The results were compared to state and federal water quality standards that apply to freshwater aquatic life.

Dissolved metals were generally reported in small concentrations with few exceedances of state or federal standards, many reported below laboratory detection methods. Arsenic levels were generally higher in the tributaries, but no samples exceeded the the aquatic life standard at any time. Laboratory methods for detecting cadmium did not measure concentrations to low enough levels to determine if there were exceedances for many sampling events; however, even when detection procedures improved, very few incidences of detection occurred. Trivalent chromium was never reported at levels above the standard. It is possible that hexavalent chromium may have exceeded the standard on four occasions, but the laboratory analysis did not distinguish between the two isomers of chromium.

In the early sampling years, the amount of exceedances of the copper criteria are unknown due to laboratory detection limits, some exceedances occurred when methods improved. Lead had more exceedances at the Kenai River main stem than in the tributaries. Of the dissolved metals, zinc had the most exceedances in both the Kenai river mainstem and the tributaries as well as during spring and summer events.

The total metals, calcium, iron, and magnesium, display a spatial trend, increasing from Kenai Lake outlet to the Kenai River estuary, and they all had higher concentrations in the spring. There is no Alaska or federal water quality standard that applies to calcium and magnesium concentrations for freshwater aquatic life, so neither experienced any exceedances. Calcium levels were highest in the estuary, most likely due to tidal influence, and concentrations were also high in the Upper Kenai River. Magnesium levels dropped at the Skilak Lake outlet and then rose throughout the remainder of the river heading downstream. The tributaries generally had higher concentrations of magnesium and iron than the mainstem (excluding the estuary). Iron levels usually exceeded the standard in all tributaries except for the Russian River, the Killey River, and Juneau Creek, had the highest concentration of iron in the spring. Iron levels generally increased downriver, and exceedances of the iron standard on the mainstem were typical from Mile 10.1 through the estuary.

The two nutrients included in this study, nitrate and phosphorus, displayed very different spatial trends. From Kenai Lake to the estuary, nitrate levels decreased. Beaver Creek had relatively low levels of nitrate, while Russian River had a very high concentration of nitrate. In contrast, Russian River had very low levels of phosphorus, and there was a general upward trend from Kenai Lake to the estuary with high levels of phosphorus in the Killey River and Beaver Creek.

Sampling for diesel range organics, gasoline range organics, and residual range organics was useful in narrowing down the main source of hydrocarbons present: benzene, toluene, ethylbenzene, and xylene (BTEX). Very few detections occurred for any of the range organics. The laboratory detection limits were too high during several sampling events to detect exceedances of gasoline range organics and residual range organics. All of the detected gasoline range organics occurred downstream of Mile 10.1 during the summer. BTEX concentrations showed an upward trend from the Middle Kenai River to the estuary, with no median exceeding the standard. No detections of BTEX occurred in the spring, indicating outboard motors as the primary source of contamination.

Fecal coliform bacteria, pH, and specific conductance all had few to zero exceedances. All of the median levels of fecal coliform bacteria were below 200 CFU/100m, although the highest levels occurred at Mile 6.5, Slikok Creek, Beaver Creek, and No Name Creek in the summer. Most of the exceedances of the pH standards occurred below the lower limit in the spring, but overall, there were very few samples outside of the acceptable range. Specific conductance was higher in the spring, especially at the estuary.

The remaining characteristics of total suspended solids, turbidity, and water temperature had high levels in several areas. The concentration of total suspended solids was highest in the estuary in the spring and the summer, along with high levels in the Killey River in the summer. Russian River had the lowest median for total suspended solids and turbidity. In the summer, turbidity samples displayed a general increasing trend moving downriver, with the highest levels at the estuary and the Killey River. Water temperature also increased from the Kenai Lake Outlet to the estuary, there were exceedances in the mainstem and tributaries during the spring and the summer for rearing areas and migration routes as well as for egg/fry incubation and spawning areas. In the summer, medians in the estuary were very close to exceeding the upper limits for spawning areas and egg and fry incubation. The medians exceeded the upper limits for spawning areas and egg and fry incubation in Beaver Creek and Soldotna Creek, and the Moose River in the summer. Additionally, the Moose River also exceeded the standards for rearing areas and migration routes.

After analyzing all of the data and corresponding trends, the Kenai Watershed Forum highlights four areas of concern for aquatic life in the Kenai River Watershed:

1. **Water temperatures** in the Moose River typically exceeded two of Alaska's standards, and two of the standards were regularly exceeded at Beaver Creek, and Soldotna Creek during the summer.
2. **Iron** median levels regularly exceeded the standard in the estuary and in No Name Creek, Beaver Creek, Slikok Creek, Soldotna Creek, Funny River, Moose River, and the Killey River, especially in the spring.
3. **Zinc** levels are on the rise since 2010. Also, Name Creek and Slikok Creek were often higher levels than the state and federal standards.
4. **Road crossings** need to be monitored more carefully specially for parameters like Zinc and Cooper.

In conclusion, these highlighted areas of concern warrant more intensive monitoring and any necessary restoration, so that the Kenai River can continue to support fishing, recreation, tourism, and the propagation of fish and wildlife.

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Appendix 1: Data Tables Organized by Parameter

Data Tables Organized by Parameter
Less than (<) indicates the sample is below the MRL or MDL of the following value, and these data are grey in color. ND indicates an instance of non-detect, in which all of the BTEX samples were reported as below the MRL or MDL, and these data are also shown in grey.

Date	Mile 1.5	Mile 6.5	Mile 10.1	Mile 12.5	Mile 18.0	Mile 21.0	Mile 23.0	Mile 31.0	Mile 40.0	Mile 43.0	Mile 50.0	Mile 70.0	Mile 82.0
4/11/01	<4	<4	<4	5	<4	<4	<4	<4	<4	<4	<4	<4	<4
4/10/02	<3	<3		<3	<3	<3	<3	<3	<3	<3	<3	<3	<3
4/29/03	4.7	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5
4/27/04	<0.25	3.28	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25
4/26/05	6.51	7.17	<0.25	<0.25	<0.25	<0.25	<0.25	3.41	<0.25	<0.25	<0.25	<0.25	<0.25
4/25/06	12.5	3.14	2.31	3.6	2.1	1.93	2.12	2.58	1.2	1.05	1.04	0.807	0.525
5/1/07	46.5	1.98	1.83	1.73	1.74	1.64	1.91	1.95	1.25	1.38	1.17	0.791	0.667
4/22/08	24.6	1.97	1.66	1.69	1.64	1.57	1.8	1.98	1.05	1.03	1.06	0.715	0.527
4/27/10	8.07	2.01	1.63	1.57	1.9	1.57	1.56	1.99	1.05	0.964	0.979	1.03	0.48
4/26/11	40.5	3.78	2.27	2.19	2.03	1.94	2.09	2.64	1.17	1.09	1.06	0.824	0.535
5/1/12	18.2	1.85	1.98	2.16	1.68	1.58	1.89	2.14	1.11	1.08	1.06	0.843	0.575
5/7/13	3.36	2.81	2.74	2.76	2.65	2.24	2.59	3.41	1.17	1.11	1.04	0.775	0.551
4/29/14	2.6	2.86	2.03	1.73	1.72	1.57	1.58						
7/18/00	<4	<4	<4	<4	<4	<4	<4	<4	<4	4	<4	<4	<4
7/24/01	<3.1	<3.1	<3.1	<3.1	<3.1	<3.1	<3.1	<3.1	<3.1	<3.1	<3.1	<3.1	<3.1
7/16/02	2	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
7/22/03	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5
7/20/04	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25
7/26/05	<2.50	<2.50	<2.50	<2.50	<2.50	<2.50	<2.50	<2.50	<2.50	<2.50	<2.50	<2.50	<2.50
7/25/06	2.56	<0.44	<0.44	<0.44	<0.44	1.3	1.29	1.22	1.23	1.19	1.15	0.523	0.405
7/17/07	2.44	1.33	1.13	1.3	1.14	1.04	1.22	1.04	1.06	1.04	1.11	0.652	0.689
7/21/09	2.52	1	1.06	1.04	1.02	1.07	1.06	1.06	0.99	0.979	0.94	0.511	0.458
7/27/10	0.973	0.703	0.738	0.7	0.74	0.686	0.664	0.735	0.591	0.574	0.595	0.404	0.324
7/26/11	1.4	1.31	1.23	0.748	1.22	1.22	1.25	1.33	1.13	1.16	1.02	0.65	0.53
7/31/12	1.62	1.11	1.11	1.15	1.04	1.02	1.07	1.08	0.99	1.04	0.884	0.608	0.517
7/30/13	1.22	1.09	1.03	1.07	1.05	1.04	1.08	1.16	1.08	1.04	1.02	0.648	0.595
7/22/14	1.61	1.18	1.09	1.14	1.16	1.14	1.15						

Table 6: Mainstem arsenic sampled in μg/L.

Date	Mile 1.5	Mile 6.5	Mile 10.1	Mile 12.5	Mile 18.0	Mile 21.0	Mile 23.0	Mile 31.0	Mile 40.0	Mile 43.0	Mile 50.0	Mile 70.0	Mile 82.0
4/11/01	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
4/10/02	1.1	<0.1		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
4/29/03	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5
4/27/04	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18
4/26/05	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18
4/25/06	<0.062	<0.062	<0.062	<0.062	<0.062	<0.062	<0.062	<0.062	<0.062	<0.062	<0.062	<0.062	<0.062
5/1/07	<0.062	<0.062	<0.062	<0.062	<0.062	<0.062	<0.062	<0.062	<0.062	<0.062	<0.062	<0.062	<0.062
4/22/08	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
4/27/10	<0.062	<0.062	<0.062	0.787	<0.062	<0.062	<0.062	<0.062	<0.062	<0.062	<0.062	<0.062	<0.062
4/26/11	<0.045	0.207	<0.045	<0.045	<0.045	<0.045	<0.045	<0.045	<0.045	<0.045	<0.045	<0.045	<0.045
5/1/12	<0.045	<0.045	<0.045	<0.045	<0.045	<0.045	<0.045	<0.045	<0.045	<0.045	<0.045	<0.045	<0.045
5/7/13	<0.066	<0.066	<0.066	<0.066	<0.066	<0.066	<0.066	<0.066	<0.066	<0.066	<0.066	<0.066	<0.066
4/29/14	<0.066	<0.066	<0.066	<0.066	<0.066	<0.066	<0.066						
7/18/00	<0.1	0.1	<0.1	<0.1	<0.1	8	0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
7/24/01	<0.14	<0.14	<0.14	<0.14	<0.14	<0.14	<0.14	<0.14	<0.14	<0.14	<0.14	<0.14	<0.14
7/16/02	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
7/22/03	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5
7/20/04	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	1
7/26/05	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
7/25/06	<0.062	<0.062	<0.062	<0.062	<0.062	<0.062	<0.062	<0.062	<0.062	<0.062	<0.062	<0.062	<0.062
7/17/07	<0.062	<0.062	<0.062	<0.062	<0.062	<0.062	<0.062	<0.062	<0.062	<0.062	<0.062	<0.062	<0.062
7/21/09	<0.062	<0.062	<0.062	<0.062	<0.062	<0.062	<0.062	<0.062	<0.062	<0.062	<0.062	<0.062	<0.062
7/27/10	<0.062	<0.062	<0.062	<0.062	<0.062	<0.062	<0.062	<0.062	<0.062	<0.062	<0.062	<0.062	<0.062
7/26/11	<0.045	<0.045	<0.045	<0.045	<0.045	<0.045	<0.045	<0.045	<0.045	<0.045	<0.045	<0.045	<0.045
7/31/12	<0.045	<0.045	<0.045	<0.045	<0.045	0.162	<0.045	<0.045	<0.045	<0.045	<0.045	<0.045	<0.045
7/30/13	<0.066	<0.066	<0.066	<0.066	<0.066	<0.066	<0.066	<0.066	<0.066	<0.066	<0.066	<0.066	<0.066
7/22/14	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07						

Table 7: Mainstem cadmium sampled in in μg/L.

Date	Mile 1.5	Mile 6.5	Mile 10.1	Mile 12.5	Mile 18.0	Mie 21.0	Mile 23.0	Mile 31.0	Mile 40.0	Mile 43.0	Mile 50.0	Mile 70.0	Mile 82.0
4/11/01	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
4/10/02	0.9	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
4/29/03	2.9	2.5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
4/27/04	<0.36	<0.36	<0.36	<0.36	<0.36	<0.36	<0.36	<0.36	<0.36	<0.36	<0.36	<0.36	<0.36
4/26/05	<0.36	11.2	<0.36	<0.36	<0.36	<0.36	<0.36	<0.36	<0.36	<0.36	<0.36	<0.36	<0.36
4/25/06	4.03	3.29	2.46	1.54	0.996	1.16	0.299	0.299	0.19	0.894	0.846	0.227	1.2
5/1/07	6.51	0.697	0.51	0.447	0.53	0.486	0.491	0.464	0.357	0.715	<0.049	<0.049	<0.049
4/22/08	5.72	1.51	0.742	0.723	0.691	0.305	0.971	1.19	0.612	0.264	0.553	0.95	0.875
4/27/10	1.95	1.72	0.678	0.665	0.793	0.587	0.42	0.413	0.27	0.285	0.293	0.264	0.233
4/26/11	8.98	2.41	1.52	1.42	1.3	1.14	1.14	0.969	0.781	0.572	0.588	0.539	0.514
5/1/12	16.8	0.479	0.337	0.272	0.423	0.27	0.275	0.388	0.212	0.229	0.211	0.285	0.271
5/7/13	0.937	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
4/29/14	0.608	0.735	0.554	<0.20	<0.20	<0.20	<0.20						
7/18/00	<2	<2	<2	<2	<2	25	<2	<2	<2	<2	<2	<2	<2
7/24/01	<0.49	<0.49	<0.49	<0.49	<0.49	<0.49	<0.49	<0.49	<0.49	<0.49	<0.49	<0.49	<0.49
7/16/02	0.7	<0.6	2	1.8	<0.6	<0.6	<0.6	0.8	<0.6	<0.6	<0.6	<0.6	1.5
7/22/03	1.4	<1.0	<1.0	<1.0	<1.0	<1.0	1	<1.0	1	<1.0	<1.0	<1.0	<1.0
7/20/04	<0.36	<0.36	<0.36	<0.36	<0.36	<0.36	<0.36	<0.36	<0.36	<0.36	<0.36	<0.36	<0.36
7/26/05	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5
7/25/06	1.78	19.5	19.9	2.71	2.17	1.86	1.43	1.41	1.15	1.32	0.952	1.22	0.898
7/17/07	2.12	1.16	0.503	0.476	0.609	0.623	0.857	0.478	0.387	0.359	0.511	0.212	0.207
7/21/09	1.13	1.05	1.05	0.938	0.969	0.814	0.858	0.994	0.701	1.16	1.17	1.15	0.961
7/27/10	1.33	0.206	0.292	0.22	0.236	0.229	0.17	0.262	<0.049	<0.049	0.151	0.167	0.228
7/26/11	0.829	0.61	0.385	0.318	0.366	0.297	0.332	0.334	0.337	0.355	0.304	0.419	0.239
7/31/12	1.81	0.38	0.379	0.709	0.352	0.313	0.266	0.309	0.236	0.261	0.19	0.218	0.226
7/30/13	0.751	0.74	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
7/22/14	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20						

Table 8: Mainstem Chromium sampled in μg/L.

Date	Mile 1.5	Mile 6.5	Mile 10.1	Mile 12.5	Mile 18.0	Mile 21.0	Mile 23.0	Mile 31.0	Mile 40.0	Mile 43.0	Mile 50.0	Mile 70.0	Mile 82.0
4/11/01	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
4/10/02	<9	<9		<9	<9	<9	<9	<9	<9	<9	<9	<9	<9
4/29/03	100	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25
4/27/04	2.19	<0.12	<0.12	1.97	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12
4/26/05	3.73	12	<0.12	<0.12	<0.12	<0.12	<0.12	2.59	<0.12	<0.12	<0.12	2.94	<0.12
4/25/06	3.28	2.99	0.772	0.604	0.596	0.997	1.23	0.493	0.543	0.479	0.483	0.474	0.548
5/1/07	3.85	1.7	0.53	0.285	0.32	0.362	0.664	0.649	0.337	0.401	0.409	2.96	0.382
4/22/08	4.15	2.07	0.28	0.547	0.157	0.572	0.757	0.88	0.542	0.49	0.256	1.17	0.373
4/28/09	2.08	1.97	0.549	0.521	0.787	0.495	0.501	0.326	0.398	0.39	0.259	0.4	2.49
4/27/10	1.9	2.76	1.02	2.11	1.79	0.663	0.429	0.723	0.518	0.469	2.04	0.474	0.474
4/26/11	4.68	2.86	1.23	0.731	0.888	0.581	0.774	0.924	0.701	0.376	0.534	0.588	0.792
5/1/12	2.16	0.779	0.928	3.97	1.25	0.728	0.758	1.02	0.679	0.667	0.564	0.649	0.618
5/7/13	2.85	1.01	0.9	0.777	0.68	0.448	0.524	0.487	0.54	0.435	0.322	0.562	0.723
4/29/14	1.78	4.98	1.4	0.843	0.664	0.58	0.831						
7/18/00	<5	<5	<5	<5	<5	443	<5	9	<5	<5	<5	6	5
7/24/01	<9.3	<9.3	<9.3	<9.3	<9.3	<9.3	<9.3	<9.3	<9.3	<9.3	<9.3	<9.3	<9.3
7/16/02	<9	<9	<9	<9	<9	<9	<9	<9	<9	<9	<9	<9	<9
7/22/03	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25
7/20/04	<0.12	<0.12	<0.12	<0.12	1.06	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12
7/26/05	8.44	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	21.1	<2.5	<2.5	<2.5	<2.5	<2.5
7/25/06	3.75	4.84	3.29	1.88	2.04	1.85	0.687	0.332	0.319	0.376	0.372	0.446	0.613
7/17/07	2.35	0.448	0.401	0.332	0.375	0.372	0.473	0.304	0.32	0.315	0.312	0.443	0.847
7/21/09	1.87	0.863	1.07	0.696	0.745	0.52	0.641	0.696	0.576	0.75	0.586	0.469	0.479
7/27/10	1.46	0.489	1.98	1.15	3.08	0.561	0.21	0.309	0.145	0.246	0.332	0.292	0.446
7/26/11	0.411	2.99	0.915	0.739	0.871	0.573	0.61	1.12	0.824	0.854	0.848	0.857	0.666
7/31/12	0.94	0.568	1.77	2.1	0.892	0.941	0.401	0.343	0.375	0.41	0.397	0.508	0.549
7/30/13	0.606	0.58	0.639	0.531	0.58	0.432	0.455	0.732	0.453	0.45	0.414	0.58	0.623
7/22/14	3.07	2.95	3.2	3.09	3.7	1.87	1.92						

Table 9: Mainstem Copper sampled in μg/L.

Date	Mile 1.5	Mile 6.5	Mile 10.1	Mile 12.5	Mile 18.0	Mile 21.0	Mile 23.0	Mile 31.0	Mile 40.0	Mile 43.0	Mile 50.0	Mile 70.0	Mile 82.0
4/11/01	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4
4/10/02	<1	<1		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
4/29/03	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5
4/27/04	1.34	<0.052	<0.052	<0.052	<0.052	<0.052	<0.052	<0.052	<0.052	<0.052	<0.052	<0.052	<0.052
4/26/05	<0.052	3.06	<0.052	<0.052	<0.052	<0.052	<0.052	<0.052	<0.052	<0.052	<0.052	<0.052	<0.052
4/25/06	0.113	0.26	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030
5/1/07	0.224	0.249	0.125	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	0.75	<0.030
4/22/08	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.124	<0.10
4/28/09	<0.030	0.174	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	0.159
4/27/10	<0.030	0.151	0.212	0.246	0.543	<0.030	<0.030	<0.030	<0.030	<0.030	0.111	<0.030	<0.030
4/26/11	1.6	3.3	0.547	0.291	0.293	0.571	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	0.149
5/1/12	0.13	0.174	0.208	0.403	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030
5/7/13	0.347	<0.073	<0.073	<0.073	<0.073	<0.073	<0.073	<0.073	<0.073	<0.073	<0.073	<0.073	<0.073
4/29/14	<0.073	0.235	<0.073	<0.073	<0.073	<0.073	<0.073						
7/18/00	<4	<4	<4	<4	<4	106	<4	<4	<4	<4	<4	<4	<4
7/24/01	<1.1	<1.1	<1.1	<1.1	<1.1	<1.1	<1.1	<1.1	<1.1	<1.1	<1.1	<1.1	<1.1
7/16/02	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	4
7/22/03	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5
7/20/04	<0.052	<0.052	<0.052	<0.052	<0.052	<0.052	<0.052	<0.052	<0.052	<0.052	<0.052	<0.052	<0.052
7/26/05	2.73	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	468	<1.0	<1.0	<1.0	<1.0	<1.0
7/25/06	0.279	19	1.65	<0.030	<0.030	1.93	0.165	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030
7/17/07	0.561	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	0.131
7/21/09	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030
7/27/10	0.385	<0.030	0.275	0.16	0.445	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030
7/26/11	<0.030	0.322	<0.030	<0.030	0.393	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	0.115	<0.030
7/31/12	0.123	0.117	0.438	0.798	0.394	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030
7/30/13	<0.073	<0.073	<0.073	<0.073	<0.073	<0.073	<0.073	<0.073	<0.073	<0.073	<0.073	<0.073	<0.073
7/22/14	<0.070	<0.070	<0.070	<0.070	<0.070	<0.070	<0.070						

Table 10: Mainsteam Lead sampled in μg/L.

Date	Mile 1.5	Mile 6.5	Mile 10.1	Mile 12.5	Mile 18.0	Mile 21.0	Mile 23.0	Mile 31.0	Mile 40.0	Mile 43.0	Mile 50.0	Mile 70.0	Mile 82.0
4/11/01	55	91	56	26	29	35	22	34	28	29	32	44	44
4/10/02	106	57		37	33	32	33	35	31	33	31	34	36
4/29/03	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50
4/27/04	40.8	41.3	38	31.6	24.1	38.2	45.2	45.7	31.2	42.3	30.6	34.2	40.1
4/26/05	55.9	102	45.9	29.8	51.1	29	25.8	17.9	25.8	21	22.9	30.7	33.1
4/25/06	38.9	47.4	28	19.6	20.3	16.8	1.96	19.2	7.96	8.08	10	10.4	5.19
5/1/07	19.2	86.8	58.6	0.947	20.6	18.8	47	6.61	2.01	10.3	19.4	33.5	18.6
4/22/08	<0.25	0.617	0.804	1.28	0.591	1.12	1.2	2.31	0.65	0.911	0.692	9.29	2.25
4/28/09	24	40.2	46.2	41.5	23.4	33.5	2.14	0.879	0.919	1.18	0.461	0.572	5.58
4/27/10	5.24	28.7	44.2	84.2	70.3	31.9	41.3	45.1	22.2	21.5	24.2	22.9	23.5
4/26/11	45.3	260	41.3	20	17.9	19.8	38.8	44.6	17.6	<0.084	15.5	18.3	22.5
5/1/12	40.9	124	117	29.4	110	62.9	70.2	124	37.6	33.9	33.7	71	54.5
5/7/13	135	<0.55	59.9	<0.55	6.35	23.6	<0.55	<0.55	<0.55	7.96	<0.55	3.16	34.3
4/29/14	154	164	83.8	76.6	29.5	14.7	47.5						
7/18/00	<9	10	<9	14	14	2900	18	32	<9	<9	11	17	21
7/24/01	36.2	28.4	36.9	31.6	43	37.1	43.2	33.5	29.8	32.5	48.5	34.6	36.2
7/16/02	32	39	31	30	30	30	36	32	33	40	26	50	32
7/22/03	65	55	51	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50
7/20/04	35.7	39.9	32	55.7	59.4	36.3	31.9	44.1	32.5	28.8	29.1	33.2	27.9
7/26/05	45.8	<10	24.9	14.4	25.7	<10	25.8	51.2	<10	26.1	15.6	19.1	19.8
7/25/06	0.94	52.1	60	19.1	18.7	15.8	2.25	0.521	0.778	0.893	0.976	20.9	20.9
7/17/07	44.4	30.2	19.4	16.1	14.6	12.6	25	13.9	20.1	16.8	10.9	15.6	16.6
7/21/09	85.4	73.9	78.2	49.3	50.2	29.6	55	39.2	26.5	40.5	26.3	22	27.6
7/27/10	25.8	28.7	72	25.3	59	35.3	26.7	16.6	0.503	0.447	5.76	15.2	16.3
7/26/11	<0.084	60.2	58.8	49.7	55.9	51.9	56	57.9	50.6	59.1	59.9	56.5	56.5
7/31/12	106	34.8	54.4	66.1	69	59.9	45.5	32	29.7	29.3	32	32.3	35.1
7/30/13	50	45	73.1	50.4	51.5	51.1	47.5	34.9	30.1	26.4	27.5	40.2	52.1
7/22/14	0.0611	0.0564	0.0543	0.0587	0.0643	0.0321	0.0348						

Table 11: Mainstem Zinc sampled in μg/L.

Date	Mile 1.5	Mile 6.5	Mile 10.1	Mile 12.5	Mile 18.0	Mile 21.0	Mile 23.0	Mile 31.0	Mile 40.0	Mile 43.0	Mile 50.0	Mile 70.0	Mile 82.0
4/11/01	36	19.3	16.3	11.3	11.2	10.7	10.9	11.4	10.3	10.2	10.6	14.5	12.9
4/10/02	107.65	15.19		12.2	12.01	12.06	11.19	12.52	10.09	10.28	10.35	13.35	11.47
4/29/03	140	17	10	10	10	10	11	11	9.7	9.4	10	13	11
4/27/04	47.4	9.2	9.28	9.65	9.79	9.02	9.89	9.95	10.1	9.64	8.83	13.6	11.8
4/26/05	54.4	22	12.3	11.1	11	10.1	11.6	12.7	10.8	10.4	10.9	14	13.2
4/25/06	45.4	32.2	11.1	10.9	11.5	10.6	9.82	12.4	10.1	9.99	11.4	16.9	13.5
5/1/07	111	19.9	9.34	9.34	9.4	8.89	9.23	9.56	8.82	8.64	7.87	13.2	12.3
4/22/08	83.4	25.3	10.8	11.2	9.89	10.5	10.8	14.2	9.25	9.67	10	14.3	12.6
4/28/09	52.7	24	9.57	9.31	9.22	8.58	9.39	11.4	8.53	8.8	9.07	14.8	13.2
4/27/10	48.9	21.1	12.8	11.1	11.8	10.8	11	12.1	10.2	10.2	10	14.4	12.6
4/26/11	174	10.9	10.4	10	10.1	9.53	10.4	11.2	9.56	9.6	10.1	15.2	10.4
5/1/12	68.4	9.46	9.64	9.76	9.86	9.61	10.5	11	9.97	9.8	10.8	14	12.6
5/7/13	21	10	9	9	9	9	10	9	10	10	11	15	13
4/29/14	18.4	18.2	13	11.2	11.1	10.6	11.3	12.2	10.6	10.4	11	14.1	12.6
7/18/00	11.3	9.42	9.77	9.68	9.76	9.65	9.74	9.9	9.88	9.79	10.5	17	12.1
7/24/01	13	11	11	10	11	10	11	10	10	10	10	12	14
7/16/02	15.41	11.2	10.6	10.29	10.4	10.36	10.29	9.4	9.56	9.61	10.22	11.26	11.11
7/22/03	10	10	9.6	9.7	9.5	9.5	9.6	9.6	9.5	9.7	10	12	12
7/20/04	13.1	12.4	10.5	10.2	10.3	10.4	10.2	10.4	10.8	10.2	11.1	12.9	12.8
7/26/05	12.9	9.27	8.93	8.87	9.14	10.2	9.85	9.72	9.58	9.54	10.5	12.5	12.5
7/25/06	13.3	10.4	9.8	9.95	9.85	9.85	9.84	9.76	9.95	9.82	11.1	12.5	12.2
7/17/07	13.9	19.4	9.59	8.52	9.52	9.56	0.917	9.79	20.5	8.54	9.6	12.8	12.7
7/29/08	13.5	10.7	10.5	9.79	10.1	11	10.7	11.1	10.2	10.1	10.8	13.3	12.6
7/21/09	14.9	11.2	11	10.6	10.6	10.9	10.8	11.3	10.6	10.4	11.6	14.3	14.1
7/27/10	17.6	9.39	9.48	9.58	9.31	9.79	9.43	9.59	11.5	11.8	12.3	14.8	14.4
7/26/11	13.2	11.4	11.2	11.3	10	10.1	10.3	10.3	9.91	9.75	10.6	12.4	11.9
7/31/12	12.4	10.4	10.3	10.3	10.6	10.5	10.6	10.6	10.5	10.2	11.2	12.9	13.2
7/30/13	11.2	11.4	11.1	11.2	11.2	11	10.8	11	10.7	11.2	11.8	13.8	13.4
7/22/14	12.1	9.98	9.97	10	10	10.1	10.2	18.5	10	9.76	10.3	12.1	11.7

Table 12: Mainstem Calcium Sampled in mg/L.

Date	Mile 1.5	Mile 6.5	Mile 10.1	Mile 12.5	Mile 18.0	Mile 21.0	Mile 23.0	Mile 31.0	Mile 40.0	Mile 43.0	Mile 50.0	Mile 70.0	Mile 82.0
4/11/01	30.2	27.5	18.7	0.22	0.2	0.41	0.46	0.62	0.39	0.37	0.25	0.09	0.51
4/10/02	7.7	11.97		1.54	0.39	0.25	0.23	0.31	0.19	0.24	0.1	0.24	0.41
4/29/03	3.3	29	0.64	0.46	0.45	0.83	0.44	0.51	0.4	0.43	0.51	0.22	0.36
4/27/04	0.958	1.25	0.763	0.706	0.612	0.715	0.678	0.665	0.501	0.633	1.78	0.376	0.555
4/26/05	30	51.4	5.35	0.934	0.987	1.02	1.03	1.24	0.763	1.69	0.377	0.215	0.234
4/25/06	14.4	128	3.07	0.866	0.964	0.866	0.66	1.06	0.46	0.688	0.147	0.209	0.442
5/1/07	4.44	44.7	0.678	0.741	0.669	0.703	0.53	0.723	0.302	0.643	0.154	0.374	0.755
4/22/08	30.3	80	1.28	0.433	0.385	0.378	0.352	0.582	0.195	0.294	0.11	0.105	0.16
4/28/09	16.1	81	1.83	1.13	1.02	1.17	1.05	2.12	0.264	0.551	0.0135	0.0135	0.0135
4/27/10	37.7	45.2	6.59	0.473	0.455	0.517	1.02	0.746	0.308	0.482	0.273	0.218	0.516
4/26/11	1.7	4.43	1.4	0.65	0.708	0.572	0.685	0.637	0.205	0.518	0.0135	0.0514	0.076
5/1/12	0.53	0.501	0.294	0.227	0.303	0.31	0.328	0.415	0.121	0.181	0.0763	0.0796	0.0879
5/7/13	43	9.1	1.3	1	1	0.79	1.1	1.2	0.34	0.51	0.17	0.03	0.06
4/29/14	10.2	19.5	1.85	2.15	0.458	0.421	0.44	0.632	0.292	0.318	0.236	0.148	0.154
7/18/00	11.9	2.3	1.97	1.6	1.54	1.5	1.19	1.43	1.25	1.32	0.43	0.25	0.15
7/24/01	4.5	1.2	0.718	0.575	0.586	0.582	0.599	0.714	0.531	0.547	0.091	0.101	0.084
7/16/02	5.34	8.42	0.42	0.33	0.3	0.27	0.3	0.25	0.25	0.2	0.05	0.16	0.17
7/22/03	2	3.2	0.87	0.84	0.72	0.76	0.66	0.53	0.52	0.57	0.27	0.23	0.31
7/20/04	12	9.27	0.71	0.62	0.629	0.562	0.625	0.549	0.54	0.503	0.242	0.189	0.199
7/26/05	0.838	0.649	0.728	0.855	0.639	0.404	0.435	0.419	0.42	0.476	0.0888	0.113	0.0867
7/25/06	5.95	3.37	1.55	1.68	1.56	1.4	1.27	1.2	1.01	1.07	0.0628	0.243	0.136
7/17/07	17.6	0.674	0.535	0.728	0.471	0.412	0.404	0.584	41	0.971	0.0793	0.25	0.254
7/29/08	6.48	0.75	0.418	0.859	0.222	0.232	1.1	0.219	0.459	0.281	0.152	0.186	0.195
7/21/09	25.9	0.694	0.445	0.376	0.376	0.391	0.4	0.351	0.417	0.449	0.216	0.0507	0.0135
7/27/10	39.7	1.52	0.815	0.633	0.577	0.575	0.526	0.748	0.183	1.64	0.115	0.0513	0.0135
7/26/11	11.2	1.77	0.849		0.674	0.692	0.65	0.818	0.662	0.687	0.14	0.0135	0.0744
7/31/12	4.28	0.0451	0.347	0.272	0.293	0.38	0.25	0.275	0.254	0.265	0.0678	0.0867	0.0839
7/30/13	0.801	0.479	0.386	0.4	0.418	0.447	0.446	0.436	0.492	0.763	0.239	0.132	0.135
7/22/14	6.76	0.288	0.248	0.247	0.258	0.268	0.292	0.709	0.249	0.304	0.112	0.117	0.122

Table 13: Mainstem iron sampled in mg/L.

Date	Mile 1.5	Mile 6.5	Mile 10.1	Mile 12.5	Mile 18.0	Mile 21.0	Mile 23.0	Mile 31.0	Mile 40.0	Mile 43.0	Mile 50.0	Mile 70.0	Mile 82.0
4/11/01	73.3	17.7	8.5	1.8	1.4	1.3	1.3	1.5	1	1	0.9	1	1
4/10/02	327.6	10.29		2.04	1.58	1.47	1.41	1.39	0.95	0.97	0.8	1.01	0.97
4/29/03	510	15	1.5	1.4	1.4	1.5	1.4	1.3	1	0.98	0.93	0.99	0.94
4/27/04	128	1.86	1.53	1.71	1.52	1.46	1.47	1.45	1.07	1.12	1.83	1.06	1.03
4/26/05	141	22.6	3.6	1.9	1.87	1.84	1.9	1.89	1.18	1.5	0.943	1.06	1.05
4/25/06	110	43.8	2.66	2.07	1.74	1.68	1.46	1.74	1.09	1.15	0.889	1.27	1.17
5/1/07	351	16.8	1.37	1.37	1.35	1.36	1.27	1.28	0.922	0.992	0.743	1.09	1.12
4/22/08	249	30.3	1.91	1.69	1.46	1.5	1.52	1.91	0.933	1.01	0.8	1.06	0.969
4/28/09	141	30.6	1.96	1.64	1.58	1.56	1.61	2.09	0.948	1.04	0.756	1.11	1.03
4/27/10	108	18.2	3.51	1.57	1.65	1.65	1.5	1.66	1.02	0.995	0.799	1.03	0.961
4/26/11	582	3.2	1.89	1.57	1.61	1.46	1.56	1.56	0.962	1.04	0.74	1.06	0.828
5/1/12	193	1.55	1.46	1.41	1.39	1.32	1.49	1.5	0.918	0.943	0.818	1.02	0.972
5/7/13	27	5	2.09	2	2	2	2	1	1	1	<1.0	1	<1.0
4/29/14	21.8	7.51	2.66	1.56	1.5	1.46	1.46	1.57	1.01	1.02	0.0914	1.07	0.972
7/18/00	5.4	1.6	1.4	1.3	1.3	1.3	1.2	1.3	1.1	1.2	0.9	1.3	0.9
7/24/01	9.2	1.1	1	0.979	0.909	1	1	0.962	0.947	0.804	0.729	0.812	0.847
7/16/02	20.29	3.66	0.96	0.92	0.91	0.9	0.88	0.81	0.78	0.76	0.75	0.84	0.82
7/22/03	2.6	1.9	1.1	1	0.95	1	0.97	0.96	0.92	0.93	0.84	0.93	0.94
7/20/04	6.42	3.92	1.03	0.931	0.977	0.963	0.918	0.945	0.983	0.903	0.875	0.97	0.959
7/26/05	2.8	0.969	0.939	0.948	0.965	0.961	0.907	0.906	0.867	0.881	0.844	0.99	0.952
7/25/06	12.5	1.98	1.33	1.38	1.32	1.3	1.2	1.19	1.12	1.13	0.869	1.01	0.969
7/17/07	10.7	3.28	0.958	2.93	0.928	0.917	0.88	1	21.3	1.01	0.747	0.935	0.945
7/29/08	6.38	1.1	0.981	0.919	0.909	0.999	0.95	0.98	0.848	0.87	0.839	1.01	0.956
7/21/09	14.7	1.14	1.05	1.01	1.02	1.05	1.04	0.987	0.986	0.998	1	1.07	1.05
7/27/10	19	1.25	1.02	0.981	0.91	0.969	0.895	0.973	0.846	0.904	0.825	0.977	0.94
7/26/11	6.13	1.5	1.15	1.09	1.06	1.06	1.08	1.15	0.984	1.03	0.86	0.946	0.933
7/31/12	5.68	0.976	0.948	0.967	0.934	0.955	0.935	0.933	0.893	0.864	0.838	0.968	1.01
7/30/13	1.97	1.17	1.11	1.11	1.13	1.16	1.12	1.14	1.08	1.15	1.03	1.16	1.11
7/22/14	4.68	0.965	0.939	0.936	0.953	0.955	0.963	3.21	0.896	0.898	0.861	0.965	0.962

Table 14: Mainstem magnesium sampled in mg/L.

Date	Mile 1.5	Mile 6.5	Mile 10.1	Mile 12.5	Mile 18.0	Mile 21.0	Mile 23.0	Mile 31.0	Mile 40.0	Mile 43.0	Mile 50.0	Mile 70.0	Mile 82.0
4/11/01	<0.10	<0.10	<0.10	<0.10	0.13	<0.10	<0.10	<0.10	<0.10	0.17	0.17	0.32	0.24
4/10/02	0.2	<0.10		<0.10	0.11	0.15	0.13	0.14	0.22	0.22	0.22	0.27	0.22
4/29/03	0.16	<0.10	<0.10	<0.10	0.11	<0.10	<0.10	0.12	0.14	0.17	0.15	0.4	0.25
4/27/04	0.272	<0.015	0.113	0.115	0.131	0.115	0.116	<0.015	0.198	0.206	0.255	0.456	0.271
4/26/05	0.147	<0.015	0.134	0.156	0.184	0.163	0.143	0.142	0.245	0.264	0.24	0.706	0.29
4/25/06	<0.015	<0.015	<0.015	<0.015	0.112	<0.015	<0.015	<0.015	0.152	0.162	0.205	0.409	0.275
5/1/07	0.172	<0.015	0.112	<0.015	0.12	0.14	0.114	0.149	0.211	0.208	0.112	0.516	0.27
4/22/08	0.125	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.141	0.143	0.174	0.293	0.201
4/28/09	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	0.156	0.175	0.158	0.365	0.234
4/27/10	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	0.141	0.176	0.142	0.337	0.217
4/26/11	0.158	0.115	0.125	0.12	0.138	0.12	0.112	0.112	0.193	0.212	0.144	0.554	0.217
5/1/12	<0.015	<0.015	<0.015	<0.015	0.106	0.115	<0.015	0.144	0.197	0.215	0.181	0.524	0.227
5/7/13	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	0.113	0.135	0.188	0.352	0.229
4/29/14	<0.015	<0.015	<0.015	<0.015	<0.015	0.152	<0.015	<0.015	0.172	0.182	0.193	0.315	0.246
7/18/00	0.18	0.15	0.16	0.15	0.15	0.14	0.15	0.16	0.19	0.17	0.18	0.2	0.21
7/24/01	0.25	0.22	0.23	0.22	0.23	0.23	0.17	0.21	0.15	0.25	0.26	0.27	0.29
7/16/02	0.1	<0.10	0.15	0.17	0.23	0.15	0.16	0.2	0.15	0.16	0.18	0.25	0.26
7/22/03	0.16	0.19	0.18	0.18	0.15	0.18	0.17	0.16	0.17	0.18	0.18	0.24	0.24
7/20/04	0.125	0.102	0.143	0.155	0.156	0.158	0.182	0.149	0.152	0.159	0.161	0.203	0.229
7/26/05	<0.10	<0.10	0.119	0.124	0.135	0.121	0.119	0.108	0.119	0.132	0.137	0.196	0.251
7/25/06	0.108	0.119	0.51	0.13	0.152	0.136	0.136	0.139	0.141	0.141	0.169	0.242	0.251
7/17/07	<0.015	0.151	0.156	0.133	0.176	0.171	0.18	0.177	0.143	0.136	0.146	0.272	0.268
7/29/08	0.105	0.144	0.15	0.15	0.169	0.154	0.157	0.136	0.172	0.157	0.179	0.244	0.248
7/21/09	<0.015	0.123	0.141	0.158	0.149	0.149	0.138	0.145	0.155	0.136	0.133	0.209	0.222
7/27/10	<0.015	0.128	0.367	0.179	0.557	0.153	0.163	0.149	0.161	0.16	0.201	0.231	0.229
7/26/11	0.105	0.149	0.152	0.151	0.158	0.151	0.149	0.144	0.154	0.149	0.157	0.231	0.228
7/31/12	0.149	0.159	0.166	0.161	0.172	0.156	0.153	0.165	0.168	0.168	0.18	0.234	0.236
7/30/13	0.146	0.148	0.148	0.149	0.155	0.146	0.137	0.135	0.154	0.146	0.151	0.201	0.195
7/22/14	<0.015	0.142	0.15	0.177	0.158	0.152	0.134	<0.015	0.139	0.137	0.147	0.218	0.222

Table 15: Mainstem nitrate sampled in mg/L.

Date	Mile 1.5	Mile 6.5	Mile 10.1	Mile 12.5	Mile 18.0	Mile 21.0	Mile 23.0	Mile 31.0	Mile 40.0	Mile 43.0	Mile 50.0	Mile 70.0	Mile 82.0
4/11/01	0.91	0.84	0.75	0.06	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
4/10/02	0.35	0.48		0.06	0.02	0.02	0.02	0.01	0.01	0.01	<0.01	0.01	0.01
4/29/03	0.22	0.93	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
4/27/04	0.056	0.046	0.048	0.045	0.039	0.051	0.039	0.039	<0.0020	<0.0020	0.065	<0.0020	<0.0020
4/26/05	0.89	1.42	0.29	0.11	<0.025	0.15	0.11	0.1	<0.025	0.1	<0.025	<0.025	<0.025
4/25/06	0.66	0.52	<0.026	<0.026	<0.026	<0.026	<0.026	0.058	<0.026	<0.026	<0.026	<0.026	<0.026
5/1/07	<0.026	2.3	<0.026	<0.026	<0.026	<0.026	<0.026	<0.026	<0.026	<0.026	<0.026	<0.026	<0.026
4/22/08	1.4	3.4	0.067	<0.051	<0.051	<0.051	<0.051	<0.051	<0.051	<0.051	<0.051	<0.051	<0.051
4/28/09	<0.026	0.42	0.15	0.093	0.055	0.072	<0.026	<0.026	<0.026	<0.026	<0.026	<0.026	<0.026
4/27/10	2	1.7	0.31	<0.026	<0.026	<0.026	0.063	0.11	<0.026	<0.026	<0.026	<0.026	<0.026
4/26/11	0.14	0.21	0.087	0.061	<0.026	0.06	<0.026	0.062	<0.026	<0.026	<0.026	<0.026	<0.026
5/1/12	<0.026	<0.026	<0.026	<0.026	<0.026	<0.026	<0.026	<0.026	<0.026	<0.026	<0.026	<0.026	<0.026
5/7/13	1.9	0.31	0.078	0.064	0.055	<0.026	<0.026	<0.026	<0.026	<0.026	<0.026	<0.026	<0.026
4/29/14	4	2.4	0.12	<0.26	<0.26	<0.26	<0.26	<0.26	<0.26	<0.26	<0.26	<0.26	<0.26
7/18/00	0.81	0.11	0.09	0.06	0.06	0.07	0.06	0.05	0.04	<0.04	<0.04	<0.04	<0.04
7/24/01	0.221	0.093	0.072	0.064	0.08	0.018	0.019	0.039	0.019	0.018	<0.010	<0.010	
7/16/02	0.42	0.3	0.01	0.02	0.01	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
7/22/03	0.085	0.12	0.049	0.036	0.03	0.049	0.032	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
7/20/04	0.507	0.267	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
7/26/05	1.1	0.099	<0.051	<0.051	<0.051	<0.051	<0.051	<0.051	<0.051	<0.051	<0.051	<0.051	<0.051
7/25/06	0.32	0.15	0.084	0.077	<0.026	<0.026	<0.026	0.098	<0.026	0.091	0.08	<0.026	<0.026
7/17/07	1	0.14	<0.026	<0.026	<0.026	<0.026	<0.026	<0.026	<0.026	<0.026	<0.026	<0.026	<0.026
7/29/08	0.92	0.065	<0.026	<0.026	<0.026	<0.026	<0.026	<0.026	<0.026	<0.026	<0.026	<0.026	<0.026
7/21/09	1.3	0.075	<0.026	<0.026	<0.026	<0.026	<0.026	<0.026	<0.026	<0.026	<0.026	<0.026	<0.026
7/27/10	2.7	0.082	<0.026	<0.026	<0.026	<0.026	<0.026	<0.026	0.059	0.08	<0.026	<0.026	<0.026
7/26/11	0.51	0.18	<0.026	<0.026	0.08	<0.026	<0.026	<0.026	<0.026	<0.026	<0.026	<0.026	<0.026
7/31/12	1.1	<0.026	<0.026	<0.026	<0.026	<0.026	<0.026	<0.026	<0.026	<0.026	<0.026	<0.026	<0.026
7/30/13	0.054	<0.026	<0.026	<0.026	<0.026	<0.026	<0.026	<0.026	<0.026	<0.026	<0.026	<0.026	<0.026
7/22/14	0.98	<0.026	<0.026	<0.026	<0.026	<0.026	<0.026	<0.026	<0.026	<0.026	<0.026	<0.026	<0.026

Table 16: Mainstem phosphorus sampled in mg/L.

Date	Mile 1.5	Mile 6.5	Mile 10.1	Mile 12.5	Mile 18.0	Mile 21.0	Mile 23.0	Mile 31.0	Mile 40.0	Mile 43.0	Mile 50.0	Mile 70.0	Mile 82.0
4/11/01	0.29	<0.25	0.27	<0.27	<0.25	<0.25	<0.27	0.29	<0.27	<0.27	<0.25	<0.27	<0.27
4/10/02	<0.26	<0.27		<0.26	<0.25	<0.26	<0.27	<0.25	<0.25	<0.25	<0.25	<0.29	<0.29
4/29/03	<0.39	<0.39	<0.44	<0.42	<0.43	<0.43	<0.43	<0.43	<0.43	<0.42	<0.42	<0.39	<0.40
4/27/04	<0.024	<0.020	<0.022	<0.022	<0.022	<0.021	<0.020	<0.022	<0.020	<0.021	<0.020	<0.021	<0.022
4/26/05	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060
7/18/00	<0.29	<0.28	<0.27	<0.29	<0.28	<0.30	<0.25	<0.25	<0.27	<0.27	<0.25	<0.28	<0.27
7/24/01	<0.27	<0.26	<0.26	<0.26	<0.25	<0.26	<0.27	<0.27	<0.26	<0.27	<0.26	<0.27	<0.27
7/16/02	<0.26	<0.26	<0.28	<0.26	<0.27	<0.30	<0.26	<0.27	<0.26	<0.27	<0.25	<0.26	<0.25
7/22/03	<0.38	<0.38	<0.41	<0.40	<0.42	<0.40	<0.41	<0.43	<0.42	<0.40	<0.40	<0.41	<0.41
7/20/04	<0.021	<0.021	<0.022	<0.022	<0.023	<0.024	<0.022	<0.023	<0.021	<0.024	<0.020	<0.023	<0.023
7/26/05	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
7/25/06	<0.0065	<0.0064	<0.0065	<0.0066	<0.0065	<0.0065	<0.0064	<0.0064	<0.0064	<0.0065	<0.0064	<0.0064	<0.0064
7/17/07	<0.0063	<0.0064	<0.0065	<0.0066	<0.0065	<0.0064	<0.0064	<0.0063	<0.0062	<0.0063	<0.0062	<0.0063	<0.0064

Table 17: Mainstem Diesel Range Organics Sampled in mg/L.

Date	Mile 1.5	Mile 6.5	Mile 10.1	Mile 12.5	Mile 18.0	Mile 21.0	Mile 23.0	Mile 31.0	Mile 40.0	Mile 43.0	Mile 50.0	Mile 70.0	Mile 82.0
4/11/01	<25.0	<25.0	<25.0	<25.0	<25.0	<25.0	<25.0	<25.0	<25.0	<25.0	<25.0	<25.0	<25.0
4/10/02	<25.0	<25.0		<25.0	<25.0	<25.0	<25.0	<25.0	<25.0	<25.0	<25.0	<25.0	<25.0
4/29/03	<25.0	<25.0	<25.0	<25.0	<25.0	<25.0	<25.0	<25.0	<25.0	<25.0	<25.0	<25.0	<25.0
4/27/04	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
7/18/00	<25.0	<25.0	<25.0	<25.0	<25.0	<25.0	<25.0	<25.0	<25.0	<25.0	<25.0	<25.0	<25.0
7/24/01	26.7	27.1	<25.0	<25.0	<25.0	<25.0	<25.0	<25.0	<25.0	<25.0	<25.0	<25.0	<25.0
7/16/02	38.3	27.4	<25.0	<25.0	<25.0	<25.0	<25.0	<25.0	<25.0	<25.0	<25.0	<25.0	<25.0
7/22/03	<25.0	<25.0	26.4	<25.0	<25.0	<25.0	<25.0	<25.0	<25.0	<25.0	<25.0	<25.0	<25.0
7/26/05	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100

Table 18: Mainstem Gasoline Range Organics sampled in μg/L.

Date	Mile 1.5	Mile 6.5	Mile 10.1	Mile 12.5	Mile 18.0	Mile 21.0	Mile 23.0	Mile 31.0	Mile 40.0	Mile 43.0	Mile 50.0	Mile 70.0	Mile 82.0
4/11/01	<2.53	<2.53	<2.53	<2.66	<2.53	<2.53	<2.70	<2.53	<2.70	<2.70	<2.53	<2.66	<2.66
4/10/02	<2.58	<2.69		<2.58	<2.53	<2.58	<2.66	<2.53	<2.53	<2.53	<2.53	<2.94	<2.91
4/29/03	<2.59	<2.63	<2.91	<2.81	<2.84	<2.84	<2.84	<2.84	<2.84	<2.81	<2.81	<2.58	<2.65
4/27/04	<0.037	<0.032	<0.034	<0.034	<0.034	<0.032	<0.032	<0.034	<0.032	<0.032	<0.032	<0.033	<0.034
4/26/05	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
7/18/00	<3.39	<3.28	<3.24	<3.43	<3.26	<3.51	4.75	<2.98	<3.17	<3.19	<2.98	<3.28	<3.17
7/24/01	<2.69	<2.58	<2.58	<2.58	<2.53	<2.63	<2.69	<2.69	<2.63	<2.66	<2.63	<2.69	<2.69
7/16/02	<2.55	<2.55	<2.81	<2.63	<2.72	<3.01	<2.60	<2.75	<2.60	<2.69	<2.53	<2.60	<2.53
7/22/03	<2.53	<2.53	<2.75	<2.69	<2.78	<2.69	<2.72	<2.87	<2.78	<2.69	<2.69	<2.75	<2.75
7/20/04	<0.032	<0.033	<0.034	<0.034	<0.036	<0.037	<0.034	<0.036	<0.033	<0.037	<0.032	<0.036	<0.036
7/26/05	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
7/25/06	<0.22	<0.22	<0.22	<0.22	<0.22	<0.22	<0.22	<0.22	<0.21	<0.22	<0.21	<0.22	<0.22
7/17/07	<0.21	<0.21	<0.22	<0.22	<0.22	<0.21	<0.21	<0.21	<0.21	<0.21	<0.21	<0.21	<0.22

Table 19: Mainstem Residual Range Organics sampled in mg/L.

Date	Mile 1.5	Mile 6.5	Mile 10.1	Mile 12.5	Mile 18.0	Mile 21.0	Mile 23.0	Mile 31.0	Mile 40.0	Mile 43.0	Mile 50.0	Mile 70.0	Mile 82.0
4/11/01	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
4/10/02	<0.50	<0.50		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
4/29/03	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
4/27/04	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15
4/26/05	<0.074	<0.074	<0.074	<0.074	<0.074	<0.074	<0.074	<0.074	<0.074	<0.074	<0.074	<0.074	<0.074
7/18/00	1.22	1.56	1.09	1.06	0.2	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
7/24/01	1.28	1.7	1.12	0.87	0.49	<0.30	<0.30	<0.30	0.3	0.3	<0.30	<0.30	<0.30
7/16/02	2.2	1.31	1.33	0.9	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
7/22/03	<0.50	0.65	1.15	0.76	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
7/20/04	2.2	1.1	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15
7/26/05	1.4	1	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
7/25/06	<0.074	1.7	1	<0.074	<0.074	<0.074	<0.074	<0.074	<0.074	<0.074	<0.074	<0.074	<0.074
7/17/07	<0.074	1.1	<0.074	<0.074	<0.074	<0.074	<0.074	<0.074	<0.074	<0.074	<0.074	<0.074	<0.074
7/29/08	<0.074	<0.074	<0.074	<0.074	<0.074	<0.074	<0.074	<0.074	<0.074	<0.074	<0.074	<0.074	<0.074
7/21/09	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
7/27/10	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
7/26/11	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
7/31/12	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
7/30/13	<0.30	<0.30							<0.30	<0.30			
7/22/14	<0.30	<0.30							<0.30	<0.30			

Table 20: Mainstem benezene sampled in μg/L.

Date	Mile 1.5	Mile 6.5	Mile 10.1	Mile 12.5	Mile 18.0	Mile 21.0	Mile 23.0	Mile 31.0	Mile 40.0	Mile 43.0	Mile 50.0	Mile 70.0	Mile 82.0
4/11/01	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
4/10/02	<0.50	<0.50		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
4/29/03	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
4/27/04	<0.24	<0.24	<0.24	<0.24	<0.24	<0.24	<0.24	<0.24	<0.24	<0.24	<0.24	<0.24	<0.24
4/26/05	<0.078	<0.078	<0.078	<0.078	<0.078	<0.078	<0.078	<0.078	<0.078	<0.078	<0.078	<0.078	<0.078
7/18/00	4.77	5.91	4.35	4.27	1.28	0.62	<0.50	<0.50	<0.50	1.08	<0.50	<0.50	<0.50
7/24/01	4.2	5.45	3.67	2.86	1.56	0.84	0.67	0.63	0.7	0.65	<0.50	<0.50	<0.50
7/16/02	6.39	3.75	3.77	2.58	1.23	0.93	0.85	0.66	1	0.84	<0.50	<0.50	<0.50
7/22/03	<0.50	1.78	3.23	2.14	0.71	0.4	0.46	<0.50	<0.50	<0.50	<0.50	<0.50	0.49
7/20/04	5.9	3.2	2.8	1.8	1.5	<0.24	<0.24	<0.24	<0.24	<0.24	<0.24	<0.24	<0.24
7/26/05	3.5	2.5	2.3	2.1	<1.0	<1.0	<1.0	<1.0	1.8	<1.0	<1.0	<1.0	<1.0
7/25/06	<0.078	3.9	2.6	2.2	<0.078	<0.078	<0.078	<0.078	<0.078	<0.078	<0.078	<0.078	<0.078
7/17/07	<0.078	<0.078	<0.078	<0.078	<0.078	<0.078	<0.078	<0.078	<0.078	<0.078	<0.078	<0.078	<0.078
7/29/08	<0.078	<0.078	<0.078	<0.078	<0.078	<0.078	<0.078	<0.078	<0.078	<0.078	<0.078	<0.078	<0.078
7/21/09	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
7/27/10	<0.35	<0.35	<0.35	<0.35	<0.35	<0.35	<0.35	<0.35	<0.35	<0.35	<0.35	<0.35	<0.35
7/26/11	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
7/31/12	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
7/30/13	<0.30	<0.30							<0.30	<0.30			
7/22/14	<0.30	<0.30							<0.30	<0.30			

Table 21: Mainstem toluene sampled in μg/L.

Date	Mile 1.5	Mile 6.5	Mile 10.1	Mile 12.5	Mile 18.0	Mile 21.0	Mile 23.0	Mile 31.0	Mile 40.0	Mile 43.0	Mile 50.0	Mile 70.0	Mile 82.0
4/11/01	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.30	<0.30	<0.30
4/10/02	<0.50	<0.50		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
4/29/03	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
4/27/04	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18
4/26/05	<0.088	<0.088	<0.088	<0.088	<0.088	<0.088	<0.088	<0.088	<0.088	<0.088	<0.088	<0.088	<0.088
7/18/00	0.56	0.51	0.31	0.31	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
7/24/01	0.5	0.66	0.43	0.33	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
7/16/02	1.09	0.65	0.66	0.461	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
7/22/03	<0.50	<0.50	0.5	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
7/20/04	1	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18
7/26/05	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
7/25/06	<0.088	<0.088	<0.088	<0.088	<0.088	<0.088	<0.088	<0.088	<0.088	<0.088	<0.088	<0.088	<0.088
7/17/07	<0.088	<0.088	<0.088	<0.088	<0.088	<0.088	<0.088	<0.088	<0.088	<0.088	<0.088	<0.088	<0.088
7/29/08	<0.46	<0.46	<0.46	<0.46	<0.46	<0.46	<0.46	<0.46	<0.46	<0.46	<0.46	<0.46	<0.46
7/21/09	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
7/27/10	<0.46	<0.46	<0.46	<0.46	<0.46	<0.46	<0.46	<0.46	<0.46	<0.46	<0.46	<0.46	<0.46
7/26/11	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
7/31/12	<0.30	<0.30	1.5	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
7/30/13	<0.30	<0.30							<0.30	<0.30			
7/22/14	<0.30	<0.30							<0.30	<0.30			

Table 22: Mainstem ethylbenzene sampled in μg/L.

Date	Mile 1.5	Mile 6.5	Mile 10.1	Mile 12.5	Mile 18.0	Mile 21.0	Mile 23.0	Mile 31.0	Mile 40.0	Mile 43.0	Mile 50.0	Mile 70.0	Mile 82.0
4/11/01	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
4/10/02	<1.00	<1.00		<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
4/29/03	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
4/26/05	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
7/18/00	2.49	2.91	1.97	1.96	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
7/24/01	2.25	2.84	1.89	1.51	0.84	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
7/16/02	3.84	2.41	2.33	1.71	<1.00	<1.00	<1.00	<1.00	1.04	<1.00	<1.00	<1.00	<1.00
7/22/03	<1.00	1.14	1.8	1.27	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
7/20/04	3.8	2	<0.41	<0.41	<0.41	<0.41	<0.41	<0.41	<0.41	<0.41	<0.41	<0.41	<0.41
7/26/05	2.4	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
7/25/06	<0.20	2.5	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20		
7/17/07	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
7/29/08	<0.20	<0.20	<0.20	<0.20	<0.20	2.6	<0.20	3	<0.20	<0.20	<0.20	<0.20	<0.20
7/21/09	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
7/27/10	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
7/26/11	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
7/31/12	<0.50	<0.50	5.4	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
7/30/13	<0.50	<0.50							<0.50	<0.50			
7/22/14	<0.50	<0.50							<0.50	<0.50			

Table 23: Mainstem M,P-Xylene sampled in μg/L.

Date	Mile 1.5	Mile 6.5	Mile 10.1	Mile 12.5	Mile 18.0	Mile 21.0	Mile 23.0	Mile 31.0	Mile 40.0	Mile 43.0	Mile 50.0	Mile 70.0	Mile 82.0
4/11/01	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
4/10/02	<0.50	<0.50		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
4/29/03	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
4/26/05	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
7/18/00	1.06	1.22	0.87	0.84	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
7/24/01	1.01	1.2	0.79	0.61	0.36	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
7/16/02	1.68	1	0.98	0.69	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
7/22/03	<0.50	0.4911	0.79	0.55	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
7/20/04	1.5	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
7/26/05	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
7/25/06	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20		
7/17/07	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
7/29/08	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
7/21/09	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
7/27/10	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
7/26/11	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
7/31/12	<0.20	<0.20	1.2	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
7/30/13	<0.20	<0.20							<0.20	<0.20			
7/22/14	<0.20	<0.20							<0.20	<0.20			

Table 24: Mainstem O-Xylene sampled in μg/L.

Date	Mile 1.5	Mile 6.5	Mile 10.1	Mile 12.5	Mile 18.0	Mile 21.0	Mile 23.0	Mile 31.0	Mile 40.0	Mile 43.0	Mile 50.0	Mile 70.0	Mile 82.0
4/11/01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4/10/02	ND	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4/29/03	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4/27/04	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4/26/05	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
7/18/00	10.1	12.11	8.59	8.44	1.48	0.62	ND	ND	ND	1.08	ND	ND	ND
7/24/01	9.24	11.85	7.9	6.18	3.25	0.84	0.67	0.63	1	0.95	ND	ND	ND
7/16/02	15.2	9.12	9.07	6.34	1.23	0.93	0.85	0.66	2.04	0.84	ND	ND	ND
7/22/03	ND	4.06	7.47	4.72	0.71	0.4	0.46	ND	ND	ND	ND	ND	0.49
7/20/04	14.4	6.3	2.8	1.8	1.5	ND	ND	ND	ND	ND	ND	ND	ND
7/26/05	7.3	3.5	2.3	2.1	ND	ND	ND	ND	1.8	ND	ND	ND	ND
7/25/06	1.5	8.1	3.6	2.2	ND	ND	ND	ND	ND	ND	ND	ND	ND
7/17/07	2.2	6.1	2.6	1.8	ND	ND	ND	ND	ND	ND	ND	ND	ND
7/29/08	ND	1.3	ND	ND	ND	3.6	ND	3.8	ND	ND	1.2	ND	ND
7/21/09	ND	0.75	0.61	0.59	ND	ND	ND	ND	ND	ND	ND	ND	ND
7/27/10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
7/26/11	0.35	0.62	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
7/31/12	ND	ND	8.1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
7/30/13	ND	ND							ND	ND			

Table 25: Mainstem Total BTEX sampled in μg/L.

Date	Mile 1.5	Mile 6.5	Mile 10.1	Mile 12.5	Mile 18.0	Mile 21.0	Mile 23.0	Mile 31.0	Mile 40.0	Mile 43.0	Mile 50.0	Mile 70.0	Mile 82.0
4/11/01	80	320	260	29	32	18	5	50	<1	10	<1	<1	<1
4/10/02	<1	64		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
4/29/03	2	13	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
4/27/04	17	19	2	3	4	<1	2	7	<1	<1	<1	3	3
4/26/05	120	18	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
4/25/06	52	102	<1	2	3	10	13	3	<1	<1	<1	<1	<1
5/1/07	20	32	2	2	2	8	<1	<1	<1	<1	<1	<1	<1
4/22/08	32	50	10	10	25	14	0	44	0	0	0	0	0
4/28/09	15	29	10	4	2	10	2	0	0	0	0	0	0
4/27/10	40	280	120	15	14	23	11	4	<1	<1	1	<1	0
4/26/11	13	25	12	40	17	22	80	<1	<1	3	<1	4	6
5/1/12	20	15	17	65	7	3	6	14	0	0	0	0	1
5/7/13	30	95	15	49	22	8	31	18	4	12	0	0	<1
4/29/14	110	34	40	0	1	1	1	3	0	2	0	0	<1
7/18/00	14	15	8	10	2	4	4	<1	10	4	<1	2	8
7/24/01	40	<1	10	<1	<1	<1	<1	10	10	<1	<1	10	<1
7/16/02	<1	2980	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
7/22/03	50	580	9	20	9	9	<1	20	<1	9	<1	9	<1
7/20/04	130	200	18	<1	18	55	<1	<1	170	27	<1	<1	9
7/26/05	36	23	15	12	23	9.3	12	33	17	20	<1	12	<1
7/25/06	67	110	80	97	72	100	190	51	20	96	<1	32	6
7/17/07	54	34	4	22	1	<1	3	8	11	21	1	3	2
7/29/08	120	11	6	4	4	5	0	2	2	1	0	1	0
7/21/09	225	57	11	6	3	2	2	9	5	4	13	2	<1
7/27/10	137	20	21	10	11	9	8	8	<1	<1	1	2	<1
7/26/11	70	9	6	1	5	3	14	4	2	2	0	3	1
7/31/12	36	8	3	2	6	3	6	1	2	4	<1	<1	<1
7/30/13	68	13	2	2	2	<1	3	6	8	13	<1	3	<1
7/22/14	111	6	2	1	0	3	2	3	3	2	0	2	0

Table 26: Mainstem Fecal Coliform Bacteria sampled in CFU/100mL.

Date	Mile 1.5	Mile 6.5	Mile 10.1	Mile 12.5	Mile 18.0	Mile 21.0	Mile 23.0	Mile 31.0	Mile 40.0	Mile 43.0	Mile 50.0	Mile 70.0	Mile 82.0
4/11/01	7.21	7.46	7.8	7.66	7.61	7.5	7.86	7.34	7.7	7.9	8	8.07	8.11
4/10/02	6.89	7.98		7.9	7.36	7.61	7.75	7.8	7.7	7.66	7.89	7.05	7.28
4/29/03	7.84	7.63	7.79	7.85	7.91	8.12	7.81	7.57	7.56	7.46	7.41	7.84	7.74
4/27/04	7.45	7.2	6.75	6.4	6.64	6.89	6.95	6.93	6.73	6.33	6.84	6.93	6.8
4/26/05	7.75	7.29	7.07	7.06	7.13	7.33	7.47	6.79	7.26	7.28	7.5	7.32	6.93
4/25/06	7.28	7.13	7	7.05	7.1	6.97	7.08	7.07	7.02	6.93	6.82	6.95	6.89
5/1/07	7.97	7.61	7.31	7.4	7.52	7.67	7.45	7.41	7.38	7.35	7.6	7.27	7.41
4/22/08	7.79	7.68	7.5	7.38	7.4	7.31	7.63	7.27	7.32	7.23	7.4	7.4	7.46
4/28/09	7.82	7.64	7.4	7.41	7.32	7.45	7.22	7.31	7.35	7.35	7.53	7.58	7.43
4/27/10	7.21	7.25	7.5	7.47	7.46	7.51	7.91	7.52	7.44	7.35	7.57	7.52	7.42
4/26/11	7.8	7.5	7.5	7.4	7.5	7.5	7.6	7.5	7.5	7.4	7.7	7.5	7.6
5/1/12	7.63	7.33	7.35	7.45	7.52	7.37	7.78	7.37	7.38	7.27	7.34		7.33
5/7/13	7.41	7.15	7.1	7.18	7.11	7.24	7.07	7.03	6.8	7.23	7.22	7.28	7.22
4/29/14	7.47	5.7	7.28	3.84	7.69	8.78	8.12	7.66	7.23	7.41	7.63	7.6	7.45
7/18/00	7.85	7.71	7.58	7.61	7.6	7.15	7.14	6.75	7.08	7.22	7.29	7.95	8
7/24/01	7.35	7.77	7.5	7.71	7.58	7.49	7.51	7.6	7.57	7.51	7.94	8.37	7.81
7/16/02	7.4	7.67	7.91	7.78	7.72	7.76	Not Reported	7.62	8.27	8.18	8.52	7.79	7.8
7/22/03	7.4	7	7.3	7.2	7.3	7.4	7.4	7.4	7.7	7.3	7.5	7.5	7.4
7/20/04	7.2	7.42	7.5	7.38	7.26	7.57	7.67	7.21	7.49	7.51	7.33	7.34	7.2
7/26/05	7.63	6.95	7.04	6.97	7.22	7.52	7.5	7.58	7.58	7.61	7.6	7.66	7.59
7/25/06	7.57	7.48	7.26	7.6	7.19	7.16	7.6	7.51	7.64	7.6	7.75	7.62	7.5
7/17/07	7.5	7.24	7.46	7.48	7.5	7.46	7.69	7.47	7.61	7.62	7.8	7.47	7.46
7/29/08	7.47	7.26	7.29	7.39	7.46	7.48	7.49	7.42	7.53	7.54	7.28	7.53	7.54
7/21/09	7.66	7.31	7.38	7.38	7.45	7.52	7.46	7.49	7.44	7.5	7.4	7.58	7.58
7/27/10	7.36	7.15	6.16	6.99	7.03	7.31	7.33	7.08	7.31	7.16	7.16	7.27	7.19
7/26/11	7.59		7.48	7.54	7.61	7.57			7.59	7.55	7.59	7.72	7.78
7/31/12	7.45	7.36	7.35	7.44	7.33	7.42	7.38	7.34	7.32	7.23	7.53	7.33	7.32
7/30/13	7.92	8.62	8.02	8.17	8.08	7.91	8.29	7.88	8.3	8.16	7.79	7.77	7.98
7/22/14	7.33	7.41	7.47	7.41	7.39	7.37	7.51		7.42	7.38	7.52	7.36	7.37

Table 27: Mainstem pH

Date	Mile 1.5	Mile 6.5	Mile 10.1	Mile 12.5	Mile 18.0	Mile 21.0	Mile 23.0	Mile 31.0	Mile 40.0	Mile 43.0	Mile 50.0	Mile 70.0	Mile 82.0
4/11/01	3810	401	137	95	79.7	79.2	75.2	76.4	66.1	54.8	64.7	89.2	86.6
4/10/02	14675	338		47.1	73.5	68	68.5	75	65.1	65	62.5	101	90.4
4/29/03	21100	330	69.7	69.1	70	63.6	71.9	70.8	57.9	55.7	45.6	74	66.7
4/27/04	6350	52.8	51	52.2	51.3	54.1	57.4	58.5	49.4	47.2	37.7	83	75.7
4/26/05	6420	118.3	76.6	74.8	75.5	72.6	77	84.3	66.8	66.8	65.3	84.3	79.2
4/25/06	5110	265	82.3	84	78.2	74.1	78.1	82.4	68	68.2	67.9	96.2	84.6
5/1/07	18615	92.1	75.3	74.2	75.4	75.2	130.6	75	70	68.5	59.6	90.1	83.1
4/22/08	10913	123.3	76.9	76	75.3	80.9	78.2	77.4	65.2	66.1	65.8	91.4	95.5
4/28/09	8247	178	73.3	70.2	89.7	74.7	88.8	76.6	63.8	62.8	60.3	90.2	87.4
4/27/10	5030	146	77	76	76	76	75	82	69	65	64	87	78
4/26/11	29398	105	74	76	75	71	75	80	64	64	63	94	81
5/1/12	10382	72.8	71.9	71	71.6	69.4	73.8	75	66.9	66.1	65.8		81.4
5/7/13	600.4	84.5	59.8	59.2	63.3	66.7	63.3	59.6	63.1	66	67.8	88.9	75.5
4/29/14	790.4	160.4	101.9	171.8	73.4	68.5	71.8	75	64.3	62.9	62.8	81.6	75.1
7/18/00	80	50	50	50	50	50	40	52	40	50	50	60	60
7/24/01	466.2	79.6	79.6	80.8	86.9	68.4	69.1	70.3	68.6	68.3	72.3	79.9	81.3
7/16/02	850.4	65.8	56.3	56.2	55.8	58.8	59	62.5	61.7	61.4	62.8	70.4	69.5
7/22/03	126	72.9	62.8	64.2	63.9	65	64.1	64.7	59.4	58.9	60.3	72.8	73
7/20/04	141.9	71.5	63	65.1	60.4	67.7	68.1	59.7	60.3	60.3	66.3	75	72.2
7/26/05	338	92.2	66.1	66.8	68.6	65.7	64.4	65.4	64.2	63.8	66.2	81.2	79
7/25/06	156.1	62.3	62.6	62	62.2	62.5	63.3	62.7	62.2	61.4	65.8	78.3	77.6
7/17/07	326	64	64	64	67	62	62	65	64	61	67	84	84
7/29/08	297.7	68.3	77.7	69.2	68.5	68.6	69.3	70.4	67.8	65.1	69.7	83.1	83.4
7/21/09	383.2	65.7	65.9	66.4	65.2	65.9	66	65.6	65.2	63.6	66.7	80.8	81.1
7/27/10	363	66	70	65	65	66	65	65	65	62	67	78	79
7/26/11	140.8	68	68.3	67.9	69	69.6	70	69.2	67.2	65.8	70.3	83.4	83.3
7/31/12	235.8	68.8	68.7	68.4	68.7	68.9	68.3	69	67.4	66.8	70	82.3	81.2
7/30/13	96.8	69.9	82.5	69.4	69.5	68.8	69.1	68.7	69.3	66.5	71.2	81.6	81.2
7/22/14	120	57.1	56.4	56.9	56.9	55.6	60.9		55.9	52.7	57	67.3	65.7

Table 28: Mainstem specific conductance sampled in μS/cm.

Date	Mile 1.5	Mile 6.5	Mile 10.1	Mile 12.5	Mile 18.0	Mile 21.0	Mile 23.0	Mile 31.0	Mile 40.0	Mile 43.0	Mile 50.0	Mile 70.0	Mile 82.0
4/11/01	838	670.7	401.3	32	19.3	4	2.7	3.3	8	7.3	2.7	2.7	2.7
4/10/02	236.7	228.7		30.7	7.3	5.3	2.7	0.7	0.7	2.7	2	5.3	1.3
4/29/03	138	663.3	2.7	45.8	0.7	0.7	0.7	1	0.7	0.7	5.3	1.3	0.7
4/27/04	30	13.3	6	3.3	1.3	10	0.7	3.2	1.3	<0.7	<0.7	1.3	0.7
4/26/05	1370	1390	71.1	15.6	18.1	45.6	9.84	16.3	17.4	25.2	1.79	1.84	<0.48
4/25/06	889.5	2073	41	3.5	5	6	4	Lab Error	11.5	12.5	0.5	1.5	1.5
5/1/07	131	1133	34	16	18.5	7.5	9	16	9	23	2.5	4	2.5
4/22/08	630	1918	57.5	8.5	5.5	5.5	3.2	2	4	15	3.4	3.4	4.8
4/28/09	764	1602	77	20.6	3.2	19.8	15.4	14	0	21.6	2	0	0
4/27/10	1976	1494	260	12.8	9	6.2	7.2	7.4	3.4	8.4	3	2.2	1.8
4/26/11	60	130	51	13	11.2	20	10.2	9.2	8.8	11.7	1.7	1.8	0.8
5/1/12	45	45.5	6.6	7.6	8.8	9.4	7.8	7.8	4.2	9	2.7	4.3	3.5
5/7/13	916	139.5	47	17.3	11	9	9.7	8.7	4.3	7	2.8	3	2.6
4/30/14	1858	2478	100	6.8	8.4	5.6	11	5.8	7.8	10	7.2	5.7	5
7/18/00	230	64	54	28	28	21.3	23.3	28	20.7	21.3	8.7	4	2
7/24/01	115.3	36.7	26	14.7	12.7	19.3	18	34.7	13.3	17.3	2	0.7	6.7
7/16/02	136.7	232	4.7	5.3	4.7	4.7	3.3	1.3	2	2	1.3	2	<0.7
7/22/03	35.3	53.3	11.3	8.7	8	8.7	7.3	4.7	2	6	1.3	1.3	3.3
7/20/04	257	231	11.7	7.84	7.39	9.64	7.28	6.2	<0.92	<0.91	<0.91	<0.98	<0.96
7/26/05	572	46.8	18.1	13.2	15.1	12.1	11.5	16.7	14.2	21	1.58	1.13	1.13
7/25/06	33	81	44	38	25	28	17	12	16	17	<5.0	<5.0	<5.0
7/17/07	976	74	18	11	11	<5.0	<5.0	<5.0	12	19	<5.0	<5.0	<5.0
7/29/08	648.7	63.6	26	18.8	14	10	13	14.6	11.8	15.8	5.8	4.8	2.4
7/21/09	1564	90.2	49	37	27.8	26.8	22	24.2	17.8	24.4	7	2.2	0.6
7/27/10	1828	98.6	26	28.4	19.8	25.2	20	16.6	16.6	24.4	2.2	4.2	2.4
7/26/11	235	64.6	24.2	22.8	15.4	15.6	19	14.2	14.2	14.4	1.8	1.8	1.4
7/31/12	511	21.8	15.8	12.4	12.4	13.2	10.4	10.2	7.6	16	1.6	3.6	2.2
7/31/13	35.5	21.2	15.8	19.4	17.6	12.8	13	14.6	15.2	28.8	4	5.6	5.2
7/23/14	491.3	23.3	13	27.3	10.5	8.5	9.5		7.5	10.7	2.3	4.2	3.7

Table 29: Mainstem total suspended solids sampled in mg/L.

Date	Mile 1.5	Mile 6.5	Mile 10.1	Mile 12.5	Mile 18.0	Mile 21.0	Mile 23.0	Mile 31.0	Mile 40.0	Mile 43.0	Mile 50.0	Mile 70.0	Mile 82.0
4/11/01	600	500	240	5.8	5.4	6.6	6.6	11.1	10	8.5	7.5	3.7	3.7
4/10/02	170	270		40	5.2	4.6	4.1	4.4	4.7	4.3	2.6	8.1	12
4/29/03	20	600	9	8.5	8.5	11	8.5	10	12	13	14	7.5	10
4/27/04	10.7	9.35	7.2	6.9	6.5	7	6.3	5.45	10.3	8.4	6.6	10.5	12.7
4/26/05	412	425.5	23	9.04	9.71	11.65	12.01	11.79	13.89	12.81	9.7	4.87	7.34
4/25/06	416	3200	26	5.5	6.98	6.5	5.82	5.63	7.11	7.51	4.4	7.03	10.39
5/1/07	76.3	666	6	5.8	8.5	7.5	4.1	6.5	6.6	7.2	3.6	11	14.7
4/22/08	702	1810	6.62	3.12	2.68	4.1	3.27	3.39	3.86	4.77	1.97	5.84	8.59
4/28/09	880	1400	23	10	12	12	5	7	6	10	9	1	2
4/27/10	830	652	93	5	6	5	6	6	6	16	5	3	6
4/26/11	44	103	13	6.5	5.5	7.4	7.6	6	5	7.4	1.4	1.3	0.6
5/1/12	28.9	14.4	6.3	5.2	5.7	5.2	5.4	4.8	5	5.3	4.2	4.99	7.29
5/7/13	ND	166	13.1	6.98	5.59	5.73	5.43	7.32	5.39	6.12	6.01	5.32	9.05
4/29/14	13.2	366	63.4	8.62	15.5	9.62	8.63	9.24	14.3	12.8	14.3	11.6	17.1
7/18/00	160	45	37	22	23	22	22	20	19	19	9.7	5.4	5.6
7/24/01	85	20	18	11	10	13	12	12	11	10	2.7	4.1	2.9
7/16/02	75	110	4.9	4	3.9	4.3	4.5	4.2	4.2	4.1	1.4	6.8	7.3
7/22/03	6.5	50	14	11	15	15	12	14	13	14	7.7	7.5	9.8
7/20/04	183.5	148.6	11	10.3	9.3	10.4	11	9.5	9.2	8.3	5.3	5.6	5.4
7/26/05	276	28.4	13.92	9.14	7.96	7.77	8.82	10.41	8.65	10.45	3.03	4.46	4.22
7/25/06	92.4	39.3	20.4	23.1	22.9	18.7	14.2	14.1	12.8	11.8	1.75	5.36	4.6
7/17/07	171.4	20.5	8.6	6.4	6.9	8.3	8.6	8.8	9.5	11	1.9	10.3	9.5
7/29/08	475	23.2	7.74	7.25	6.61	5.99	6.31	6.73	5.66	7.6	1.39	4.32	4.29
7/21/09	1000	29	21	19	15	16	17	18	17	18	7	13	2
7/27/10	1240	39	12	10	10	10	12	12	10	11	4	4	3
7/26/11	223	31.1	11.7	12	12.1	12.1	7.53	13.9	13.5	14	4.4	1.57	1.03
7/31/12	162	7.38	6.14	8.26	8.01	7.24	6.73	6.88	6.39	7.29	2.13		4.76
7/30/13	24.1	12.8	11.4	12.2	11.4	13.2	13.2	13.1	16.7	18.1	7.39	6.35	7.04
7/22/14	335	14.3	26.4	9.82	10.8	10.8	10.9		10.5	13.3	9.64	23.6	18.6

Table 30: Mainstem turbidity sampled in NTU.

Date	Mile 1.5	Mile 6.5	Mile 10.1	Mile 12.5	Mile 18.0	Mile 21.0	Mile 23.0	Mile 31.0	Mile 40.0	Mile 43.0	Mile 50.0	Mile 70.0	Mile 82.0
4/11/01	4	4.28	2.22	3.78	2.89	3.28	3.78	2.36	4.6	2.4	4.72	3	2
4/10/02	0.45	-0.14		-0.15	0.24	0.54	0.85	1.11	1.3	1.39	1.48		0.68
4/29/03	7.3	8.3	7	7.2	7	7.6	7.1	6.2	6.3	5.03	3.9	3.7	3.7
4/27/04	4.6	4.5	4.4	4.3	4.4	4	4.3	4.2	3.3	2.7	1	2.8	0.2
4/26/05	7.5	6.6	6.6	6.2	5.7	7.2	7.6	5.7	7.6	6.8	2	4.4	3.2
4/25/06	3.3	3	4.2	3	2.9	3.1	3.6	3	5.9	3.7	2.5	4.2	2.2
5/1/07	5.2	4.2	4.2	4.2	4.4	3.9	3.5	3.6	4.3	3.8	4.6	2.8	2.1
4/22/08	5.2	4.4	3.89	3.33	3.33	3.2	4.9	2.4	6.4	5.8	3.3	2.2	1.7
4/28/09	8.3	13.53	8.39	11.36	12.06	10.78	9.68	9.8	12.1	10.4	9.3	10.08	9.55
4/27/10	3.8	3.8	3.8	3.7	3.5	3.2	4.3	2.3	5.2	3.5	4.8	3.3	1.9
4/26/11		4.8	4.4	4.4	4.3	4.1	4.9	4.1	5.2	4.5	4.6	3.2	3.1
5/1/12		5.5	5.1	4.8	4.8	4.7	5.5	4.8	3.8	3.1	2.5	3.1	2.2
5/7/13	3.4	3	3.5	3		2.1	2.5	1.3	5.5	3.4	2.6	3.2	2.4
4/29/14	17.94	15.24	14.32	14.24	13.55	14.5	14.51	14.89	14.84	13.71	10.7	13.89	14.52
7/18/00	9	8	9	9	9	8.89	8.89	8.29	8.89	8.89	9.44	10	10
7/24/01	11.8	11.8	12	11.8	11.8	11.7	11.8	11.69	11.74	11.58	12.58	11.3	11.5
7/16/02	12.9	13.05	11.52	11.69	11.41	11.2	11.35	11.12	11.61	11.52	11.99	9.04	9.31
7/22/03	13	13	13.5	13	13	14	14	14	14	13.5	13.5	12	13
7/20/04	14.8	16.6	14.1	13.9	13.7	13.5	13.5	13.2	12.9	13.5	13.9	14.6	14.6
7/26/05	14.1	13.9	13.8	13.8	13.8	13.3	13.6	14	13.8	13.6	13.8	13.8	7.1
7/25/06	12	11.7	11.6	11.6	11.7	11.5	11.4	11.5	11.8	11.8	11.8	10.4	10.1
7/17/07	13.6	11.8	11.4	11.1	11.1	10.5	11.5	9.9	12.1	11.4	13.3	7.9	7.7
7/29/08	11	10.4	10.4	10.4	10.5	11	11	10.4	10.2	9.8	11.6	8.6	8.7
7/21/09	13.6	13.6	13.8	13.7	13.7	13.8	13.6	13.5	13.4	13.2	13.6	12.2	12.1
7/27/10	10.2	9.7	9.6	9.5	9.6	9.4	9.5	9.2	9.5	9.1	9.5	9.3	9.1
7/26/11	12.7	13.14	14.13	14.8	16.4	15.6	16.5	15.6	16	15	15.1	14.1	12.6
7/31/12	15.39	13.55	13.18	13.49	12.89	14.38	13.54	13.44	14.59	13	11.94	15.11	13.15
7/30/13	16.51	16.85	16.35	16.38	16.36	15.76	16.68	16.32	17.06	16.08	18.86	16.1	16.8
7/22/14	17.02	15.08	16	15.93	16.23	16.87	17.2		16.99	17.03	14.64	15.72	16.21

Table 31: Mainstem water temperature sampled in C.

Date	No Name Creek	Beaver Creek	Slikok Creek	Soldotna Creek	Funny River	Moose River	Killey River	Russian River	Juneau Creek
4/11/01	<4		<4	7	<4	<4	<4	<4	
4/10/02	<3	5	4	8	<3	6	<3	<3	
4/29/03	<2.5	5	<2.5	5.9	<2.5	4	<2.5	<2.5	
4/27/04	<0.25	3.82	<0.25	4.54	<0.25	3.6	<0.25	<0.25	
4/26/05	<0.25	3.57	<0.25	6.84	<0.25	6.46	<0.25	<0.25	
4/25/06	1.56	4.66	2.04	7.9	2.46	5.87	1.39	0.682	
5/1/07	1.45	6.51	2.8	7.65	2.29	5.11	1.44	0.702	
4/22/08	1.2	4.24	2	5.72	2.44	3.93	1.42	0.802	
4/27/10	1.87	5.32	2.42	6.63	1.97	4.14	1.21	686	0.673
4/26/11	1.17	5.99	2.45	5.95	1.87	5.06	1.16	0.826	0.706
5/1/12	1.03	1.84	0	5.26	1.74	3.83	1.22	0.708	
5/7/13	1.78	5.02	2.08	7.61	2.31	4.27	1.5	0.83	0.698
4/29/14	2.2*	5.59	1.72	7.21					
7/18/00	<4		6	10	<4	8	4	5	
7/24/01	<3.1		<3.1	9.7	<3.1	6.7	<3.1	<3.1	
7/16/02	<1	3	2	8	<1	6	<1	<1	
7/22/03	<2.5	4.4	2.6	10	2.6	5.2	<2.5	<2.5	
7/20/04	<0.25	4.74	<0.25	11.3	2.83	6.01	<0.25	<0.25	
7/26/05	<2.5	5.01	<2.5	10.1	2.56	5.58	<2.5	<2.5	
7/25/06	1.78	4.57	2.11	9.44	2.63	7.63	1.38	0.919	
7/17/07	2.09	6.3	2.91	10.5	2.46	7.86	1.65	1.14	
7/21/09	1.47	3.26	1.79	9.08	2.51	7.61	1.25	0.97	1.02
7/27/10	0.776	3.01	1.64	5	1.39	3.97	0.83	0.625	0.698
7/26/11	0.996	5.72	2.57	8.64	2.77	9.39	1.47	1.03	1.08
7/31/12	1.26	5.15	2.4	8.88	2.15	7.37	1.29	0.932	
7/30/13	1.57	5.48	1.64	9.44	3.02	7.56	1.48	1.11	1.15
7/22/14	1.71	8.06	2.7	12.8					

Table 32: Tributary arsenic sampled in μg/L.

Date	No Name Creek	Beaver Creek	Slikok Creek	Soldotna Creek	Funny River	Moose River	Killey River	Russian River	Juneau Creek
4/11/01	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
4/10/02	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	
4/29/03	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	
4/27/04	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	
4/26/05	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	
4/25/06	<0.062	<0.062	<0.062	<0.062	<0.062	<0.062	<0.062	<0.062	
5/1/07	<0.062	<0.062	<0.062	<0.062	<0.062	<0.062	<0.062	<0.062	
4/22/08	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	
4/27/10	<0.062	<0.062	<0.062	<0.062	<0.062	<0.062	<0.062	<0.062	<0.062
4/26/11	<0.045	<0.045	<0.045	<0.045	<0.045	<0.045	<0.045	<0.045	0.147
5/1/12	<0.045	<0.045	<0.045	<0.045	<0.045	<0.045	<0.045	<0.045	
5/7/13	<0.066	<0.066	<0.066	<0.066	<0.066	<0.066	<0.066	<0.066	<0.066
4/29/14	<0.066	<0.066	<0.066	<0.066					
7/18/00	<0.1		0.1	<0.1	<0.1	<0.1	<0.1	<0.1	
7/24/01	<0.14		<0.14	<0.14	<0.14	<0.14	<0.14	<0.14	
7/16/02	<2	<2	<2	63	<2	<2	<2	<2	
7/22/03	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	
7/20/04	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	
7/26/05	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	
7/25/06	<0.062	<0.062	<0.062	<0.062	<0.062	<0.062	<0.062	<0.062	
7/17/07	<0.062	<0.062	<0.062	<0.062	<0.062	<0.062	<0.062	<0.062	
7/21/09	<0.062	<0.062	<0.062	<0.062	<0.062	<0.062	<0.062	<0.062	<0.062
7/27/10	<0.062	<0.062	<0.062	<0.062	<0.062	<0.062	<0.062	<0.062	<0.062
7/26/11	<0.045	<0.045	<0.045	<0.045	<0.045	<0.045	<0.045	<0.045	<0.045
7/31/12	<0.045	<0.045	0.501	0.103	<0.045	<0.045	<0.045	<0.045	
7/30/13	<0.066	<0.066	<0.066	<0.066	<0.066	<0.066	<0.066	<0.066	<0.066
7/22/14	<0.07	<0.07	<0.07	<0.07					

Table 33: Tributary cadmium sampled in μg/L.

Date	No Name Creek	Beaver Creek	Slikok Creek	Soldotna Creek	Funny River	Moose River	Killey River	Russian River	Juneau Creek
4/11/01	<2		<2	<2	<2	<2	<2	<2	
4/10/02	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
4/29/03	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	
4/27/04	<0.36	<0.36	<0.36	<0.36	<0.36	<0.36	<0.36	<0.36	
4/26/05	<0.36	<0.36	<0.36	<0.36	<0.36	<0.36	<0.36	<0.36	
4/25/06	2.6	2.38	0.517	0.493	1.23	0.29	0.341	0.248	
5/1/07	2.33	1.04	0.548	0.751	0.709	0.645	<0.049	<0.049	
4/22/08	1.5	0.571	0.558	1.19	1.91	1.27	0.339	1.04	
4/27/10	1.51	1.32	0.848	0.737	0.49	0.417	0.343	0.278	0.591
4/26/11	1.24	2.33	1.37	1.37	1.14	0.999	0.669	0.581	0.487
5/1/12	0.778	0.602	0.361	0.375	0.342	0.447	0.296	0.29	
5/7/13	<0.20	0.536	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
4/29/14	0.523	<0.20	<0.20	<0.20					
7/18/00	<2		<2	<2	<2	<2	<2	<2	
7/24/01	<0.49		<0.49	<0.49	<0.49	<0.49	<0.49	<0.49	
7/16/02	<0.6	1	0.9	1.6	1.1	<0.6	<0.6	<0.6	
7/22/03	<1.0	<1.0	<1.0	<1.0	<1.0	1	<1.0	<1.0	
7/20/04	<0.36	<0.36	<0.36	<0.36	<0.36	<0.36	3.33	<0.36	
7/26/05	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	
7/25/06	3.93	16.4	<0.049	<0.049	2.97	5.26	0.42	1.26	
7/17/07	3.13	1.57	1.03	1.17	0.627	0.674	0.579	<0.049	
7/21/09	1.67	2.29	1.32	2.33	1.85	3.45	0.816	1.59	1.32
7/27/10	0.659	0.432	0.411	0.315	0.647	0.293	<0.049	0.212	0.232
7/26/11	0.846	0.797	0.628	0.596	0.401	0.364	0.3	0.393	0.305
7/31/12	0.893	1.04	0.686	0.657	0.282	0.377	0.278	0.253	
7/30/13	0.801	0.685	<0.20	0.546	<0.20	<0.20	0.544	<0.20	<0.20
7/22/14	<0.20	<0.20	<0.20	<0.20					

Table 34: Tributary chromium sampled in μg/L.

Date	No Name Creek	Beaver Creek	Slikok Creek	Soldotna Creek	Funny River	Moose River	Killey River	Russian River	Juneau Creek
4/11/01	<5		<5	<5	<5	<5	<5	<5	
4/10/02	<9	<9	<9	<9	<9	<9	13	<9	
4/29/03	<25	<25	<25	<25	<25	<25	<25	<25	
4/27/04	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	
4/26/05	8.21	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	3	
4/25/06	0.792	0.567	0.837	0.832	0.616	0.449	0.692	0.928	
5/1/07	0.601	0.73	0.495	0.593	0.764	0.251	0.703	0.431	
4/22/08	0.599	0.811	0.659	0.739	0.276	0.215	0.601	0.658	
4/28/09	0.641	0.983	0.546	0.414	1.55	0.262	0.558	0.27	0.881
4/27/10	0.548	2.29	0.711	0.58	0.801	0.641	0.698	0.381	0.734
4/26/11	1.08	2.4	0.823	0.868	1.31	0.764	1.11	0.477	1.3
5/1/12	0.515	0.93	1.12	0.838	1.11	1.06	1.03	1.25	
5/7/13	0.828	3.28	0.661	0.371	0.578	0.576	0.766	0.344	0.631
4/29/14	0.69	1.35	0.546	0.658					
7/18/00	<5		<5	<5	<5	6	<5	7	
7/24/01	<9.3		<9.3	<9.3	<9.3	<9.3	<9.3	<9.3	
7/16/02	<9	<9	<9	<9	<9	<9	<9	<9	
7/22/03	<25	<25	<25	<25	<25	<25	<25	<25	
7/20/04	<0.12	<0.12	12.1	<0.12	<0.12	<0.12	8.42	<0.12	
7/26/05	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	
7/25/06	0.665	1.74	3.51	<0.34	0.5	0.315	1.45	0.869	
7/17/07	0.478	0.419	0.291	0.26	0.494	0.262	0.448	0.291	
7/21/09	1.01	1.83	0.456	0.591	0.746	0.484	0.801	0.687	0.315
7/27/10	0.557	0.694	0.378	0.271	1.21	0.24	0.407	0.461	1.14
7/26/11	1.54	1.37	0.586	0.385	0.992	0.59	0.873	0.749	0.687
7/31/12	0.492	0.68	0.529	0.859	0.593	0.214	0.487	0.38	
7/30/13	0.472	0.627	0.795	0.322	0.476	0.493	0.545	0.456	1.04
7/22/14	3.22	2.95	1.66	0.68					

Table 35: Tributary copper sampled in μg/L.

Date	No Name Creek	Beaver Creek	Slikok Creek	Soldotna Creek	Funny River	Moose River	Killey River	Russian River	Juneau Creek
4/11/01	<4		<4	<4	<4	<4	<4	<4	
4/10/02	<1	<1	<1	<1	<1	<1	<1	<1	
4/29/03	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	
4/27/04	<0.052	<0.052	<0.052	<0.052	<0.052	<0.052	<0.052	<0.052	
4/26/05	<0.052	<0.052	<0.052	<0.052	<0.052	<0.052	<0.052	<0.052	
4/25/06	0.111	0.158	<0.030	<0.030	<0.030	0.118	<0.030	<0.030	
5/1/07	<0.030	0.152	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	
4/22/08	<0.10	0.227	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	
4/28/09	<0.030	0.219	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030
4/27/10	<0.030	0.254	0.101	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030
4/26/11	0.301	2.7	0.675	0.336	0.139	<0.030	<0.030	<0.030	0.16
5/1/12	<0.030	0.261	0.102	<0.030	<0.030	0.232	<0.030	<0.030	
5/7/13	<0.073	0.326	<0.073	<0.073	<0.073	<0.073	<0.073	<0.073	<0.073
4/29/14	<0.073	0.282	<0.073	0.374					
7/18/00	<4		<4	<4	<4	<4	<4	<4	
7/24/01	<1.1		<1.1	<1.1	<1.1	<1.1	<1.1	<1.1	
7/16/02	<2	<2	<2	<2	<2	<2	<2	<2	
7/22/03	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	
7/20/04	<0.052	<0.052	<0.052	<0.052	<0.052	<0.052	1.21	<0.052	
7/26/05	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	
7/25/06	<0.030	3.92	<0.030	<0.030	<0.030	<0.030	0.201	<0.030	
7/17/07	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	
7/21/09	<0.030	<0.030	<0.030	0.598	<0.030	<0.030	<0.030	<0.030	<0.030
7/27/10	<0.030	0.101	<0.030	<0.030	0.252	<0.030	<0.030	<0.030	0.803
7/26/11	<0.030	0.108	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030
7/31/12	0.104	0.124	<0.030	0.12	<0.030	<0.030	<0.030	<0.030	
7/30/13	<0.073	<0.073	<0.073	<0.073	<0.073	<0.073	<0.073	<0.073	1.15
7/22/14	<0.070	<0.070	<0.070	<0.070					

Table 36: Tributary lead sampled in μg/L.

Date	No Name Creek	Beaver Creek	Slikok Creek	Soldotna Creek	Funny River	Moose River	Killey River	Russian River	Juneau Creek
4/11/01	84		41	33	34	33	28	46	
4/10/02	122	41	40	37	70	79	34	34	
4/29/03	60	<50	69	<50	52	49	<50	<50	
4/27/04	61.9	36.2	39.5	39	27.4	41.3	37.9	49.7	
4/26/05	63.3	59.1	47.9	58.6	46.8	24	27.2	30.6	
4/25/06	52.2	46.4	5.59	3	20.5	33.6	11.9	7.6	
5/1/07	18.7	108	78.6	52.6	51.9	49	14.4	20.8	
4/22/08	8.63	3.66	1.46	2.48	34.1	1.87	1.21	2.04	
4/28/09	28.6	84.8	31	51.4	0.86	0.632	0.891	0.462	29
4/27/10	20.8	61.5	38.4	43.4	48	48.9	24.1	14	23.6
4/26/11	8.29	247	47.9	61.8	45.6	21.2	40	17	25.7
5/1/12	115	196	116	94.6	66.1	120	60.7	52.8	
5/7/13	113	87.6	105	23.4	2.98	<0.55	57.4	4.53	<0.55
4/29/14	97.8	111	56.3	55.1					
7/18/00	12		27	<9	<9	10	<9	<9	
7/24/01	46.3		69.4	68	41	76.1	34.4	34.6	
7/16/02	29	41	61	57	51	<9	26	50	
7/22/03	75	<50	<50	<50	<50	<50	<50	<50	
7/20/04	48.5	47.4	54.2	63.4	59.1	11	49.5	33.8	
7/26/05	51.1	26	<10	19.4	16.2	<10	19.9	19.6	
7/25/06	2.62	49.7	11.2	17.8	20	0.831	5.21	24.7	
7/17/07	40.7	42.9	36.7	33.7	34.8	14	17.7	15.5	
7/21/09	46.6	110	37.2	50.8	31.4	26	44.4	26.8	1.11
7/27/10	15.4	36.6	40.6	34.1	28.9	15.3	6.34	23.5	25.6
7/26/11	148	114	59.6	49.4	56.7	<0.084	57.8	55	56.7
7/31/12	86.1	85.7	68.3	63.8	9.49	52.3	57.5	30.4	
7/30/13	58.4	99.6	54.8	55.8	31.8	13.6	41.5	28.2	31.8
7/22/14	0.0671	0.0659		0.0325					

Table 37: Tributary zinc sampled in μg/L.

Date	No Name Creek	Beaver Creek	Slikok Creek	Soldotna Creek	Funny River	Moose River	Killey River	Russian River	Juneau Creek
4/11/01	8.25		5.03	10.8	9.45	10.3	10.4	18.5	
4/10/02	11.16	17.82	19.06	23.31	10.84	25.33	8.06	20.59	
4/29/03	12	15	11	16	7.7	18	7.4	18	
4/27/04	7	8.25	6.34	8.3	6.28	9.95	9.1	15.3	
4/26/05	4.22	8.53	6.61	10.3	8.11	17.2	8.26	15.8	
4/25/06	8.17	8.18	6.47	11.5	9.07	16.4	6.71	15.8	
5/1/07	8.41	12.9	7.68	12.8	7.44	12.8	6.93	14.1	
4/22/08	9.91	11.6	8.86	11	9	17.4	6.5	19.6	
4/28/09	7.87	8.57	6.95	9.57	5.77	10.3	6.43	18.9	13.9
4/27/10	15.7	16.1	8.27	12.2	7.56	17	7.77	16.7	16.8
4/26/11	7.41	11.9	9.7	10.3	6.35	14.3	6.92	15.6	12.6
5/1/12	7	6.28	5.97	8.72	6.85	12.9	8.28	13.5	
5/7/13	3	6	6	9	6	8	6	21	17
4/29/14	6.67	9.25	8.56	12.1	7.73	15.2	8.16	18.8	
7/18/00	12.8		14.3	19.2	8.88	24.5	3.95	14.3	
7/24/01	15		13	15	9.1	24	3.8	13	
7/16/02	11.96	18.48	19.48	22.08	8.22	22.38	10.26	13.36	
7/22/03	13	20	18	22	9.5	24	3.3	14	
7/20/04	13.5	23.5	14.9	24.1	9.88	25.7	3.41	15.9	
7/26/05	14.1	22.4	4.61	22.1	10.8	23.8	20.2	15.3	
7/25/06	12.8	19	12.8	19.2	9.48	23.9	4.99	16.5	
7/17/07	13.9	18.6	16.8	14.1	9.45	16.1	4.66	14.6	
7/29/08	12	12.6	10.8	14.8	7.26	15.8	5.13	13.7	
7/21/09	12.8	16.4	13.8	21	10.4	23.8	4.53	16.7	14.9
7/27/10	10.1	14.9	12.3	14.8	7.61	20.8	3.9	15.5	14.2
7/26/11	12.9	19.4	15.9	18.9	10.5	22.5	4.9	14.5	13.4
7/31/12	13.2	18.6	16.8	18.9	9.21	22.2	4.32	14.4	
7/30/13	12.6	20.6	14.6	20.1	10.3	23.6	3.18	16.6	14.8
7/22/14	11.3	15.2	15.2	15.5	9.34	10.2	3.62	13.9	

Table 38: Tributary calcium sampled in mg/L.

Date	No Name Creek	Beaver Creek	Slikok Creek	Soldotna Creek	Funny River	Moose River	Killey River	Russian River	Juneau Creek
4/11/01	2.86	18.7	0.67	1.62	1.89	1.08	0.31	<0.04	
4/10/02	2.04	2.3	1.27	1.16	0.75	1.06	0.19	<0.03	
4/29/03	3.2	5.1	1.3	0.95	2.2	1.1	0.67	<0.11	
4/27/04	3.58	2.7	0.603	0.832	1.96	0.876	0.242	0.104	
4/26/05	3.16	3.83	0.917	2.06	2.25	2.02	0.941	<0.0040	
4/25/06	4.35	6.42	3.13	2.62	7.21	3.13	1.43	0.199	
5/1/07	4.25	7.35	2.32	1.69	2.49	1.74	0.778	<0.04	
4/22/08	2.6	16.3	1.79	2.4	1.13	1.28	0.844	<0.050	
4/28/09	3.62	10.6	1.96	1.55	3.18	1.33	1.71	<0.0027	0.0857
4/27/10	2.89	20.5	1.99	1.74	2.26	2.44	0.649	0.0848	0.449
4/26/11	5.94	7.56	2.75	1.39	1.02	1.74	1.05	<0.0027	0.0861
5/1/12	3.02	2.2	0.58	0.698	0.882	0.788	0.394	<0.0027	
5/7/13	5.1	3.7	1.7	1.4	0.71	1.4	1.3	0.03	<0.03
4/29/14	4.22	4.94	1.21	1.74	1.02	1.59	0.558	0.0248	
7/18/00	2.85		1.18	1.13	1.46	1.1	6.26	<0.04	
7/24/01	2.5		0.842	0.613	1.1	0.64	2.9	0.083	
7/16/02	1.58	1.87	0.42	0.72	0.38	0.63	0.06	0.06	
7/22/03	3.3	1.8	1.1	0.59	0.58	0.27	3.6	<0.10	
7/20/04	2.57	2.4	0.802	0.761	0.387	0.521	3.33	<0.0040	
7/26/05	5.12	0.931	8.24	0.867	0.574	0.85	<0.050	<0.050	
7/25/06	3.38	2.26	1.52	1.09	0.629	0.867	9.99	<0.0027	
7/17/07	3.16	0.648	0.785	1.2	0.47	2.52	3.88	<0.0027	
7/29/08	2.56	2.17	0.761	0.73	0.727	0.376	0.787	0.0695	
7/21/09	2.44	1.49	0.592	0.807	0.472	0.755	1.34	<0.0027	<0.0027
7/27/10	3.11	2.32	1.32	0.964	1.98	0.702	2.09	<0.0027	0.0604
7/26/11	1.99	2.77	0.872	0.796	0.543	0.96	1.58	<0.0027	<0.0027
7/31/12	2.93	2.43	1.09	0.874	0.431	0.885	1.39	<0.0027	
7/30/13	3.09	2.64	0.504	0.643	0.401	0.713	4.04	<0.0027	<0.0027
7/22/14	3.68	2.96	1.1	1.11	0.618	10.2	1.87	<0.007	

Table 39: Tributary iron sampled in mg/L.

Date	No Name Creek	Beaver Creek	Slikok Creek	Soldotna Creek	Funny River	Moose River	Killey River	Russian River	Juneau Creek
4/11/01	3.5		1.5	2.9	3	1.8	0.9	1.1	
4/10/02	3.44	4.6	5.85	6.75	3.88	4.59	1.55	1.31	
4/29/03	6.7	4.7	3.4	4.8	3	3	1.3	1.2	
4/27/04	2.76	2.32	1.86	2.45	2.46	1.75	0.746	0.97	
4/26/05	1.56	2.69	2.09	3.08	3.33	3.03	1.7	1.02	
4/25/06	3.13	2.73	2.06	3.48	3.86	2.94	1.56	1.2	
5/1/07	3.54	4.08	2.51	3.93	3.05	2.38	1.48	0.964	
4/22/08	4.4	6.12	2.84	3.28	3.16	3.02	1.43	1.3	
4/28/09	3.64	4.1	2.21	2.93	2.48	1.63	1.55	1.24	1.14
4/27/10	21.4	8.54	2.61	3.72	2.9	3.02	1.5	1.04	1.31
4/26/11	4.44	4.14	2.98	3.08	2.27	2.54	1.45	0.914	1.01
5/1/12	2.63	1.84	1.91	2.73	2.47	2.3	1.37	0.88	
5/7/13	1	2	2	3	2	2	1	1	1
4/29/14	2.52	2.53	2.53	3.52	2.68	2.64	1.35	1.18	
7/18/00	4.3		4	5.1	3.2	3.9	2.7	0.9	
7/24/01	7.7		3.6	4.1	2.6	3.6	1.4	0.84	
7/16/02	3.87	4.43	5.57	5.92	2.77	3.84	0.77	0.93	
7/22/03	4.4	5.1	5.5	6.4	3.3	4.5	1.6	1	
7/20/04	4.25	5.31	3.01	6.4	3.09	4.16	1.55	1.04	
7/26/05	5.3	3.86	3.3	6.01	3.57	3.91	1.69	1.09	
7/25/06	4.35	4.76	2.79	5.52	3.29	4.25	3.94	1.13	
7/17/07	9.31	3.12	4.76	4.24	0.944	3.99	1.95	0.868	
7/29/08	4.91	3.05	3.14	4.17	2.26	2.61	1.03	0.892	
7/21/09	5.16	3.45	2.64	6.14	3.45	4.19	1.14	1.12	1.16
7/27/10	4.49	3.69	3.63	4.1	2.79	3.37	1.19	0.883	0.934
7/26/11	3.99	4.96	4.46	5.39	3.44	3.83	1.28	1.02	1.05
7/31/12	4.35	2.43	4.9	5.19	3.02	3.68	1.09	0.917	
7/30/13	4.89	5.25	3.22	6.32	3.81	4.48	1.85	1.21	1.17
7/22/14	3.91	3.38	1.1	4.48	3.12	0.958	1.15	0.975	

Table 40: Tributary magnesium sampled in mg/L.

Date	No Name Creek	Beaver Creek	Slikok Creek	Soldotna Creek	Funny River	Moose River	Killey River	Russian River	Juneau Creek
4/11/01	<0.10		<0.10	<0.10	<0.10	<0.10	0.22	0.59	
4/10/02	0.22	<0.10	0.3	0.13	<0.10	<0.10	0.15	0.64	
4/29/03	0.12	<0.10	0.12	<0.10	<0.10	<0.10	0.22	0.54	
4/27/04	0.138	<0.015	<0.015	<0.015	<0.015	<0.015	0.159	0.756	
4/26/05	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	1.11	
4/25/06	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	0.299	
5/1/07	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	1.05	
4/22/08	0.16	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.522	
4/28/09	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	0.546	0.219
4/27/10	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	0.68	0.19
4/26/11	0.171	<0.015	<0.015	<0.015	<0.015	<0.015	0.196	0.939	0.389
5/1/12	0.246	<0.015	<0.015		<0.015	<0.015	0.234	0.983	
5/7/13	<0.015	<0.015	<0.015		0.574	<0.015	<0.015	0.571	0.216
4/29/14	0.154	<0.015	0.115	<0.015	<0.015	<0.015	0.231	0.566	
7/18/00	0.08		0.12	0.06	0.04	<0.03	<0.03	0.31	
7/24/01	<0.10		<0.10	<0.10	<0.10	<0.10	<0.10	0.36	
7/16/02	<0.10	<0.10	0.36	<0.10	<0.10	<0.10	0.19	0.37	
7/22/03	<0.10	<0.10	0.12	<0.10	<0.10	<0.10	<0.10	0.3	
7/20/04	<0.015	<0.015	0.179	<0.015	<0.015	<0.015	<0.015	0.281	
7/26/05	<0.10	<0.10	0.135	<0.10	<0.10	<0.10	<0.10	0.308	
7/25/06	<0.015	<0.015	0.146	<0.015	<0.015	<0.015	<0.015	0.43	
7/17/07	<0.015	<0.015	0.164	<0.015	<0.015	<0.015	<0.015	0.456	
7/29/08	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	0.354	
7/21/09	<0.015	<0.015	0.117	<0.015	<0.015	<0.015	<0.015	0.26	<0.015
7/27/10	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	0.312	0.279
7/26/11	<0.015	<0.015	0.192	<0.015	<0.015	<0.015	<0.015	0.326	<0.015
7/31/12	0.14	<0.015	0.139	<0.015	<0.015	<0.015	<0.015	0.308	
7/30/13	0.251	<0.015	0.19	<0.015	<0.015	<0.015	<0.015	0.299	0.234
7/22/14	0.202	<0.015	0.211	<0.015	<0.015	0.139	<0.015	0.287	

Table 41: Tributary nitrate sampled in mg/L.

Date	No Name Creek	Beaver Creek	Slikok Creek	Soldotna Creek	Funny River	Moose River	Killey River	Russian River	Juneau Creek
4/11/01	0.12		0.06	0.15	0.12	0.06	<0.05	<0.05	
4/10/02	0.04	0.08	0.05	0.12	0.04	0.06	0.01	<0.01	
4/29/03	<0.025	0.17	0.033	0.092	0.13	0.049	0.033	<0.025	
4/27/04	0.057	0.106	0.035	0.094	0.11	0.059	<0.0020	<0.0020	
4/26/05	0.13	0.26	<0.025	0.27	0.23	0.23	0.12	<0.025	
4/25/06	0.06	<0.026	0.11	0.15	0.12	0.087	<0.026	<0.026	
5/1/07	0.1	0.38	<0.026	0.16	0.11	<0.026	<0.026	0.073	
4/22/08	0.06	0.74	<0.051	0.077	<0.051	<0.051	<0.051	<0.051	
4/28/09	<0.026	1.2	0.095	0.12	0.17	0.098	0.058	<0.026	<0.026
4/27/10	0.12	0.54	0.091	0.28	0.22	0.2	<0.026	<0.026	<0.026
4/26/11	0.22	0.25	0.11	0.19	0.084	0.14	<0.026	<0.026	<0.026
5/1/12	<0.026	0.12	<0.026	0.054	0.1	<0.026	<0.026	<0.026	
5/7/13	0.076	0.13	64	<0.026	<0.026	0.056	<0.026	<0.026	<0.026
4/29/14	<0.26	0.29	<0.26	0.13	0.088	0.058	<0.26	<0.26	
7/18/00	<0.04		<0.04	0.1	0.11	0.05	0.21	<0.04	
7/24/01	0.029		0.023	0.093	0.07	0.024	0.088	<0.010	
7/16/02	0.05	0.09	0.09	0.11	0.04	0.03	<0.01	<0.01	
7/22/03	0.04	0.063	0.03	0.11	0.044	0.027	0.14	<0.025	
7/20/04	0.042	0.0742	0.0279	0.116	0.0311	0.0263	0.0614	<0.0020	
7/26/05	<0.051	0.077	<0.051	0.13	<0.051	<0.051	0.4	<0.051	
7/25/06	<0.026	0.093	<0.026	0.16	0.088	<0.026	0.57	<0.026	
7/17/07	<0.026	<0.026	0.064	<0.026	0.056	<0.026	0.14	<0.026	
7/29/08	<0.026	0.12	0.062	0.1	0.12	<0.026	<0.026	<0.026	
7/21/09	<0.026	0.087	<0.026	0.08	<0.026	<0.026	0.15	<0.026	<0.026
7/27/10	0.083	0.087	0.12	0.22	0.16	0.098	0.092	<0.026	0.057
7/26/11	0.064	0.12	1.3	0.13	<0.026	<0.026	<0.026	<0.026	<0.026
7/31/12	0.12	<0.026	<0.026	0.11	<0.026	<0.026	0.069	<0.026	
7/30/13	<0.026	0.058	<0.026	0.089	<0.026	<0.026	0.35	<0.026	<0.026
7/22/14	<0.026	0.12	<0.026	0.094	0.066	<0.026	<0.026	<0.026	

Table 42: Tributary phosphorus sampled in mg/L.

Date	No Name Creek	Beaver Creek	Slikok Creek	Soldotna Creek	Funny River	Moose River	Killey River	Russian River	Juneau Creek
4/11/01	<0.25		0.32	0.35	<0.25	0.37	<0.27	<0.25	
4/10/02	<0.26	<0.26	<0.26	<0.26	<0.26	<0.25	<0.25	<0.27	
4/29/03	<0.40	<0.44	<0.42	<0.43	<0.42	<0.44	<0.43	<0.41	
4/27/04	<0.021	<0.022	<0.021	<0.022	<0.021	<0.022	<0.021	<0.022	
4/26/05	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	
7/18/00	<0.25		<0.25	0.37	<0.25	<0.25	<0.25	<0.28	
7/24/01	<0.27		<0.26	<0.27	<0.28	<0.25	<0.27	<0.27	
7/16/02	<0.27	<0.27	<0.25	<0.25	<0.27	<0.27	<0.25	<0.25	
7/22/03	<0.39	<0.41	<0.81	<0.40	<0.45	<0.42	<0.41	<0.42	
7/20/04	<0.022	<0.022	<0.022	<0.022	<0.022	<0.023	<0.021	<0.022	
7/26/05	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	
7/25/06	<0.0065	<0.0064	<0.0064	<0.0064	<0.0064	<0.0064	<0.0064	<0.0063	
7/17/07	<0.0066	<0.0064	<0.0064	<0.0063	<0.0064	<0.0063	<0.0063	<0.0063	

Table 43: Tributary diesel range organics sampled in mg/L.

Date	No Name Creek	Beaver Creek	Slikok Creek	Soldotna Creek	Funny River	Moose River	Killey River	Russian River	Juneau Creek
4/11/01	<25.0		<25.0	<25.0	<25.0	<25.0	<25.0	<25.0	
4/10/02	<25.0	<25.0	<25.0	<25.0	<25.0	<25.0	<25.0	<25.0	
4/29/03	<25.0	<25.0	<25.0	<25.0	<25.0	<25.0	<25.0	<25.0	
4/27/04	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	
5/1/12				ND					
7/18/00	<25.0		<25.0	<25.0	<25.0	<25.0	<25.0	<25.0	
7/24/01	<25.0		<25.0	<25.0	<25.0	<25.0	<25.0	<25.0	
7/16/02	<25.0	<25.0	<25.0	<25.0	<25.0	<25.0	<25.0	<25.0	
7/22/03	<25.0	<25.0	<25.0	<25.0	<25.0	<25.0	<25.0	<25.0	
7/26/05	<100	<100	<100	<100	<100	<100	<100	<100	

Table 44: Tributary gasoline range organics sampled in μg/L.

Date	No Name Creek	Beaver Creek	Slikok Creek	Soldotna Creek	Funny River	Moose River	Killey River	Russian River	Juneau Creek
4/11/01	<2.53		<2.53	<2.66	<2.53	<2.53	<2.66	<2.53	
4/10/02	<2.60	<2.58	<2.58	<2.58	<2.55	<2.53	<2.53	<2.72	
4/29/03	<2.65	<2.91	<2.78	<2.84	<2.78	<2.94	<2.84	<2.70	
4/27/04	0.24	<0.034	<0.032	<0.034	<0.032	<0.034	<0.032	<0.034	
4/26/05	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	
7/18/00	<2.98		<2.98	5.67	<2.98	<2.98	<2.98	<3.35	
7/24/01	<2.69		<2.58	<2.75	<2.81	<2.53	<2.66	<2.66	
7/16/02	<2.75	<2.75	<2.53	<2.53	<2.66	<2.72	<2.53	<2.53	
7/22/03	<2.63	<2.72	<5.38	<2.69	<3.01	<2.81	<2.72	<2.78	
7/20/04	0.32	<0.034	<0.034	<0.034	<0.035	<0.036	<0.033	<0.034	
7/26/05	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	
7/25/06	<0.22	<0.22	<0.21	<0.21	<0.22	<0.22	<0.22	<0.21	
7/17/07	<0.22	<0.21	<0.21	<0.21	<0.21	<0.21	<0.21	<0.21	

Table 45: Tributary residual range organics sampled in mg/L.

Date	No Name Creek	Beaver Creek	Slikok Creek	Soldotna Creek	Funny River	Moose River	Killey River	Russian River	Juneau Creek
4/11/01	<0.30		<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	
4/10/02	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	
4/29/03	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	
4/27/04	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	
4/26/05	<0.074	<0.074	<0.074	<0.074	<0.074	<0.074	<0.074	<0.074	
7/18/00	<0.20		<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	
7/24/01	<0.30		<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	
7/16/02	<0.50	<0.50	<0.50	<0.50	<0.50	0.88	<0.50	<0.50	
7/22/03	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	
7/20/04	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	
7/26/05	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	
7/25/06	<0.074	<0.074	<0.074	<0.074	<0.074	<0.074	<0.074	<0.074	
7/17/07	<0.074	<0.074	<0.074	<0.074	<0.074	<0.074	<0.074	<0.074	
7/29/08	<0.074	<0.074	<0.074	1.4	<0.074	<0.074	<0.074	<0.074	
7/21/09	<0.30	<0.30	<0.30	0.66	<0.30	<0.30	<0.30	<0.30	<0.30
7/27/10	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
7/26/11	<0.30	<0.30	<0.30	0.66	<0.30	<0.30	<0.30	<0.30	<0.30
7/31/12	<0.30		<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	

Table 46: Tributary benzene sampled in μg/L.

Date	No Name Creek	Beaver Creek	Slikok Creek	Soldotna Creek	Funny River	Moose River	Killey River	Russian River	Juneau Creek
4/11/01	<0.50		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	
4/10/02	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	
4/29/03	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	
4/27/04	<0.24	<0.24	<0.24	<0.24	<0.24	<0.24	<0.24	<0.24	
4/26/05	<0.078	<0.078	<0.078	<0.078	<0.078	<0.078	<0.078	<0.078	
7/18/00	<0.50		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	
7/24/01	<0.50		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	
7/16/02	<0.50	0.479	<0.50	<0.50	<0.50	2.83	0.82	<0.50	
7/22/03	<0.50	<0.50	<0.50	<0.50	<0.50	0.52	<0.50	<0.50	
7/20/04	<0.24	<0.24	<0.24	<0.24	<0.24	1.6	<0.24	<0.24	
7/26/05	<1.0	1.3	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	
7/25/06	<0.078	<0.078	<0.078	<0.078	<0.078	<0.078	<0.078	<0.078	
7/17/07	<0.078	<0.078	<0.078	<0.078	<0.078	<0.078	<0.078	<0.078	
7/29/08	<0.078	<0.078	<0.078	<0.078	<0.078	<0.078	<0.078	<0.078	
7/21/09	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
7/27/10	<0.35	<0.35	<0.35	<0.35	<0.35	<0.35	<0.35	<0.35	<0.35
7/26/11	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
7/31/12	<0.30		<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	

Table 47: Tributary toluene sampled in μg/L.

Date	No Name Creek	Beaver Creek	Slikok Creek	Soldotna Creek	Funny River	Moose River	Killey River	Russian River	Juneau Creek
4/11/01	<0.20		<0.20	<0.20	<0.20	<0.20	<0.20	<0.30	
4/10/02	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	
4/29/03	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	
4/27/04	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	
4/26/05	<0.088	<0.088	<0.088	<0.088	<0.088	<0.088	<0.088	<0.088	
7/18/00	<0.20		<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	
7/24/01	<0.30		<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	
7/16/02	<0.50	<0.50	<0.50	<0.50	<0.50	0.5	<0.50	<0.50	
7/22/03	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	
7/20/04	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	
7/26/05	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	
7/25/06	<0.088	<0.088	<0.088	<0.088	<0.088	<0.088	<0.088	<0.088	
7/17/07	<0.088	<0.088	<0.088	<0.088	<0.088	<0.088	<0.088	<0.088	
7/29/08	<0.46	<0.46	<0.46	<0.46	<0.46	<0.46	<0.46	<0.46	
7/21/09	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
7/27/10	<0.46	<0.46	<0.46	<0.46	<0.46	<0.46	<0.46	<0.46	<0.46
7/26/11	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
7/31/12	<0.30		<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	

Table 48: Tributary ethylbenzene sampled in µg/L.

Date	No Name Creek	Beaver Creek	Slikok Creek	Soldotna Creek	Funny River	Moose River	Killey River	Russian River	Juneau Creek
4/11/01	<0.50		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	
4/10/02	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	
4/29/03	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	
4/26/05	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	
7/18/00	<0.50		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	
7/24/01	<0.50		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	
7/16/02	<1.00	<1.00	<1.00	<1.00	<1.00	1.74	<1.00	<1.00	
7/22/03	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	
7/20/04	<0.41	<0.41	<0.41	<0.41	<0.41	<0.41	<0.41	<0.41	
7/26/05	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	
7/25/06	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20		
7/17/07	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	
7/29/08	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	2.1	2.2	
7/21/09	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
7/27/10	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
7/26/11	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
7/31/12	<0.50		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	

Table 49: Tributary m,p-xylene sampled in μg/L.

Date	No Name Creek	Beaver Creek	Slikok Creek	Soldotna Creek	Funny River	Moose River	Killey River	Russian River	Juneau Creek
4/11/01	<0.30		<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	
4/10/02	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	
4/29/03	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	
4/26/05	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	
7/18/00		<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	
7/24/01		<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	
7/16/02	<0.50	<0.50	<0.50	<0.50	<0.50	0.7	<0.50	<0.50	
7/22/03	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	
7/20/04	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	
7/26/05	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	
7/25/06	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20		
7/17/07	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	
7/29/08	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	
7/21/09	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
7/27/10	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
7/26/11	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
7/31/12	<0.20		<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	

Table 50: Tributary o-xylene sampled in μg/L.

Date	No Name Creek	Beaver Creek	Slikok Creek	Soldotna Creek	Funny River	Moose River	Killey River	Russian River	Juneau Creek
4/11/01	ND		ND	ND	ND	ND	ND	ND	
4/10/02	ND	ND	ND	ND	ND	ND	ND	ND	
4/29/03	ND	ND	ND	ND	ND	ND	ND	ND	
4/27/04	ND	ND	ND	ND	ND	ND	ND	ND	
4/26/05	ND	ND	ND	ND	ND	ND	ND	ND	
7/18/00	ND		ND	ND	ND	ND	ND	ND	
7/24/01	ND		ND	ND	ND	ND	ND	ND	
7/16/02	ND	0.47	ND	ND	ND	6.65	0.82	ND	
7/22/03	ND	ND	ND	ND	ND	0.52	ND	ND	
7/20/04	ND	ND	ND	ND	ND	1.6	ND	ND	
7/26/05	ND	1.3	ND	ND	ND	ND	ND	ND	
7/25/06	ND	ND	ND	ND	ND	ND	ND	ND	
7/17/07	ND	ND	ND	ND	ND	ND	ND	ND	
7/29/08	ND	ND	ND	2.7	ND	ND	3.7	3	
7/21/09	ND	ND	ND	0.66	ND	ND	ND	ND	ND
7/27/10	ND	ND	ND	ND	ND	ND	ND	ND	ND
7/26/11	ND	ND	ND	ND	ND	ND	ND	ND	ND
7/31/12	ND		ND	ND	ND	ND	ND	ND	

Table 51: Tributary total BTEX sampled in μg/L.

Date	No Name Creek	Beaver Creek	Slikok Creek	Soldotna Creek	Funny River	Moose River	Killey River	Russian River	Juneau Creek
4/11/01	13		144	520	500	118	<1	4	
4/10/02	<1	<1	<1	12	<1	<1	<1	<1	
4/29/03	9	2	<1	<1	4	<1	<1	<1	
4/27/04	5	42	5	10	7	9	<1	3	
4/26/05	45	18	<1	82	<1	<1	<1	<1	
4/25/06	10	86	23	68	39	6	<1	<1	
5/1/07	<1	28	10	2	6	<1	4	<1	
4/22/08	0	232	112	56	1	44	24	0	
4/28/09	0	50	0	14	80	6	4	0	2
4/27/10	<1	188	44	20	82	67	4	<1	<1
4/26/11	38	242	48	113	44	7	15	1	<1
5/1/12	4	26	22	34	55	25	2	0	
5/7/13	42	204	39	46	68	16		1	<1
4/30/14	4	56	2	14	44	7		0	
7/18/00	40		16	6	<1	2	2	8	
7/24/01	170		10	30	40	<1	70	<1	
7/16/02	10	30	160	20	10	<1	<1	<1	
7/22/03	80	9	200	9	110	9	20	20	
7/20/04	64	170	82	9	64	9	<1	9	
7/26/05	230	69	120	71	11	4	440	240	
7/25/06	260	370	160	180	68	130	230	83	
7/17/07	157	330	260	260	43	1	65	24	
7/29/08	56	57	39	28	57	21	21	6	
7/21/09	73	850	12	37	10	6	16	7	3
7/27/10	97	62	123	55	0	5	22	2	3
7/26/11	91	40	42	25	31	4	20	5	5
7/31/12	84	85	42	20	16	7	25	8	
7/30/13	93	9	31	14	13	2	76		7
7/22/14	39	14	15	8	7	1	12	4	

Table 52: Tributary Fecal Coliform Bacteria sampled in CFU/100mL.

Date	No Name Creek	Beaver Creek	Slikok Creek	Soldotna Creek	Funny River	Moose River	Killey River	Russian River	Juneau Creek
4/11/01	6.89		7.45	7.1	7.27	6.94	7.84	8.19	
4/10/02	7.18	7.19	7.36	7.39	7.3	7.24	7.39	7.15	
4/29/03	8.04	7.54	7.69	7.53	7.26	7.61	7.18	7.88	
4/27/04	6.53	6.44	6.37	6.77	6.64	6.98	6.68	7.08	
4/26/05	6.2	6.58	6.69	6.88	6.89	6.83	7.01	7.17	
4/25/06	7	6.83	6.91	7.06	6.87	7.1	6.5	6.99	
5/1/07	7.45	7.33	7.64	7.32	7.33	7.34	7.02	7.48	
4/22/08	7.16	6.95	7.03	7.25	7.12	7.11	6.75	7.7	
4/28/09	7.11	6.92	7.38	7.01	7.09	7.14	6.91	7.72	7.38
4/27/10	7.17	7.14	7.12	7.5	7.27	7.41	7.02	7.71	7.6
4/26/11	7.2	7.3	7.2	7.4	6.9	7.3	7.1	7.8	7.5
5/1/12	7.18	6.96	7.05	7.23	7.33	7.28	7.26	7.37	
5/7/13	6.68	6.67	6.86	7.24	6.74	6.87	6.89	7.42	7.35
4/29/14	7.09	7.1	7.16	7.48	7.4	7.43	7.44	7.73	
7/18/00	7.03		6.76	7.21	6.85	7.05	6.57	8.14	
7/24/01	7.46		7.29	7.24	7.56	7.35	7.22	8.05	
7/16/02	7.46	7.54	7.4	7.76	7.54	9.03	8.27	7.84	
7/22/03	7.3	7.3	7.1	7.4	7.5	8.4	6.7	7.4	
7/20/04	7.34	7.38	7.36	7.68	7.51	8	7.15	7.28	
7/26/05	7.59	7.27	7.43	7.36	7.28	7.93	7.02	7.72	
7/25/06	7.58	7.52	7.22	7.71	7.53	8.16	7.28	7.76	
7/17/07	7.37	7.27	7.31	7.62	7.48	8.64	7.1	7.66	
7/29/08	7.41	7.18	6.86	7.54	7.21	7.29	6.88	7.57	
7/21/09	7.52	7.29	7.26	7.71	7.61	8.36	6.91	7.71	7.68
7/27/10	7.02	7.01	7.06	7.33	7.09	7.41	7.15	7.26	7.21
7/26/11	7.58	7.44	7.39	7.73	7.53	8.01	6.98	7.86	7.81
7/31/12	7.38	7.31	7.06	7.53	7.38	7.69	6.89	7.48	
7/30/13	7.7	7.69	7.6	7.87	7.98	8.6	8.05	7.86	7.54
7/22/14	7.41	7.29	7.24	7.46	7.43		7.35	7.41	

Table 53: Tributary pH.

Date	No Name Creek	Beaver Creek	Slikok Creek	Soldotna Creek	Funny River	Moose River	Killey River	Russian River	Juneau Creek
4/11/01	143		78.9	97.9	73.6	77	72.8	111	
4/10/02	146.9	139.1	142.4	167.8	90.5	179.3	65.7	139	
4/29/03	220	131.4	90.5	139.5	63.3	118.7	54	98	
4/27/04	80.6	53.6	48.7	75.5	42.2	69.3	51.4	94.6	
4/26/05	48.4	61.6	54.8	83.8	65.8	114.4	64.1	88.6	
4/25/06	113	63.4	53.4	94.6	64	108	55.9	90.1	
5/1/07	157.3	133	73.5	81.3	73.1	103.9	62.8	90.6	
4/22/08	184.8	71.5	66.8	91.4	70.3	98.8	57.1	195.5	
4/28/09	163.6	62.5	65.1	61.3	50.5	84.4	52.1	112	80.3
4/27/10	1088	119	74	112	64	115	63	98	98
4/26/11	217	97	85	107	57	104	57	110	94
5/1/12	104.4	55.2	53.9	79	57.9	88.1	62.3	81.6	
5/7/13	46.8	45.1	48.4	75.7	47.4	53	49.1	116	96.6
4/29/14	86.8	69.9	69.4	101.3	62.5	98.3	58.8	105.4	
7/18/00	130		100	140	62	135	20	70	
7/24/01	366.8		110.3	124.7	69.5	152.8	32	80.8	
7/16/02	153.2	144.6	149.2	168	74.5	148.9	65	77.7	
7/22/03	157	155	149	180	84.9	157	22.7	81.6	
7/20/04	156.7	177.1	161.6	196.6	88.9	163.3	18	91	
7/26/05	218	180	112	182	98.7	141	26.8	97.3	
7/25/06	158.9	150.1	91.1	160.5	81.8	148.1	25.2	91.9	
7/17/07	438	131	126	144	77	131	36	94	
7/29/08	204.3	103.9	88.6	125.7	82.9	105.6	41.2	83	
7/21/09	220.3	118.7	90.7	169.7	82.8	156.8	32	90.5	79.5
7/27/10	207	127	113	137	69	148	31	83	73
7/26/11	131.5	146.2	155.8	167.7	89.1	159.7	40.6	95	88.8
7/31/12	159.8	142	139.1	160.4	80.4	144.6	35.7	86.6	
7/30/13	163.8	158.3	113.7	172.5	88.6	151	20.6	96.2	90.3
7/22/14	110.5	95.5	117	113.5	71.3		26.6	73.7	

Table 54: Tributary specific conductance sampled in μS/cm.

Date	No Name Creek	Beaver Creek	Slikok Creek	Soldotna Creek	Funny River	Moose River	Killey River	Russian River	Juneau Creek
4/11/01	26		15.3	26	50	9.3	6	1.3	
4/10/02	4.7	5.3	2	1.3	6	2	2.7	1.3	
4/29/03	4	2.7	0.7	2	37.3	0.7	1.3	0.7	
4/27/04	14.7	17.3	0.7	1.3	43.3	5.4	36	<0.7	
4/26/05	7.8	62.8	5.38	16.8	67.5	25.3	20	<0.48	
4/25/06	20.5	65	22	18.5	205	29.5	14	1.5	
5/1/07	15.5	196	31.5	18	77	19.5	16	0.5	
4/22/08	4	419	15	33.5	10.5	1.5	16	0.6	
4/28/09	9.8	748	6	12	125	14	75.2	0	7
4/27/10	13	556	33	16	63.5	38	13.8	ND	3.2
4/26/11	52	251	36	53	72	57	36	2.8	5.8
5/1/12	14	81.5	10.3	11.3	65	16.7	8.8	1.8	
5/7/13	17	31.5	15	9	5.7	12.7	46.6	2.8	0.5
4/30/14	10	247	11.7	16	54.7	9	34.6	1.5	
7/18/00	8.7		14.7	9.3	32.7	20.7	162	2	
7/24/01	6		1.3	5.3	34.7	6.7	86	2	
7/16/02	0.7	2	2	1.3	0.7	3.3	1.3	2.7	
7/22/03	0.7	0.7	0.7	0.7	2	0.7	64	0.7	
7/20/04	5.22	7.09	3.02	3.35	2.45	<1.0	16	<0.98	
7/26/05	5.43	2.65	5.4	2.71	13.2	1.49	210	<0.95	
7/25/06	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	201	<5.0	
7/17/07	<5.0	<5.0	13	<5.0	16	<5.0	66	<5.0	
7/29/08	6.3	9.2	4.2	25.4	59	4	32.8	0.8	
7/21/09	11.5	25.5	14	8.8	11.6	7.6	40.2	2.2	0.4
7/27/10	19	8	7.6	15.6	90.4	1.7	50.8	1.2	3.8
7/26/11	5	8	15.4	7.7	11.4	1.7	19	1.6	1.2
7/31/12	14	17.7	5	3	11.2	0.4	45.7	1.6	
7/31/13	8	5.7	27.3	3.4	5	4.7	250.5	4.2	3.4
7/23/14	12.5	491.3	2	6.7	8		19.7	1.8	

Table 55: Tributary suspended solids sampled in mg/L.

Date	No Name Creek	Beaver Creek	Slikok Creek	Soldotna Creek	Funny River	Moose River	Killey River	Russian River	Juneau Creek
4/11/01	50		4	10	34.6	8.7	8.8	0.1	
4/10/02	16	14	3.2	4.5	4.8	5	1.1	0.1	
4/29/03	16	24	2.5	2.5	22	3.5	8.5	0.4	
4/27/04	13	6.4	2.1	2.05	10.2	3.75	13.3	0.75	
4/26/05	7.9	9.86	1.21	5.15	28.2	5.48	4.18	0.53	
4/25/06	11.49	23.2	9.51	6.28	24	9.29	2.48	9.2	
5/1/07	30.2	76	8.7	10	23	5.3	3.8	0.7	
4/22/08	11.5	62.8	4.03	9.05	4.31	4.12	2.59	0.18	
4/28/09	10	276	11	4	34	6	22	0	2
4/27/10	14	336	7	6	16	14	6	ND	2
4/26/11	83	56	10.2	4.1	11.5	13.4	7.9	0.6	2.3
5/1/12	2.9	20.9	2.9	4	14	5.7	5.4	0.92	
5/7/13	16.3	13.6	5.03	5.12	2.95	5.79	8.43	0.6	1.61
4/29/14	12.1	20.3	4.22	6.68	16.3	6.36	12.7	0.54	
7/18/00	16		15	6.6	11	3	90	0.45	
7/24/01	14		2.7	2.1	12	1.8	65	2.2	
7/16/02	9.3	10	1.8	2.5	3.6	1.8	1.8	0.28	
7/22/03	16	11	5.3	2.8	6.3	1.39	80	0.45	
7/20/04	14.5	9	7.2	3	2.4	1.3	37.4	0.4	
7/26/05	25.5	10.8	6.45	3.1	4.22	1.72	96.3	0.05	
7/25/06	19.4	9.8	12.02	4.7	2.76	1.72	129.9	0.02	
7/17/07	22.8	10.3	5.5	2.5	4.9	2.1	46	0.3	
7/29/08	16.3	7.54	13	4.27	13	1.4	23.1	0.45	
7/21/09	18	16	13	3	4	2	41	1	1
7/27/10	19	10	5	4	21	2	28	0.4	3
7/26/11	9.06	11.9	3.92	3.88	4.45	2.82	24.3	0.69	0.64
7/31/12	12.1	11.5	3.96	2.21	2.67	2.15	29.6	0.51	
7/30/13	13.9	12.4	8.47	2.37	2.53	2.18	146	0.35	0.52
7/22/14	20.1	13.3	5.44	3.39	4.4		66.3	0.6	

Table 56: Tributary turbidity sampled in NTU.

Date	No Name Creek	Beaver Creek	Slikok Creek	Soldotna Creek	Funny River	Moose River	Killey River	Russian River	Juneau Creek
4/11/01	1.61		3.78	0.5	0.04	0.03	8.8	2	
4/10/02	0.2	-0.17	0.71	-0.02	-0.18	0.09	-0.21	0	
4/29/03	5.4	6.7	5.4	6.8	3.8	10.6	5.4	4.9	
4/27/04	4.2	4.5	4.7	4.9	1.8	4.3	2.8	3.3	
4/26/05	6.5	6.1	7.1	5.5	3.4	4.3	6.5	5.2	
4/25/06	1.7	1.8	0.7	1.5	-0.1	1.1	0	3.9	
5/1/07	3.7	3.8	2	3	1.6	3.6	1.7	3.5	
4/22/08	1.6	0.56	0.9	1.6	0	0.1	0.2	2.4	
4/28/09	9.6	8.81	9.13	6.8	7.88	7.8	9.5	10.41	
4/27/10	2.5	2	2	3	0.1	2.4	0.1	4.4	1.8
4/26/11	2.5	2.5	2.8	2.8	0.1	1.2	0.1	3	3
5/1/12	3.2	5.0	4.3	4.7	2.1	5.9	2.9	3.4	
5/7/13	1.1	0.5	1.1	1.1	0.1	0.2	0.2	4	0.555
4/29/14	16.2	14.22	14.86	15.51	14.92	14.18	10.78	15.9	
7/18/00	12.09		9.44	11.67	8.95	13.93	7.78	11.39	
7/24/01	15.12		12.04	14.62	10.72	15.92	7.67	11.5	
7/16/02	14.5	13.03	9.6	14.78	10.7	17.48	11.74	12.09	
7/22/03	15	13	12	17	12	19	8	13	
7/20/04	14.8	14.1	13.3	15.7	18.5	18.7	9.5	14.9	
7/26/05	14.7	13.3	12.2	12.1	12.7	17.3	8	13.8	
7/25/06	12.4	11.5	9.9	11	9.9	13.8	7.2	11.5	
7/17/07	12.6	11.9	9.4	13	10.8	15.5	9.7	12.7	
7/29/08	11.5	10.7	9	14	8.2	11.8	7.6	9.7	
7/21/09	13.1	13.2	13.2	12	9.9	16.4	8.6	13.4	10.6
7/27/10	11.5	10	8.9	10.2	8.2	11.8	7.5	10.1	8
7/26/11	12.4	13.95	12.8	14.9	12.7	15.9	13.8	15.2	14.9
7/31/12	17.19	13.13	14.21	14.8	14.35	14.57	13	14.12	
7/30/13	17.62	16.06	15.05	18.3	17.23	18.64	16.74	16.6	16.28
7/22/14	17.18	18.04	16.6	16.78	17.01		16.87	16.94	

Table 57: Tributary water temperature sampled in °C.

Appendix 2: Water Quality Standards

Parameter	ADEC Standard	USEPA Standard	References
Arsenic	150 µg/L for aquatic life, fresh water, and chronic exposure.	150 µg/L for a priority toxic pollutant, fresh water, and Criterion Continuous Concentration (CCC).	• ADEC, (2008), Alaska Water Quality Criteria Manual for Toxic and Other Deleterious Organic and Inorganic Substances. Data accessed on June 17, 2015 at https://dec.alaska.gov/water/wqsar/wqs/pdfs/Alaska%20Water%20Quality%20Criteria%20Manual%20for%20Toxic%20and%20Other%20Deleterious%20Organic%20and%20Inorganic%20Substances.pdf • USEPA, (2014), National Recommended Water Quality Criteria: USEPA data available on the World Wide Web, accessed June 17, 2015 at http://water.epa.gov/scitech/swguidance/standards/criteria/current/index.cfm
Arsenic	10 µg/L for Drinking Water	10 µg/L for Drinking Water	• ADEC, (2008), Alaska Water Quality Criteria Manual for Toxic and Other Deleterious Organic and Inorganic Substances. Data accessed on June 17, 2015 at https://dec.alaska.gov/water/wqsar/wqs/pdfs/Alaska%20Water%20Quality%20Criteria%20Manual%20for%20Toxic%20and%20Other%20Deleterious%20Organic%20and%20Inorganic%20Substances.pdf • USEPA, (2013), Arsenic in Drinking Water. Data accessed on June 23, 2015 at http://water.epa.gov/lawsregs/rulesregs/sdwa/arsenic/index.cfm
Cadmium	$(e^{7.409(\ln \text{hardness})-4.719})$ $(1.1101672-[(\ln \text{hardness})(0.041838)])$ for aquatic life, fresh water, and chronic exposure.	$(e^{7.409(\ln \text{hardness})-4.719})$ $(1.1101672-[(\ln \text{hardness})(0.041838)])$ for a priority toxic pollutant, fresh water, and CCC.	• ADEC, (2008), Alaska Water Quality Criteria Manual for Toxic and Other Deleterious Organic and Inorganic Substances. Data accessed on June 17, 2015 at https://dec.alaska.gov/water/wqsar/wqs/pdfs/Alaska%20Water%20Quality%20Criteria%20Manual%20for%20Toxic%20and%20Other%20Deleterious%20Organic%20and%20Inorganic%20Substances.pdf • USEPA, (2014), National Recommended Water Quality Criteria: USEPA data available on the World Wide Web, accessed June 17, 2015 at http://water.epa.gov/scitech/swguidance/standards/criteria/current/index.cfm

Table 58: Arsenic and Cadmium Water Quality Standards.

Parameter	ADEC Standard	USEPA Standard	References
Chromium III	$(e^{0.819(\ln \text{hardness})+0.6848})$ (0.860) for aquatic life, fresh water, and chronic exposure.	$(e^{0.819(\ln \text{hardness})+0.6848})$ (0.860) for a priority toxic pollutant, fresh water, and CCC.	• ADEC, (2008), Alaska Water Quality Criteria Manual for Toxic and Other Deleterious Organic and Inorganic Substances. Data accessed on June 17, 2015 at https://dec.alaska.gov/water/wqsar/wqs/pdfs/Alaska%20Water%20Quality%20Criteria%20Manual%20for%20Toxic%20and%20Other%20Deleterious%20Organic%20and%20Inorganic%20Substances.pdf • USEPA, (2014), National Recommended Water Quality Criteria: USEPA data available on the World Wide Web, accessed June 17, 2015 at http://water.epa.gov/ scitech/swguidance/standards/criteria/current/index.cfm
Chromium VI	11 µg/L for aquatic life, fresh water, and chronic exposure.	11 µg/L for a priority toxic pollutant, fresh water, and CCC.	• ADEC, (2008), Alaska Water Quality Criteria Manual for Toxic and Other Deleterious Organic and Inorganic Substances. Data accessed on June 17, 2015 at https://dec.alaska.gov/water/wqsar/wqs/pdfs/Alaska%20Water%20Quality%20Criteria%20Manual%20for%20Toxic%20and%20Other%20Deleterious%20Organic%20and%20Inorganic%20Substances.pdf • USEPA, (2014), National Recommended Water Quality Criteria: USEPA data available on the World Wide Web, accessed June 17, 2015 at http://water.epa.gov/ scitech/swguidance/standards/criteria/current/index.cfm
Copper	$(e^{0.8545(\ln \text{hardness})-1.702})(.960)$ for aquatic life, fresh water, and chronic exposure.	See EPA, 2007.	• ADEC, (2008), Alaska Water Quality Criteria Manual for Toxic and Other Deleterious Organic and Inorganic Substances. Data accessed on June 17, 2015 at https://dec.alaska.gov/water/wqsar/wqs/pdfs/Alaska%20Water%20Quality%20Criteria%20Manual%20for%20Toxic%20and%20Other%20Deleterious%20Organic%20and%20Inorganic%20Substances.pdf • USEPA, (2007), Aquatic Life Ambient Freshwater Quality Criteria-Copper 2007 Revision (EPA-822-R-07-001): EPA data available on the World Wide Web, accessed June 17, 2015 at http://water.epa.gov/scitech/swguidance/standards/criteria/aqlife/copper/upload/2009_04_27_criteria_copper_2007_criteria-full.pdf

Table 59: Chromium III, Chromium VI, and Copper Water Quality Standards.

Parameter	ADEC Standard	USEPA Standard	References
Lead	$(e^{1.273(\ln \text{hardness})-4.705})$ (1.46203- [(ln hardness)(0.145712) for aquatic life, fresh water, and chronic exposure.	$(e^{1.273(\ln \text{hardness})-4.705})$ (1.46203- [(ln hardness)(0.145712) for a priority toxic pollutant, fresh water, and CCC.	• ADEC, (2008), Alaska Water Quality Criteria Manual for Toxic and Other Deleterious Organic and Inorganic Substances. Data accessed on June 17, 2015 at https://dec.alaska.gov/water/wqsar/wqs/pdfs/Alaska%20Water%20Quality%20Criteria%20Manual%20for%20Toxic%20and%20Other%20Deleterious%20Organic%20and%20Inorganic%20Substances.pdf • USEPA, (2014), National Recommended Water Quality Criteria: USEPA data available on the World Wide Web, accessed June 17, 2015 at http://water.epa.gov/scitech/swguidance/standards/criteria/current/index.cfm
Zinc	$(e^{0.8473(\ln \text{hardness})+0.884})(0.986)$ for aquatic life, fresh water, and chronic exposure.	$(e^{0.8473(\text{lnhardness})+0.884})(0.986)$ for a priority toxic pollutant, fresh water, and CCC.	• ADEC, (2008), Alaska Water Quality Criteria Manual for Toxic and Other Deleterious Organic and Inorganic Substances. Data accessed on June 17, 2015 at https://dec.alaska.gov/water/wqsar/wqs/pdfs/Alaska%20Water%20Quality%20Criteria%20Manual%20for%20Toxic%20and%20Other%20Deleterious%20Organic%20and%20Inorganic%20Substances.pdf • USEPA, (2014), National Recommended Water Quality Criteria: USEPA data available on the World Wide Web, accessed June 17, 2015 at http://water.epa.gov/scitech/swguidance/standards/criteria/current/index.cfm
Calcium	None applicable to aquatic life, fresh water, and chronic exposure.	None applicable to a priority or non-priority pollutant, fresh water, and CCC.	
Iron	1 mg/L for aquatic life, fresh water, and chronic exposure.	1 mg/L for a non-priority pollutant, fresh water, and CCC.	• ADEC, (2008), Alaska Water Quality Criteria Manual for Toxic and Other Deleterious Organic and Inorganic Substances. Data accessed on June 17, 2015 at https://dec.alaska.gov/water/wqsar/wqs/pdfs/Alaska%20Water%20Quality%20Criteria%20Manual%20for%20Toxic%20and%20Other%20Deleterious%20Organic%20and%20Inorganic%20Substances.pdf • USEPA, (2014), National Recommended Water Quality Criteria: USEPA data available on the World Wide Web, accessed June 17, 2015 at http://water.epa.gov/scitech/swguidance/standards/criteria/current/index.cfm

Table 60: Lead, Zinc, Calcium, and Iron Water Quality Standards.

Parameter	ADEC Standard	USEPA Standard	References
Magnesium	None applicable to aquatic life, fresh water, and chronic exposure.	None applicable to a priority or non-priority pollutant, fresh water, and CCC.	
Nitrate	None applicable to aquatic life, fresh water, and chronic exposure.	None applicable to a priority or non-priority pollutant, fresh water, and CCC.	
Phosphorus	None applicable to aquatic life, fresh water, and chronic exposure.	None applicable to a priority or non-priority pollutant, fresh water, and CCC.	
Diesel Range Organics	None applicable to aquatic life, fresh water, and chronic exposure.	None applicable to a priority or non-priority pollutant, fresh water, and CCC.	
Gasoline Range Organics	None applicable to aquatic life, fresh water, and chronic exposure.	None applicable to a priority or non-priority pollutant, fresh water, and CCC.	
Residual Range Organics	None applicable to aquatic life, fresh water, and chronic exposure.	None applicable to a priority or non-priority pollutant, fresh water, and CCC.	
BTEX	For fresh water growth and propagation of fish, shellfish, other aquatic life, and wildlife: total aromatic hydrocarbons (TAH) in the water column may not exceed10 µg/L. There may be no concentrations of petroleum hydrocarbons, animal fats, or vegetable oils in shoreline or bottom sediments that cause deleterious effects to aquatic life. Surface waters and adjoining shorelines must be virtually free from floating oil, film, sheen, or discoloration.	No comparable standard for a priority or non-priority pollutant, fresh water, and CCC.	• ADEC, (2012), Water Quality Standards, 18 AAC 70, data accessed on June 17, 2015 at http://dec.alaska.gov/commish/regulations/pdfs/18%20AAC%2070.pdf

Table 61: Magnesium, Nitrate, Phosphorus, Diesel Range Organics, Gasoline Range Organics, Residual Range Organics, and BTEX Water Quality Standards.

Parameter	ADEC Standard	USEPA Standard	References
Fecal Coliform Bacteria	Not applicable to the sampling methods used in this study.	Not applicable to the sampling methods used in this study.	• ADEC, (2012), Water Quality Standards, 18 AAC 70, data accessed on June 17, 2015 at http://dec.alaska.gov/commish/regulations/pdfs/18%20AAC%2070.pdf • USEPA, (1989), 1989 Total Coliform Rule Requirements, accessed June 17, 2015 at http://water.epa.gov/lawsregs/rulesregs/sdwa/tcr/regulation.cfm
pH	For fresh water growth and propagation of fish, shellfish, other aquatic life, and wildlife: May not be less than 6.5 or greater than 8.5. May not vary more than 0.5 pH units from natural conditions	6.5-9 for a non-priority pollutant, fresh water, and CCC.	• ADEC, (2012), Water Quality Standards, 18 AAC 70, data accessed on June 17, 2015 at http://dec.alaska.gov/commish/regulations/pdfs/18%20AAC%2070.pdf • USEPA, (2014), National Recommended Water Quality Criteria: USEPA data available on the World Wide Web, accessed June 17, 2015 at http://water.epa.gov/scitech/swguidance/standards/criteria/current/index.cfm
Specific Conductance	None applicable to the aquatic life, fresh water, and chronic exposure.	None applicable to a priority or non-priority pollutant, fresh water, and CCC.	

Table 62: Fecal Coliform Bacteria, pH, and Specific Conductance Water Quality Standards.

Parameter	ADEC Standard	USEPA Standard	References
Total Suspended Solids	For fresh water growth and propagation of fish, shellfish, other aquatic life, and wildlife: The percent accumulation of fine sediment in the range of 0.1 mm to 4.0 mm in the gravel bed of waters used by anadromous or resident fish for spawning may not be increased by more than 5% by weight above natural conditions. In no case may the 0.1 mm to 4.0 mm fine sediment range in those gravel beds exceed a maximum of 30% by weight. In all other surface waters no sediment loads (suspended or deposited) that can cause adverse effects on aquatic animal or plant life, their reproduction or habitat may be present.	For fresh water fish and other aquatic life: Settleable and suspended solids should not reduce the depth of the compensation point for photosynthetic activity by more than 10% from the seasonably established norm for aquatic life.	• ADEC, (2012), Water Quality Standards, 18 AAC 70, data accessed on June 17, 2015 at http:// http://dec.alaska.gov/commish/regulations/pdfs/18%20AAC%2070.pdf • USEPA, (1986), Quality Criteria for Water 1986 [The Gold Book] (EPA 440/5-86-001, May 1996): EPA data available on the World Wide Web, accessed June 17, 2015 at http://water.epa.gov/scitech/swguidance/standards/criteria/aqlife/upload/2009_01_13_criteria_goldbook.pdf

Table 63: Total Suspended Solids Water Quality Standards.

Parameter	ADEC Standard	USEPA Standard	References
Turbidity	For fresh water growth and propagation of fish, shellfish, other aquatic life, and wildlife: May not exceed 25 NTU above natural conditions. For all lake waters, may not exceed 5 NTU above natural conditions.	For fresh water fish and other aquatic life: Settleable and suspended solids should not reduce the depth of the compensation point for photosynthetic activity by more than 10% from the seasonably established norm for aquatic life.	• ADEC, (2012), Water Quality Standards, 18 AAC 70, data accessed on June 17, 2015 at http:// http://dec.alaska.gov/commish/regulations/pdfs/18%20AAC%2070.pdf • USEPA, (1986), Quality Criteria for Water 1986 [The Gold Book] (EPA 440/5-86-001, May 1996): EPA data available on the World Wide Web, accessed June 17, 2015 at http://water.epa.gov/scitech/swguidance/standards/criteria/aqlife/upload/2009_01_13_criteria_goldbook.pdf
Water Temperature	For fresh water growth and propagation of fish, shellfish, other aquatic life, and wildlife: May not exceed 20°C at any time. The following maximum temperatures may not be exceeded, where applicable: Migration routes 15°C Spawning areas 13°C Rearing areas 15°C Egg & fry incubation 13°C For all other waters, the weekly average temperature may not exceed site-specific requirements needed to preserve normal species diversity or to prevent appearance of nuisance organisms.	Not applicable in Alaska to a non-priority pollutant, fresh water, and CCC.	• ADEC, (2012), Water Quality Standards, 18 AAC 70, data accessed on June 17, 2015 at http:// http://dec.alaska.gov/commish/regulations/pdfs/18%20AAC%2070.pdf • USEPA, (1986), Quality Criteria for Water 1986 [The Gold Book] (EPA 440/5-86-001, May 1996): EPA data available on the World Wide Web, accessed June 17, 2015 at http://water.epa.gov/scitech/swguidance/standards/criteria/aqlife/upload/2009_01_13_criteria_goldbook.pdf

Table 64: Turbidity and Water Temperature Water Quality Standards.

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Appendix 3: Hardness-Dependent Standards and Exceedances Summary Tables

Parameter	Site	Date	Hardness (mg/L)	Standard (µg/L)	Result Value (µg/L)
Cadmium	Mile 21	7/18/00	29.45	0.11	8
	Mile 82	7/20/04	35.91	0.12	1
	Soldotna Creek	7/16/02	79.51	0.25	63
	Slikok Creek	7/31/12	62.13	0.21	0.501
Chromium	No exceedances				
Copper	Mile 1.5	7/26/05	43.74	4.42	8.44
	Mile 6.5	7/25/06	34.12	3.57	4.84
	Mile 10.1	7/25/06	29.95	3.2	3.29
		7/22/14	28.76	3.08	3.2
	Mile 18	7/22/14	28.89	3.1	3.7
	Mile 21	7/18/00	29.45	3.15	443
	Mile 31	7/18/00	30.07	3.21	9
		7/26/05	28	3.02	21.1
	Mile 70	7/18/00	47.8	4.76	6
	Mile 82	7/18/00	33.92	3.56	5
	No Name Creek	4/26/05	16.96	1.97	8.21
	Beaver Creek	5/7/13	23.22	2.57	3.28
	Slikok Creek	7/20/04	49.6	4.92	12.1
	Killey River	4/10/02	26.51	2.88	13
		7/20/04	14.9	1.76	8.42
	Russian River	7/18/00	39.41	4.04	7
Lead	Mile 1.5	7/26/05	43.74	1.01	2.73
	Mile 6.5	7/25/06	34.12	0.77	19
		4/26/11	40.39	0.93	3.3
	Mile 10.1	7/25/06	29.95	0.66	1.65
	Mile 21	7/18/00	29.45	0.65	106
		7/25/06	29.95	0.66	1.93

Parameter	Site	Date	Hardness (mg/L)	Standard (µg/L)	Result Value (µg/L)
Lead	Mile 31	7/26/05	28	0.61	468
	Mile 82	7/16/02	31.12	0.69	4
	Beaver Creek	7/25/06	67.04	1.62	3.92
		4/26/11	46.76	1.09	2.7
	Killey River	7/20/04	14.89	0.3	1.21
	Juneau Creek	7/30/13	41.77	0.96	1.15
Zinc	Mile 1.5	4/29/14	135.72	153.03	154
		7/22/03	35.68	49.33	65
		7/31/12	54.35	70.45	106
		7/30/13	36.08	49.8	50
	Mile 6.5	5/1/12	30	42.6	124
		4/29/14	76.37	94.02	164
		7/22/03	32.79	45.93	55
		7/25/06	34.12	47.5	52.1
		7/21/09	32.66	45.78	73.9
		7/26/11	34.64	48.12	60.2
		7/22/14	28.89	41.26	56.4
	Mile 10.1	5/1/07	28.96	41.34	58.6
		4/28/09	31.97	44.95	46.2
		5/1/12	30.08	42.7	117
		5/7/13	31.08	43.89	59.9
		4/29/14	43.41	58.26	83.8
		7/22/03	28.5	40.78	51
		7/25/06	29.95	42.53	60
		7/21/09	31.79	44.74	78.2
		7/27/10	27.87	40.02	72
		7/26/11	32.7	45.82	58.8
		7/31/12	29.62	42.14	54.4
		7/30/13	32.29	45.33	73.1
		7/22/14	28.76	41.1	54.3
	Mile 12.5	4/27/10	34.18	47.58	84.2
		4/29/14	34.39	47.82	76.6
		7/20/04	29.3	41.76	55.7
		7/21/09	30.63	43.35	49.3
		7/26/11	32.7	45.83	49.7
		7/31/12	29.7	42.24	66.1
		7/30/13	32.54	45.63	50.4

Parameter	Site	Date	Hardness (mg/L)	Standard (µg/L)	Result Value (µg/L)
Zinc	Mile 12.5	7/22/14	28.82	41.18	58.7
	Mile 18	4/26/05	35.17	48.73	51.1
		4/27/10	36.26	50.01	70.3
		5/1/12	30.34	43.01	110
		7/20/04	29.74	42.28	59.4
		7/21/09	30.67	43.4	50.2
		7/27/10	26.99	38.95	59
		7/26/11	29.34	41.79	55.9
		7/31/12	30.31	42.97	69
		7/30/13	32.62	45.73	51.5
		7/22/14	28.89	41.26	64.3
	Mile 21	5/1/12	29.43	41.91	62.9
		7/18/00	29.45	41.93	2900
		7/26/11	29.58	42.09	51.9
		7/31/12	30.15	42.78	59.9
		7/30/13	32.24	45.28	51.1
	Mile 23	4/27/04	30.75	43.49	45.2
		5/1/07	28.28	40.51	47
		5/1/12	32.35	45.41	70.2
		7/21/09	31.25	44.09	55
		7/26/11	30.17	42.8	56
		7/31/12	30.32	42.98	45.5
		7/30/13	31.58	44.49	47.5
	Mile 31	4/27/04	30.82	43.57	45.7
		5/1/12	33.64	46.94	124
		7/20/04	29.86	42.43	44.1
		7/26/05	28	40.18	51.2
		7/26/11	30.45	43.14	57.9
	Mile 40	7/26/11	28.8	41.14	50.6
	Mile 43	4/27/04	28.68	41.01	42.3
		7/26/02	27.13	39.11	40
		7/26/11	28.59	40.89	59.1
	Mile 50	7/24/01	27.97	40.14	48.5
		7/26/11	30	42.61	59.9
	Mile 70	5/1/12	39.16	53.38	71
		7/16/02	31.58	44.48	50
		7/26/11	34.86	48.37	56.5
	Mile 82	5/1/12	35.46	49.08	54.5
		7/26/11	33.56	46.84	56.5

Parameter	Site	Date	Hardness (mg/L)	Standard (µg/L)	Result Value (µg/L)
Zinc	Mile 82	7/30/13	38.03	52.08	52.1
	No Name Creek	4/11/01	35.01	48.55	84
		4/10/02	42.03	56.68	122
		4/27/04	28.84	41.2	61.9
		4/26/05	16.96	26.27	63.3
		4/25/06	33.29	46.52	52.2
		5/1/12	28.31	40.55	115
		5/7/13	11.61	19.05	113
		4/29/14	27.03	39	97.8
		7/22/03	50.58	66.31	75
		7/26/11	48.64	64.15	148
		7/31/12	50.87	66.64	86.1
		7/22/14	44.31	59.28	67.1
	Beaver Creek	4/26/05	32.38	45.44	59.1
		4/25/06	31.67	44.59	46.4
		5/1/07	49.01	64.56	108
		4/28/09	38.28	52.37	84.8
		4/26/11	46.76	62.04	247
		5/1/12	23.26	34.33	196
		5/7/13	23.22	34.28	87.6
		4/29/14	33.52	46.79	111
		7/21/09	55.16	71.36	110
		7/26/11	68.87	86.13	114
		7/31/12	56.45	72.78	85.7
		7/30/13	73.06	90.55	99.6
	Slikok Creek	4/11/01	18.74	28.59	41
		4/29/03	41.47	56.04	69
		4/27/04	23.49	34.62	39.5
		4/26/05	25.11	36.64	47.9
		5/1/07	29.51	42.01	78.6
		5/1/12	22.77	33.72	116
		5/7/13	23.22	34.28	105
		4/29/14	31.79	44.74	56.3
		7/24/01	47.29	62.63	69.4
	Soldotna Creek	4/26/05	38.4	52.51	58.6
		4/28/09	35.96	49.67	51.4
		4/26/11	38.4	52.51	61.8
		5/1/12	33.02	46.2	94.6

Parameter	Site	Date	Hardness (mg/L)	Standard (µg/L)	Result Value (µg/L)
Zinc	Funny River	4/10/02	43.05	57.84	70
		4/29/03	31.58	44.49	52
		4/26/05	21.61	32.26	46.8
		5/1/07	31.14	43.96	51.9
		4/27/10	30.82	43.58	48
		4/26/11	25.2	36.75	45.6
		5/1/12	27.28	39.29	66.1
		7/16/02	31.93	44.91	51
		7/20/04	37.39	51.34	59.1
		7/26/11	40.38	54.79	56.7
	Moose River	5/1/12	70.59	56.28	120
	Killey River	4/27/04	25.79	37.48	37.9
		4/26/11	23.25	34.32	40
		5/1/12	26.32	38.12	60.7
		5/7/13	19.1	29.05	57.4
		7/24/01	15.25	24.01	34.4
		7/20/04	14.9	23.54	49.5
		7/21/09	16.01	25.01	44.4
		7/26/11	17.51	26.99	57.8
		7/31/12	15.28	24.04	57.5
		7/30/13	15.56	24.42	41.5
	Russian River	5/1/12	37.33	51.27	52.8
		7/26/11	40.41	54.82	55
	Juneau Creek	7/26/11	37.78	51.79	56.7

Table 65: Hardness-Dependent Standards and Exceedances Summary Table.

12 Hardness was calculated using the following formula:
2.497(Calcium in mg/L) + 4.119(Magnesium in mg/L) (Clesceri and others, 1998).
13 Standard calculated with the hardness value of 400 mg/l (ADEC, 2003).

Appendix 4: Data Tables Organized by Site Locations

Less than (<) indicates the sample is below the MRL and MDL of the following value, and these data are grey in color. ND indicates an instance of non-detect, in which all of the BTEX samples were reported as below the MRL or MDL, and these data are also shown in grey.

Date	Arsenic (µg/L)	Cadmium (µg/L)	Chromium (µg/L)	Copper (µg/L)	Lead (µg/L)	Zinc (µg/L)	Calcium (µg/L)
4/11/01	<4	<0.5	<2	<5	<4	55	36
4/10/02	<3	1.1	0.9	<9	<1	106	107.65
4/29/03	4.7	<2.5	2.9	100	<2.5	<50	140
4/27/04	<0.25	<0.18	<0.36	2.19	1.34	40.8	47.4
4/26/05	6.51	<0.18	<0.36	3.73	<0.052	55.9	54.4
4/25/06	12.5	<0.062	4.03	3.28	0.113	38.9	45.4
5/1/07	46.5	<0.062	6.51	3.85	0.224	19.2	111
4/22/08	24.6	<0.20	5.72	4.15	<0.10	<0.25	83.4
4/28/09				2.08	<0.030	24	52.7
4/27/10	8.07	<0.062	1.95	1.9	<0.030	5.24	48.9
4/26/11	40.5	<0.045	8.98	4.68	1.6	45.3	174
5/1/12	18.2	<0.045	16.8	2.16	0.13	40.9	68.4
5/7/13	3.36	<0.066	0.937	2.85	0.347	135	21
4/29/14	2.6	<0.066	0.608	1.78	<0.073	154	18.4
7/18/00	<4	<0.1	<2	<5	<4	<9	11.3
7/24/01	<3.1	<0.14	<0.49	<9.3	<1.1	36.2	13
7/16/02	2	<2	0.7	<9	<2	32	15.41
7/22/03	<2.5	<2.5	1.4	<25	<2.5	65	10
7/20/04	<0.25	<0.18	<0.36	<0.12	<0.052	35.7	13.1
7/26/05	<2.50	<1.0	<2.5	8.44	2.73	45.8	12.9
7/25/06	2.56	<0.062	1.78	3.75	0.279	0.94	13.3
7/17/07	2.44	<0.062	2.12	2.35	0.561	44.4	13.9
7/29/08							13.5
7/21/09	2.52	<0.062	1.13	1.87	<0.030	85.4	14.9
7/27/10	0.973	<0.062	1.33	1.46	0.385	25.8	17.6
7/26/11	1.4	<0.045	0.829	0.411	<0.030	<0.084	13.2
7/31/12	1.62	<0.045	1.81	0.94	0.123	106	12.4
7/30/13	1.22	<0.066	0.751	0.606	<0.073	50	11.2
7/22/14	1.61	<0.07	<0.20	3.07	<0.070	0.0611	12.1

Table 66: Arsenic, Cadmium, Chromium, Copper, Lead, Zinc, and Calcium samples taken at Mile 1.5

Date	Iron (µg/L)	Magnesium (µg/L)	Nitrate (mg/L)	Phosphorus (mg/L)	DRO (mg/L)	GRO (µg/L)	RRO (mg/L)
4/11/01	30.2	73.3	<0.10	0.91	0.29	<25.0	<2.53
4/10/02	7.7	327.6	0.2	0.35	<0.26	<25.0	<2.58
4/29/03	3.3	510	0.16	0.22	<0.39	<25.0	<2.59
4/27/04	0.958	128	0.272	0.056	<0.024	<3.0	<0.037
4/26/05	30	141	0.147	0.89	<0.0060		<0.20
4/25/06	14.4	110	<0.015	0.66			
5/1/07	4.44	351	0.172	<0.026			
4/22/08	30.3	249	0.125	1.4			
4/28/09	16.1	141	<0.015	<0.026			
4/27/10	37.7	108	<0.015	2			
4/26/11	1.7	582	0.158	0.14			
5/1/12	0.53	193	<0.015	<0.026			
5/7/13	43	27	<0.015	1.9			
4/29/14	10.2	21.8	<0.015	4			
7/18/00	11.9	5.4	0.18	0.81	<0.29	<25.0	<3.39
7/24/01	4.5	9.2	0.25	0.221	<0.27	26.7	<2.69
7/16/02	5.34	20.29	0.1	0.42	<0.26	38.3	<2.55
7/22/03	2	2.6	0.16	0.085	<0.38	<25.0	<2.53
7/20/04	12	6.42	0.125	0.507	<0.021	<100	<0.032
7/26/05	0.838	2.8	<0.10	1.1	<0.10		<0.50
7/25/06	5.95	12.5	0.108	0.32	<0.0065		<0.22
7/17/07	17.6	10.7	<0.015	1	<0.0063		<0.21
7/29/08	6.48	6.38	0.105	0.92			
7/21/09	25.9	14.7	<0.015	1.3			
7/27/10	39.7	19	<0.015	2.7			
7/26/11	11.2	6.13	0.105	0.51			
7/31/12	4.28	5.68	0.149	1.1			
7/30/13	0.801	1.97	0.146	0.054			
7/22/14	6.76	4.68	<0.015	0.98			

Table 67: Iron, Magnesium, Nitrate, Phosphorus, DRO, GRO, and RRO samples taken at Mile 1.5.

Date	BTEX (µg/L)	Fecal (CFU/100mL)	pH	Conductivity (µS/cm)	TSS (mg/L)	Turbidity (NTU)	Water Temp.(°C)
4/11/01	ND	80	7.21	3810	838	600	4
4/10/02	ND	<1	6.89	14675	236.7	170	0.45
4/29/03	ND	2	7.84	21100	138	20	7.3
4/27/04	ND	17	7.45	6350	30	10.7	4.6
4/26/05	ND	120	7.75	6420	1370	412	7.5
4/25/06		52	7.28	5110	889.5	416	3.3
5/1/07		20	7.97	18615	131	76.3	5.2
4/22/08		32	7.79	10913	630	702	5.2
4/28/09		15	7.82	8247	764	880	8.3
4/27/10		40	7.21	5030	1976	830	3.8
4/26/11		13	7.8	29398	60	44	
5/1/12		20	7.63	10382	45	28.9	
5/7/13		30	7.41	600.4	916	ND	3.4
4/30/14		110	7.47	790.4	1858	13.2	17.94
7/18/00	10.1	14	7.85	80	230	160	9
7/24/01	9.24	40	7.35	466.2	115.3	85	11.8
7/16/02	15.2	<1	7.4	850.4	136.7	75	12.9
7/22/03	ND	50	7.4	126	35.3	6.5	13
7/20/04	14.4	130	7.2	141.9	257	183.5	14.8
7/26/05	7.3	36	7.63	338	572	276	14.1
7/25/06	1.5	67	7.57	156.1	33	92.4	12
7/17/07	2.2	54	7.5	326	976	171.4	13.6
7/29/08	ND	120	7.47	297.7	648.7	475	11
7/21/09	ND	225	7.66	383.2	1564	1000	13.6
7/27/10	ND	137	7.36	363	1828	1240	10.2
7/26/11	0.35	70	7.59	140.8	235	223	12.7
7/31/12	ND	36	7.45	235.8	511	162	15.39
7/30/13	ND	68	7.92	96.8	35.5	24.1	16.51
7/22/14		111	7.33	120	491.3	335	17.02

Table 68: BTEX, Fecal, pH, Conductivity, TSS, Turbidity, and Water Temperature samples taken at Mile 1.5.

Date	Arsenic (µg/L)	Cadmium (µg/L)	Chromium (µg/L)	Copper (µg/L)	Lead (µg/L)	Zinc (µg/L)	Calcium (µg/L)
4/11/01	<4	<0.5	<2	<5	<4	91	19.3
4/10/02	<3	<0.1	<0.5	<9	<1	57	15.19
4/29/03	<2.5	<2.5	2.5	<25	<2.5	<50	17
4/27/04	3.28	<0.18	<0.36	<0.12	<0.052	41.3	9.2
4/26/05	7.17	<0.18	11.2	12	3.06	102	22
4/25/06	3.14	<0.062	3.29	2.99	0.26	47.4	32.2
5/1/07	1.98	<0.062	0.697	1.7	0.249	86.8	19.9
4/22/08	1.97	<0.20	1.51	2.07	<0.10	0.617	25.3
4/28/09				1.97	0.174	40.2	24
4/27/10	2.01	<0.062	1.72	2.76	0.151	28.7	21.1
4/26/11	3.78	0.207	2.41	2.86	3.3	260	10.9
5/1/12	1.85	<0.045	0.479	0.779	0.174	124	9.46
5/7/13	2.81	<0.066	<0.20	1.01	<0.073	<0.55	10
4/29/14	2.86	<0.066	0.735	4.98	0.235	164	18.2
7/18/00	<4	0.1	<2	<5	<4	10	9.42
7/24/01	<3.1	<0.14	<0.49	<9.3	<1.1	28.4	11
7/16/02	<1	<2	<0.6	<9	<2	39	11.2
7/22/03	<2.5	<2.5	<1.0	<25	<2.5	55	10
7/20/04	<0.25	<0.18	<0.36	<0.12	<0.052	39.9	12.4
7/26/05	<2.50	<1.0	<2.5	<2.5	<1.0	<10	9.27
7/25/06	<0.44	<0.062	19.5	4.84	19	52.1	10.4
7/17/07	1.33	<0.062	1.16	0.448	<0.030	30.2	19.4
7/29/08							10.7
7/21/09	1	<0.062	1.05	0.863	<0.030	73.9	11.2
7/27/10	0.703	<0.062	0.206	0.489	<0.030	28.7	9.39
7/26/11	1.31	<0.045	0.61	2.99	0.322	60.2	11.4
7/31/12	1.11	<0.045	0.38	0.568	0.117	34.8	10.4
7/30/13	1.09	<0.066	0.74	0.58	<0.073	45	11.4
7/22/14	1.18	<0.07	<0.20	2.95	<0.070	0.0564	9.98

Table 69: Arsenic, Cadmium, Chromium, Copper, Lead, Zinc, and Calcium samples taken at Mile 6.5.

Date	Iron (µg/L)	Magnesium (µg/L)	Nitrate (mg/L)	Phosphorus (mg/L)	DRO (mg/L)	GRO (µg/L)	RRO (mg/L)
4/11/01	27.5	17.7	<0.10	0.84	<0.25	<25.0	<2.53
4/10/02	11.97	10.29	<0.10	0.48	<0.27	<25.0	<2.69
4/29/03	29	15	<0.10	0.93	<0.39	<25.0	<2.63
4/27/04	1.25	1.86	<0.015	0.046	<0.020	<3.0	<0.032
4/26/05	51.4	22.6	<0.015	1.42	<0.0060		<0.20
4/25/06	128	43.8	<0.015	0.52			
5/1/07	44.7	16.8	<0.015	2.3			
4/22/08	80	30.3	<0.10	3.4			
4/28/09	81	30.6	<0.015	0.42			
4/27/10	45.2	18.2	<0.015	1.7			
4/26/11	4.43	3.2	0.115	0.21			
5/1/12	0.501	1.55	<0.015	<0.026			
5/7/13	9.1	5	<0.015	0.31			
4/29/14	19.5	7.51	<0.015	2.4			
7/18/00	2.3	1.6	0.15	0.11	<0.28	<25.0	<3.28
7/24/01	1.2	1.1	0.22	0.093	<0.26	27.1	<2.58
7/16/02	8.42	3.66	<0.10	0.3	<0.26	27.4	<2.55
7/22/03	3.2	1.9	0.19	0.12	<0.38	<25.0	<2.53
7/20/04	9.27	3.92	0.102	0.267	<0.021	<100	<0.033
7/26/05	0.649	0.969	<0.10	0.099	<0.10		<0.50
7/25/06	3.37	1.98	0.119	0.15	<0.0064		<0.22
7/17/07	0.674	3.28	0.151	0.14	<0.0064		<0.21
7/29/08	0.75	1.1	0.144	0.065			
7/21/09	0.694	1.14	0.123	0.075			
7/27/10	1.52	1.25	0.128	0.082			
7/26/11	1.77	1.5	0.149	0.18			
7/31/12	0.0451	0.976	0.159	<0.026			
7/30/13	0.479	1.17	0.148	<0.026			
7/22/14	0.288	0.965	0.142	<0.026			

Table 70: Iron, Magnesium, Nitrate, Phosphorus, DRO, GRO, and RRO samples taken at Mile 6.5.

Date	BTEX (µg/L)	Fecal (CFU/100mL)	pH	Conductivity (µS/cm)	TSS (mg/L)	Turbidity (NTU)	Water Temp.(°C)
4/11/01	ND	320	7.46	401	670.7	500	4.28
4/10/02	ND	64	7.98	338	228.7	270	-0.14
4/29/03	ND	13	7.63	330	663.3	600	8.3
4/27/04	ND	19	7.2	52.8	13.3	9.35	4.5
4/26/05	ND	18	7.29	118.3	1390	425.5	6.6
4/25/06		102	7.13	265	2073	3200	3
5/1/07		32	7.61	92.1	1133	666	4.2
4/22/08		50	7.68	123.3	1918	1810	4.4
4/28/09		29	7.64	178	1602	1400	13.53
4/27/10		280	7.25	146	1494	652	3.8
4/26/11		25	7.5	105	130	103	4.8
5/1/12		15	7.33	72.8	45.5	14.4	5.5
5/7/13		95	7.15	84.5	139.5	166	3
4/30/14		34	5.7	160.4	2478	366	15.24
7/18/00	12.11	15	7.71	50	64	45	8
7/24/01	11.85	<1	7.77	79.6	36.7	20	11.8
7/16/02	9.12	2980	7.67	65.8	232	110	13.05
7/22/03	4.06	580	7	72.9	53.3	50	13
7/20/04	6.3	200	7.42	71.5	231	148.6	16.6
7/26/05	3.5	23	6.95	92.2	46.8	28.4	13.9
7/25/06	8.1	110	7.48	62.3	81	39.3	11.7
7/17/07	6.1	34	7.24	64	74	20.5	11.8
7/29/08	1.3	11	7.26	68.3	63.6	23.2	10.4
7/21/09	0.75	57	7.31	65.7	90.2	29	13.6
7/27/10	ND	20	7.15	66	98.6	39	9.7
7/26/11	0.62	9		68	64.6	31.1	13.14
7/31/12	ND	8	7.36	68.8	21.8	7.38	13.55
7/30/13	ND	13	8.62	69.9	21.2	12.8	16.85
7/22/14		6	7.41	57.1	23.3	14.3	15.08

Table 71: BTEX, Fecal, pH, Conductivity, TSS, Turbidity, and Water Temperature samples taken at Mile 6.5.

Date	Arsenic (µg/L)	Cadmium (µg/L)	Chromium (µg/L)	Copper (µg/L)	Lead (µg/L)	Zinc (µg/L)	Calcium (µg/L)
4/11/01	<4	<0.5	<2	<5	<4	56	16.3
4/10/02							
4/29/03	<2.5	<2.5	<1.0	<25	<2.5	<50	10
4/27/04	<0.25	<0.18	<0.36	<0.12	<0.052	38	9.28
4/26/05	<0.25	<0.18	<0.36	<0.12	<0.052	45.9	12.3
4/25/06	2.31	<0.062	2.46	0.772	<0.030	28	11.1
5/1/07	1.83	<0.062	0.51	0.53	0.125	58.6	9.34
4/22/08	1.66	<0.20	0.742	0.28	<0.10	0.804	10.8
4/28/09				0.549	<0.030	46.2	9.57
4/27/10	1.63	<0.062	0.678	1.02	0.212	44.2	12.8
4/26/11	2.27	<0.045	1.52	1.23	0.547	41.3	10.4
5/1/12	1.98	<0.045	0.337	0.928	0.208	117	9.64
5/7/13	2.74	<0.066	<0.20	0.9	<0.073	59.9	9
4/29/14	2.03	<0.066	0.554	1.4	<0.073	83.8	13
7/18/00	<4	<0.1	<2	<5	<4	<9	9.77
7/24/01	<3.1	<0.14	<0.49	<9.3	<1.1	36.9	11
7/16/02	<1	<2	2	<9	<2	31	10.6
7/22/03	<2.5	<2.5	<1.0	<25	<2.5	51	9.6
7/20/04	<0.25	<0.18	<0.36	<0.12	<0.052	32	10.5
7/26/05	<2.50	<1.0	<2.5	<2.5	<1.0	24.9	8.93
7/25/06	<0.44	<0.062	19.9	3.29	1.65	60	9.8
7/17/07	1.13	<0.062	0.503	0.401	<0.030	19.4	9.59
7/29/08							10.5
7/21/09	1.06	<0.062	1.05	1.07	<0.030	78.2	11
7/27/10	0.738	<0.062	0.292	1.98	0.275	72	9.48
7/26/11	1.23	<0.045	0.385	0.915	<0.030	58.8	11.2
7/31/12	1.11	<0.045	0.379	1.77	0.438	54.4	10.3
7/30/13	1.03	<0.066	<0.20	0.639	<0.073	73.1	11.1
7/22/14	1.09	<0.07	<0.20	3.2	<0.070	0.0543	9.97

Table 72: Arsenic, Cadmium, Chromium, Copper, Lead, Zinc, and Calcium samples taken at Mile 10.1.

Date	Iron (µg/L)	Magnesium (µg/L)	Nitrate (mg/L)	Phosphorus (mg/L)	DRO (mg/L)	GRO (µg/L)	RRO (mg/L)
4/11/01	18.7	8.5	<0.10	0.75	0.27	<25.0	<2.53
4/10/02							
4/29/03	0.64	1.5	<0.10	<0.025	<0.44	<25.0	<2.91
4/27/04	0.763	1.53	0.113	0.048	<0.022	<3.0	<0.034
4/26/05	5.35	3.6	0.134	0.29	<0.0060		<0.20
4/25/06	3.07	2.66	<0.015	<0.026			
5/1/07	0.678	1.37	0.112	<0.026			
4/22/08	1.28	1.91	<0.10	0.067			
4/28/09	1.83	1.96	<0.015	0.15			
4/27/10	6.59	3.51	<0.015	0.31			
4/26/11	1.4	1.89	0.125	0.087			
5/1/12	0.294	1.46	<0.015	<0.026			
5/7/13	1.3	2.09	<0.015	0.078			
4/29/14	1.85	2.66	<0.015	0.12			
7/18/00	1.97	1.4	0.16	0.09	<0.27	<25.0	<3.24
7/24/01	0.718	1	0.23	0.072	<0.26	<25.0	<2.58
7/16/02	0.42	0.96	0.15	0.01	<0.28	<25.0	<2.81
7/22/03	0.87	1.1	0.18	0.049	<0.41	26.4	<2.75
7/20/04	0.71	1.03	0.143	<0.0020	<0.022	<100	<0.034
7/26/05	0.728	0.939	0.119	<0.051	<0.10		<0.50
7/25/06	1.55	1.33	0.51	0.084	<0.0065		<0.22
7/17/07	0.535	0.958	0.156	<0.026	<0.0065		<0.22
7/29/08	0.418	0.981	0.15	<0.026			
7/21/09	0.445	1.05	0.141	<0.026			
7/27/10	0.815	1.02	0.367	<0.026			
7/26/11	0.849	1.15	0.152	<0.026			
7/31/12	0.347	0.948	0.166	<0.026			
7/30/13	0.386	1.11	0.148	<0.026			
7/22/14	0.248	0.939	0.15	<0.026			

Table 73: Iron, Magnesium, Nitrate, Phosphorus, DRO, GRO, and RRO samples taken at Mile 10.1.

Date	BTEX (µg/L)	Fecal (CFU/100mL)	pH	Conductivity (µS/cm)	TSS (mg/L)	Turbidity (NTU)	Water Temp.(°C)
4/11/01	ND	260	7.8	137	401.3	240	2.22
4/10/02							
4/29/03	ND	<1	7.79	69.7	2.7	9	7
4/27/04	ND	2	6.75	51	6	7.2	4.4
4/26/05	ND	<1	7.07	76.6	71.1	23	6.6
4/25/06		<1	7	82.3	41	26	4.2
5/1/07		2	7.31	75.3	34	6	4.2
4/22/08		10	7.5	76.9	57.5	6.62	3.89
4/28/09		10	7.4	73.3	77	23	8.39
4/27/10		120	7.5	77	260	93	3.8
4/26/11		12	7.5	74	51	13	4.4
5/1/12		17	7.35	71.9	6.6	6.3	5.1
5/7/13		15	7.1	59.8	47	13.1	3.5
4/30/14		40	7.28	101.9	100	63.4	14.32
7/18/00	8.59	8	7.58	50	54	37	9
7/24/01	7.9	10	7.5	79.6	26	18	12
7/16/02	9.07	<1	7.91	56.3	4.7	4.9	11.52
7/22/03	7.47	9	7.3	62.8	11.3	14	13.5
7/20/04	2.8	18	7.5	63	11.7	11	14.1
7/26/05	2.3	15	7.04	66.1	18.1	13.92	13.8
7/25/06	3.6	80	7.26	62.6	44	20.4	11.6
7/17/07	2.6	4	7.46	64	18	8.6	11.4
7/29/08	ND	6	7.29	77.7	26	7.74	10.4
7/21/09	0.61	11	7.38	65.9	49	21	13.8
7/27/10	ND	21	6.16	70	26	12	9.6
7/26/11	ND	6	7.48	68.3	24.2	11.7	14.13
7/31/12	8.1	3	7.35	68.7	15.8	6.14	13.18
7/30/13		2	8.02	82.5	15.8	11.4	16.35
7/22/14		2	7.47	56.4	13	26.4	16

Table 74: BTEX, Fecal, pH, Conductivity, TSS, Turbidity, and Water Temperature samples taken at Mile 10.1.

Date	Arsenic (µg/L)	Cadmium (µg/L)	Chromium (µg/L)	Copper (µg/L)	Lead (µg/L)	Zinc (µg/L)	Calcium (µg/L)
4/11/01	5	<0.5	<2	<5	<4	26	11.3
4/10/02	<3	<0.1	<0.5	<9	<1	37	12.2
4/29/03	<2.5	<2.5	<1.0	<25	<2.5	<50	10
4/27/04	<0.25	<0.18	<0.36	1.97	<0.052	31.6	9.65
4/26/05	<0.25	<0.18	<0.36	<0.12	<0.052	29.8	11.1
4/25/06	3.6	<0.062	1.54	0.604	<0.030	19.6	10.9
5/1/07	1.73	<0.062	0.447	0.285	<0.030	0.947	9.34
4/22/08	1.69	<0.20	0.723	0.547	<0.10	1.28	11.2
4/28/09				0.521	<0.030	41.5	9.31
4/27/10	1.57	0.787	0.665	2.11	0.246	84.2	11.1
4/26/11	2.19	<0.045	1.42	0.731	0.291	20	10
5/1/12	2.16	<0.045	0.272	3.97	0.403	29.4	9.76
5/7/13	2.76	<0.066	<0.20	0.777	<0.073	<0.55	9
4/29/14	1.73	<0.066	<0.20	0.843	<0.073	76.6	11.2
7/18/00	<4	<0.1	<2	<5	<4	14	9.68
7/24/01	<3.1	<0.14	<0.49	<9.3	<1.1	31.6	10
7/16/02	<1	<2	1.8	<9	<2	30	10.29
7/22/03	<2.5	<2.5	<1.0	<25	<2.5	<50	9.7
7/20/04	<0.25	<0.18	<0.36	<0.12	<0.052	55.7	10.2
7/26/05	<2.50	<1.0	<2.5	<2.5	<1.0	14.4	8.87
7/25/06	<0.44	<0.062	2.71	1.88	<0.030	19.1	9.95
7/17/07	1.3	<0.062	0.476	0.332	<0.030	16.1	8.52
7/29/08							9.79
7/21/09	1.04	<0.062	0.938	0.696	<0.030	49.3	10.6
7/27/10	0.7	<0.062	0.22	1.15	0.16	25.3	9.58
7/26/11	0.748	<0.045	0.318	0.739	<0.030	49.7	11.3
7/31/12	1.15	<0.045	0.709	2.1	0.798	66.1	10.3
7/30/13	1.07	<0.066	<0.20	0.531	<0.073	50.4	11.2
7/22/14	1.14	<0.07	<0.20	3.09	<0.070	0.0587	10

Table 75: Arsenic, Cadmium, Chromium, Copper, Lead, Zinc, and Calcium samples taken at Mile 12.5.

Date	Iron (µg/L)	Magnesium (µg/L)	Nitrate (mg/L)	Phosphorus (mg/L)	DRO (mg/L)	GRO (µg/L)	RRO (mg/L)
4/11/01	0.22	1.8	<0.10	0.06	<0.27	<25.0	<2.66
4/10/02	1.54	2.04	<0.10	0.06	<0.26	<25.0	<2.58
4/29/03	0.46	1.4	<0.10	<0.025	<0.42	<25.0	<2.81
4/27/04	0.706	1.71	0.115	0.045	<0.022	<3.0	<0.034
4/26/05	0.934	1.9	0.156	0.11	<0.0060		<0.20
4/25/06	0.866	2.07	<0.015	<0.026			
5/1/07	0.741	1.37	<0.015	<0.026			
4/22/08	0.433	1.69	<0.10	<0.051			
4/28/09	1.13	1.64	<0.015	0.093			
4/27/10	0.473	1.57	<0.015	<0.026			
4/26/11	0.65	1.57	0.12	0.061			
5/1/12	0.227	1.41	<0.015	<0.026			
5/7/13	1	2	<0.015	0.064			
4/29/14	2.15	1.56	<0.015	<0.26			
7/18/00	1.6	1.3	0.15	0.06	<0.29	<25.0	<3.43
7/24/01	0.575	0.979	0.22	0.064	<0.26	<25.0	<2.58
7/16/02	0.33	0.92	0.17	0.02	<0.26	<25.0	<2.63
7/22/03	0.84	1	0.18	0.036	<0.40	<25.0	<2.69
7/20/04	0.62	0.931	0.155	<0.0020	<0.022	<100	<0.034
7/26/05	0.855	0.948	0.124	<0.051	<0.10		<0.50
7/25/06	1.68	1.38	0.13	0.077	<0.0066		<0.22
7/17/07	0.728	2.93	0.133	<0.026	<0.0066		<0.22
7/29/08	0.859	0.919	0.15	<0.026			
7/21/09	0.376	1.01	0.158	<0.026			
7/27/10	0.633	0.981	0.179	<0.026			
7/26/11		1.09	0.151	<0.026			
7/31/12	0.272	0.967	0.161	<0.026			
7/30/13	0.4	1.11	0.149	<0.026			
7/22/14	0.247	0.936	0.177	<0.026			

Table 76: Iron, Magnesium, Nitrate, Phosphorus, DRO, GRO, and RRO samples taken at Mile 12.5.

Date	BTEX (µg/L)	Fecal (CFU/100mL)	pH	Conductivity (µS/cm)	TSS (mg/L)	Turbidity (NTU)	Water Temp.(°C)
4/11/01	ND	29	7.66	95	32	5.8	3.78
4/10/02	ND	<1	7.9	47.1	30.7	40	-0.15
4/29/03	ND	<1	7.85	69.1	45.8	8.5	7.2
4/27/04	ND	3	6.4	52.2	3.3	6.9	4.3
4/26/05	ND	<1	7.06	74.8	15.6	9.04	6.2
4/25/06		2	7.05	84	3.5	5.5	3
5/1/07		2	7.4	74.2	16	5.8	4.2
4/22/08		10	7.38	76	8.5	3.12	3.33
4/28/09		4	7.41	70.2	20.6	10	11.36
4/27/10		15	7.47	76	12.8	5	3.7
4/26/11		40	7.4	76	13	6.5	4.4
5/1/12		65	7.45	71	7.6	5.2	4.8
5/7/13		49	7.18	59.2	17.3	6.98	3
4/30/14		0	3.84	171.8	6.8	8.62	14.24
7/18/00	8.44	10	7.61	50	28	22	9
7/24/01	6.18	<1	7.71	80.8	14.7	11	11.8
7/16/02	6.34	<1	7.78	56.2	5.3	4	11.69
7/22/03	4.72	20	7.2	64.2	8.7	11	13
7/20/04	1.8	<1	7.38	65.1	7.84	10.3	13.9
7/26/05	2.1	12	6.97	66.8	13.2	9.14	13.8
7/25/06	2.2	97	7.6	62	38	23.1	11.6
7/17/07	1.8	22	7.48	64	11	6.4	11.1
7/29/08	ND	4	7.39	69.2	18.8	7.25	10.4
7/21/09	0.59	6	7.38	66.4	37	19	13.7
7/27/10	ND	10	6.99	65	28.4	10	9.5
7/26/11	ND	1	7.54	67.9	22.8	12	14.8
7/31/12	ND	2	7.44	68.4	12.4	8.26	13.49
7/30/13		2	8.17	69.4	19.4	12.2	16.38
7/22/14		1	7.41	56.9	27.3	9.82	15.93

Table 77: BTEX, Fecal, pH, Conductivity, TSS, Turbidity, and Water Temperature samples taken at Mile 12.5

Date	Arsenic (µg/L)	Cadmium (µg/L)	Chromium (µg/L)	Copper (µg/L)	Lead (µg/L)	Zinc (µg/L)	Calcium (µg/L)
4/11/01	<4	<0.5	<2	<5	<4	29	11.2
4/10/02	<3	<0.1	<0.5	<9	<1	33	12.01
4/29/03	<2.5	<2.5	<1.0	<25	<2.5	<50	10
4/27/04	<0.25	<0.18	<0.36	<0.12	<0.052	24.1	9.79
4/26/05	<0.25	<0.18	<0.36	<0.12	<0.052	51.1	11
4/25/06	2.1	<0.062	0.996	0.596	<0.030	20.3	11.5
5/1/07	1.74	<0.062	0.53	0.32	<0.030	20.6	9.4
4/22/08	1.64	<0.20	0.691	0.157	<0.10	0.591	9.89
4/28/09				0.787	<0.030	23.4	9.22
4/27/10	1.9	<0.062	0.793	1.79	0.543	70.3	11.8
4/26/11	2.03	<0.045	1.3	0.888	0.293	17.9	10.1
5/1/12	1.68	<0.045	0.423	1.25	<0.030	110	9.86
5/7/13	2.65	<0.066	<0.20	0.68	<0.073	6.35	9
4/29/14	1.72	<0.066	<0.20	0.664	<0.073	29.5	11.1
7/18/00	<4	<0.1	<2	<5	<4	14	9.76
7/24/01	<3.1	<0.14	<0.49	<9.3	<1.1	43	11
7/16/02	<1	<2	<0.6	<9	<2	30	10.4
7/22/03	<2.5	<2.5	<1.0	<25	<2.5	<50	9.5
7/20/04	<0.25	<0.18	<0.36	1.06	<0.052	59.4	10.3
7/26/05	<2.50	<1.0	<2.5	<2.5	<1.0	25.7	9.14
7/25/06	<0.44	<0.062	2.17	2.04	<0.030	18.7	9.85
7/17/07	1.14	<0.062	0.609	0.375	<0.030	14.6	9.52
7/29/08							10.1
7/21/09	1.02	<0.062	0.969	0.745	<0.030	50.2	10.6
7/27/10	0.74	<0.062	0.236	3.08	0.445	59	9.31
7/26/11	1.22	<0.045	0.366	0.871	0.393	55.9	10
7/31/12	1.04	<0.045	0.352	0.892	0.394	69	10.6
7/30/13	1.05	<0.066	<0.20	0.58	<0.073	51.5	11.2
7/22/14	1.16	<0.07	<0.20	3.7	<0.070	0.0643	10

Table 78: Arsenic, Cadmium, Chromium, Copper, Lead, Zinc, and Calcium samples taken at Mile 18.0

Date	Iron (µg/L)	Magnesium (µg/L)	Nitrate (mg/L)	Phosphorus (mg/L)	DRO (mg/L)	GRO (µg/L)	RRO (mg/L)
4/11/01	0.2	1.4	0.13	<0.05	<0.25	<25.0	<2.53
4/10/02	0.39	1.58	0.11	0.02	<0.25	<25.0	<2.53
4/29/03	0.45	1.4	0.11	<0.025	<0.43	<25.0	<2.84
4/27/04	0.612	1.52	0.131	0.039	<0.022	<3.0	<0.034
4/26/05	0.987	1.87	0.184	<0.025	<0.0060		<0.20
4/25/06	0.964	1.74	0.112	<0.026			
5/1/07	0.669	1.35	0.12	<0.026			
4/22/08	0.385	1.46	<0.10	<0.051			
4/28/09	1.02	1.58	<0.015	0.055			
4/27/10	0.455	1.65	<0.015	<0.026			
4/26/11	0.708	1.61	0.138	<0.026			
5/1/12	0.303	1.39	0.106	<0.026			
5/7/13	1	2	<0.015	0.055			
4/29/14	0.458	1.5	<0.015	<0.26			
7/18/00	1.54	1.3	0.15	0.06	<0.28	<25.0	<3.26
7/24/01	0.586	0.909	0.23	0.08	<0.25	<25.0	<2.53
7/16/02	0.3	0.91	0.23	0.01	<0.27	<25.0	<2.72
7/22/03	0.72	0.95	0.15	0.03	<0.42	<25.0	<2.78
7/20/04	0.629	0.977	0.156	<0.0020	<0.023	<100	<0.036
7/26/05	0.639	0.965	0.135	<0.051	<0.10		<0.50
7/25/06	1.56	1.32	0.152	<0.026	<0.0065		<0.22
7/17/07	0.471	0.928	0.176	<0.026	<0.0065		<0.22
7/29/08	0.222	0.909	0.169	<0.026			
7/21/09	0.376	1.02	0.149	<0.026			
7/27/10	0.577	0.91	0.557	<0.026			
7/26/11	0.674	1.06	0.158	0.08			
7/31/12	0.293	0.934	0.172	<0.026			
7/30/13	0.418	1.13	0.155	<0.026			
7/22/14	0.258	0.953	0.158	<0.026			

Table 79: Iron, Magnesium, Nitrate, Phosphorus, DRO, GRO, and RRO samples taken at Mile 18.0.

Date	BTEX (µg/L)	Fecal (CFU/100mL)	pH	Conductivity (µS/cm)	TSS (mg/L)	Turbidity (NTU)	Water Temp.(°C)
4/11/01	ND	32	7.61	79.7	19.3	5.4	2.89
4/10/02	ND	<1	7.36	73.5	7.3	5.2	0.24
4/29/03	ND	<1	7.91	70	0.7	8.5	7
4/27/04	ND	4	6.64	51.3	1.3	6.5	4.4
4/26/05	ND	<1	7.13	75.5	18.1	9.71	5.7
4/25/06		3	7.1	78.2	5	6.98	2.9
5/1/07		2	7.52	75.4	18.5	8.5	4.4
4/22/08		25	7.4	75.3	5.5	2.68	3.33
4/28/09		2	7.32	89.7	3.2	12	12.06
4/27/10		14	7.46	76	9	6	3.5
4/26/11		17	7.5	75	11.2	5.5	4.3
5/1/12		7	7.52	71.6	8.8	5.7	4.8
5/7/13		22	7.11	63.3	11	5.59	
4/30/14		1	7.69	73.4	8.4	15.5	13.55
7/18/00	1.48	2	7.6	50	28	23	9
7/24/01	3.25	<1	7.58	86.9	12.7	10	11.8
7/16/02	1.23	<1	7.72	55.8	4.7	3.9	11.41
7/22/03	0.71	9	7.3	63.9	8	15	13
7/20/04	1.5	18	7.26	60.4	7.39	9.3	13.7
7/26/05	ND	23	7.22	68.6	15.1	7.96	13.8
7/25/06	ND	72	7.19	62.2	25	22.9	11.7
7/17/07	ND	1	7.5	67	11	6.9	11.1
7/29/08	ND	4	7.46	68.5	14	6.61	10.5
7/21/09	ND	3	7.45	65.2	27.8	15	13.7
7/27/10	ND	11	7.03	65	19.8	10	9.6
7/26/11	ND	5	7.61	69	15.4	12.1	16.4
7/31/12	ND	6	7.33	68.7	12.4	8.01	12.89
7/30/13		2	8.08	69.5	17.6	11.4	16.36
7/22/14		0	7.39	56.9	10.5	10.8	16.23

Table 80: BTEX, Fecal, pH, Conductivity, TSS, Turbidity, and Water Temperature samples taken at Mile 18.0.

Date	Arsenic (µg/L)	Cadmium (µg/L)	Chromium (µg/L)	Copper (µg/L)	Lead (µg/L)	Zinc (µg/L)	Calcium (µg/L)
4/11/01	<4	<0.5	<2	<5	<4	35	10.7
4/10/02	<3	<0.1	<0.5	<9	<1	32	12.06
4/29/03	<2.5	<2.5	<1.0	<25	<2.5	<50	10
4/27/04	<0.25	<0.18	<0.36	<0.12	<0.052	38.2	9.02
4/26/05	<0.25	<0.18	<0.36	<0.12	<0.052	29	10.1
4/25/06	1.93	<0.062	1.16	0.997	<0.030	16.8	10.6
5/1/07	1.64	<0.062	0.486	0.362	<0.030	18.8	8.89
4/22/08	1.57	<0.20	0.305	0.572	<0.10	1.12	10.5
4/28/09				0.495	<0.030	33.5	8.58
4/27/10	1.57	<0.062	0.587	0.663	<0.030	31.9	10.8
4/26/11	1.94	<0.045	1.14	0.581	0.571	19.8	9.53
5/1/12	1.58	<0.045	0.27	0.728	<0.030	62.9	9.61
5/7/13	2.24	<0.066	<0.20	0.448	<0.073	23.6	9
4/29/14	1.57	<0.066	<0.20	0.58	<0.073	14.7	10.6
7/18/00	<4	8	25	443	106	2900	9.65
7/24/01	<3.1	<0.14	<0.49	<9.3	<1.1	37.1	10
7/16/02	<1	<2	<0.6	<9	<2	30	10.36
7/22/03	<2.5	<2.5	<1.0	<25	<2.5	<50	9.5
7/20/04	<0.25	<0.18	<0.36	<0.12	<0.052	36.3	10.4
7/26/05	<2.50	<1.0	<2.5	<2.5	<1.0	<10	10.2
7/25/06	1.3	<0.062	1.86	1.85	1.93	15.8	9.85
7/17/07	1.04	<0.062	0.623	0.372	<0.030	12.6	9.56
7/29/08							11
7/21/09	1.07	<0.062	0.814	0.52	<0.030	29.6	10.9
7/27/10	0.686	<0.062	0.229	0.561	<0.030	35.3	9.79
7/26/11	1.22	<0.045	0.297	0.573	<0.030	51.9	10.1
7/31/12	1.02	0.162	0.313	0.941	<0.030	59.9	10.5
7/30/13	1.04	<0.066	<0.20	0.432	<0.073	51.1	11
7/22/14	1.14	<0.07	<0.20	1.87	<0.070	0.0321	10.1

Table 81: Arsenic, Cadmium, Chromium, Copper, Lead, Zinc, and Calcium samples taken at Mile 21.0

Date	Iron (µg/L)	Magnesium (µg/L)	Nitrate (mg/L)	Phosphorus (mg/L)	DRO (mg/L)	GRO (µg/L)	RRO (mg/L)
4/11/01	0.41	1.3	<0.10	<0.05	<0.25	<25.0	<2.53
4/10/02	0.25	1.47	0.15	0.02	<0.26	<25.0	<2.58
4/29/03	0.83	1.5	<0.10	<0.025	<0.43	<25.0	<2.84
4/27/04	0.715	1.46	0.115	0.051	<0.021	<3.0	<0.032
4/26/05	1.02	1.84	0.163	0.15	<0.0060		<0.20
4/25/06	0.866	1.68	<0.015	<0.026			
5/1/07	0.703	1.36	0.14	<0.026			
4/22/08	0.378	1.5	<0.10	<0.051			
4/28/09	1.17	1.56	<0.015	0.072			
4/27/10	0.517	1.65	<0.015	<0.026			
4/26/11	0.572	1.46	0.12	0.06			
5/1/12	0.31	1.32	0.115	<0.026			
5/7/13	0.79	2	<0.015	<0.026			
4/29/14	0.421	1.46	0.152	<0.26			
7/18/00	1.5	1.3	0.14	0.07	<0.30	<25.0	<3.51
7/24/01	0.582	1	0.23	0.018	<0.26	<25.0	<2.63
7/16/02	0.27	0.9	0.15	0.02	<0.30	<25.0	<3.01
7/22/03	0.76	1	0.18	0.049	<0.40	<25.0	<2.69
7/20/04	0.562	0.963	0.158	<0.0020	<0.024	<100	<0.037
7/26/05	0.404	0.961	0.121	<0.051	<0.10		<0.50
7/25/06	1.4	1.3	0.136	<0.026	<0.0065		<0.22
7/17/07	0.412	0.917	0.171	<0.026	<0.0064		<0.21
7/29/08	0.232	0.999	0.154	<0.026			
7/21/09	0.391	1.05	0.149	<0.026			
7/27/10	0.575	0.969	0.153	<0.026			
7/26/11	0.692	1.06	0.151	<0.026			
7/31/12	0.38	0.955	0.156	<0.026			
7/30/13	0.447	1.16	0.146	<0.026			
7/22/14	0.268	0.955	0.152	<0.026			

Table 82: Iron, Magnesium, Nitrate, Phosphorus, DRO, GRO, and RRO samples taken at Mile 21.0.

Date	BTEX (µg/L)	Fecal (CFU/100mL)	pH	Conductivity (µS/cm)	TSS (mg/L)	Turbidity (NTU)	Water Temp.(°C)
4/11/01	ND	18	7.5	79.2	4	6.6	3.28
4/10/02	ND	<1	7.61	68	5.3	4.6	0.54
4/29/03	ND	<1	8.12	63.6	0.7	11	7.6
4/27/04	ND	<1	6.89	54.1	10	7	4
4/26/05	ND	<1	7.33	72.6	45.6	11.65	7.2
4/25/06		10	6.97	74.1	6	6.5	3.1
5/1/07		8	7.67	75.2	7.5	7.5	3.9
4/22/08		14	7.31	80.9	5.5	4.1	3.2
4/28/09		10	7.45	74.7	19.8	12	10.78
4/27/10		23	7.51	76	6.2	5	3.2
4/26/11		22	7.5	71	20	7.4	4.1
5/1/12		3	7.37	69.4	9.4	5.2	4.7
5/7/13		8	7.24	66.7	9	5.73	2.1
4/30/14		1	8.78	68.5	5.6	9.62	14.5
7/18/00	0.62	4	7.15	50	21.3	22	8.89
7/24/01	0.84	<1	7.49	68.4	19.3	13	11.7
7/16/02	0.93	<1	7.76	58.8	4.7	4.3	11.2
7/22/03	0.4	9	7.4	65	8.7	15	14
7/20/04	ND	55	7.57	67.7	9.64	10.4	13.5
7/26/05	ND	9.3	7.52	65.7	12.1	7.77	13.3
7/25/06	ND	100	7.16	62.5	28	18.7	11.5
7/17/07	ND	<1	7.46	62	<5.0	8.3	10.5
7/29/08	3.6	5	7.48	68.6	10	5.99	11
7/21/09	ND	2	7.52	65.9	26.8	16	13.8
7/27/10	ND	9	7.31	66	25.2	10	9.4
7/26/11	ND	3	7.57	69.6	15.6	12.1	15.6
7/31/12	ND	3	7.42	68.9	13.2	7.24	14.38
7/30/13		<1	7.91	68.8	12.8	13.2	15.76
7/22/14		3	7.37	55.6	8.5	10.8	16.87

Table 83: BTEX, Fecal, pH, Conductivity, TSS, Turbidity, and Water Temperature samples taken at Mile 21.0.

Date	Arsenic (µg/L)	Cadmium (µg/L)	Chromium (µg/L)	Copper (µg/L)	Lead (µg/L)	Zinc (µg/L)	Calcium (µg/L)
4/11/01	<4	<0.5	<2	<5	<4	22	10.9
4/10/02	<3	<0.1	<0.5	<9	<1	33	11.19
4/29/03	<2.5	<2.5	<1.0	<25	<2.5	<50	11
4/27/04	<0.25	<0.18	<0.36	<0.12	<0.052	45.2	9.89
4/26/05	<0.25	<0.18	<0.36	<0.12	<0.052	25.8	11.6
4/25/06	2.12	<0.062	0.299	1.23	<0.030	1.96	9.82
5/1/07	1.91	<0.062	0.491	0.664	<0.030	47	9.23
4/22/08	1.8	<0.20	0.971	0.757	<0.10	1.2	10.8
4/28/09				0.501	<0.030	2.14	9.39
4/27/10	1.56	<0.062	0.42	0.429	<0.030	41.3	11
4/26/11	2.09	<0.045	1.14	0.774	<0.030	38.8	10.4
5/1/12	1.89	<0.045	0.275	0.758	<0.030	70.2	10.5
5/7/13	2.59	<0.066	<0.20	0.524	<0.073	<0.55	10
4/29/14	1.58	<0.066	<0.20	0.831	<0.073	47.5	11.3
7/18/00	<4	0.1	<2	<5	<4	18	9.74
7/24/01	<3.1	<0.14	<0.49	<9.3	<1.1	43.2	11
7/16/02	<1	<2	<0.6	<9	<2	36	10.29
7/22/03	<2.5	<2.5	1	<25	<2.5	<50	9.6
7/20/04	<0.25	<0.18	<0.36	<0.12	<0.052	31.9	10.2
7/26/05	<2.50	<1.0	<2.5	<2.5	<1.0	25.8	9.85
7/25/06	1.29	<0.062	1.43	0.687	0.165	2.25	9.84
7/17/07	1.22	<0.062	0.857	0.473	<0.030	25	0.917
7/29/08							10.7
7/21/09	1.06	<0.062	0.858	0.641	<0.030	55	10.8
7/27/10	0.664	<0.062	0.17	0.21	<0.030	26.7	9.43
7/26/11	1.25	<0.045	0.332	0.61	<0.030	56	10.3
7/31/12	1.07	<0.045	0.266	0.401	<0.030	45.5	10.6
7/30/13	1.08	<0.066	<0.20	0.455	<0.073	47.5	10.8
7/22/14	1.15	<0.07	<0.20	1.92	<0.070	0.0348	10.2

Table 84: Arsenic, Cadmium, Chromium, Copper, Lead, Zinc, and Calcium samples taken at Mile 23.0.

Date	Iron (µg/L)	Magnesium (µg/L)	Nitrate (mg/L)	Phosphorus (mg/L)	DRO (mg/L)	GRO (µg/L)	RRO (mg/L)
4/11/01	0.46	1.3	<0.10	<0.05	<0.27	<25.0	<2.70
4/10/02	0.23	1.41	0.13	0.02	<0.27	<25.0	<2.66
4/29/03	0.44	1.4	<0.10	<0.025	<0.43	<25.0	<2.84
4/27/04	0.678	1.47	0.116	0.039	<0.020	<3.0	<0.032
4/26/05	1.03	1.9	0.143	0.11	<0.0060		<0.20
4/25/06	0.66	1.46	<0.015	<0.026			
5/1/07	0.53	1.27	0.114	<0.026			
4/22/08	0.352	1.52	<0.10	<0.051			
4/28/09	1.05	1.61	<0.015	<0.026			
4/27/10	1.02	1.5	<0.015	0.063			
4/26/11	0.685	1.56	0.112	<0.026			
5/1/12	0.328	1.49	<0.015	<0.026			
5/7/13	1.1	2	<0.015	<0.026			
4/29/14	0.44	1.46	<0.015	<0.26			
7/18/00	1.19	1.2	0.15	0.06	<0.25	<25.0	4.75
7/24/01	0.599	1	0.17	0.019	<0.27	<25.0	<2.69
7/16/02	0.3	0.88	0.16	<0.01	<0.26	<25.0	<2.60
7/22/03	0.66	0.97	0.17	0.032	<0.41	<25.0	<2.72
7/20/04	0.625	0.918	0.182	<0.0020	<0.022	<100	<0.034
7/26/05	0.435	0.907	0.119	<0.051	<0.10		<0.50
7/25/06	1.27	1.2	0.136	<0.026	<0.0064		<0.22
7/17/07	0.404	0.88	0.18	<0.026	<0.0064		<0.21
7/29/08	1.1	0.95	0.157	<0.026			
7/21/09	0.4	1.04	0.138	<0.026			
7/27/10	0.526	0.895	0.163	<0.026			
7/26/11	0.65	1.08	0.149	<0.026			
7/31/12	0.25	0.935	0.153	<0.026			
7/30/13	0.446	1.12	0.137	<0.026			
7/22/14	0.292	0.963	0.134	<0.026			

Table 85: Iron, Magnesium, Nitrate, Phosphorus, DRO, GRO, and RRO samples taken at Mile 23.0.

Date	BTEX (µg/L)	Fecal (CFU/100mL)	pH	Conductivity (µS/cm)	TSS (mg/L)	Turbidity (NTU)	Water Temp.(°C)
4/11/01	ND	5	7.86	75.2	2.7	6.6	3.78
4/10/02	ND	<1	7.75	68.5	2.7	4.1	0.85
4/29/03	ND	<1	7.81	71.9	0.7	8.5	7.1
4/27/04	ND	2	6.95	57.4	0.7	6.3	4.3
4/26/05	ND	<1	7.47	77	9.84	12.01	7.6
4/25/06		13	7.08	78.1	4	5.82	3.6
5/1/07		<1	7.45	130.6	9	4.1	3.5
4/22/08		0	7.63	78.2	3.2	3.27	4.9
4/28/09		2	7.22	88.8	15.4	5	9.68
4/27/10		11	7.91	75	7.2	6	4.3
4/26/11		80	7.6	75	10.2	7.6	4.9
5/1/12		6	7.78	73.8	7.8	5.4	5.5
5/7/13		31	7.07	63.3	9.7	5.43	2.5
4/30/14		1	8.12	71.8	11	8.63	14.51
7/18/00	ND	4	7.14	40	23.3	22	8.89
7/24/01	0.67	<1	7.51	69.1	18	12	11.8
7/16/02	0.85	<1	Not Reported	59	3.3	4.5	11.35
7/22/03	0.46	<1	7.4	64.1	7.3	12	14
7/20/04	ND	<1	7.67	68.1	7.28	11	13.5
7/26/05	ND	12	7.5	64.4	11.5	8.82	13.6
7/25/06	ND	190	7.6	63.3	17	14.2	11.4
7/17/07	ND	3	7.69	62	<5.0	8.6	11.5
7/29/08	ND	0	7.49	69.3	13	6.31	11
7/21/09	ND	2	7.46	66	22	17	13.6
7/27/10	ND	8	7.33	65	20	12	9.5
7/26/11	ND	14		70	19	7.53	16.5
7/31/12	ND	6	7.38	68.3	10.4	6.73	13.54
7/30/13		3	8.29	69.1	13	13.2	16.68
7/22/14		2	7.51	60.9	9.5	10.9	17.2

Table 86: BTEX, Fecal, pH, Conductivity, TSS, Turbidity, and Water Temperature samples taken at Mile 23.0.

Date	Arsenic (µg/L)	Cadmium (µg/L)	Chromium (µg/L)	Copper (µg/L)	Lead (µg/L)	Zinc (µg/L)	Calcium (µg/L)
4/11/01	<4	<0.5	<2	<5	<4	34	11.4
4/10/02	<3	<0.1	<0.5	<9	<1	35	12.52
4/29/03	<2.5	<2.5	<1.0	<25	<2.5	<50	11
4/27/04	<0.25	<0.18	<0.36	<0.12	<0.052	45.7	9.95
4/26/05	3.41	<0.18	<0.36	2.59	<0.052	17.9	12.7
4/25/06	2.58	<0.062	0.299	0.493	<0.030	19.2	12.4
5/1/07	1.95	<0.062	0.464	0.649	<0.030	6.61	9.56
4/22/08	1.98	<0.20	1.19	0.88	<0.10	2.31	14.2
4/28/09				0.326	<0.030	0.879	11.4
4/27/10	1.99	<0.062	0.413	0.723	<0.030	45.1	12.1
4/26/11	2.64	<0.045	0.969	0.924	<0.030	44.6	11.2
5/1/12	2.14	<0.045	0.388	1.02	<0.030	124	11
5/7/13	3.41	<0.066	<0.20	0.487	<0.073	<0.55	9
4/29/14							12.2
7/18/00	<4	0.1	<2	9	<4	32	9.9
7/24/01	<3.1	<0.14	<0.49	<9.3	<1.1	33.5	10
7/16/02	<1	<2	0.8	<9	<2	32	9.4
7/22/03	<2.5	<2.5	<1.0	<25	<2.5	<50	9.6
7/20/04	<0.25	<0.18	<0.36	<0.12	<0.052	44.1	10.4
7/26/05	<2.50	<1.0	<2.5	21.1	468	51.2	9.72
7/25/06	1.22	<0.062	1.41	0.332	<0.030	0.521	9.76
7/17/07	1.04	<0.062	0.478	0.304	<0.030	13.9	9.79
7/29/08							11.1
7/21/09	1.06	<0.062	0.994	0.696	<0.030	39.2	11.3
7/27/10	0.735	<0.062	0.262	0.309	<0.030	16.6	9.59
7/26/11	1.33	<0.045	0.334	1.12	<0.030	57.9	10.3
7/31/12	1.08	<0.045	0.309	0.343	<0.030	32	10.6
7/30/13	1.16	<0.066	<0.20	0.732	<0.073	34.9	11
7/22/14							18.5

Table 87: Arsenic, Cadmium, Chromium, Copper, Lead, Zinc, and Calcium samples taken at Mile 31.0.

Date	Iron (µg/L)	Magnesium (µg/L)	Nitrate (mg/L)	Phosphorus (mg/L)	DRO (mg/L)	GRO (µg/L)	RRO (mg/L)
4/11/01	0.62	1.5	<0.10	<0.05	0.29	<25.0	<2.53
4/10/02	0.31	1.39	0.14	0.01	<0.25	<25.0	<2.53
4/29/03	0.51	1.3	0.12	<0.025	<0.43	<25.0	<2.84
4/27/04	0.665	1.45	<0.015	0.039	<0.022	<3.0	<0.034
4/26/05	1.24	1.89	0.142	0.1	<0.0060		<0.20
4/25/06	1.06	1.74	<0.015	0.058			
5/1/07	0.723	1.28	0.149	<0.026			
4/22/08	0.582	1.91	<0.10	<0.051			
4/28/09	2.12	2.09	<0.015	<0.026			
4/27/10	0.746	1.66	<0.015	0.11			
4/26/11	0.637	1.56	0.112	0.062			
5/1/12	0.415	1.5	0.144	<0.026			
5/7/13	1.2	1	<0.015	<0.026			
4/29/14	0.632	1.57	<0.015	<0.26			
7/18/00	1.43	1.3	0.16	0.05	<0.25	<25.0	<2.98
7/24/01	0.714	0.962	0.21	0.039	<0.27	<25.0	<2.69
7/16/02	0.25	0.81	0.2	<0.01	<0.27	<25.0	<2.75
7/22/03	0.53	0.96	0.16	<0.025	<0.43	<25.0	<2.87
7/20/04	0.549	0.945	0.149	<0.0020	<0.023	<100	<0.036
7/26/05	0.419	0.906	0.108	<0.051	<0.10		<0.50
7/25/06	1.2	1.19	0.139	0.098	<0.0064		<0.22
7/17/07	0.584	1	0.177	<0.026	<0.0063		<0.21
7/29/08	0.219	0.98	0.136	<0.026			
7/21/09	0.351	0.987	0.145	<0.026			
7/27/10	0.748	0.973	0.149	<0.026			
7/26/11	0.818	1.15	0.144	<0.026			
7/31/12	0.275	0.933	0.165	<0.026			
7/30/13	0.436	1.14	0.135	<0.026			
7/22/14	0.709	3.21	<0.015	<0.026			

Table 88: Iron, Magnesium, Nitrate, Phosphorus, DRO, GRO, and RRO samples taken at Mile 31.0.

Date	BTEX (µg/L)	Fecal (CFU/100mL)	pH	Conductivity (µS/cm)	TSS (mg/L)	Turbidity (NTU)	Water Temp.(°C)
4/11/01	ND	50	7.34	76.4	3.3	11.1	2.36
4/10/02	ND	<1	7.8	75	0.7	4.4	1.11
4/29/03	ND	<1	7.57	70.8	1	10	6.2
4/27/04	ND	7	6.93	58.5	3.2	5.45	4.2
4/26/05	ND	<1	6.79	84.3	16.3	11.79	5.7
4/25/06		3	7.07	82.4	Lab Error	5.63	3
5/1/07		<1	7.41	75	16	6.5	3.6
4/22/08		44	7.27	77.4	2	3.39	2.4
4/28/09		0	7.31	76.6	14	7	9.8
4/27/10		4	7.52	82	7.4	6	2.3
4/26/11		<1	7.5	80	9.2	6	4.1
5/1/12		14	7.37	75	7.8	4.8	4.8
5/7/13		18	7.03	59.6	8.7	7.32	1.3
4/30/14		3	7.66	75	5.8	9.24	14.89
7/18/00	ND	<1	6.75	52	28	20	8.29
7/24/01	0.63	10	7.6	70.3	34.7	12	11.69
7/16/02	0.66	<1	7.62	62.5	1.3	4.2	11.12
7/22/03	ND	20	7.4	64.7	4.7	14	14
7/20/04	ND	<1	7.21	59.7	6.2	9.5	13.2
7/26/05	ND	33	7.58	65.4	16.7	10.41	14
7/25/06	ND	51	7.51	62.7	12	14.1	11.5
7/17/07	ND	8	7.47	65	<5.0	8.8	9.9
7/29/08	3.8	2	7.42	70.4	14.6	6.73	10.4
7/21/09	ND	9	7.49	65.6	24.2	18	13.5
7/27/10	ND	8	7.08	65	16.6	12	9.2
7/26/11	ND	4		69.2	14.2	13.9	15.6
7/31/12	ND	1	7.34	69	10.2	6.88	13.44
7/30/13		6	7.88	68.7	14.6	13.1	16.32
7/22/14		3					

Table 89: BTEX, Fecal, pH, Conductivity, TSS, Turbidity, and Water Temperature samples taken at Mile 31.0.

Date	Arsenic (µg/L)	Cadmium (µg/L)	Chromium (µg/L)	Copper (µg/L)	Lead (µg/L)	Zinc (µg/L)	Calcium (µg/L)
4/11/01	<4	<0.5	<2	<5	<4	28	10.3
4/10/02	<3	<0.1	<0.5	<9	<1	31	10.09
4/29/03	<2.5	<2.5	<1.0	<25	<2.5	<50	9.7
4/27/04	<0.25	<0.18	<0.36	<0.12	<0.052	31.2	10.1
4/26/05	<0.25	<0.18	<0.36	<0.12	<0.052	25.8	10.8
4/25/06	1.2	<0.062	0.19	0.543	<0.030	7.96	10.1
5/1/07	1.25	<0.062	0.357	0.337	<0.030	2.01	8.82
4/22/08	1.05	<0.20	0.612	0.542	<0.10	0.65	9.25
4/28/09				0.398	<0.030	0.919	8.53
4/27/10	1.05	<0.062	0.27	0.518	<0.030	22.2	10.2
4/26/11	1.17	<0.045	0.781	0.701	<0.030	17.6	9.56
5/1/12	1.11	<0.045	0.212	0.679	<0.030	37.6	9.97
5/7/13	1.17	<0.066	<0.20	0.54	<0.073	<0.55	10
4/29/14							10.6
7/18/00	<4	<0.1	<2	<5	<4	<9	9.88
7/24/01	<3.1	<0.14	<0.49	<9.3	<1.1	29.8	10
7/16/02	<1	<2	<0.6	<9	<2	33	9.56
7/22/03	<2.5	<2.5	1	<25	<2.5	<50	9.5
7/20/04	<0.25	<0.18	<0.36	<0.12	<0.052	32.5	10.8
7/26/05	<2.50	<1.0	<2.5	<2.5	<1.0	<10	9.58
7/25/06	1.23	<0.062	1.15	0.319	<0.030	0.778	9.95
7/17/07	1.06	<0.062	0.387	0.32	<0.030	20.1	20.5
7/29/08							10.2
7/21/09	0.99	<0.062	0.701	0.576	<0.030	26.5	10.6
7/27/10	0.591	<0.062	<0.049	0.145	<0.030	0.503	11.5
7/26/11	1.13	<0.045	0.337	0.824	<0.030	50.6	9.91
7/31/12	0.99	<0.045	0.236	0.375	<0.030	29.7	10.5
7/30/13	1.08	<0.066	<0.20	0.453	<0.073	30.1	10.7
7/22/14							10

Table 90: Arsenic, Cadmium, Chromium, Copper, Lead, Zinc, and Calcium samples taken at Mile 40.0.

Date	Iron (µg/L)	Magnesium (µg/L)	Nitrate (mg/L)	Phosphorus (mg/L)	DRO (mg/L)	GRO (µg/L)	RRO (mg/L)
4/11/01	0.39	1	<0.10	<0.05	<0.27	<25.0	<2.70
4/10/02	0.19	0.95	0.22	0.01	<0.25	<25.0	<2.53
4/29/03	0.4	1	0.14	<0.025	<0.43	<25.0	<2.84
4/27/04	0.501	1.07	0.198	<0.0020	<0.020	<3.0	<0.032
4/26/05	0.763	1.18	0.245	<0.025	<0.0060		<0.20
4/25/06	0.46	1.09	0.152	<0.026			
5/1/07	0.302	0.922	0.211	<0.026			
4/22/08	0.195	0.933	0.141	<0.051			
4/28/09	0.264	0.948	0.156	<0.026			
4/27/10	0.308	1.02	0.141	<0.026			
4/26/11	0.205	0.962	0.193	<0.026			
5/1/12	0.121	0.918	0.197	<0.026			
5/7/13	0.34	1	0.113	<0.026			
4/29/14	0.292	1.01	0.172	<0.26			
7/18/00	1.25	1.1	0.19	0.04	<0.27	<25.0	<3.17
7/24/01	0.531	0.947	0.15	0.019	<0.26	<25.0	<2.63
7/16/02	0.25	0.78	0.15	<0.01	<0.26	<25.0	<2.60
7/22/03	0.52	0.92	0.17	<0.025	<0.42	<25.0	<2.78
7/20/04	0.54	0.983	0.152	<0.0020	<0.021	<100	<0.033
7/26/05	0.42	0.867	0.119	<0.051	<0.10		<0.50
7/25/06	1.01	1.12	0.141	<0.026	<0.0064		<0.21
7/17/07	41	21.3	0.143	<0.026	<0.0062		<0.21
7/29/08	0.459	0.848	0.172	<0.026			
7/21/09	0.417	0.986	0.155	<0.026			
7/27/10	0.183	0.846	0.161	0.059			
7/26/11	0.662	0.984	0.154	<0.026			
7/31/12	0.254	0.893	0.168	<0.026			
7/30/13	0.492	1.08	0.154	<0.026			
7/22/14	0.249	0.896	0.139	<0.026			

Table 91: Iron, Magnesium, Nitrate, Phosphorus, DRO, GRO, and RRO samples taken at Mile 40.0.

Date	BTEX (µg/L)	Fecal (CFU/100mL)	pH	Conductivity (µS/cm)	TSS (mg/L)	Turbidity (NTU)	Water Temp.(°C)
4/11/01	ND	<1	7.7	66.1	8	10	4.6
4/10/02	ND	<1	7.7	65.1	0.7	4.7	1.3
4/29/03	ND	<1	7.56	57.9	0.7	12	6.3
4/27/04	ND	<1	6.73	49.4	1.3	10.3	3.3
4/26/05	ND	<1	7.26	66.8	17.4	13.89	7.6
4/25/06		<1	7.02	68	11.5	7.11	5.9
5/1/07		<1	7.38	70	9	6.6	4.3
4/22/08		0	7.32	65.2	4	3.86	6.4
4/28/09		0	7.35	63.8	0	6	12.1
4/27/10		<1	7.44	69	3.4	6	5.2
4/26/11		<1	7.5	64	8.8	5	5.2
5/1/12		0	7.38	66.9	4.2	5	3.8
5/7/13		4	6.8	63.1	4.3	5.39	5.5
4/30/14		0	7.23	64.3	7.8	14.3	14.84
7/18/00	ND	10	7.08	40	20.7	19	8.89
7/24/01	1	10	7.57	68.6	13.3	11	11.74
7/16/02	2.04	<1	8.27	61.7	2	4.2	11.61
7/22/03	ND	<1	7.7	59.4	2	13	14
7/20/04	ND	170	7.49	60.3	<0.92	9.2	12.9
7/26/05	1.8	17	7.58	64.2	14.2	8.65	13.8
7/25/06	ND	20	7.64	62.2	16	12.8	11.8
7/17/07	ND	11	7.61	64	12	9.5	12.1
7/29/08	ND	2	7.53	67.8	11.8	5.66	10.2
7/21/09	ND	5	7.44	65.2	17.8	17	13.4
7/27/10	ND	<1	7.31	65	16.6	10	9.5
7/26/11	ND	2	7.59	67.2	14.2	13.5	16
7/31/12	ND	2	7.32	67.4	7.6	6.39	14.59
7/30/13	ND	8	8.3	69.3	15.2	16.7	17.06
7/22/14		3	7.42	55.9	7.5	10.5	16.99

Table 92: BTEX, Fecal, pH, Conductivity, TSS, Turbidity, and Water Temperature samples taken at Mile 40.0.

Date	Arsenic (µg/L)	Cadmium (µg/L)	Chromium (µg/L)	Copper (µg/L)	Lead (µg/L)	Zinc (µg/L)	Calcium (µg/L)
4/11/01	<4	<0.5	<2	<5	<4	29	10.2
4/10/02	<3	<0.1	<0.5	<9	<1	33	10.28
4/29/03	<2.5	<2.5	<1.0	<25	<2.5	<50	9.4
4/27/04	<0.25	<0.18	<0.36	<0.12	<0.052	42.3	9.64
4/26/05	<0.25	<0.18	<0.36	<0.12	<0.052	21	10.4
4/25/06	1.05	<0.062	0.894	0.479	<0.030	8.08	9.99
5/1/07	1.38	<0.062	0.715	0.401	<0.030	10.3	8.64
4/22/08	1.03	<0.20	0.264	0.49	<0.10	0.911	9.67
4/28/09				0.39	<0.030	1.18	8.8
4/27/10	0.964	<0.062	0.285	0.469	<0.030	21.5	10.2
4/26/11	1.09	<0.045	0.572	0.376	<0.030	<0.084	9.6
5/1/12	1.08	<0.045	0.229	0.667	<0.030	33.9	9.8
5/7/13	1.11	<0.066	<0.20	0.435	<0.073	7.96	10
4/29/14							10.4
7/18/00	4	<0.1	<2	<5	<4	<9	9.79
7/24/01	<3.1	<0.14	<0.49	<9.3	<1.1	32.5	10
7/16/02	<1	<2	<0.6	<9	<2	40	9.61
7/22/03	<2.5	<2.5	<1.0	<25	<2.5	<50	9.7
7/20/04	<0.25	<0.18	<0.36	<0.12	<0.052	28.8	10.2
7/26/05	<2.50	<1.0	<2.5	<2.5	<1.0	26.1	9.54
7/25/06	1.19	<0.062	1.32	0.376	<0.030	0.893	9.82
7/17/07	1.04	<0.062	0.359	0.315	<0.030	16.8	8.54
7/29/08							10.1
7/21/09	0.979	<0.062	1.16	0.75	<0.030	40.5	10.4
7/27/10	0.574	<0.062	<0.049	0.246	<0.030	0.447	11.8
7/26/11	1.16	<0.045	0.355	0.854	<0.030	59.1	9.75
7/31/12	1.04	<0.045	0.261	0.41	<0.030	29.3	10.2
7/30/13	1.04	<0.066	<0.20	0.45	<0.073	26.4	11.2
7/22/14							9.76

Table 93: Arsenic, Cadmium, Chromium, Copper, Lead, Zinc, and Calcium samples taken at Mile 43.0.

Date	Iron (µg/L)	Magnesium (µg/L)	Nitrate (mg/L)	Phosphorus (mg/L)	DRO (mg/L)	GRO (µg/L)	RRO (mg/L)
4/11/01	0.37	1	0.17	<0.05	<0.27	<25.0	<2.70
4/10/02	0.24	0.97	0.22	0.01	<0.25	<25.0	<2.53
4/29/03	0.43	0.98	0.17	<0.025	<0.42	<25.0	<2.81
4/27/04	0.633	1.12	0.206	<0.0020	<0.021	<3.0	<0.032
4/26/05	1.69	1.5	0.264	0.1	<0.0060		<0.20
4/25/06	0.688	1.15	0.162	<0.026			
5/1/07	0.643	0.992	0.208	<0.026			
4/22/08	0.294	1.01	0.143	<0.051			
4/28/09	0.551	1.04	0.175	<0.026			
4/27/10	0.482	0.995	0.176	<0.026			
4/26/11	0.518	1.04	0.212	<0.026			
5/1/12	0.181	0.943	0.215	<0.026			
5/7/13	0.51	1	0.135	<0.026			
4/29/14	0.318	1.02	0.182	<0.26			
7/18/00	1.32	1.2	0.17	<0.04	<0.27	<25.0	<3.19
7/24/01	0.547	0.804	0.25	0.018	<0.27	<25.0	<2.66
7/16/02	0.2	0.76	0.16	<0.01	<0.27	<25.0	<2.69
7/22/03	0.57	0.93	0.18	<0.025	<0.40	<25.0	<2.69
7/20/04	0.503	0.903	0.159	<0.0020	<0.024	<100	<0.037
7/26/05	0.476	0.881	0.132	<0.051	<0.10		<0.50
7/25/06	1.07	1.13	0.141	0.091	<0.0065		<0.22
7/17/07	0.971	1.01	0.136	<0.026	<0.0063		<0.21
7/29/08	0.281	0.87	0.157	<0.026			
7/21/09	0.449	0.998	0.136	<0.026			
7/27/10	1.64	0.904	0.16	0.08			
7/26/11	0.687	1.03	0.149	<0.026			
7/31/12	0.265	0.864	0.168	<0.026			
7/30/13	0.763	1.15	0.146	<0.026			
7/22/14	0.304	0.898	0.137	<0.026			

Table 94: Iron, Magnesium, Nitrate, Phosphorus, DRO, GRO, and RRO samples taken at Mile 43.0.

Date	BTEX (µg/L)	Fecal (CFU/100mL)	pH	Conductivity (µS/cm)	TSS (mg/L)	Turbidity (NTU)	Water Temp.(°C)
4/11/01	ND	10	7.9	54.8	7.3	8.5	2.4
4/10/02	ND	<1	7.66	65	2.7	4.3	1.39
4/29/03	ND	<1	7.46	55.7	0.7	13	5.03
4/27/04	ND	<1	6.33	47.2	<0.7	8.4	2.7
4/26/05	ND	<1	7.28	66.8	25.2	12.81	6.8
4/25/06		<1	6.93	68.2	12.5	7.51	3.7
5/1/07		<1	7.35	68.5	23	7.2	3.8
4/22/08		0	7.23	66.1	15	4.77	5.8
4/28/09		0	7.35	62.8	21.6	10	10.4
4/27/10		<1	7.35	65	8.4	16	3.5
4/26/11		3	7.4	64	11.7	7.4	4.5
5/1/12		0	7.27	66.1	9	5.3	3.1
5/7/13		12	7.23	66	7	6.12	3.4
4/30/14		2	7.41	62.9	10	12.8	13.71
7/18/00	1.08	4	7.22	50	21.3	19	8.89
7/24/01	0.95	<1	7.51	68.3	17.3	10	11.58
7/16/02	0.84	<1	8.18	61.4	2	4.1	11.52
7/22/03	ND	9	7.3	58.9	6	14	13.5
7/20/04	ND	27	7.51	60.3	<0.91	8.3	13.5
7/26/05	ND	20	7.61	63.8	21	10.45	13.6
7/25/06	ND	96	7.6	61.4	17	11.8	11.8
7/17/07	ND	21	7.62	61	19	11	11.4
7/29/08	ND	1	7.54	65.1	15.8	7.6	9.8
7/21/09	ND	4	7.5	63.6	24.4	18	13.2
7/27/10	ND	<1	7.16	62	24.4	11	9.1
7/26/11	ND	2	7.55	65.8	14.4	14	15
7/31/12	ND	4	7.23	66.8	16	7.29	13
7/30/13	ND	13	8.16	66.5	28.8	18.1	16.08
7/22/14		2	7.38	52.7	10.7	13.3	17.03

Table 95: BTEX, Fecal, pH, Conductivity, TSS, Turbidity, and Water Temperature samples taken at Mile 43.0.

Date	Arsenic (µg/L)	Cadmium (µg/L)	Chromium (µg/L)	Copper (µg/L)	Lead (µg/L)	Zinc (µg/L)	Calcium (µg/L)
4/11/01	<4	<0.5	<2	<5	<4	32	10.6
4/10/02	<3	<0.1	<0.5	<9	<1	31	10.35
4/29/03	<2.5	<2.5	<1.0	<25	<2.5	<50	10
4/27/04	<0.25	<0.18	<0.36	<0.12	<0.052	30.6	8.83
4/26/05	<0.25	<0.18	<0.36	<0.12	<0.052	22.9	10.9
4/25/06	1.04	<0.062	0.846	0.483	<0.030	10	11.4
5/1/07	1.17	<0.062	<0.049	0.409	<0.030	19.4	7.87
4/22/08	1.06	<0.20	0.553	0.256	<0.10	0.692	10
4/28/09				0.259	<0.030	0.461	9.07
4/27/10	0.979	<0.062	0.293	2.04	0.111	24.2	10
4/26/11	1.06	<0.045	0.588	0.534	<0.030	15.5	10.1
5/1/12	1.06	<0.045	0.211	0.564	<0.030	33.7	10.8
5/7/13	1.04	<0.066	<0.20	0.322	<0.073	<0.55	11
4/29/14							11
7/18/00	<4	<0.1	<2	<5	<4	11	10.5
7/24/01	<3.1	<0.14	<0.49	<9.3	<1.1	48.5	10
7/16/02	<1	<2	<0.6	<9	<2	26	10.22
7/22/03	<2.5	<2.5	<1.0	<25	<2.5	<50	10
7/20/04	<0.25	<0.18	<0.36	<0.12	<0.052	29.1	11.1
7/26/05	<2.50	<1.0	<2.5	<2.5	<1.0	15.6	10.5
7/25/06	1.15	<0.062	0.952	0.372	<0.030	0.976	11.1
7/17/07	1.11	<0.062	0.511	0.312	<0.030	10.9	9.6
7/29/08							10.8
7/21/09	0.94	<0.062	1.17	0.586	<0.030	26.3	11.6
7/27/10	0.595	<0.062	0.151	0.332	<0.030	5.76	12.3
7/26/11	1.02	<0.045	0.304	0.848	<0.030	59.9	10.6
7/31/12	0.884	<0.045	0.19	0.397	<0.030	32	11.2
7/30/13	1.02	<0.066	<0.20	0.414	<0.073	27.5	11.8
7/22/14							10.3

Table 96: Arsenic, Cadmium, Chromium, Copper, Lead, Zinc, and Calcium samples taken at Mile 50.0.

Date	Iron (µg/L)	Magnesium (µg/L)	Nitrate (mg/L)	Phosphorus (mg/L)	DRO (mg/L)	GRO (µg/L)	RRO (mg/L)
4/11/01	0.25	0.9	0.17	<0.05	<0.25	<25.0	<2.53
4/10/02	0.1	0.8	0.22	<0.01	<0.25	<25.0	<2.53
4/29/03	0.51	0.93	0.15	<0.025	<0.42	<25.0	<2.81
4/27/04	1.78	1.83	0.255	0.065	<0.020	<3.0	<0.032
4/26/05	0.377	0.943	0.24	<0.025	<0.0060		<0.20
4/25/06	0.147	0.889	0.205	<0.026			
5/1/07	0.154	0.743	0.112	<0.026			
4/22/08	0.11	0.8	0.174	<0.051			
4/28/09	0.0135	0.756	0.158	<0.026			
4/27/10	0.273	0.799	0.142	<0.026			
4/26/11	0.0135	0.74	0.144	<0.026			
5/1/12	0.0763	0.818	0.181	<0.026			
5/7/13	0.17	<1.0	0.188	<0.026			
4/29/14	0.236	0.0914	0.193	<0.26			
7/18/00	0.43	0.9	0.18	<0.04	<0.25	<25.0	<2.98
7/24/01	0.091	0.729	0.26	<0.010	<0.26	<25.0	<2.63
7/16/02	0.05	0.75	0.18	<0.01	<0.25	<25.0	<2.53
7/22/03	0.27	0.84	0.18	<0.025	<0.40	<25.0	<2.69
7/20/04	0.242	0.875	0.161	<0.0020	<0.020	<100	<0.032
7/26/05	0.0888	0.844	0.137	<0.051	<0.10		<0.50
7/25/06	0.0628	0.869	0.169	0.08	<0.0064		<0.21
7/17/07	0.0793	0.747	0.146	<0.026	<0.0062		<0.21
7/29/08	0.152	0.839	0.179	<0.026			
7/21/09	0.216	1	0.133	<0.026			
7/27/10	0.115	0.825	0.201	<0.026			
7/26/11	0.14	0.86	0.157	<0.026			
7/31/12	0.0678	0.838	0.18	<0.026			
7/30/13	0.239	1.03	0.151	<0.026			
7/22/14	0.112	0.861	0.147	<0.026			

Table 97: Iron, Magnesium, Nitrate, Phosphorus, DRO, GRO, and RRO samples taken at Mile 50.0.

Date	BTEX (µg/L)	Fecal (CFU/100mL)	pH	Conductivity (µS/cm)	TSS (mg/L)	Turbidity (NTU)	Water Temp.(°C)
4/11/01	ND	<1	8	64.7	2.7	7.5	4.72
4/10/02	ND	<1	7.89	62.5	2	2.6	1.48
4/29/03	ND	<1	7.41	45.6	5.3	14	3.9
4/27/04	ND	<1	6.84	37.7	<0.7	6.6	1
4/26/05	ND	<1	7.5	65.3	1.79	9.7	2
4/25/06		<1	6.82	67.9	0.5	4.4	2.5
5/1/07		<1	7.6	59.6	2.5	3.6	4.6
4/22/08		0	7.4	65.8	3.4	1.97	3.3
4/28/09		0	7.53	60.3	2	9	9.3
4/27/10		1	7.57	64	3	5	4.8
4/26/11		<1	7.7	63	1.7	1.4	4.6
5/1/12		0	7.34	65.8	2.7	4.2	2.5
5/7/13		0	7.22	67.8	2.8	6.01	2.6
4/30/14		0	7.63	62.8	7.2	14.3	10.7
7/18/00	ND	<1	7.29	50	8.7	9.7	9.44
7/24/01	ND	<1	7.94	72.3	2	2.7	12.58
7/16/02	ND	<1	8.52	62.8	1.3	1.4	11.99
7/22/03	ND	<1	7.5	60.3	1.3	7.7	13.5
7/20/04	ND	<1	7.33	66.3	<0.91	5.3	13.9
7/26/05	ND	<1	7.6	66.2	1.58	3.03	13.8
7/25/06	ND	<1	7.75	65.8	<5.0	1.75	11.8
7/17/07	ND	1	7.8	67	<5.0	1.9	13.3
7/29/08	1.2	0	7.28	69.7	5.8	1.39	11.6
7/21/09	ND	13	7.4	66.7	7	7	13.6
7/27/10	ND	1	7.16	67	2.2	4	9.5
7/26/11	ND	0	7.59	70.3	1.8	4.4	15.1
7/31/12	ND	<1	7.53	70	1.6	2.13	11.94
7/30/13		<1	7.79	71.2	4	7.39	18.86
7/22/14		0	7.52	57	2.3	9.64	14.64

Table 98: BTEX, Fecal, pH, Conductivity, TSS, Turbidity, and Water Temperature samples taken at Mile 50.0.

Date	Arsenic (µg/L)	Cadmium (µg/L)	Chromium (µg/L)	Copper (µg/L)	Lead (µg/L)	Zinc (µg/L)	Calcium (µg/L)
4/11/01	<4	<0.5	<2	<5	<4	44	14.5
4/10/02	<3	<0.1	<0.5	<9	<1	34	13.35
4/29/03	<2.5	<2.5	<1.0	<25	<2.5	<50	13
4/27/04	<0.25	<0.18	<0.36	<0.12	<0.052	34.2	13.6
4/26/05	<0.25	<0.18	<0.36	2.94	<0.052	30.7	14
4/25/06	0.807	<0.062	0.227	0.474	<0.030	10.4	16.9
5/1/07	0.791	<0.062	<0.049	2.96	0.75	33.5	13.2
4/22/08	0.715	<0.20	0.95	1.17	0.124	9.29	14.3
4/28/09				0.4	<0.030	0.572	14.8
4/27/10	1.03	<0.062	0.264	0.474	<0.030	22.9	14.4
4/26/11	0.824	<0.045	0.539	0.588	<0.030	18.3	15.2
5/1/12	0.843	<0.045	0.285	0.649	<0.030	71	14
5/7/13	0.775	<0.066	<0.20	0.562	<0.073	3.16	15
4/29/14							14.1
7/18/00	<4	<0.1	<2	6	<4	17	17
7/24/01	<3.1	<0.14	<0.49	<9.3	<1.1	34.6	12
7/16/02	<1	<2	<0.6	<9	<2	50	11.26
7/22/03	<2.5	<2.5	<1.0	<25	<2.5	<50	12
7/20/04	<0.25	<0.18	<0.36	<0.12	<0.052	33.2	12.9
7/26/05	<2.50	<1.0	<2.5	<2.5	<1.0	19.1	12.5
7/25/06	0.523	<0.062	1.22	0.446	<0.030	20.9	12.5
7/17/07	0.652	<0.062	0.212	0.443	<0.030	15.6	12.8
7/29/08							13.3
7/21/09	0.511	<0.062	1.15	0.469	<0.030	22	14.3
7/27/10	0.404	<0.062	0.167	0.292	<0.030	15.2	14.8
7/26/11	0.65	<0.045	0.419	0.857	0.115	56.5	12.4
7/31/12	0.608	<0.045	0.218	0.508	<0.030	32.3	12.9
7/30/13	0.648	<0.066	<0.20	0.58	<0.073	40.2	13.8
7/22/14							12.1

Table 99: Arsenic, Cadmium, Chromium, Copper, Lead, Zinc, and Calcium samples taken at Mile 70.0.

Date	Iron (µg/L)	Magnesium (µg/L)	Nitrate (mg/L)	Phosphorus (mg/L)	DRO (mg/L)	GRO (µg/L)	RRO (mg/L)
4/11/01	0.09	1	0.32	<0.05	<0.27	<25.0	<2.66
4/10/02	0.24	1.01	0.27	0.01	<0.29	<25.0	<2.94
4/29/03	0.22	0.99	0.4	<0.025	<0.39	<25.0	<2.58
4/27/04	0.376	1.06	0.456	<0.0020	<0.021	<3.0	<0.033
4/26/05	0.215	1.06	0.706	<0.025	<0.0060		<0.20
4/25/06	0.209	1.27	0.409	<0.026			
5/1/07	0.374	1.09	0.516	<0.026			
4/22/08	0.105	1.06	0.293	<0.051			
4/28/09	0.0135	1.11	0.365	<0.026			
4/27/10	0.218	1.03	0.337	<0.026			
4/26/11	0.0514	1.06	0.554	<0.026			
5/1/12	0.0796	1.02	0.524	<0.026			
5/7/13	0.03	1	0.352	<0.026			
4/29/14	0.148	1.07	0.315	<0.26			
7/18/00	0.25	1.3	0.2	<0.04	<0.28	<25.0	<3.28
7/24/01	0.101	0.812	0.27	<0.010	<0.27	<25.0	<2.69
7/16/02	0.16	0.84	0.25	<0.01	<0.26	<25.0	<2.60
7/22/03	0.23	0.93	0.24	<0.025	<0.41	<25.0	<2.75
7/20/04	0.189	0.97	0.203	<0.0020	<0.023	<100	<0.036
7/26/05	0.113	0.99	0.196	<0.051	<0.10		<0.50
7/25/06	0.243	1.01	0.242	<0.026	<0.0064		<0.22
7/17/07	0.25	0.935	0.272	<0.026	<0.0063		<0.21
7/29/08	0.186	1.01	0.244	<0.026			
7/21/09	0.0507	1.07	0.209	<0.026			
7/27/10	0.0513	0.977	0.231	<0.026			
7/26/11	0.0135	0.946	0.231	<0.026			
7/31/12	0.0867	0.968	0.234	<0.026			
7/30/13	0.132	1.16	0.201	<0.026			
7/22/14	0.117	0.965	0.218	<0.026			

Table 100: Iron, Magnesium, Nitrate, Phosphorus, DRO, GRO, and RRO samples taken at Mile 70.0.

Date	BTEX (µg/L)	Fecal (CFU/100mL)	pH	Conductivity (µS/cm)	TSS (mg/L)	Turbidity (NTU)	Water Temp.(°C)
4/11/01	ND	<1	8.07	89.2	2.7	3.7	3
4/10/02	ND	<1	7.05	101	5.3	8.1	NR
4/29/03	ND	<1	7.84	74	1.3	7.5	3.7
4/27/04	ND	3	6.93	83	1.3	10.5	2.8
4/26/05	ND	<1	7.32	84.3	1.84	4.87	4.4
4/25/06		<1	6.95	96.2	1.5	7.03	4.2
5/1/07		<1	7.27	90.1	4	11	2.8
4/22/08		0	7.4	91.4	3.4	5.84	2.2
4/28/09		0	7.58	90.2	0	1	10.08
4/27/10		<1	7.52	87	2.2	3	3.3
4/26/11		4	7.5	94	1.8	1.3	3.2
5/1/12		0			4.3	4.99	3.1
5/7/13		0	7.28	88.9	3	5.32	3.2
4/30/14		0	7.6	81.6	5.7	11.6	13.89
7/18/00	ND	2	7.95	60	4	5.4	10
7/24/01	ND	10	8.37	79.9	0.7	4.1	11.3
7/16/02	ND	<1	7.79	70.4	2	6.8	9.04
7/22/03	ND	9	7.5	72.8	1.3	7.5	12
7/20/04	ND	<1	7.34	75	<0.98	5.6	14.6
7/26/05	ND	12	7.66	81.2	1.13	4.46	13.8
7/25/06	ND	32	7.62	78.3	<5.0	5.36	10.4
7/17/07	ND	3	7.47	84	<5.0	10.3	7.9
7/29/08	ND	1	7.53	83.1	4.8	4.32	8.6
7/21/09	ND	2	7.58	80.8	2.2	13	12.2
7/27/10	ND	2	7.27	78	4.2	4	9.3
7/26/11	ND	3	7.72	83.4	1.8	1.57	14.1
7/31/12	ND	<1	7.33	82.3	3.6		15.11
7/30/13		3	7.77	81.6	5.6	6.35	16.1
7/22/14		2	7.36	67.3	4.2	23.6	15.72

Table 101: BTEX, Fecal, pH, Conductivity, TSS, Turbidity, and Water Temperature samples taken at Mile 70.0.

Date	Arsenic (µg/L)	Cadmium (µg/L)	Chromium (µg/L)	Copper (µg/L)	Lead (µg/L)	Zinc (µg/L)	Calcium (µg/L)
4/11/01	<4	<0.5	<2	<5	<4	44	12.9
4/10/02	<3	<0.1	<0.5	<9	<1	36	11.47
4/29/03	<2.5	<2.5	<1.0	<25	<2.5	<50	11
4/27/04	<0.25	<0.18	<0.36	<0.12	<0.052	40.1	11.8
4/26/05	<0.25	<0.18	<0.36	<0.12	<0.052	33.1	13.2
4/25/06	0.525	<0.062	1.2	0.548	<0.030	5.19	13.5
5/1/07	0.667	<0.062	<0.049	0.382	<0.030	18.6	12.3
4/22/08	0.527	<0.20	0.875	0.373	<0.10	2.25	12.6
4/28/09				2.49	0.159	5.58	13.2
4/27/10	0.48	<0.062	0.233	0.474	<0.030	23.5	12.6
4/26/11	0.535	<0.045	0.514	0.792	0.149	22.5	10.4
5/1/12	0.575	<0.045	0.271	0.618	<0.030	54.5	12.6
5/7/13	0.551	<0.066	<0.20	0.723	<0.073	34.3	13
4/29/14							12.6
7/18/00	<4	<0.1	<2	5	<4	21	12.1
7/24/01	<3.1	<0.14	<0.49	<9.3	<1.1	36.2	14
7/16/02	<1	<2	1.5	<9	4	32	11.11
7/22/03	<2.5	<2.5	<1.0	<25	<2.5	<50	12
7/20/04	<0.25	1	<0.36	<0.12	<0.052	27.9	12.8
7/26/05	<2.50	<1.0	<2.5	<2.5	<1.0	19.8	12.5
7/25/06	0.405	<0.062	0.898	0.613	<0.030	20.9	12.2
7/17/07	0.689	<0.062	0.207	0.847	0.131	16.6	12.7
7/29/08							12.6
7/21/09	0.458	<0.062	0.961	0.479	<0.030	27.6	14.1
7/27/10	0.324	<0.062	0.228	0.446	<0.030	16.3	14.4
7/26/11	0.53	<0.045	0.239	0.666	<0.030	56.5	11.9
7/31/12	0.517	<0.045	0.226	0.549	<0.030	35.1	13.2
7/30/13	0.595	<0.066	<0.20	0.623	<0.073	52.1	13.4
7/22/14							11.7

Table 102: Arsenic, Cadmium, Chromium, Copper, Lead, Zinc, and Calcium samples taken at Mile 82.0.

Date	Iron (µg/L)	Magnesium (µg/L)	Nitrate (mg/L)	Phosphorus (mg/L)	DRO (mg/L)	GRO (µg/L)	RRO (mg/L)
4/11/01	0.51	1	0.24	<0.05	<0.27	<25.0	<2.66
4/10/02	0.41	0.97	0.22	0.01	<0.29	<25.0	<2.91
4/29/03	0.36	0.94	0.25	<0.025	<0.40	<25.0	<2.65
4/27/04	0.555	1.03	0.271	<0.0020	<0.022	<3.0	<0.034
4/26/05	0.234	1.05	0.29	<0.025	<0.0060		<0.20
4/25/06	0.442	1.17	0.275	<0.026			
5/1/07	0.755	1.12	0.27	<0.026			
4/22/08	0.16	0.969	0.201	<0.051			
4/28/09	0.0135	1.03	0.234	<0.026			
4/27/10	0.516	0.961	0.217	<0.026			
4/26/11	0.076	0.828	0.217	<0.026			
5/1/12	0.0879	0.972	0.227	<0.026			
5/7/13	0.06	<1.0	0.229	<0.026			
4/29/14	0.154	0.972	0.246	<0.26			
7/18/00	0.15	0.9	0.21	<0.04	<0.27	<25.0	<3.17
7/24/01	0.084	0.847	0.29		<0.27	<25.0	<2.69
7/16/02	0.17	0.82	0.26	<0.01	<0.25	<25.0	<2.53
7/22/03	0.31	0.94	0.24	<0.025	<0.41	<25.0	<2.75
7/20/04	0.199	0.959	0.229	<0.0020	<0.023	<100	<0.036
7/26/05	0.0867	0.952	0.251	<0.051	<0.10		<0.50
7/25/06	0.136	0.969	0.251	<0.026	<0.0064		<0.22
7/17/07	0.254	0.945	0.268	<0.026	<0.0064		<0.22
7/29/08	0.195	0.956	0.248	<0.026			
7/21/09	0.0135	1.05	0.222	<0.026			
7/27/10	0.0135	0.94	0.229	<0.026			
7/26/11	0.0744	0.933	0.228	<0.026			
7/31/12	0.0839	1.01	0.236	<0.026			
7/30/13	0.135	1.11	0.195	<0.026			
7/22/14	0.122	0.962	0.222	<0.026			

Table 103: Iron, Magnesium, Nitrate, Phosphorus, DRO, GRO, and RRO samples taken at Mile 82.0.

Date	BTEX (µg/L)	Fecal (CFU/100mL)	pH	Conductivity (µS/cm)	TSS (mg/L)	Turbidity (NTU)	Water Temp.(°C)
4/11/01	ND	<1	8.11	86.6	2.7	3.7	2
4/10/02	ND	<1	7.28	90.4	1.3	12	0.68
4/29/03	ND	<1	7.74	66.7	0.7	10	3.7
4/27/04	ND	3	6.8	75.7	0.7	12.7	0.2
4/26/05	ND	<1	6.93	79.2	<0.48	7.34	3.2
4/25/06		<1	6.89	84.6	1.5	10.39	2.2
5/1/07		<1	7.41	83.1	2.5	14.7	2.1
4/22/08		0	7.46	95.5	4.8	8.59	1.7
4/28/09		0	7.43	87.4	0	2	9.55
4/27/10		0	7.42	78	1.8	6	1.9
4/26/11		6	7.6	81	0.8	0.6	3.1
5/1/12		1	7.33	81.4	3.5	7.29	2.2
5/7/13		<1	7.22	75.5	2.6	9.05	2.4
4/30/14		<1	7.45	75.1	5	17.1	14.52
7/18/00	ND	8	8	60	2	5.6	10
7/24/01	ND	<1	7.81	81.3	6.7	2.9	11.5
7/16/02	ND	<1	7.8	69.5	<0.7	7.3	9.31
7/22/03	0.49	<1	7.4	73	3.3	9.8	13
7/20/04	ND	9	7.2	72.2	<0.96	5.4	14.6
7/26/05	ND	<1	7.59	79	1.13	4.22	7.1
7/25/06	ND	6	7.5	77.6	<5.0	4.6	10.1
7/17/07	ND	2	7.46	84	<5.0	9.5	7.7
7/29/08	ND	0	7.54	83.4	2.4	4.29	8.7
7/21/09	ND	<1	7.58	81.1	0.6	2	12.1
7/27/10	ND	<1	7.19	79	2.4	3	9.1
7/26/11	ND	1	7.78	83.3	1.4	1.03	12.6
7/31/12	ND	<1	7.32	81.2	2.2	4.76	13.15
7/30/13		<1	7.98	81.2	5.2	7.04	16.8
7/22/14		0	7.37	65.7	3.7	18.6	16.21

Table 104: BTEX, Fecal, pH, Conductivity, TSS, Turbidity, and Water Temperature samples taken at Mile 82.0.

Date	Arsenic (µg/L)	Cadmium (µg/L)	Chromium (µg/L)	Copper (µg/L)	Lead (µg/L)	Zinc (µg/L)	Calcium (µg/L)
4/11/01	<4	<0.5	<2	<5	<4	84	8.25
4/10/02	<3	1.1	<0.5	<9	<1	122	11.16
4/29/03	<2.5	<2.5	<1.0	<25	<2.5	60	12
4/27/04	<0.25	<0.18	<0.36	<0.12	<0.052	61.9	7
4/26/05	<0.25	<0.18	<0.36	8.21	<0.052	63.3	4.22
4/25/06	1.56	<0.062	2.6	0.792	0.111	52.2	8.17
5/1/07	1.45	<0.062	2.33	0.601	<0.030	18.7	8.41
4/22/08	1.2	<0.20	1.5	0.599	<0.10	8.63	9.91
4/28/09				0.641	<0.030	28.6	7.87
4/27/10	1.87	<0.062	1.51	0.548	<0.030	20.8	15.7
4/26/11	1.17	<0.045	1.24	1.08	0.301	8.29	7.41
5/1/12	1.03	<0.045	0.778	0.515	<0.030	115	7
5/7/13	1.78	<0.066	<0.20	0.828	<0.073	113	3
4/29/14	2.2	<0.066	0.523	0.69	<0.073	97.8	6.67
7/18/00	<4	<0.1	<2	<5	<4	12	12.8
7/24/01	<3.1	<0.14	<0.49	<9.3	<1.1	46.3	15
7/16/02	<1	<2	<0.6	<9	<2	29	11.96
7/22/03	<2.5	<2.5	<1.0	<25	<2.5	75	13
7/20/04	<0.25	<0.18	<0.36	<0.12	<0.052	48.5	13.5
7/26/05	<2.5	<1.0	<2.5	<2.5	<1.0	51.1	14.1
7/25/06	1.78	<0.062	3.93	0.665	<0.030	2.62	12.8
7/17/07	2.09	<0.062	3.13	0.478	<0.030	40.7	13.9
7/29/08							12
7/21/09	1.47	<0.062	1.67	1.01	<0.030	46.6	12.8
7/27/10	0.776	<0.062	0.659	0.557	<0.030	15.4	10.1
7/26/11	0.996	<0.045	0.846	1.54	<0.030	148	12.9
7/31/12	1.26	<0.045	0.893	0.492	0.104	86.1	13.2
7/30/13	1.57	<0.066	0.801	0.472	<0.073	58.4	12.6
7/22/14	1.71	<0.07	<0.20	3.22	<0.070	0.0671	11.3

Table 105: Arsenic, Cadmium, Chromium, Copper, Lead, Zinc, and Calcium samples taken at No Name Creek.

Date	Iron (µg/L)	Magnesium (µg/L)	Nitrate (mg/L)	Phosphorus (mg/L)	DRO (mg/L)	GRO (µg/L)	RRO (mg/L)
4/11/01	2.86	3.5	<0.10	0.12	<0.25	<25.0	<2.53
4/10/02	2.04	3.44	0.22	0.04	<0.26	<25.0	<2.60
4/29/03	3.2	6.7	0.12	<0.025	<0.40	<25.0	<2.65
4/27/04	3.58	2.76	0.138	0.057	<0.021	<3.0	0.24
4/26/05	3.16	1.56	<0.015	0.13	<0.0060		<0.20
4/25/06	4.35	3.13	<0.015	0.06			
5/1/07	4.25	3.54	<0.015	0.1			
4/22/08	2.6	4.4	0.16	0.06			
4/28/09	3.62	3.64	<0.015	<0.026			
4/27/10	2.89	21.4	<0.015	0.12			
4/26/11	5.94	4.44	0.171	0.22			
5/1/12	3.02	2.63	0.246	<0.026			
5/7/13	5.1	1	<0.015	0.076			
4/29/14	4.22	2.52	0.154	<0.26			
7/18/00	2.85	4.3	0.08	<0.04	<0.25	<25.0	<2.98
7/24/01	2.5	7.7	<0.10	0.029	<0.27	<25.0	<2.69
7/16/02	1.58	3.87	<0.10	0.05	<0.27	<25.0	<2.75
7/22/03	3.3	4.4	<0.10	0.04	<0.39	<25.0	<2.63
7/20/04	2.57	4.25	<0.015	0.042	<0.022	<100	0.32
7/26/05	5.12	5.3	<0.10	<0.051	<0.10		<0.50
7/25/06	3.38	4.35	<0.015	<0.026	<0.0065		<0.22
7/17/07	3.16	9.31	<0.015	<0.026	<0.0066		<0.22
7/29/08	2.56	4.91	<0.015	<0.026			
7/21/09	2.44	5.16	<0.015	<0.026			
7/27/10	3.11	4.49	<0.015	0.083			
7/26/11	1.99	3.99	<0.015	0.064			
7/31/12	2.93	4.35	0.14	0.12			
7/30/13	3.09	4.89	0.251	<0.026			
7/22/14	3.68	3.91	0.202	<0.026			

Table 106: Iron, Magnesium, Nitrate, Phosphorus, DRO, GRO, and RRO samples taken at No Name Creek.

Date	BTEX (µg/L)	Fecal (CFU/100mL)	pH	Conductivity (µS/cm)	TSS (mg/L)	Turbidity (NTU)	Water Temp.(°C)
4/11/01	ND	13	6.89	143	26	50	1.61
4/10/02	ND	<1	7.18	146.9	4.7	16	0.2
4/29/03	ND	9	8.04	220	4	16	5.4
4/27/04	ND	5	6.53	80.6	14.7	13	4.2
4/26/05	ND	45	6.2	48.4	7.8	7.9	6.5
4/25/06		10	7	113	20.5	11.49	1.7
5/1/07		<1	7.45	157.3	15.5	30.2	3.7
4/22/08		0	7.16	184.8	4	11.5	1.6
4/28/09		0	7.11	163.6	9.8	10	9.6
4/27/10		<1	7.17	1088	13	14	2.5
4/26/11		38	7.2	217	52	83	2.5
5/1/12		4	7.18	104.4	14	2.9	3.2
5/7/13		42	6.68	46.8	17	16.3	1.1
4/30/14		4	7.09	86.8	10	12.1	16.2
7/18/00	ND	40	7.03	130	8.7	16	12.09
7/24/01	ND	170	7.46	366.8	6	14	15.12
7/16/02	ND	10	7.46	153.2	0.7	9.3	14.5
7/22/03	ND	80	7.3	157	0.7	16	15
7/20/04	ND	64	7.34	156.7	5.22	14.5	14.8
7/26/05	ND	230	7.59	218	5.43	25.5	14.7
7/25/06	ND	260	7.58	158.9	<5.0	19.4	12.4
7/17/07	ND	157	7.37	438	<5.0	22.8	12.6
7/29/08	ND	56	7.41	204.3	6.3	16.3	11.5
7/21/09	ND	73	7.52	220.3	11.5	18	13.1
7/27/10	ND	97	7.02	207	19	19	11.5
7/26/11	ND	91	7.58	131.5	5	9.06	12.4
7/31/12	ND	84	7.38	159.8	14	12.1	17.19
7/30/13		93	7.7	163.8	8	13.9	17.62
7/22/14		39	7.41	110.5	12.5	20.1	17.18

Table 107: BTEX, Fecal, pH, Conductivity, TSS, Turbidity, and Water Temperature samples taken at No Name Creek.

Date	Arsenic (µg/L)	Cadmium (µg/L)	Chromium (µg/L)	Copper (µg/L)	Lead (µg/L)	Zinc (µg/L)	Calcium (µg/L)
4/11/01		<0.5					
4/10/02	5	1.1	<0.5	<9	<1	41	17.82
4/29/03	5	<2.5	<1.0	<25	<2.5	<50	15
4/27/04	3.82	<0.18	<0.36	<0.12	<0.052	36.2	8.25
4/26/05	3.57	<0.18	<0.36	<0.12	<0.052	59.1	8.53
4/25/06	4.66	<0.062	2.38	0.567	0.158	46.4	8.18
5/1/07	6.51	<0.062	1.04	0.73	0.152	108	12.9
4/22/08	4.24	<0.20	0.571	0.811	0.227	3.66	11.6
4/28/09				0.983	0.219	84.8	8.57
4/27/10	5.32	<0.062	1.32	2.29	0.254	61.5	16.1
4/26/11	5.99	<0.045	2.33	2.4	2.7	247	11.9
5/1/12	1.84	<0.045	0.602	0.93	0.261	196	6.28
5/7/13	5.02	<0.066	0.536	3.28	0.326	87.6	6
4/29/14	5.59	<0.066	<0.20	1.35	0.282	111	9.25
7/18/00							
7/24/01							
7/16/02	3	<2	1	<9	<2	41	18.48
7/22/03	4.4	<2.5	<1.0	<25	<2.5	<50	20
7/20/04	4.74	<0.18	<0.36	<0.12	<0.052	47.4	23.5
7/26/05	5.01	<1.0	<2.5	<2.5	<1.0	26	22.4
7/25/06	4.57	<0.062	16.4	1.74	3.92	49.7	19
7/17/07	6.3	<0.062	1.57	0.419	<0.030	42.9	18.6
7/29/08							12.6
7/21/09	3.26	<0.062	2.29	1.83	<0.030	110	16.4
7/27/10	3.01	<0.062	0.432	0.694	0.101	36.6	14.9
7/26/11	5.72	<0.045	0.797	1.37	0.108	114	19.4
7/31/12	5.15	<0.045	1.04	0.68	0.124	85.7	18.6
7/30/13	5.48	<0.066	0.685	0.627	<0.073	99.6	20.6
7/22/14	8.06	<0.07	<0.20	2.95	<0.070	0.0659	15.2

Table 108: Arsenic, Cadmium, Chromium, Copper, Lead, Zinc, and Calcium samples taken at Beaver Creek.

Date	Iron (µg/L)	Magnesium (µg/L)	Nitrate (mg/L)	Phosphorus (mg/L)	DRO (mg/L)	GRO (µg/L)	RRO (mg/L)
4/11/01							
4/10/02	2.3	4.6	<0.10	0.08	<0.26	<25.0	<2.58
4/29/03	5.1	4.7	<0.10	0.17	<0.44	<25.0	<2.91
4/27/04	2.7	2.32	<0.015	0.106	<0.022	<3.0	<0.034
4/26/05	3.83	2.69	<0.015	0.26	<0.0060		<0.20
4/25/06	6.42	2.73	<0.015	<0.026			
5/1/07	7.35	4.08	<0.015	0.38			
4/22/08	16.3	6.12	<0.10	0.74			
4/28/09	10.6	4.1	<0.015	1.2			
4/27/10	20.5	8.54	<0.015	0.54			
4/26/11	7.56	4.14	<0.015	0.25			
5/1/12	2.2	1.84	<0.015	0.12			
5/7/13	3.7	2	<0.015	0.13			
4/29/14	4.94	2.53	<0.015	0.29			
7/18/00							
7/24/01							
7/16/02	1.87	4.43	<0.10	0.09	<0.27	<25.0	<2.75
7/22/03	1.8	5.1	<0.10	0.063	<0.41	<25.0	<2.72
7/20/04	2.4	5.31	<0.015	0.0742	<0.022	<100	<0.034
7/26/05	0.931	3.86	<0.10	0.077	<0.10		<0.50
7/25/06	2.26	4.76	<0.015	0.093	<0.0064		<0.22
7/17/07	0.648	3.12	<0.015	<0.026	<0.0064		<0.21
7/29/08	2.17	3.05	<0.015	0.12			
7/21/09	1.49	3.45	<0.015	0.087			
7/27/10	2.32	3.69	<0.015	0.087			
7/26/11	2.77	4.96	<0.015	0.12			
7/31/12	2.43	2.43	<0.015	<0.026			
7/30/13	2.64	5.25	<0.015	0.058			
7/22/14	2.96	3.38	<0.015	0.12			

Table 109: Iron, Magnesium, Nitrate, Phosphorus, DRO, GRO, and RRO samples taken at Beaver Creek.

Date	BTEX (µg/L)	Fecal (CFU/100mL)	pH	Conductivity (µS/cm)	TSS (mg/L)	Turbidity (NTU)	Water Temp.(°C)
4/11/01							
4/10/02	ND	<1	7.19	139.1	5.3	14	-0.17
4/29/03	ND	2	7.54	131.4	2.7	24	6.7
4/27/04	ND	42	6.44	53.6	17.3	6.4	4.5
4/26/05	ND	18	6.58	61.6	62.8	9.86	6.1
4/25/06		86	6.83	63.4	65	23.2	1.8
5/1/07		28	7.33	133	196	76	3.8
4/22/08		232	6.95	71.5	419	62.8	0.56
4/28/09		50	6.92	62.5	748	276	8.81
4/27/10		188	7.14	119	556	336	2
4/26/11		242	7.3	97	251	56	2.5
5/1/12		26	6.96	55.2	81.5	20.9	5.0
5/7/13		204	6.67	45.1	31.5	13.6	0.5
4/30/14		56	7.1	69.9	247	20.3	14.22
7/18/00							
7/24/01							
7/16/02	0.47	30	7.54	144.6	2	10	13.03
7/22/03	ND	9	7.3	155	0.7	11	13
7/20/04	ND	170	7.38	177.1	7.09	9	14.1
7/26/05	1.3	69	7.27	180	2.65	10.8	13.3
7/25/06	ND	370	7.52	150.1	<5.0	9.8	11.5
7/17/07	ND	330	7.27	131	<5.0	10.3	11.9
7/29/08	ND	57	7.18	103.9	9.2	7.54	10.7
7/21/09	ND	850	7.29	118.7	25.5	16	13.2
7/27/10	ND	62	7.01	127	8	10	10
7/26/11	ND	40	7.44	146.2	8	11.9	13.95
7/31/12		85	7.31	142	17.7	11.5	13.13
7/30/13		9	7.69	158.3	5.7	12.4	16.06
7/22/14		14	7.29	95.5	491.3	13.3	18.04

Table 110: BTEX, Fecal, pH, Conductivity, TSS, Turbidity, and Water Temperature samples taken at Beaver Creek.

Date	Arsenic (µg/L)	Cadmium (µg/L)	Chromium (µg/L)	Copper (µg/L)	Lead (µg/L)	Zinc (µg/L)	Calcium (µg/L)
4/11/01	<4	<0.5	<2	<5	<4	41	5.03
4/10/02	4	1.1	<0.5	<9	<1	40	19.06
4/29/03	<2.5	<2.5	<1.0	<25	<2.5	69	11
4/27/04	<0.25	<0.18	<0.36	<0.12	<0.052	39.5	6.34
4/26/05	<0.25	<0.18	<0.36	<0.12	<0.052	47.9	6.61
4/25/06	2.04	<0.062	0.517	0.837	<0.030	5.59	6.47
5/1/07	2.8	<0.062	0.548	0.495	<0.030	78.6	7.68
4/22/08	2	<0.20	0.558	0.659	<0.10	1.46	8.86
4/28/09				0.546	<0.030	31	6.95
4/27/10	2.42	<0.062	0.848	0.711	0.101	38.4	8.27
4/26/11	2.45	<0.045	1.37	0.823	0.675	47.9	9.7
5/1/12	0	<0.045	0.361	1.12	0.102	116	5.97
5/7/13	2.08	<0.066	<0.20	0.661	<0.073	105	6
4/29/14	1.72	<0.066	<0.20	0.546	<0.073	56.3	8.56
7/18/00	6	0.1	<2	<5	<4	27	14.3
7/24/01	<3.1	<0.14	<0.49	<9.3	<1.1	69.4	13
7/16/02	2	<2	0.9	<9	<2	61	19.48
7/22/03	2.6	<2.5	<1.0	<25	<2.5	<50	18
7/20/04	<0.25	<0.18	<0.36	12.1	<0.052	54.2	14.9
7/26/05	<2.5	<1.0	<2.5	<2.5	<1.0	<10	4.61
7/25/06	2.11	<0.062	<0.049	3.51	<0.030	11.2	12.8
7/17/07	2.91	<0.062	1.03	0.291	<0.030	36.7	16.8
7/29/08							10.8
7/21/09	1.79	<0.062	1.32	0.456	<0.030	37.2	13.8
7/27/10	1.64	<0.062	0.411	0.378	<0.030	40.6	12.3
7/26/11	2.57	<0.045	0.628	0.586	<0.030	59.6	15.9
7/31/12	2.4	0.501	0.686	0.529	<0.030	68.3	16.8
7/30/13	1.64	<0.066	<0.20	0.795	<0.073	54.8	14.6
7/22/14	2.7	<0.07	<0.20	1.66	<0.070		15.2

Table 111: Arsenic, Cadmium, Chromium, Copper, Lead, Zinc, and Calcium samples taken at Slikok Creek.

Date	Iron (µg/L)	Magnesium (µg/L)	Nitrate (mg/L)	Phosphorus (mg/L)	DRO (mg/L)	GRO (µg/L)	RRO (mg/L)
4/11/01	0.67	1.5	<0.10	0.06	0.32	<25.0	<2.53
4/10/02	1.27	5.85	0.3	0.05	<0.26	<25.0	<2.58
4/29/03	1.3	3.4	0.12	0.033	<0.42	<25.0	<2.78
4/27/04	0.603	1.86	<0.015	0.035	<0.021	<3.0	<0.032
4/26/05	0.917	2.09	<0.015	<0.025	<0.0060		<0.20
4/25/06	3.13	2.06	<0.015	0.11			
5/1/07	2.32	2.51	<0.015	<0.026			
4/22/08	1.79	2.84	<0.10	<0.051			
4/28/09	1.96	2.21	<0.015	0.095			
4/27/10	1.99	2.61	<0.015	0.091			
4/26/11	2.75	2.98	<0.015	0.11			
5/1/12	0.58	1.91	<0.015	<0.026			
5/7/13	1.7	2	<0.015	64			
4/29/14	1.21	2.53	0.115	<0.26			
7/18/00	1.18	4	0.12	<0.04	<0.25	<25.0	<2.98
7/24/01	0.842	3.6	<0.10	0.023	<0.26	<25.0	<2.58
7/16/02	0.42	5.57	0.36	0.09	<0.25	<25.0	<2.53
7/22/03	1.1	5.5	0.12	0.03	<0.81	<25.0	<5.38
7/20/04	0.802	3.01	0.179	0.0279	<0.022	<100	<0.034
7/26/05	8.24	3.3	0.135	<0.051	<0.10		<0.50
7/25/06	1.52	2.79	0.146	<0.026	<0.0064		<0.21
7/17/07	0.785	4.76	0.164	0.064	<0.0064		<0.21
7/29/08	0.761	3.14	<0.015	0.062			
7/21/09	0.592	2.64	0.117	<0.026			
7/27/10	1.32	3.63	<0.015	0.12			
7/26/11	0.872	4.46	0.192	1.3			
7/31/12	1.09	4.9	0.139	<0.026			
7/30/13	0.504	3.22	0.19	<0.026			
7/22/14	1.1	1.1	0.211	<0.026			

Table 112: Iron, Magnesium, Nitrate, Phosphorus, DRO, GRO, and RRO samples taken at Slikok Creek.

Date	BTEX (µg/L)	Fecal (CFU/100mL)	pH	Conductivity (µS/cm)	TSS (mg/L)	Turbidity (NTU)	Water Temp.(°C)
4/11/01	ND	144	7.45	78.9	15.3	4	3.78
4/10/02	ND	<1	7.36	142.4	2	3.2	0.71
4/29/03	ND	<1	7.69	90.5	0.7	2.5	5.4
4/27/04	ND	5	6.37	48.7	0.7	2.1	4.7
4/26/05	ND	<1	6.69	54.8	5.38	1.21	7.1
4/25/06		23	6.91	53.4	22	9.51	0.7
5/1/07		10	7.64	73.5	31.5	8.7	2
4/22/08		112	7.03	66.8	15	4.03	0.9
4/28/09		0	7.38	65.1	6	11	9.13
4/27/10		44	7.12	74	33	7	2
4/26/11		48	7.2	85	36	10.2	2.8
5/1/12		22	7.05	53.9	10.3	2.9	4.3
5/7/13		39	6.86	48.4	15	5.03	1.1
4/30/14		2	7.16	69.4	11.7	4.22	14.86
7/18/00	ND	16	6.76	100	14.7	15	9.44
7/24/01	ND	10	7.29	110.3	1.3	2.7	12.04
7/16/02	ND	160	7.4	149.2	2	1.8	9.6
7/22/03	ND	200	7.1	149	0.7	5.3	12
7/20/04	ND	82	7.36	161.6	3.02	7.2	13.3
7/26/05	ND	120	7.43	112	5.4	6.45	12.2
7/25/06	ND	160	7.22	91.1	<5.0	12.02	9.9
7/17/07	ND	260	7.31	126	13	5.5	9.4
7/29/08	ND	39	6.86	88.6	4.2	13	9
7/21/09	ND	12	7.26	90.7	14	13	13.2
7/27/10	ND	123	7.06	113	7.6	5	8.9
7/26/11	ND	42	7.39	155.8	15.4	3.92	12.8
7/31/12	ND	42	7.06	139.1	5	3.96	14.21
7/30/13		31	7.6	113.7	27.3	8.47	15.05
7/22/14		15	7.24	117	2	5.44	16.6

Table 113: BTEX, Fecal, pH, Conductivity, TSS, Turbidity, and Water Temperature samples taken at Slikok Creek.

Date	Arsenic (µg/L)	Cadmium (µg/L)	Chromium (µg/L)	Copper (µg/L)	Lead (µg/L)	Zinc (µg/L)	Calcium (µg/L)
4/11/01	7	<0.5	<2	<5	<4	33	10.8
4/10/02	8	1.1	<0.5	<9	<1	37	23.31
4/29/03	5.9	<2.5	<1.0	<25	<2.5	<50	16
4/27/04	4.54	<0.18	<0.36	<0.12	<0.052	39	8.3
4/26/05	6.84	<0.18	<0.36	<0.12	<0.052	58.6	10.3
4/25/06	7.9	<0.062	0.493	0.832	<0.030	3	11.5
5/1/07	7.65	<0.062	0.751	0.593	<0.030	52.6	12.8
4/22/08	5.72	<0.20	1.19	0.739	<0.10	2.48	11
4/28/09				0.414	<0.030	51.4	9.57
4/27/10	6.63	<0.062	0.737	0.58	<0.030	43.4	12.2
4/26/11	5.95	<0.045	1.37	0.868	0.336	61.8	10.3
5/1/12	5.26	<0.045	0.375	0.838	<0.030	94.6	8.72
5/7/13	7.61	<0.066	<0.20	0.371	<0.073	23.4	9
4/29/14	7.21	<0.066	<0.20	0.658	0.374	55.1	12.1
7/18/00	10	<0.1	<2	<5	<4	<9	19.2
7/24/01	9.7	<0.14	<0.49	<9.3	<1.1	68	15
7/16/02	8	63	1.6	<9	<2	57	22.08
7/22/03	10	<2.5	<1.0	<25	<2.5	<50	22
7/20/04	11.3	<0.18	<0.36	<0.12	<0.052	63.4	24.1
7/26/05	10.1	<1.0	<2.5	<2.5	<1.0	19.4	22.1
7/25/06	9.44	<0.062	<0.049	<0.34	<0.030	17.8	19.2
7/17/07	10.5	<0.062	1.17	0.26	<0.030	33.7	14.1
7/29/08							14.8
7/21/09	9.08	<0.062	2.33	0.591	0.598	50.8	21
7/27/10	5	<0.062	0.315	0.271	<0.030	34.1	14.8
7/26/11	8.64	<0.045	0.596	0.385	<0.030	49.4	18.9
7/31/12	8.88	0.103	0.657	0.859	0.12	63.8	18.9
7/30/13	9.44	<0.066	0.546	0.322	<0.073	55.8	20.1
7/22/14	12.8	<0.07	<0.20	0.68	<0.070	0.0325	15.5

Table 114: Arsenic, Cadmium, Chromium, Copper, Lead, Zinc, and Calcium samples taken at Soldotna Creek.

Date	Iron (µg/L)	Magnesium (µg/L)	Nitrate (mg/L)	Phosphorus (mg/L)	DRO (mg/L)	GRO (µg/L)	RRO (mg/L)
4/11/01	1.62	2.9	<0.10	0.15	0.35	<25.0	<2.66
4/10/02	1.16	6.75	0.13	0.12	<0.26	<25.0	<2.58
4/29/03	0.95	4.8	<0.10	0.092	<0.43	<25.0	<2.84
4/27/04	0.832	2.45	<0.015	0.094	<0.022	<3.0	<0.034
4/26/05	2.06	3.08	<0.015	0.27	<0.0060		<0.20
4/25/06	2.62	3.48	<0.015	0.15			
5/1/07	1.69	3.93	<0.015	0.16			
4/22/08	2.4	3.28	<0.10	0.077			
4/28/09	1.55	2.93	<0.015	0.12			
4/27/10	1.74	3.72	<0.015	0.28			
4/26/11	1.39	3.08	<0.015	0.19			
5/1/12	0.698	2.73		0.054		ND	
5/7/13	1.4	3		<0.026			
4/29/14	1.74	3.52	<0.015	0.13			
7/18/00	1.13	5.1	0.06	0.1	0.37	<25.0	5.67
7/24/01	0.613	4.1	<0.10	0.093	<0.27	<25.0	<2.75
7/16/02	0.72	5.92	<0.10	0.11	<0.25	<25.0	<2.53
7/22/03	0.59	6.4	<0.10	0.11	<0.40	<25.0	<2.69
7/20/04	0.761	6.4	<0.015	0.116	<0.022	<100	<0.034
7/26/05	0.867	6.01	<0.10	0.13	<0.10		<0.50
7/25/06	1.09	5.52	<0.015	0.16	<0.0064		<0.21
7/17/07	1.2	4.24	<0.015	<0.026	<0.0063		<0.21
7/29/08	0.73	4.17	<0.015	0.1			
7/21/09	0.807	6.14	<0.015	0.08			
7/27/10	0.964	4.1	<0.015	0.22			
7/26/11	0.796	5.39	<0.015	0.13			
7/31/12	0.874	5.19	<0.015	0.11			
7/30/13	0.643	6.32	<0.015	0.089			
7/22/14	1.11	4.48	<0.015	0.094			

Table 115: Iron, Magnesium, Nitrate, Phosphorus, DRO, GRO, and RRO samples taken at Soldotna Creek.

Date	BTEX (µg/L)	Fecal (CFU/100mL)	pH	Conductivity (µS/cm)	TSS (mg/L)	Turbidity (NTU)	Water Temp.(°C)
4/11/01	ND	520	7.1	97.9	26	10	0.5
4/10/02	ND	12	7.39	167.8	1.3	4.5	-0.02
4/29/03	ND	<1	7.53	139.5	2	2.5	6.8
4/27/04	ND	10	6.77	75.5	1.3	2.05	4.9
4/26/05	ND	82	6.88	83.8	16.8	5.15	5.5
4/25/06		68	7.06	94.6	18.5	6.28	1.5
5/1/07		2	7.32	81.3	18	10	3
4/22/08		56	7.25	91.4	33.5	9.05	1.6
4/28/09		14	7.01	61.3	12	4	6.8
4/27/10		20	7.5	112	16	6	3
4/26/11		113	7.4	107	53	4.1	2.8
5/1/12		34	7.23	79	11.3	4	4.7
5/7/13		46	7.24	75.7	9	5.12	1.1
4/30/14		14	7.48	101.3	16	6.68	15.51
7/18/00	ND	6	7.21	140	9.3	6.6	11.67
7/24/01	ND	30	7.24	124.7	5.3	2.1	14.62
7/16/02	ND	20	7.76	168	1.3	2.5	14.78
7/22/03	ND	9	7.4	180	0.7	2.8	17
7/20/04	ND	9	7.68	196.6	3.35	3	15.7
7/26/05	ND	71	7.36	182	2.71	3.1	12.1
7/25/06	ND	180	7.71	160.5	<5.0	4.7	11
7/17/07	ND	260	7.62	144	<5.0	2.5	13
7/29/08	2.7	28	7.54	125.7	25.4	4.27	14
7/21/09	0.66	37	7.71	169.7	8.8	3	12
7/27/10	ND	55	7.33	137	15.6	4	10.2
7/26/11	ND	25	7.73	167.7	7.7	3.88	14.9
7/31/12	ND	20	7.53	160.4	3	2.21	14.8
7/30/13		14	7.87	172.5	3.4	2.37	18.3
7/22/14		8	7.46	113.5	6.7	3.39	16.78

Table 116: BTEX, Fecal, pH, Conductivity, TSS, Turbidity, and Water Temperature samples taken at Soldotna Creek.

Date	Arsenic (μg/L)	Cadmium (μg/L)	Chromium (μg/L)	Copper (μg/L)	Lead (μg/L)	Zinc (μg/L)	Calcium (μg/L)
4/11/01	<4	<0.5	<2	<5	<4	34	9.45
4/10/02	<3	1.1	<0.5	<9	<1	70	10.84
4/29/03	<2.5	<2.5	<1.0	<25	<2.5	52	7.7
4/27/04	<0.25	<0.18	<0.36	<0.12	<0.052	27.4	6.28
4/26/05	<0.25	<0.18	<0.36	<0.12	<0.052	46.8	8.11
4/25/06	2.46	<0.062	1.23	0.616	<0.030	20.5	9.07
5/1/07	2.29	<0.062	0.709	0.764	<0.030	51.9	7.44
4/22/08	2.44	<0.20	1.91	0.276	<0.10	34.1	9
4/28/09				1.55	<0.030	0.86	5.77
4/27/10	1.97	<0.062	0.49	0.801	<0.030	48	7.56
4/26/11	1.87	<0.045	1.14	1.31	0.139	45.6	6.35
5/1/12	1.74	<0.045	0.342	1.11	<0.030	66.1	6.85
5/7/13	2.31	<0.066	<0.20	0.578	<0.073	2.98	6
4/29/14							7.73
7/18/00	<4	<0.1	<2	<5	<4	<9	8.88
7/24/01	<3.1	<0.14	<0.49	<9.3	<1.1	41	9.1
7/16/02	<1	<2	1.1	<9	<2	51	8.22
7/22/03	2.6	<2.5	<1.0	<25	<2.5	<50	9.5
7/20/04	2.83	<0.18	<0.36	<0.12	<0.052	59.1	9.88
7/26/05	2.56	<1.0	<2.5	<2.5	<1.0	16.2	10.8
7/25/06	2.63	<0.062	2.97	0.5	<0.030	20	9.48
7/17/07	2.46	<0.062	0.627	0.494	<0.030	34.8	9.45
7/29/08							7.26
7/21/09	2.51	<0.062	1.85	0.746	<0.030	31.4	10.4
7/27/10	1.39	<0.062	0.647	1.21	0.252	28.9	7.61
7/26/11	2.77	<0.045	0.401	0.992	<0.030	56.7	10.5
7/31/12	2.15	<0.045	0.282	0.593	<0.030	9.49	9.21
7/30/13	3.02	<0.066	<0.20	0.476	<0.073	31.8	10.3
7/22/14							9.34

Table 117: Arsenic, Cadmium, Chromium, Copper, Lead, Zinc, and Calcium samples taken at Funny River.

Date	Iron (µg/L)	Magnesium (µg/L)	Nitrate (mg/L)	Phosphorus (mg/L)	DRO (mg/L)	GRO (µg/L)	RRO (mg/L)
4/11/01	1.89	3	<0.10	0.12	<0.25	<25.0	<2.53
4/10/02	0.75	3.88	<0.10	0.04	<0.26	<25.0	<2.55
4/29/03	2.2	3	<0.10	0.13	<0.42	<25.0	<2.78
4/27/04	1.96	2.46	<0.015	0.11	<0.021	<3.0	<0.032
4/26/05	2.25	3.33	<0.015	0.23	<0.0060		<0.20
4/25/06	7.21	3.86	<0.015	0.12			
5/1/07	2.49	3.05	<0.015	0.11			
4/22/08	1.13	3.16	<0.10	<0.051			
4/28/09	3.18	2.48	<0.015	0.17			
4/27/10	2.26	2.9	<0.015	0.22			
4/26/11	1.02	2.27	<0.015	0.084			
5/1/12	0.882	2.47	<0.015	0.1			
5/7/13	0.71	2	0.574	<0.026			
4/29/14	1.02	2.68	<0.015	0.088			
7/18/00	1.46	3.2	0.04	0.11	<0.25	<25.0	<2.98
7/24/01	1.1	2.6	<0.10	0.07	<0.28	<25.0	<2.81
7/16/02	0.38	2.77	<0.10	0.04	<0.27	<25.0	<2.66
7/22/03	0.58	3.3	<0.10	0.044	<0.45	<25.0	<3.01
7/20/04	0.387	3.09	<0.015	0.0311	<0.022	<100	<0.035
7/26/05	0.574	3.57	<0.10	<0.051	<0.10		<0.50
7/25/06	0.629	3.29	<0.015	0.088	<0.0064		<0.22
7/17/07	0.47	0.944	<0.015	0.056	<0.0064		<0.21
7/29/08	0.727	2.26	<0.015	0.12			
7/21/09	0.472	3.45	<0.015	<0.026			
7/27/10	1.98	2.79	<0.015	0.16			
7/26/11	0.543	3.44	<0.015	<0.026			
7/31/12	0.431	3.02	<0.015	<0.026			
7/30/13	0.401	3.81	<0.015	<0.026			
7/22/14	0.618	3.12	<0.015	0.066			

Table 118: Iron, Magnesium, Nitrate, Phosphorus, DRO, GRO, and RRO samples taken at Funny River.

Date	BTEX (µg/L)	Fecal (CFU/100mL)	pH	Conductivity (µS/cm)	TSS (mg/L)	Turbidity (NTU)	Water Temp.(°C)
4/11/01	ND	500	7.27	73.6	50	34.6	0.04
4/10/02	ND	<1	7.3	90.5	6	4.8	-0.18
4/29/03	ND	4	7.26	63.3	37.3	22	3.8
4/27/04	ND	7	6.64	42.2	43.3	10.2	1.8
4/26/05	ND	<1	6.89	65.8	67.5	28.2	3.4
4/25/06		39	6.87	64	205	24	-0.1
5/1/07		6	7.33	73.1	77	23	1.6
4/22/08		1	7.12	70.3	10.5	4.31	0
4/28/09		80	7.09	50.5	125	34	7.88
4/27/10		82	7.27	64	63.5	16	0.1
4/26/11		44	6.9	57	72	11.5	0.1
5/1/12		55	7.33	57.9	65	14	2.1
5/7/13		68	6.74	47.4	5.7	2.95	0.1
4/30/14		44	7.4	62.5	54.7	16.3	14.92
7/18/00	ND	<1	6.85	62	32.7	11	8.95
7/24/01	ND	40	7.56	69.5	34.7	12	10.72
7/16/02	ND	10	7.54	74.5	0.7	3.6	10.7
7/22/03	ND	110	7.5	84.9	2	6.3	12
7/20/04	ND	64	7.51	88.9	2.45	2.4	18.5
7/26/05	ND	11	7.28	98.7	13.2	4.22	12.7
7/25/06	ND	68	7.53	81.8	<5.0	2.76	9.9
7/17/07	ND	43	7.48	77	16	4.9	10.8
7/29/08	ND	57	7.21	82.9	59	13	8.2
7/21/09	ND	10	7.61	82.8	11.6	4	9.9
7/27/10	ND	0	7.09	69	90.4	21	8.2
7/26/11	ND	31	7.53	89.1	11.4	4.45	12.7
7/31/12	ND	16	7.38	80.4	11.2	2.67	14.35
7/30/13		13	7.98	88.6	5	2.53	17.23
7/22/14		7	7.43	71.3	8	4.4	17.01

Table 119: BTEX, Fecal, pH, Conductivity, TSS, Turbidity, and Water Temperature samples taken at Funny River.

Date	Arsenic (µg/L)	Cadmium (µg/L)	Chromium (µg/L)	Copper (µg/L)	Lead (µg/L)	Zinc (µg/L)	Calcium (µg/L)
4/11/01	<4	<0.5	<2	<5	<4	33	10.3
4/10/02	6	1.1	<0.5	<9	<1	79	25.33
4/29/03	4	<2.5	<1.0	<25	<2.5	49	18
4/27/04	3.6	<0.18	<0.36	<0.12	<0.052	41.3	9.95
4/26/05	6.46	<0.18	<0.36	<0.12	<0.052	24	17.2
4/25/06	5.87	<0.062	0.29	0.449	<0.030	33.6	16.4
5/1/07	5.11	<0.062	0.645	0.251	<0.030	49	12.8
4/22/08	3.93	<0.20	1.27	0.215	<0.10	1.87	17.4
4/28/09				0.262	<0.030	0.632	10.3
4/27/10	4.14	<0.062	0.417	0.641	<0.030	48.9	17
4/26/11	5.06	<0.045	0.999	0.764	0.139	21.2	14.3
5/1/12	3.83	<0.045	0.447	1.06	<0.030	120	12.9
5/7/13	4.27	<0.066	<0.20	0.576	<0.073	<0.55	8
4/29/14							15.2
7/18/00	8	<0.1	<2	6	<4	10	24.5
7/24/01	6.7	<0.14	<0.49	<9.3	<1.1	76.1	24
7/16/02	6	<2	<0.6	<9	<2	<9	22.38
7/22/03	5.2	<2.5	1	<25	<2.5	<50	24
7/20/04	6.01	<0.18	<0.36	<0.12	<0.052	11	25.7
7/26/05	5.58	<1.0	<2.5	<2.5	<1.0	<10	23.8
7/25/06	7.63	<0.062	5.26	0.315	<0.030	0.831	23.9
7/17/07	7.86	<0.062	0.674	0.262	<0.030	14	16.1
7/29/08							15.8
7/21/09	7.61	<0.062	3.45	0.484	<0.030	26	23.8
7/27/10	3.97	<0.062	0.293	0.24	0.252	15.3	20.8
7/26/11	9.39	<0.045	0.364	0.59	<0.030	<0.084	22.5
7/31/12	7.37	<0.045	0.377	0.214	<0.030	52.3	22.2
7/30/13	7.56	<0.066	<0.20	0.493	<0.073	13.6	23.6
7/22/14							10.2

Table 120: Arsenic, Cadmium, Chromium, Copper, Lead, Zinc, and Calcium samples taken at Moose River.

Date	Iron (µg/L)	Magnesium (µg/L)	Nitrate (mg/L)	Phosphorus (mg/L)	DRO (mg/L)	GRO (µg/L)	RRO (mg/L)
4/11/01	1.08	1.8	<0.10	0.06	0.37	<25.0	<2.53
4/10/02	1.06	4.59	<0.10	0.06	<0.25	<25.0	<2.53
4/29/03	1.1	3	<0.10	0.049	<0.44	<25.0	<2.94
4/27/04	0.876	1.75	<0.015	0.059	<0.022	<3.0	<0.034
4/26/05	2.02	3.03	<0.015	0.23	<0.0060		<0.20
4/25/06	3.13	2.94	<0.015	0.087			
5/1/07	1.74	2.38	<0.015	<0.026			
4/22/08	1.28	3.02	<0.10	<0.051			
4/28/09	1.33	1.63	<0.015	0.098			
4/27/10	2.44	3.02	<0.015	0.2			
4/26/11	1.74	2.54	<0.015	0.14			
5/1/12	0.788	2.3	<0.015	<0.026			
5/7/13	1.4	2	<0.015	0.056			
4/29/14	1.59	2.64	<0.015	0.058			
7/18/00	1.1	3.9	<0.03	0.05	<0.25	<25.0	<2.98
7/24/01	0.64	3.6	<0.10	0.024	<0.25	<25.0	<2.53
7/16/02	0.63	3.84	<0.10	0.03	<0.27	<25.0	<2.72
7/22/03	0.27	4.5	<0.10	0.027	<0.42	<25.0	<2.81
7/20/04	0.521	4.16	<0.015	0.0263	<0.023	<100	<0.036
7/26/05	0.85	3.91	<0.10	<0.051	<0.10		<0.50
7/25/06	0.867	4.25	<0.015	<0.026	<0.0064		<0.22
7/17/07	2.52	3.99	<0.015	<0.026	<0.0063		<0.21
7/29/08	0.376	2.61	<0.015	<0.026			
7/21/09	0.755	4.19	<0.015	<0.026			
7/27/10	0.702	3.37	<0.015	0.098			
7/26/11	0.96	3.83	<0.015	<0.026			
7/31/12	0.885	3.68	<0.015	<0.026			
7/30/13	0.713	4.48	<0.015	<0.026			
7/22/14	10.2	0.958	0.139	<0.026			

Table 121: Iron, Magnesium, Nitrate, Phosphorus, DRO, GRO, and RRO samples taken at Moose River.

Date	BTEX (µg/L)	Fecal (CFU/100mL)	pH	Conductivity (µS/cm)	TSS (mg/L)	Turbidity (NTU)	Water Temp.(°C)
4/11/01	ND	118	6.94	77	9.3	8.7	0.03
4/10/02	ND	<1	7.24	179.3	2	5	0.09
4/29/03	ND	<1	7.61	118.7	0.7	3.5	10.6
4/27/04	ND	9	6.98	69.3	5.4	3.75	4.3
4/26/05	ND	<1	6.83	114.4	25.3	5.48	4.3
4/25/06		6	7.1	108	29.5	9.29	1.1
5/1/07		<1	7.34	103.9	19.5	5.3	3.6
4/22/08		44	7.11	98.8	1.5	4.12	0.1
4/28/09		6	7.14	84.4	14	6	7.8
4/27/10		67	7.41	115	38	14	2.4
4/26/11		7	7.3	104	57	13.4	1.2
5/1/12		25	7.28	88.1	16.7	5.7	5.9
5/7/13		16	6.87	53	12.7	5.79	0.2
4/30/14		7	7.43	98.3	9	6.36	14.18
7/18/00	ND	2	7.05	135	20.7	3	13.93
7/24/01	ND	<1	7.35	152.8	6.7	1.8	15.92
7/16/02	6.65	<1	9.03	148.9	3.3	1.8	17.48
7/22/03	0.52	9	8.4	157	0.7	1.39	19
7/20/04	1.6	9	8	163.3	<1.0	1.3	18.7
7/26/05	ND	4	7.93	141	1.49	1.72	17.3
7/25/06	ND	130	8.16	148.1	<5.0	1.72	13.8
7/17/07	ND	1	8.64	131	<5.0	2.1	15.5
7/29/08	ND	21	7.29	105.6	4	1.4	11.8
7/21/09	ND	6	8.36	156.8	7.6	2	16.4
7/27/10	ND	5	7.41	148	1.7	2	11.8
7/26/11	ND	4	8.01	159.7	1.7	2.82	15.9
7/31/12	ND	7	7.69	144.6	0.4	2.15	14.57
7/30/13		2	8.6	151	4.7	2.18	18.64
7/22/14		1					

Table 122: BTEX, Fecal, pH, Conductivity, TSS, Turbidity, and Water Temperature samples taken at Moose River.

Date	Arsenic (µg/L)	Cadmium (µg/L)	Chromium (µg/L)	Copper (µg/L)	Lead (µg/L)	Zinc (µg/L)	Calcium (µg/L)
4/11/01	<4	<0.5	<2	<5	<4	28	10.4
4/10/02	<3	1.1	<0.5	13	<1	34	8.06
4/29/03	<2.5	<2.5	<1.0	<25	<2.5	<50	7.4
4/27/04	<0.25	<0.18	<0.36	<0.12	<0.052	37.9	9.1
4/26/05	<0.25	<0.18	<0.36	<0.12	<0.052	27.2	8.26
4/25/06	1.39	<0.062	0.341	0.692	<0.030	11.9	6.71
5/1/07	1.44	<0.062	<0.049	0.703	<0.030	14.4	6.93
4/22/08	1.42	<0.20	0.339	0.601	<0.10	1.21	6.5
4/28/09				0.558	<0.030	0.891	6.43
4/27/10	1.21	<0.062	0.343	0.698	<0.030	24.1	7.77
4/26/11	1.16	<0.045	0.669	1.11	<0.030	40	6.92
5/1/12	1.22	<0.045	0.296	1.03	<0.030	60.7	8.28
5/7/13	1.5	<0.066	<0.20	0.766	<0.073	57.4	6
4/29/14							8.16
7/18/00	4	<0.1	<2	<5	<4	<9	3.95
7/24/01	<3.1	<0.14	<0.49	<9.3	<1.1	34.4	3.8
7/16/02	<1	<2	<0.6	<9	<2	26	10.26
7/22/03	<2.5	<2.5	<1.0	<25	<2.5	<50	3.3
7/20/04	<0.25	<0.18	3.33	8.42	1.21	49.5	3.41
7/26/05	<2.5	<1.0	<2.5	<2.5	<1.0	19.9	20.2
7/25/06	1.38	<0.062	0.42	1.45	0.201	5.21	4.99
7/17/07	1.65	<0.062	0.579	0.448	<0.030	17.7	4.66
7/29/08							5.13
7/21/09	1.25	<0.062	0.816	0.801	<0.030	44.4	4.53
7/27/10	0.83	<0.062	<0.049	0.407	<0.030	6.34	3.9
7/26/11	1.47	<0.045	0.3	0.873	<0.030	57.8	4.9
7/31/12	1.29	<0.045	0.278	0.487	<0.030	57.5	4.32
7/30/13	1.48	<0.066	0.544	0.545	<0.073	41.5	3.18
7/22/14							3.62

Table 123: Arsenic, Cadmium, Chromium, Copper, Lead, Zinc, and Calcium samples taken at Killey River.

Date	Iron (µg/L)	Magnesium (µg/L)	Nitrate (mg/L)	Phosphorus (mg/L)	DRO (mg/L)	GRO (µg/L)	RRO (mg/L)
4/11/01	0.31	0.9	0.22	<0.05	<0.27	<25.0	<2.66
4/10/02	0.19	1.55	0.15	0.01	<0.25	<25.0	<2.53
4/29/03	0.67	1.3	0.22	0.033	<0.43	<25.0	<2.84
4/27/04	0.242	0.746	0.159	<0.0020	<0.021	<3.0	<0.032
4/26/05	0.941	1.7	<0.015	0.12	<0.0060		<0.20
4/25/06	1.43	1.56	<0.015	<0.026			
5/1/07	0.778	1.48	<0.015	<0.026			
4/22/08	0.844	1.43	<0.10	<0.051			
4/28/09	1.71	1.55	<0.015	0.058			
4/27/10	0.649	1.5	<0.015	<0.026			
4/26/11	1.05	1.45	0.196	<0.026			
5/1/12	0.394	1.37	0.234	<0.026			
5/7/13	1.3	1	<0.015	<0.026			
4/29/14	0.558	1.35	0.231	<0.26			
7/18/00	6.26	2.7	<0.03	0.21	<0.25	<25.0	<2.98
7/24/01	2.9	1.4	<0.10	0.088	<0.27	<25.0	<2.66
7/16/02	0.06	0.77	0.19	<0.01	<0.25	<25.0	<2.53
7/22/03	3.6	1.6	<0.10	0.14	<0.41	<25.0	<2.72
7/20/04	3.33	1.55	<0.015	0.0614	<0.021	<100	<0.033
7/26/05	<0.050	1.69	<0.10	0.4	<0.10		<0.50
7/25/06	9.99	3.94	<0.015	0.57	<0.0064		<0.22
7/17/07	3.88	1.95	<0.015	0.14	<0.0063		<0.21
7/29/08	0.787	1.03	<0.015	<0.026			
7/21/09	1.34	1.14	<0.015	0.15			
7/27/10	2.09	1.19	<0.015	0.092			
7/26/11	1.58	1.28	<0.015	<0.026			
7/31/12	1.39	1.09	<0.015	0.069			
7/30/13	4.04	1.85	<0.015	0.35			
7/22/14	1.87	1.15	<0.015	<0.026			

Table 124: Iron, Magnesium, Nitrate, Phosphorus, DRO, GRO, and RRO samples taken at Killey River.

Date	BTEX (µg/L)	Fecal (CFU/100mL)	pH	Conductivity (µS/cm)	TSS (mg/L)	Turbidity (NTU)	Water Temp.(°C)
4/11/01	ND	<1	7.84	72.8	6	8.8	8.8
4/10/02	ND	<1	7.39	65.7	2.7	1.1	-0.21
4/29/03	ND	<1	7.18	54	1.3	8.5	5.4
4/27/04	ND	<1	6.68	51.4	36	13.3	2.8
4/26/05	ND	<1	7.01	64.1	20	4.18	6.5
4/25/06		<1	6.5	55.9	14	2.48	0
5/1/07		4	7.02	62.8	16	3.8	1.7
4/22/08		24	6.75	57.1	16	2.59	0.2
4/28/09		4	6.91	52.1	75.2	22	9.5
4/27/10		4	7.02	63	13.8	6	0.1
4/26/11		15	7.1	57	36	7.9	0.1
5/1/12		2	7.26	62.3	8.8	5.4	2.9
5/7/13			6.89	49.1	46.6	8.43	0.2
4/30/14			7.44	58.8	34.6	12.7	10.78
7/18/00	ND	2	6.57	20	162	90	7.78
7/24/01	ND	70	7.22	32	86	65	7.67
7/16/02	0.82	<1	8.27	65	1.3	1.8	11.74
7/22/03	ND	20	6.7	22.7	64	80	8
7/20/04	ND	<1	7.15	18	16	37.4	9.5
7/26/05	ND	440	7.02	26.8	210	96.3	8
7/25/06	ND	230	7.28	25.2	201	129.9	7.2
7/17/07	ND	65	7.1	36	66	46	9.7
7/29/08	3.7	21	6.88	41.2	32.8	23.1	7.6
7/21/09	ND	16	6.91	32	40.2	41	8.6
7/27/10	ND	22	7.15	31	50.8	28	7.5
7/26/11	ND	20	6.98	40.6	19	24.3	13.8
7/31/12	ND	25	6.89	35.7	45.7	29.6	13
7/30/13		76	8.05	20.6	250.5	146	16.74
7/22/14		12	7.35	26.6	19.7	66.3	16.87

Table 125: BTEX, Fecal, pH, Conductivity, TSS, Turbidity, and Water Temperature samples taken at Killey River.

Date	Arsenic (µg/L)	Cadmium (µg/L)	Chromium (µg/L)	Copper (µg/L)	Lead (µg/L)	Zinc (µg/L)	Calcium (µg/L)
4/11/01	<4	<0.5	<2	<5	<4	46	18.5
4/10/02	<3	1.1	<0.5	<9	<1	34	20.59
4/29/03	<2.5	<2.5	<1.0	<25	<2.5	<50	18
4/27/04	<0.25	<0.18	<0.36	<0.12	<0.052	49.7	15.3
4/26/05	<0.25	<0.18	<0.36	3	<0.052	30.6	15.8
4/25/06	0.682	<0.062	0.248	0.928	<0.030	7.6	15.8
5/1/07	0.702	<0.062	<0.049	0.431	<0.030	20.8	14.1
4/22/08	0.802	<0.20	1.04	0.658	<0.10	2.04	19.6
4/28/09				0.27	<0.030	0.462	18.9
4/27/10	686	<0.062	0.278	0.381	<0.030	14	16.7
4/26/11	0.826	<0.045	0.581	0.477	<0.030	17	15.6
5/1/12	0.708	<0.045	0.29	1.25	<0.030	52.8	13.5
5/7/13	0.83	<0.066	<0.20	0.344	<0.073	4.53	21
4/29/14							18.8
7/18/00	5	<0.1	<2	7	<4	<9	14.3
7/24/01	<3.1	<0.14	<0.49	<9.3	<1.1	34.6	13
7/16/02	<1	<2	<0.6	<9	<2	50	13.36
7/22/03	<2.5	<2.5	<1.0	<25	<2.5	<50	14
7/20/04	<0.25	<0.18	<0.36	<0.12	<0.052	33.8	15.9
7/26/05	<2.5	<1.0	<2.5	<2.5	<1.0	19.6	15.3
7/25/06	0.919	<0.062	1.26	0.869	<0.030	24.7	16.5
7/17/07	1.14	<0.062	<0.049	0.291	<0.030	15.5	14.6
7/29/08							13.7
7/21/09	0.97	<0.062	1.59	0.687	<0.030	26.8	16.7
7/27/10	0.625	<0.062	0.212	0.461	<0.030	23.5	15.5
7/26/11	1.03	<0.045	0.393	0.749	<0.030	55	14.5
7/31/12	0.932	<0.045	0.253	0.38	<0.030	30.4	14.4
7/30/13	1.11	<0.066	<0.20	0.456	<0.073	28.2	16.6
7/22/14							13.9

Table 126: Arsenic, Cadmium, Chromium, Copper, Lead, Zinc, and Calcium samples taken at Russian River.

Date	Iron (µg/L)	Magnesium (µg/L)	Nitrate (mg/L)	Phosphorus (mg/L)	DRO (mg/L)	GRO (µg/L)	RRO (mg/L)
4/11/01	<0.04	1.1	0.59	<0.05	<0.25	<25.0	<2.53
4/10/02	<0.03	1.31	0.64	<0.01	<0.27	<25.0	<2.72
4/29/03	<0.11	1.2	0.54	<0.025	<0.41	<25.0	<2.70
4/27/04	0.104	0.97	0.756	<0.0020	<0.022	<3.0	<0.034
4/26/05	<0.0040	1.02	1.11	<0.025	<0.0060		<0.20
4/25/06	0.199	1.2	0.299	<0.026			
5/1/07	<0.04	0.964	1.05	0.073			
4/22/08	<0.050	1.3	0.522	<0.051			
4/28/09	<0.0027	1.24	0.546	<0.026			
4/27/10	0.0848	1.04	0.68	<0.026			
4/26/11	<0.0027	0.914	0.939	<0.026			
5/1/12	<0.0027	0.88	0.983	<0.026			
5/7/13	0.03	1	0.571	<0.026			
4/29/14	0.0248	1.18	0.566	<0.26			
7/18/00	<0.04	0.9	0.31	<0.04	<0.28	<25.0	<3.35
7/24/01	0.083	0.84	0.36	<0.010	<0.27	<25.0	<2.66
7/16/02	0.06	0.93	0.37	<0.01	<0.25	<25.0	<2.53
7/22/03	<0.10	1	0.3	<0.025	<0.42	<25.0	<2.78
7/20/04	<0.0040	1.04	0.281	<0.0020	<0.022	<100	<0.034
7/26/05	<0.050	1.09	0.308	<0.051	<0.10		<0.50
7/25/06	<0.0027	1.13	0.43	<0.026	<0.0063		<0.21
7/17/07	<0.0027	0.868	0.456	<0.026	<0.0063		<0.21
7/29/08	0.0695	0.892	0.354	<0.026			
7/21/09	<0.0027	1.12	0.26	<0.026			
7/27/10	<0.0027	0.883	0.312	<0.026			
7/26/11	<0.0027	1.02	0.326	<0.026			
7/31/12	<0.0027	0.917	0.308	<0.026			
7/30/13	<0.0027	1.21	0.299	<0.026			
7/22/14	<0.007	0.975	0.287	<0.026			

Table 127: Iron, Magnesium, Nitrate, Phosphorus, DRO, GRO, and RRO samples taken at Russian River.

Date	BTEX (µg/L)	Fecal (CFU/100mL)	pH	Conductivity (µS/cm)	TSS (mg/L)	Turbidity (NTU)	Water Temp.(°C)
4/11/01	ND	4	8.19	111	1.3	0.1	2
4/10/02	ND	<1	7.15	139	1.3	0.1	0
4/29/03	ND	<1	7.88	98	0.7	0.4	4.9
4/27/04	ND	3	7.08	94.6	<0.7	0.75	3.3
4/26/05	ND	<1	7.17	88.6	<0.48	0.53	5.2
4/25/06		<1	6.99	90.1	1.5	9.2	3.9
5/1/07		<1	7.48	90.6	0.5	0.7	3.5
4/22/08		0	7.7	195.5	0.6	0.18	2.4
4/28/09		0	7.72	112	0	0	10.41
4/27/10		<1	7.71	98	ND	ND	4.4
4/26/11		1	7.8	110	2.8	0.6	3
5/1/12		0	7.37	81.6	1.8	0.92	3.4
5/7/13		1	7.42	116	2.8	0.6	4
4/30/14		0	7.73	105.4	1.5	0.54	15.9
7/18/00	ND	8	8.14	70	2	0.45	11.39
7/24/01	ND	<1	8.05	80.8	2	2.2	11.5
7/16/02	ND	<1	7.84	77.7	2.7	0.28	12.09
7/22/03	ND	20	7.4	81.6	0.7	0.45	13
7/20/04	ND	9	7.28	91	<0.98	0.4	14.9
7/26/05	ND	240	7.72	97.3	<0.95	0.05	13.8
7/25/06	ND	83	7.76	91.9	<5.0	0.02	11.5
7/17/07	ND	24	7.66	94	<5.0	0.3	12.7
7/29/08	3	6	7.57	83	0.8	0.45	9.7
7/21/09	ND	7	7.71	90.5	2.2	1	13.4
7/27/10	ND	2	7.26	83	1.2	0.4	10.1
7/26/11	ND	5	7.86	95	1.6	0.69	15.2
7/31/12	ND	8	7.48	86.6	1.6	0.51	14.12
7/30/13			7.86	96.2	4.2	0.35	16.6
7/22/14		4	7.41	73.7	1.8	0.6	16.94

Table 128: BTEX, Fecal, pH, Conductivity, TSS, Turbidity, and Water Temperature samples taken at Russian River.

Date	Arsenic (µg/L)	Cadmium (µg/L)	Chromium (µg/L)	Copper (µg/L)	Lead (µg/L)	Zinc (µg/L)	Calcium (µg/L)
4/11/01							
4/10/02							
4/29/03							
4/27/04							
4/26/05							
4/25/06							
5/1/07							
4/22/08							
4/28/09				0.881	<0.030	29	13.9
4/27/10	0.673	<0.062	0.591	0.734	<0.030	23.6	16.8
4/26/11	0.706	0.147	0.487	1.3	0.16	25.7	12.6
5/1/12							
5/7/13	0.698	<0.066	<0.20	0.631	<0.073	<0.55	17
4/29/14							
7/18/00							
7/24/01							
7/16/02							
7/22/03							
7/20/04							
7/26/05							
7/25/06							
7/17/07							
7/29/08							
7/21/09	1.02	<0.062	1.32	0.315	<0.030	1.11	14.9
7/27/10	0.698	<0.062	0.232	1.14	0.803	25.6	14.2
7/26/11	1.08	<0.045	0.305	0.687	<0.030	56.7	13.4
7/31/12							
7/30/13	1.15	<0.066	<0.20	1.04	1.15	31.8	14.8
7/22/14							

Table 129: Arsenic, Cadmium, Chromium, Copper, Lead, Zinc, and Calcium samples taken at Juneau Creek.

Date	Iron (µg/L)	Magnesium (µg/L)	Nitrate (mg/L)	Phosphorus (mg/L)	DRO (mg/L)	GRO (µg/L)	RRO (mg/L)
4/11/01							
4/10/02							
4/29/03							
4/27/04							
4/26/05							
4/25/06							
5/1/07							
4/22/08							
4/28/09	0.0857	1.14	0.219	<0.026			
4/27/10	0.449	1.31	0.19	<0.026			
4/26/11	0.0861	1.01	0.389	<0.026			
5/1/12							
5/7/13	<0.03	1	0.216	<0.026			
4/29/14							
7/18/00							
7/24/01							
7/16/02							
7/22/03							
7/20/04							
7/26/05							
7/25/06							
7/17/07							
7/29/08							
7/21/09	<0.0027	1.16	<0.015	<0.026			
7/27/10	0.0604	0.934	0.279	0.057			
7/26/11	<0.0027	1.05	<0.015	<0.026			
7/31/12							
7/30/13	<0.0027	1.17	0.234	<0.026			
7/22/14							

Table 130: Iron, Magnesium, Nitrate, Phosphorus, DRO, GRO, and RRO samples taken at Juneau Creek.

Date	BTEX (µg/L)	Fecal (CFU/100mL)	pH	Conductivity (µS/cm)	TSS (mg/L)	Turbidity (NTU)	Water Temp.(°C)
4/11/01							
4/10/02							
4/29/03							
4/27/04							
4/26/05							
4/25/06							
5/1/07							
4/22/08							
4/28/09		2	7.38	80.3	7	2	
4/27/10		<1	7.6	98	3.2	2	1.8
4/26/11		<1	7.5	94	5.8	2.3	3
5/1/12							
5/7/13		<1	7.35	96.6	0.5	1.61	0.555
4/30/14							
7/18/00							
7/24/01							
7/16/02							
7/22/03							
7/20/04							
7/26/05							
7/25/06							
7/17/07							
7/29/08							
7/21/09	ND	3	7.68	79.5	0.4	1	10.6
7/27/10	ND	3	7.21	73	3.8	3	8
7/26/11	ND	5	7.81	88.8	1.2	0.64	14.9
7/31/12							
7/30/13		7	7.54	90.3	3.4	0.52	16.28
7/22/14							

Table 131: BTEX, Fecal, pH, Conductivity, TSS, Turbidity, and Water Temperature samples taken at Juneau Creek.

Appendix 5: Data Quality Analysis Tables for Spring

Metal (unit)	Sample Date	Location	Normal Sample Value	Duplicate Sample Value	Relative Percentage Difference	Number of Duplicate Samples That Have Relative Percentage Differences Greater Than 10 Percent
Arsenic (µg/L)	4/10/02	Mile 6.5	<3	<3	0%	4
	4/10/02	Beaver Creek	5	3	50%	
	4/29/03	Mile 43.0	<2.5	<2.5	0%	
	4/29/03	Soldotna Creek	5.9	<2.5	0%	
	4/27/04	Mile 6.5	3.28	2.61	23%	
	4/27/04	Funny River	<0.25	<0.25	0%	
	4/26/05	Mile 40.0	<0.25	<0.25	0%	
	4/26/05	Russian River	<0.25	<0.25	0%	
	4/25/06	Mile 70.0	0.807	0.799	1%	
	4/25/06	Funny River	2.46	2.38	3%	
	5/1/07	Mile 6.5	1.98	2.02	2%	
	5/1/07	No Name Creek	1.45	1.57	8%	
	4/22/08	Mile 70.0	0.715	0.644	10%	
	4/22/08	No Name Creek	1.2	1.22	2%	
	4/27/10	No Name Creek	1.87	2.12	13%	
	4/27/10	Moose River	1.87	1.94	4%	
	4/26/11	No Name Creek	1.17	1.2	3%	
	4/26/11	Funny River	1.87	1.94	4%	
	5/1/12	Mile 12.5	2.16	1.67	26%	
	5/1/12	No Name Creek	1.03	1.07	4%	
	5/7/13	Mile 31.0	3.41	3.51	3%	
	5/7/13	No Name Creek	1.78	1.79	1%	
Cadmium (µg/L)	4/10/02	Mile 6.5	<0.1	<0.1	0%	0
	4/10/02	Beaver Creek	<0.1	<0.1	0%	
	4/29/03	Mile 43.0	<2.5	<2.5	0%	
	4/29/03	Soldotna Creek	<2.5	<2.5	0%	
	4/27/04	Mile 6.5	<0.18	<0.18	0%	
	4/27/04	Funny River	<0.18	<0.18	0%	
	4/26/05	Mile 40.0	<0.18	<0.18	0%	
	4/26/05	Russian River	<0.18	<0.18	0%	
	4/25/06	Mile 1.5	<0.062	<0.062	0%	
	4/25/06	Mile 70.0	<0.062	<0.062	0%	
	4/25/06	Funny River	<0.062	<0.062	0%	
	5/1/07	Mile 1.5	<0.062	<0.062	0%	
	5/1/07	Mile 6.5	<0.062	<0.062	0%	
	5/1/07	No Name Creek	<0.062	<0.062	0%	

Metal (unit)	Sample Date	Location	Normal Sample Value	Duplicate Sample Value	Relative Percentage Difference	Number of Duplicate Samples That Have Relative Percentage Differences Greater Than 10 Percent
Cadmium (µg/L) (Cont.)	4/22/08	Mile 1.5	<0.20	<0.20	0%	0
	4/22/08	Mile 70.0	<0.20	<0.20	0%	
	4/27/10	Mile 1.5	<0.062	<0.062	0%	
	4/27/10	No Name Creek	<0.062	<0.062	0%	
	4/27/10	Moose River	<0.062	<0.062	0%	
	4/26/11	Mile 1.5	<0.045	<0.045	0%	
	4/26/11	No Name Creek	<0.045	<0.045	0%	
	4/26/11	Funny River	<0.045	<0.045	0%	
	5/1/12	Mile 1.5	<0.045	<0.045	0%	
	5/1/12	Mile 12.5	<0.045	<0.045	0%	
	5/1/12	No Name Creek	<0.045	<0.045	0%	
	5/7/13	Mile 1.5	<0.066	<0.066	0%	
	5/7/13	Mile 31.0	<0.066	<0.066	0%	
	5/7/13	No Name Creek	<0.066	<0.066	0%	
	4/29/14	Mile 1.5	<0.07	<0.07	0%	
	4/29/14	No Name Creek	<0.07	<0.07	0%	
Chromium (µg/L)	4/10/02	Mile 6.5	<0.5	<0.5	0%	6
	4/10/02	Beaver Creek	<0.5	<0.5	0%	
	4/29/03	Mile 43.0	<1.0	<1.0	0%	
	4/29/03	Soldotna Creek	<1.0	<1.0	0%	
	4/27/04	Mile 6.5	<0.36	<0.36	0%	
	4/27/04	Funny River	<0.36	<0.36	0%	
	4/26/05	Mile 40.0	<0.36	<0.36	0%	
	4/26/05	Russian River	<0.36	<0.36	0%	
	4/25/06	Mile 70.0	0.227	0.301	28%	
	4/25/06	Funny River	1.23	0.555	76%	
	5/1/07	Mile 6.5	0.697	0.835	18%	
	5/1/07	No Name Creek	2.33	2.9	22%	
	4/22/08	Mile 70.0	0.95	0.917	4%	
	4/22/08	No Name Creek	1.5	1.52	1%	
	4/27/10	No Name Creek	1.51	1.33	13%	
	4/27/10	Moose River	0.417	0.423	1%	
	4/26/11	No Name Creek	1.24	1.34	8%	
	4/26/11	Funny River	1.14	1.08	5%	
	5/1/12	Mile 12.5	0.272	0.419	43%	
	5/1/12	No Name Creek	0.778	0.763	2%	
	5/7/13	Mile 31.0	<0.20	<0.20	0%	
	5/7/13	No Name Creek	<0.20	<0.20	0%	
	4/29/14	No Name Creek	0.523	0.535	2%	

Metal (unit)	Sample Date	Location	Normal Sample Value	Duplicate Sample Value	Relative Percentage Difference	Number of Duplicate Samples That Have Relative Percentage Differences Greater Than 10 Percent
Copper (µg/L)	4/10/02	Mile 6.5	<9	<9	0%	13
	4/10/02	Beaver Creek	<9	<9	0%	
	4/29/03	Mile 43.0	<25	<25	0%	
	4/29/03	Soldotna Creek	<25	<25	0%	
	4/27/04	Mile 6.5	<0.12	<0.12	0%	
	4/27/04	Funny River	<0.12	<0.12	0%	
	4/26/05	Russian River	3	<0.12	0%	
	4/26/05	Mile 40.0	<0.12	<0.12	0%	
	4/25/06	Funny River	0.616	0.655	6%	
	4/25/06	Mile 70.0	0.474	1.11	80%	
	5/1/07	No Name Creek	0.601	0.682	13%	
	5/1/07	Mile 6.5	1.7	0.879	64%	
	4/22/08	No Name Creek	0.599	0.521	14%	
	4/22/08	Mile 70.0	1.17	0.417	95%	
	4/28/09	No Name Creek	0.641	2.08	106%	
	4/28/09	Funny River	1.55	1.89	20%	
	4/27/10	No Name Creek	0.548	0.658	18%	
	4/27/10	Moose River	0.641	1.28	67%	
	4/26/11	No Name Creek	1.08	1.07	1%	
	4/26/11	Funny River	1.31	1.1	17%	
	5/1/12	No Name Creek	0.515	0.537	4%	
	5/1/12	Mile 12.5	3.97	0.846	130%	
	5/7/13	No Name Creek	0.828	0.731	12%	
	5/7/13	Mile 31.0	0.487	0.486	0%	
	4/29/14	No Name Creek	0.69	0.945	31%	
Lead (µg/L)	4/10/02	Beaver Creek	<1	<1	0%	2
	4/10/02	Mile 6.5	<1	<1	0%	
	4/29/03	Soldotna Creek	<2.5	<2.5	0%	
	4/29/03	Mile 43.0	<2.5	<2.5	0%	
	4/27/04	Funny River	<0.052	<0.052	0%	
	4/27/04	Mile 6.5	<0.052	<0.052	0%	
	4/26/05	Russian River	<0.052	<0.052	0%	
	4/26/05	Mile 40.0	<0.052	<0.052	0%	
	4/25/06	Funny River	<0.030	<0.030	0%	
	4/25/06	Mile 70.0	<0.030	0.117	0%	
	5/1/07	No Name Creek	<0.030	<0.030	0%	
	5/1/07	Mile 6.5	0.249	<0.030	0%	
	4/22/08	No Name Creek	<0.10	<0.10	0%	
	4/22/08	Mile 70.0	0.124	<0.10	0%	

Metal (unit)	Sample Date	Location	Normal Sample Value	Duplicate Sample Value	Relative Percentage Difference	Number of Duplicate Samples That Have Relative Percentage Differences Greater Than 10 Percent
Lead (µg/L) (Cont.)	4/28/09	No Name Creek	<0.030	<0.030	0%	2
	4/28/09	Funny River	<0.030	<0.030	0%	
	4/27/10	No Name Creek	<0.030	0.102	0%	
	4/27/10	Moose River	<0.030	<0.030	0%	
	4/26/11	No Name Creek	0.301	0.301	0%	
	4/26/11	Funny River	0.139	0.111	22%	
	5/1/12	No Name Creek	<0.030	<0.030	0%	
	5/1/12	Mile 12.5	0.403	0.198	68%	
	5/7/13	No Name Creek	<0.073	<0.073	0%	
	5/7/13	Mile 31.0	<0.073	<0.073	0%	
	4/29/14	No Name Creek	<0.073	<0.073	0%	
Zinc (µg/L)	4/10/02	Beaver Creek	41	39	5%	13
	4/10/02	Mile 6.5	57	57	0%	
	4/29/03	Soldotna Creek	<50	51	0%	
	4/29/03	Mile 43.0	<50	<50	0%	
	4/27/04	Funny River	27.4	11.2	84%	
	4/27/04	Mile 6.5	41.3	41.3	0%	
	4/26/05	Russian River	30.6	24.4	23%	
	4/26/05	Mile 40	25.8	23.4	10%	
	4/25/06	Funny River	20.5	36.2	55%	
	4/25/06	Mile 70.0	10.4	15	36%	
	5/1/07	No Name Creek	18.7	53.6	97%	
	5/1/07	Mile 6.5	86.8	86	1%	
	4/22/08	No Name Creek	8.63	8.3	4%	
	4/22/08	Mile 70.0	9.29	1.33	150%	
	4/28/09	No Name Creek	28.6	2.55	167%	
	4/28/09	Funny River	0.86	0.751	14%	
	4/27/10	No Name Creek	20.8	47.7	79%	
	4/27/10	Moose River	48.9	51	4%	
	4/26/11	No Name Creek	8.29	11.7	34%	
	4/26/11	Funny River	45.6	47.5	4%	
	5/1/12	No Name Creek	115	119	3%	
	5/1/12	Mile 12.5	29.4	118	120%	
	5/7/13	No Name Creek	113	144	24%	
	5/7/13	Mile 31.0	<0.55	<0.55	0%	
	4/29/14	No Name Creek	97.8	124	24%	
Calcium (mg/L)	4/10/02	Beaver Creek	17.82	18.33	3%	1
	4/10/02	Mile 6.5	15.19	15.58	3%	
	4/29/03	Soldotna Creek	16	16	0%	

Metal (unit)	Sample Date	Location	Normal Sample Value	Duplicate Sample Value	Relative Percentage Difference	Number of Duplicate Samples That Have Relative Percentage Differences Greater Than 10 Percent
Calcium (mg/L) (Cont.)	4/29/03	Mile 43	9.4	9.6	2%	1
	4/27/04	Funny River	6.28	6.25	0%	
	4/27/04	Mile 6.5	9.2	9.05	2%	
	4/26/05	Russian River	15.8	14.9	6%	
	4/26/05	Mile 40	10.8	10.4	4%	
	4/25/06	Funny River	9.07	9.6	6%	
	4/25/06	Mile 70	16.9	17	1%	
	5/1/07	No Name Creek	8.41	8.48	1%	
	5/1/07	Mile 6.5	19.9	17.2	15%	
	4/22/08	No Name Creek	9.91	9.92	0%	
	4/22/08	Mile 70.0	14.3	14.4	1%	
	4/28/09	No Name Creek	7.87	7.34	7%	
	4/28/09	Funny River	5.77	5.8	1%	
	4/27/10	No Name Creek	15.7	15.4	2%	
	4/27/10	Moose River	17	17	0%	
	4/26/11	No Name Creek	7.41	8.23	10%	
	4/26/11	Funny River	6.35	6.21	2%	
	5/1/12	No Name Creek	7	7.14	2%	
	5/1/12	Mile 12.5	9.76	9.73	0%	
	5/7/13	No Name Creek	3	3	0%	
	5/7/13	Mile 31.0	9	9	0%	
	4/29/14	No Name Creek	6.67	6.66	0%	
	4/29/14	Moose River	15.2	15.2	0%	
Iron (mg/L)	4/10/02	Beaver Creek	2.3	2.32	1%	7
	4/10/02	Mile 6.5	11.97	11.89	1%	
	4/29/03	Soldotna Creek	0.95	0.96	1%	
	4/29/03	Mile 43.0	0.43	0.42	2%	
	4/27/04	Funny River	1.96	1.89	4%	
	4/27/04	Mile 6.5	1.25	0.952	27%	
	4/26/05	Russian River	<0.0040	<0.0040	0%	
	4/26/05	Mile 40.0	0.763	0.755	1%	
	4/25/06	Funny River	7.21	9.48	27%	
	4/25/06	Mile 70.0	0.209	0.205	2%	
	5/1/07	Mile 6.5	44.7	33.1	30%	
	4/22/08	No Name Creek	2.6	2.55	2%	
	4/22/08	Mile 70.0	0.105	0.131	22%	
	4/28/09	No Name Creek	3.62	3.35	8%	
	4/28/09	Funny River	3.18	2.96	7%	
	4/27/10	No Name Creek	2.89	2.69	7%	

Metal (unit)	Sample Date	Location	Normal Sample Value	Duplicate Sample Value	Relative Percentage Difference	Number of Duplicate Samples That Have Relative Percentage Differences Greater Than 10 Percent
Iron (mg/L) (Cont.)	4/27/10	Moose River	2.44	2.22	9%	7
	4/26/11	No Name Creek	5.94	6.18	4%	
	4/26/11	Funny River	1.02	1.04	2%	
	5/1/12	No Name Creek	3.02	3.09	2%	
	5/1/12	Mile 12.5	0.227	0.272	18%	
	5/7/13	No Name Creek	5.1	5.4	6%	
	5/7/13	Mile 31.0	1.2	1	18%	
	4/29/14	No Name Creek	4.22	6.65	45%	
	4/29/14	Moose River	1.59	1.58	1%	
Magnesium (mg/L)	4/10/02	Beaver Creek	4.6	4.57	1%	3
	4/10/02	Mile 6.5	10.29	10.28	0%	
	4/29/03	Soldotna Creek	4.8	4.9	2%	
	4/29/03	Mile 43.0	0.98	0.98	0%	
	4/27/04	Funny River	2.46	2.46	0%	
	4/27/04	Mile 6.5	1.86	1.64	13%	
	4/26/05	Russian River	1.02	0.92	10%	
	4/26/05	Mile 40.0	1.18	1.24	5%	
	4/25/06	Funny River	3.86	4.47	15%	
	4/25/06	Mile 70.0	1.27	1.29	2%	
	5/1/07	No Name Creek	3.54	3.53	0%	
	5/1/07	Mile 6.5	16.8	12.8	27%	
	4/22/08	No Name Creek	4.4	4.46	1%	
	4/22/08	Mile 70.0	1.06	1.07	1%	
	4/28/09	No Name Creek	3.64	3.5	4%	
	4/28/09	Funny River	2.48	2.43	2%	
	4/27/10	No Name Creek	21.4	20.8	3%	
	4/27/10	Moose River	3.02	2.98	1%	
	4/26/11	No Name Creek	4.44	4.73	6%	
	4/26/11	Funny River	2.27	2.26	0%	
	5/1/12	No Name Creek	2.63	2.67	2%	
	5/1/12	Mile 12.5	1.41	1.4	1%	
	5/7/13	No Name Creek	1	1	0%	
	5/7/13	Mile 31.0	1	1	0%	
	4/29/14	No Name Creek	2.52	2.54	1%	
	4/29/14	Moose River	2.64	2.61	1%	

Table 132: Data Quality Analysis for Metals in Spring.

Nutrient (unit)	Sample Date	Location	Normal Sample Value	Duplicate Sample Value	Relative Percentage Difference	Number of Duplicate Samples That Have Relative Percentage Differences Greater Than 10 Percent
Nitrate (mg/L)	4/10/02	Beaver Creek	<0.10	<0.10	0%	1
	4/10/02	Mile 6.5	<0.10	<0.10	0%	
	4/29/03	Soldotna Creek	<0.10	<0.10	0%	
	4/29/03	Mile 43.0	0.17	0.17	0%	
	4/27/04	Funny River	<0.015	<0.015	0%	
	4/27/04	Mile 6.5	<0.015	<0.015	0%	
	4/26/05	Russian River	1.11	1.19	7%	
	4/26/05	Mile 40.0	0.245	0.24	2%	
	4/25/06	Funny River	<0.015	<0.015	0%	
	4/25/06	Mile 70.0	0.409	0.378	8%	
	5/1/07	No Name Creek	<0.015	<0.015	0%	
	5/1/07	Mile 6.5	<0.015	<0.015	0%	
	4/22/08	No Name Creek	0.16	0.139	14%	
	4/22/08	Mile 70.0	0.293	0.269	9%	
	4/28/09	No Name Creek	<0.015	<0.015	0%	
	4/28/09	Funny River	<0.015	<0.015	0%	
	4/26/11	No Name Creek	0.171	0.166	3%	
	4/26/11	Funny River	<0.015	<0.015	0%	
	5/1/12	No Name Creek	0.246	0.244	1%	
	5/1/12	Mile 12.5	<0.015	0.105	0%	
	5/7/13	No Name Creek	<0.015	<0.015	0%	
	5/7/13	Mile 31.0	<0.015	<0.015	0%	
	4/29/14	No Name Creek	0.154	0.151	2%	
	4/29/14	Moose River	<0.015	<0.015	0%	
Phosphorus (mg/L)	4/10/02	Beaver Creek	0.08	0.08	0%	8
	4/10/02	Mile 6.5	0.48	0.42	13%	
	4/29/03	Soldotna Creek	0.092	0.094	2%	
	4/29/03	Mile 43.0	<0.025	<0.025	0%	
	4/27/04	Funny River	0.11	0.103	7%	
	4/27/04	Mile 6.5	0.046	0.039	16%	
	4/26/05	Russian River	<0.025	<0.025	0%	
	4/26/05	Mile 40.0	<0.025	<0.025	0%	
	4/25/06	Funny River	0.12	0.11	9%	
	4/25/06	Mile 70.0	<0.026	<0.026	0%	
	5/1/07	No Name Creek	0.1	0.073	31%	
	5/1/07	Mile 6.5	2.3	1.4	49%	
	4/22/08	No Name Creek	0.06	0.078	26%	
	4/22/08	Mile 70.0	<0.051	<0.051	0%	
	4/28/09	No Name Creek	<0.026	<0.026	0%	
Nutrient	**Sample**	**Location**	**Normal**	**Duplicate**	**Relative**	**Number of**

(unit)	Date		Sample Value	Sample Value	Percentage Difference	Duplicate Samples That Have Relative Percentage Differences Greater Than 10 Percent
Phosphorus (mg/L) (Cont.)	4/28/09	Funny River	0.17	0.16	6%	8
	4/27/10	No Name Creek	0.12	0.14	15%	
	4/27/10	Moose River	0.2	0.061	107%	
	4/26/11	No Name Creek	0.22	0.22	0%	
	4/26/11	Funny River	0.084	0.11	27%	
	5/1/12	No Name Creek	<0.026	0.059	0%	
	5/7/13	No Name Creek	0.076	0.076	0%	
	5/7/13	Mile 31.0	<0.026	<0.026	0%	
	4/29/14	No Name Creek	<0.026	<0.026	0%	
	4/29/14	Moose River	0.058	0.064	10%	

Table 133: Data Quality Analysis for Nutrients in Spring.

Hydrocarbon (unit)	Sample Date	Location	Normal Sample Value	Duplicate Sample Value	Relative Percentage Difference	Number of Duplicate Samples That Have Relative Percentage Differences Greater Than 10 Percent
Diesel Range Organics (mg/L)	4/10/02	Beaver Creek	<0.26	<0.26	0%	0
	4/10/02	Mile 6.5	<0.27	<0.27	0%	
	4/29/03	Soldotna Creek	<0.43	<0.43	0%	
	4/29/03	Mile 43.0	<0.42	<0.42	0%	
	4/27/04	Funny River	<0.021	<0.021	0%	
	4/27/04	Mile 6.5	<0.021	<0.021	0%	
	4/26/05	Russian River	<0.0060	<0.0060	0%	
	4/26/05	Mile 40.0	<0.0060	<0.0060	0%	
Gasoline Range Organics (µg/L)	4/10/02	Beaver Creek	<25.0	<25.0	0%	0
	4/10/02	Mile 6.5	<25.0	<25.0	0%	
	4/29/03	Soldotna Creek	<25.0	<25.0	0%	
	4/29/03	Mile 43.0	<25.0	<25.0	0%	
	4/27/04	Funny River	<3.0	<3.0	0%	
	4/27/04	Mile 6.5	<3.0	<3.0	0%	
Residual Range Organics (mg/L)	4/10/02	Beaver Creek	<2.58	<2.58	0%	0
	4/10/02	Mile 6.5	<2.69	<2.69	0%	
	4/29/03	Soldotna Creek	<2.84	<2.84	0%	
	4/29/03	Mile 43.0	<2.81	<2.81	0%	
	4/27/04	Funny River	<0.32	<0.32	0%	
	4/27/04	Mile 6.5	<0.32	<0.32	0%	
	4/26/05	Russian River	<0.20	<0.20	0%	
	4/26/05	Mile 40.0	<0.20	<0.20	0%	
Benzene (µg/L)	4/10/02	Beaver Creek	<0.50	<0.50	0%	0
	4/10/02	Mile 6.5	<0.50	<0.50	0%	
	4/29/03	Soldotna Creek	<0.50	<0.50	0%	
	4/29/03	Mile 43.0	<0.50	<0.50	0%	
	4/27/04	Funny River	<0.15	<0.15	0%	
	4/27/04	Mile 6.5	<0.15	<0.15	0%	
	4/26/05	Russian River	<0.074	<0.074	0%	
	4/26/05	Mile 40.0	<0.074	<0.074	0%	
Toluene (µg/L)	4/10/02	Beaver Creek	<0.50	<0.50	0%	0
	4/10/02	Mile 6.5	<0.50	<0.50	0%	
	4/29/03	Soldotna Creek	<0.50	<0.50	0%	
	4/29/03	Mile 43.0	<0.50	<0.50	0%	
	4/27/04	Funny River	<0.24	<0.24	0%	
	4/27/04	Mile 6.5	<0.24	<0.24	0%	
	4/26/05	Russian River	<0.078	<0.078	0%	
	4/26/05	Mile 40.0	<0.078	<0.078	0%	

Hydrocarbon (unit)	Sample Date	Location	Normal Sample Value	Duplicate Sample Value	Relative Percentage Difference	Number of Duplicate Samples That Have Relative Percentage Differences Greater Than 10 Percent
Ethylbenzene (µg/L)	4/10/02	Beaver Creek	<0.50	<0.50	0%	0
	4/10/02	Mile 6.5	<0.50	<0.50	0%	
	4/29/03	Soldotna Creek	<0.50	<0.50	0%	
	4/29/03	Mile 43.0	<0.50	<0.50	0%	
	4/27/04	Funny River	<0.18	<0.18	0%	
	4/27/04	Mile 6.5	<0.18	<0.18	0%	
	4/26/05	Russian River	<0.088	<0.088	0%	
	4/26/05	Mile 40.0	<0.088	<0.088	0%	
M,P-Xylene (µg/L)	4/10/02	Beaver Creek	<1.00	<1.00	0%	0
	4/10/02	Mile 6.5	<1.00	<1.00	0%	
	4/29/03	Soldotna Creek	<1.00	<1.00	0%	
	4/29/03	Mile 43.0	<1.00	<1.00	0%	
	4/26/05	Funny River	<0.20	<0.20	0%	
	4/26/05	Mile 40.0	<0.20	<0.20	0%	
O-Xylene (µg/L)	4/10/02	Beaver Creek	<0.50	<0.50	0%	0
	4/10/02	Mile 6.5	<0.50	<0.50	0%	
	4/29/03	Soldotna Creek	<0.50	<0.50	0%	
	4/29/03	Mile 43.0	<0.50	<0.50	0%	
	4/26/05	Funny River	<0.20	<0.20	0%	
	4/26/05	Mile 40.0	<0.20	<0.20	0%	

Table 134: Data Quality Analysis for Hydrocarbons in Spring.

Additional Parameters (unit)	Sample Date	Location	Normal Sample Value	Duplicate Sample Value	Relative Percentage Difference	Number of Duplicate Samples That Have Relative Percentage Differences Greater Than 10 Percent
Fecal Coliform Bacteria (CFU/100mL)	4/10/02	Beaver Creek	0	0	0%	9
	4/10/02	Mile 6.5	64	40	46%	
	4/29/03	Soldotna Creek	0	0	0%	
	4/29/03	Mile 43	0	0	0%	
	4/27/04	Funny River	7	5	33%	
	4/27/04	Mile 6.5	19	4	130%	
	4/26/05	Russian River	<1	<1	0%	
	4/26/05	Mile 40	<1	<1	0%	
	4/25/06	Funny River	39	54	32%	
	4/25/06	Mile 70	0	0	0%	
	5/1/07	No Name Creek	<1	<1	0%	
	5/1/07	Mile 6.5	32	28	13%	
	4/22/08	No Name Creek	0	1	200%	
	4/22/08	Mile 70	0	0	0%	
	4/28/09	No Name Creek	0	0	0%	
	4/28/09	Funny River	80	86	7%	
	4/27/10	No Name Creek	<1	<1	0%	
	4/27/10	Moose River	67	64	5%	
	4/26/11	No Name Creek	38	42	10%	
	4/26/11	Funny River	44	34	26%	
	5/7/13	No Name Creek	42	27	43%	
	5/7/13	Mile 6.5	18	11	48%	
pH	4/10/02	Beaver Creek	7.19	7.29	1%	0
	4/10/02	Mile 6.5	7.98	7.86	2%	
	4/29/03	Soldotna Creek	7.53	7.53	0%	
	4/29/03	Mile 43	7.46	7.46	0%	
	4/27/04	Funny River	6.64	6.75	2%	
	4/27/04	Mile 6.5	7.2	6.64	8%	
	4/26/05	Russian River	7.17	7.25	1%	
	4/26/05	Mile 40	7.26	7.11	2%	
	4/25/06	Funny River	7.16	7.22	1%	
	4/25/06	Mile 70	7.25	7.22	0%	
	5/1/07	No Name Creek	7.45	7.38	1%	
	5/1/07	Mile 6.5	7.61	7.6	0%	
	4/22/08	No Name Creek	7.16	7.13	0%	
	4/22/08	Mile 70	7.4	7.49	1%	
	4/28/09	No Name Creek	7.11	7.11	0%	
	4/28/09	Funny River	7.09	7.11	0%	

Additional Parameters (unit)	Sample Date	Location	Normal Sample Value	Duplicate Sample Value	Relative Percentage Difference	Number of Duplicate Samples That Have Relative Percentage Differences Greater Than 10 Percent
pH (Cont.)	4/27/10	No Name Creek	7.17	7.16	0%	0
	4/27/10	Moose River	7.41	7.4	0%	
	4/26/11	No Name Creek	7.2	7	3%	
	4/26/11	Funny River	6.9	7.1	3%	
	5/1/12	No Name Creek	7.18	7.19	0%	
	5/1/12	Mile 12.5	7.45	7.35	1%	
Specific Conductance (µs/cm)	4/10/02	Beaver Creek	11.59	11.02	5%	1
	4/10/02	Mile 6.5	12.53	12.44	1%	
	4/29/03	Soldotna Creek	139.5	139.5	0%	
	4/29/03	Mile 43	55.7	55.7	0%	
	4/27/04	Funny River	42.2	43.6	3%	
	4/27/04	Mile 6.5	52.8	60.4	13%	
	4/26/05	Russian River	88.6	88.2	0%	
	4/26/05	Mile 40	66.8	66.4	1%	
	4/25/06	Funny River	64	63.5	1%	
	4/25/06	Mile 70	96.2	96.6	0%	
	5/1/07	No Name Creek	157.3	158.9	1%	
	5/1/07	Mile 6.5	92.1	98.3	7%	
	4/22/08	No Name Creek	184.8	194.2	5%	
	4/22/08	Mile 70	91.4	91.5	0%	
	4/28/09	No Name Creek	163.6	163.6	0%	
	4/28/09	Funny River	50.5	50.4	0%	
	4/27/10	No Name Creek	1088	1046	4%	
	4/27/10	Moose River	115	115	0%	
	4/26/11	No Name Creek	217	209	4%	
	4/26/11	Funny River	57	57	0%	
	5/1/12	No Name Creek	104.4	105.4	1%	
	5/1/12	Mile 12.5	71	73.1	3%	
	5/7/13	No Name Creek	46.8	46.3	1%	
	5/7/13	Mile 31.0	59.6	59.2	1%	
Total Suspended Solids (mg/L)	4/10/02	Beaver Creek	5.3	4.7	12%	13
	4/10/02	Mile 6.5	228.7	288	23%	
	4/29/03	Soldotna Creek	2	2	0%	
	4/29/03	Mile 43	0.7	0.7	0%	
	4/27/04	Funny River	43.3	38	13%	
	4/27/04	Mile 6.5	13.3	12.7	5%	
	4/26/05	Russian River	<0.47	<0.47	0%	
	4/26/05	Mile 40	17.4	10.5	49%	
	4/25/06	Funny River	205	190.5	7%	

Additional Parameters (unit)	Sample Date	Location	Normal Sample Value	Duplicate Sample Value	Relative Percentage Difference	Number of Duplicate Samples That Have Relative Percentage Differences Greater Than 10 Percent
Total Suspended Solids (mg/L) (Cont.)	4/25/06	Mile 70	1.5	2.5	50%	13
	5/1/07	No Name Creek	15.5	9.5	48%	
	5/1/07	Mile 6.5	1133	903	23%	
	4/22/08	No Name Creek	4	4.5	12%	
	4/22/08	Mile 70	3.4	4.8	34%	
	4/28/09	No Name Creek	9.8	12.5	24%	
	4/28/09	Funny River	125	137	9%	
	4/27/10	No Name Creek	13	12	8%	
	4/27/10	Moose River	38	43.5	13%	
	4/26/11	No Name Creek	52	59	13%	
	4/26/11	Funny River	72	77	7%	
	5/1/12	No Name Creek	14	14	0%	
	5/1/12	Mile 12.5	7.6	8.2	8%	
	5/7/13	No Name Creek	17	18	6%	
	5/7/13	Mile 31.0	8.7	7.3	18%	
Turbidity (NTU)	4/10/02	Beaver Creek	14	14	0%	7
	4/10/02	Mile 6.5	270	270	0%	
	4/29/03	Soldotna Creek	2.5	2.5	0%	
	4/29/03	Mile 43	13	13	0%	
	4/27/04	Funny River	10.2	10.3	1%	
	4/27/04	Mile 6.5	9.35	12.6	30%	
	4/26/05	Russian River	0.53	0.37	36%	
	4/26/05	Mile 40	13.89	13.21	5%	
	4/25/06	Funny River	24	42.7	56%	
	4/25/06	Mile 70	7.03	7.13	1%	
	5/1/07	No Name Creek	30.2	31	3%	
	5/1/07	Mile 6.5	666	516	25%	
	4/22/08	No Name Creek	11.8	11.9	1%	
	4/22/08	Mile 70	5.84	5.89	1%	
	4/28/09	No Name Creek	10	11	10%	
	4/28/09	Funny River	34	58	52%	
	4/27/10	No Name Creek	14	14	0%	
	4/27/10	Moose River	14	14	0%	
	4/26/11	No Name Creek	83	80	4%	
	4/26/11	Funny River	11.5	11	4%	
	5/1/12	No Name Creek	2.9	17.5	143%	
	5/1/12	mile 12.5	5.2	5.5	6%	
	5/7/13	No Name Creek	16.3	16.4	1%	
	5/7/13	Mile 31.0	7.32	5.5	28%	

Additional Parameters (unit)	Sample Date	Location	Normal Sample Value	Duplicate Sample Value	Relative Percentage Difference	Number of Duplicate Samples That Have Relative Percentage Differences Greater Than 10 Percent
Water Temperature (°C)	4/10/02	Beaver Creek	-0.17	-0.16	6%	1
	4/10/02	Mile 6.5	-0.14	-0.16	13%	
	4/29/03	Soldotna Creek	6.83	6.83	0%	
	4/29/03	Mile 43	5.03	5.03	0%	
	4/27/04	Funny River	1.8	1.8	0%	
	4/27/04	Mile 6.5	4.5	4.5	0%	
	4/26/05	Russian River	5.2	5.2	0%	
	4/26/05	Mile 40	7.6	7.6	0%	
	4/25/06	Funny River	-0.1	-0.1	0%	
	4/25/06	Mile 70	4.2	4.2	0%	
	5/1/07	No Name Creek	3.7	3.7	0%	
	5/1/07	Mile 6.5	4.2	4.2	0%	
	4/22/08	No Name Creek	1.6	1.6	0%	
	4/28/09	No Name Creek	9.6	9.25	4%	
	4/28/09	Funny River	7.88	8.3	5%	
	4/27/10	No Name Creek	2.5	2.5	0%	
	4/27/10	Moose River	2.4	2.4	0%	
	4/26/11	No Name Creek	2.5	2.6	4%	
	4/26/11	Funny River	0.1	0.1	0%	
	5/7/13	No Name Creek	1.1	1.1	0%	
	5/7/13	Mile 31.0	1.3	1.3	0%	

Table 135: Data Quality analysis for Additional Parameters in Spring.

Appendix 6: Data Quality Analysis Tables for Summer

Metal (unit)	Sample Date	Location	Normal Sample Value	Duplicate Sample Value	Relative Percentage Difference	Number of Duplicate Samples That Have Relative Percentage Differences Greater Than 10 Percent
Arsenic (µg/L)	7/16/02	Mile 6.5	<3	<3	0%	4
	7/16/02	Beaver Creek	3	4	29%	
	7/22/03	Mile 10.1	<2.5	<2.5	0%	
	7/22/03	No Name Creek	<2.5	<2.5	0%	
	7/20/04	Mile 6.5	<0.25	<0.25	0%	
	7/20/04	Mile 10.1	<0.25	<0.25	0%	
	7/26/05	Mile 31.0	<2.5	<2.5	0%	
	7/26/05	Mile 70.0	<2.5	<2.5	0%	
	7/25/06	Mile 1.5	2.56	1.61	46%	
	7/25/06	Mile 23.0	1.29	1.2	7%	
	7/17/07	Mile 1.5	2.44	2.41	1%	
	7/17/07	Moose River	7.86	7.68	2%	
	7/21/09	Mile 1.5	2.52	2.9	14%	
	7/21/09	Mile 31	1.06	1.06	0%	
	7/27/10	Mile 1.5	0.973	1.02	5%	
	7/27/10	Mile 6.5	0.703	0.656	7%	
	7/26/11	Mile 1.5	1.4	1.33	5%	
	7/26/11	Mile 12.5	0.748	1.2	46%	
	7/26/11	Mile 21.0	1.22	1.11	9%	
	7/31/12	Mile 1.5	1.62	1.58	3%	
	7/31/12	Slikok Creek	2.4	2.34	3%	
	7/30/13	Mile 1.5	1.22	1.2	2%	
	7/30/13	Funny River	3.02	3.15	4%	
	7/22/14	Mile 18.0	1.16	1.14	2%	
Cadmium (µg/L)	7/16/02	Mile 6.5	<0.1	<0.1	0%	0
	7/16/02	Beaver Creek	<0.1	<0.1	0%	
	7/22/03	Mile 10.1	<2.5	<2.5	0%	
	7/22/03	No Name Creek	<2.5	<2.5	0%	
	7/20/04	Mile 6.5	<0.18	1.18	0%	
	7/20/04	Mile 10.1	<0.18	1.05	0%	
	7/26/05	Mile 31.0	<1.0	<1.0	0%	
	7/26/05	Mile 70.0	<1.0	<1.0	0%	
	7/25/06	Mile 23.0	<0.062	<0.062	0%	
	7/17/07	No Name Creek	<0.062	<0.062	0%	
	7/17/07	Moose River	<0.062	<0.062	0%	
	7/21/09	Mile 31.0	<0.062	<0.062	0%	

Metal (unit)	Sample Date	Location	Normal Sample Value	Duplicate Sample Value	Relative Percentage Difference	Number of Duplicate Samples That Have Relative Percentage Differences Greater Than 10 Percent
Cadmium (µg/L) (Cont.)	7/27/10	Mile 6.5	<0.062	<0.062	0%	0
	7/26/11	Mile 21.0	<0.045	<0.045	0%	
	7/31/12	Slikok Creek	0.501	<0.045	0%	
	7/30/13	Funny River	<0.066	<0.066	0%	
	7/22/14	Mile 1.5	<0.07	<0.07	0%	
	7/22/14	Mile 18.0	<0.07	<0.07	0%	
Chromium (µg/L)	7/16/02	Mile 6.5	<0.6	<0.6	0%	6
	7/16/02	Beaver Creek	1	1	0%	
	7/22/03	Mile 10.1	<1.0	<1.0	0%	
	7/22/03	No Name Creek	<1.0	<1.0	0%	
	7/20/04	Mile 6.5	<0.36	<0.36	0%	
	7/20/04	Mile 10.1	<0.36	<0.36	0%	
	7/26/05	Mile 31.0	<2.5	<2.5	0%	
	7/26/05	Mile 70.0	<2.5	<2.5	0%	
	7/25/06	Mile 1.5	1.78	1.71	4%	
	7/25/06	Mile 23.0	1.43	0.977	38%	
	7/17/07	Mile 1.5	2.12	1.85	14%	
	7/17/07	Moose River	0.674	0.704	4%	
	7/21/09	Mile 1.5	1.13	1.24	9%	
	7/21/09	Mile 31.0	0.994	0.988	1%	
	7/27/10	Mile 1.5	1.33	1.09	20%	
	7/27/10	Mile 6.5	0.206	0.175	16%	
	7/26/11	Mile 1.5	0.829	0.938	12%	
	7/26/11	Mile 21.0	0.297	0.262	13%	
	7/31/12	Mile 1.5	1.81	1.67	8%	
	7/31/12	Slikok Creek	0.686	0.714	4%	
	7/30/13	Mile 1.5	0.751	0.707	6%	
	7/30/13	Funny River	<0.20	<0.20	0%	
	7/22/14	Mile 1.5	<0.20	<0.20	0%	
	7/22/14	Mile 18.0	<0.20	<0.20	0%	
Copper (µg/L)	7/16/02	Mile 6.5	<9	<9	0%	9
	7/16/02	Beaver Creek	<9	<9	0%	
	7/22/03	Mile 10.1	<25	<25	0%	
	7/22/03	No Name Creek	<25	<25	0%	
	7/20/04	Mile 6.5	<0.12	<0.12	0%	
	7/20/04	Mile 10.1	<0.12	1.37	0%	
	7/26/05	Mile 31.0	21.1	<2.5	0%	
	7/26/05	Mile 70.0	<2.5	<2.5	0%	
	7/25/06	Mile 1.5	3.75	1.18	104%	

Metal (unit)	Sample Date	Location	Normal Sample Value	Duplicate Sample Value	Relative Percentage Difference	Number of Duplicate Samples That Have Relative Percentage Differences Greater Than 10 Percent
Copper (µg/L) (Cont.)	7/25/06	Mile 23.0	0.687	0.397	54%	9
	7/17/07	Mile 1.5	2.35	1.44	48%	
	7/17/07	Moose River	0.262	0.206	24%	
	7/21/09	Mile 1.5	1.87	2.54	30%	
	7/21/09	Mile 31.0	0.696	0.69	1%	
	7/27/10	Mile 1.5	1.46	1.51	3%	
	7/27/10	Mile 6.5	0.489	0.775	45%	
	7/26/11	Mile 1.5	0.411	0.445	8%	
	7/26/11	Mile 21.0	0.573	0.604	5%	
	7/31/12	Mile 1.5	0.94	0.998	6%	
	7/31/12	Slikok Creek	0.529	0.452	16%	
	7/30/13	Mile 1.5	0.606	0.638	5%	
	7/30/13	Funny River	0.476	0.521	9%	
	7/22/14	Mile 1.5	3.07	2.7	13%	
	7/22/14	Mile 18.0	3.7	1.72	73%	
Lead (µg/L)	7/16/02	Beaver Creek	<2	<2	0%	3
	7/16/02	Mile 6.5	<2	<2	0%	
	7/22/03	No Name Creek	<2.5	<2.5	0%	
	7/22/03	Mile 10.1	<2.5	<2.5	0%	
	7/20/04	Mile 6.5	<0.052	<0.052	0%	
	7/20/04	Mile 10.1	<0.052	<0.052	0%	
	7/26/05	Mile 31.0	468	<1.0	0%	
	7/26/05	Mile 70.0	<1.0	<1.0	0%	
	7/25/06	Mile 1.5	0.279	1.71	144%	
	7/25/06	Mile 23.0	0.165	<0.084	0%	
	7/17/07	Moose River	<0.030	<0.030	0%	
	7/17/07	Mile 1.5	0.561	0.283	66%	
	7/21/09	Mile 1.5	<0.030	0.463	0%	
	7/21/09	Mile 31.0	<0.030	<0.030	0%	
	7/27/10	Mile 1.5	0.385	0.267	36%	
	7/27/10	Mile 6.5	<0.030	0.205	0%	
	7/26/11	Mile 1.5	<0.030	<0.030	0%	
	7/26/11	Mile 21.0	<0.030	<0.030	0%	
	7/31/12	Slikok Creek	<0.030	<0.030	0%	
	7/31/12	Mile 1.5	0.123	0.132	7%	
	7/30/13	Funny River	<0.073	<0.073	0%	
	7/30/13	Mile 1.5	<0.073	<0.073	0%	
	7/22/14	Mile 1.5	<0.070	<0.070	0%	
	7/22/14	Mile 18.0	<0.070	<0.070	0%	

Metal (unit)	Sample Date	Location	Normal Sample Value	Duplicate Sample Value	Relative Percentage Difference	Number of Duplicate Samples That Have Relative Percentage Differences Greater Than 10 Percent
Zinc (µg/L)	7/16/02	Beaver Creek	41	69	51%	13
	7/16/02	Mile 6.5	39	42	7%	
	7/22/03	No Name Creek	75	78	4%	
	7/22/03	Mile 10.1	51	<50	0%	
	7/20/04	Mile 6.5	39.9	78.3	65%	
	7/20/04	Mile 10.1	32	44.8	33%	
	7/26/05	Mile 31.0	51.2	<10	0%	
	7/26/05	Mile 70.0	19.1	<10	0%	
	7/25/06	Mile 1.5	0.94	0.561	50%	
	7/25/06	Mile 23.0	2.25	1.01	76%	
	7/17/07	Moose River	14	22.1	45%	
	7/17/07	Mile 1.5	44.4	39.3	12%	
	7/21/09	Mile 1.5	85.4	102	18%	
	7/21/09	Mile 31.0	39.2	30.7	24%	
	7/27/10	Mile 1.5	25.8	25.5	1%	
	7/27/10	Mile 6.5	28.7	6.06	130%	
	7/26/11	Mile 1.5	<0.084	<0.084	0%	
	7/26/11	Mile 21.0	51.9	50.6	3%	
	7/31/12	Slikok Creek	68.3	115	51%	
	7/31/12	Mile 1.5	106	104	2%	
	7/30/13	Funny River	31.8	32.5	2%	
	7/30/13	Mile 1.5	50	53	6%	
	7/22/14	Mile 1.5	0.0611	0.0332	59%	
	7/22/14	Mile 18.0	0.0643	0.0551	15%	
Calcium (mg/L)	7/16/02	Beaver Creek	18.48	19.33	4%	7
	7/16/02	Mile 6.5	11.2	11.88	6%	
	7/22/03	No Name Creek	13	13	0%	
	7/22/03	Mile 10.1	9.6	9.6	0%	
	7/20/04	Mile 6.5	12.4	12.6	2%	
	7/20/04	Mile 10.1	10.5	10.7	2%	
	7/26/05	Mile 31.0	9.72	20.6	72%	
	7/26/05	Mile 70.0	12.5	12.4	1%	
	7/25/06	Mile 1.5	13.3	11.7	13%	
	7/25/06	Mile 23.0	9.84	10	2%	
	7/17/07	Moose River	16.1	9.86	48%	
	7/17/07	Mile 1.5	13.9	9.28	40%	
	7/29/08	Russian River	13.7	13.3	3%	
	7/29/08	Mile 1.5	13.9	9.28	40%	
	7/21/09	Mile 1.5	14.9	15.4	3%	

Metal (unit)	Sample Date	Location	Normal Sample Value	Duplicate Sample Value	Relative Percentage Difference	Number of Duplicate Samples That Have Relative Percentage Differences Greater Than 10 Percent
Calcium (mg/L)	7/21/09	Mile 31.0	11.3	10.8	5%	7
	7/27/10	Mile 1.5	17.6	14.8	17%	
	7/27/10	Mile 6.5	9.39	9.78	4%	
	7/26/11	Mile 1.5	13.2	12.8	3%	
	7/26/11	Mile 21.0	10.1	10.1	0%	
	7/31/12	Slikok Creek	16.8	17.3	3%	
	7/31/12	Mile 1.5	12.4	13.9	11%	
	7/30/13	Funny River	10.3	10.3	0%	
	7/30/13	Mile 1.5	11.2	11	2%	
	7/22/14	Mile 1.5	12.1	10.9	10%	
	7/22/14	Mile 18.0	10	10	0%	
Iron (mg/L)	7/16/02	Beaver Creek	1.87	1.89	1%	17
	7/16/02	Mile 6.5	8.42	8.02	5%	
	7/22/03	No Name Creek	3.3	3.6	9%	
	7/22/03	Mile 10.1	0.87	0.82	6%	
	7/20/04	Mile 6.5	9.27	6.57	34%	
	7/20/04	Mile 10.1	0.71	0.708	0%	
	7/26/05	Mile 31.0	0.419	<0.050	0%	
	7/26/05	Mile 70.0	0.113	0.0986	14%	
	7/25/06	Mile 1.5	5.95	8.68	37%	
	7/25/06	Mile 23.0	1.27	1.78	33%	
	7/17/07	Moose River	2.52	1.93	27%	
	7/17/07	Mile 1.5	17.6	0.536	188%	
	7/29/08	Russian River	0.0695	0.069	1%	
	7/29/08	Mile 1.5	6.48	7.31	12%	
	7/21/09	Mile 1.5	25.9	21.9	17%	
	7/21/09	Mile 31.0	0.351	0.131	91%	
	7/27/10	Mile 1.5	39.7	17.9	76%	
	7/27/10	Mile 6.5	1.52	2.34	42%	
	7/26/11	Mile 1.5	11.2	8.52	27%	
	7/26/11	Mile 21.0	0.692	0.591	16%	
	7/31/12	Slikok Creek	1.09	1.34	21%	
	7/31/12	Mile 1.5	4.28	5.06	17%	
	7/30/13	Funny River	0.401	0.403	0%	
	7/30/13	Mile 1.5	0.801	0.701	13%	
	7/22/14	Mile 1.5	6.76	3.91	53%	
	7/22/14	Mile 18.0	0.258	0.255	1%	

Metal (unit)	Sample Date	Location	Normal Sample Value	Duplicate Sample Value	Relative Percentage Difference	Number of Duplicate Samples That Have Relative Percentage Differences Greater Than 10 Percent
Magnesium (mg/L)	7/16/02	Beaver Creek	4.43	4.73	7%	11
	7/16/02	Mile 6.5	3.66	3.58	2%	
	7/22/03	No Name Creek	4.4	4.4	0%	
	7/22/03	Mile 10.1	1.1	1	10%	
	7/20/04	Mile 6.5	3.92	3.25	19%	
	7/20/04	Mile 10.1	1.03	1.04	1%	
	7/26/05	Mile 31.0	0.906	1.15	24%	
	7/26/05	Mile 70.0	0.99	0.941	5%	
	7/25/06	Mile 1.5	12.5	7.2	54%	
	7/25/06	Mile 23.0	1.2	1.39	15%	
	7/17/07	Moose River	3.99	1.44	94%	
	7/17/07	Mile 1.5	10.7	0.896	169%	
	7/29/08	Russian River	0.892	0.876	2%	
	7/29/08	Mile 1.5	6.38	6.82	7%	
	7/21/09	Mile 1.5	14.7	13.4	9%	
	7/21/09	Mile 31.0	0.987	0.877	12%	
	7/27/10	Mile 1.5	19	12.2	44%	
	7/27/10	Mile 6.5	1.25	1.47	16%	
	7/26/11	Mile 1.5	6.13	5.24	16%	
	7/26/11	Mile 21.0	1.06	1.09	3%	
	7/31/12	Slikok Creek	4.9	5.06	3%	
	7/31/12	Mile 1.5	5.68	5.45	4%	
	7/30/13	Funny River	3.81	3.81	0%	
	7/30/13	Mile 1.5	1.97	1.87	5%	
	7/22/14	Mile 1.5	4.68	3.2	38%	
	7/22/14	Mile 18.0	0.953	0.944	1%	

Nutrient (unit)	Sample Date	Location	Normal Sample Value	Duplicate Sample Value	Relative Percentage Difference	Number of Duplicate Samples That Have Relative Percentage Differences Greater Than 10 Percent
Nitrate (mg/L)	7/16/02	Beaver Creek	<0.10	<0.10	0%	5
	7/16/02	Mile 6.5	<0.10	0.14	0%	
	7/22/03	No Name Creek	<0.10	<0.10	0%	
	7/22/03	Mile 10.1	0.18	0.2	11%	
	7/20/04	Mile 6.5	0.102	<0.015	0%	
	7/20/04	Mile 10.1	0.143	0.168	16%	
	7/26/05	Mile 31.0	0.108	0.111	3%	
	7/26/05	Mile 70.0	0.196	0.205	4%	
	7/25/06	Mile 1.5	0.108	<0.015	0%	
	7/25/06	Mile 23.0	0.136	0.139	2%	
	7/17/07	Moose River	<0.015	<0.015	0%	
	7/17/07	Mile 1.5	0.105	<0.015	0%	
	7/29/08	Russian River	0.354	0.413	15%	
	7/29/08	Mile 1.5	0.105	<0.015	0%	
	7/21/09	Mile 1.5	<0.015	<0.015	0%	
	7/21/09	Mile 31.0	0.145	0.145	0%	
	7/27/10	Mile 1.5	<0.015	<0.015	0%	
	7/27/10	Mile 6.5	0.128	0.139	8%	
	7/26/11	Mile 1.5	0.105	0.138	27%	
	7/26/11	Mile 21.0	0.151	0.147	3%	
	7/31/12	Slikok Creek	0.139	0.128	8%	
	7/31/12	Mile 1.5	0.149	0.0128	168%	
	7/30/13	Funny River	<0.015	<0.015	0%	
	7/30/13	0.146	0.137	<0.015	0%	
	7/22/14	Mile 1.5	<0.015	0.117	0%	
	7/22/14	Mile 18.0	0.158	0.164	4%	
Phosphorus (mg/L)	7/16/02	Beaver Creek	0.09	0.07	25%	11
	7/16/02	Mile 6.5	0.3	0.38	24%	
	7/22/03	No Name Creek	0.04	0.04	0%	
	7/22/03	Mile 10.1	0.04	0.036	11%	
	7/20/04	Mile 6.5	0.267	0.148	57%	
	7/20/04	Mile 10.1	<0.0020	<0.0020	0%	
	7/26/05	Mile 31.0	<0.051	<0.051	0%	
	7/26/05	Mile 70.0	<0.051	<0.051	0%	
	7/25/06	Mile 1.5	0.32	0.18	56%	
	7/25/06	Mile 23.0	<0.026	<0.026	0%	
	7/17/07	Moose River	<0.026	<0.026	0%	
	7/17/07	Mile 1.5	1	0.95	5%	
	7/29/08	Russian River	<0.026	<0.026	0%	

Nutrient (unit)	Sample Date	Location	Normal Sample Value	Duplicate Sample Value	Relative Percentage Difference	Number of Duplicate Samples That Have Relative Percentage Differences Greater Than 10 Percent
Phosphorus (mg/L) (Cont.)	7/29/08	Mile 1.5	0.92	1.4	41%	11
	7/21/09	Mile 1.5	1.3	1.3	0%	
	7/21/09	Mile 31.0	<0.026	<0.026	0%	
	7/27/10	Mile 1.5	2.7	2	30%	
	7/27/10	Mile 6.5	0.082	0.094	14%	
	7/26/11	Mile 1.5	0.51	0.41	22%	
	7/26/11	Mile 21.0	<0.026	<0.026	0%	
	7/31/12	Slikok Creek	<0.026	0.076	0%	
	7/31/12	Mile 1.5	1.1	0.92	18%	
	7/30/13	Funny River	<0.026	<0.026	0%	
	7/30/13	Mile 1.5	0.054	<0.026	0%	
	7/22/14	Mile 1.5	0.98	0.7	33%	
	7/22/14	Mile 18.0	<0.026	<0.026	0%	

Hydrocarbon (unit)	Sample Date	Location	Normal Sample Value	Duplicate Sample Value	Relative Percentage Difference	Number of Duplicate Samples That Have Relative Percentage Differences Greater Than 10 Percent
Diesel Range Organics (mg/L)	7/16/02	Beaver Creek	<0.27	<0.28	0%	0
	7/16/02	Mile 6.5	<0.26	<0.26	0%	
	7/22/03	No Name Creek	<0.39	<0.38	0%	
	7/22/03	Mile 10.1	<0.41	<0.41	0%	
	7/20/04	Mile 6.5	<0.021	<0.022	0%	
	7/20/04	Mile 10.1	<0.022	<0.022	0%	
	7/26/05	Mile 31.0	<0.10	<0.10	0%	
	7/26/05	Mile 70.0	<0.10	<0.10	0%	
	7/25/06	Mile 1.5	<0.0065	<0.0064	0%	
	7/25/06	Mile 23.0	<0.0064	<0.0064	0%	
	7/17/07	Moose River	<0.0063	<0.0063	0%	
	7/17/07	Mile 1.5	<0.0063	<0.0063	0%	
Gasoline Range Organics (µg/L)	7/16/02	Beaver Creek	<25.0	<25.0	0%	0
	7/16/02	Mile 6.5	<25.0	<25.0	0%	
	7/22/03	No Name Creek	<25.0	<25.0	0%	
	7/22/03	Mile 10.1	<25.0	<25.0	0%	
	7/26/05	Mile 31.0	<100	<100	0%	
	7/26/05	Mile 70.0	<100	<100	0%	
Residual Range Organics (mg/L)	7/16/02	Beaver Creek	<0.27	<0.28	0%	0
	7/16/02	Mile 6.5	<0.26	<0.26	0%	
	7/22/03	No Name Creek	<0.39	<0.38	0%	
	7/22/03	Mile 10.1	<0.41	<0.41	0%	
	7/20/04	Mile 6.5	<0.021	<0.022	0%	
	7/20/04	Mile 10.1	<0.022	<0.022	0%	
	7/26/05	Mile 31.0	<0.10	<0.10	0%	
	7/26/05	Mile 70.0	<0.10	<0.10	0%	
	7/25/06	Mile 1.5	<0.0065	<0.0064	0%	
	7/25/06	Mile 23.0	<0.0064	<0.0064	0%	
	7/17/07	Moose River	<0.21	<0.21	0%	
	7/17/07	Mile 1.5	<0.21	<0.21	0%	
Benzene (µg/L)	7/16/02	Beaver Creek	<0.50	<0.50	0%	1
	7/16/02	Mile 6.5	1.31	1.8	32%	
	7/22/03	No Name Creek	<0.50	<0.50	0%	
	7/22/03	Mile 10.1	1.15	1.14	1%	
	7/20/04	Mile 6.5	1.1	1.2	9%	
	7/20/04	Mile 10.1	<0.15	1.3	0%	
	7/26/05	Mile 31.0	<1.0	<1.0	0%	
	7/26/05	Mile 70.0	<1.0	<1.0	0%	
	7/25/06	Mile 1.5	<0.074	<0.074	0%	

Hydrocarbon (unit)	Sample Date	Location	Normal Sample Value	Duplicate Sample Value	Relative Percentage Difference	Number of Duplicate Samples That Have Relative Percentage Differences Greater Than 10 Percent
Benzene (µg/L) (Cont.)	7/25/06	Mile 23.0	<0.074	<0.074	0%	1
	7/17/07	Moose River	<0.074	<0.074	0%	
	7/17/07	Mile 1.5	<0.074	<0.074	0%	
	7/29/08	Russian River	<0.074	<0.074	0%	
	7/29/08	Mile 1.5	<0.074	<0.074	0%	
	7/21/09	Mile 1.5	<0.30	<0.30	0%	
	7/21/09	Mile 31.0	<0.30	<0.30	0%	
	7/27/10	Mile 1.5	<0.33	<0.33	0%	
	7/27/10	Mile 6.5	<0.33	<0.33	0%	
	7/26/11	Mile 1.5	<0.30	<0.30	0%	
	7/26/11	Mile 21.0	<0.30	<0.30	0%	
	7/31/12	Slikok Creek	<0.30	<0.30	0%	
Toluene (µg/L)	7/16/02	Beaver Creek	0.47	0.63	29%	3
	7/16/02	Mile 6.5	3.75	3.37	11%	
	7/16/02	No Name Creek	<0.50	<0.50	0%	
	7/16/02	Mile 10.1	3.23	3.33	3%	
	7/20/04	Mile 6.5	3.2	3.2	0%	
	7/20/04	Mile 10.1	2.8	3.6	25%	
	7/26/05	Mile 31.0	<1.0	<1.0	0%	
	7/26/05	Mile 70.0	<1.0	<1.0	0%	
	7/25/06	Mile 1.5	<0.078	1.5	0%	
	7/25/06	Mile 23.0	<0.078	<0.078	0%	
	7/17/07	Moose River	<0.078	<0.078	0%	
	7/17/07	Mile 1.5	<0.078	<0.078	0%	
	7/29/08	Russian River	<0.078	<0.078	0%	
	7/29/08	Mile 1.5	<0.078	<0.078	0%	
	7/21/09	Mile 1.5	<0.30	<0.30	0%	
	7/21/09	Mile 31.0	<0.30	<0.30	0%	
	7/27/10	Mile 1.5	<0.35	<0.35	0%	
	7/27/10	Mile 6.5	<0.35	<0.35	0%	
	7/26/11	Mile 1.5	<0.30	<0.30	0%	
	7/26/11	Mile 21.0	<0.30	<0.30	0%	
	7/31/12	Slikok Creek	<0.30	<0.30	0%	
	7/31/12	Mile 1.5	<0.30	<0.30	0%	
Ethylbenzene (µg/L)	7/16/02	Beaver Creek	<0.50	<0.50	0%	1
	7/16/02	Mile 6.5	0.65	0.57	13%	
	7/22/03	No Name Creek	<0.50	<0.50	0%	
	7/22/03	Mile 10.1	0.5	0.52	4%	
	7/20/04	Mile 6.5	<0.18	<0.18	0%	

Hydrocarbon (unit)	Sample Date	Location	Normal Sample Value	Duplicate Sample Value	Relative Percentage Difference	Number of Duplicate Samples That Have Relative Percentage Differences Greater Than 10 Percent
Ethylbenzene (µg/L) (Cont.)	7/20/04	Mile 10.1	<0.18	<0.18	0%	1
	7/26/05	Mile 31.0	<1.0	<1.0	0%	
	7/26/05	Mile 70.0	<1.0	<1.0	0%	
	7/25/06	Mile 1.5	<0.088	<0.088	0%	
	7/25/06	Mile 23.0	<0.088	<0.088	0%	
	7/17/07	Moose River	<0.088	<0.088	0%	
	7/17/07	Mile 1.5	<0.088	<0.088	0%	
	7/29/08	Russian River	<0.46	<0.46	0%	
	7/29/08	Mile 1.5	<0.46	<0.46	0%	
	7/21/09	Mile 1.5	<0.30	<0.30	0%	
	7/21/09	Mile 31.0	<0.30	<0.30	0%	
	7/27/10	Mile 1.5	<0.46	<0.46	0%	
	7/27/10	Mile 6.5	<0.46	<0.46	0%	
	7/26/11	Mile 1.5	<0.30	<0.30	0%	
	7/26/11	Mile 21.0	<0.30	<0.30	0%	
	7/31/12	Slikok Creek	<0.30	<0.30	0%	
	7/31/12	Mile 1.5	<0.30	<0.30	0%	
M,P-Xylene (µg/L)	7/16/02	Beaver Creek	<1.00	<1.00	0%	1
	7/16/02	Mile 6.5	2.41	2	19%	
	7/22/03	No Name Creek	<1.00	<1.00	0%	
	7/22/03	Mile 10.1	1.8	1.94	7%	
	7/20/04	Mile 6.5	2	2	0%	
	7/20/04	Mile 10.1	<0.41	2.3	0%	
	7/26/05	Mile 31.0	<1.00	<1.00	0%	
	7/26/05	Mile 70.0	<1.00	<1.00	0%	
	7/25/06	Mile 1.5	<0.20	<0.20	0%	
	7/25/06	Mile 23.0	<0.20	<0.20	0%	
	7/17/07	Moose River	<0.20	<0.20	0%	
	7/17/07	Mile 1.5	<0.20	<0.20	0%	
	7/29/08	Russian River	2.2	<0.20	0%	
	7/29/08	Mile 1.5	<0.20	<0.20	0%	
	7/21/09	Mile 1.5	<0.50	<0.50	0%	
	7/21/09	Mile 31.0	<0.50	<0.50	0%	
	7/27/10	Mile 1.5	<0.20	<0.20	0%	
	7/27/10	Mile 6.5	<0.20	<0.20	0%	
	7/26/11	Mile 1.5	<0.50	<0.50	0%	
	7/26/11	Mile 21.0	<0.50	<0.50	0%	
	7/31/12	Mile 1.5	<0.50	<0.50	0%	
	7/31/12	Slikok Creek	<0.50	<0.50	0%	

Hydrocarbon (unit)	Sample Date	Location	Normal Sample Value	Duplicate Sample Value	Relative Percentage Difference	Number of Duplicate Samples That Have Relative Percentage Differences Greater Than 10 Percent
O-Xylene (µg/L)	7/16/02	Beaver Creek	<0.50	<0.50	0%	1
	7/16/02	Mile 6.5	1	0.83	19%	
	7/22/03	No Name Creek	<0.50	<0.50	0%	
	7/22/03	Mile 10.1	0.79	0.84	6%	
	7/20/04	Mile 6.5	<0.20	<0.20	0%	
	7/20/04	Mile 10.1	<0.20	<0.20	0%	
	7/26/05	Mile 31.0	<1.0	<1.0	0%	
	7/26/05	Mile 70.0	<1.0	<1.0	0%	
	7/25/06	Mile 1.5	<0.20	<0.20	0%	
	7/25/06	Mile 23.0	<0.20	<0.20	0%	
	7/17/07	Moose River	<0.20	<0.20	0%	
	7/17/07	Mile 1.5	<0.20	<0.20	0%	
	7/29/08	Russian River	<0.20	<0.20	0%	
	7/29/08	Mile 1.5	<0.20	<0.20	0%	
	7/21/09	Mile 1.5	<0.20	<0.20	0%	
	7/21/09	Mile 31.0	<0.20	<0.20	0%	
	7/27/10	Mile 1.5	<0.20	<0.20	0%	
	7/27/10	Mile 6.5	<0.20	<0.20	0%	
	7/26/11	Mile 1.5	<0.20	<0.20	0%	
	7/26/11	Mile 21.0	<0.20	<0.20	0%	
	7/31/12	Slikok Creek	<0.20	<0.20	0%	
	7/31/12	Mile 1.5	<0.20	<0.20	0%	

Additional Parameters (unit)	Sample Date	Location	Normal Sample Value	Duplicate Sample Value	Relative Percentage Difference	Number of Duplicate Samples That Have Relative Percentage Differences Greater Than 10 Percent
Fecal Coliform Bacteria (CFU/100mL)	7/16/02	Beaver Creek	30	<10	0%	18
	7/16/02	Mile 6.5	2980	<10	0%	
	7/22/03	No Name Creek	80	100	22%	
	7/22/03	Mile 10.1	20	20	0%	
	7/20/04	Mile 6.5	200	680	109%	
	7/20/04	Mile 10.1	18	27	40%	
	7/26/05	Mile 31.0	33	24	32%	
	7/26/05	Mile 70.0	12	12	0%	
	7/25/06	Mile 1.5	67	160	82%	
	7/25/06	Mile 23.0	190	200	5%	
	7/17/07	Moose River	1	0	200%	
	7/17/07	Mile 1.5	54	33	48%	
	7/29/08	Russian River	6	7	15%	
	7/21/09	Mile 1.5	225	242	7%	
	7/21/09	Mile 31.0	9	6	40%	
	7/27/10	Mile 1.5	137	120	13%	
	7/27/10	Mile 6.5	20	12	50%	
	7/26/11	Mile 1.5	70	15	129%	
	7/26/11	Mile 21.0	3	4	29%	
	7/31/12	Slikok Creek	42	43	2%	
	7/31/12	Mile 1.5	36	55	42%	
	7/30/13	Funny River	13	9	36%	
	7/30/13	Mile 1.5	68	60	13%	
	7/22/14	Mile 1.5	111	35	104%	
	7/22/14	Mile 18.0	0	2	200%	
pH	7/16/02	Beaver Creek	7.54	7.48	1%	0
	7/16/02	Mile 6.5	7.67	7.51	2%	
	7/22/03	No Name Creek	7.3	7.3	0%	
	7/22/03	Mile 10.1	7.3	7.3	0%	
	7/20/04	Mile 6.5	7.5	7.47	0%	
	7/20/04	Mile 10.1	7.42	7.33	1%	
	7/26/05	Mile 31.0	7.58	7.6	0%	
	7/26/05	Mile 70.0	7.66	7.56	1%	
	7/25/06	Mile 1.5	7.57	7.5	1%	
	7/25/06	Mile 23.0	7.6	7.56	1%	
	7/17/07	Moose River	8.64	8.64	0%	
	7/17/07	Mile 1.5	7.5	7.53	0%	
	7/29/08	Russian River	7.57	7.59	0%	

Additional Parameters (unit)	Sample Date	Location	Normal Sample Value	Duplicate Sample Value	Relative Percentage Difference	Number of Duplicate Samples That Have Relative Percentage Differences Greater Than 10 Percent
pH (Cont.)	7/29/08	Mile 1.5	7.47	7.5	0%	0
	7/21/09	Mile 1.5	7.66	7.66	0%	
	7/21/09	Mile 31.0	7.49	7.49	0%	
	7/27/10	Mile 1.5	7.36	7.3	1%	
	7/27/10	Mile 6.5	7.15	6.98	2%	
	7/26/11	Mile 1.5	7.59	7.54	1%	
	7/26/11	Mile 21.0	7.57	7.6	0%	
	7/31/12	Slikok Creek	7.06	6.9	2%	
	7/31/12	Mile 1.5	7.45	7.44	0%	
Specific Conductance (µs/cm)	7/16/02	Beaver Creek	144.6	144.8	0%	4
	7/16/02	Mile 6.5	65.8	64.5	2%	
	7/22/03	No Name Creek	157	161	3%	
	7/22/03	Mile 10.1	62.8	61.9	1%	
	7/20/04	Mile 6.5	71.5	82.6	14%	
	7/20/04	Mile 10.1	63	61.6	2%	
	7/26/05	Mile 31.0	65.4	66.2	1%	
	7/26/05	Mile 70.0	81.2	80.4	1%	
	7/25/06	Mile 1.5	156.1	249	46%	
	7/25/06	Mile 23.0	63.3	62.3	2%	
	7/17/07	Moose River	131	134	2%	
	7/17/07	Mile 1.5	326	394	19%	
	7/29/08	Russian River	83	83.8	1%	
	7/29/08	Mile 1.5	297.7	282.8	5%	
	7/21/09	Mile 1.5	383.2	438.3	13%	
	7/21/09	Mile 31.0	65.6	66.1	1%	
	7/27/10	Mile 1.5	363	389	7%	
	7/27/10	Mile 6.5	66	65	2%	
	7/26/11	Mile 1.5	140.8	137	3%	
	7/26/11	Mile 21.0	69.6	67.9	2%	
	7/31/12	Slikok Creek	139.1	148.3	6%	
	7/31/12	Mile 1.5	235.8	227.7	3%	
Total Suspended Solids (mg/L)	7/16/02	Beaver Creek	2	2	0%	13
	7/16/02	Mile 6.5	232	179.3	26%	
	7/22/03	No Name Creek	0.7	4.7	148%	
	7/22/03	Mile 10.1	11.3	12	6%	
	7/20/04	Mile 6.5	231	138	50%	
	7/20/04	Mile 10.1	11.7	9.02	26%	
	7/26/05	Mile 31.0	16.7	16.6	1%	
	7/26/05	Mile 70.0	1.13	<0.95	0%	

Additional Parameters (unit)	Sample Date	Location	Normal Sample Value	Duplicate Sample Value	Relative Percentage Difference	Number of Duplicate Samples That Have Relative Percentage Differences Greater Than 10 Percent
Total Suspended Solids (mg/L) (Cont.)	7/25/06	Mile 1.5	33	253	154%	13
	7/25/06	Mile 23.0	17	28	49%	
	7/17/07	Moose Creek	<5.0	<5.0	0%	
	7/17/07	Mile 1.5	976	1080	10%	
	7/29/08	Russian River	0.8	0.6	29%	
	7/29/08	Mile 1.5	648.7	655.3	1%	
	7/21/09	Mile 1.5	1564	2034	26%	
	7/21/09	Mile 31.0	24.2	26.8	10%	
	7/27/10	Mile 1.5	1828	2080	13%	
	7/27/10	Mile 6.5	98.6	98.2	0%	
	7/26/11	Mile 1.5	235	122	63%	
	7/26/11	Mile 21.0	15.6	16.8	7%	
	7/31/12	Slikok Creek	5	6.3	23%	
	7/31/12	Mile 1.5	511	232	75%	
	7/31/13	Funny River	5	4	22%	
	7/31/13	Mile 1.5	35.5	34	4%	
Turbidity (NTU)	7/16/02	Beaver Creek	10	10	0%	13
	7/16/02	Mile 6.5	110	110	0%	
	7/22/03	No Name Creek	16	18	12%	
	7/22/03	Mile 10.1	14	16	13%	
	7/20/04	Mile 6.5	148.6	110.2	30%	
	7/20/04	Mile 10.1	11	10.8	2%	
	7/26/05	Mile 31.0	10.41	10.23	2%	
	7/26/05	Mile 70.0	4.46	4.48	0%	
	7/25/06	Mile 1.5	92.4	146.6	45%	
	7/25/06	Mile 23.0	14.2	14.3	1%	
	7/17/07	Moose River	2.1	1.8	15%	
	7/17/07	Mile 1.5	171.4	517	100%	
	7/29/08	Russian River	0.45	0.62	32%	
	7/29/08	Mile 1.5	475	523	10%	
	7/21/09	Mile 1.5	1000	1464	38%	
	7/21/09	Mile 31.0	18	16	12%	
	7/27/10	Mile 1.5	1240	1162	6%	
	7/27/10	Mile 6.5	39	42	7%	
	7/26/11	Mile 1.5	223	121	59%	
	7/26/11	Mile 21.0	12.1	13.4	10%	
	7/31/12	Slikok Creek	3.96	5.85	39%	
	7/31/12	Mile 1.5	162	126	25%	

Additional Parameters (unit)	Sample Date	Location	Normal Sample Value	Duplicate Sample Value	Relative Percentage Difference	Number of Duplicate Samples That Have Relative Percentage Differences Greater Than 10 Percent
Water Temperature (°C)	7/16/02	Beaver Creek	13.03	13.19	1%	1
	7/16/02	Mile 6.5	13.18	13.05	1%	
	7/22/03	No Name Creek	15	15	0%	
	7/22/03	Mile 10.1	13.5	13.5	0%	
	7/20/04	Mile 6.5	16.6	16.4	1%	
	7/20/04	Mile 10.1	14.1	14.1	0%	
	7/26/05	Mile 31.0	14	14	0%	
	7/26/05	Mile 70.0	13.8	13.8	0%	
	7/25/06	Mile 1.5	12	12	0%	
	7/25/06	Mile 23.0	11.4	11.4	0%	
	7/17/07	Moose River	15.5	15.5	0%	
	7/17/07	Mile 1.5	13.6	13.9	2%	
	7/29/08	Russian River	9.7	9.7	0%	
	7/29/08	Mile 1.5	11	11.1	1%	
	7/21/09	Mile 1.5	13.6	13.6	0%	
	7/21/09	Mile 31.0	13.5	13.5	0%	
	7/27/10	Mile 1.5	10.2	10.4	2%	
	7/27/10	Mile 6.5	9.7	9.7	0%	
	7/26/11	Mile 1.5	12.7	16.3	25%	
	7/26/11	Mile 21.0	15.6	15.2	3%	

SUPPLEMENTAL ANALYSIS OF RECENT ZINC AND COPPER CONCENTRATIONS IN THE KENAI RIVER WATERSHED

KENAI WATERSHED FORUM

10/31/2016

Prepared by the Kenai Watershed Forum for the Alaska Department of Environmental Conservation

KENAI WATERSHED FORUM

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The Kenai Watershed Forum (KWF) is a 501(c)(3) non-profit and is recognized as the regional watershed organization of the Kenai Peninsula, successfully identifying and addressing the environmental needs of the region by providing high quality education, restoration and research programs. KWF is a dynamic organization dedicated to protecting the streams, rivers, and surrounding communities on the Kenai Peninsula.

Figures

PURPOSE

This supplemental analysis is being provided in response to noted elevations of zinc and copper concentrations in the Kenai River watershed. These elevations were discussed briefly in a Kenai Watershed Forum (KWF) report titled *Water Quality Assessment of the Kenai River Watershed from July 2000 to July 2014*. As a result, the Alaska Department of Environmental Conservation (ADEC) requested further evaluation of sampling data for these parameters. This document provides further confirmation of the noted elevations and will serve as an appendix to the original report. Eventually, this information will be used as the basis for a literature review focused on potential sources of zinc and copper in the vicinity of the Kenai River watershed.

ZINC

KWF's *Water Quality Assessment of the Kenai River Watershed from July 2000 to July 2014* contains the following statement in regards to zinc concentrations in the Kenai River watershed:

> *A trend analysis was conducted using the average and median values for all data collected during the time period between years 2000-2014. The concentrations of zinc throughout the entire Kenai River show a relative decrease from Mile 1.5 to Mile 50 and a relative increase at Mile 70 and Mile 82. This pattern is visible during both the spring and summer sampling events (Figure 58-61). A similar analysis was run for each sampling station at the Kenai River. During the spring all the stations present a relative decrease in zinc concentrations until year 2008, after that a low increase is apparent at all stations. For the summer the same general trend is visible, with a stronger increase pattern after year 2008 (Figure 75-87).*

Zinc concentrations since 2010 appear to be significantly higher than those from 2001 through 2009 for nearly every sampling location. Shown below are graphs (Figure 1 – Figure 4) depicting average zinc sample results after 2010 and average zinc sample results before 2010. The graphs display results for spring and summer sampling events in the Kenai River mainstem, as well as the sampled tributaries. Juneau Creek was not included in the analysis because data was not collected at this site before 2009.

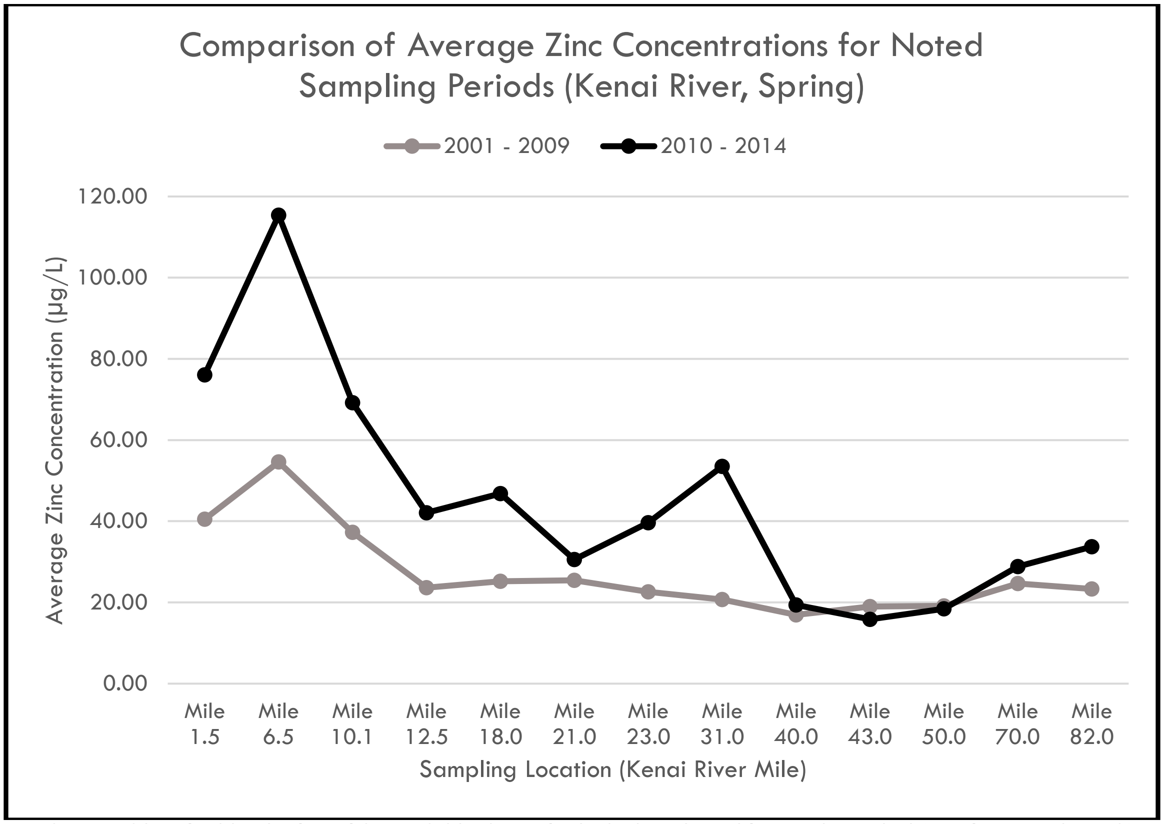

FIGURE 1: COMPARISON OF AVERAGE ZINC CONCENTRATIONS FOR NOTED SAMPLING PERIODS (KENAI RIVER, SPRING)

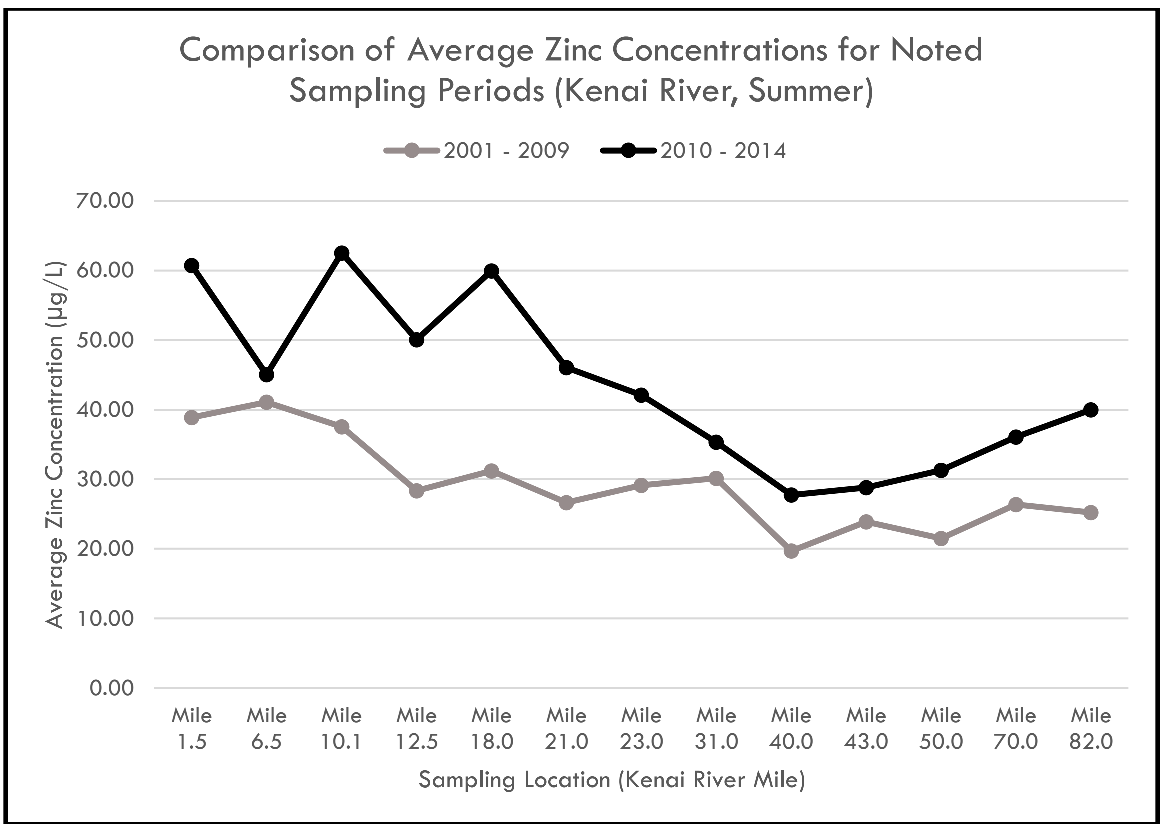

FIGURE 2: COMPARISON OF AVERAGE ZINC CONCENTRATIONS FOR NOTED SAMPLING PERIODS (KENAI RIVER, SUMMER)

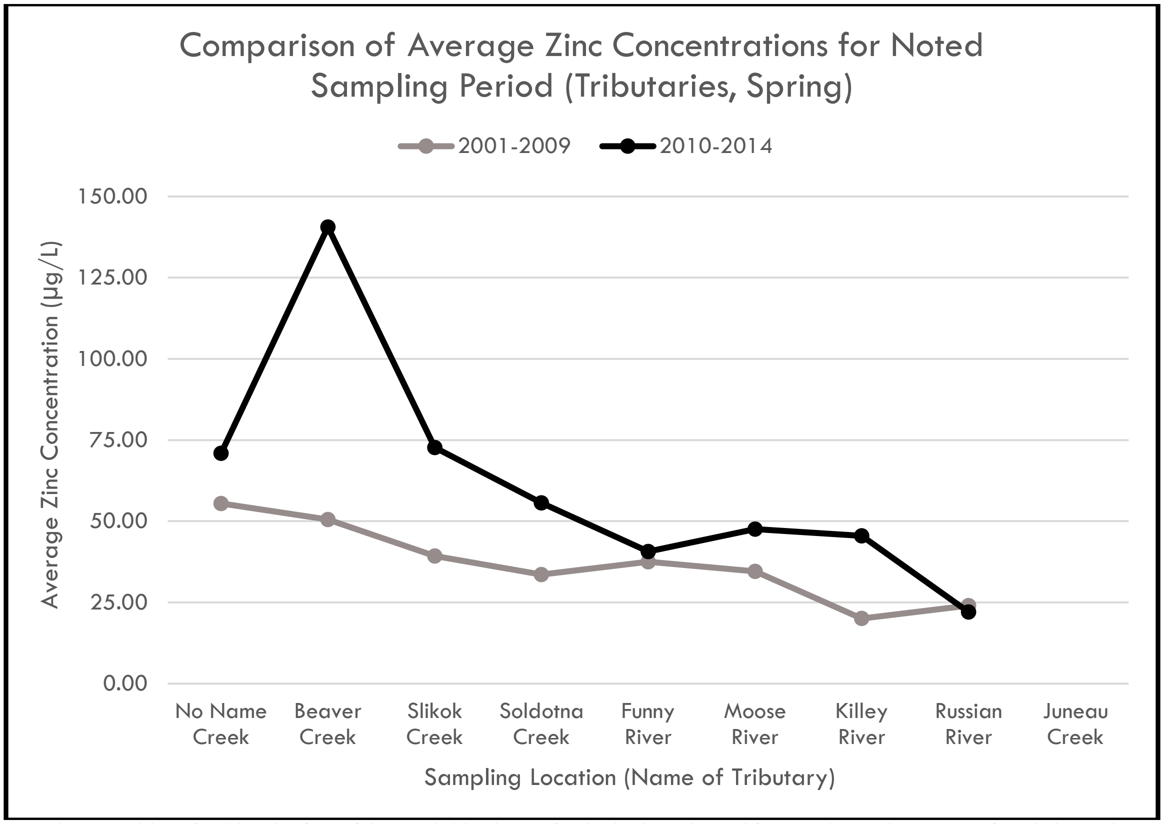

FIGURE 3: COMPARISON OF AVERAGE ZINC CONCENTRATIONS FOR NOTED SAMPLING PERIOD (TRIBUTARIES, SPRING)

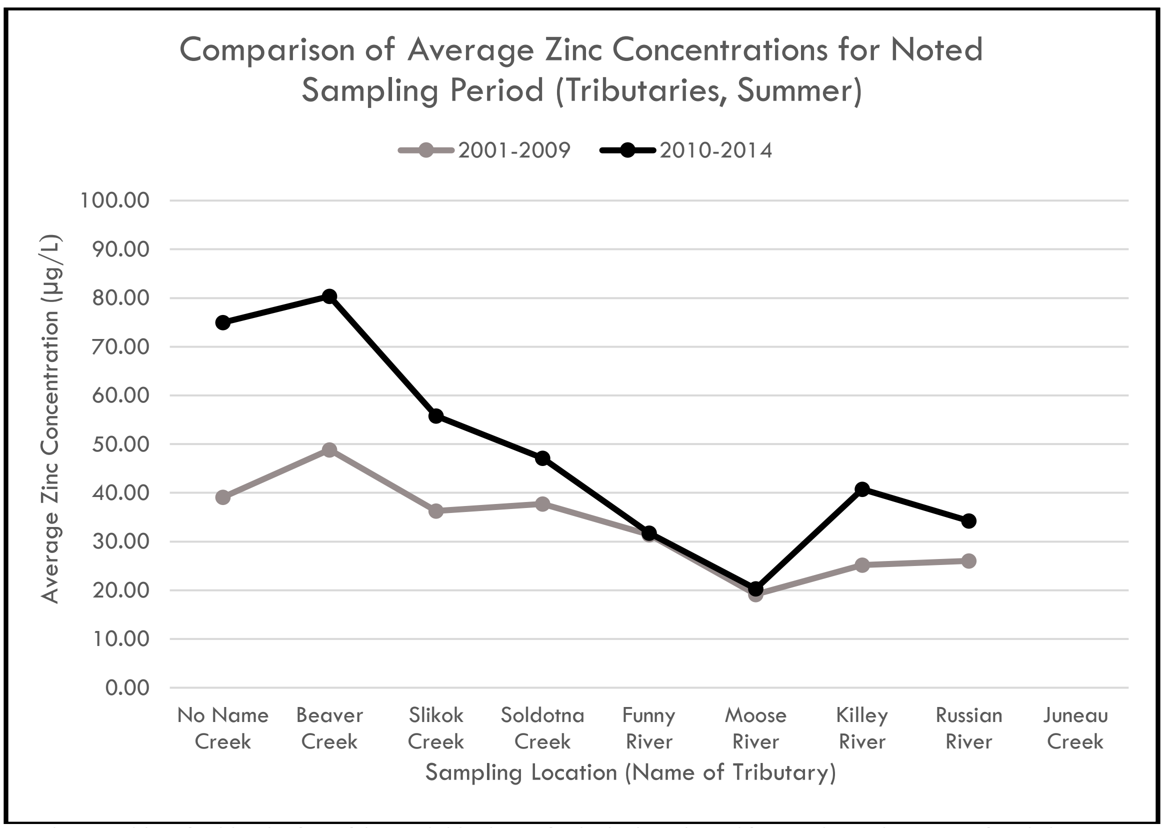

FIGURE 4: COMPARISON OF AVERAGE ZINC CONCENTRATIONS FOR NOTED SAMPLING PERIOD (TRIBUTARIES, SUMMER)

The most notable increases since 2010 have occurred at different sites for spring sampling than for summer sampling. The next two figures (Figure 1 and Figure 2) display the percent differences at each site for spring and summer events.

Spring sampling has shown significant increases in zinc concentrations at River Miles 1.5, 6.5,10.1, 18.0, 23.0, 31.0, and 82.0. River Mile 31.0 has seen nearly a 90% increase in average zinc concentrations since 2010. The largest difference (about 63%) in average zinc concentrations found in summer samples occurred at River Mile 18.0. While the largest increases for spring sampling occurred at River Miles 6.5 and 31.0, these sites produced the two lowest percent differences for summer sampling. Two sites resulted in a small decrease in zinc concentrations.

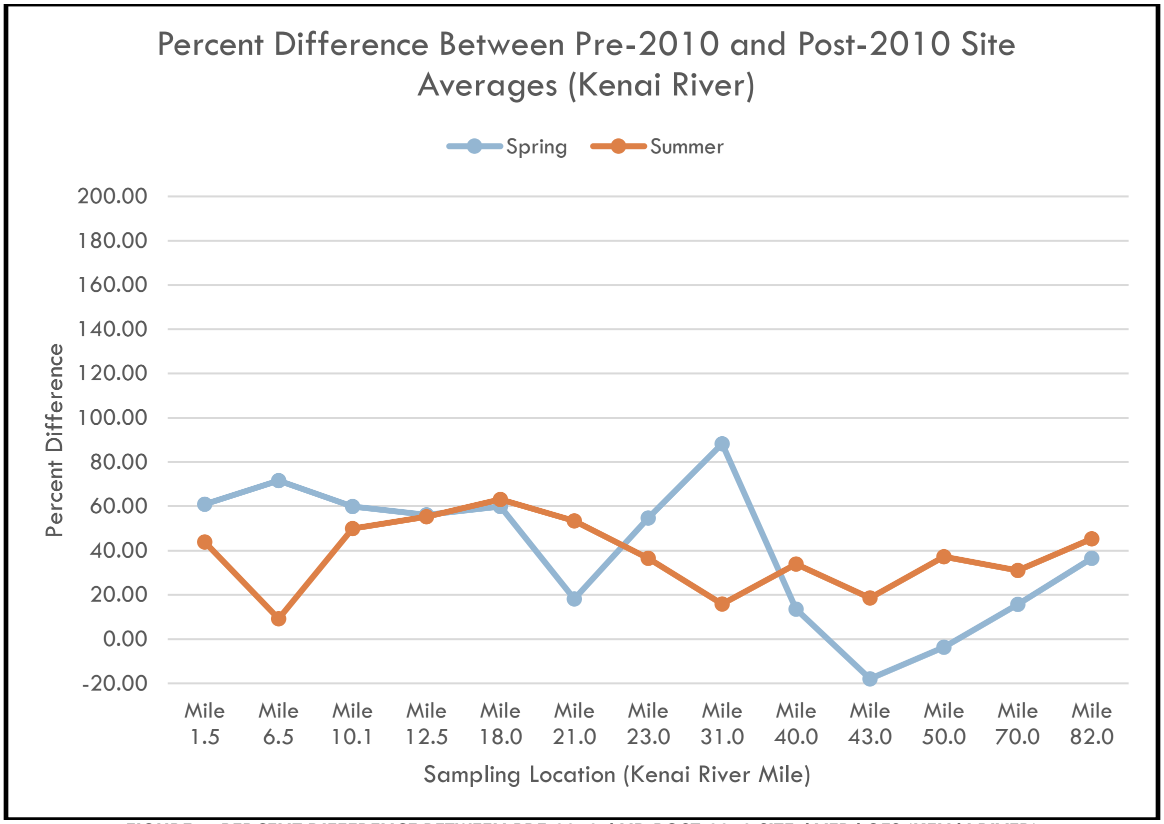

FIGURE 5: PERCENT DIFFERENCE BETWEEN PRE-2010 AND POST-2010 SITE AVERAGES (KENAI RIVER)

Percent differences at Tributary sampling sites displayed larger increases in zinc concentrations for spring sampling events. The largest increases for spring samples occurred at Beaver Creek and Killey River, with Soldotna Creek and Slikok Creek also having increases near or above 50%. Summer sampling events demonstrated large percent increases at No Name Creek, Beaver Creek, Slikok Creek and Killey River.

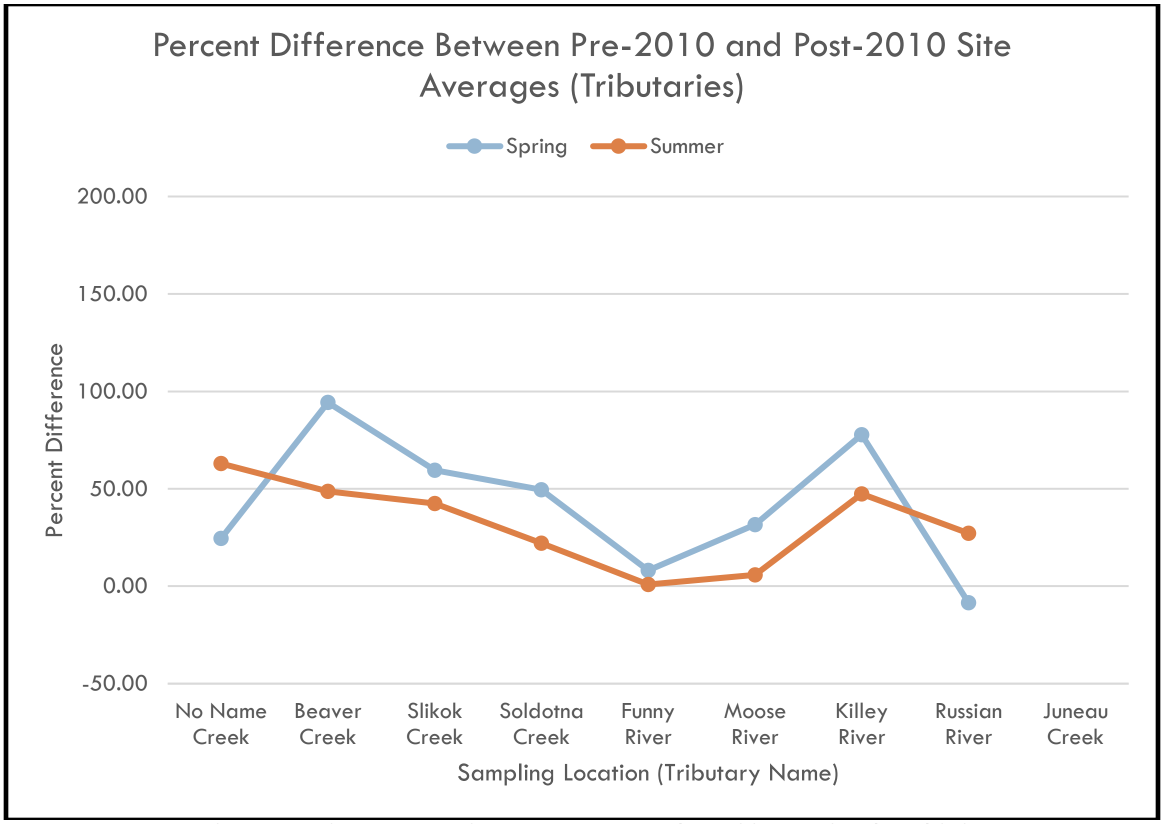

FIGURE 6: PERCENT DIFFERENCE BETWEEN PRE-2010 AND POST-2010 SITE AVERAGES

COPPER

KWF's *Water Quality Assessment of the Kenai River Watershed from July 2000 to July 2014* contains the following statement in regards to copper concentrations in the Kenai River watershed:

> *Median concentrations and the number of exceedances were generally higher in the summer than in the spring in the tributaries and the mainstem. More detected concentrations occurred in sampling events after 2005, but this may be partially due to the large fluctuation in MDLs and MRLs. From summer 2000 to summer 2003, the MDLs or MRLs were higher than the standard, so it is unknown if many of these samples exceeded the standard (Figure 40-43).*

For the reasons outlined in the above quote, this supplemental analysis focuses only on data collected after 2003. Similar graphs were produced for copper as were produced for zinc in the previous section. The graphs (Figure 7 – Figure 10) display results for spring and summer sampling events in the Kenai River mainstem, as well as the sampled tributaries. Data was not collected at Juneau Creek until 2009.

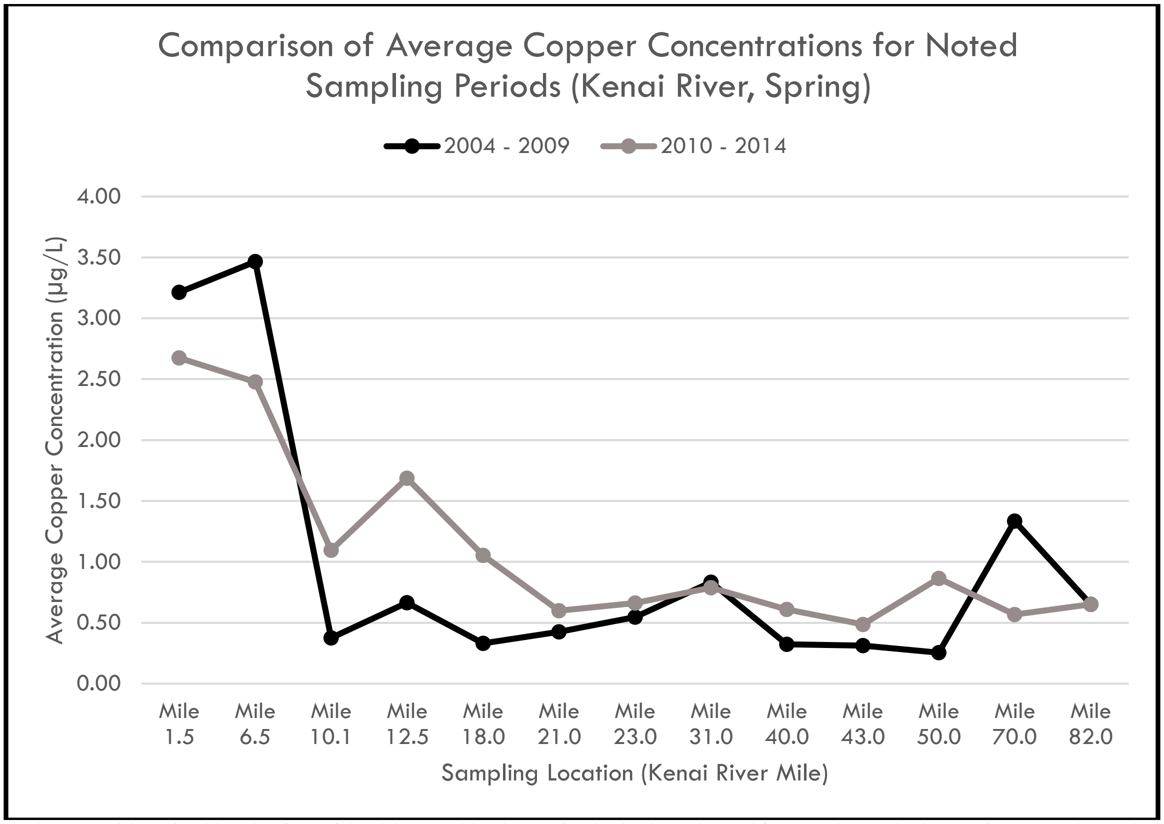

FIGURE 7: COMPARISON OF AVERAGE COPPER CONCENTRATIONS FOR NOTED SAMPLING PERIODS (KENAI RIVER, SPRING)

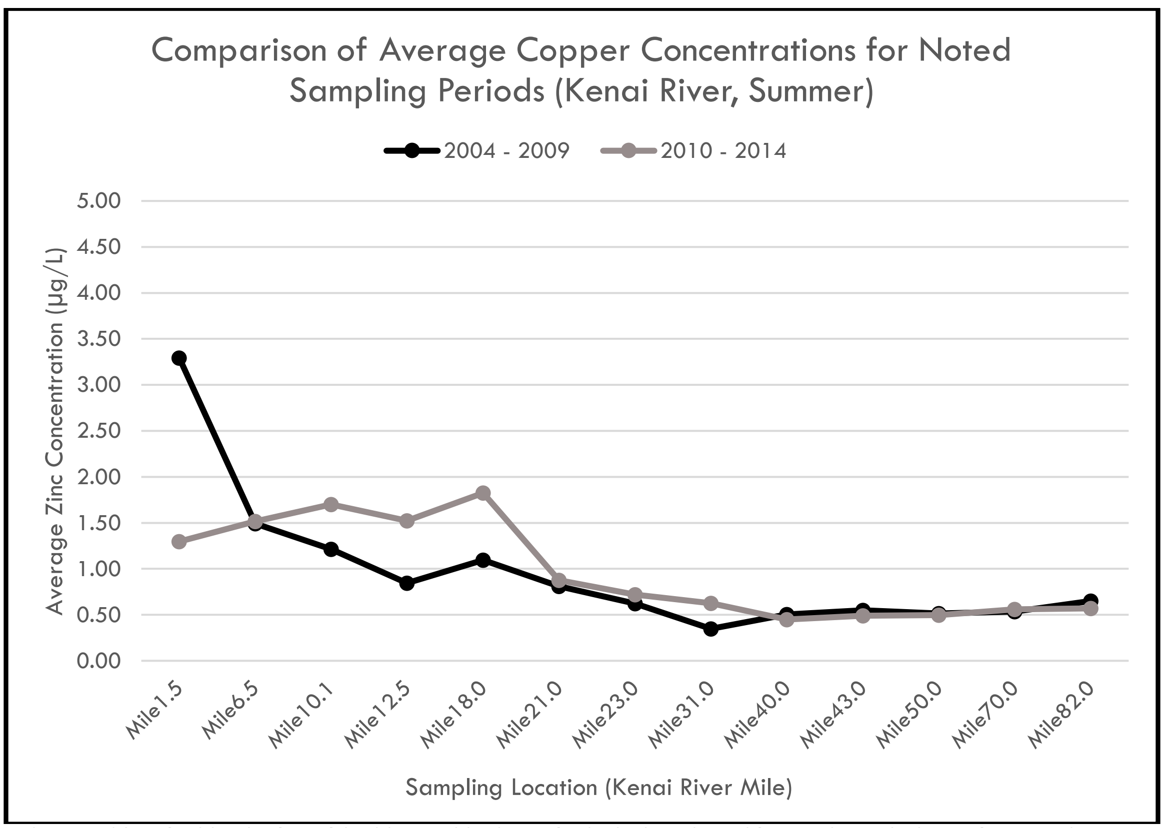

FIGURE 8: COMPARISON OF AVERAGE COPPER CONCENTRATIONS FOR NOTED SAMPLING PERIODS (KENAI RIVER, SUMMER)

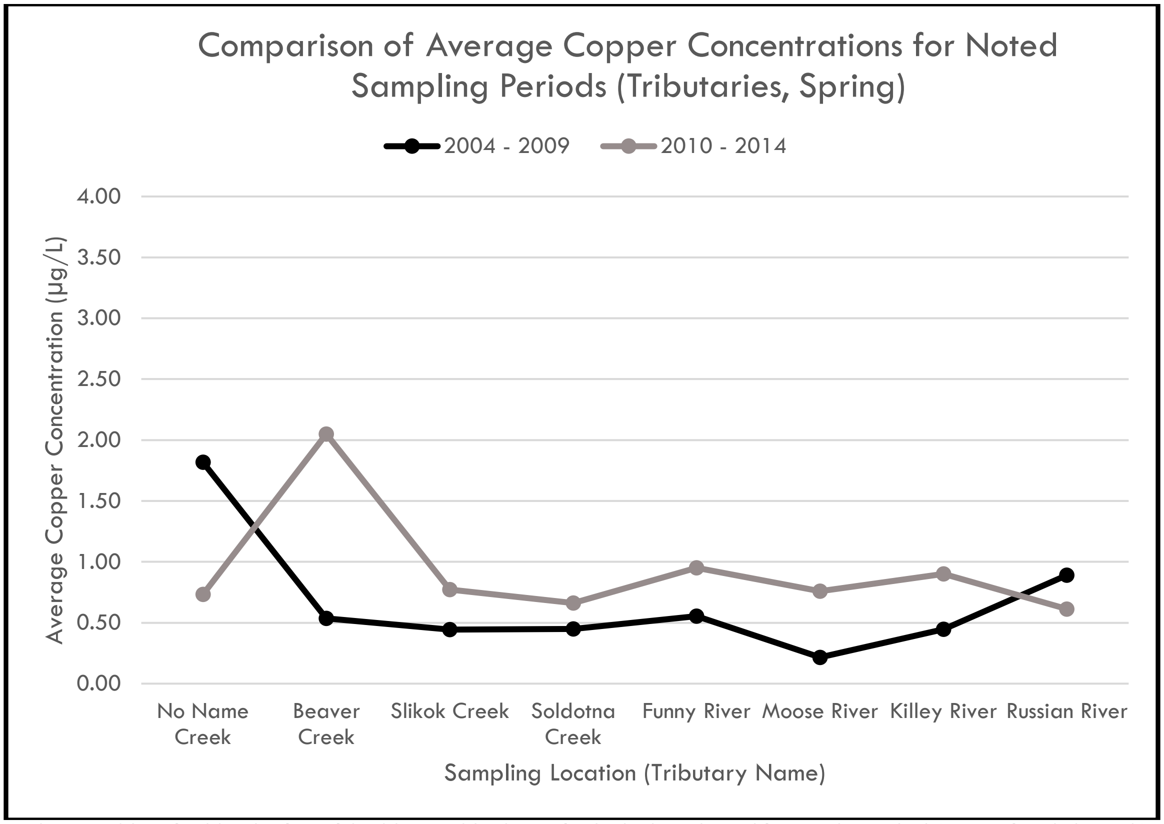

FIGURE 9: COMPARISON OF AVERAGE COPPER CONCENTRATIONS FOR NOTED SAMPLING PERIODS (TRIBUTARIES, SPRING)

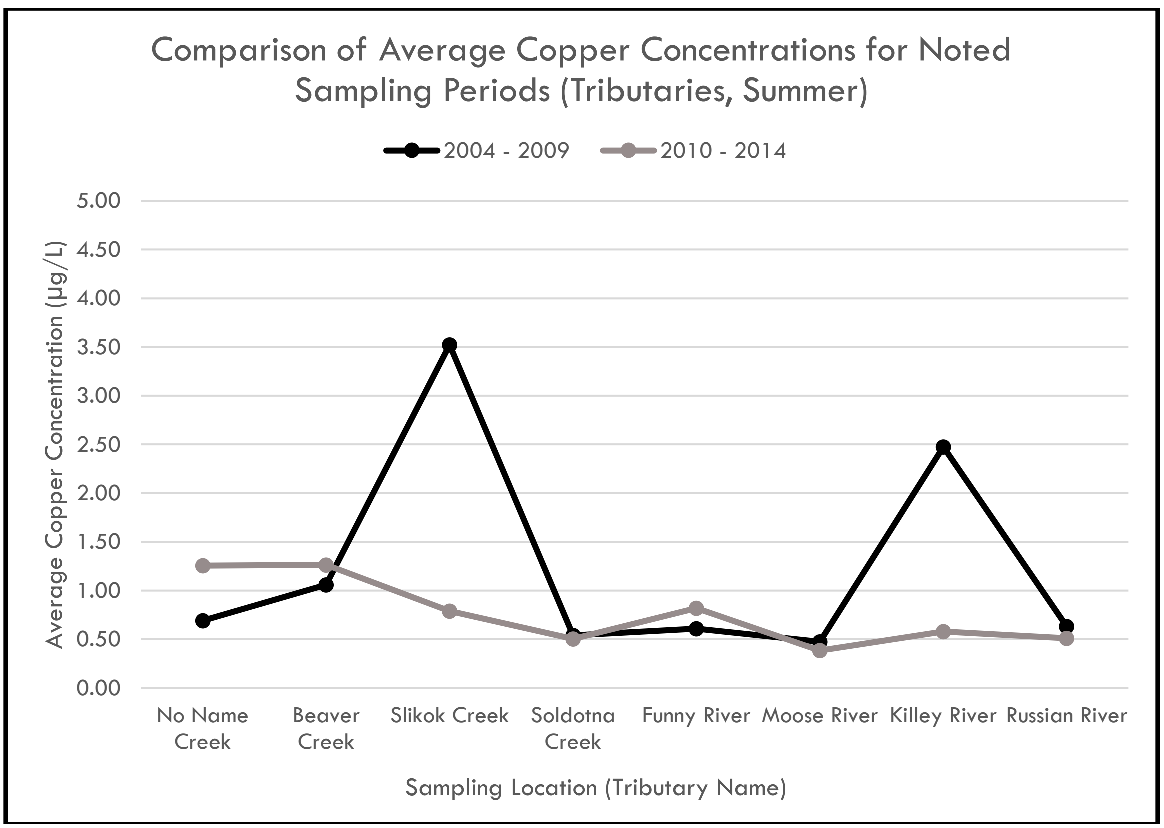

FIGURE 10: COMPARISON OF AVERAGE COPPER CONCENTRATIONS FOR NOTED SAMPLING PERIODS (TRIBUTARIES, SUMMER)

Similar to zinc, several sites in the Kenai River mainstem demonstrated a significant increase in copper concentrations since 2010. However, there were also a number of sites that demonstrated a decrease, or a negligible difference, in copper concentrations. This was the case for both spring and summer sampling.

Spring sample results from many Kenai River tributaries also display an increase in copper concentrations since 2010. However, summer sample results show that multiple tributaries have had a notable decrease in copper concentrations since 2010.

As shown in the next figure (Figure 11), the largest increase in spring Kenai River copper levels occurred at Mile 10.1, Mile 12.5, Mile 18.0, and Mile 50.0. The largest increases in summer Kenai River copper levels occurred at Mile 12.5, Mile 18.0, and Mile 31.0. In general, copper levels increased more in the spring than in the summer. Mile 70.0 displays a significant decrease in copper levels during the spring, and Mile 1.5 displays a significant decrease in copper levels during the summer.

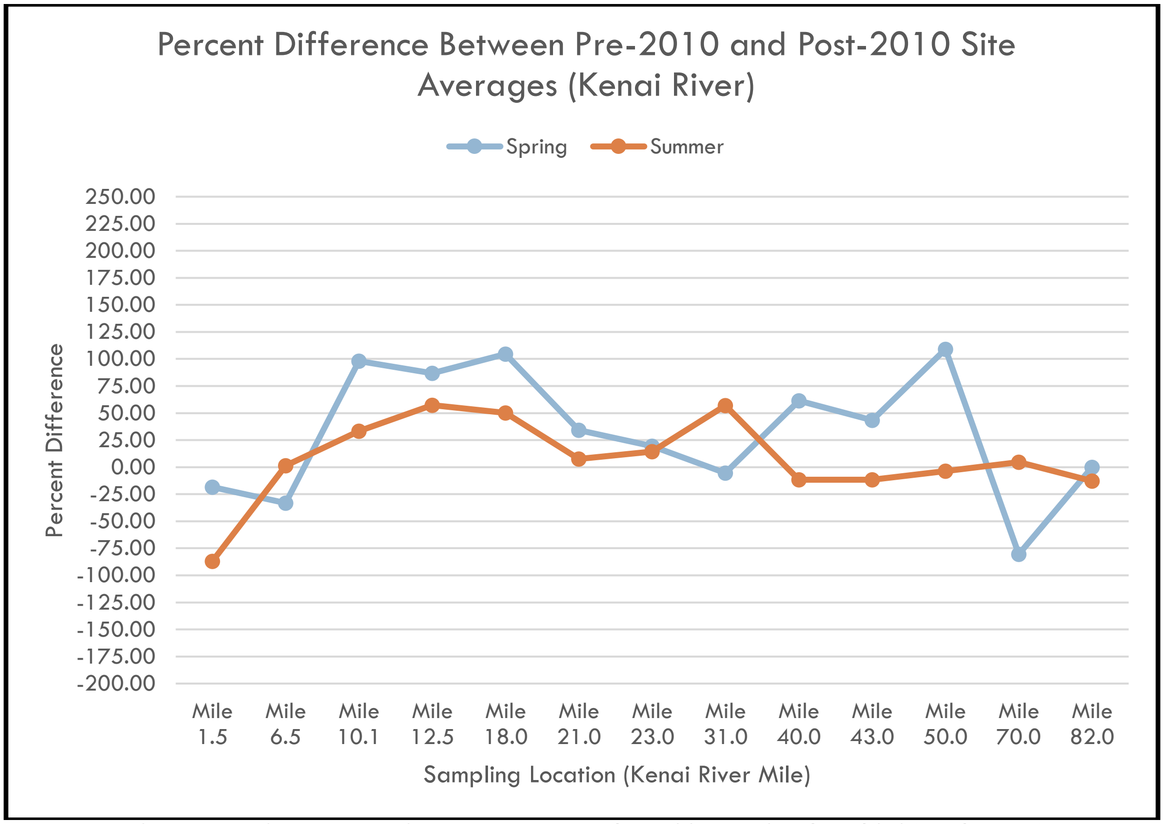

FIGURE 11: PERCENT DIFFERENCE BETWEEN PRE-2010 AND POST-2010 SITE AVERAGES (KENAI RIVER)

Beaver Creek and Moose River spring sample results displayed the largest increase in copper levels since 2010, whereas No Name Creek demonstrated a significant decrease in copper levels during the spring. Summer sample results display mixed results. Slikok Creek and Killey River samples displayed notable reductions in copper concentrations since 2010. In general, summer increases in copper levels at tributary sites were not as significant. No Name Creek results did show an increase of over 50% since 2010. This information is depicted in Figure 12.

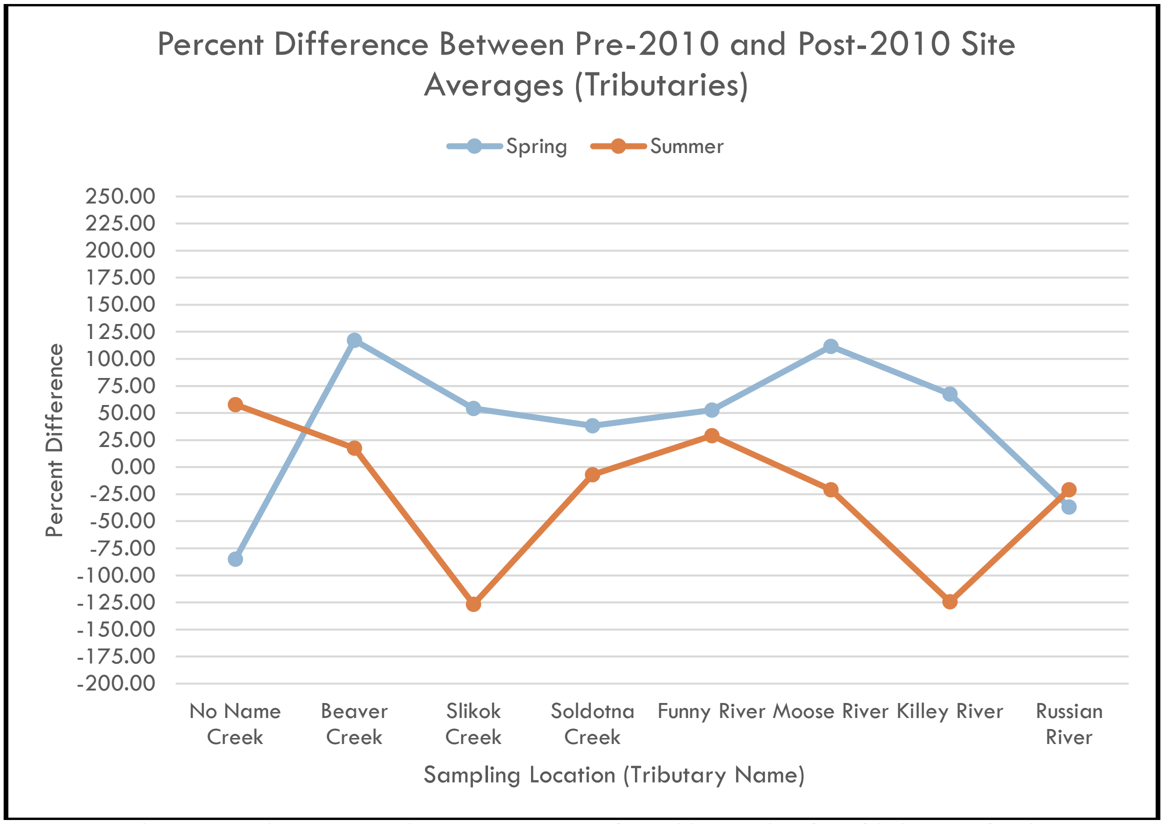

FIGURE 12: PERCENT DIFFERENCE BETWEEN PRE-2010 AND POST-2010 SITE AVERAGES (TRIBUTARIES)

DISCUSSION

Results from many sampling sites, both in the Kenai River and its tributaries, appear to display notable increases in zinc and copper concentrations since 2010. There are several factors, both natural and unnatural, that can contribute to such fluctuations. For this reason, it is not currently possible to determine baseline levels, or to say whether zinc and copper concentrations are in exceedance of any water quality standards. Developing site specific standards for zinc or copper requires frequent collection of samples and the provision of data on additional water quality parameters that are not currently sampled for under the Agency Baseline project. However, KWF will use the information provided in this supplemental analysis to highlight sections of the river that should be investigated further. In addition, a literature review will be conducted to determine potential sources of zinc and copper contamination in the Kenai River watershed.

In developing a plan for the literature review, KWF will address geographic areas of particular concern, attempt to answer several questions that have arisen as a result of this supplemental analysis (regarding difference in spring and summer results, tributary concentrations versus river concentrations, zinc and copper relationship to each other, etc.), and update this document as necessary.