



Keeyask Generation Project Aquatic Effects Monitoring Plan

Adult Lake Sturgeon Movement Monitoring Report

AEMP-2024-01



KEYYASK GENERATION PROJECT

AQUATIC EFFECTS MONITORING PLAN

REPORT #AEMP-2024-01

ADULT LAKE STURGEON MOVEMENT MONITORING IN THE NELSON RIVER BETWEEN CLARK LAKE AND THE LIMESTONE GENERATING STATION, OCTOBER 2022 TO OCTOBER 2023: YEAR 2 OPERATION

Prepared for

Manitoba Hydro

By

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SUMMARY

Background

The Keeyask Hydropower Limited Partnership (KHLP) was required to prepare a plan to monitor the effects of construction and operation of the Keeyask Generating Station (GS) on the environment. Monitoring results provide information to assess the accuracy of predictions, information to determine the actual effects of construction and operation of the GS on the environment, and whether more needs to be done to reduce harmful effects.

Construction of the Keeyask GS began in mid-July 2014 and instream work was completed in 2020. The reservoir was impounded with water levels being raised to full supply level between August 31 and September 5, 2020. Commissioning of the powerhouse turbines was initiated after impoundment. They were brought into service one at a time with the final of seven turbines completed on March 9, 2022.

Lake Sturgeon (sturgeon) were identified as one of the key species for monitoring. They were chosen because they are culturally important to partner First Nations, local sturgeon populations have been previously impacted, and construction and operation of the GS will change or may negatively impact important habitat. The plan to monitor the impacts of GS construction and operation on sturgeon includes several types of studies:

- Estimating the number of adults;
- Estimating the number and growth of juveniles (less than 800 millimetres [mm] in length);
- Identifying spawning locations and numbers of spawning fish; and
- Recording seasonal habitat use and long-distance movements (*i.e.*, over GSs or rapids) through movement studies.

The movements of sturgeon over Birthday and Gull rapids were monitored before 2011, but because different methods were used from 2011 onward, the results of the two monitoring periods are not directly comparable. While pre-2011 studies did not record detailed fish movement patterns between Clark Lake and Stephens Lake, the data showed that most tagged sturgeon continued to live in the area where they had been tagged and did not move across rapids into different parts of the river. When fish occasionally crossed either Birthday or Gull rapids, they did so in the summer or fall, which suggests that these movements were not part of spring egg-laying behaviour. No fish moved downstream over the Kettle GS.

This report provides the results of adult sturgeon movement monitoring conducted from October 2022 to October 2023. Monitoring was initiated in June 2011 and 2012 when 59 adult sturgeon were tagged with acoustic transmitters with a 10-year battery life. Over the years, more transmitters were applied to replace those that had gone missing or were captured. Movements have been monitored for approximately three years before any changes to the river occurred

(June 2011 to July 2014), approximately six years and two months of construction (July 2014 to September 2020), and just under three years after impoundment (September 5, 2020 to October 2, 2023). The Keeyask GS was finished in March 2022 so this open-water period is the second year when changes associated with GS operation may be seen both upstream and downstream of the GS.



Adult sturgeon.

Why is the study being done?

Monitoring during the time when the Keeyask GS is operational is being done to answer three questions:

How many adult sturgeon are moving through and/or away from the generating station during operation and how far are they going?

Movement studies tell us how many sturgeon are moving up or down past the generating station, how far they travel up or downstream away from the site, whether they are leaving the Keeyask area completely and when they are making these movements. The distance they travel is monitored as far upstream as the inlet to Clark Lake and downstream as far as the Limestone reservoir.

Are fish moving downstream through the GS and are these fish surviving passage?

Now that the reservoir is flooded, fish may react to changes in habitat by leaving the area. If they move downstream through the GS, they cannot move back, and may be injured or killed during passage. This could decrease the number of fish living upstream of the GS.

Did adult sturgeon change where they live after the reservoir was flooded?

Flooding of Gull Lake has caused changes to available habitat in the area. This may cause adult sturgeon to move away or to use different areas of the river.

Are sturgeon gathering downstream of Birthday Rapids and the Keeyask GS during the spawning season or are they going somewhere else?

Before the Keeyask GS was built, sturgeon in Gull Lake spawned at Birthday Rapids and sturgeon in Stephens Lake spawned at the base of Gull Rapids. After the GS was built and the reservoir was flooded, flow patterns changed in both areas. Because sturgeon are attracted to fast water

when they spawn, they may go somewhere else to spawn if conditions at Birthday Rapids and downstream of the GS aren't right for spawning.

What was done?

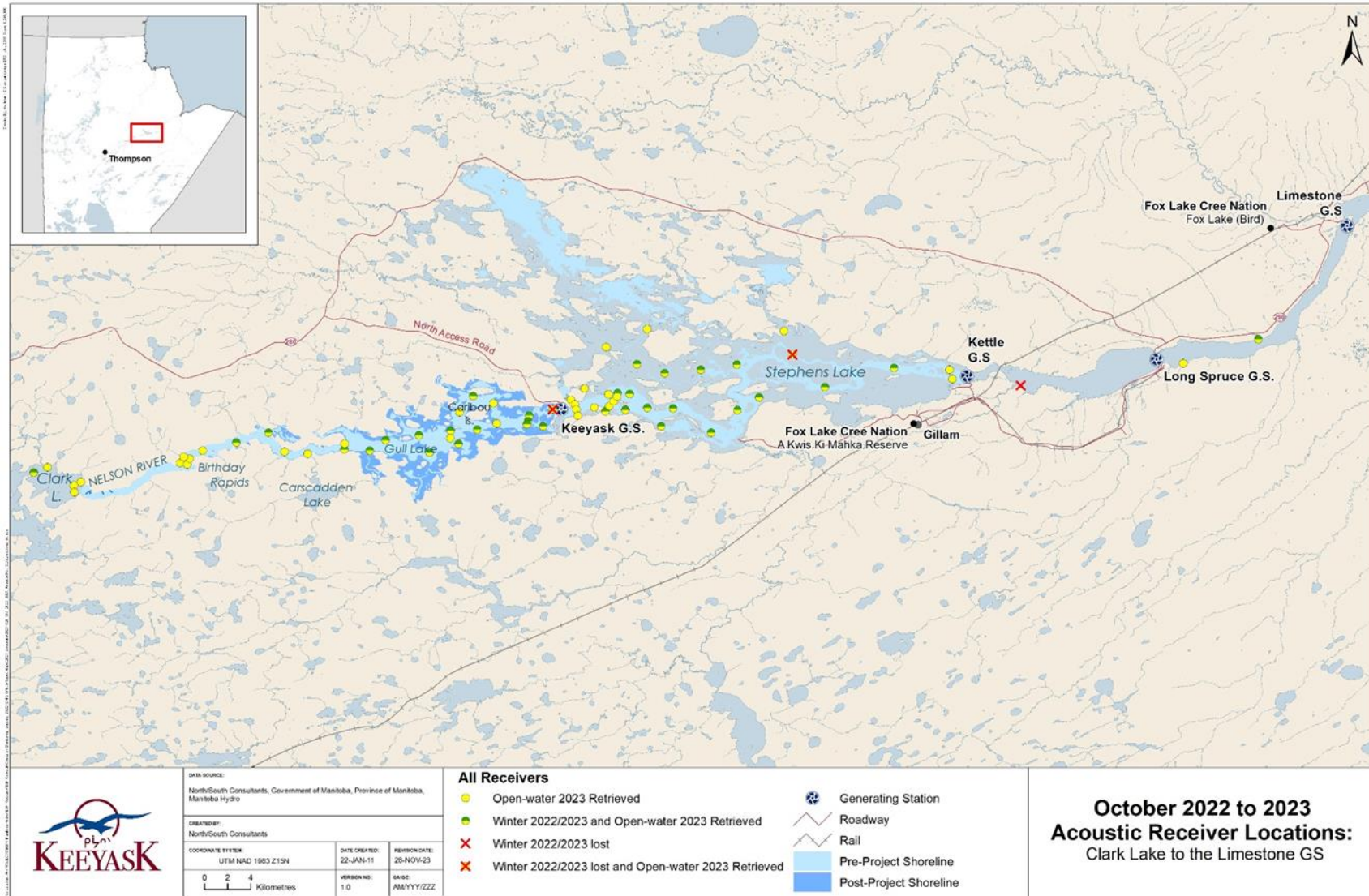
Movements of adult sturgeon were tracked using acoustic telemetry. This is a technique in which a tag is surgically implanted inside a fish. Each tag sends out a sound signal (called a "ping") that is picked up by receivers placed along the Nelson River between Clark Lake and the Limestone GS (see study area map below). Receivers are usually set downstream of the Kettle GS, however, low water levels in 2023 meant that the single receiver set in this area in winter 2022/2023 could not be retrieved and additional receivers could not be set.



Boat launch downstream of the Kettle GS looking north at the launch (left) and east from the launch (right) showing low water levels observed during open-water 2023.

Each fish is given a transmitter that sends out a unique ping, which can be detected up to 1 kilometre (km) from a receiver. By looking at the detections that were recorded by different receivers, the movements of each fish can be tracked. The tags are powered by batteries with a 10-year lifespan.

Adult sturgeon were tagged with acoustic transmitters in 2011, 2012, 2013, 2014, and 2018. All of these transmitters have now expired except for seven in Stephens Lake. Fifty-one adult sturgeon were tagged in spring 2019, 26 upstream and 25 downstream of the Keeyask GS. These fish will be tracked both before and after reservoir impoundment. Because a large number of tagged fish moved downstream through the Keeyask GS in 2021, 23 more fish were tagged in the Keeyask reservoir in the spring of 2022, and 14 were tagged in spring of 2023.



Map showing the study area. The dots represent the locations of receivers in the river. The different colours represent receivers that were in the river at different times of the year.



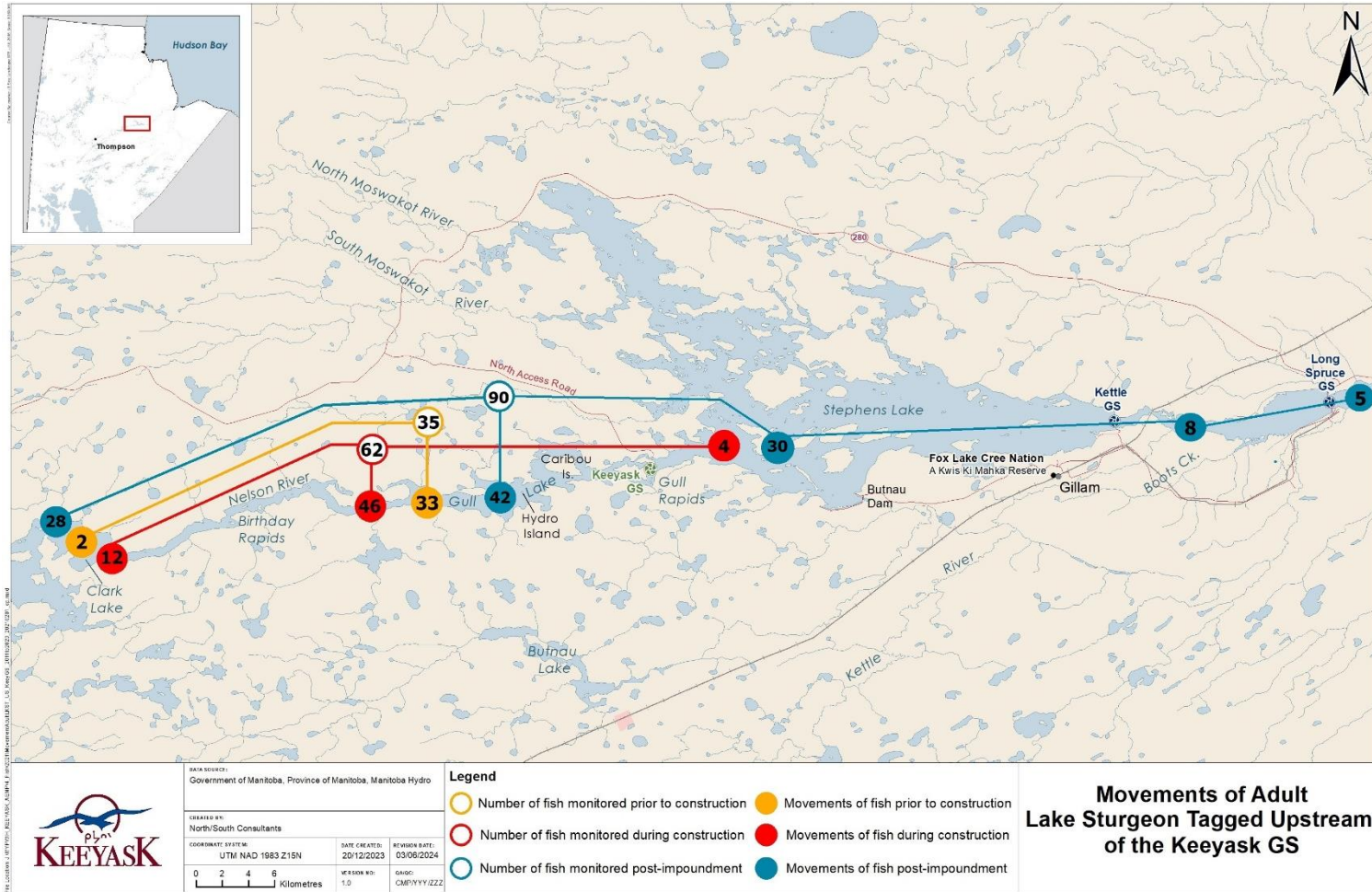
Adult sturgeon being held in a tank prior to surgery (left). Acoustic tag being implanted in an adult sturgeon (middle). Adult sturgeon released into the river after acoustic surgery (right).

What was found?

Sturgeon are different from other fish in Manitoba because they do not begin to reproduce (spawn) until they are at least 15 years old, do not spawn every year, and they can live a very long time (more than 60 years and even up to 100 years). This means that where an individual sturgeon moves may change between years depending on how old it is, whether it is spawning, and what its individual habits are. Sturgeon spawn in spring in the fast-flowing water of large rapids and spend the rest of the open-water season feeding in areas of rivers or lakes. During the winter, they move to areas where they are protected from ice and fast water.

Before 2021, adult sturgeon that were tagged upstream of the Keeyask GS tended to stay in the same areas year after year. They were divided into three groups: fish that usually lived in Gull Lake (sometimes these fish leave for short periods of time then return); fish that usually stayed in the channel of the Nelson River between Birthday Rapids and Gull Lake; and fish that usually stayed in Clark Lake. In open-water 2021, most fish moved differently often travelling farther distances, including 13 fish that moved downstream through the Keeyask GS into Stephens Lake. Similar movements were observed in the following years, with seven moving downstream through the GS from winter 2021 to 2022, and another ten from winter 2022 to the end of the 2023 open-water period.

The 30 adult sturgeon that moved downstream through the GS between 2021 and 2023 shows an increase over previous years. Between 2011 and 2020, only six fish moved downstream. All movements through Gull Rapids/the Keeyask GS are shown in the maps below. Twenty-eight of the fish that moved through the Keeyask GS displayed multiple upstream and downstream movements within Stephens Lake showing that they are alive. One fish that moved downstream between 2022 and 2023 was not detected in Stephens Lake but was captured alive during adult sturgeon population monitoring (Dowd and Hrenchuk 2024a). The remaining fish was detected briefly in Stephens Lake and, based on a lack of upstream and downstream movements, it is unclear if this fish survived passage. Overall, between 8 and 35% of acoustically tagged fish have moved downstream through the Keeyask GS each year since the reservoir was impoundment.



Map showing how many adult sturgeon moved upstream out of Gull Lake, stayed in Gull Lake, moved into Stephens Lake, downstream through the Kettle GS, and Long Spruce GS before construction (yellow), during construction (red) and after reservoir impoundment (blue). Movements of fish due to tagging stress or mortality were not included. Numbers of fish monitored (hollow circles) represent the number of fish tagged while the number of fish movements (solid circles) represent the number of fish detected. The total number of fish includes all fish tagged during a period although all fish may not have been trackable through the entire period.

A large number of downstream movements from the Keeyask reservoir into Stephens Lake were also seen from Floy-tag recaptures. A large number of sturgeon tagged in the Keeyask reservoir were recaptured in Stephens Lake during spring population monitoring in 2022 and 2023. Recaptured fish in Stephens Lake were last captured in the Keeyask reservoir. Most of these fish (39 of the 45 or 87%) were adults, measuring >800 mm in length.

Mark-recapture data also suggest that the number of downstream movements past the Keeyask GS has increased. Before spring 2022, only a small number of adult fish recaptured in Stephens Lake (0–7%) were tagged in the Keeyask reservoir. In contrast, 35 adult sturgeon tagged in the Keeyask reservoir were recaptured in Stephens Lake in 2022 (20% of all captures) and 39 (25% of all captures) in 2023.

Upstream movements out of the reservoir have continued to increase in 2023. Before construction of the Keeyask GS started (before 2014), two fish (7% of all tagged fish) moved from Gull Lake through Clark Lake, while 12 fish (19%) moved during construction. Two fish (5%) moved upstream through Clark Lake in 2021 while nine (31%) moved upstream in 2022. In 2023, 16 fish (53%) moved upstream through Clark Lake

Downstream movements out of Stephens Lake through the Kettle GS decreased in 2023. Three fish moved downstream through the Kettle GS before construction and one during construction. During the operation period, 14 fish moved downstream through the Kettle GS, two in winter 2021/2022 and 12 during open-water 2022. In 2023, only one fish moved downstream through the Kettle GS during the open-water period, and continued through the Long Spruce GS. Eight of the 14 fish continued to move downstream through the Long Spruce GS. Most of these 14 fish (eight that moved through the Kettle GS and five that moved through the Long Spruce GS) were originally tagged upstream of the Keeyask GS and moved downstream into Stephens Lake in 2021.

The fish that stayed in Stephens Lake continued to show the same movements as in previous years. Fish tagged in Stephens Lake tend to stay in the main river channel, specifically the part of Stephens Lake where the river channel was flooded when the Kettle GS was built. Fish tagged in Stephens Lake continue to be split into two groups: those that remain in upper Stephens Lake within about 10 km of the Keeyask GS; and those that periodically move downstream into lower Stephens Lake.

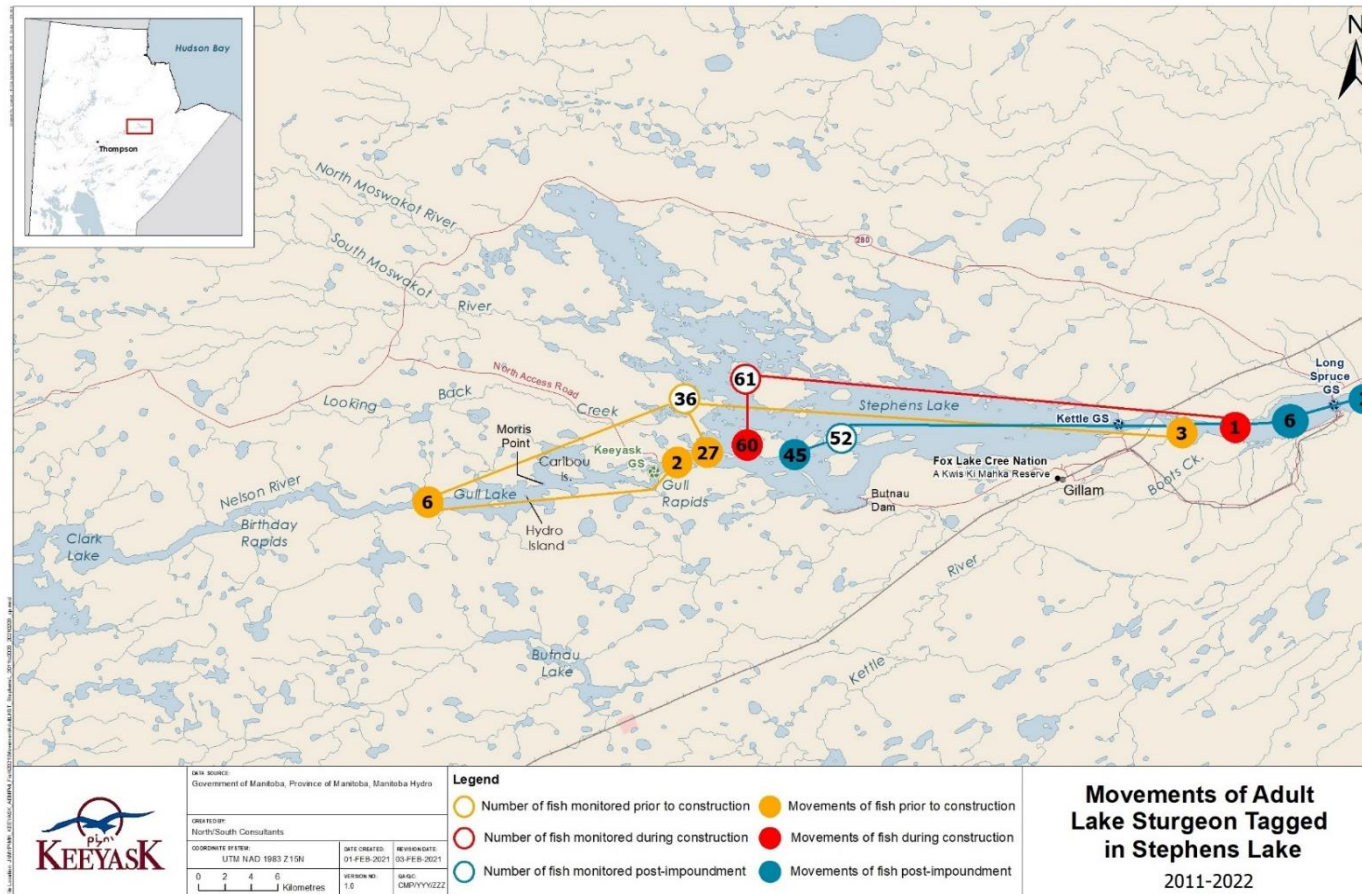
Fish upstream of the GS continued to move to Birthday Rapids during the spring spawning period. Fish also continued to be detected immediately downstream of the Keeyask GS during the spring spawning period.

What does it mean?

Before the Keeyask GS reservoir was flooded, monitoring upstream of the GS showed that each sturgeon did not usually move great distances and that most preferred to live in similar locations year after year. The same patterns were seen immediately after impoundment in September 2020, during winter 2020/2021, and during the early part of open-water 2021. However, beginning in June 2021, differences in adult sturgeon movement patterns were observed, with most fish moving to different areas, some staying in the reservoir and some leaving. There was an increase

in the number of sturgeon that moved downstream through the GS into Stephens Lake and an increase in the number of fish that moved upstream through Clark Lake past the receiver array. The EIS predicted that adult sturgeon would move out of the Keeyask reservoir, both upstream and downstream, after impoundment

Many sturgeon continue to use habitat immediately downstream of Birthday Rapids and the Keeyask GS during the spawning period. This suggests they have continued to spawn in both areas.



Map showing how many adult sturgeon tagged in Stephens Lake moved upstream through Gull Rapids, stayed in Stephens Lake and moved downstream through the Kettle GS and Long Spruce GS before construction (yellow), during construction (red), and after reservoir impoundment (blue). Movements of fish due to tagging stress or mortality were not included. Numbers of fish monitored (hollow circles) represent the number of fish tagged while the number of fish movements (solid circles) represent the number of fish detected. Two fish moved upstream and then returned to Stephens Lake. The total number of fish includes all fish tagged during a period although all fish may not have been trackable through the entire period.

What will be done next?

The tags that were applied in 2019 will last until 2029, those applied in 2022 will last until 2032, and those applied in 2023 will last until 2033. Following the movements of individual fish over such a long time will provide a better idea of what kinds of habitats these fish need to use over many years, and if fish continue to change their movements in the Keeyask reservoir. We will also be able to see if fish continue to move out of the reservoir and if any that moved upstream will come back.

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1.0 INTRODUCTION

The Keeyask Generation Project (the Project) is a 695-megawatt (MW) hydroelectric generating station on the lower Nelson River in northern Manitoba. The GS is approximately 725 kilometres (km) northeast of Winnipeg, 35 km upstream of the existing Kettle Generating Station, 60 km east of the community of Split Lake, 180 km east-northeast of Thompson and 30 km west of Gillam. Construction of the GS began in July 2014 and the seven generating units were all in-service in March 2022.

The *Keeyask Generation Project: Response to EIS Guidelines*, completed in June 2012, provides a summary of predicted effects and planned mitigation for the Project. Technical supporting information for the aquatic environment, including a description of the environmental setting, effects and mitigation, and a summary of proposed monitoring and follow-up programs is provided in the *Keeyask Generation Project Environmental Impact Statement: Aquatic Environment Supporting Volume* (AE SV). As part of the licensing process for the Project, an Aquatic Effects Monitoring Plan (AEMP) was developed detailing the monitoring activities of various components of the aquatic environment, including the focus of this report, adult Lake Sturgeon movement, for the construction and operation phases of the Project.

A pre-Project study of adult Lake Sturgeon movements in the Keeyask Study Area (*i.e.*, in support of the Keeyask Generation Project EIS) using acoustic and radio telemetry began in 2001 and was conducted until 2011. One of the main objectives associated with radio and acoustic telemetry studies was detecting upstream and downstream movements of fish over rapids in the study area (Birthday Rapids and Gull Rapids). Pre-Project movement data revealed that the majority of Lake Sturgeon did not move upstream or downstream over rapids into adjacent study reaches; instead, they remained within the reach where they had been tagged. Those few fish that moved over one or more sets of rapids did so in the summer or fall, suggesting that these movements were not associated with a life history event such as spawning. Movement data collected from telemetry studies conducted prior to 2011 are not directly comparable to those described herein given that receiver coverage has improved considerably; the pre-Project acoustic receiver array was comprised of 20 receivers, while the array used after 2011 consists of as many as 60 receivers. Also, radio telemetry has not been used since 2004.

Adult Lake Sturgeon movement monitoring for the AEMP began in 2011 and 2012, when 59 fish (measuring > 796 mm fork length) were tagged with acoustic transmitters with a 10-year battery lifespan. Thirty-one fish were captured and tagged upstream of Gull Rapids, and 29 fish were captured and tagged in Stephens Lake. An additional fish was tagged in Stephens Lake in 2013 to replace a tag returned by a local resource user. By the end of 2013, 11 tags were either missing or lost. Additional tags were implanted in 2014 to restore the sample size to 59 fish. An additional 51 adult Lake Sturgeon were tagged in 2019 to track changes before and up to nine years after reservoir impoundment. After data were analyzed in 2021, it was discovered that a large number of tagged fish moved downstream out of the Keeyask reservoir into Stephens Lake. An additional 23 fish were tagged in the Keeyask reservoir in spring 2022, and 14 in 2023, to compensate for this loss.

Results from all studies dating back to 2011 are presented in Hrenchuk and McDougall (2012); Hrenchuk and Barth (2013); Hrenchuk *et al.* (2014); Hrenchuk and Barth (2015); Hrenchuk and Barth (2016); Hrenchuk and Barth (2017); Hrenchuk *et al.* (2018), Hrenchuk and Lacho (2019), Hrenchuk (2020; 2021; 2023), and Hrenchuk and Small (2022).

Adult Lake Sturgeon movement monitoring during the construction period (2014–2020) was conducted between Clark Lake and the upper portion of the Limestone reservoir ([Map 1](#)) to determine if disturbances associated with construction alter habitat use and coarse-scale movement patterns upstream and downstream of the Project. Results assisted in identifying:

- The use of key habitats (*i.e.*, spawning, rearing, and foraging) during construction;
- The potential vulnerability of sturgeon to activities at the construction site (*i.e.*, if sturgeon use the area in the immediate vicinity of the construction site they may be vulnerable to construction effects such as stranding during dewatering, releases of suspended sediment); and
- The potential for increased emigration or avoidance of the construction site due to disturbance (*i.e.*, blasting, suspended sediment inputs, *etc.*).

Impoundment of the Keeyask reservoir was completed on September 5, 2020. Monitoring in the Keeyask reservoir in 2021 represented the first year of monitoring when the reservoir was at full supply level. Monitoring in Stephens Lake, however, represented a transition between construction and operation as a considerable portion of the flow was still being passed through the spillway in spring and early summer when only a few units were in-service. All powerhouse units were commissioned by March 22, 2022. Therefore, monitoring in 2023 represents the second year of operation monitoring. Key questions identified in the AEMP relating to monitoring adult Lake Sturgeon movements during the operation period include:

- Will the frequency of long-distance movements (and subsequent downstream emigration/entrainment) by Lake Sturgeon increase during construction and operation of the Project?
- Are fish moving downstream past the GS and, if so, is there an indication that they have survived passage?
- Will there be a change in the proportional distribution of adult Lake Sturgeon following reservoir creation (*i.e.*, will there be a population level shift in distribution patterns following reservoir creation)?

This report provides adult Lake Sturgeon movement monitoring results from October 2022 to October 2023. This report includes data collected during the third winter after impoundment of the Keeyask reservoir in September 2020 and the second open-water period after construction of the Keeyask GS was completed in March 2022.

2.0 STUDY SETTING

The study area encompasses an approximately 110 km long reach of the Nelson River from Clark Lake to the upstream end of the Limestone Reservoir ([Map 1](#)). This section of river offers a diversity of physical habitat conditions, including a variety of substrate types, and variable water depths (range: 0–30 m) and velocities. Clark Lake is located immediately downstream of Split Lake, and approximately 42 km upstream of the Keeyask GS. Current is restricted to the main section of the lake, with off-current bays outside the main channel. The Assean River is the only major tributary to Clark Lake and flows into the north side. Downstream from the outlet of Clark Lake, the Nelson River narrows and water velocity increases for a 3 km stretch, known as Long Rapids. For the next 7 km, the river widens, and water velocity decreases. The area between Clark Lake and Birthday Rapids is referred to herein as the upper Keeyask reservoir.

Birthday Rapids is located approximately 10 km downstream of Clark Lake and 30 km upstream of the Keeyask GS and marks the upstream end of major water level changes because of impoundment by the Keeyask GS. The drop in elevation from the upstream to downstream side of Birthday Rapids was approximately 2 m prior to impoundment but is now nearly level, albeit a fast-flowing section of river. The 14 km reach of the Nelson River between Birthday Rapids and Gull Lake was characterized as a large and somewhat uniform channel with medium to high water velocities and a few large bays. This area is now within the Keeyask reservoir, though flooding was limited to mainly shoreline areas, and is referred to herein as the middle Keeyask reservoir.

Prior to impoundment, Gull Lake was a widening of the Nelson River, with moderate to low water velocity beginning approximately 20 km upstream the Keeyask GS. Water levels on Gull Lake increased by several metres following impoundment and flooding along the shoreline and small tributaries entering this reach was extensive. Although this area is larger than prior to impoundment, the portion of the Keeyask reservoir is referred to herein as Gull Lake.

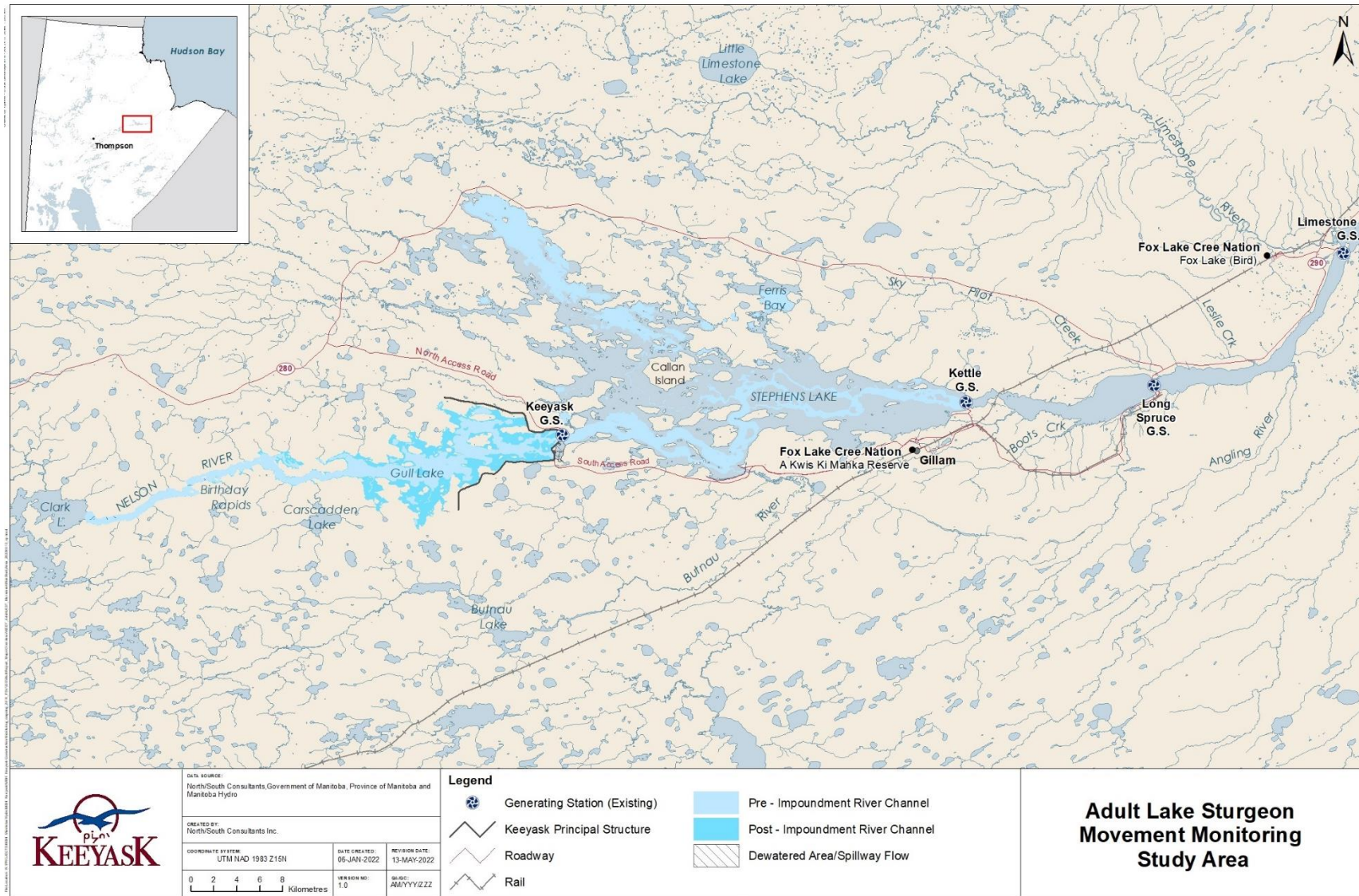
Just below the Keeyask GS, the Nelson River enters Stephens Lake. Stephens Lake was formed in 1971 by construction of the Kettle GS. Construction of the Keeyask GS has altered the flow distribution immediately downstream of the station.

Construction of the Kettle GS flooded Moose Nose Lake (north arm) and several other small lakes that previously drained into the Nelson River, as well as the old channels of the Nelson River that now lie within the southern portion of the lake. Major tributaries of Stephens Lake include the North and South Moswakot rivers that enter the north arm of the lake. Looking Back Creek is a second order stream that drains into the north arm of Stephens Lake. Kettle GS is located approximately 40 km downstream of the Keeyask GS.

The Long Spruce reservoir was formed in 1979 by the construction of the Long Spruce GS. It is a 16 km reach of the Nelson River extending from Long Spruce GS upstream to Kettle GS (Manitoba Hydro Public Affairs 1999). Kettle River and Boots Creek are the only major tributaries flowing into Long Spruce reservoir, with both tributaries entering the reservoir on the south shore.

The Limestone reservoir was formed in 1990 by the construction of the Limestone GS. It is a 23 km reach of the Nelson River extending from Limestone GS upstream to Long Spruce GS. Four

tributaries of the Nelson River enter the reservoir; Wilson Creek and Brooks Creek enter from the south, and Sky Pilot Creek and Leslie Creek enter from the north. Aquatic habitat within the reservoir ranges from a riverine environment in the upper reach, to more lacustrine conditions just upstream of the Limestone GS.



Map 1: Map of the Nelson River showing the site of the Keeyask Generating Station and the adult Lake Sturgeon movement monitoring study setting.

3.0 METHODS

3.1 ACOUSTIC TELEMETRY

Acoustic telemetry involves tracking movements of fish surgically implanted with internal acoustic transmitters (tags). Each transmitter emits a unique signal, recognizable by stationary receivers. When tagged fish come into the detection range of a receiver (generally within 500 m to 1 km, depending on conditions), the transmitter code number, as well as the date and time, are stored in the receiver.

3.1.1 ACOUSTIC TRANSMITTER APPLICATION

Thirty-one fish were tagged with acoustic transmitters (VEMCO V16-4x, estimated 3,650-day battery life) upstream of Gull Rapids (now referred to as the Keeyask GS) in 2011 and 2012, and four additional transmitters were applied in June 2014 ([Table 1](#)). One additional female used as broodstock was tagged in 2018 (with a three-year tag). All tags applied to fish in 2011, 2012, 2014, and 2018 upstream of the Keeyask GS have now expired. Tagging date, date of last detection, and subsequent recaptures for fish with expired tags are outlined in Appendix A6-1.

Table 1: Number of acoustic transmitters applied, missing tags, immigrants and emigrants, and harvested adult Lake Sturgeon upstream of Gull Rapids¹, indicating the number of fish remaining in the area at the end of each study period between June 2011 and October 2023.

Year	Tags Applied	Missing Tags	In ²	Out ³	Harvest	# Active Tags
2011	30	-	1	-	-	31
2012	1	-	4	-	1	35
2013	0	-	1	-	-	36
2014	4	6	-	2	-	32
2015	0	6	-	1	-	31
2016	0	5	-	2	-	30
2017	0	5	-	1	-	29
2018	1	6	-	-	-	28
2019	26	6	-	-	-	54
2020	0	6	-	-	1	54
2021	0	16	-	14	-	15
2022	23	0	-	6	-	28
2023	14	2	-	9	1	30

1. Referred to as the Keeyask GS after spillway commissioning in 2018.
2. Immigration from Stephens Lake.
3. Emigration to Stephens Lake.

Twenty-eight fish were originally tagged in Stephens Lake in 2011 and 2012. Additional tags were applied in 2013 (n = 1) and 2014 (n = 7) ([Table 2](#)). All tags applied to fish in 2011, 2012, 2013, and 2014 in Stephens Lake have now expired. Tagging date, date of last detection, and subsequent recaptures for fish with expired tags are outlined in Appendix A6-2.

Table 2: Number of acoustic transmitters applied, missing tags, immigrants and emigrants, and harvested adult Lake Sturgeon in Stephens Lake, indicating the number of fish remaining in the area at the end of each study period between June 2011 and October 2023.

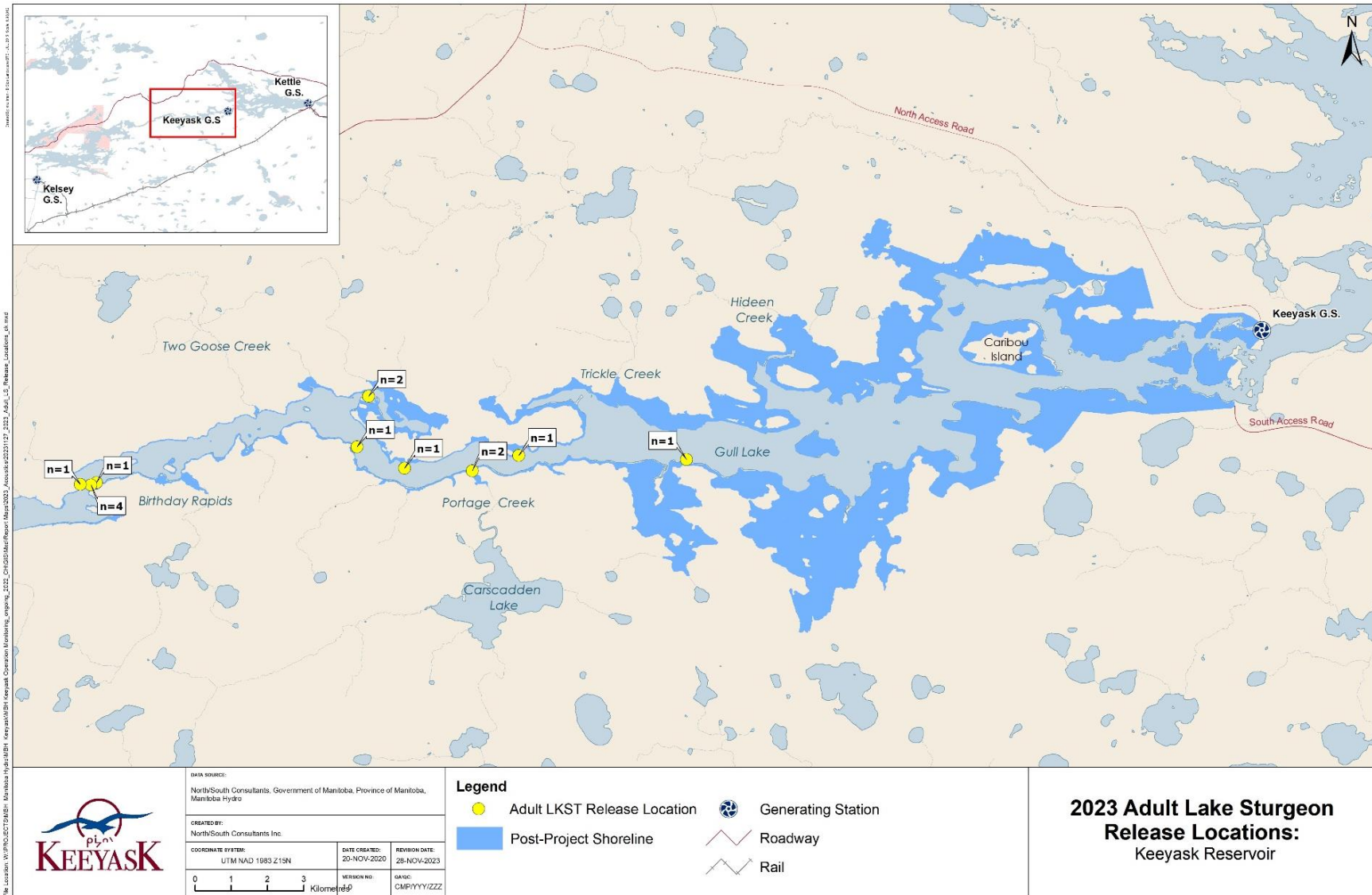
Year	Tags Applied	Missing Tags	In ¹	Out (Gull Rapids) ²	Out (Kettle GS) ³	Harvest	# Active Tags
2011	19	-	-	1	-	-	18
2012	9	-	-	4	2	-	21
2013	1	-	-	1	-	-	21
2014	7	4	2	-	1	-	25
2015	0	4	1	-	-	-	26
2016	0	4	2	-	-	-	28
2017	0	4	1	-	-	-	29
2018	0	5	-	-	1	-	28
2019	25	5	-	-	-	-	52
2020	0	5	-	-	-	-	52
2021	0	14	13	-	-	-	56
2022	0	0	6	-	14	-	30
2023	0	3	9	-	1	-	35

1. Immigration from upstream of Gull Rapids.

2. Emigration to upstream of Gull Rapids.

3. Emigration to downstream of the Kettle GS.

Acoustic transmitters (VEMCO V16-4x, estimated 3,650-day battery life) were applied to an additional 51 fish in 2019: 26 upstream and 25 downstream of the Keeyask GS. These transmitters will allow tracking of Lake Sturgeon through GS construction, and the first eight years of GS operation (to 2029). Additional transmitters (VEMCO V16-4x, estimated 3,650-day battery life) were applied to 23 fish upstream of the Keeyask GS in 2022. These transmitters were applied to increase the sample size of tagged adult lake Sturgeon upstream of the Keeyask GS to compensate for the loss of tagged fish that moved downstream out of the Keeyask reservoir in 2021. An additional 14 fish were tagged in the Keeyask reservoir in 2023. Release locations for the 14 adult Lake Sturgeon tagged in 2023 are presented in [Map 2](#).



Map 2: Release locations for adult Lake Sturgeon tagged with acoustic transmitters in the Keeyask reservoir in spring 2023.

Following capture, Lake Sturgeon receiving tags were placed in a 76 L nesting fish tub fitted with an aquarium aerator. All tagging was conducted on shore near the site of capture. Prior to transmitter implantation, Lake Sturgeon were anaesthetized in a solution of clove oil and ethanol, adapted from Anderson *et al.* (1997). When the Lake Sturgeon became immobile, they were placed in a surgery cradle ventral side up. Because the anesthetic renders a fish unable to ventilate on its own, fresh water was continuously pumped over the gills. A small incision was made through the ventral body wall using a sterilized scalpel. An acoustic transmitter was inserted into the body cavity and the incision was closed with sutures. Lake Sturgeon were monitored in a recovery tank until they were able to maintain equilibrium and had regained their strength. They were released in off-current areas near the original capture site.

3.1.2 ACOUSTIC RECEIVERS

Since 2011, stationary acoustic receivers (VEMCO model VR2W) have been used to continuously monitor tagged adult Lake Sturgeon in the Nelson River between Clark Lake and the Long Spruce GS. In spring 2016, the receiver array was extended to the upper Limestone reservoir, with the placement of two receivers downstream of the Long Spruce GS. The intent of adding these receivers was to determine whether fish that had moved into the Long Spruce reservoir had continued to move downstream.

During the six-year construction phase of the Project (beginning in July 2014), receivers were deployed at the same sites as those established during the pre-construction phase (2011–2013). During the open-water period, receivers were deployed in calm water with a flat bottom free of large debris to maximize detection range and spaced along the main river channel throughout the study area to maximize spatial coverage. In Stephens Lake, receivers were placed at locations within pre-flood river channels, based on the observation that sturgeon tend to stay within river channels, even in flooded environments. At constrictions within the river channel, a series of receivers were deployed to create “gates” with the intent of recording all fish that passed by the river cross-section (described in Section 3.1.2.2).

The retrieval of receivers deployed during winter has proven challenging and several were lost in previous winters, likely moved by ice (Hrenchuk and Barth 2013). Because it appears that receivers will only remain safe from ice if deployed in calm areas at depths greater than 10 m, the number of possible receiver locations during winter is limited, especially in areas upstream of the Keeyask GS.

3.1.2.1 WINTER 2022/2023

The stationary acoustic receiver array for the winter 2021/2022 (October 11, 2021, to May 15, 2022) period consisted of 36 receivers ([Figure 1](#)). Seventeen were set upstream of the Keeyask GS, 17 in Stephens Lake, one downstream of the Kettle GS, and one downstream of the Long Spruce GS (Maps [3](#) and [4](#)). The 2022/2023 winter array differed slightly from the array used in 2021/2022. Eight additional receivers were set within Gull Lake to increase over-winter coverage within the Keeyask reservoir at rkms -15.0 (#108010), -9.9 (#125103), -7.8 (#129194), -2.1

(#107993, #129191, and #125555), -0.8 (#114232), and -0.3 (#114235; [Map 3](#)). Prior to flooding, these sites were too shallow and fast to be considered suitable locations to deploy receivers during winter.

One additional receiver was set downstream of the Long Spruce GS at the mouth of Leslie Creek (rkm 65.3; #125552; [Map 4](#)).

3.1.2.2 OPEN-WATER 2023

An array of 68 acoustic receivers was used during the beginning of the 2023 open-water period (defined as May 16 to October 2, 2023) ([Figure 2](#)). Thirty-three were set upstream of the Keeyask GS, 33 in Stephens Lake, and two downstream of the Long Spruce GS (Maps [5](#), [6](#), and [7](#)). The 2023 open-water array differed slightly from the array used in 2022. One receiver (#129182; rkm -44.5) was added to the “gate” (described below) at the outlet of Clark Lake ([Map 5](#)). Acoustic receivers could not be set in the Long Spruce reservoir during the 2023 open-water period due to low water levels that prevented boat access. The acoustic receiver set in this area during winter 2022/2023 (#129187; rkm 45.1) could not be retrieved.

Similar to previous years, receiver “gates” were established in several key areas selected by river morphology (channel restrictions) and habitat characteristics (areas with low velocity adjacent to the main flow of the river). Receiver “gates” consisted of two or more acoustic receivers set parallel to flow to provide complete (or nearly complete) signal coverage of a river cross-section. Areas between the “gates” were referred to as river zones. Receiver gates provide confidence that movements past key points are being detected, which allows for extrapolation of coarse-scale positions (*i.e.*, which zone) during periods when fish remain undetected. When analyzing data, fish detected within a zone that subsequently go undetected for a period of time without passing through a gate, are assumed to be within the zone in which they were last detected.

Five gates were established between Clark Lake and the Keeyask GS (44.0, 34.0, 20.0, 9.0, and 2.1 rkms upstream of the GS), dividing the river into six zones (Zones 1, 2, 3, 4, 5, and 5.5; [Map 5](#)). Three were established in Stephens Lake (1.2, 4.5, and 40.0 rkms downstream of the GS), dividing the lake into three zones (Zones 6.5, 6, and 7; [Map 6](#)). The location of the “gates” has remained consistent since 2013 except for the two gates closest to the station which were added in 2022 to track movements of fish close to and past the GS.

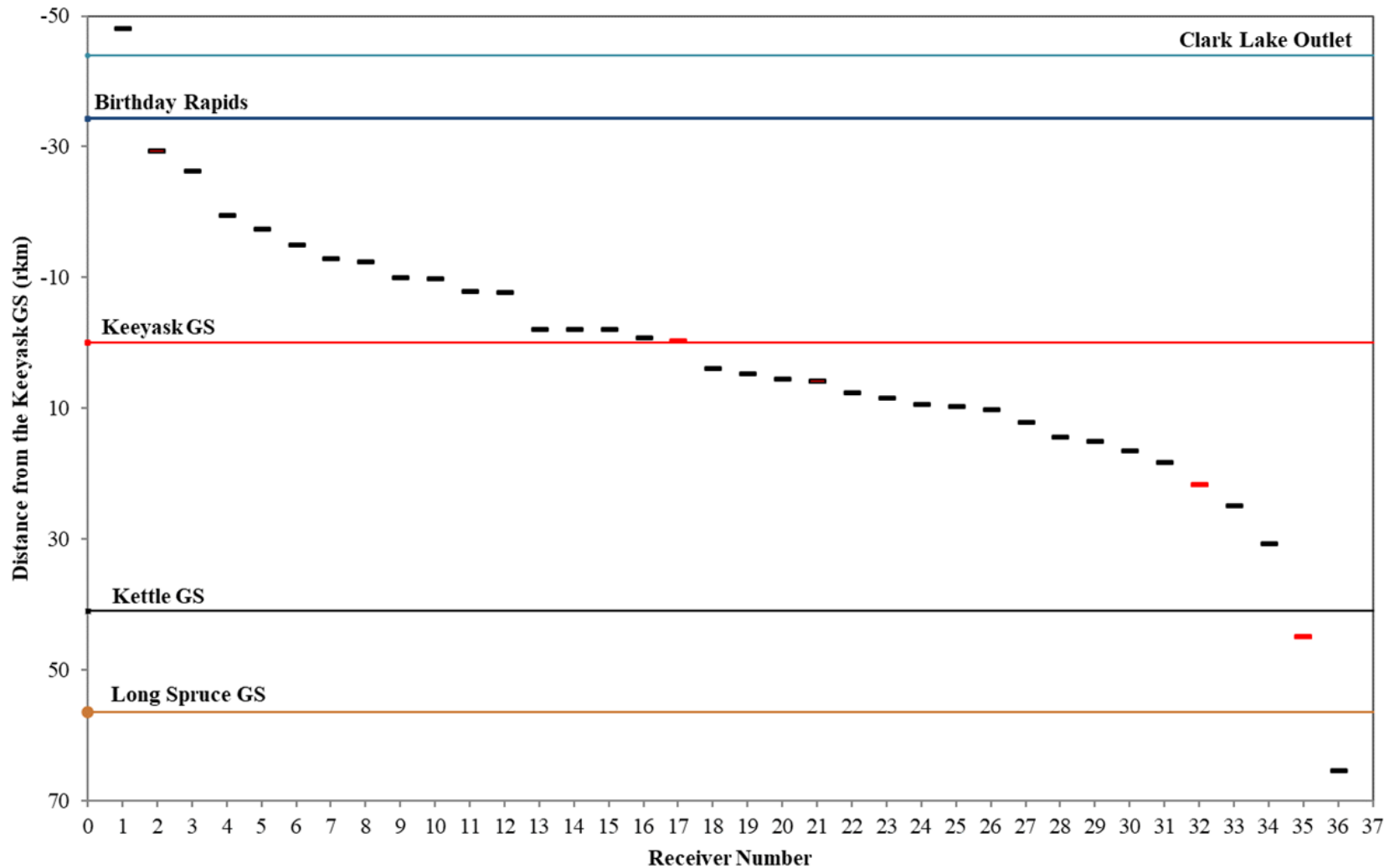
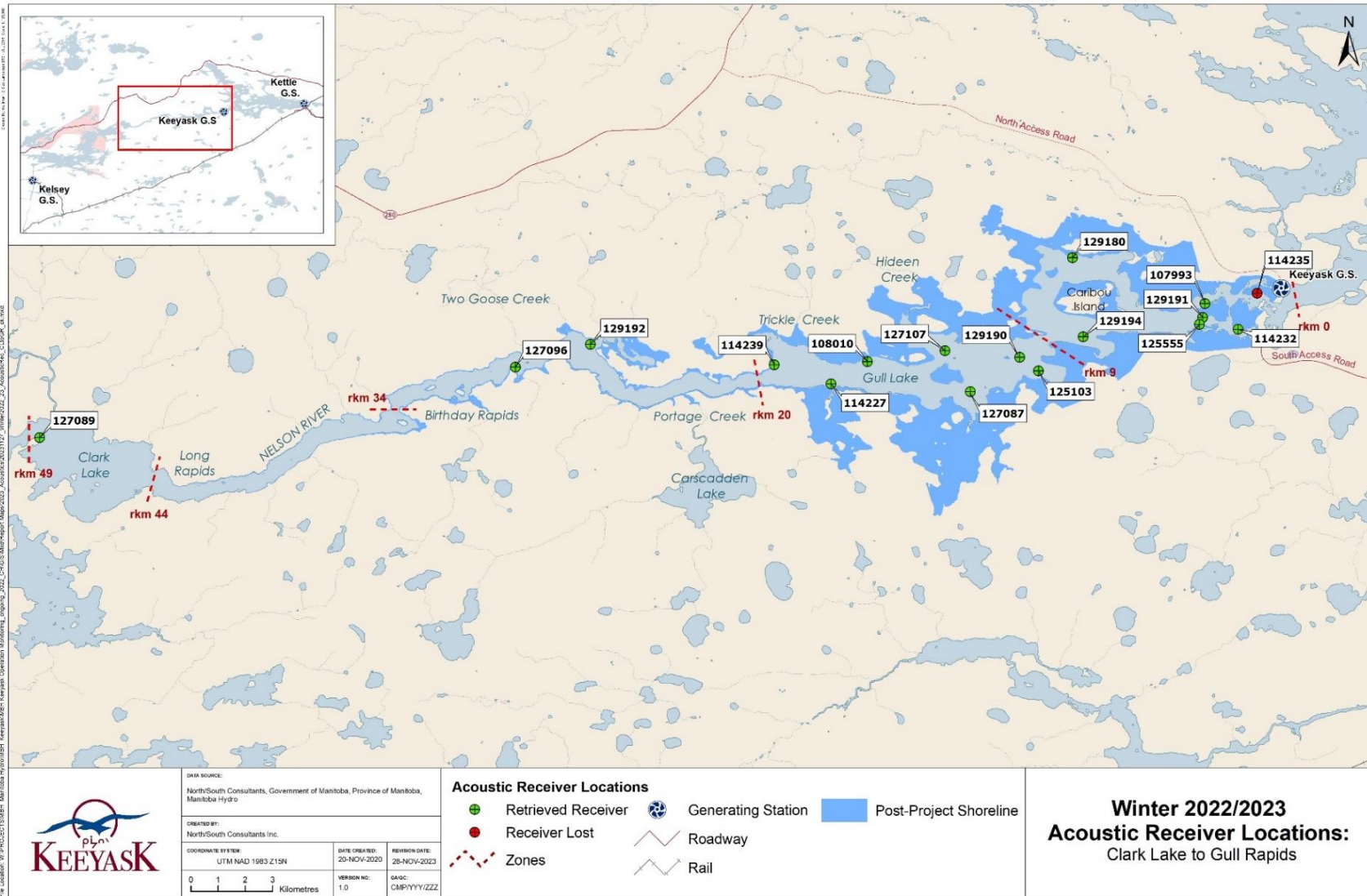
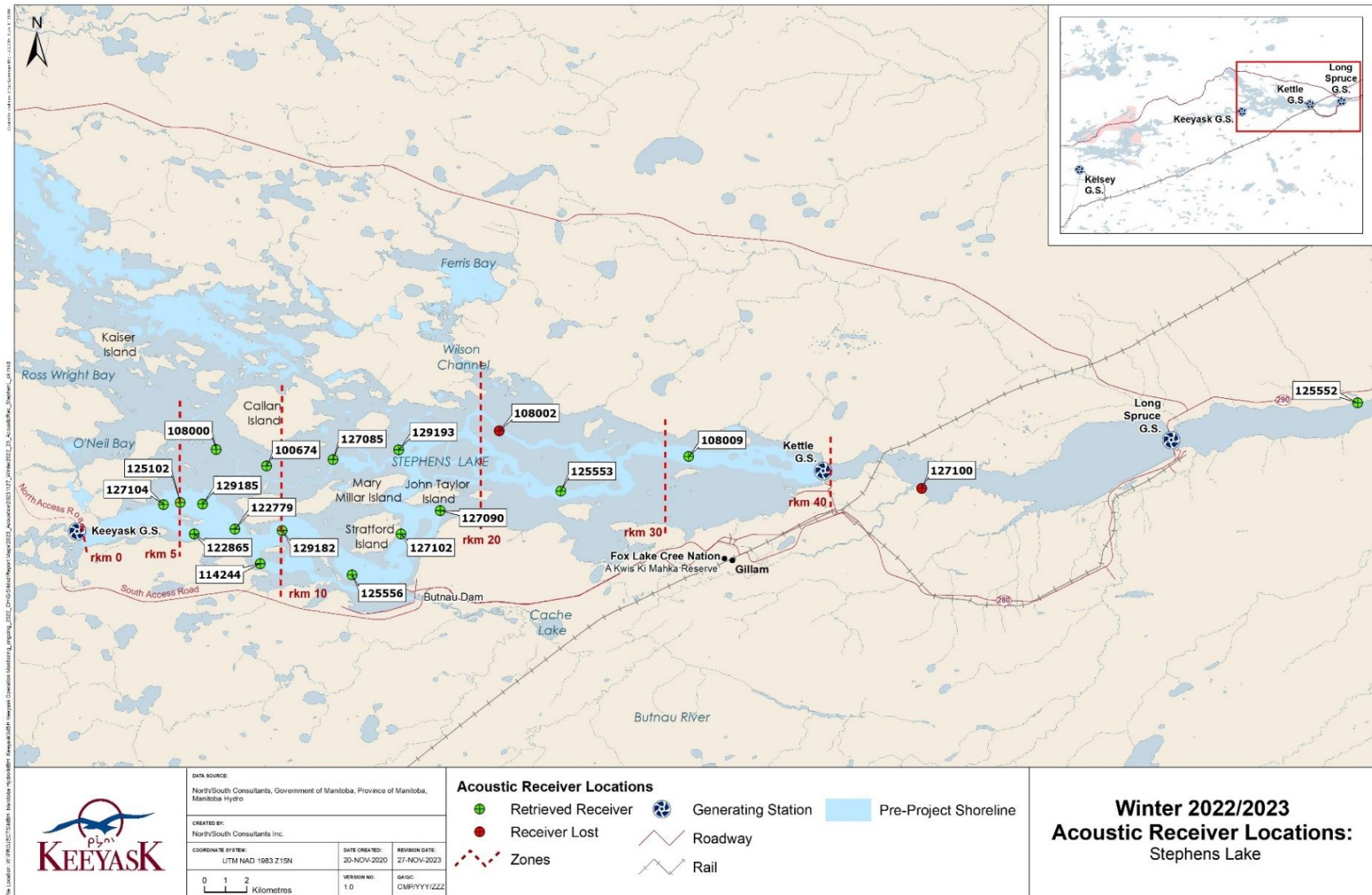


Figure 1: Locations of stationary acoustic receivers (dashes) in relation to the base of the Keyyask GS (rkm 0) and other major landmarks (lines) in the Nelson River between Clark Lake and the Kettle GS between October 2022 and May 2023. Red dashes indicate receivers that could not be located at the end of the winter 2022/2023 period.



Map 3: Locations of stationary receivers set in the Nelson River from Clark Lake to the Keyask GS between October 2022 and May 2023. River kilometer (rkm) distances are indicated with a dotted line. The former (pre-impoundment) river channel is shown in light blue.



Map 4: Locations of stationary receivers set in Stephens Lake from the Keeyask GS to Kettle GS between October 2022 to May 2023. River kilometer (rkm) distances are indicated with a dotted line. The former (pre-impoundment) river channel is shown in light blue.

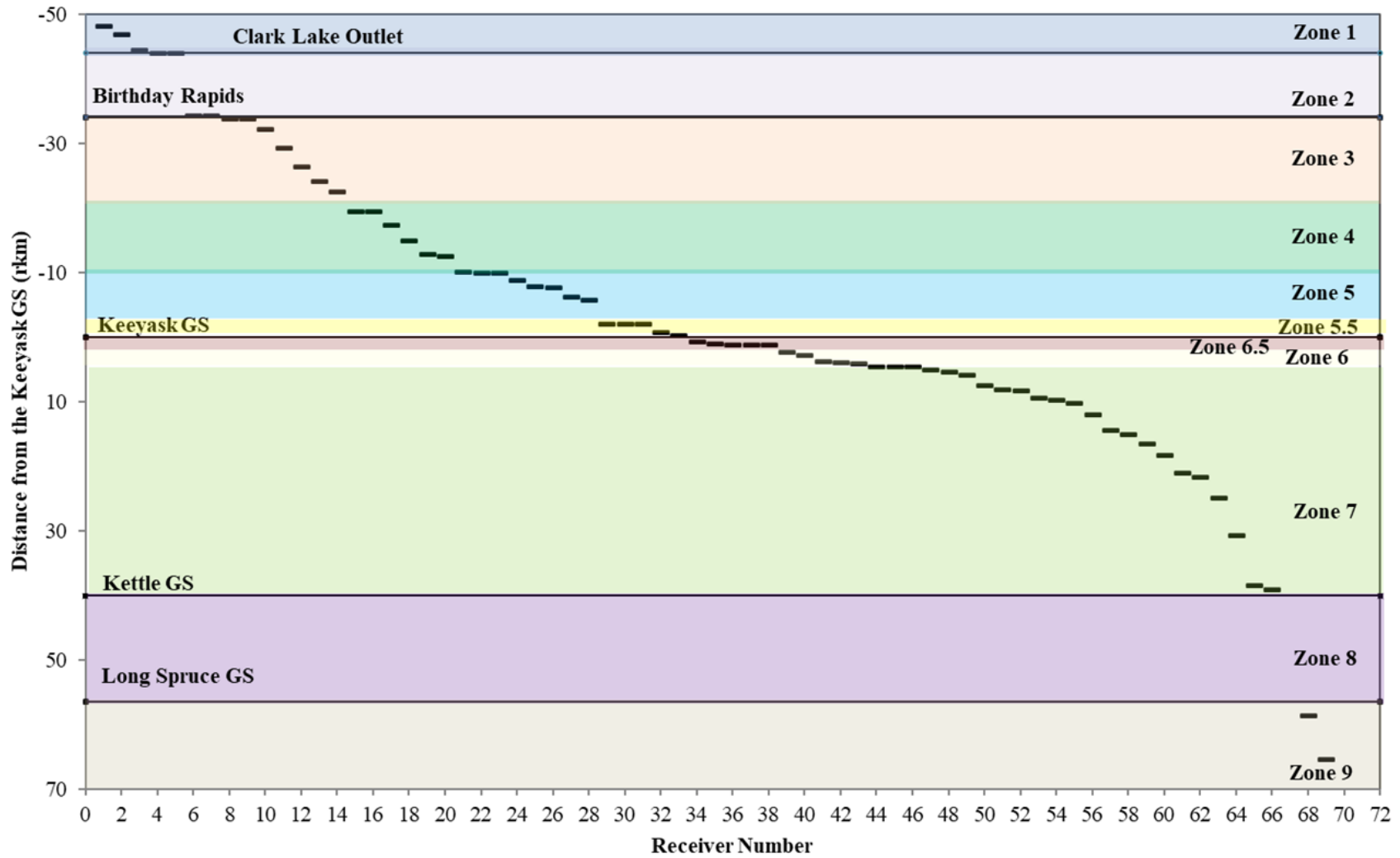
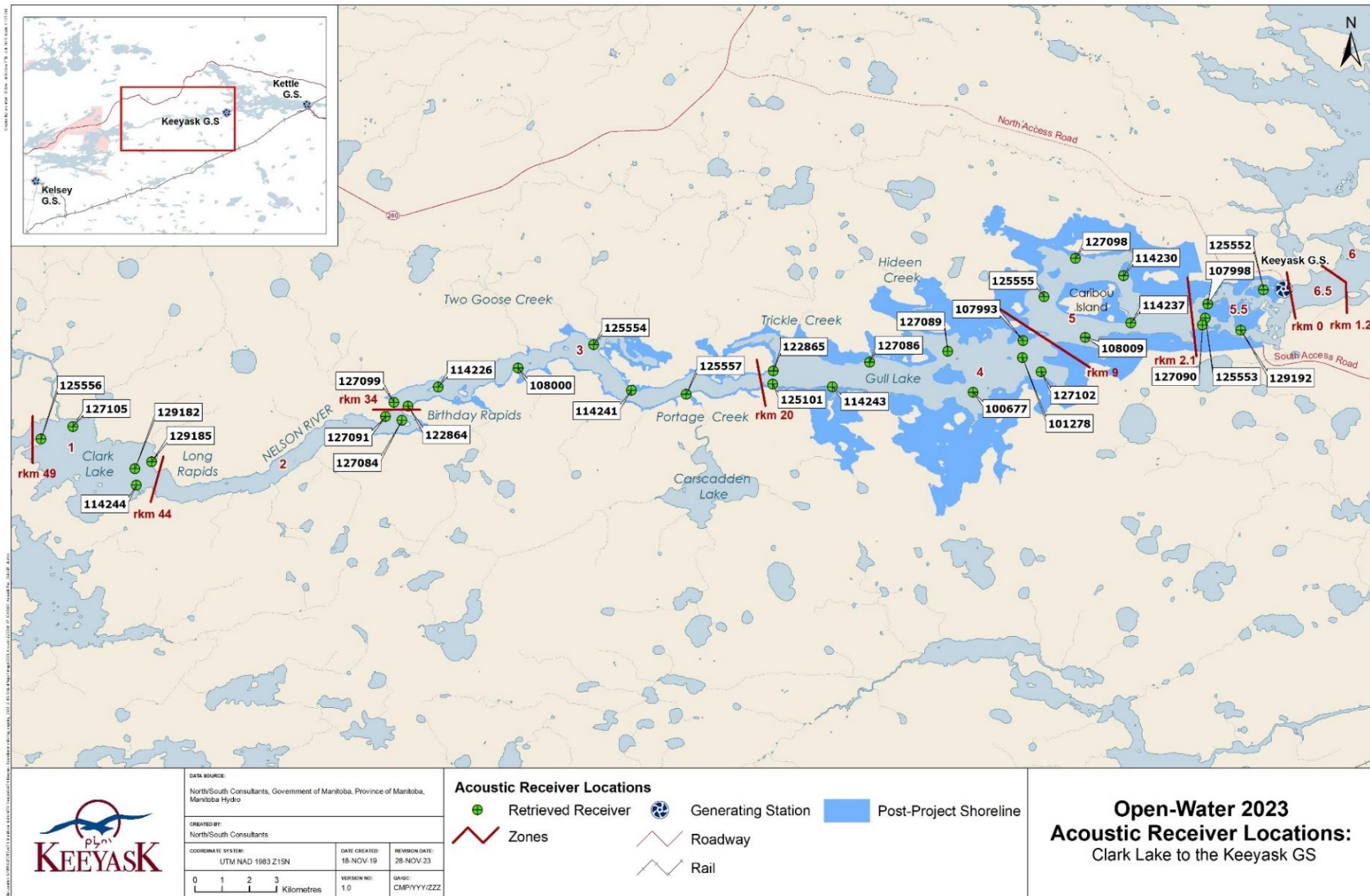
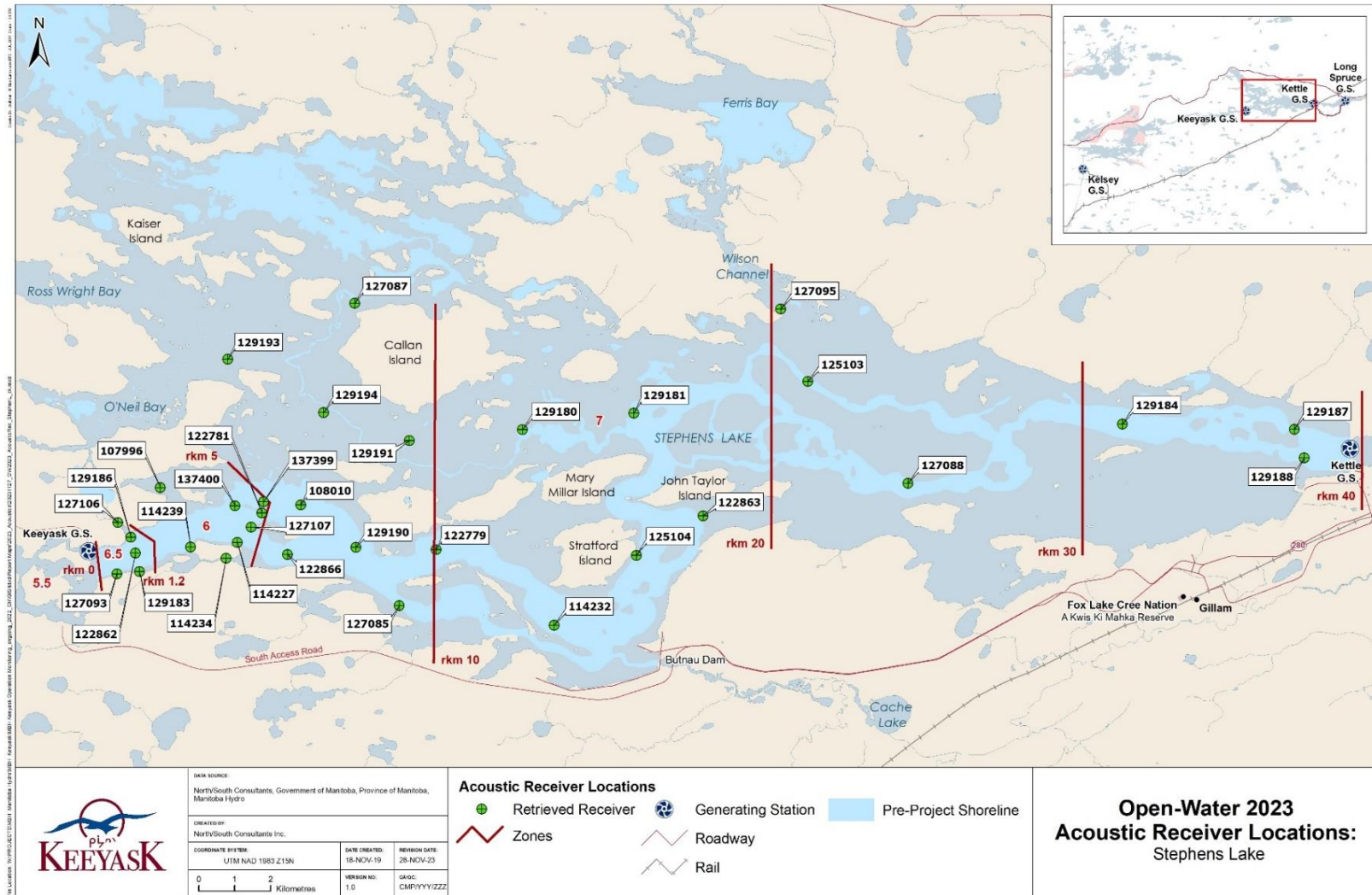


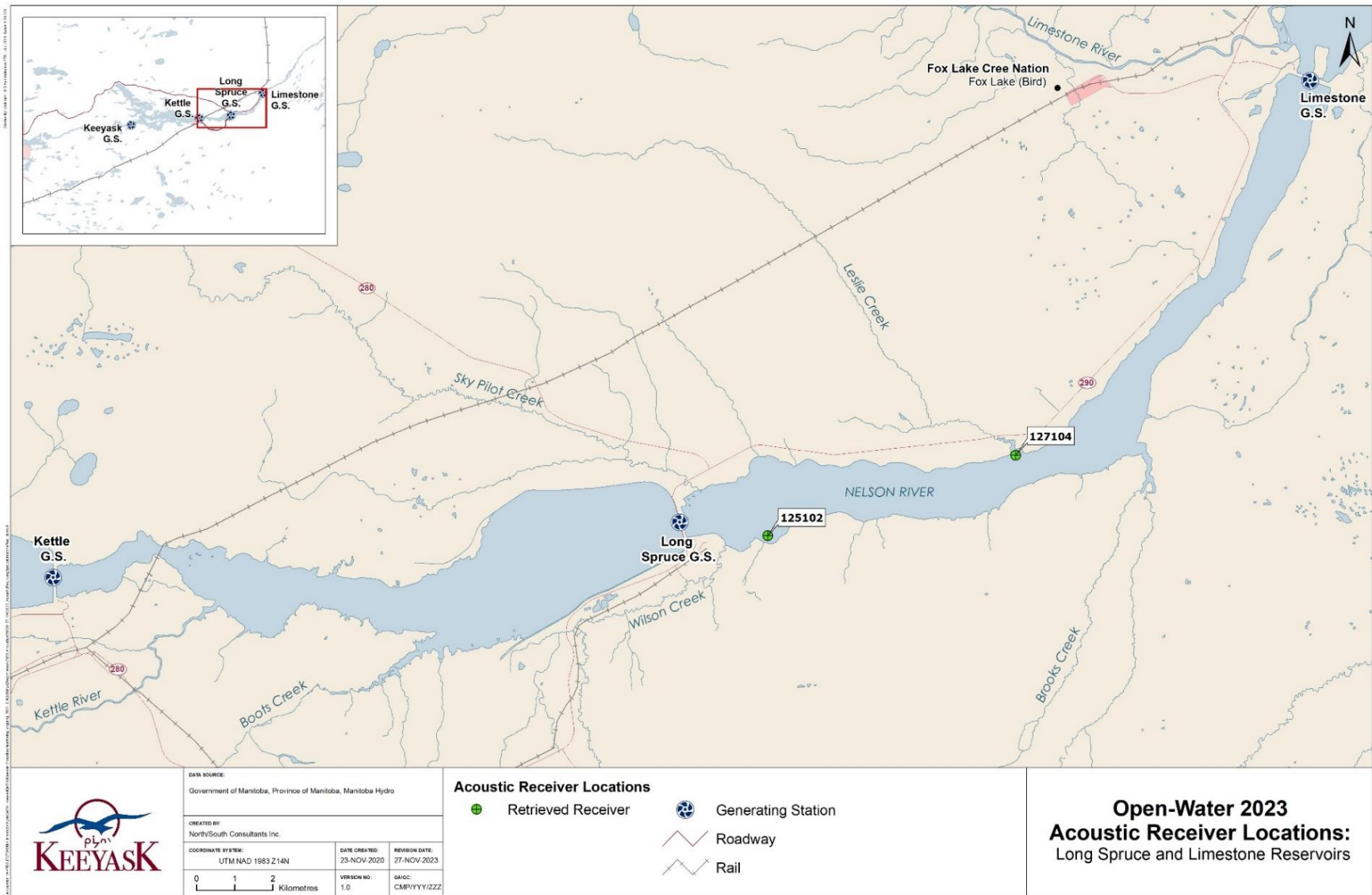
Figure 2: Locations of stationary acoustic receivers (dashes) in relation to the base of the Keeyask GS (rkm 0) and other major landmarks (lines) in the Nelson River between Clark Lake (Zone 1) and the Limestone GS (Zone 9) between May and October 2023. River zones are indicated by different colours.



Map 5: Locations of stationary receivers set in the Nelson River from Clark Lake to the Keeyask GS between May and October 2023. The river is divided into six "zones" (numbers 1 to 5.5) based on placement of receiver "gates" indicated within the river in red. River kilometer (rkm) distances at zone divisions are indicated in red.



Map 6: Locations of stationary receivers set in Stephens Lake between May and October 2023. The river is divided into three "zones" (numbers 5.5 to 7) based on placement of receiver "gates" indicated within the river in red. The pre-impoundment river channel is shown in light blue. River kilometer (rkm) distances are indicated with a dotted red line.



Map 7: Locations of stationary receivers set between the Kettle and Limestone Generating Stations between May and October 2023.

To describe fish movements for reporting purposes, the study area was divided into eleven different zones. The area upstream of the Keeyask GS was divided into six zones (Zones 1–5.5), while Stephens Lake was divided into three zones (Zones 6.5, 6, and 7). The Long Spruce reservoir is referred to as Zone 8 and the Limestone reservoir as Zone 9. Two additional zones were created in 2022 close to the Keeyask GS. Zone 5.5 is located within 2.1 rkm upstream of the GS, and Zone 6.5 is located within 1.2 rkm downstream of the GS.

Water temperature within the Nelson River mainstem was recorded with a HOBO Water Temperature Pro data logger from October 11, 2022, to October 2, 2023. Lake Sturgeon generally spawn in the spring when water temperature ranges from 8–13°C (KHLP 2014). In 2023, there were indications that the spawning period lasted beyond these temperatures. During population monitoring studies, adult Lake Sturgeon were captured in spawning condition when water temperature measured as high as 14°C (Dowd and Hrenchuk 2024a). Thus, data collected when water temperature measured between 8 and 14°C was considered as the “spawning period”.

3.1.3 DATA ANALYSIS

False detections can arise on acoustic telemetry receivers due to code collisions and/or environmental noise (Pincock 2012). To filter out false detections, a fish was required to be detected at least two times within a 30-minute interval at a given stationary receiver. Single detections were filtered and not used in most analyses; however, in instances when fish went undetected for lengthy periods, and/or rapid movements were suspected, raw data were also explored. In no instance did examination of raw data suggest that consideration of a single detection would result in a different behaviour or movement pattern compared with the result when single detections were removed.

Movements were analysed in terms of rkm distance, with the base of the Keeyask GS representing a distance of 0 rkm. The area located downstream of the Keeyask GS (*i.e.*, Stephens Lake) was given a positive (+) distance value from the GS, while the area located upstream (*i.e.*, Gull and Clark lakes) was given negative (-) distance values (Figures [1](#) and [2](#)). The average rkm distance from the GS was calculated over a 4-hour interval and plotted versus time for each fish. Total detection ranges were calculated by subtracting the farthest downstream detection location from the location of the farthest upstream detection. The proportion of time that all fish spent within each river zone during each 4-hour interval was plotted and presented as a percentage of the study period. For example, a fish spent 44% of the time between May 1 and May 31 within Zone 4 means that the fish was detected within Zone 4 for 44% of the 186 4-hour intervals between May 1 and May 31.

Rapid downstream movements observed within two weeks of tagging were classified as caused by tagging mortality or stress. If the fish made a rapid downstream movement within two weeks of tagging followed by upstream and downstream movements, it was classified as tagging stress. If a fish made a rapid downstream movement within two weeks of tagging and was not detected again or did not display upstream movements, it was classified as a tagging mortality. If a fish was not detected for more than one year, it was classified as missing.

3.1.3.1 MAXIMUM LIKELIHOOD APPROACH

A maximum likelihood approach was used to compare pre- and post-construction movements, both between river zones and through Gull Rapids (now the Keeyask GS), Kettle GS, and Long Spruce GS. This method is broadly applicable and simple to apply.

A standard binomial coefficient was used to assess the probability of movement estimators.

$$f(y|N, p) = \binom{N}{n} p^y (1 - p)^{(N-y)}$$

Where:

$$\binom{N}{n} = \frac{N!}{n!(N-n)!}$$

A simple example is the chance of observing 5 heads in 20 coin tosses, if $p = 0.50$, would be:

$$f(5|20, 0.5) = \binom{20}{5} 0.5^5 (1 - 0.5)^{(20-5)} = 0.0148$$

For any observed set of results, the binomial coefficient is constant so we can ignore it when evaluating p . The values of p were evaluated using the maximum likelihood approach given the observed data for the following:

- Movement or no movement between zones;
- Upstream movement from zone to zone;
- Downstream movement from zone to zone; and
- Movement past barriers.

4.0 RESULTS

Section 4.1 provides a summary of movements observed for all active tags since the date of tagging to October 2, 2023. Appendix A1 provides farthest upstream and downstream detection locations by river kilometre for each tagged fish (2011–2023) while Appendices A2 and A3 provide movement summaries, by river kilometre, for each tagged sturgeon since the study began in June 2011. Appendices A4 and A5 illustrate movement ranges and detection distributions for fish tagged upstream and downstream of the GS during each open-water season since 2011. Appendix 6 provides tagging and recapture information for Lake Sturgeon whose tags have now expired.

4.1 2011–2022 RESULTS SUMMARY

4.1.1 UPSTREAM OF THE KEEYASK GS

Thirty-one fish were tagged upstream of Gull Rapids (now referred to as the Keeyask GS) in 2011 and 2012, and four additional transmitters were applied in June 2014. One additional female used as broodstock was tagged in 2018 (with a smaller, three-year tag). None of these fish have been detected since 2021 and these tags are now expired. Tagging date, date of last detection, and subsequent recaptures for fish with expired tags are outlined in Appendix A6-1. Seven fish with expired transmitters (#16061, #16065, #16066, #16067, #16070, #16073, and #32176) have been recaptured since their last detection date.

Twenty-six tags were applied in spring 2019 and 23 in spring 2022 in the Keeyask reservoir to replace tags that had expired and fish that had moved downstream. Tagging date, biological information, and tag status is outlined in [Table 3](#).

Table 3: Tagging and biological information associated with adult Lake Sturgeon implanted with acoustic transmitters upstream of the Keeyask GS.

Tag ID	Date Tagged	Expiry Date	Status	Floy Tag	Fork Length	Total Length	Weight
7053	25/05/2019	22/05/2029	Active	114648	866	994	4,800
7056	25/05/2019	22/05/2029	Active	64726	1,217	1,346	-
7059	25/05/2019	22/05/2029	Active	86137	923	1,042	6,400
7065	28/05/2019	25/05/2029	Active	107113	1,034	1,145	8,165
7064	29/05/2019	26/05/2029	Active	114643	1,016	1,128	7,938
7066	29/05/2019	26/05/2029	Active	91376	880	1,010	5,897
7067	29/05/2019	26/05/2029	Active	46424	1,317	1,445	-
7018	05/06/2019	02/06/2029	Active	114248	825	907	3,629
7019	05/06/2019	02/06/2029	Active	76330	1,172	1,293	14,061
7033	05/06/2019	02/06/2029	Active	114777	868	981	4,990
7034	05/06/2019	02/06/2029	Active	77504	968	1,090	6,577
7061	05/06/2019	02/06/2029	Active	114776	930	1,058	5,897
7021	06/06/2019	03/06/2029	Active	91388	971	1,080	7,257
7022	07/06/2019	04/06/2029	Active	114774	1,020	1,142	7,257
7025	07/06/2019	04/06/2029	Active	114773	902	1,000	5,443
7017	08/06/2019	05/06/2029	Active	114771	949	1,160	7,257
7023	08/06/2019	05/06/2029	Active	114770	955	1,075	5,897
7024	08/06/2019	05/06/2029	Active	103456	953	1,070	6,350
7028	08/06/2019	05/06/2029	Active	79711	1,285	1,413	17,236
7031	08/06/2019	05/06/2029	Active	114772	920	1,040	6,804
7020	09/06/2019	06/06/2029	Active	105417	1,000	1,112	5,443
7026	09/06/2019	06/06/2029	Active	114769	1,070	1,173	8,165
7027	09/06/2019	06/06/2029	Active	50836	1,280	1,325	13,154
7029	09/06/2019	06/06/2029	Active	114768	1,135	1,259	9,525
7030	09/06/2019	06/06/2029	Active	64705	1,065	1,167	9,072
7032	09/06/2019	06/06/2029	Active	101388	890	1,000	4,990
57485	28/05/2022	25/05/2032	Active	112000	897	1,033	5,910
57478	29/05/2022	26/05/2032	Active	120437	962	1,062	6,400
57486	31/05/2022	28/05/2032	Active	121679	859	962	4,800
57480	02/06/2022	30/05/2032	Active	-	928	1,044	7,400
57483	02/06/2022	30/05/2032	Active	111971	1,081	1,157	9,500
57489	06/06/2022	03/06/2032	Active	121694	885	991	5,000
57492	06/06/2022	03/06/2032	Active	121693	911	1,001	5,050
57495	07/06/2022	04/06/2032	Active	121683	1,108	1,294	12,600
57494	08/06/2022	05/06/2032	Active	121696	954	1,100	5,750
57479	09/06/2022	06/06/2032	Active	119124	1,030	1,136	7,050

Table 3: Tagging and biological information associated with adult Lake Sturgeon implanted with acoustic transmitters upstream of the Keeyask GS (continued).

Tag ID	Date Tagged	Expiry Date	Status	Floy Tag	Fork Length	Total Length	Weight
57482	09/06/2022	06/06/2032	Active	105409	1,021	1,113	7,960
57488	10/06/2022	07/06/2032	Active	103474	834	936	5,300
57439	11/06/2022	08/06/2032	Active	121923	1,367	1,472	21,000
57491	11/06/2022	08/06/2032	Active	80299	1,125	1,229	9,700
57487	12/06/2022	09/06/2032	Active	76410	1,100	1,212	9,600
57490	12/06/2022	09/06/2032	Active	121922	1,325	1,404	19,100
57484	13/06/2022	10/06/2032	Active	111768	837	932	3,950
57481	14/06/2022	11/06/2032	Active	121919	1,040	1,177	10,810
57504	24/06/2022	21/06/2032	Active	117039	995	1,099	6,600
57506	24/06/2022	21/06/2032	Active	119116	900	1,000	4,100
57507	24/06/2022	21/06/2032	Active	75288	1,081	1,165	9,950
57505	28/06/2022	25/06/2032	Active	116621	841	933	4,350
57502	02/07/2022	29/06/2032	Active	117034	895	985	5,000
57497	27/05/2023	24/05/2033	Active	100416	940	1,092	8,180
57496	28/05/2023	25/05/2033	Active	128055	820	920	5,240
57499	28/05/2023	25/05/2033	Active	128056	805	905	5,290
57498	30/05/2023	27/05/2033	Active	48803	1,140	1,265	10,380
57500	30/05/2023	27/05/2033	Active	128057	885	971	5,830
57501	02/06/2023	30/05/2033	Active	128060	895	995	5,850
57503	02/06/2023	30/05/2033	Active	128051	885	1,000	6,850
7022b	06/06/2023	04/06/2029	Active	114765	1,016	1,130	8,618
51939	06/06/2023	03/06/2033	Active	107230	980	1,050	8,170
51942	06/06/2023	03/06/2033	Active	128061	1,000	1,109	8,140
51940	08/06/2023	05/06/2033	Active	94108	941	1,013	9,020
51953	08/06/2023	05/06/2033	Active	128058	960	1,090	8,320
51941	09/06/2023	06/06/2033	Active	225867	1,050	1,121	10,780
51952	10/06/2023	07/06/2033	Active	111990	835	937	5,740

Prior to winter 2022/2023, 20 fish moved downstream through the Keeyask GS into Stephens Lake:

- Thirteen fish moved downstream during the 2021 open-water period.
 - Three (#7020, #7024, and #7034) moved upstream out of the reservoir into Clark Lake in June 2021. All three fish returned downstream in July and were last detected immediately upstream of the Keeyask GS (rkm -2.5 and -2.2) between July 2 and 16, 2021.

- All fish were next detected in Stephens Lake immediately downstream of the spillway (rkm 0.8) in July (#7034) or September (#7020 and #7024) 2021.
- Three made a single upstream movement to Birthday Rapids during the spawning period, followed by a single downstream movement.
 - #7021 was located downstream of the spillway (rkm 0.8) on June 23, 2021.
 - #7026 returned to Gull Lake after the spawning period. It remained here until at least August 5, 2021, when it was last detected immediately upstream of the spillway. It was next detected downstream of the spillway on August 30, 2021.
 - #7066 was located in Stephens Lake (rkm 0.8) on September 13, 2021.
- Three moved into the middle Keeyask reservoir during the spawning period in 2021. They were last detected upstream of the Keeyask GS between June 17 and 23, 2021. Their next detection was downstream of the GS.
 - #7028 was detected downstream of the spillway on September 16, 2021.
 - #7030 was detected downstream of the powerhouse (rkm 1.2) on July 18, 2021.
 - #7061 was detected farther downstream in Stephens Lake (rkm 2.7) on June 23, 2021.
- One (#7017) made extensive movements within the reservoir, moving between lower Gull Lake and Birthday Rapids several times between May 21 and August 10, 2021. It was last detected in lower Gull Lake on August 10. It was first detected downstream of the spillway on September 16.
- Three remained within Gull Lake and did not show extensive movements prior to moving downstream. Each were last detected in lower Gull Lake in mid-June 2021.
 - #7025 was detected downstream of the spillway on September 12, 2021.
 - #7027 was detected downstream of the spillway on June 27, 2021.
 - #7031 was detected farther downstream in Stephens Lake (rkm 2.7) on June 14, 2021.
- One (#7032) was last detected in the Keeyask reservoir on June 28, 2021, upstream of the Keeyask GS (rkm -2.2). It was next detected in Stephens Lake on October 15 at rkm 3.9.
- Six moved downstream during the 2022 open-water period. All six fish survived passage and were detected in Stephens Lake during the 2023 open-water period.
 - #7019 was tagged on June 2, 2019, at the inlet to Gull Lake. It was regularly detected moving within Gull Lake until August 2022. It was last detected immediately upstream of the Keeyask GS spillway (rkm -0.8) on August 25, 2022.

It was next detected in Stephens Lake (downstream of the spillway at rkm 1.2) on September 12, 2022.

- #57478 was tagged on May 29, 2022, downstream of Birthday Rapids. It displayed movements within the reservoir until June 26, when it was last detected immediately upstream of the Keeyask GS spillway (rkm -0.8). It was next detected in Stephens Lake on July 17, 2022 downstream of the spillway (rkm 0.7).
- #57479 was tagged on June 9, 2022, at the inlet to Gull Lake. It moved within the reservoir until August 27, when it was last detected immediately upstream of the Keeyask GS spillway (rkm -0.8). It was next detected on September 7 in Stephens Lake immediately downstream of the spillway (rkm 0.7).
- #57495 was tagged on June 6, 2022, downstream of Birthday Rapids. It was detected in Gull Lake at rkm -2.1 on June 11, 2022. It was detected in Stephens Lake on July 16, 2022 at rkm 1.2.
- #57502 was tagged on July 2, 2022, within Gull Lake. It then moved upstream into Clark Lake before returning to the reservoir. It was last detected immediately upstream of the Keeyask GS spillway (rkm -0.8) on September 29, 2022 and was detected in Stephens Lake (rkm 5.4) on October 1, 2022.
- #57506 was tagged on June 24, 2022, in the middle Keeyask reservoir. It moved within this area until August 19, 2022 when it was detected immediately upstream of the Keeyask GS powerhouse (rkm -0.3). It was detected in Stephens Lake on August 20, 2022 in the middle of the river channel at rkm 1.2.

Two additional fish are considered missing (*i.e.*, have not been detected for more than a year) due to a lack of detections.

- #7053 was tagged at the inlet to Gull Lake (rkm -19.5) on May 25, 2019. It was detected in Gull Lake until June 13, 2021, when it moved upstream. It was last detected at the inlet to Clark Lake on June 23, 2021, and likely moved upstream past the array.
- #7056 was tagged at the inlet to Gull Lake (rkm -19.5) on May 25, 2019. It was detected regularly until July 11, 2021, when it was last detected in lower Gull Lake at rkm -3.8.

One transmitter (#7022) was returned by a local resource used in 2022. It is unclear where this fish was captured.

In summary, 49 adult Lake Sturgeon were tagged upstream of the Keeyask GS in 2019 and 2022. Twenty fish have moved downstream through the Keeyask GS, two fish are considered missing, and one fish was captured by a local resource user. Therefore, a total of 26 tagged sturgeon were available to be detected upstream of the Keeyask GS during winter 2022/2023.

Six additional Lake Sturgeon moved downstream through the Keeyask GS prior to the 2023 open-water period (described further in Section 4.2.1). An additional 14 adult Lake Sturgeon were

tagged in the Keeyask reservoir in spring 2023. Therefore, 34 adult Lake Sturgeon were available to be detected in the Keeyask reservoir during the 2023 open-water period.

4.1.2 STEPHENS LAKE

Twenty-eight fish were originally tagged in Stephens Lake in 2011 and 2012. Additional tags were applied in 2013 (n = 1) and 2014 (n = 7). Tags applied to fish in 2011, 2012, 2013, and 2014 in Stephens Lake have now expired. Tagging date, date of last detection, and subsequent recaptures for fish with expired tags are outlined in Appendix A6-2. Four fish (#16033, #16040, #16043, and #32170) have been recaptured during both adult and juvenile Lake Sturgeon adult populations studies in Stephens Lake since their last detection date.

Twenty-five tags were applied to adult Lake Sturgeon in Stephens Lake in spring 2019 to replace tags that had expired. Tagging date, biological information, and tag status is outlined in [Table 4](#).

Twenty fish moved into Stephens Lake from the Keeyask reservoir prior to winter 2022/2023 (described in Section 4.1.1). Eight of these 20 fish continued to move downstream through the Kettle GS.

- #7017 was detected in Stephens Lake from September 16 to October 28, 2021. It was detected downstream of the Kettle GS on October 29, 2021. It is unclear if this fish survived passage.
- #7020 was detected in Stephens Lake from September 17, 2021, to June 11, 2022. It was detected downstream of the Kettle GS from June 14 to 26, 2022. Multiple upstream and downstream movements in the Long Spruce reservoir indicate this fish survived passage. It was then detected downstream of the Long Spruce GS on August 31, 2022. It is unclear if this fish survived passage through the Long Spruce GS.
- #7021 was detected in Stephens Lake from June 23, 2021, to June 26, 2022. It was detected downstream of the Kettle GS from June 26 to July 10. Multiple upstream and downstream movements indicate this fish survived passage.
- #7025 was detected in Stephens Lake from September 12 to November 14, 2021. It was detected downstream of the Kettle GS from June 16 to 24, 2022. It was then detected downstream of the Long Spruce GS on July 9, 2022. Multiple upstream and downstream movements in the Limestone reservoir indicate this fish survived passage.
- #7026 was detected in Stephens Lake from August 30, 2021 to June 12, 2022. It was detected downstream of the Kettle GS from June 13 to July 3, 2022. It was then detected downstream of the Long Spruce GS on July 8, 2022. Multiple upstream and downstream movements in the Limestone reservoir indicate this fish survived passage.

- #7027 was detected in Stephens Lake from June 27, 2021, to June 30, 2022. It was detected downstream of the Kettle GS from July 1 to 17, 2022. It was then detected downstream of the Long Spruce GS on July 24, 2022. Multiple upstream and downstream movements in the Limestone reservoir indicate this fish survived passage.
- #7030 was detected in Stephens Lake from July 18 to November 5, 2021. It was detected downstream of the Kettle GS on November 6, 2021. Based on a lack of upstream movements in the Long Spruce reservoir, it is unclear if this fish survived passage.
- #7032 was detected in Stephens Lake from October 15, 2021 to June 19, 2022. It was detected downstream of the Kettle GS on June 25, 2022 and downstream of the Long Spruce GS on June 27, 2022. Based on a lack of upstream movements in the Limestone reservoir, it is unclear if this fish survived passage.

Six fish tagged in Stephens Lake moved downstream through the Kettle GS prior to winter 2022/2023.

- Four remained within the Long Spruce reservoir.
 - #7035 was tagged at rkm 1.3 on May 31, 2019. It was located regularly and was last detected in Stephens Lake on July 26, 2022. It was then detected downstream of the Kettle GS on July 26, 2022. Based on a lack of upstream movements, it is unclear if this fish survived passage.
 - #7038 was tagged at rkm 1.3 on May 31, 2019. It was located regularly and was last detected in Stephens Lake on June 27, 2022. It was detected downstream of the Kettle GS on June 28. Multiple upstream and downstream movements indicate this fish survived passage.
 - #7040 was tagged at rkm 1.3 on June 3, 2019. It was located regularly and was last detected in Stephens Lake on July 26, 2022. It was detected downstream of the Kettle GS on August 8, 2022. Based on a lack of upstream movements, it is unclear if this fish survived passage.
 - #7050 was tagged at rkm 1.2 on June 1, 2019. It was located regularly and was last detected in Stephens Lake on June 22, 2022. It was detected downstream of the Kettle GS on June 26, 2022. Based on a lack of upstream movements, it is unclear if this fish survived passage.
- Two continued moving downstream through the Long Spruce GS.
 - #7051 was tagged at rkm 1.2 on June 3, 2019. It was located regularly and was last detected in Stephens Lake on June 22, 2022. It was last detected downstream of the Kettle GS on June 23, 2022 and downstream of the Long Spruce GS on July 1, 2022. Based on a lack of upstream movements, it is unclear if this fish survived passage.

- #7052 was tagged at rkm 1.2 on June 3, 2019. It was located regularly and was last detected in Stephens Lake on July 1, 2022. It was detected downstream of the Kettle GS on July 4, 2022 and downstream of the Long Spruce GS on August 31, 2022. Based on a lack of upstream movements in the Limestone reservoir, it is unclear if this fish survived passage.

Three additional fish are considered missing (*i.e.*, have not been detected for more than a year) due to a lack of detections. These include two fish (#7024 and #7061) that moved downstream through the Keeyask GS.

- #7024 was first detected in Stephens Lake on September 28, 2021. It continued to move downstream, showing few upstream movements, and was last detected upstream of the Kettle GS on October 16, 2021. It is possible that this fish moved downstream through the Kettle GS.
- #7037 was tagged in Stephens Lake at rkm 1.3 on May 31, 2019. It was located regularly and was last detected in the middle of the lake (rkm 16.3) on September 30, 2021.
- #7061 was first detected in Stephens Lake on June 23, 2021. It was only detected on a single day and, based on a lack of upstream movements, it is unclear if this fish survived passage.

In summary, 25 adult Lake Sturgeon were tagged in Stephens Lake in 2019. Twenty fish have moved downstream through the Keeyask GS, 12 of which remained in Stephens Lake. Six fish tagged in Stephens Lake moved downstream through the Kettle GS and three are considered missing. Therefore, total of 28 tagged sturgeon were available to be detected in Stephens Lake during winter 2022/2023.

Six additional Lake Sturgeon moved downstream through the Keeyask GS prior to the 2023 open-water period (described further in Section 4.2.1). Therefore, 34 fish were available to be detected in Stephens Lake during the 2023 open-water period.

Table 4: Tagging and biological information associated with adult Lake Sturgeon implanted with acoustic transmitters in Stephens Lake.

Tag ID	Date Tagged	Expiry Date	Status	Floy Tag	Fork Length (mm)	Total Length (mm)	Weight (g)
7035	31/05/2019	28/05/2029	Active	115802	1,086	1,206	9,072
7036	31/05/2019	28/05/2029	Active	100151	890	996	5,897
7037	31/05/2019	28/05/2029	Active	114626	896	994	5,670
7038	31/05/2019	28/05/2029	Active	114627	1,032	1,153	8,618
7039	03/06/2019	31/05/2029	Active	46844	1,115	1,230	11,340
7040	03/06/2019	31/05/2029	Active	114780	1,050	1,174	9,072
7041	31/05/2019	28/05/2029	Active	56152	1,090	1,211	10,886
7042	03/06/2019	31/05/2029	Active	114778	965	1,074	6,804
7043	15/09/2019	12/09/2029	Active	116091	1,060	1,182	-
7044	31/05/2019	28/05/2029	Active	88477	850	936	4,536
7045	12/09/2019	09/09/2029	Active	116010	830	921	4,850
7046	14/09/2019	11/09/2029	Active	91714	950	1,100	-
7047	31/05/2019	28/05/2029	Active	100162	830	917	4,536
7048	03/06/2019	31/05/2029	Active	69834	990	1,114	9,072
7049	03/06/2019	31/05/2029	Active	114781	931	1,035	6,350
7050	01/06/2019	29/05/2029	Active	114791	935	1,043	6,577
7051	03/06/2019	31/05/2029	Active	50808	1,371	1,510	19,504
7052	03/06/2019	31/05/2029	Active	93921	980	1,075	7,938
7054	03/06/2019	31/05/2029	Active	110710	1,003	1,123	8,618
7055	01/06/2019	29/05/2029	Active	114790	930	1,040	5,443
7057	03/06/2019	31/05/2029	Active	115843	893	1,021	5,443
7058	03/06/2019	31/05/2029	Active	115740	1,135	1,277	14,515
7060	03/06/2019	31/05/2029	Active	112911	820	910	3,402
7062	03/06/2019	31/05/2029	Active	110716	1,065	1,181	12,020
7063	03/06/2019	31/05/2029	Active	101041	830	951	4,536

4.2 WINTER 2022/2023

Sixteen of 17 receivers deployed between Clark Lake and the Keeyask GS during the 2022/2023 winter period were retrieved. A single receiver (#114235) set immediately upstream of the Keeyask GS powerhouse could not be located ([Map 3](#)). Sixteen of 17 receivers deployed in Stephens Lake were also retrieved. A receiver set in lower Stephens Lake at rkm 21.7 (#108002) could not be located ([Map 4](#)). The single receiver set downstream of the Kettle GS (#127100) could not be retrieved due to low water levels that prevented boat access during the 2023 open-water period.

4.2.1 UPSTREAM OF THE KEEYASK GS

Twenty-six adult Lake Sturgeon were available to be detected in the Keeyask reservoir during winter 2022/2023. Ten (38%) were located a total of 205,305 times (range: 6–64,714 detections per individual) (Appendix A1-2). Fish were detected on 1 to 193 days of the 217-day winter period (0–89% of the time) for an average of 85 days, or for 39% of the study period (standard deviation [StDev] = 75 days). The farthest upstream detections occurred at rkm -29.3 (by one fish; 11%), while the farthest downstream occurred at rkm -7.8 (by four fish; 44%) (Appendix A1-1). The average movement range was 1.8 rkm (range 0.0–7.2 rkm).

The majority of detections were logged by receivers located in the middle basin of Gull Lake at rkm -10.1 and -9.9 (n = 145,976; 71%; [Figure 3](#)). Individual movement graphs can be found in Appendix 2.

Six fish moved downstream through the Keeyask GS prior to or during winter 2022/2023. Because of the timing of detections, it is not clear when these fish passed through the GS. All six fish survived passage and were detected in Stephens Lake during the 2023 open-water period.

- #7018 was tagged at the inlet to Gull Lake (rkm -19.5) on June 5, 2019. It was regularly detected moving between Clark and Gull lakes until June 13, 2022, when it was last detected in lower Gull Lake at rkm -2.1. It was next detected in Stephens Lake on March 8, 2023, at rkm 5.4.
- #7029 was tagged at the inlet to Gull Lake (rkm -19.5) on June 9, 2019. It was last detected in the Keeyask reservoir on August 14, 2021, and has not been detected since. It was captured alive in Stephens Lake on June 1, 2023. Based on a lack of detections, it is likely that the tag has malfunctioned.
- #7059 was tagged in lower Gull Lake (rkm -8.2) on May 25, 2019. It was regularly detected moving between Clark and Gull lakes until August 7, 2022, when it was last detected upstream of the Keeyask GS spillway (rkm -0.8). It was next detected in Stephens Lake on May 22, 2023, at rkm 3.8.

- #7064 was tagged at the inlet to Gull Lake (rkm -19.5) on May 29, 2019. It was regularly detected moving between Clark and Gull lakes until July 15, 2022, when it was last detected upstream of the Keeyask GS powerhouse (rkm -0.3). It was next detected in Stephens Lake on May 19, 2023, at rkm 3.8.
- #57480 was tagged downstream of Birthday Rapids (rkm -33.5) on June 2, 2022. It was detected in Gull Lake until August 17, 2022, when it was last detected upstream of the Keeyask GS spillway (rkm -0.8). It was next detected in Stephens Lake on May 22, 2023, at rkm 3.8.
- #57491 was tagged in the middle Keeyask reservoir (rkm -20.5) on June 11, 2022. It moved between Clark and Gull lakes until July 28, 2022, when it was last detected upstream of the Keeyask GS spillway (rkm -0.8). It was next detected in Stephens Lake on July 9, 2023, at rkm 0.7.

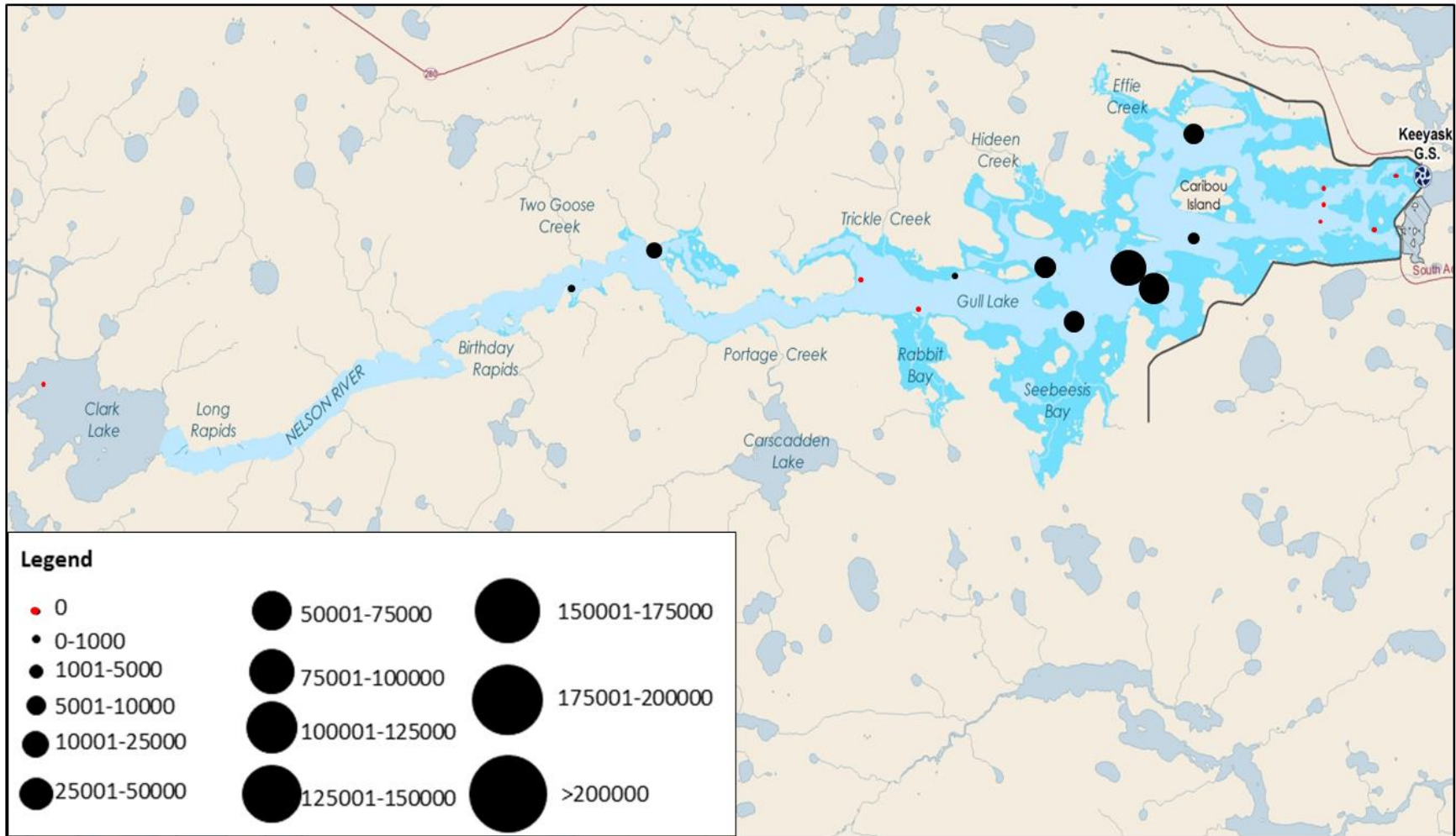


Figure 3: Relative number of detections at each acoustic receiver set between Clark Lake and the Keeyask GS during winter 2022/2023 (October 11, 2022 to May 15, 2023). Number of detections indicated by size of bubble (defined in legend). Receivers with no detections indicated with red dot.

4.2.2 STEPHENS LAKE

Twenty-eight adult Lake Sturgeon were available to be detected in Stephens Lake during winter 2022/2023. Eighteen (64%) were located for a total of 606,991 detections (range: 7–84,127 detections per individual) (Appendix A1-2). On average, fish were detected for 132 days of the 217-day winter period (61%) (range: 1–214 days). The farthest upstream detections occurred at rkm 3.8 (by nine fish; 50%), while the farthest downstream occurred at rkm 24.9 (by one fish; 1%). The average movement range was 5.1 rkm (range 0.0–12.8 rkm) (Appendix A1-2). Based on continued detections in Stephens Lake, none of the 18 fish moved downstream through the Kettle GS.

The majority of detections were logged by receivers located in the southern portion of Stephens Lake between rkm 4.6 and 5.9 (n = 302,015; 50%; [Figure 4](#)). Movements were as follows:

- Ten fish (56% of all fish detected) were detected exclusively in the upstream portion of Stephens Lake, moving no farther downstream than rkm 10.2.
- Four (22%) moved between the upstream and downstream portions of Stephens Lake, as far upstream as rkm 3.8 and as far downstream as rkm 18.2.
- Four (22%) remained in lower Stephens Lake, moving no farther upstream than rkm 12.0.

Individual movement graphs can be found in Appendix 3.

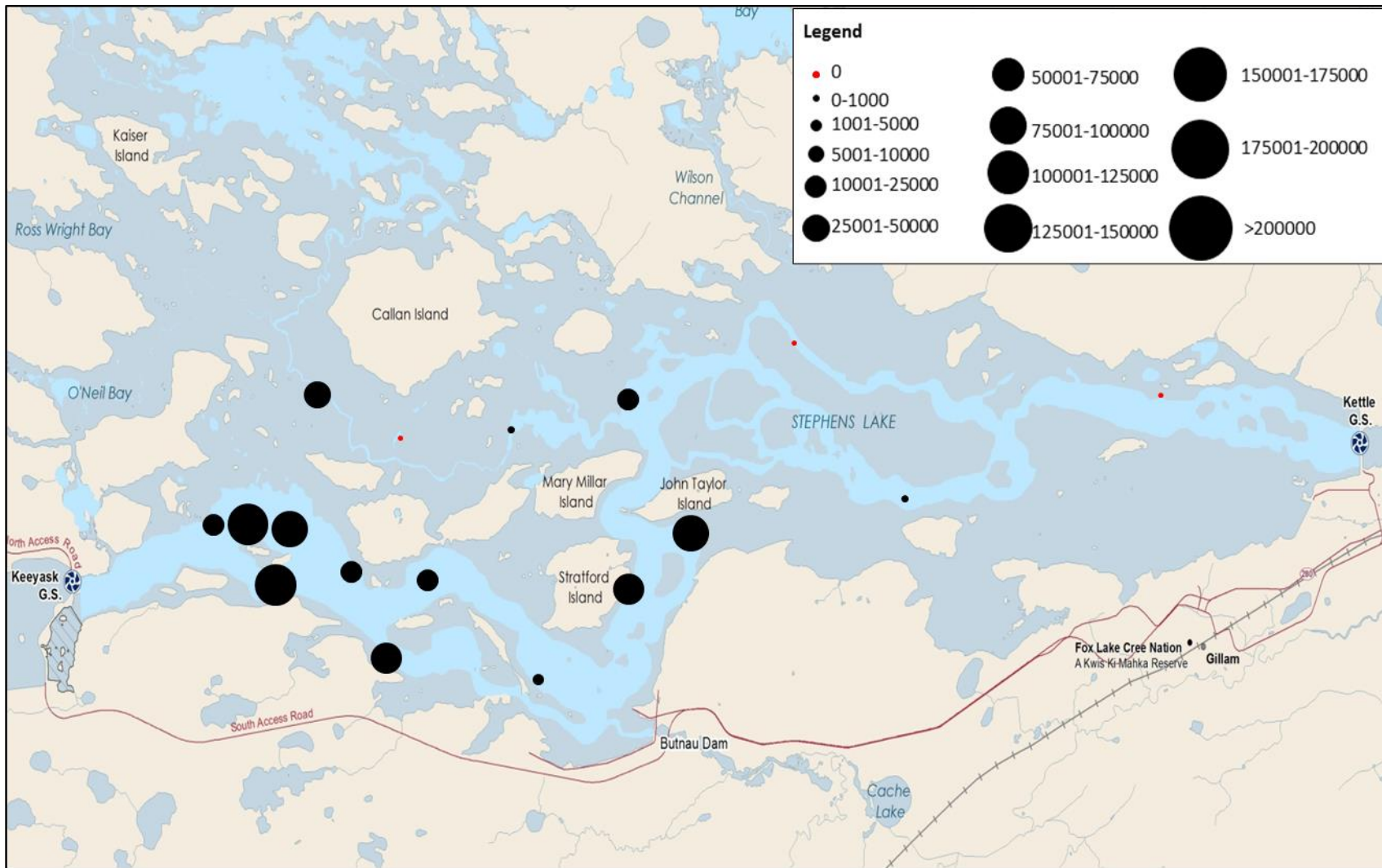


Figure 4: Relative number of detections at each acoustic receiver set in Stephens Lake during winter 2022/2023 (October 11, 2022 to May 15, 2023). Number of detections indicated by size of bubble (defined in legend).

4.3 OPEN-WATER 2023

All stationary acoustic receivers deployed upstream of the Keeyask GS (n = 33), in Stephens Lake (n = 33), and downstream of the Long Spruce GS (n = 2) during the 2023 open-water period were successfully retrieved (Maps 4, 5, and 6).

Water temperature, as measured in the Nelson River mainstem, reached 8°C on May 25, 2023, and increased to 14°C by June 6 (Figure 5). Based on these water temperatures, the time between May 24 and June 6 is referred to as the spawning period.

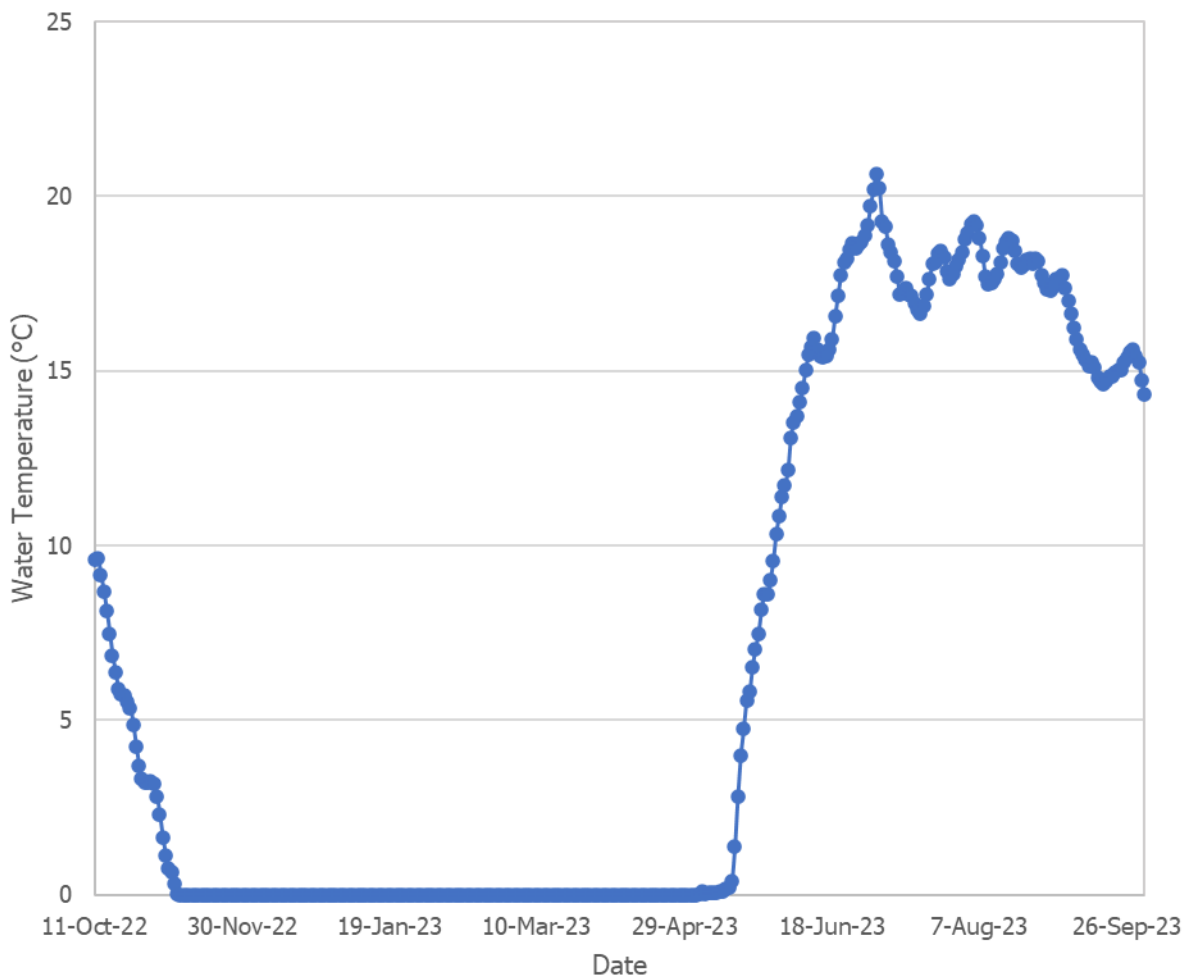


Figure 5: Water temperature in the Nelson River mainstem from October 11, 2022, to October 2, 2023.

4.3.1 UPSTREAM OF THE KEEYASK GS

Thirty-four adult Lake Sturgeon were available to be detected upstream of the Keeyask GS during the 2023 open-water period (Section 4.1.1). Thirty (88%) of these were detected between 116 and 44,615 times for 2–132 days of the 140-day study period (1–94% of the time) for an average of 65 days, or for 46% of the study period (standard deviation [StDev] = 14 days). The average total movement range was 24.2 rkm (StDev = 13.7 rkm; range: 1.3–66.4 rkm) (Appendix A1-3). The farthest upstream detections occurred at the inlet of Clark Lake at rkm -48.2 (by 15 fish; 50%). Four fish moved downstream through the Keeyask GS (discussed further in Section 4.3.1.2). Not including these fish, the farthest downstream detections occurred in lower Gull Lake immediately upstream of the spillway at rkm -0.8 (by four fish; 13%).

All four fish that were not detected were last located in Clark Lake in open-water 2022 and likely moved upstream past the receiver array.

- #57483 was tagged in the middle Keeyask reservoir (rkm -29.0) on June 2, 2022. It moved upstream and was last detected in Clark Lake on July 8, 2022.
- #57485 was tagged in the middle Keeyask reservoir (rkm -25.1) on May 28, 2022. It moved upstream and was last detected in Clark Lake on July 17, 2022.
- #57486 was tagged in the middle Keeyask reservoir (rkm -22.0) on May 31, 2022. It moved upstream and was last detected in Clark Lake on June 12, 2022.
- #57487 downstream of Birthday Rapids (rkm -33.7) on June 12, 2022. It moved upstream and was last detected in Clark Lake on June 28, 2022.

One fish with an active transmitter (#57505) was captured downstream of Birthday Rapids during adult Lake Sturgeon population monitoring conducted from May 24 to July 1, 2023. Capture details can be found in Dowd and Hrenchuk (2024a). Following capture, this fish moved upstream into Clark Lake and likely moved upstream past the receiver array.

Three additional fish (#32176, #16062, and #16066) with expired tags were captured during spring adult Lake Sturgeon population surveys. All three fish were last detected in the Keeyask reservoir in 2020 and 2021 but were recaptured in Stephens Lake in spring 2023 (additional capture details can be found in Dowd and Hrenchuk 2024a). Capture details for fish with expired tags can be found in Appendix 6.

4.3.1.1 PROPORTIONAL DISTRIBUTION

Individual adult Lake Sturgeon that remained in the Keeyask reservoir (not including the four fish that moved downstream through the Keeyask GS) spent a larger proportion of the open-water period in 2023 in Clark Lake (Zone 1) and the middle Keeyask reservoir (Zone 3) than in years prior to impoundment ([Table 5](#); [Figure 6](#)). The proportion of time spent in each zone was as follows:

- Zone 1 for 51% of the time (StDev = 43%; range: 0–100%);

- Zone 2 for 6% of the time (StDev = 13%; range: 0–56%);
- Zone 3 for 18% of the time (StDev = 25%; range: 0–79%);
- Zone 4 for 19% of the time (StDev = 31%; range: 0–100%);
- Zone 5 for 6% of the time (StDev = 17%; range: 0–85%); and
- Zone 5.5 for 0% of the time (SdDev = 1%; range:0–5%).

Table 5: Average proportion of time spent in each river zone by adult Lake Sturgeon tagged upstream of the Keeyask GS during a portion of the 2013 (June 4 to October 15), 2014 (June 4 to October 3), 2015 (June 4 to October 11), 2016 (June 4 to October 19), 2017 (June 7 to October 16), 2018 (June 6 to October 10), 2019 (June 2 to October 7), 2020 (July 3 to September 23), 2021 (June 13 to October 10), 2022 (June 4 to October 10), and 2023 (June 4 to October 2) open-water periods.

Study Year	Zone					
	1	2	3	4	5	5.5
2013	6.4	0.1	12.4	72.5	8.6	-
2014	9.0	0.1	10.8	52.3	27.7	-
2015	4.7	0.1	9.9	43.6	41.7	-
2016	7.3	0.1	12.1	56.5	24.1	-
2017	5.3	0.0	10.7	62.6	21.4	-
2018	7.4	0.1	14.8	48.5	29.2	-
2019	7.8	0.1	11.1	62.0	19.0	-
2020	2.0	0.1	9.9	66.2	21.8	-
2021	19.5	0.7	13.9	37.2	28.7	-
2022	29.5	3.1	27.6	20.1	15.1	4.5
2023	51.1	5.8	18.4	18.6	5.8	0.4

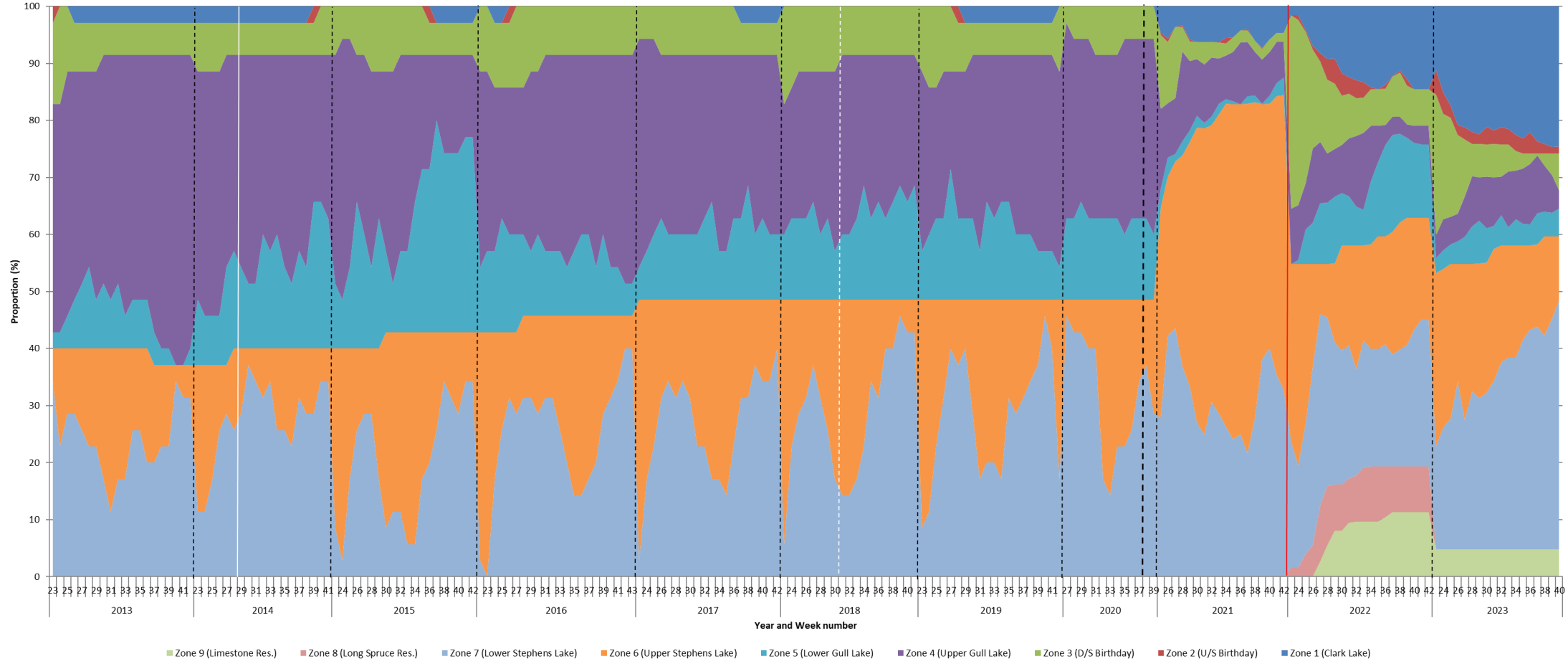


Figure 6: Proportional distribution by zone, for adult Lake Sturgeon tagged with acoustic transmitters in 2011 in the Keyyask GS Area during a portion of the 2013 (June 4 to October 15), 2014 (June 4 to October 3), 2015 (June 4 to October 11), 2016 (June 4 to October 19), 2017 (June 7 to October 16), 2018 (June 6 to October 10), 2019 (June 2 to October 7), 2020 (July 3 to September 23), 2021 (June 13 to October 10), 2022 (June 4 to October 10), and 2023 (June 4 to October 2) open-water periods. Black dashed lines indicate study years. Solid white line indicates start of Keyyask construction. Dashed white line indicates spillway commissioning. Thick black dashed line indicates end of reservoir impoundment. Solid red line indicated beginning of the operation period. Zones 5.5 and 6.5 were created in 2022 but were combined with zones 6 and 5 to remain consistent with previous monitoring years.

4.3.1.2 MOVEMENT PATTERNS

During the 2023 open-water period, most detections were logged at the inlet to Clark Lake (rkms -44.0 to -44.5; n = 57,775; 22%; [Figure 7](#)), the middle Keeyask reservoir (rkm -26.4; n = 54,358; 20%), the middle of Gull Lake (rkm -9.9 to -10.1; n = 60,331; 23%), and in lower Gull Lake north-west of Caribou Island (rkm -8.9; n = 18,062; 7%). As observed in both 2021 and 2022, individual Lake Sturgeon generally moved farther compared to the habitual movement patterns shown pre-impoundment.

Three fish (#57481, #57493, and #57504) remained in Gull Lake for the entire study period, moving no farther upstream than the inlet to Gull Lake (-19.5).

Seven fish (#7065, #51940, #57496, #57497, #57498, #57501, and #57503) moved throughout the reservoir, moving as far upstream as Birthday Rapids and as far downstream as the area immediately upstream of the Keeyask GS.

Sixteen fish moved upstream into Clark Lake. All of these fish were last detected in Clark Lake and likely moved upstream past the receiver array prior to the end of the open-water period.

- Three were only detected within Clark Lake
 - Two (#7033 and #57492) were detected briefly (on two and 12 days, respectively), and spent the majority of the time upstream of the receiver array.
 - One (#57507) was detected for the majority of the study period (112 days) within Clark Lake.
- Eleven were detected between the inlet of Clark Lake (rkm -48.2) and the middle Keeyask reservoir downstream of Birthday Rapids (as far downstream as rkm -22.6).
 - Five (#51939, #51952, #51953, #57500, and #7022b) were captured and tagged in the middle Keeyask reservoir in spring 2023. Each moved upstream into Clark Lake shortly after tagging.
- Two moved between Clark Lake and lower Gull Lake (as far downstream as rkm -2.1).
 - #7067 was first detected in Clark Lake on June 16, 2023. It moved downstream and was detected in lower Gull Lake on June 25, 2023. It returned to Clark Lake on June 29, 2023, and was last detected here on October 1, 2023.
 - #51942 was tagged in the middle Keeyask reservoir on June 6, 2023. It moved between the middle Keeyask reservoir and lower Gull Lake until June 18, 2023 when it moved upstream into Clark Lake. It was last detected at the inlet of Clark Lake on July 3, 2023.

Four fish moved downstream through the Keeyask GS to Stephens Lake. The Keeyask GS spillway was open when all three fish moved downstream (Manitoba Hydro 2023) and it is likely that, based on the size of fish (*i.e.*, adult Lake Sturgeon are likely too large to fit through the Keeyask GS powerhouse trashracks) and the first location of detection in Stephens Lake (*i.e.*, downstream of the spillway channel), all three fish moved downstream past the spillway.

- Three displayed upstream and downstream movements within Stephens Lake, indicating they survived passage.
 - #7023 was tagged on June 8, 2019, downstream of Birthday Rapids. It was regularly detected moving within Gull Lake until July 2, 2023, when it was detected in Clark Lake. It returned downstream and was last detected in lower Gull Lake (rkm -2.1) on July 12, 2023. It was next detected in Stephens Lake on August 2, 2023 downstream of the spillway at rkm 1.2.
 - #57489 was tagged on June 6, 2022, downstream of Birthday Rapids. It was regularly detected moving within Gull Lake until June 21, 2023, when it moved downstream. It was last detected in Gull Lake immediately upstream of the spillway (rkm -0.8) on June 26, 2023. It was next detected within Stephens Lake immediately downstream of the spillway (at rkm 0.7) on September 19, 2023. It is likely that this fish moved downstream through the spillway in June and remained in the area upstream of the first receiver in Stephens Lake until September.
 - #57494 was tagged on June 8, 2022, in the middle Keeyask reservoir. It was detected within the middle Keeyask reservoir until July 2, 2023, when it moved downstream. It was last detected in Gull Lake immediately upstream of the spillway (rkm -0.8) on July 6, 2023. It was next detected within Stephens Lake immediately downstream of the spillway (at rkm 0.7) on July 28, 2023.
- One moved downstream within five days of tagging. This movement is likely due to tagging stress.
 - #51941 was tagged on June 9, 2023, downstream of Birthday Rapids. It moved throughout Gull Lake until June 14, 2023 when it was last detected at rkm -2.1 in lower Gull Lake. It was detected within Stephens Lake on June 15, 2023. Based on a lack of upstream and downstream movements, it is unclear if this fish survived passage.

Individual movement graphs can be found in Appendix 2.

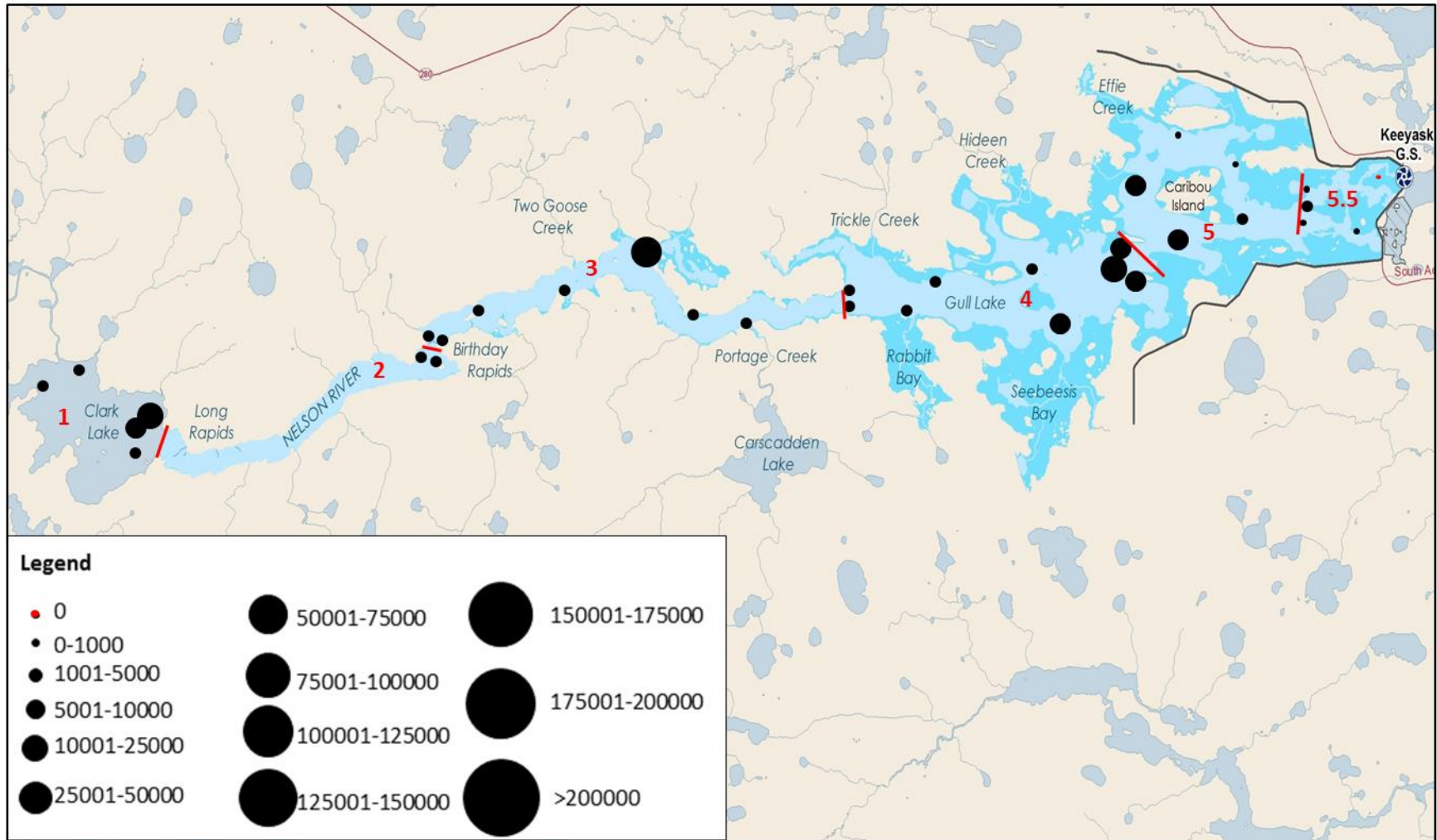


Figure 7: Relative number of detections at each acoustic receiver set in the Nelson River between Clark Lake and the Keyyask GS during the beginning of the 2023 open-water period (May 16 to October 2). Number of detections indicated by size of circle (defined in legend). The river is divided into five "zones" based on placement of receiver "gates".

4.3.1.3 SPAWNING MOVEMENTS

During the spawning period (May 25 to June 6, 2023), six fish (32% of the 19 fish detected during this time) were detected downstream of Birthday Rapids between rkms -33.9 and -32.2. A total of 1,744 detections (representing 10% of all detections) were logged in this area ([Figure 8](#)).

- Two (#57490 and #57494) fish made distinct upstream movements to Birthday Rapids and returned downstream to Gull Lake following the spawning period. It is likely that these movements were for spawning.
- #57498 was captured and tagged downstream of Birthday Rapids in spring 2023. It remained at Birthday Rapids until June 12 when it moved downstream to the middle Keeyask reservoir.
- Three (#7023, #57484, and #57488) continued to move upstream into Clark Lake and likely moved past the receiver array.

There is no evidence that fish moved upstream to Long Rapids to spawn.

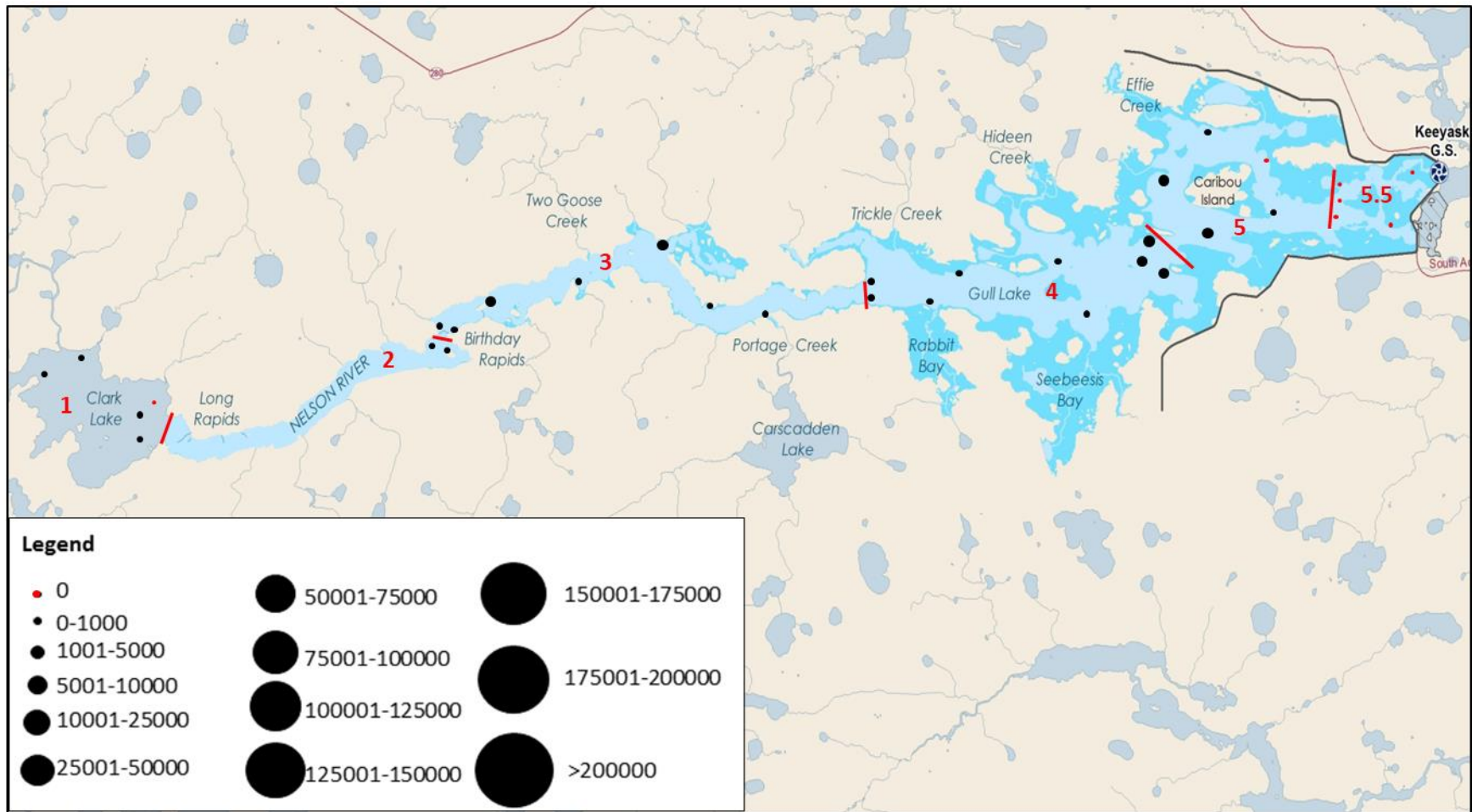


Figure 8: Relative number of detections at each acoustic receiver set in the Nelson River between Clark Lake and the Keyyask GS during the 2023 spawning period (May 25 to June 6). Number of detections indicated by size of circle (defined in legend). Receivers with no detections are indicated with a red dot. The river is divided into six "zones" based on placement of receiver "gates."

4.3.2 STEPHENS LAKE

Thirty-four adult Lake Sturgeon were available to be detected in Stephens Lake during the 2023 open-water period (Section 4.1.2). Thirty-one fish (91%) were detected between 1,549 and 45,447 times over 18–124 days of the 140-day open-water period (13–89% of the time; Appendix A1-4) for an average of 76 days, or for 54% of the study period (standard deviation [StDev] = 31 days). Mean movement range was 19.1 rkm (StDev = 9.9 rkm; range: 3.8–55.1 rkm). The farthest upstream detections occurred immediately downstream of the Keeyask GS spillway at rkm 0.7 (by 25 fish; 81%). One fish moved downstream through the Kettle and Long Spruce GSs (described further in Section 4.3.2.2). Not including this fish, the farthest downstream detections occurred in lower Stephens Lake at rkm 30.7 (by four fish; 13%).

Of the three fish that were not detected:

- One was originally tagged in Stephens Lake.
 - #7058 was tagged on June 3, 2019, in upper Stephens Lake (rkm 1.2). It moved between upper and lower Stephens Lake and was last detected on July 3, 2022, immediately upstream of the Kettle GS (rkm 38.4). It is possible that this fish moved downstream through the GS.
- Two were originally tagged in the Keeyask reservoir.
 - #7029 was last detected in the Keeyask reservoir on August 14, 2021, and has not been detected since. It was captured alive in Stephens Lake on June 1, 2023. Based on a lack of detections, it is likely that the tag has malfunctioned.
 - #7031 was tagged on June 8, 2019, at the inlet of Gull Lake (rkm -19.5). It was located regularly until June 13, 2021, when it was last detected in lower Gull Lake at rkm -2.1. It moved downstream through the Keeyask GS and was first detected in Stephens Lake on June 14, 2021. It was last detected in upper Stephens Lake (rkm 4.5) on September 1, 2022.

Eight fish with active acoustic transmitters were captured during adult Lake Sturgeon population monitoring conducted from May 24 to July 1, 2023 (Dowd and Hrenchuk 2024a).

- Five (#7034, #7064, #7066, #57478, and #57506) were originally tagged in the Keeyask reservoir.
- Three (#7036, #7057 [captured three times], and #7062) were originally tagged in Stephens Lake.

One fish with an expired acoustic transmitter (#16040) was also captured during adult Lake Sturgeon population monitoring (Appendix A6-2).

All six fish that moved downstream from the Keeyask reservoir into Stephens Lake in 2022 (#7019, #57478, #57479, #57495, #57502, and #57506) remained in Stephens Lake during the 2023 open-water period.

4.3.2.1 PROPORTIONAL DISTRIBUTION

Fish tagged in Stephens Lake (not including the three fish that moved downstream through the Keyyask GS or the one that moved through the Kettle GS) used all three zones of Stephens Lake ([Table 6](#)). The proportion of time spent in each zone was as follows:

- Zone 6.5 for 24% of the time (StDev = 31%; range: 0–100%);
- Zone 6 for 15% of the time (StDev = 16%; range: 0–65%); and
- Zone 7 for 61% of the time (StDev = 34%; range: 0–100%).

Table 6: Average proportion of time spent in each river zone by adult Lake Sturgeon tagged in Stephens Lake during a portion of the 2013 (June 4 to October 15), 2014 (June 4 to October 3), 2015 (June 4 to October 11), 2016 (June 4 to October 19), 2017 (June 7 to October 16), 2018 (June 6 to October 10), 2019 (June 2 to October 7), 2020 (July 3 to September 23), 2021 (June 13 to October 10), 2022 (June 4 to October 10), and 2023 (June 4 to October 2) open-water periods.

Study Year	Zone		
	6.5	6	7
2013	-	45.0	55.0
2014	-	38.2	61.8
2015	-	55.6	44.9
2016	-	41.8	59.2
2017	-	47.6	52.9
2018	-	47.4	53.3
2019	-	50.6	49.4
2020	-	44.2	55.8
2021	-	50.3	49.4
2022	26.3	17.3	56.4
2023	23.8	15.4	60.8

4.3.2.2 MOVEMENT PATTERNS

Most detections (n = 337,334; 85%) were logged by receivers located in the southern portion of Stephens Lake between rkms 0.7 and 10.2 during the 2023 open-water period ([Figure 9](#)).

Five fish (#7034, #7060, #7062, #57479, and #57491) remained within upper Stephens Lake (rkms 0.7 to 10.2) for the entire 2023 open-water period.

- Three were originally tagged upstream of the Keyyask GS and moved downstream into Stephens Lake in 2021 (#7034), 2022 (#57479) and between 2022 and 2023 (#57491).

One fish (#7043) remained in lower Stephens Lake for the entire study period, moving between rkm 14.4 and 21.7.

Twenty-four fish moved extensively within Stephens Lake.

- Twelve moved only as far downstream as rkm 18.2.
 - Five (#7019, #7059, #7064, #57480, and #57495) were originally tagged in the Keeyask reservoir and moved downstream between 2021 and 2023.
- Eight moved as far downstream as rkm 24.9.
 - Four (#7028, #7066, #57478, and #57506) were originally tagged in the Keeyask reservoir and moved downstream between 2022 and 2023.
- Four moved as far downstream as rkm 30.7.
 - Two (#7018 and #57502) were originally tagged in the Keeyask reservoir and moved downstream between 2022 and 2023.

One fish (#7042) moved downstream through the Kettle and Long Spruce GSs. This fish was tagged in Stephens Lake in 2019 and was regularly detected between rkms 0.8 and 18.0. It was last detected in lower Stephens Lake at rkm 21.7 on June 3, 2023. It was next detected in the Limestone reservoir on June 16. It was detected until June 20 and displayed upstream and downstream movements, indicating it survived passage.

Individual movement graphs can be found in Appendix 3.

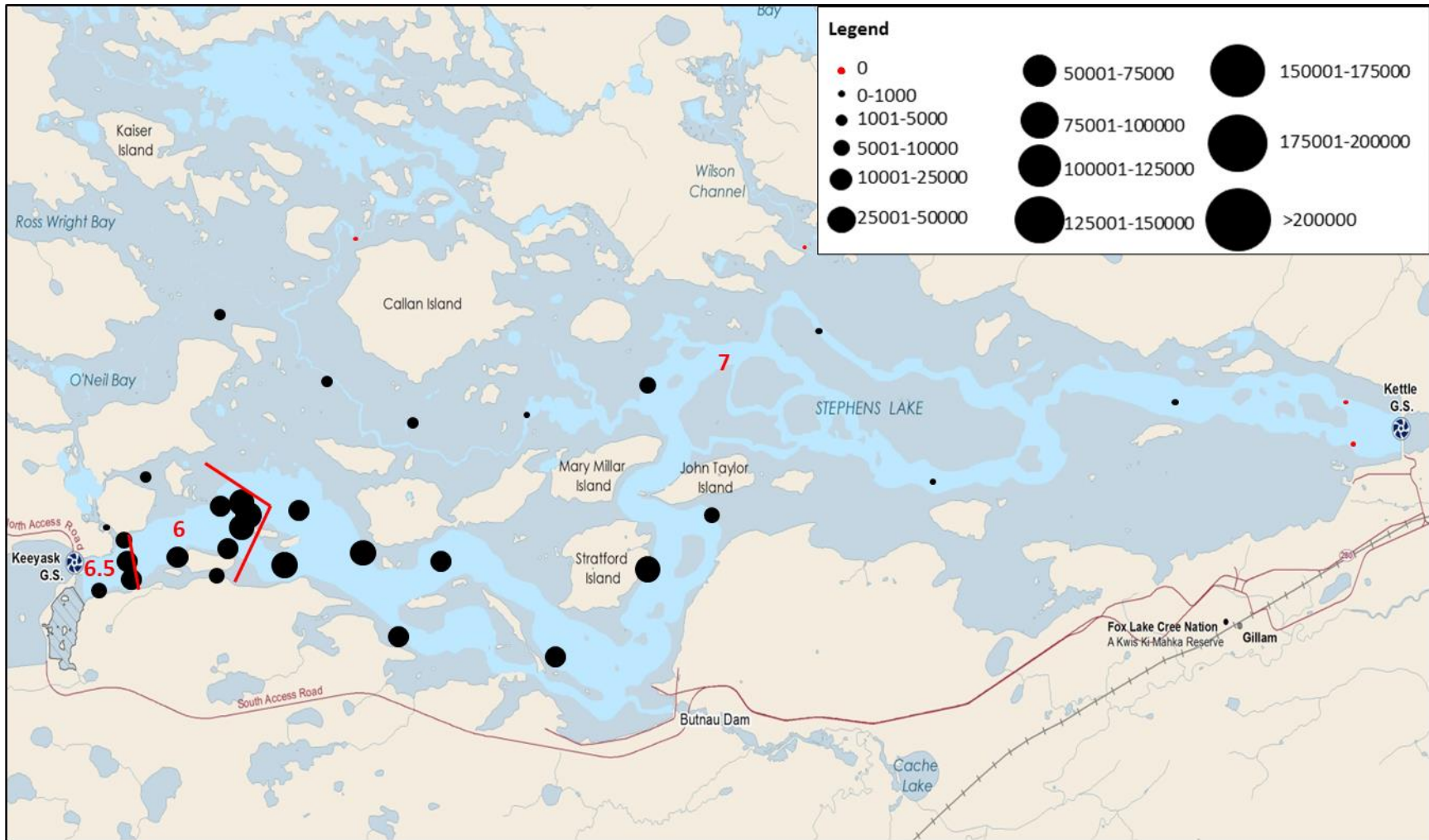


Figure 9: Relative number of detections at each acoustic receiver set in Stephens Lake during a portion of the 2023 open-water period (May 16 to October 2). Number of detections indicated by size of circle (defined in legend). Receivers with no detections are indicated with a red dot. The river is divided into three “zones” based on placement of receiver “gates.”

4.3.2.3 SPAWNING MOVEMENTS

During the spawning period (May 25 to June 6, 2023), 23 fish (77% of all fish detected during this time) were detected downstream of the Keeyask GS between rkms 0.7 to 1.2. A total of 3,852 detections (11%) were logged at the receiver located in the middle of the channel approximately 1.2 km downstream of the Keeyask GS (#122862; by 22 fish), while 3,042 detections (9%) were logged at the receiver on the south shore 1.2 km downstream of the spillway (#129183; by 21 fish; [Figure 10](#)). An additional 814 detections (2%) were logged at the receiver located closest to the tailrace (#129186; rkm 1.2; by 20 fish) while 933 detections (3%) were logged at the receiver located closest to the spillway (#127093; rkm 0.7; by 14 fish).

A total of 23 fish were detected within 1.2 rkm of the GS during the spawning period.

- Ten were originally tagged in Stephens Lake. All ten fish made distinct upstream movements to the GS. These movements are likely related to spawning.
- Thirteen were migrants from the Keeyask reservoir.
 - Six (#7018, #7034, #7064, #7066, #57480, and #57495) made distinct upstream movements to the GS during the spawning period.
 - Four (#7019, #7028, #7059, and #57479) made distinct upstream movements to the GS during the spawning period but remained within 1.2 rkm for the majority of the open-water period.
 - Three (#57478, #57502, and #57506) made multiple movements to the Keeyask GS throughout the open-water period in addition to those made during the spawning period.

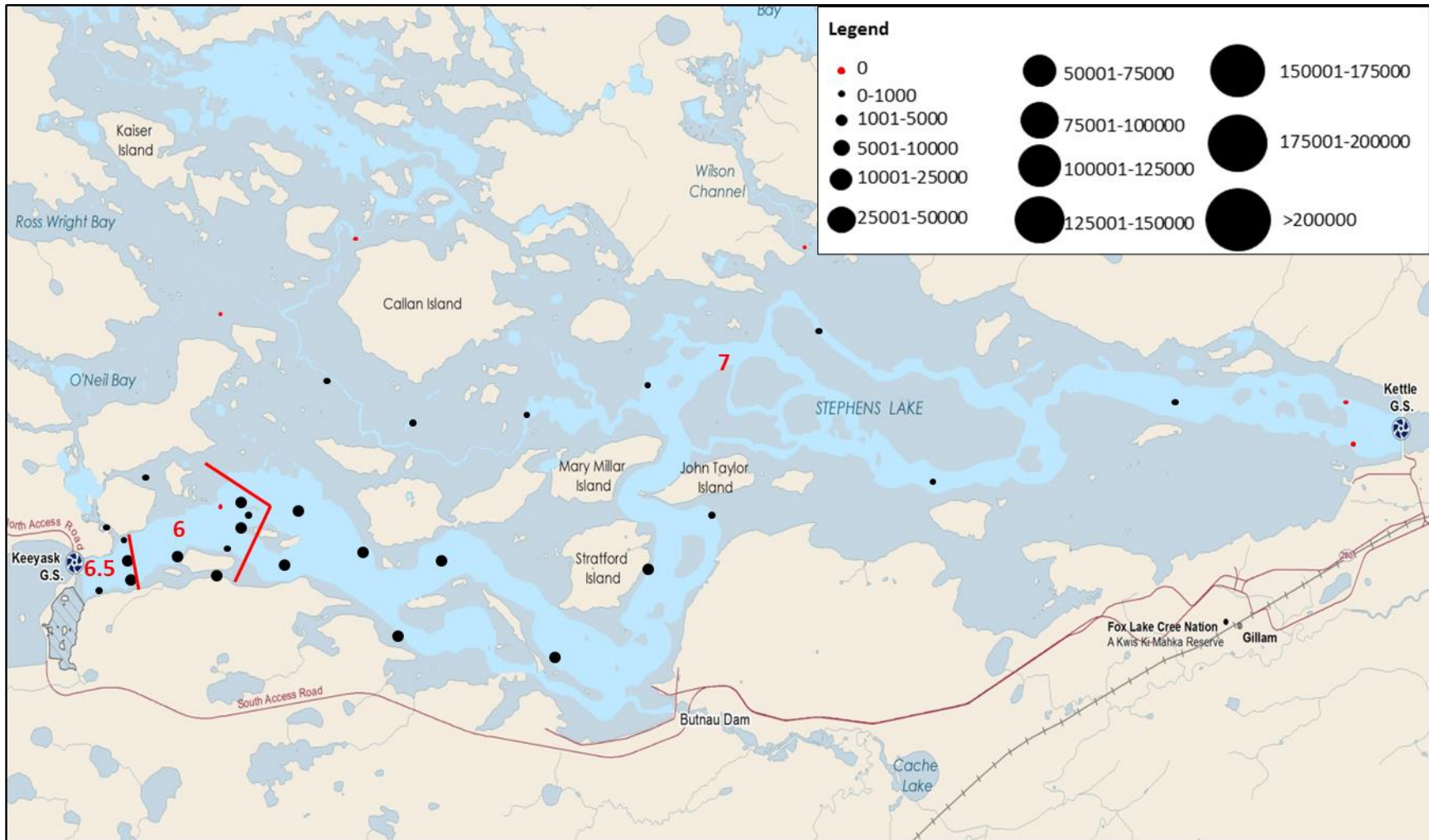


Figure 10: Relative number of detections at each acoustic receiver set in Stephens Lake during the 2023 spawning period (May 25 to June 6). Number of detections indicated by size of circle (defined in legend). Receivers with no detections are indicated with a red dot. The river is divided into three "zones" based on placement of receiver "gates."

4.3.3 LONG SPRUCE AND LIMESTONE RESERVOIRS

Fourteen fish moved downstream through the Kettle GS in 2021 and 2022, seven of which continued moving downstream through the Long Spruce GS. Due to low water levels that prevented boat access downstream of the Kettle GS throughout the open-water period, no acoustic receivers were set in or retrieved from the Long Spruce reservoir in 2023.

Two adult Lake Sturgeon last detected in the Long Spruce reservoir in 2021 and 2022 were detected in the Limestone reservoir in 2023.

- #7038 was detected downstream of the Kettle GS between June 28 and August 31, 2022. It was next detected downstream of the Long Spruce GS on July 14, 2023. It made multiple upstream and downstream movements indicating it survived passage.
- #7040 was detected downstream of the Kettle GS between August 8 and October 10, 2022. It was next detected downstream of the Long Spruce GS on June 24, 2023. It did not make any upstream movements and it is unclear if it survived passage.

One adult Lake Sturgeon last detected in the Limestone reservoir in 2023 was detected in the same location in 2022.

- #7027 was detected downstream of the Kettle GS from July 1 to 17, 2022. It was then detected downstream of the Long Spruce GS between July 24 and August 28, 2022. It remained in the Long Spruce reservoir and was detected from September 22 to 29, 2023. It made multiple upstream and downstream movements indicating it survived passage.

4.4 ADULT LAKE STURGEON DISTRIBUTION

Proportional distributions of fish during each open-water period since 2013 were compared, and the likelihood of fish movements between zones before construction, during construction, and after reservoir impoundment were calculated. The overall likelihood of a movement (either upstream or downstream) between zones was 12% prior to construction, 14% during construction, and 17% after reservoir impoundment ([Figure 11](#)). The likelihood of a fish moving upstream from one zone to another was 43% prior to the onset of construction, 45% during construction, and 37% after impoundment ([Figure 12](#)). The likelihood of a fish moving downstream from one zone to another was 57% before construction, 55% during construction, and 63% after impoundment ([Figure 13](#)).

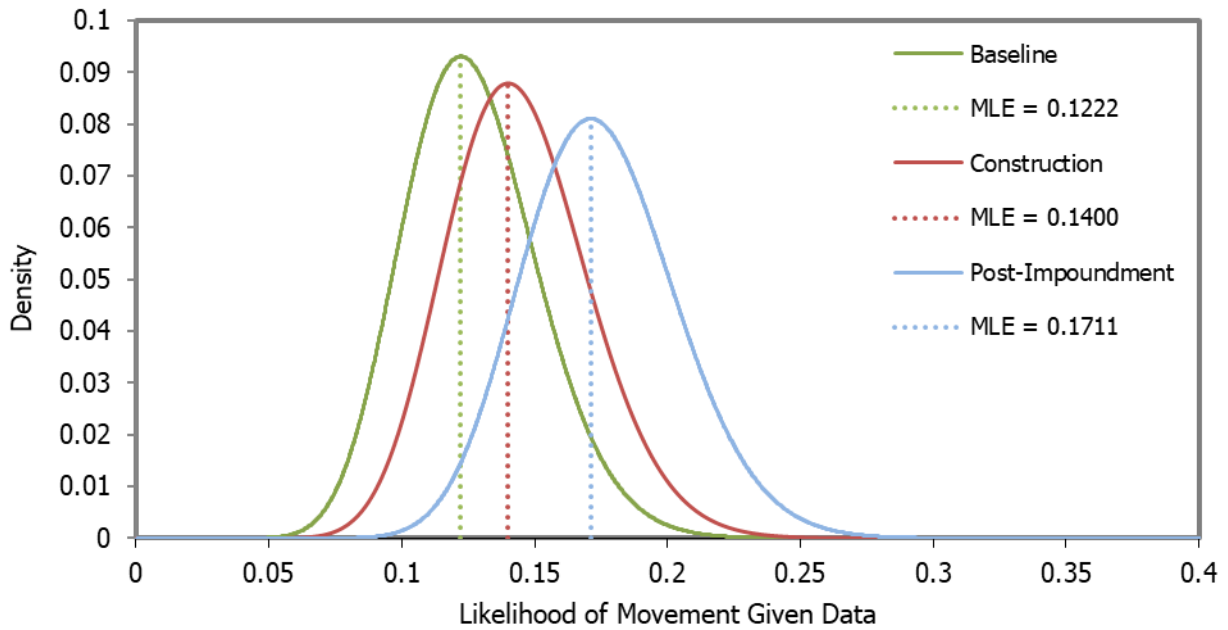


Figure 11: Likelihood of an adult Lake Sturgeon moving between river zones (either upstream or downstream) pre-construction (2011–2014), during construction (2014–2020), and post-impoundment (2020–2023).

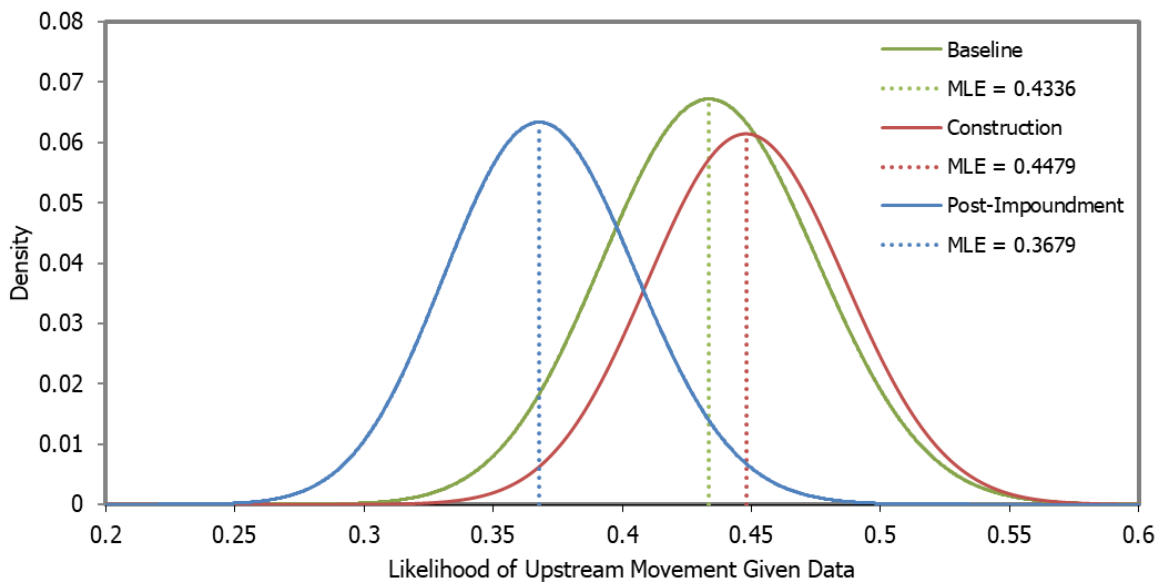


Figure 12: Likelihood that, if an adult Lake Sturgeon moves between river zones, the movement will be upstream pre-construction (2011–2014), during construction (2014–2020), and post-impoundment (2020–2023).

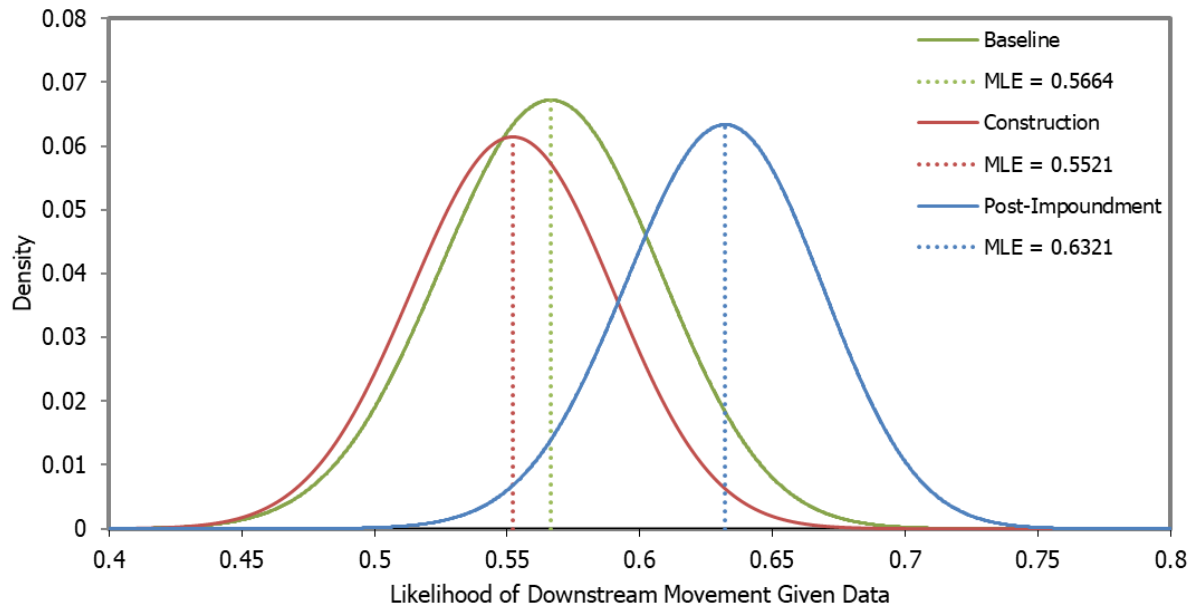


Figure 13: Likelihood that, if an adult Lake Sturgeon moves between river zones, the movement will be downstream pre-construction (2011–2014), during construction (2014–2020), and post-impoundment (2020–2023).

4.5 MOVEMENTS THROUGH BARRIERS

Prior to the onset of construction in 2014:

- Six movements through Gull Rapids/the Keeyask GS were observed.
 - Four fish (#16029, #16033, #16038, and #16046) tagged in Stephens Lake moved upstream through Gull Rapids and remained upstream in Gull Lake.
 - Two fish (#16025 and #16037) tagged in Stephens Lake moved upstream into Gull Lake and then returned to Stephens Lake.
- Three fish tagged in Stephens Lake (#16021, #16025, #16034) moved downstream through the Kettle GS.

During the construction period (2014–2020):

- Four fish moved downstream through Gull Rapids (#16060, #16048, #16076, and #32174).
- One fish moved downstream through the Kettle GS (#16035).
- Two fish moved downstream through the Long Spruce GS (#16021 and #16034).

Following impoundment of the Keeyask GS reservoir in fall 2020 (fall 2020–2023), 29 Lake Sturgeon moved downstream through the Keeyask GS into Stephens Lake, representing a large increase over all previous years.

- Thirteen moved in open-water 2021;
- One in winter 2021/2022;
- Six in open-water 2022;
- Six in winter 2022/2023; and
- Three in open-water 2023.

Fifteen fish moved downstream through the Kettle GS.

- Two moved in winter 2021/2022;
- Twelve during open-water 2022; and
- One during open-water 2023.

Eight fish continued to move downstream through the Long Spruce GS.

- Seven moved in open-water 2022; and
- One during open-water 2023.

The likelihood of a fish moving through Gull Rapids (now the Keeyask GS), Kettle GS, or the Long Spruce GS was calculated for the pre-construction (2011–2014), during construction (2014–2020), and post-impoundment (2020–2023) study periods. Prior to construction, there was a 2% chance that a fish would move past the rapids or a generating station, compared to a 1% chance after the onset of construction. Post-impoundment, this increased to a 10% chance ([Figure 14](#)).

All movements of adult Lake Sturgeon tagged with acoustic tags out of the Keeyask reservoir and Stephens Lake since 2011 are outlined in [Table 7](#) and Figures [15](#) and [16](#).

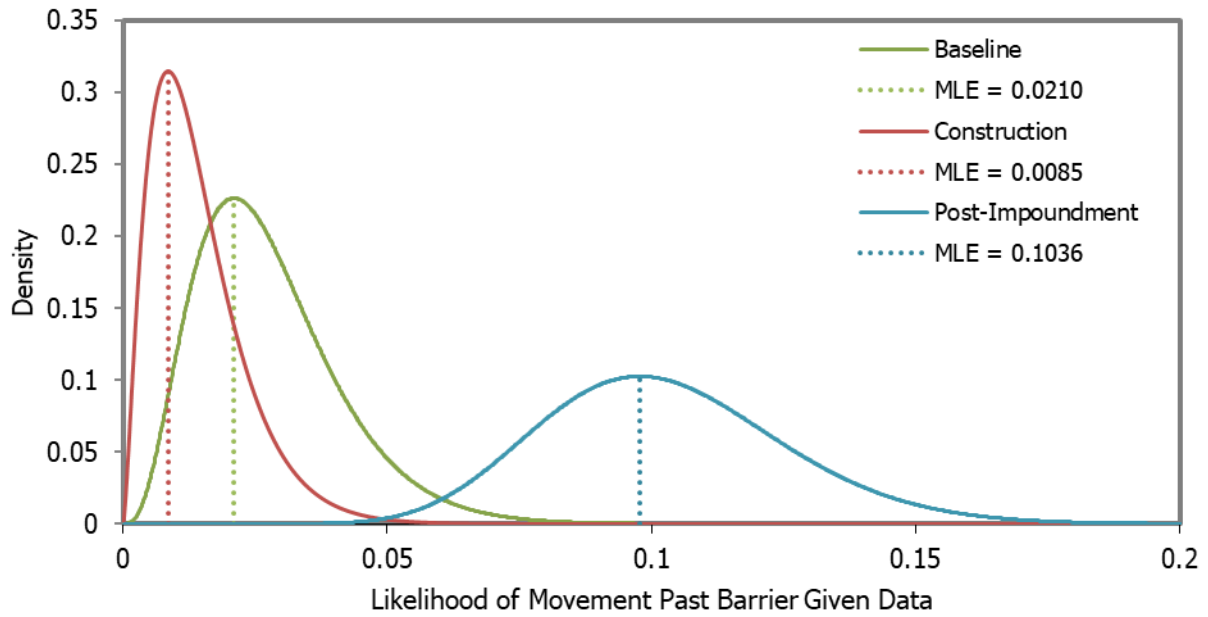


Figure 14: Likelihood of an adult Lake Sturgeon moving past a barrier (either Gull Rapids/the Keeyask GS, Kettle GS, or Long Spruce GS) pre-construction (2011–2014), during construction (2014–2020), and post-impoundment (2020–2023).

Table 7: Number of Lake Sturgeon tagged with acoustic and radio tags that moved upstream or downstream through the Keeyask GS site during studies conducted in 2001–2004 and 2011–2023.

Life Stage	Year ¹	# Tagged Fish		# Fish Detected		Downstream Movements			Upstream Movements		
		U/S ²	D/S ³	U/S	D/S	#	% total	% detected	#	% total	% detected
Adult ⁴	2001	21	11	21	11	1	4.8	4.8	0	0	0
	2002	19	12	19	10	0	0	0	3	25.0	30.0
	2003	21	9	20	4	1	4.8	5.0	0	0	0
	2004	19	9	16	4	0	0	0	0	0	0
	2011	30	19	28	19	0	0	0	1	5.3	5.3
	2012	32	27	30	27	0	0	0	4	14.8	14.8
	2013	35	22	28	19	0	0	0	1	4.5	5.3
	2014	34	24	33	24	2	5.9	6.1	0	0	0
	2015	32	25	28	25	1	3.1	3.6	0	0	0
	2016	32	26	29	26	2	6.3	6.9	0	0	0
	2017	30	28	26	27	1	3.3	3.8	0	0	0
	2018	28	28	28	28	0	0	0	0	0	0
	2019	54	53	54	51	0	0	0	-	-	-
	2020	54	52	48	51	0	0	0	-	-	-
	2021	44	41	41	39	14	31.8	34.1	-	-	-
	2022	34	44	29	41	12 ⁶	35.2	41.3	-	-	-
2023	34	33	30	31	3	8.8	10.3	-	-	-	
Juvenile ⁵	2013	20	20	18	20	0	0	0	0	0	0
	2014	20	20	20	19	0	0	0	0	0	0
	2015	20	20	19	19	0	0	0	0	0	0
	2016	20	20	19	19	0	0	0	0	0	0
	2017	20	18	18	13	0	0	0	0	0	0
	2018	20	19	20	14	0	0	0	0	0	0
	2019	20	14	17	13	1	5.0	5.9	-	-	-
	2020	19	13	17	12	0	0	0	-	-	-
	2021	19	13	19	12	3	15.7	15.7	-	-	-
	2022	30	40	29	27	4	13.3	13.8	-	-	-
2023	16	15	16	14	0	0	0	-	-	-	

1. Includes data from the current study (2011–2022), a study conducted between 2001 and 2004 (Barth and Mochnacz 2004; Barth 2005; Barth and Murray 2005; Barth and Ambrose 2006), and the juvenile Lake Sturgeon acoustic telemetry study initiated in Gull and Stephens Lake in 2013 (Hrenchuk and Barth 2014; Lacho *et al.* 2015, Lacho and Hrenchuk 2016; Lacho and Hrenchuk 2017; Lacho *et al.* 2018; Lacho and Hrenchuk 2019; Hrenchuk 2020; Hrenchuk 2021; and Funk and Hrenchuk 2022).
2. Upstream of Gull Rapids (between Clark Lake and Gull Rapids) now referred to as the Keeyask GS.
3. Downstream of Gull Rapids (in Stephens Lake between Gull Rapids and the Kettle GS) now referred to as the Keeyask GS.
4. Refers to fish greater than 800 mm fork length.
5. Refers to fish less than 800 mm fork length.
6. Includes six fish that moved downstream after the 2022 open-water period but before the 2023 open-water period.

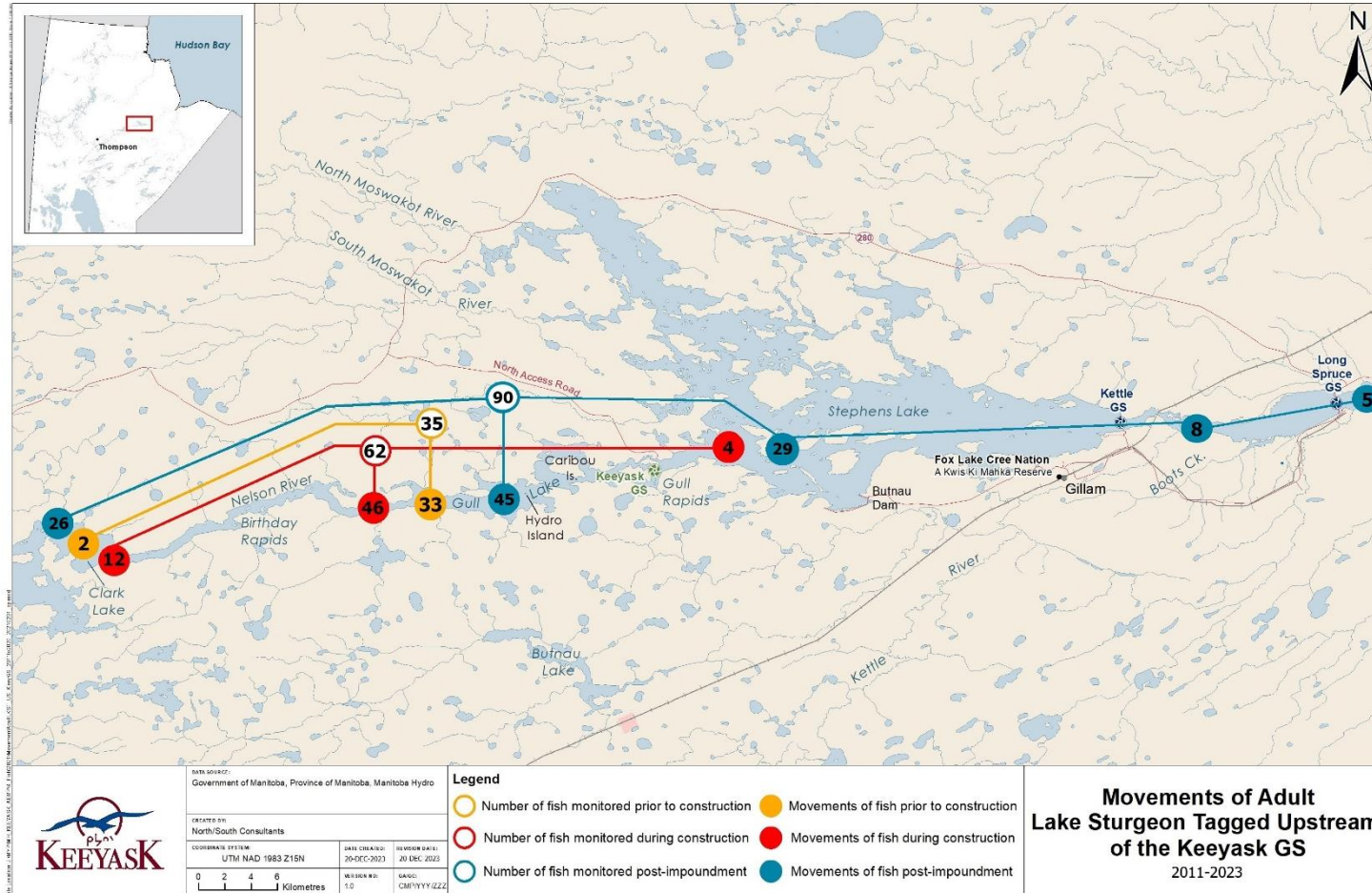


Figure 15: Map showing how many adult Lake Sturgeon tagged with acoustic tags moved upstream out of Gull Lake, stayed in Gull Lake, moved into Stephens Lake, and moved downstream through the Kettle GS before construction (yellow), during construction (red) and after reservoir impoundment (blue). Numbers of fish monitored (hollow circles) represent the number of fish tagged while the number of fish movements (solid circles) represent the number of fish detected. The total number of fish includes all fish tagged during a period although all fish may not have been trackable through the entire period.

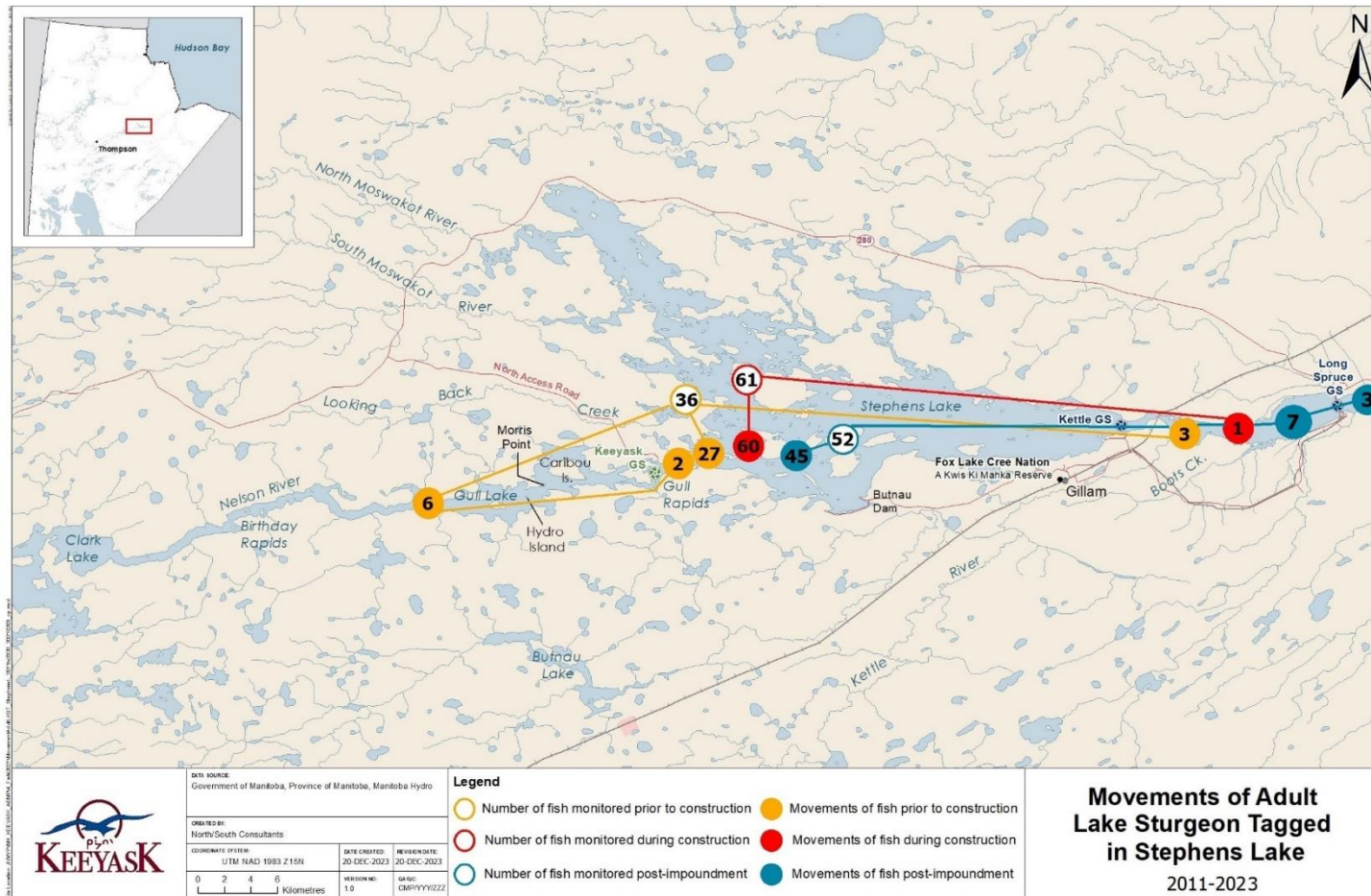


Figure 16: Map showing how many adult Lake Sturgeon tagged with acoustic tags stayed in Stephens Lake and moved downstream through the Kettle GS during before construction (yellow), during construction (red), and after reservoir impoundment (blue). Movements of fish due to tagging stress or mortality were not included. Numbers of fish monitored (hollow circles) represent the number of fish tagged while the number of fish movements (solid circles) represent the number of fish detected. Two fish moved upstream and then returned to Stephens Lake. The total number of fish includes all fish tagged during a period although all fish may not have been trackable through the entire period.

4.6 TAGGED LAKE STURGEON MOVEMENT SUMMARY

Since studies began in 2001, 7,199 Lake Sturgeon (including both adult and juvenile fish) have been tagged with Floy- and/or acoustic tags, including 2,713 in the Upper Split Lake Area (including the Nelson River downstream of the Kelsey GS, Split Lake, and the Burntwood River), 3,073 in the Keeyask reservoir, and 1,413 in Stephens Lake ([Table 8](#)).

4.6.1.1 BASELINE (2001–2013)

A total of 2,201 Lake Sturgeon were tagged with Floy-tags during the baseline period, including 977 in the Upper Split Lake Area, 965 in Gull Lake (now the Keeyask reservoir), and 259 in Stephens Lake ([Table 8](#)). Seventy-one of these fish were also tagged with acoustic transmitters (35 in Gull Lake and 36 in Stephens Lake). Most fish were recaptured (or located with acoustic receivers) in the same reach where they were tagged. Movements between Gull Lake and the Upper Split Lake Area, and Gull Lake and Stephens Lake were observed ([Figure 17](#)).

4.6.1.2 CONSTRUCTION (2014–2020)

A total of 3,116 Lake Sturgeon were tagged with Floy-tags during construction of the Keeyask GS, including 1,208 in the Upper Split Lake Area, 1,297 in Gull Lake (now the Keeyask reservoir), and 611 in Stephens Lake ([Table 8](#)). One-hundred and twenty-three of these fish were also tagged with acoustic transmitters (62 in Gull Lake and 61 in Stephens Lake). As during the baseline period, most fish were recaptured (or located with acoustic receivers) in the same reach where they were tagged. Several movements between each area were observed, although no Lake Sturgeon tagged in Stephens Lake were recaptured in the Upper Split Lake Area ([Figure 18](#)). Movements upstream from Stephens Lake were no longer possible following commissioning of the spillway in 2018.

4.6.1.3 POST-IMPOUNDMENT (2021–2023)

A total of 1,882 Lake Sturgeon were tagged with Floy-tags following impoundment of the Keeyask reservoir, including 528 in the Upper Split Lake Area, 811 in the Keeyask reservoir, and 543 in Stephens Lake ([Table 8](#)). One-hundred and forty-two of these fish were also tagged with acoustic transmitters (90 in the Keeyask reservoir and 52 in Stephens Lake). The majority of fish were recaptured (or located with acoustic receivers) in the same reach where they were tagged; however, more fish tagged in the Keeyask reservoir moved upstream into the Upper Split Lake Area and downstream into Stephens Lake than observed during the pre-impoundment and construction periods ([Figure 19](#)).

Of the 167 Lake Sturgeon that moved downstream through the Keeyask GS post impoundment, 118 were adults (measuring >800 mm FL) and 49 were juveniles. Due to the length of time between last capture and recapture, it is impossible to determine when most of these fish moved

downstream. However, 62 of these fish definitively moved downstream following impoundment, including 45 adult and 17 juvenile fish.

Table 8: Summary of the total number of Floy-tags applied to Lake Sturgeon and recaptured in the Upper Split Lake Area (USLA), Keeyask reservoir, and Stephens Lake during fisheries investigations from 2001 to 2023.

Year	USLA ¹				# Tags Applied	Keeyask reservoir ²			# Tags Applied	Stephens Lake				
	# Tags Applied	Recap Original Tagging Location				# Tags Applied	Recap Original Tagging Location			# Tags Applied	Recap Original Tagging Location			
		USLA	Keeyask reservoir	Stephens Lake			USLA	Keeyask reservoir			Stephens Lake	USLA	Keeyask reservoir	Stephens Lake
2001	35	-	-	-	82	-	-	-	4	-	-	-		
2002	19	-	-	-	53	-	15	-	4	-	-	-		
2003	0	-	-	-	75	-	15	1	22	-	1	3		
2004	3	2	-	-	36	-	15	-	2	-	-	3		
2005	63	3	-	-	0	-	-	-	4	-	-	2		
2006	140	11	1	-	310	-	25	-	20	-	2	7		
2007	123	23	1	-	0	-	-	-	0	-	-	-		
2008	0	-	-	-	121	1	32	-	0	-	-	-		
2009	59	48	-	-	0	-	-	-	12	-	-	-		
2010	29	10	-	-	112	-	22	1	42	-	2	8		
2011	270	37	-	-	7	-	19	-	62	-	-	6		
2012	40	14	-	-	166	-	41	-	81	-	1	16		
2013	196	63	4	-	3	-	-	-	6	-	-	-		
2014	42	40	2	-	264	3	83	1	44	-	1	11		
2015	224	72	4	-	116	1	22	-	41	-	-	11		
2016	32	2	-	-	192	1	89	2	102	-	2	33		
2017	271	114	5	-	131	1	37	-	77	-	12	59		
2018	63	5	-	-	287	-	91	-	211	-	9	105		
2019	427	145	8	-	165	2	76	-	83	1	13	127		
2020	149	19	-	-	142	1	61	-	53	2	7	80		
2021	0	-	-	-	275	4	156	1	121	1	28	173		
2022	528	162	22	-	186	2	60	-	207	1	51	74		
2023	0	-	-	-	350	3	64	-	215	-	59	51		
Total	2,713	770	47	0	3,073	19	923	6	1,413	5	188	769		

1. Upper Split Lake Area including the Nelson River downstream of the Kelsey GS and the confluence of the Grass River, Split Lake, and the Burntwood River including the confluence of the Odei River.
2. The Nelson River between the outlet of Clark Lake and Gull Rapids/the Keeyask GS.



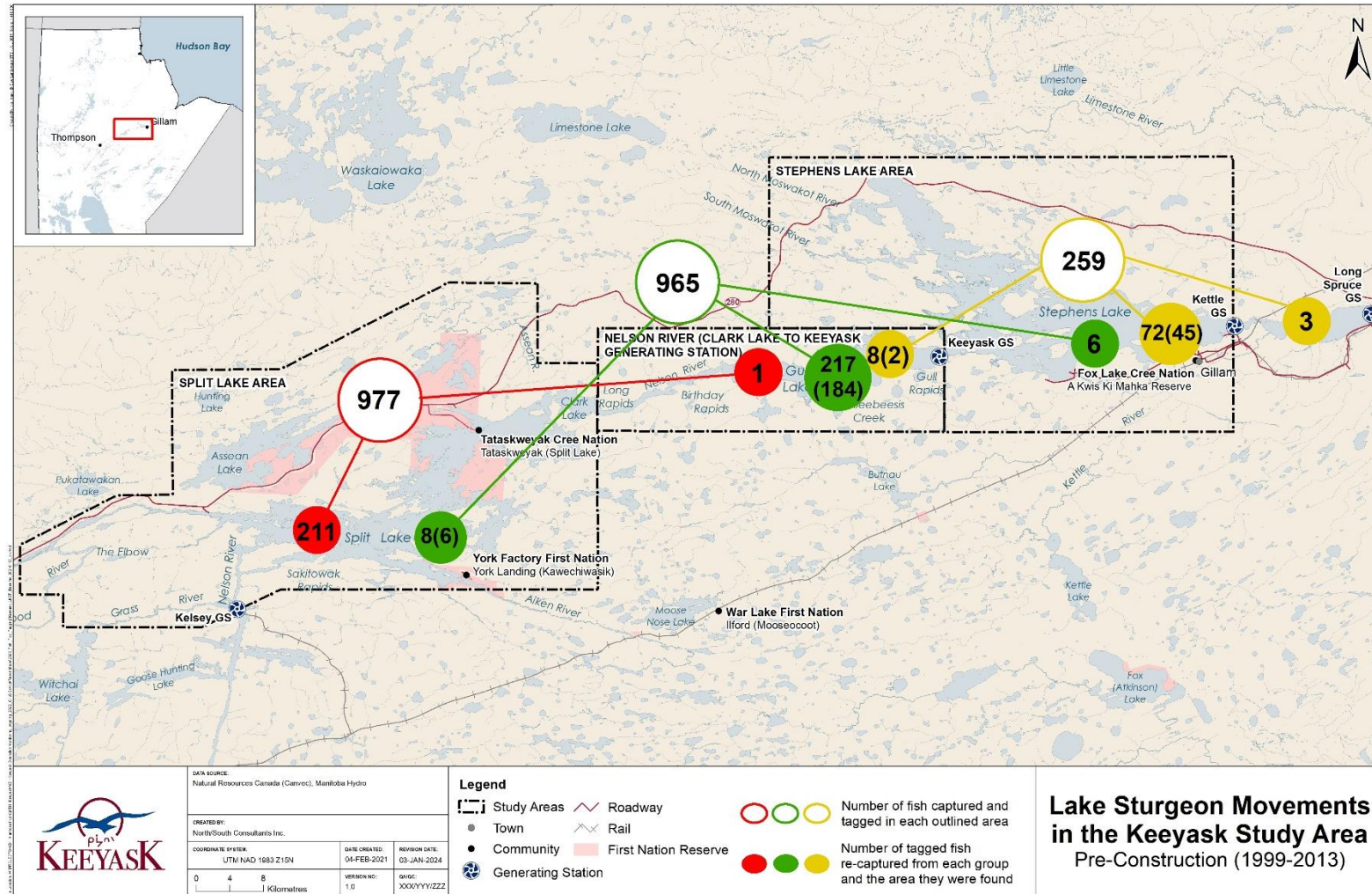


Figure 17. Movements of Lake Sturgeon tagged with Floy and acoustic tags in the Split Lake Area, the Nelson River between Clark Lake and Gull Rapids (now the Keeyask GS), and Stephens Lake prior to construction of the Keeyask GS (2001–2013). The number in the hollow circles is the number of fish tagged in each area while the number in the solid circles is the number of fish recaptured and detected with acoustic receivers. The number in brackets is the number of those that were recaptured.

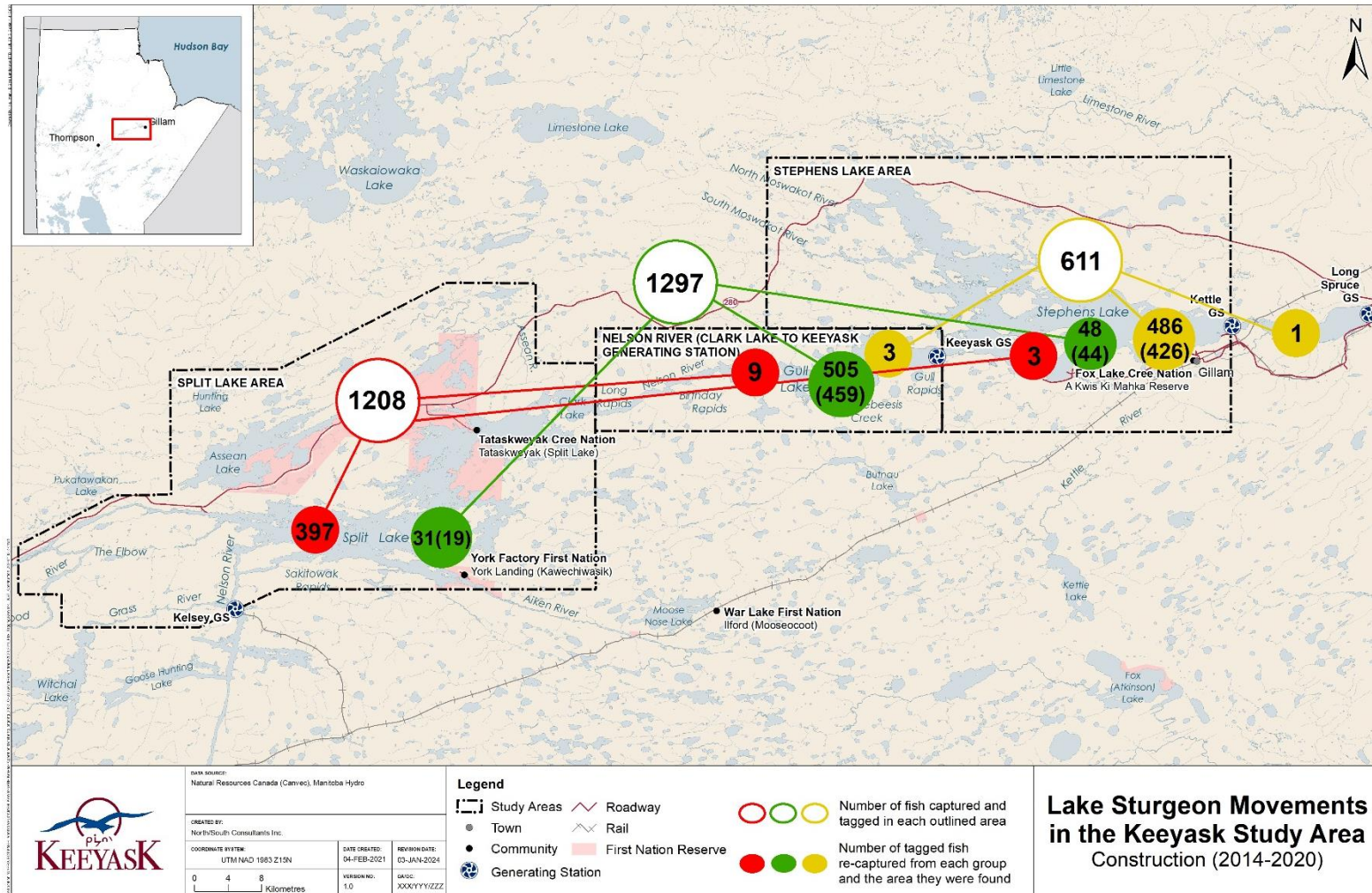


Figure 18. Movements of Lake Sturgeon tagged with Floy and acoustic tags in the Nelson River between Clark Lake and the Keyeyask GS construction site and Stephens Lake during construction of the Keyeyask GS (2014–2020). The number in the hollow circles is the number of fish tagged in each area, including fish acoustically tagged in 2013, while the number in the solid circles is the number of fish recaptured and detected with acoustic receivers. The number in brackets is the number of those that were recaptured.

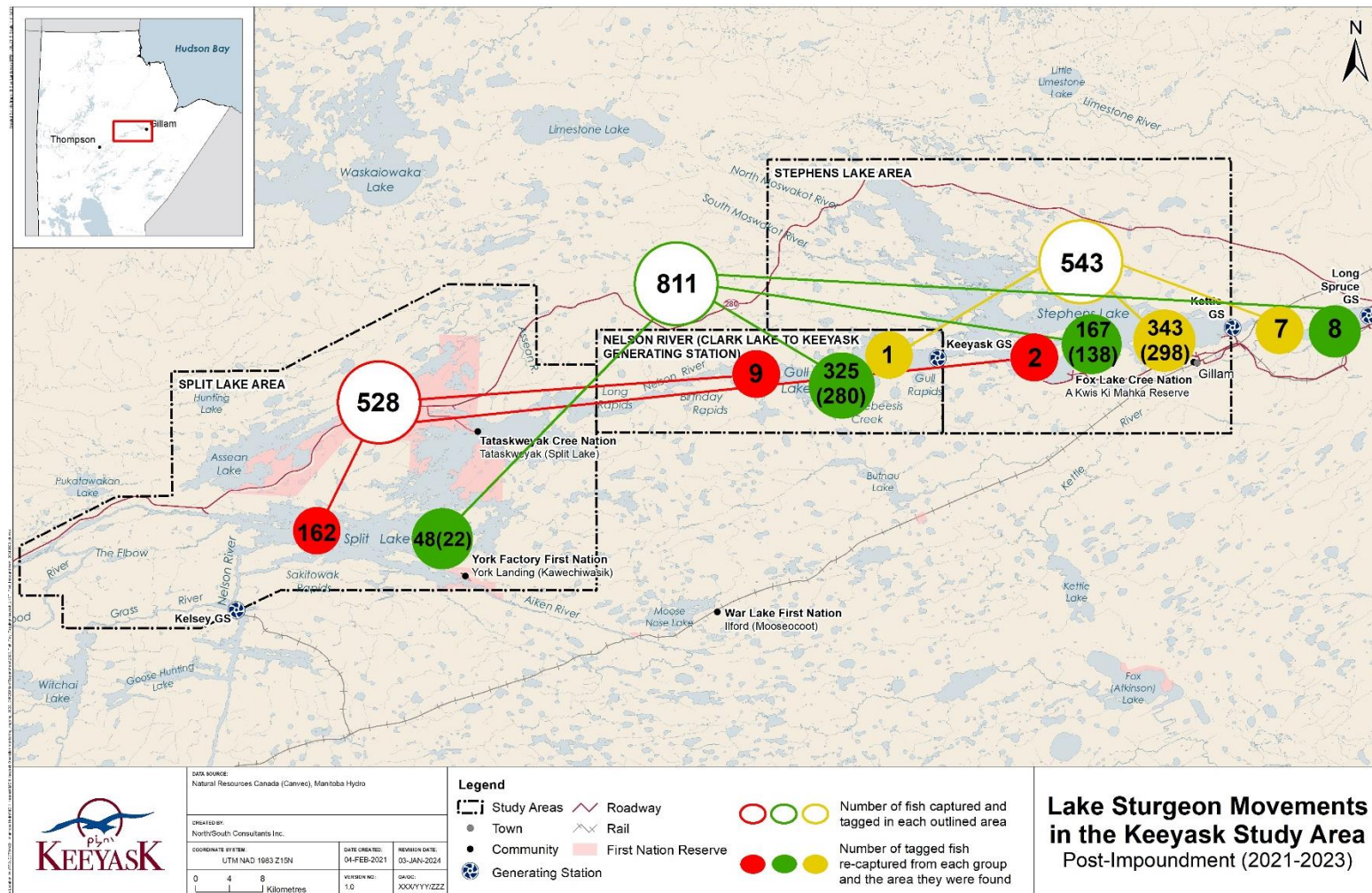


Figure 19. Movements of Lake Sturgeon tagged with Floy and acoustic tags in the Nelson River between Clark Lake and the Keeyask GS and Stephens Lake following impoundment of the Keeyask GS reservoir (2021–2023). The number in the hollow circles is the number of fish tagged in each area while the number in the solid circles is the number of fish recaptured and detected with acoustic receivers. The number in brackets is the number of those that were recaptured.

5.0 DISCUSSION

Adult Lake Sturgeon acoustic tracking was initiated in 2011 to describe movements during the pre-construction or baseline (2011–2013), construction/commissioning (2014–2021), and operation (2022 onward) periods of the Keeyask Project. The intent of the study was to determine if habitat changes associated with construction and operation of the GS would alter habitat use and coarse-scale movement patterns. The discussion below highlights movement patterns that have been observed and discusses the key questions (presented in the AEMP) with respect to potential impacts of construction and impoundment on adult Lake Sturgeon and their movements.

5.1 EVALUATION OF METHODOLOGY

Acoustic telemetry continues to be an effective method for monitoring movements and habitat use patterns of adult Lake Sturgeon in the Keeyask study area. During the 2023 open-water period, the majority of tagged fish remaining in the study area were located. Upstream of the Keeyask GS fish were detected for 47% of the 2023 open-water period (22–63% in previous years) and downstream in Stephens Lake fish were detected for 53% of the 2023 open-water period (34–77% in previous years). As a result of the frequency of detection in both Gull and Stephens lakes, a good understanding of coarse scale movement and habitat use patterns during the open-water period has been established.

5.2 KEY QUESTIONS

Key questions identified in the AEMP for the operation period are addressed below.

Will the frequency of long-distance movements (and subsequent downstream emigration/entrainment) by Lake Sturgeon increase during operation of the Project?

Prior to impoundment of the Keeyask reservoir, movements through Gull Rapids (or the Keeyask GS construction site) were rare. In all pre-impoundment study years (2011–2020), only six fish tagged with acoustic tags moved downstream through Gull Rapids: two before construction began in 2014, and four after (Figures [15](#) and [16](#)). Six fish moved upstream through Gull Rapids, all prior to construction. The Keeyask GS spillway was commissioned in August 2018, after which upstream movement was no longer possible. The EIS predicted Lake Sturgeon may emigrate upstream or downstream away from the Keeyask reservoir in response to habitat disturbances associated with impoundment. Post-impoundment data indicate that the number of adult Lake Sturgeon that have moved downstream through the Keeyask GS has increased, beginning in 2021. Since that time, 29 adult Lake Sturgeon tagged with acoustic transmitters have moved downstream from the Keeyask reservoir into Stephens Lake: 13 of 41 (32%) in open-water 2021, one of 13 (8%) in winter 2021/2022, six of 34 (18%) in open-water 2022, six of 26 (23%) in winter 2022/2023, and four of 30 (13%) in open-water 2023.

Mark-recapture data also suggest that the frequency of downstream movements past the Keeyask GS has increased. Prior to spring 2022, only a small proportion of adult fish recaptured in Stephens Lake (0–7%) were tagged in the Keeyask reservoir. Recaptures have increased to 47 fish in 2022 (27% of all captures) and 45 fish in 2023 (28% of all captures) (Ambrose *et al.* 2023; Dowd and Hrenchuk 2024a). Thirty-five of the recaptures in 2022 (20% of all captures) and 39 (25% of all captures) in 2023 were adult sized measuring >800 mm FL. Due to the length of time between last capture and recapture, it is impossible to determine when most of these fish moved downstream, or whether they moved through the powerhouse or the spillway. However, it is likely that adult-sized fish are too large to fit through the powerhouse trashracks and all downstream movements happen past the spillway. Eight fish captured in 2022 and ten fish captured in 2023 definitively moved downstream after impoundment, as their most recent capture in the Keeyask reservoir occurred after September 2020. The timing of movements of fish tagged with acoustic transmitters and the overall increase in the number of captures suggests that most of these movements occurred following reservoir impoundment.

Movements upstream out of the Keeyask reservoir have also increased since impoundment. In 2021, only two fish (5% of all detected) moved upstream through Clark Lake past the receiver array, while nine (31%) moved upstream in 2022, and 16 in 2023 (53%). Before construction began, two of the tagged fish (7%) moved from Gull Lake through Clark Lake, while twelve fish (19%) moved during construction. The increase was also reflected in Floy-tag recaptures from spring adult Lake Sturgeon population monitoring conducted in 2022 (Ambrose *et al.* 2023). Downstream of the Kelsey GS, 24% of previously tagged fish were last captured in Gull Lake (now the Keeyask reservoir). In previous years, fish from this area represented between 0 and 10% of recaptured fish.

Movements downstream out of Stephens Lake also increased following 2021; however, only a single fish moved downstream in 2023. Prior to construction, three fish tagged in Stephens Lake moved downstream through the Kettle GS. During construction a single fish moved downstream through the Kettle GS while two moved downstream through the Long Spruce GS. During the operation period, 15 fish moved downstream through the Kettle GS, two in winter 2021/2022, 12 during open-water 2022, and one during open-water 2023. Seven fish continued to move downstream through the Long Spruce GS. Eight fish that moved downstream through the Kettle GS (and five that moved through the Long Spruce GS) were originally tagged upstream of the Keeyask GS and moved downstream into Stephens Lake in 2021.

Maximum likelihood estimates were calculated based on movements observed during acoustic monitoring. If an adult Lake Sturgeon moved between river zones, the likelihood of it moving downstream out of the Keeyask reservoir or Stephens Lake was considerably lower prior to (2%) and during (1%) construction than in the two years following impoundment (10%).

Are fish moving downstream past the GS and, if so, is there an indication that they have survived passage?

Since impoundment, 30 adult Lake Sturgeon tagged with acoustic transmitters have moved downstream from the Keeyask reservoir into Stephens Lake: 13 in open-water 2021, one in winter 2021/2022, six in open-water 2022, six in winter 2022/2023, and four in open-water 2023. The

majority of these fish (29 of 30; 97%) have survived passage past the GS. Twenty-five fish that moved downstream prior to open-water 2023 and three that moved downstream in open-water 2023 displayed multiple upstream and downstream movements within Stephens Lake. One fish that moved downstream between 2022 and 2023 was not detected in Stephens Lake but was captured alive during adult Lake Sturgeon population monitoring (Dowd and Hrenchuk 2024a). The remaining fish was detected briefly in Stephens Lake but, based on a lack of upstream and downstream movements, it is unclear if this fish survived passage.

Fifteen adult Lake Sturgeon moved downstream through the Kettle GS: two in winter 2021/2022, 12 during open-water 2022, and one during open-water 2023. Eight fish continued to move downstream through the Long Spruce GS. Based on upstream and downstream detections downstream of the GS, it appears that at least eight fish (53%) survived passage through the Kettle GS and at least three (38%) survived passage through the Long Spruce GS.

Will there be a change in the proportional distribution of adult Lake Sturgeon following reservoir creation (i.e., will there be a population level shift in distribution patterns following reservoir creation)?

During the third full open-water period after reservoir impoundment, Lake Sturgeon tagged upstream of the GS spent less time in Gull Lake than in previous years. During the construction period (2014–2020), fish spent 78–88% of each open-water study period in Gull Lake (zones 4 and 5; [Map 5](#)). Following reservoir impoundment, the fish that remained upstream of the GS spent 66% of the time in this area in open-water 2021, 40% in 2022, and 25% in 2023. Fish spent a greater amount of time in Clark Lake (Zone 1; 51%) in 2023 than in any other open-water period.

In Stephens Lake, Lake Sturgeon continued to spend nearly equal amounts of time in the two zones closer to and farther from the GS. During the construction period (2014–2020), Lake Sturgeon spent 38–56% of the time in Zone 6 (closer to the GS) and 45–62% of the time in Zone 7 (farther from the GS; [Map 6](#)). Following impoundment, fish spent 39–50% of the time in Zone 6 (zones 6.5 and 6 in 2022 and 2023) and 49–60% of the time in Zone 7.

Are sturgeon congregating downstream of Birthday Rapids and the Keeyask GS during the spawning season or are they moving elsewhere?

Within the Keeyask reservoir, it was predicted in the EIS that habitat changes at Birthday Rapids following impoundment may make the area unsuitable for Lake Sturgeon spawning and that they may use Long Rapids as an alternative spawning area. Similar to other years, adult Lake Sturgeon were detected downstream of Birthday Rapids during the 2023 spawning period; 32% of detected fish (six of 19) were located near the base of the rapids. Two of these fish made distinct upstream movements out of Gull Lake to Birthday Rapids, and it is likely that these movement were related to spawning. Seven adult male Lake Sturgeon in spawning condition were captured immediately downstream of Birthday Rapids during population monitoring studies in 2023 (Dowd and Hrenchuk 2024a). Three fish were detected immediately upstream of Birthday Rapids during the spawning period, however, all three fish were detected in this area briefly and continued to move upstream into Clark Lake. This is similar to what was observed in 2022 and suggests that adult Lake Sturgeon have continued to spawn at Birthday Rapids following reservoir impoundment. A

single young-of-the-year Lake Sturgeon was captured during fall juvenile Lake Sturgeon surveys in 2023 (Dowd and Hrenchuk 2024b) further suggesting that spawning in the Keeyask reservoir occurred.

It was predicted in the EIS that Lake Sturgeon use of the river reach downstream of the Keeyask GS may change due to channeling flow through the GS and flow cycling. This might, in turn, lead to a loss of spawning habitat. Lake Sturgeon spawning shoals were constructed within the Keeyask GS tailrace to mitigate this impact. The Keeyask GS became fully operational prior to the spawning period in 2022. During this time, high water levels on the Nelson River necessitated the use of both the Keeyask spillway and powerhouse. A total of 76% of tagged fish were detected downstream of the GS in 2022, with the majority of the detections logged downstream of the spillway. Spawning adult fish were captured during spring (Ambrose *et al.* 2023) and wild young-of-the-year fish were captured in fall (Burnett *et al.* 2023), indicating that successful spawning occurred downstream of the GS during the first year of operation. In 2023, the Keeyask spillway gates were closed during the entire spawning period due to low water levels (Manitoba Hydro 2023). Despite these differences in operation, adult Lake Sturgeon were detected close to the GS during the spawning period in a similar proportion as 2022, with 77% of detected fish (23 of 30) detected within 0.7 to 1.2 km of the GS. The majority of detections were logged in the middle of the channel (receiver #122862 by 22 fish) and on the south shore (receiver #129183 by 21 fish) approximately 1.2 km downstream of the GS. Three male spawning-condition fish were captured downstream of the Keeyask GS in spring 2023 (Dowd and Hrenchuk 2024a) while two young-of-the-year fish were captured during fall (Dowd and Hrenchuk 2024b). Together, this suggests Lake Sturgeon have continued to use the area downstream of the Keeyask GS for spawning in both years since commissioning.

6.0 SUMMARY AND CONCLUSIONS

- Acoustic telemetry continues to be an effective method for monitoring adult Lake Sturgeon movement and habitat use. Movement monitoring is generally more effective during the open-water period relative to the winter period due to more locations where receivers can be effectively deployed. Adult Lake Sturgeon were detected for 39% of the 2022/2023 winter period and 47% of the 2023 open-water period upstream of the GS, and 61% of the winter period and 53% of the open-water period in Stephens Lake.
- The key questions, as described in the AEMP, for adult Lake Sturgeon movement monitoring during operation of the Keeyask GS were as follows:
 - *Will the frequency of long-distance movements (and subsequent downstream emigration/entrainment) by Lake Sturgeon increase during operation of the Project?*

Post-impoundment data indicate that the number of adult Lake Sturgeon that have moved downstream through the Keeyask GS has increased, beginning in 2021. Since that time, 30 adult Lake Sturgeon tagged with acoustic transmitters have moved downstream from the Keeyask reservoir into Stephens Lake: 13 of 41 (32%) in open-water 2021, one of 13 (8%) in winter 2021/2022, six of 34 (18%) in open-water 2022, six of 26 (23%) in winter 2022/2023, and four of 30 (13%) in open-water 2023.

Mark-recapture data also suggest that the frequency of long-distance movement and downstream movements past the Keeyask GS has increased. Prior to spring 2022, only a small proportion of adult fish recaptured in Stephens Lake (0–7%) were tagged in the Keeyask reservoir. Recaptures have increased to 47 fish in 2022 (27% of all captures) and 45 fish in 2023 (28% of all captures) (Ambrose *et al.* 2023; Dowd and Hrenchuk 2024a). Thirty-five of the recaptures in 2022 (20% of all captures) and 39 (25% of all captures) in 2023 were adult sized measuring >800 mm FL.

Movements upstream out of the Keeyask reservoir have also increased since impoundment. During the operation period, in 2021, two fish tagged with acoustic transmitters (5% of all detected) moved upstream through Clark Lake past the receiver array, while nine (31%) moved upstream in 2022, and 16 in 2023 (53%). Before construction began, two of the tagged fish (7%) moved from Gull Lake through Clark Lake, while twelve fish (19%) moved during the construction period.

Movements downstream out of Stephens Lake also increased following 2021. Prior to construction, three fish tagged in Stephens Lake moved downstream through the Kettle GS. During construction a single fish moved downstream through the Kettle GS while two moved downstream through the Long Spruce GS. During the operation period, 15 fish moved downstream through the Kettle

GS, two in winter 2021/2022, 12 during open-water 2022, and one during open-water 2023.

Maximum likelihood estimates were calculated based on movements observed during acoustic monitoring. If an adult Lake Sturgeon moved between river zones, the likelihood of it moving downstream out of the Keeyask reservoir or Stephens Lake was considerably lower prior to (2%) and during (1%) construction than in the two years following impoundment (10%).

- *Are fish moving downstream past the GS and, if so, is there an indication that they have survived passage?*

Since impoundment, 29 adult Lake Sturgeon tagged with acoustic transmitters have moved downstream from the Keeyask reservoir into Stephens Lake. The majority of these fish (29 of 30; 97%) have survived passage past the GS.

Fifteen adult Lake Sturgeon moved downstream through the Kettle GS. Eight fish continued to move downstream through the Long Spruce GS. Based on upstream and downstream detections downstream of the GS, it appears that at least eight fish (53%) survived passage through the Kettle GS and at least three (38%) survived passage through the Long Spruce GS.

- *Will there be a change in the proportional distribution of adult Lake Sturgeon following reservoir creation (i.e., will there be a population level shift in distribution patterns following reservoir creation)?*

During the third full open-water period after reservoir impoundment, Lake Sturgeon tagged upstream of the GS spent less time in Gull Lake than in previous years. During the construction period (2014–2020), fish spent 78–88% of each open-water study period in Gull Lake (zones 4 and 5). Following reservoir impoundment, the fish that remained upstream of the GS spent 66% of the time in this area in open-water 2021, 40% in 2022, and 25% in 2023. Fish spent a greater amount of time in Clark Lake (Zone 1; 51%) in 2023 than in any other open-water period.

In Stephens Lake, Lake Sturgeon continued to spend nearly equal amounts of time in the two zones closer to and farther from the GS. During the construction period (2014–2020), Lake Sturgeon spent 38–56% of the time in Zone 6 (closer to the GS) and 45–62% of the time in Zone 7 (farther from the GS). Following impoundment, fish spent 39–50% of the time in Zone 6 (zones 6.5 and 6 in 2022 and 2023) and 49–60% of the time in Zone 7.

- *Are sturgeon congregating downstream of Birthday Rapids and the Keeyask GS during the spawning season or are they moving elsewhere?*

Similar to other years, adult Lake Sturgeon were detected downstream of Birthday Rapids during the 2023 spawning period; 33% of detected fish (six of 18) were located near the base of the rapids. Two of these fish made distinct upstream movements out of Gull Lake to Birthday Rapids, and it is likely that

these movement were related to spawning. Seven adult male Lake Sturgeon in spawning condition were captured immediately downstream of Birthday Rapids during population monitoring studies in 2023 (Dowd and Hrenchuk 2024a).

In 2023, the Keeyask spillway gates were closed during the entire spawning period due to low water levels (Manitoba Hydro 2023). During this time, 77% of detected fish (23 of 30) were detected within 0.7 to 1.2 km of the GS. Most detections were logged in the middle of the channel and on the south shore approximately 1.2 km downstream of the GS. Three male spawning-condition fish were captured downstream of the Keeyask GS in spring 2023 (Dowd and Hrenchuk 2024a) while two young-of-the-year fish were captured during fall (Dowd and Hrenchuk 2024b).

- During the initial years of Project operation, the EIS predicted that increased numbers of Lake Sturgeon would leave the Keeyask reservoir (both upstream and downstream) leading to a decrease in population abundance. Movement monitoring using acoustic telemetry suggests that both upstream and downstream emigration has occurred. Prior to impoundment, six adult Lake Sturgeon moved downstream through Gull Rapids/the Keeyask GS since studies began in 2011. This number increased following reservoir impoundment: thirteen fish moved downstream through the Keeyask GS in 2021, one moved downstream in winter 2021/2022, six moved downstream in open-water 2022, six moved downstream in winter 2022/2023, and four in open-water 2023. Mark-recapture data also suggest that the frequency of long-distance movement and downstream movements past the Keeyask GS has increased. The number of movements upstream out of the Keeyask reservoir also increased in 2022. Before construction began, two fish (7% of tagged fish) moved upstream from Gull Lake through Clark Lake, while twelve fish (19%) moved during construction. Two fish (5%) moved upstream through Clark Lake in 2021, nine (31%) moved upstream in 2022, and 16 (53%) moved upstream in 2023.
- The EIS also predicted that habitat alterations would lead to a decrease in attraction and use of spawning habitat at Birthday Rapids and fish might move upstream to Long Rapids. Although there has been a reduction in the amount of white-water present, water velocities have remained high and six fish were detected downstream of Birthday Rapids during the 2023 spawning period. There was no evidence that fish moved upstream to Long Rapids. Similarly, the EIS predicted that Lake Sturgeon use of the river reach downstream of the Keeyask GS may change due to channeling flow through the GS and flow cycling. This might, in turn, lead to a loss of spawning habitat. Lake Sturgeon spawning shoals were constructed within the Keeyask GS tailrace to mitigate this impact. However, adult Lake Sturgeon were detected close to the GS during the spawning period in 2023.

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APPENDICES

APPENDIX 1: DETECTION SUMMARIES FOR LAKE STURGEON TAGGED AND MONITORED BETWEEN 2011 AND 2023

Table A1-1:	Detection summary for adult Lake Sturgeon tagged in 2019-2022 and monitored upstream of the Keeyask GS during the winter 2019/2020 (October 8, 2019 to April 30, 2020), 2020/2021 (September 24, 2020 to April 30, 2021), 2021/2022 (October 11, 2021 to May 15, 2022), and 2022/2023 (October 11, 2022 to May 15, 2023) periods.	76
Table A1-2:	Detection summary for adult Lake Sturgeon tagged in 2019 and monitored in Stephens Lake during the winter 2019/2020 (October 8, 2019 to April 30, 2020), 2020/2021 (September 24, 2020 to April 30, 2021), 2021/2022 (October 11, 2021 to May 15, 2022), and 2022/2023 (October 11, 2022 to May 15, 2023) period.	78
Table A1-3:	Detection summary for adult Lake Sturgeon tagged in 2019-2023 and monitored upstream of the Keeyask GS during the 2019 (June 1 to October 7), 2020 (May 1 to September 23), 2021 (May 1 to October 10), 2022 (May 16 to October 10), and 2023 (May 16 to August 10) open-water periods.	79
Table A1-4:	Detection summary for adult Lake Sturgeon tagged in 2019 and monitored in Stephens Lake during the 2019 (June 1 to October 7), 2020 (May 1 to September 23), 2021 (May 1 to October 10), 2022 (May 16 to October 10), and 2023 (May 16 to August 10) open-water periods.	81

Table A1-1: Detection summary for adult Lake Sturgeon tagged in 2019-2022 and monitored upstream of the Keeyask GS during the winter 2019/2020 (October 8, 2019 to April 30, 2020), 2020/2021 (September 24, 2020 to April 30, 2021), 2021/2022 (October 11, 2021 to May 15, 2022), and 2022/2023 (October 11, 2022 to May 15, 2023) periods. Tag ID highlighted red = moved downstream through Kettle GS. Tag ID highlighted purple = moved downstream through the Keeyask GS. Tag ID highlighted green = harvested by local fisher. Tag ID highlighted yellow = missing.

Tag ID	2019/2020					2020/2021					2021/2022					2022/2023				
	n	# Days	U/S (rkm)	D/S (rkm)	Range (rkm)	n	# Days	U/S (rkm)	D/S (rkm)	Range (rkm)	n	# Days	U/S (rkm)	D/S (rkm)	Range (rkm)	n	# Days	U/S (rkm)	D/S (rkm)	Range (rkm)
7017	24444	174	-10.3	-10.3	0.0	21752	152	-12.9	-10.1	-2.8	1856	15	3.9	45.7	41.8	-	-	-	-	-
7018	1121	19	-12.4	-10.3	2.1	18248	148	-19.5	-10.1	-9.4	9898	82	-26.4	-7.9	18.5	24494	70	5.4	8.3	2.9
7019	2600	35	-12.4	-10.3	2.1	19171	170	-12.9	-7.9	-5.0	27765	190	-19.5	-7.9	11.6	39668	190	3.8	8.3	4.5
7020	607	21	-12.4	-12.4	0.0	11929	122	-7.9	-7.9	0.0	34460	191	3.9	16.1	12.2	-	-	-	-	-
7021	25206	79	-29.4	-29.4	0.0	22928	95	-29.3	-29.3	0.0	23986	170	13.4	18.8	5.4	-	-	-	-	-
7022	456	2	-29.4	-29.4	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7023	8685	70	-10.3	-10.3	0.0	26264	191	-12.9	-10.1	-2.8	33022	171	-12.9	-10.1	2.8	57227	150	-12.5	-7.8	4.7
7024	27181	168	-10.3	-10.3	0.0	19880	107	-29.3	-7.9	-21.4	458	3	32.5	32.5	0.0	-	-	-	-	-
7025	3	1	-12.4	-12.4	0.0	3586	68	-12.9	-12.4	-0.5	1762	28	10.2	24.9	14.7	-	-	-	-	-
7026	2214	41	-12.4	-12.4	0.0	9317	174	-10.1	-10.1	0.0	46716	177	3.9	8.7	4.8	-	-	-	-	-
7027	11820	105	-10.3	-10.3	0.0	22856	174	-12.9	-2.2	-10.7	21889	161	3.9	32.5	28.6	-	-	-	-	-
7028	28985	177	-10.3	-10.3	0.0	25217	128	-12.4	-10.1	-2.3	58972	205	3.9	18.8	14.9	-	-	-	-	-
7029	99	18	-10.3	-10.3	0.0	7059	121	-12.9	-10.1	-2.8	-	-	-	-	-	-	-	-	-	-
7030	8152	60	-10.3	-10.3	0.0	8291	122	-12.9	-7.9	-5.0	2181	20	8.7	45.7	37.0	-	-	-	-	-
7031	27053	148	-10.3	-10.3	0.0	41670	199	-17.4	-10.1	-7.3	-	-	-	-	-	-	-	-	-	-
7032	8394	63	-10.3	-10.3	0.0	3671	110	-10.1	-10.1	0.0	30724	158	3.9	18.8	14.9	-	-	-	-	-
7033	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7034	-	-	-	-	-	44744	218	-19.5	-7.9	-11.6	18930	100	3.9	16.1	12.2	4171	32	3.8	8.3	4.5
7053	219	13	-12.4	-10.3	2.1	8571	123	-12.9	-10.1	-2.8	-	-	-	-	-	-	-	-	-	-
7056	688	27	-12.4	-12.4	0.0	13204	160	-12.9	-10.1	-2.8	-	-	-	-	-	-	-	-	-	-
7059	852	14	-12.4	-10.3	2.1	17168	210	-12.9	-10.1	-2.8	24652	135	-26.4	-7.9	18.5	-	-	-	-	-
7061	-	-	-	-	-	213	22	-7.9	-7.9	0.0	-	-	-	-	-	-	-	-	-	-
7064	696	37	-12.4	-10.3	2.1	17306	166	-12.9	-10.1	-2.8	18132	125	-19.5	-7.9	11.6	-	-	-	-	-
7065	67	11	-10.3	-10.3	0.0	22991	203	-12.4	-10.1	-2.3	15719	116	-12.9	-10.1	2.8	64714	168	-15.0	-7.8	7.2

Table A1-1: Detection summary for adult Lake Sturgeon tagged in 2019-2022 and monitored upstream of the Keeyask GS during the winter 2019/2020 (October 8, 2019 to April 30, 2020), 2020/2021 (September 24, 2020 to April 30, 2021), 2021/2022 (October 11, 2021 to May 15, 2022), and 2022/2023 (October 11, 2022 to May 15, 2023) periods. Tag ID highlighted red = moved downstream through Kettle GS. Tag ID highlighted purple = moved downstream through the Keeyask GS. Tag ID highlighted green = harvested by local fisher. Tag ID highlighted yellow = missing (continued).

Tag ID	2019/2020					2020/2021					2021/2022					2022/2023				
	n	# Days	U/S (rkm)	D/S (rkm)	Range (rkm)	n	# Days	U/S (rkm)	D/S (rkm)	Range (rkm)	n	# Days	U/S (rkm)	D/S (rkm)	Range (rkm)	n	# Days	U/S (rkm)	D/S (rkm)	Range (rkm)
7066	959	39	-12.4	-10.3	2.1	18176	170	-12.9	-10.1	-2.8	7979	68	3.9	10.2	6.3	84127	149	3.8	8.3	4.5
7067	19911	124	-10.3	-10.3	0.0	15384	139	-12.9	-7.9	-5.0	-	-	-	-	-	-	-	-	-	-
57478	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
57479	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
57480	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
57481	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	34534	193	-12.9	-9.9	3.0
57482	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	50	1	-29.3	-29.3	0.0
57483	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
57484	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9064	44	-26.4	-26.4	0.0
57485	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
57486	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
57487	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
57488	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
57489	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	18853	107	-7.9	-7.8	0.1
57490	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	381	3	-26.4	-26.4	0.0
57491	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
57492	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
57493	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	19057	140	-12.9	-9.9	3.0
57494	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6	1	-26.4	-26.4	0.0
57495	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5113	112	3.8	16.4	12.6
57502	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
57504	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1419	46	-7.9	-7.8	0.1
57505	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
57506	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
57507	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table A1-2: Detection summary for adult Lake Sturgeon tagged in 2019 and monitored in Stephens Lake during the winter 2019/2020 (October 8, 2019 to April 30, 2020), 2020/2021 (September 24, 2020 to April 30, 2021), 2021/2022 (October 11, 2021 to May 15, 2022), and 2022/2023 (October 11, 2022 to May 15, 2023) period. Tag ID highlighted red = moved downstream through Kettle GS. Tag ID highlighted orange = moved downstream through Long Spruce GS. Tag ID highlighted yellow = missing tag.

Tag ID	2020/2021					2020/2021					2021/2022					2022/2023				
	n	# Days	U/S (rkm)	D/S (rkm)	Range (rkm)	n	# Days	U/S (rkm)	D/S (rkm)	Range (rkm)	n	# Days	U/S (rkm)	D/S (rkm)	Range (rkm)	n	# Days	U/S (rkm)	D/S (rkm)	Range (rkm)
7035	5505	54	5.2	5.8	0.6	12401	74	3.9	8.7	4.8	43021	189	3.9	13.4	9.5	-	-	-	-	-
7036	15525	114	5.2	10.3	5.1	40691	209	3.9	10.2	6.3	30186	190	3.9	18.8	14.9	-	-	-	-	-
7037	49403	202	5.2	10.3	5.1	41308	194	3.9	10.2	6.3	-	-	-	-	-	-	-	-	-	-
7038	28537	127	5.2	7.9	2.7	17429	114	3.9	10.2	6.3	10660	84	3.9	10.2	6.3	-	-	-	-	-
7039	-	-	-	-	-	18757	79	3.9	7.8	3.9	59182	208	3.9	10.2	6.3	7	1	3.8	3.8	0.0
7040	40531	190	5.2	13.9	8.7	49504	211	3.9	18.8	14.9	46575	206	3.9	16.1	12.2	-	-	-	-	-
7041	14379	84	5.2	13.9	8.7	26800	102	3.9	10.2	6.3	2944	34	3.9	18.8	14.9	38560	166	12.0	18.2	6.2
7042	22913	131	13.9	16.8	2.9	40897	182	13.4	13.4	0.0	3303	76	13.4	16.1	2.7	106	1	24.9	24.9	0.0
7043	34656	202	7.9	10.3	2.4	69934	219	3.9	10.2	6.3	19779	152	10.2	22.0	11.8	67965	212	14.4	18.2	3.8
7044	31446	178	5.2	9.4	4.2	51876	163	3.9	7.8	3.9	21949	117	3.9	10.2	6.3	-	-	-	-	-
7045	24721	118	5.2	7.9	2.7	11341	135	3.9	7.8	3.9	6443	46	3.9	5.9	2.0	80987	214	3.8	9.7	5.9
7046	-	-	-	-	-	98	16	3.9	3.9	0.0	51836	210	3.9	18.8	14.9	-	-	-	-	-
7047	24191	165	7.9	10.3	2.4	53403	204	3.9	10.2	6.3	53319	209	3.9	10.2	6.3	12034	145	5.4	18.2	12.8
7048	40541	160	5.2	13.9	8.7	46907	192	3.9	8.7	4.8	32741	203	3.9	16.1	12.2	72616	214	3.8	8.3	4.5
7049	33043	177	5.2	13.9	8.7	68196	213	10.2	16.1	5.9	22928	166	3.9	18.8	14.9	36831	173	14.4	18.2	3.8
7050	24998	152	5.2	18.6	13.4	4630	160	3.9	10.2	6.3	9384	158	3.9	18.8	14.9	-	-	-	-	-
7051	18711	120	5.2	13.9	8.7	46586	205	3.9	10.2	6.3	5933	130	10.2	32.5	22.3	-	-	-	-	-
7052	36882	196	5.2	36.1	30.9	4836	145	3.9	13.4	9.5	12550	190	3.9	13.4	9.5	-	-	-	-	-
7054	26409	175	5.2	9.4	4.2	7666	168	10.2	13.4	3.2	44	5	3.9	3.9	0.0	-	-	-	-	-
7055	36130	192	5.2	10.3	5.1	43461	203	3.9	10.2	6.3	12207	106	3.9	7.8	3.9	9004	89	8.3	9.7	1.4
7057	36308	203	5.2	10.3	5.1	32930	199	3.9	10.2	6.3	50278	212	3.9	13.4	9.5	48612	162	3.8	10.2	6.4
7058	30636	159	7.9	18.6	10.7	28970	183	10.2	18.8	8.6	23036	182	3.9	24.9	21.0	-	-	-	-	-
7060	30137	184	5.2	10.3	5.1	39966	211	3.9	8.7	4.8	12071	86	3.9	10.2	6.3	50089	183	7.5	12.0	4.5
7062	987	21	5.2	9.4	4.2	8213	50	3.9	8.7	4.8	17206	91	3.9	8.7	4.8	6460	83	3.8	8.3	4.5
7063	4	1	5.2	5.2	0.0	18786	90	3.9	8.7	4.8	9599	65	3.9	13.4	9.5	26147	185	9.7	18.2	8.5

Table A1-3: Detection summary for adult Lake Sturgeon tagged in 2019-2023 and monitored upstream of the Keeyask GS during the 2019 (June 1 to October 7), 2020 (May 1 to September 23), 2021 (May 1 to October 10), 2022 (May 16 to October 10), and 2023 (May 16 to October 2) open-water periods. Tag ID highlighted purple = moved downstream through the Keeyask GS. Tag ID highlighted red = moved downstream through Kettle GS. Tag ID highlighted orange = moved downstream through Long Spruce GS. Tag ID highlighted green = harvested by local fisher. Tag ID highlighted yellow = missing tag.

Tag ID	2019					2020					2021					2022					2023				
	n	# Days Detected	U/S (rkm)	D/S (rkm)	Range (rkm)	n	# Days Detected	U/S (rkm)	D/S (rkm)	Range (rkm)	n	# Days Detected	U/S (rkm)	D/S (rkm)	Range (rkm)	n	# Days Detected	U/S (rkm)	D/S (rkm)	Range (rkm)	n	# Days Detected	U/S (rkm)	D/S (rkm)	Range (rkm)
7017	10934	113	-46.9	-9.9	37.0	5650	72	-29.3	-9.9	19.4	9619	78	-33.9	1.3	35.2	-	-	-	-	-	-	-	-	-	-
7018	8505	88	-46.9	-9.9	37.0	6403	72	-17.4	-3.8	13.6	21136	137	-48.2	-2.2	46.0	2909	27	-34.3	-2.1	32.2	5666	43	0.7	30.7	30.0
7019	9944	102	-19.5	-7.4	12.1	6530	72	-19.5	-5.8	13.7	24954	150	-33.9	-2.2	31.7	12855	103	-19.5	14.4	33.9	11765	88	0.7	18.2	17.5
7020	11960	94	-24.7	-4.8	19.9	3797	59	-15.0	-3.8	11.2	7291	53	-48.2	13.2	61.4	3957	41	1.2	65.3	64.1	-	-	-	-	-
7021	7937	51	-33.8	-26.5	7.3	10778	71	-34.3	-26.4	7.9	9160	72	-33.9	32	65.9	3547	33	3.8	45.1	41.3	-	-	-	-	-
7022	22714	105	-33.8	-24.7	9.1	7286	46	-48.2	-26.4	21.8	7566	40	-48.2	-7.7	40.5	-	-	-	-	-	-	-	-	-	-
7022b	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3605	21	-48.2	-26.4	21.8
7023	7212	82	-33.8	-9.9	23.9	3849	84	-17.4	-9.9	7.5	14268	150	-29.3	-2.5	26.8	13354	129	-19.5	-2.1	17.4	12162	80	-48.2	18.2	66.4
7024	6599	80	-33.8	-9.9	23.9	5966	84	-33.8	-2.2	31.6	6973	52	-48.2	24.9	73.1	-	-	-	-	-	-	-	-	-	-
7025	17574	114	-46.9	-9.9	37.0	10765	90	-17.4	-9.9	7.5	6099	45	-17.4	5.4	22.8	1444	11	41.7	65.3	23.6	-	-	-	-	-
7026	6780	46	-46.9	-9.9	37.0	3840	52	-29.4	-8.9	20.5	15026	97	-34.3	13.4	47.7	6880	43	2.7	65.3	62.6	-	-	-	-	-
7027	10611	112	-19.5	-9.9	9.6	12281	69	-19.5	-6.2	13.3	13205	91	-24.2	18.8	43.0	9003	78	0.7	58.6	57.9	-	-	-	-	-
7028	18216	108	-19.5	-9.9	9.6	10967	96	-17.4	-8.9	8.5	9251	55	-22.6	18.8	41.4	5360	24	0.7	7.8	7.1	15997	75	0.7	24.9	24.2
7029	7705	94	-19.5	-9.9	9.6	7584	67	-19.5	-9.9	9.6	11026	79	-48.2	-2.2	46.0	-	-	-	-	-	-	-	-	-	-
7030	6345	100	-19.5	-9.9	9.6	5911	72	-19.5	-8.9	10.6	10693	91	-19.5	24.9	44.4	-	-	-	-	-	-	-	-	-	-
7031	18594	117	-19.5	-4.8	14.7	9560	92	-19.5	-5.8	13.7	6325	49	-12.9	3.9	16.8	293	18	4.5	4.5	0.0	-	-	-	-	-
7032	9883	114	-19.5	-4.8	14.7	3024	55	-19.5	-9.9	9.6	4122	37	-24.2	-2.2	22.0	1308	30	0.7	65.3	64.6	-	-	-	-	-
7033	18839	116	-12.5	-4.8	7.7	1428	16	-48.2	-4.8	43.4	-	-	-	-	-	-	-	-	-	116	2	-48.2	-46.9	1.3	
7034	13573	98	-29.4	-4.8	24.6	10215	69	-17.4	-3.8	13.6	6008	66	-48.2	24.9	73.1	47737	131	0.7	12	11.3	18754	107	0.7	10.2	9.5
7053	8500	106	-19.5	-9.9	9.6	5183	70	-19.5	-9.9	9.6	2426	29	-48.2	-17.4	30.8	-	-	-	-	-	-	-	-	-	-
7056	4253	89	-19.5	-9.3	10.2	3597	71	-19.5	-8.9	10.6	7633	54	-34.3	-2.2	32.1	-	-	-	-	-	-	-	-	-	-
7059	9639	97	-19.5	-9.3	10.2	18696	102	-17.4	-9.9	7.5	27824	142	-48.2	-2.2	46.0	8232	74	-34.3	-0.8	33.5	8934	70	0.7	14.4	13.7
7061	12007	93	-29.4	-4.8	24.6	11986	71	-8.9	-2.2	6.7	1713	33	-24.2	7.5	31.7	-	-	-	-	-	-	-	-	-	-
7064	13665	104	-33.8	-9.9	23.9	5783	62	-29.4	-9.9	19.5	13837	106	-48.2	-2.2	46.0	9269	52	-24.2	-0.3	23.9	14793	124	0.7	14.4	13.7
7065	7891	107	-24.7	-9.9	14.8	6776	60	-19.5	-9.9	9.6	16700	145	-34.3	-3.8	30.5	10366	132	-29.3	-2.1	27.2	8333	132	-22.6	-7.8	14.8
7066	12321	108	-19.5	-9.3	10.2	8428	81	-29.4	-9.9	19.5	5690	47	-29.3	0.8	30.1	7232	55	0.7	18.2	17.5	10681	113	0.7	24.9	24.2
7067	8705	109	-19.5	-5.8	13.7	10238	78	-15	-6.2	8.8	9054	68	-48.2	-2.2	46.0	883	12	-48.2	-33.8	14.4	5755	33	-48.2	-2.1	46.1
51939	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	487	18	-48.2	-26.4	21.8	
51940	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	14521	91	-33.9	-2.1	31.8	
51941	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	387	7	-26.4	4.6	31	
51942	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1727	20	-48.2	-7.8	40.4	
51952	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	500	5	-48.2	-26.4	21.8	
51953	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6923	76	-46.9	-26.4	20.5	
57478	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3302	27	-26.4	0.7	27.1	2447	39	0.7	24.9	24.2
57479	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9505	73	-32.2	0.7	32.9	1956	36	0.7	4.5	3.8
57480	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5391	61	-33.9	-0.8	33.1	6518	68	0.7	14.4	13.7

Table A1-3: Detection summary for adult Lake Sturgeon tagged in 2019-2023 and monitored upstream of the Keeyask GS during the 2019 (June 1 to October 7), 2020 (May 1 to September 23), 2021 (May 1 to October 10), 2022 (May 16 to October 10), and 2023 (May 16 to October 2) open-water periods. Tag ID highlighted purple = moved downstream through the Keeyask GS. Tag ID highlighted red = moved downstream through Kettle GS. Tag ID highlighted orange = moved downstream through Long Spruce GS. Tag ID highlighted green = harvested by local fisher. Tag ID highlighted yellow = missing tag (continued).

Tag ID	2019					2020					2021					2022					2023				
	n	# Days Detected	U/S (rkm)	D/S (rkm)	Range (rkm)	n	# Days Detected	U/S (rkm)	D/S (rkm)	Range (rkm)	n	# Days Detected	U/S (rkm)	D/S (rkm)	Range (rkm)	n	# Days Detected	U/S (rkm)	D/S (rkm)	Range (rkm)	n	# Days Detected	U/S (rkm)	D/S (rkm)	Range (rkm)
57481	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4743	55	-26.4	-5.8	20.6	26741	131	-19.5	-0.8	18.7	
57482	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6800	52	-48.2	-7.8	40.4	7092	82	-46.9	-26.4	20.5	
57483	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2467	30	-48.2	-9.9	38.3	-	-	-	-	-	
57484	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3742	46	-34.3	-26.4	7.9	643	20	-48.2	-26.4	21.8	
57485	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1371	24	-48.2	-19.5	28.7	-	-	-	-	-	
57486	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1183	12	-48.2	-9.9	38.3	-	-	-	-	-	
57487	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1970	24	-48.2	-9.9	38.3	-	-	-	-	-	
57488	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2303	29	-48.2	-24.2	24.0	607	14	-48.2	-26.4	21.8	
57489	-	-	-	-	-	-	-	-	-	-	-	-	-	-	18516	113	-33.9	-2.1	31.8	6115	54	-10.1	9.3	19.4	
57490	-	-	-	-	-	-	-	-	-	-	-	-	-	-	18579	77	-34.3	-26.4	7.9	4487	33	-48.2	-22.6	25.6	
57491	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2547	32	-48.2	-0.8	47.4	2733	32	0.7	5.9	5.2	
57492	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5404	38	-48.2	-24.2	24.0	236	12	-48.2	-44	4.2	
57493	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8636	52	-19.5	-7.8	11.7	24338	131	-19.5	-5.8	13.7	
57494	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9928	71	-33.9	-24.2	9.7	15231	100	-34.3	18.2	52.5	
57495	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6355	51	-33.9	24.9	58.8	5837	83	0.7	14.4	13.7	
57496	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	19402	109	-29.3	-7.8	21.5	
57497	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	17477	109	-34.3	-0.8	33.5	
57498	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	11929	112	-34.3	-9.9	24.4	
57499	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10454	75	-48.2	-26.4	21.8	
57500	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1707	15	-48.2	-22.6	25.6	
57501	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7861	92	-26.4	-0.8	25.6	
57502	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2743	47	-46.9	10.2	57.1	8721	72	0.7	30.7	30.0	
57503	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	15748	111	-29.3	-0.8	28.5	
57504	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6159	81	-24.2	-5.8	18.4	19814	128	-12.9	-2.1	10.8	
57505	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2905	33	-48.2	-26.4	21.8	1365	28	-48.2	-33.8	14.4	
57506	-	-	-	-	-	-	-	-	-	-	-	-	-	-	14601	78	-34.3	1.2	35.5	6634	40	0.7	24.9	24.2	
57507	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1650	30	-48.2	-26.4	21.8	44615	112	-48.2	-44	4.2	

Table A1-4: Detection summary for adult Lake Sturgeon tagged in 2019 and monitored in Stephens Lake during the 2019 (June 1 to October 7), 2020 (May 1 to September 23), 2021 (May 1 to October 10), 2022 (May 16 to October 10), and 2023 (May 16 to October 2) open-water periods. Tag ID highlighted red = moved downstream through Kettle GS. Tag ID highlighted orange = moved downstream through Long Spruce GS.

Tag ID	2019					2020					2021					2022					2023				
	n	# Days Detected	U/S (rkm)	D/S (rkm)	Range (rkm)	n	# Days Detected	U/S (rkm)	D/S (rkm)	Range (rkm)	n	# Days Detected	U/S (rkm)	D/S (rkm)	Range (rkm)	n	# Days Detected	U/S (rkm)	D/S (rkm)	Range (rkm)	n	# Days Detected	U/S (rkm)	D/S (rkm)	Range (rkm)
7035	19933	119	0.6	10.3	9.7	8021	77	1.2	13.4	12.2	14453	92	0.8	13.4	12.6	13067	119	0.7	41.7	41.0	-	-	-	-	-
7036	19903	109	0.6	10.3	9.7	12401	102	2.7	9.4	6.7	16310	135	0.8	18.8	18.0	2984	19	0.7	8.7	8.0	8175	91	0.7	18.2	17.5
7037	21304	127	1.2	18.6	17.4	8027	68	0.6	18.8	18.2	15981	100	0.8	18.8	18.0	-	-	-	-	-	-	-	-	-	-
7038	12726	78	0.6	10.3	9.7	12491	75	0.6	13.0	12.4	6743	62	0.8	24.9	24.1	4290	50	0.7	45.1	44.4	229	16	58.6	65.3	6.7
7039	10752	109	0.6	18.6	18.0	4523	69	0.6	18.8	18.2	11024	118	0.8	18.8	18.0	12364	96	1.2	30.7	29.5	10037	93	0.7	18.2	17.5
7040	5823	89	0.6	18.6	18.0	7485	78	0.6	18.8	18.2	10448	73	0.8	13.4	12.6	11506	99	0.7	41.7	41.0	158	3	58.6	65.3	6.7
7041	20381	108	0.6	18.6	18.0	7261	77	1.2	18.8	17.6	12094	75	0.8	18.8	18.0	9647	92	0.7	30.7	30.0	12321	81	0.7	30.7	30.0
7042	18735	119	0.6	18.6	18.0	10964	98	0.6	16.8	16.2	13836	116	0.8	18.8	18.0	7064	83	0.7	30.7	30.0	1549	18	10.2	65.3	55.1
7043	3795	22	3.9	18.6	14.7	12258	100	1.2	18.8	17.6	15588	119	0.8	40.9	40.1	7352	86	2.7	24.9	22.2	5559	51	14.4	21.7	7.3
7044	10107	94	0.6	18.6	18.0	8483	73	1.2	24.7	23.5	12893	94	0.8	18.8	18.0	7267	50	1.0	24.9	23.9	28289	107	0.7	24.9	24.2
7045	5079	23	0.6	13.9	13.3	8293	87	0.6	18.6	18.0	5958	44	0.8	18.8	18.0	23139	124	3.8	24.9	21.1	20772	109	1.2	24.9	23.7
7046	4188	22	1.2	7.9	6.7	10581	86	0.6	9.4	8.8	6506	56	0.8	24.9	24.1	7496	51	0.7	21.7	21.0	18063	78	0.7	18.2	17.5
7047	11770	101	1.2	13.9	12.7	12139	92	1.2	13.4	12.2	11354	108	0.8	18.8	18.0	12256	105	0.7	30.7	30.0	4650	57	0.7	18.2	17.5
7048	19411	107	1.2	13.9	12.7	21325	110	0.6	13.4	12.8	13644	98	0.8	18.8	18.0	14557	110	0.7	30.7	30.0	16463	80	0.7	18.2	17.5
7049	17017	113	0.6	18.6	18.0	7696	100	2.7	24.9	22.2	11804	105	0.8	32.0	31.2	13254	127	4.1	30.7	26.6	15841	117	10.2	24.9	14.7
7050	20573	116	0.6	13	12.4	10323	80	0.6	16.1	15.5	11679	114	0.8	18.8	18.0	6622	43	0.7	41.7	41.0	-	-	-	-	-
7051	13163	108	0.6	18.6	18.0	12468	75	0.6	18.8	18.2	19401	100	0.8	18.8	18.0	5133	40	0.7	65.3	64.6	-	-	-	-	-
7052	16243	106	0.6	24.7	24.1	8029	92	1.2	18.8	17.6	7819	74	0.8	24.9	24.1	3415	56	0.7	65.3	64.6	-	-	-	-	-
7054	30588	96	0.6	18.6	18.0	22518	109	1.2	18.8	17.6	18679	96	0.8	24.9	24.1	9123	49	0.7	10.2	9.5	5175	43	0.7	18.2	17.5
7055	18411	112	0.6	10.3	9.7	11888	97	1.2	18.8	17.6	15312	119	0.8	24.9	24.1	7792	95	0.7	30.7	30.0	3313	41	3.9	30.7	26.8
7057	27099	110	0.6	10.3	9.7	15469	92	1.2	18.8	17.6	8878	86	0.8	24.9	24.1	29941	116	0.7	24.9	24.2	45447	113	0.7	18.2	17.5
7058	13394	113	0.6	18.6	18.0	6453	101	0.6	18.8	18.2	6086	56	0.8	18.8	18.0	6932	45	2.7	38.4	35.7	-	-	-	-	-
7060	16679	120	0.6	10.3	9.7	17039	85	0.6	10.3	9.7	27580	127	0.8	10.2	9.4	8367	71	1.2	24.9	23.7	3178	55	3.8	10.2	6.4
7062	27646	122	0.6	10.3	9.7	10919	90	1.2	8.7	7.5	8520	48	0.8	18.8	18.0	33437	118	0.7	30.7	30.0	40810	124	0.7	10.2	9.5
7063	27802	111	0.6	10.3	9.7	9448	85	0.6	13.4	12.8	10433	91	0.8	18.8	18.0	8571	100	1.2	18.2	17.0	15609	117	0.7	24.9	24.2

APPENDIX 2: LOCATION SUMMARY FOR INDIVIDUAL ACOUSTIC TAGGED ADULT LAKE STURGEON, UPSTREAM OF THE KEEYASK GS, MAY 2019 TO AUGUST 2023

Figure A2-1: Position of a Lake Sturgeon tagged with an acoustic transmitter (code #7017) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0), from May 1, 2019 to August 10, 2023.88

Figure A2-2: Position of a Lake Sturgeon tagged with an acoustic transmitter (code #7018) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0), from May 1, 2019 to August 10, 2023.89

Figure A2-3: Position of a Lake Sturgeon tagged with an acoustic transmitter (code #7019) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0), from May 1, 2019 to August 10, 2023.90

Figure A2-4: Position of a Lake Sturgeon tagged with an acoustic transmitter (code #7020) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0), from May 1, 2019 to August 10, 2023.91

Figure A2-5: Position of a Lake Sturgeon tagged with an acoustic transmitter (code #7021) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0), from May 1, 2019 to August 10, 2023.92

Figure A2-6: Position of a Lake Sturgeon tagged with an acoustic transmitter (code #7022) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0), from May 1, 2019 to August 10, 2023.93

Figure A2-7: Position of a Lake Sturgeon tagged with an acoustic transmitter (code #7022b) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0), from May 16 August 10, 2023.94

Figure A2-8: Position of a Lake Sturgeon tagged with an acoustic transmitter (code #7023) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0), from May 1, 2019 to August 10, 2023.95

Figure A2-9: Position of a Lake Sturgeon tagged with an acoustic transmitter (code #7024) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0), from May 1, 2019 to August 10, 2023.96

Figure A2-10: Position of a Lake Sturgeon tagged with an acoustic transmitter (code #7025) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0), from May 1, 2019 to August 10, 2023.97

- Figure A2-11: Position of a Lake Sturgeon tagged with an acoustic transmitter (code #7026) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0), from May 1, 2019 to August 10, 2023.98
- Figure A2-12: Position of a Lake Sturgeon tagged with an acoustic transmitter (code #7027) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0), from May 1, 2019 to August 10, 2023.99
- Figure A2-13: Position of a Lake Sturgeon tagged with an acoustic transmitter (code #7028) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0), from May 1, 2019 to August 10, 2023.100
- Figure A2-14: Position of a Lake Sturgeon tagged with an acoustic transmitter (code #7029) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0), from May 1, 2019 to August 10, 2023.101
- Figure A2-15: Position of a Lake Sturgeon tagged with an acoustic transmitter (code #7030) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0), from May 1, 2019 to August 10, 2023.102
- Figure A2-16: Position of a Lake Sturgeon tagged with an acoustic transmitter (code #7031) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0), from May 1, 2019 to August 10, 2023.103
- Figure A2-17: Position of a Lake Sturgeon tagged with an acoustic transmitter (code #7032) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0), from May 1, 2019 to August 10, 2023.104
- Figure A2-18: Position of a Lake Sturgeon tagged with an acoustic transmitter (code #7033) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0), from May 1, 2019 to August 10, 2023.105
- Figure A2-19: Position of a Lake Sturgeon tagged with an acoustic transmitter (code #7034) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0), from May 1, 2019 to August 10, 2023.106
- Figure A2-20: Position of a Lake Sturgeon tagged with an acoustic transmitter (code #7053) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0), from May 1, 2019 to August 10, 2023.107
- Figure A2-21: Position of a Lake Sturgeon tagged with an acoustic transmitter (code #7056) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0), from May 1, 2019 to August 10, 2023.108
- Figure A2-22: Position of a Lake Sturgeon tagged with an acoustic transmitter (code #7059) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0), from May 1, 2019 to August 10, 2023.109
- Figure A2-23: Position of a Lake Sturgeon tagged with an acoustic transmitter (code #7061) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0), from May 1, 2019 to August 10, 2023.110

- Figure A2-24: Position of a Lake Sturgeon tagged with an acoustic transmitter (code #7064) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0), from May 1, 2019 to August 10, 2023. 111
- Figure A2-25: Position of a Lake Sturgeon tagged with an acoustic transmitter (code #7065) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0), from May 1, 2019 to August 10, 2023. 112
- Figure A2-26: Position of a Lake Sturgeon tagged with an acoustic transmitter (code #7066) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0), from May 1, 2019 to August 10, 2023. 113
- Figure A2-27: Position of a Lake Sturgeon tagged with an acoustic transmitter (code #7067) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0), from May 1, 2019 to August 10, 2023. 114
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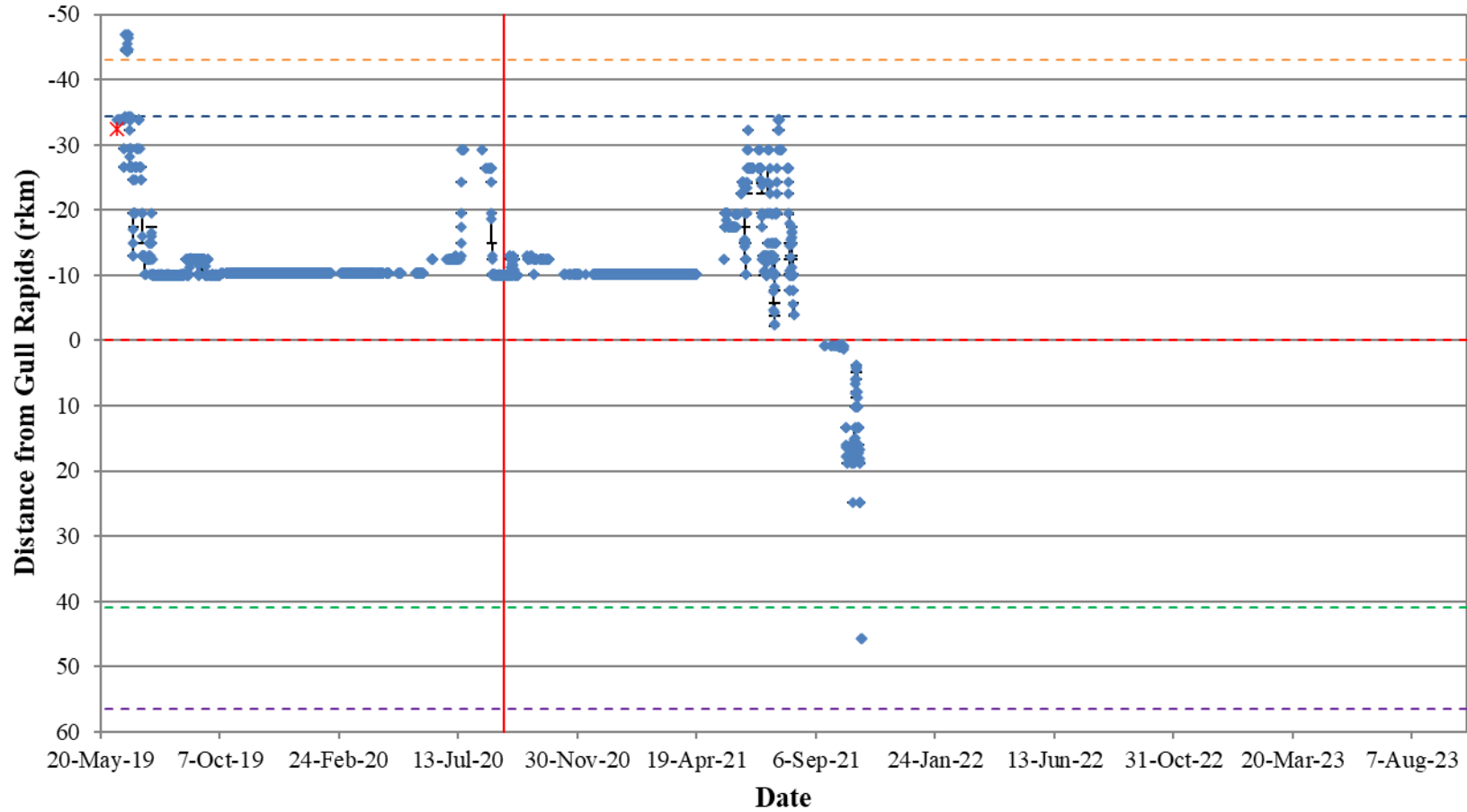


Figure A2-1: Position of a Lake Sturgeon tagged with an acoustic transmitter (code #7017) in the Nelson River between Clark Lake and the Keyyask GS in relation to the Keyyask GS (rkm 0), from May 1, 2019 to October 2, 2023. Date and location of tagging is indicated by a star. Completion of reservoir impoundment is indicated by a vertical solid red line. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keyyask GS; green = Kettle GS; purple = Long Spruce GS).

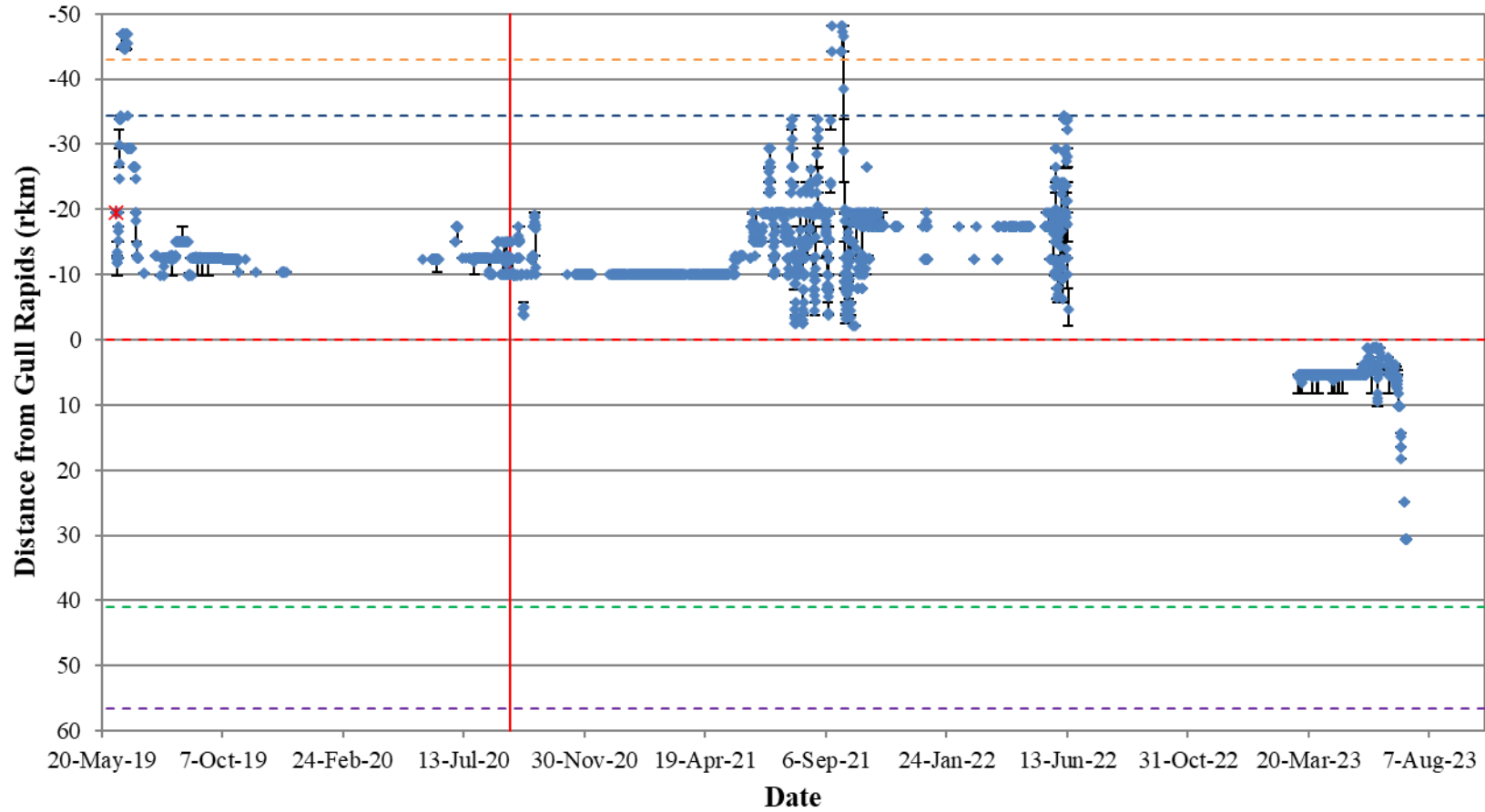


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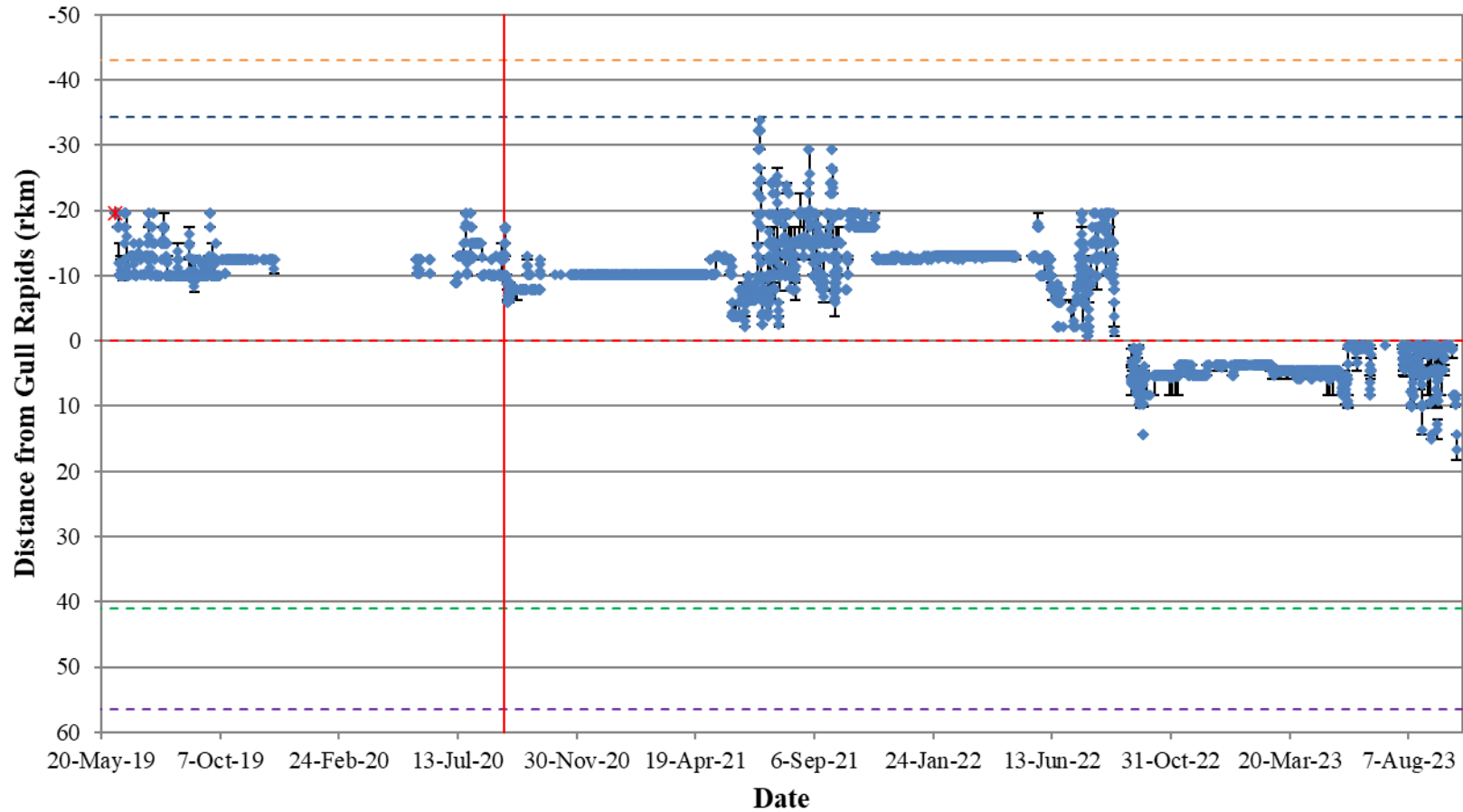


Figure A2-3: Position of a Lake Sturgeon tagged with an acoustic transmitter (code #7019) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0), from May 1, 2019 to October 2, 2023. Date and location of tagging is indicated by a star. Completion of reservoir impoundment is indicated by a vertical solid red line. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keeyask GS; green = Kettle GS; purple = Long Spruce GS).

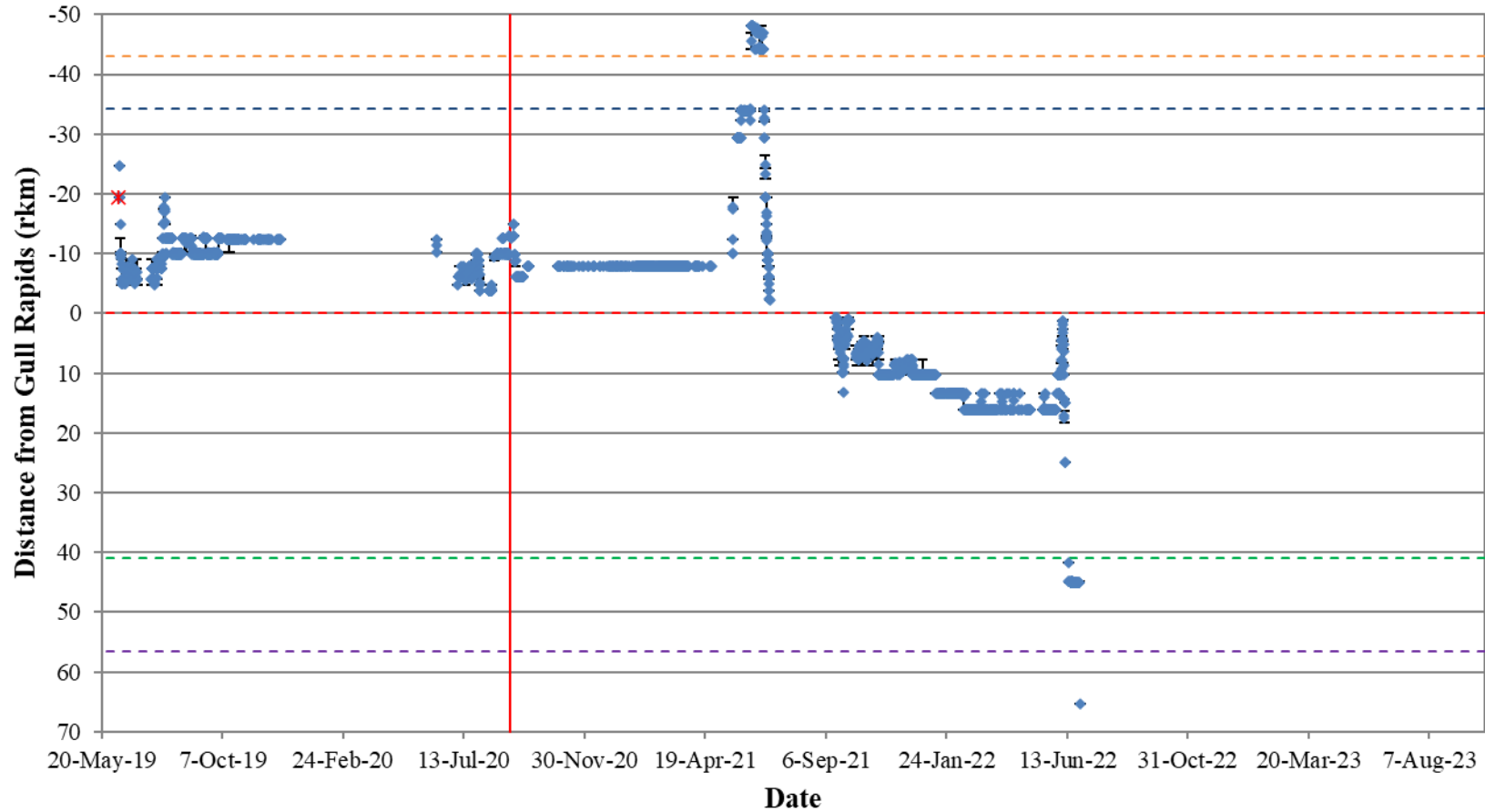


Figure A2-4: Position of a Lake Sturgeon tagged with an acoustic transmitter (code #7020) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0), from May 1, 2019 to October 2, 2023. Date and location of tagging is indicated by a star. Completion of reservoir impoundment is indicated by a vertical solid red line. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keeyask GS; green = Kettle GS; purple = Long Spruce GS).

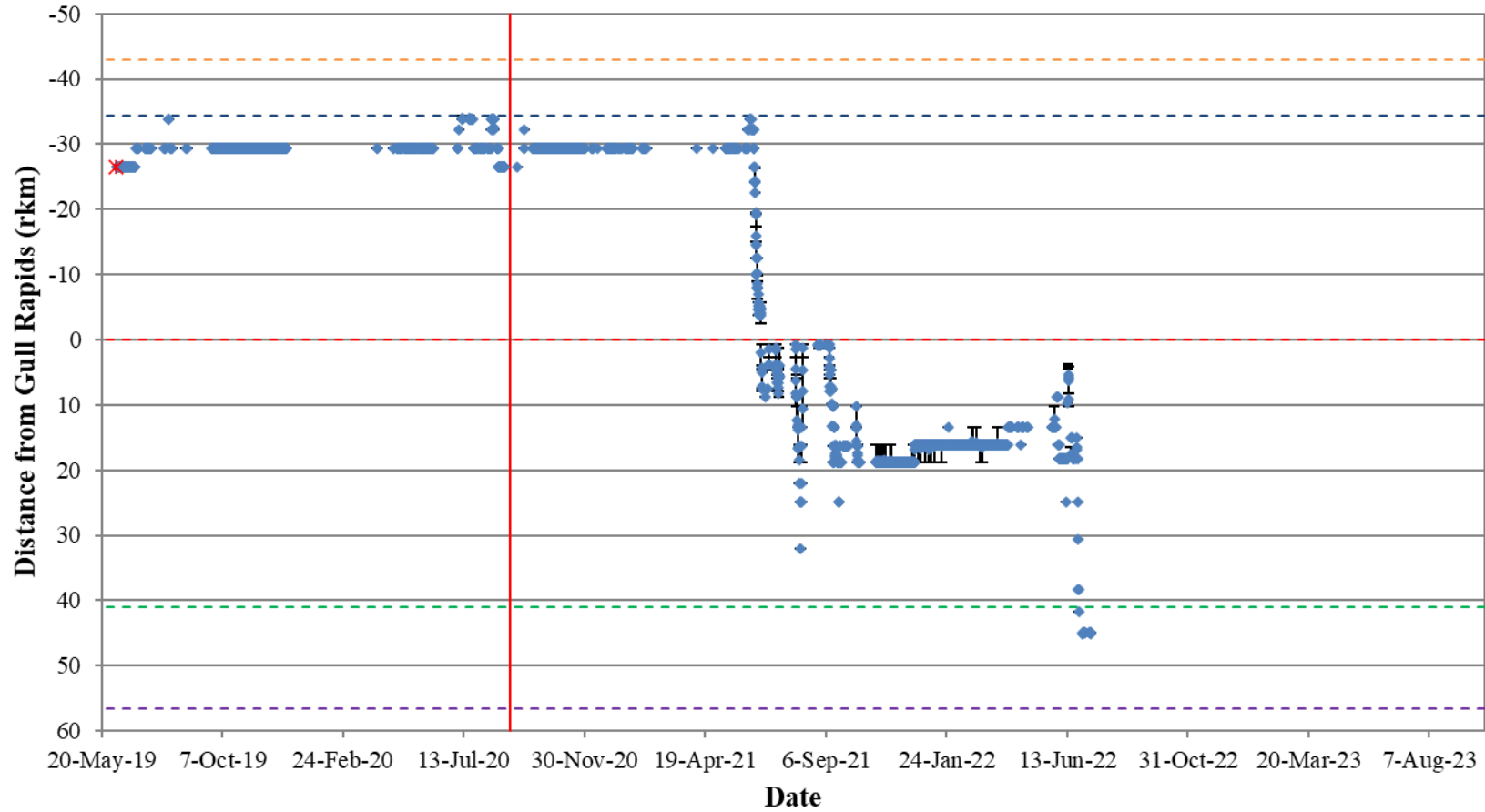


Figure A2-5: Position of a Lake Sturgeon tagged with an acoustic transmitter (code #7021) in the Nelson River between Clark Lake and the Keyeyask GS in relation to the Keyeyask GS (rkm 0), from May 1, 2019 to October 2, 2023. Date and location of tagging is indicated by a star. Completion of reservoir impoundment is indicated by a vertical solid red line. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keyeyask GS; green = Kettle GS; purple = Long Spruce GS).

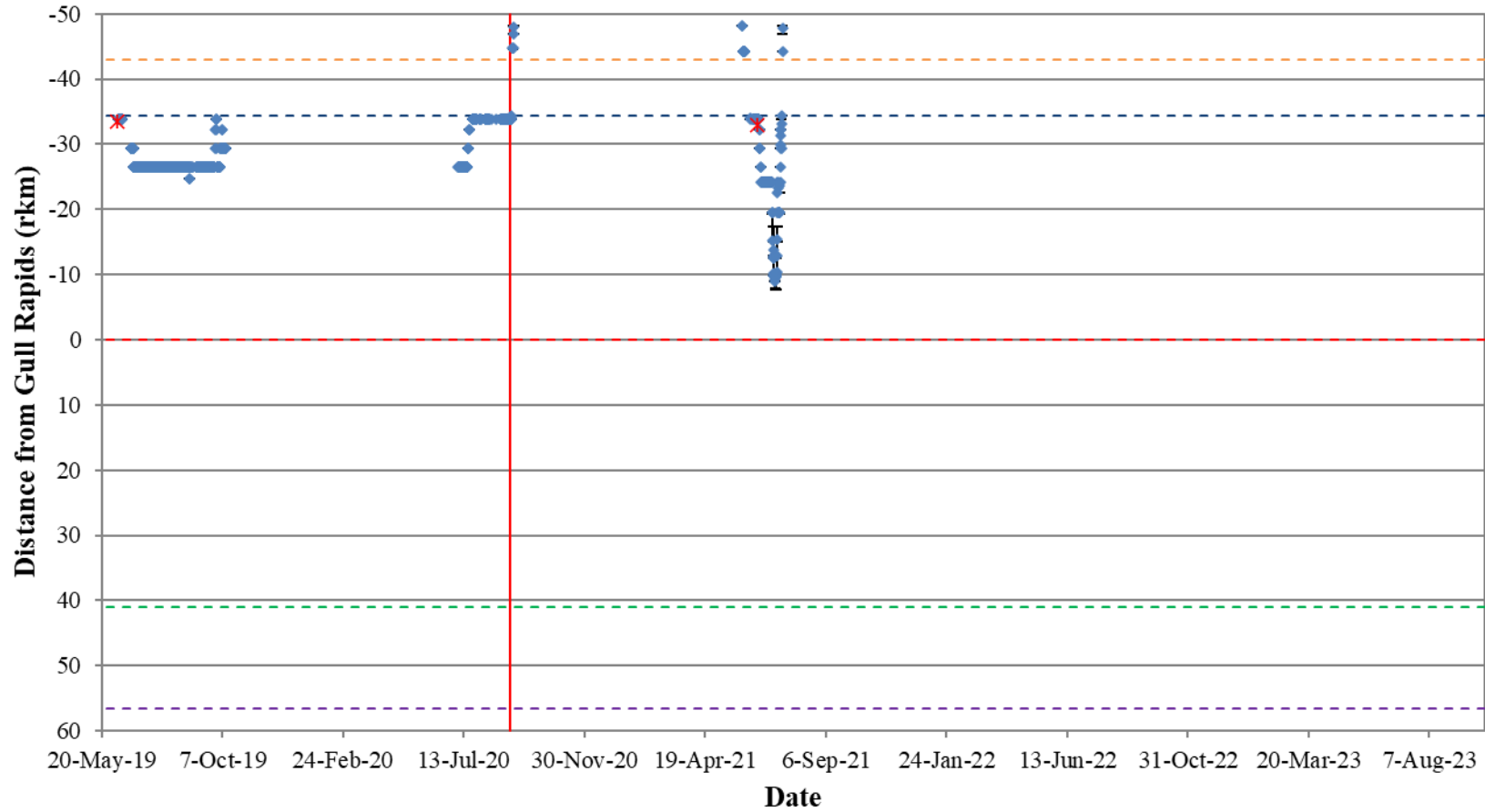


Figure A2-6: Position of a Lake Sturgeon tagged with an acoustic transmitter (code #7022) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0), from May 1, 2019 to October 2, 2023. Date and location of tagging is indicated by a star. Completion of reservoir impoundment is indicated by a vertical solid red line. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keeyask GS; green = Kettle GS; purple = Long Spruce GS).

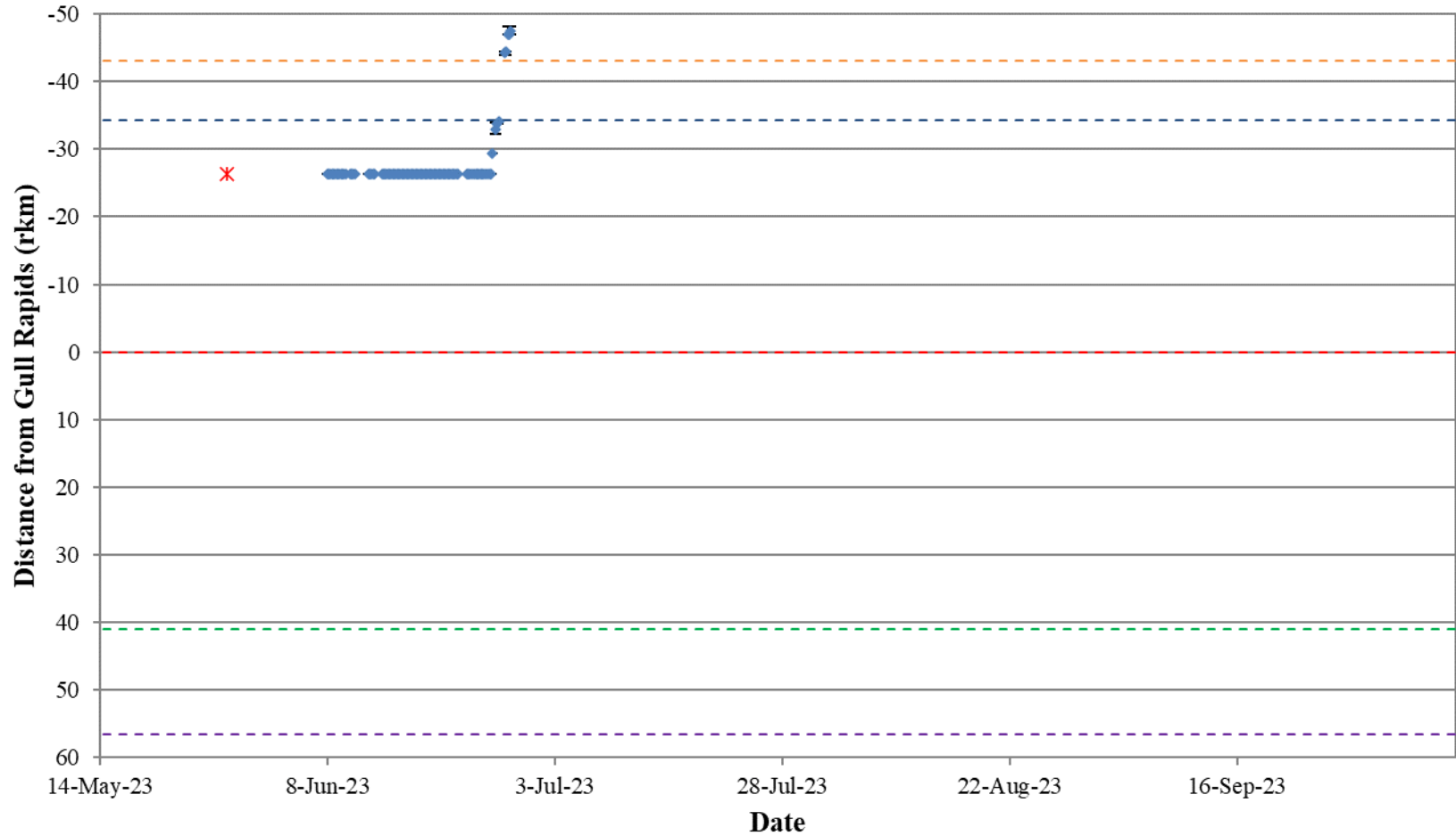


Figure A2-7: Position of a Lake Sturgeon tagged with an acoustic transmitter (code #7022b) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0), from May 16 October 2, 2023. Date and location of tagging is indicated by a star. Completion of reservoir impoundment is indicated by a vertical solid red line. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keeyask GS; green = Kettle GS; purple = Long Spruce GS).

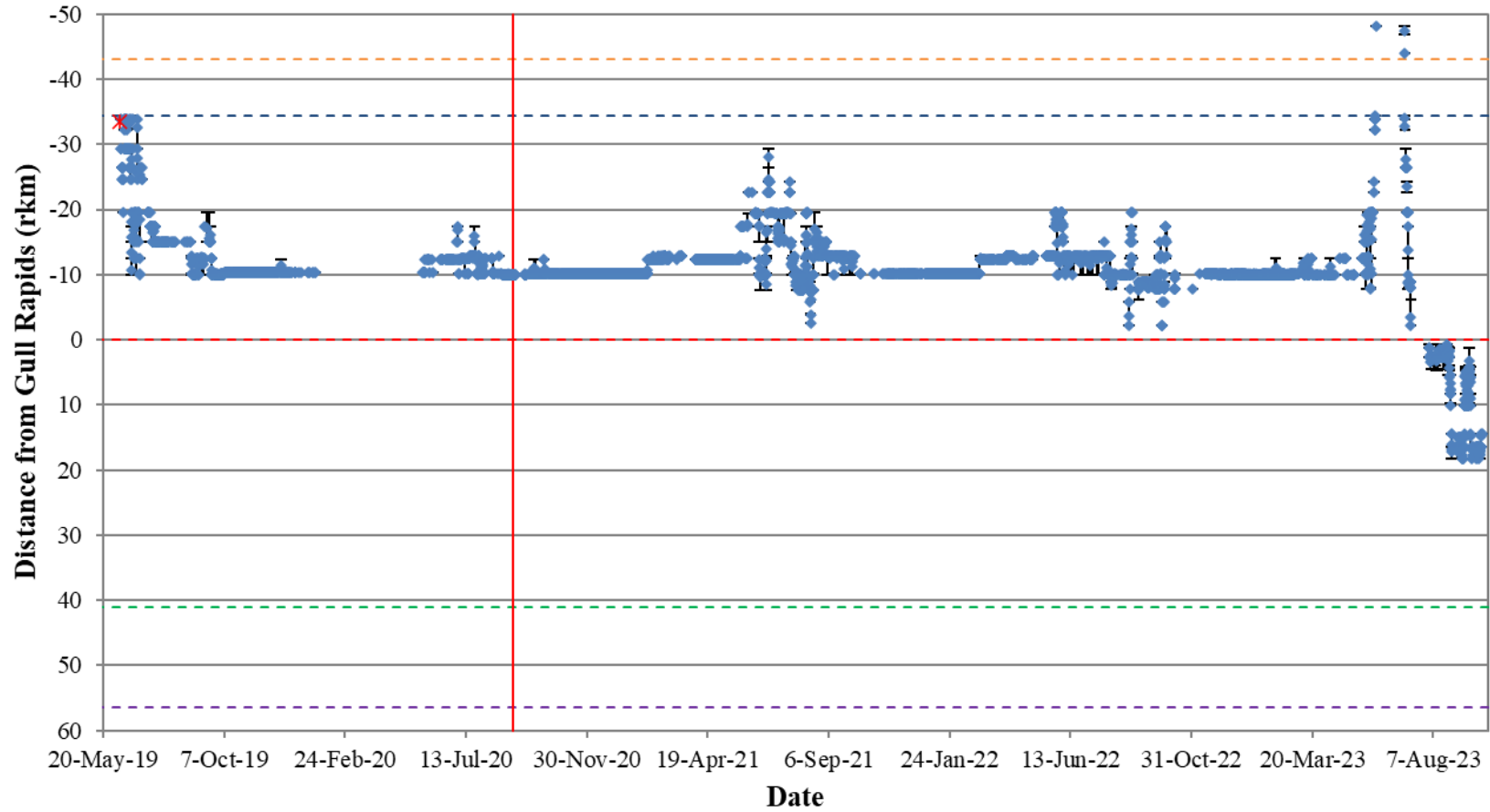


Figure A2-8: Position of a Lake Sturgeon tagged with an acoustic transmitter (code #7023) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0), from May 1, 2019 to October 2, 2023. Date and location of tagging is indicated by a star. Completion of reservoir impoundment is indicated by a vertical solid red line. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keeyask GS; green = Kettle GS; purple = Long Spruce GS).

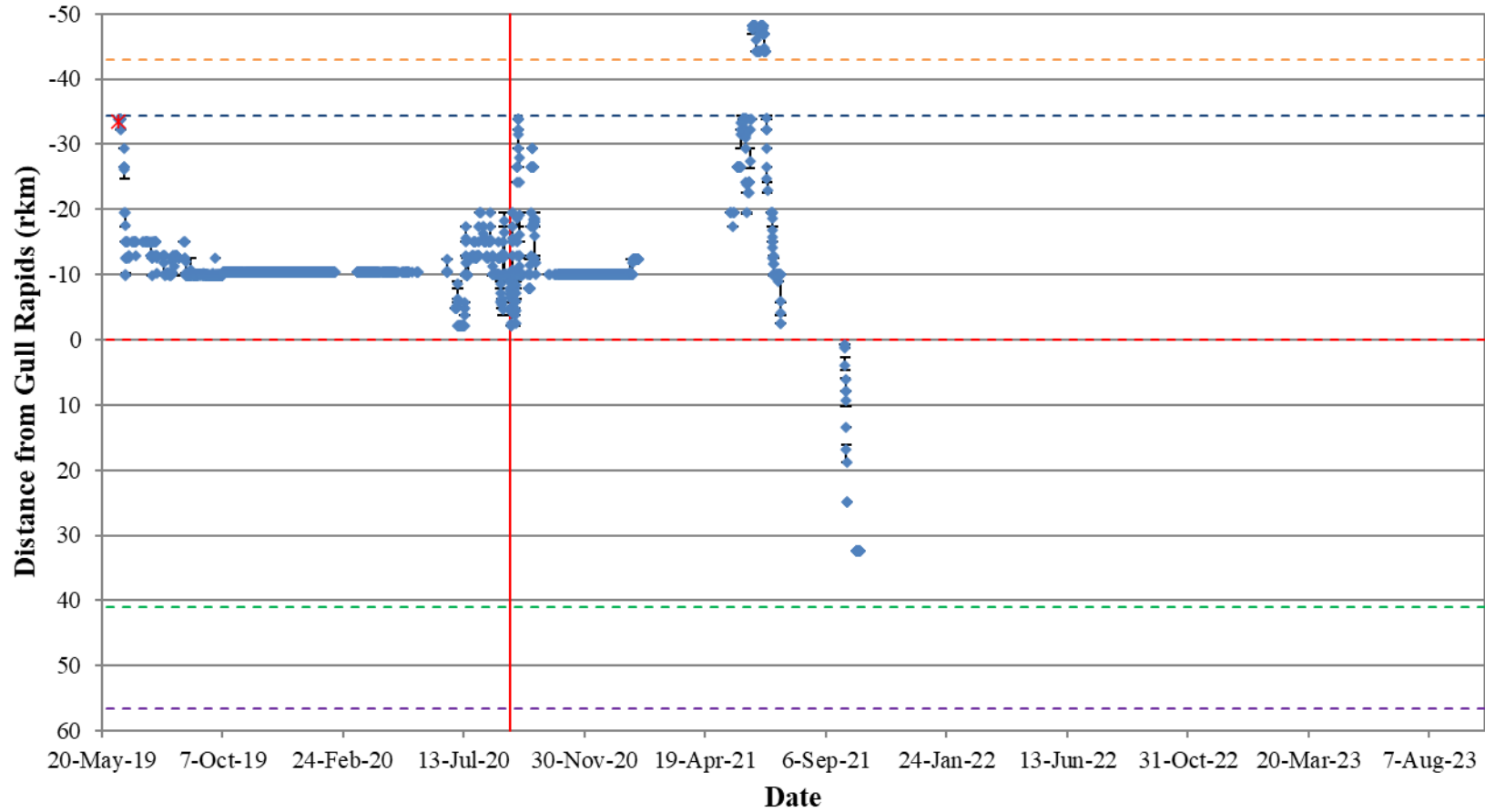


Figure A2-9: Position of a Lake Sturgeon tagged with an acoustic transmitter (code #7024) in the Nelson River between Clark Lake and the Keyeyask GS in relation to the Keyeyask GS (rkm 0), from May 1, 2019 to October 2, 2023. Date and location of tagging is indicated by a star. Completion of reservoir impoundment is indicated by a vertical solid red line. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keyeyask GS; green = Kettle GS; purple = Long Spruce GS).

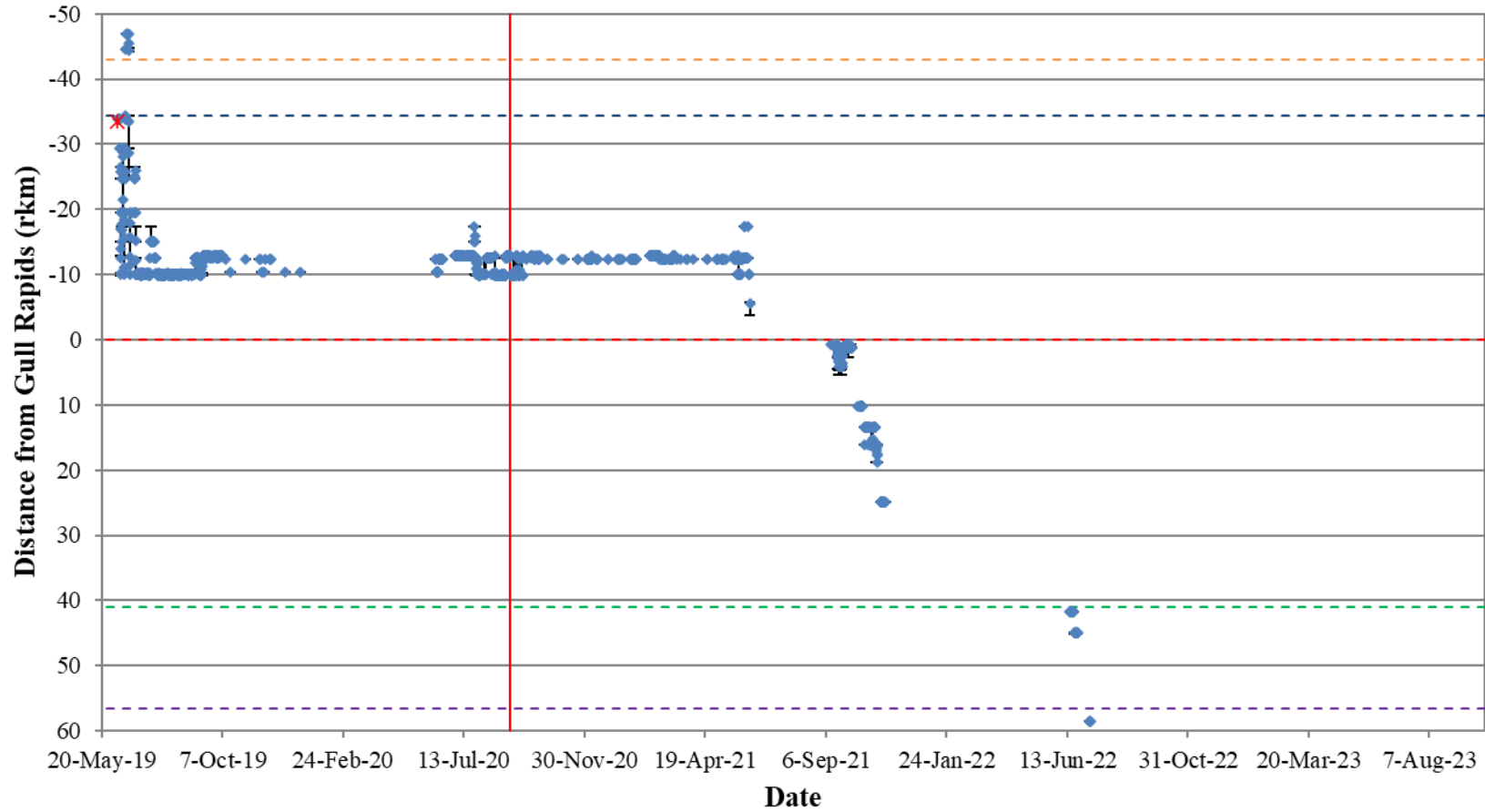


Figure A2-10: Position of a Lake Sturgeon tagged with an acoustic transmitter (code #7025) in the Nelson River between Clark Lake and the Keyeyask GS in relation to the Keyeyask GS (rkm 0), from May 1, 2019 to October 2, 2023. Date and location of tagging is indicated by a star. Completion of reservoir impoundment is indicated by a vertical solid red line. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keyeyask GS; green = Kettle GS; purple = Long Spruce GS).

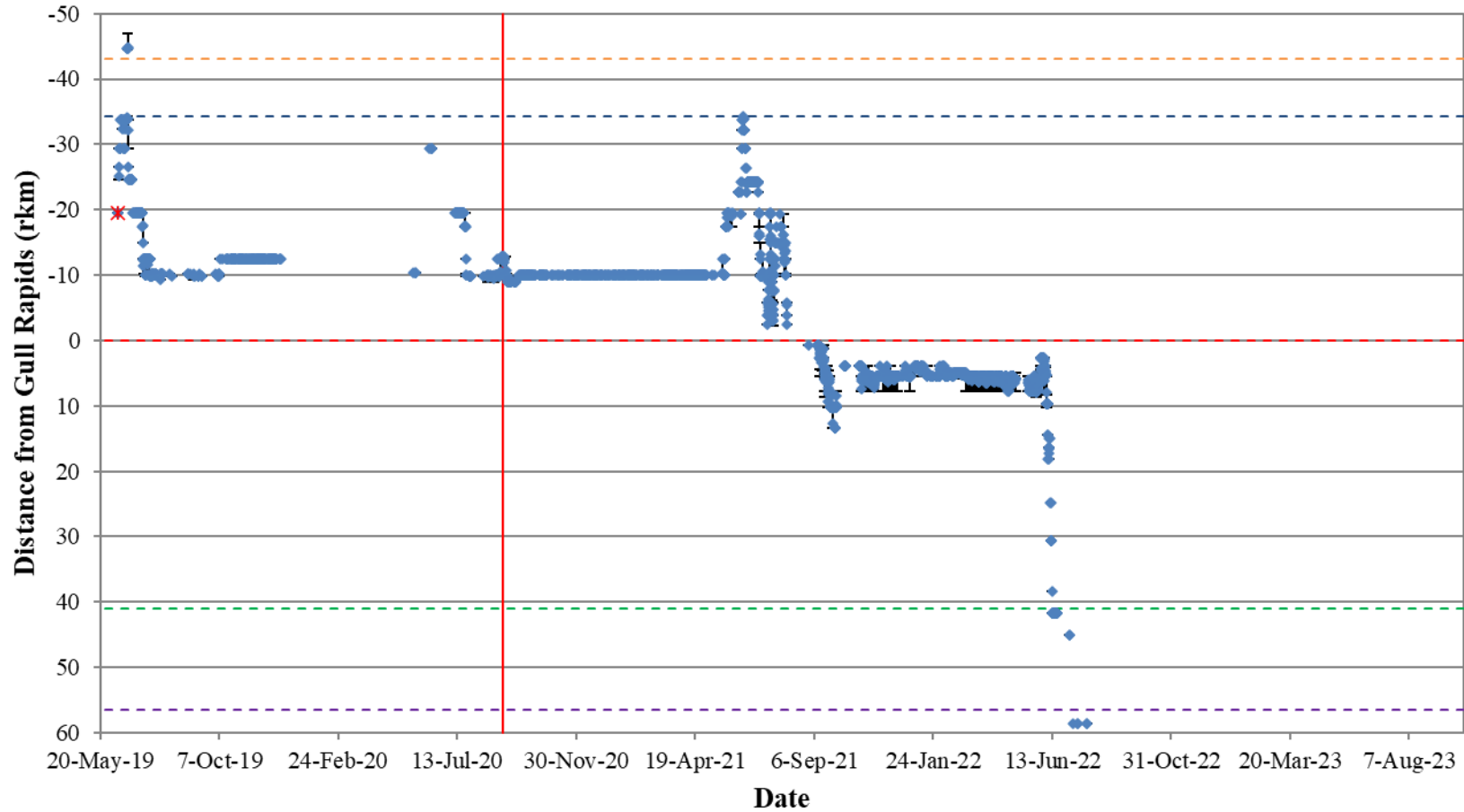


Figure A2-11: Position of a Lake Sturgeon tagged with an acoustic transmitter (code #7026) in the Nelson River between Clark Lake and the Keyeyask GS in relation to the Keyeyask GS (rkm 0), from May 1, 2019 to October 2, 2023. Date and location of tagging is indicated by a star. Completion of reservoir impoundment is indicated by a vertical solid red line. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keyeyask GS; green = Kettle GS; purple = Long Spruce GS).

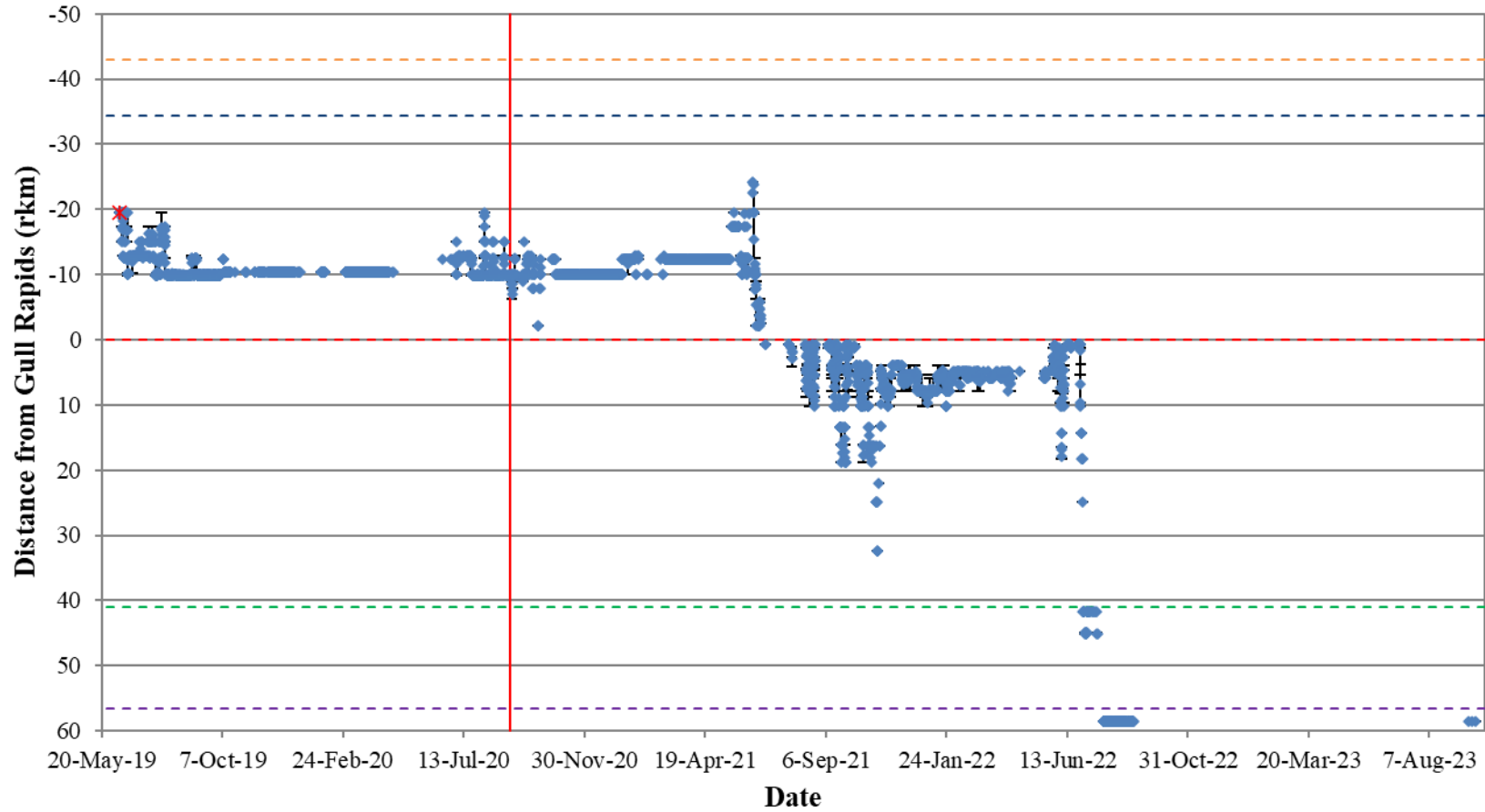


Figure A2-12: Position of a Lake Sturgeon tagged with an acoustic transmitter (code #7027) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0), from May 1, 2019 to October 2, 2023. Date and location of tagging is indicated by a star. Completion of reservoir impoundment is indicated by a vertical solid red line. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keeyask GS; green = Kettle GS; purple = Long Spruce GS).

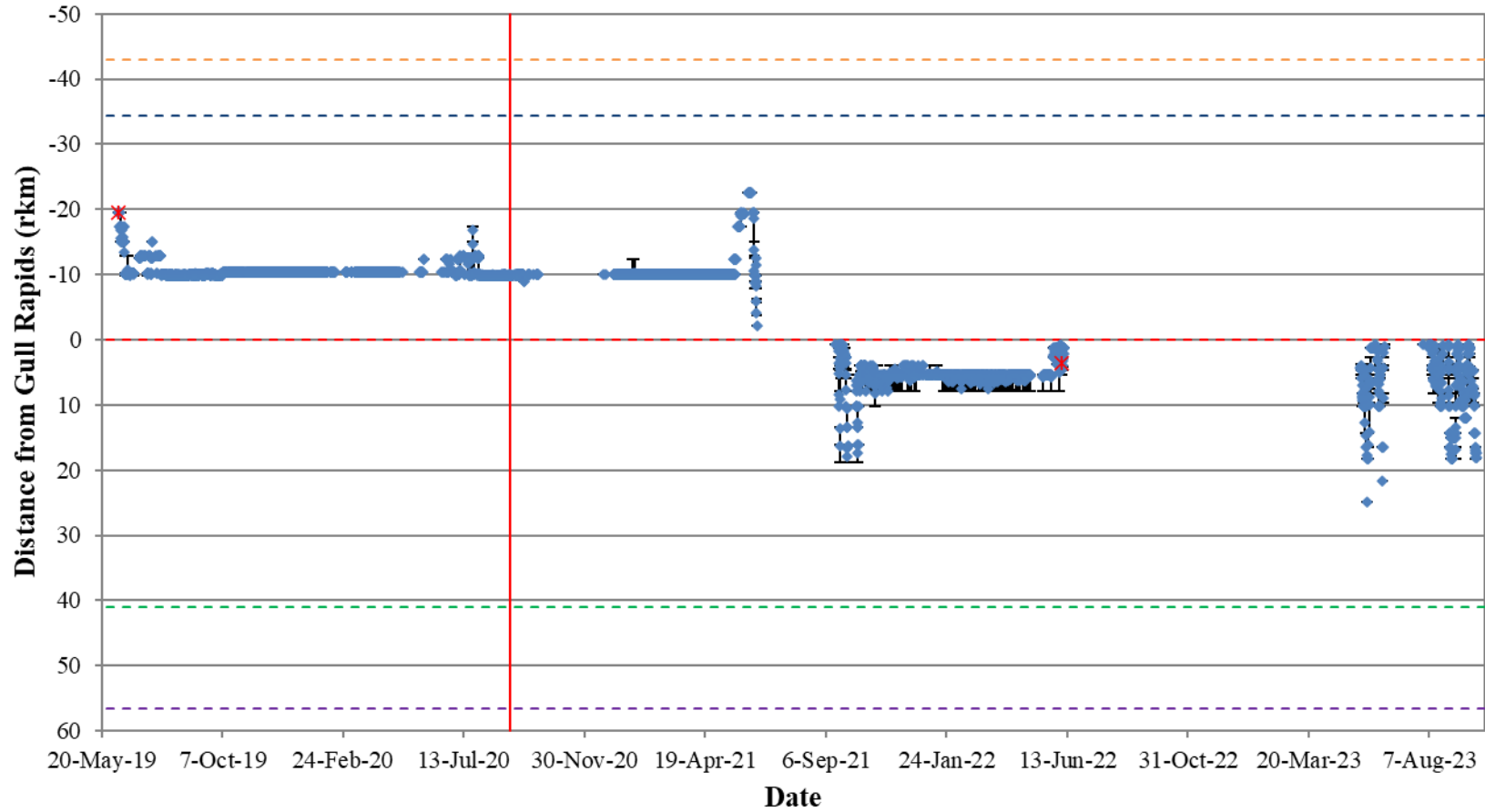


Figure A2-13: Position of a Lake Sturgeon tagged with an acoustic transmitter (code #7028) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0), from May 1, 2019 to October 2, 2023. Date and location of tagging is indicated by a star. Completion of reservoir impoundment is indicated by a vertical solid red line. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keeyask GS; green = Kettle GS; purple = Long Spruce GS).

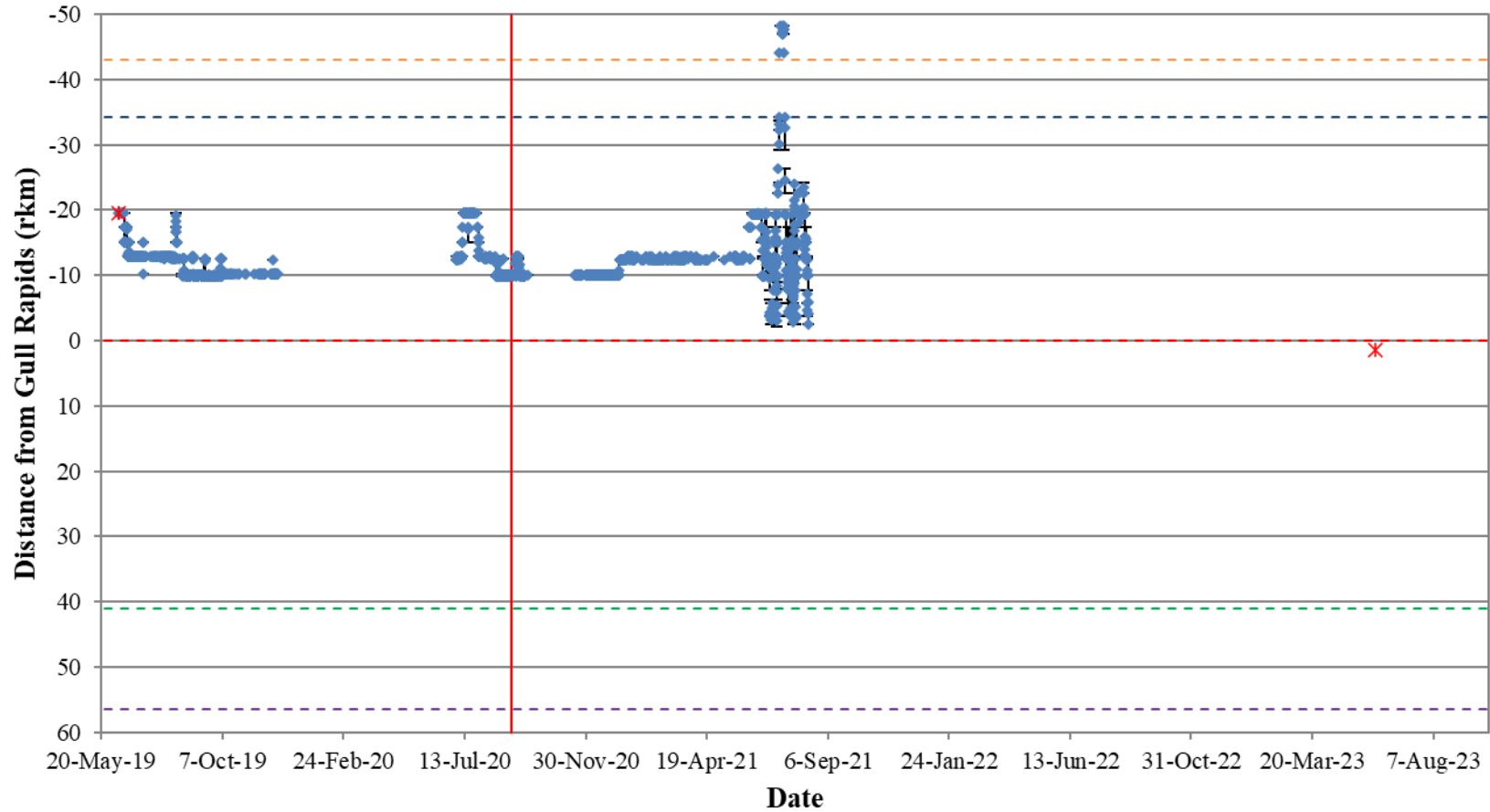


Figure A2-14: Position of a Lake Sturgeon tagged with an acoustic transmitter (code #7029) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0), from May 1, 2019 to October 2, 2023. Date and location of tagging is indicated by a star. Completion of reservoir impoundment is indicated by a vertical solid red line. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keeyask GS; green = Kettle GS; purple = Long Spruce GS).

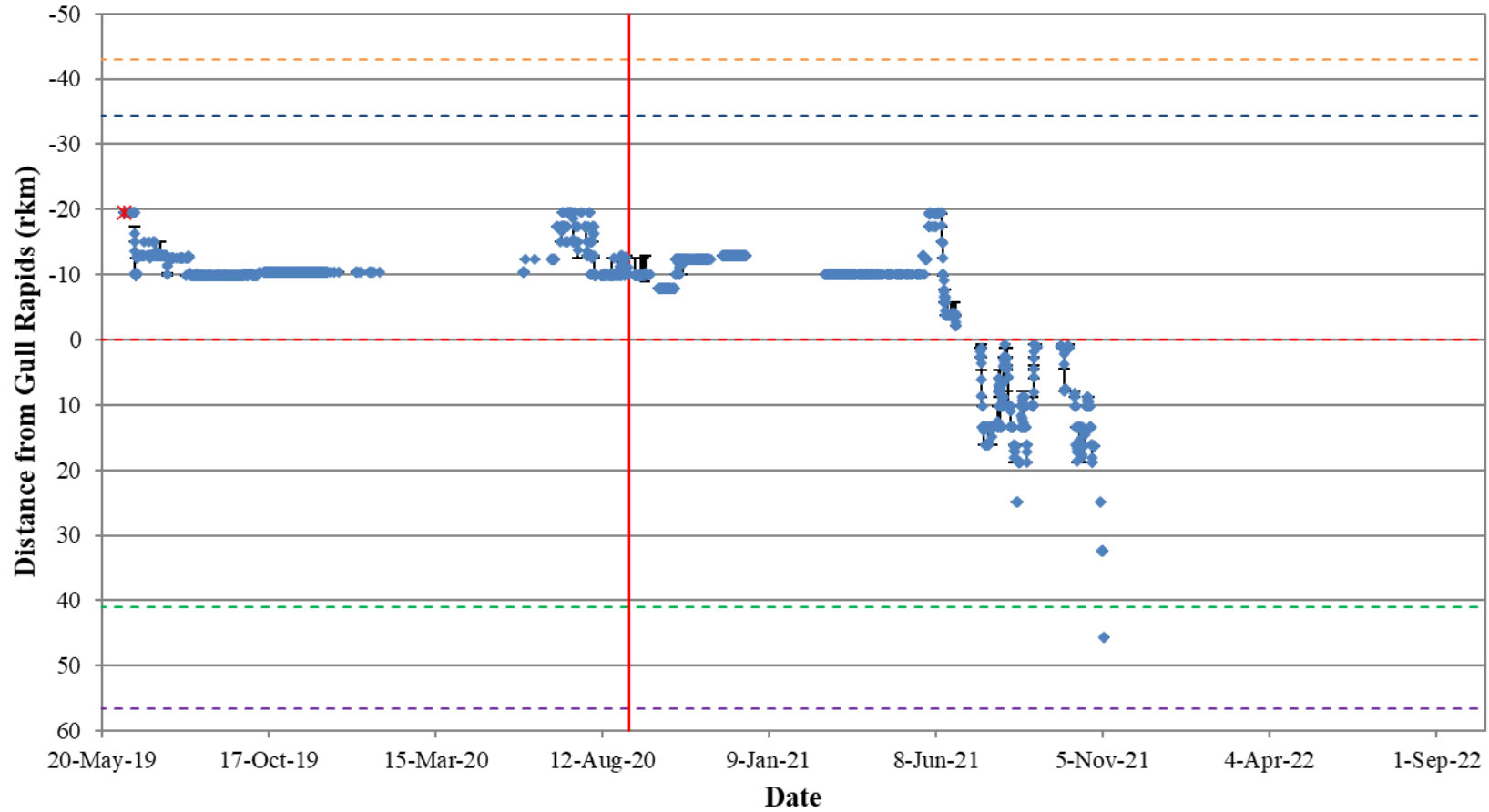


Figure A2-15: Position of a Lake Sturgeon tagged with an acoustic transmitter (code #7030) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0), from May 1, 2019 to October 2, 2023. Date and location of tagging is indicated by a star. Completion of reservoir impoundment is indicated by a vertical solid red line. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keeyask GS; green = Kettle GS; purple = Long Spruce GS).

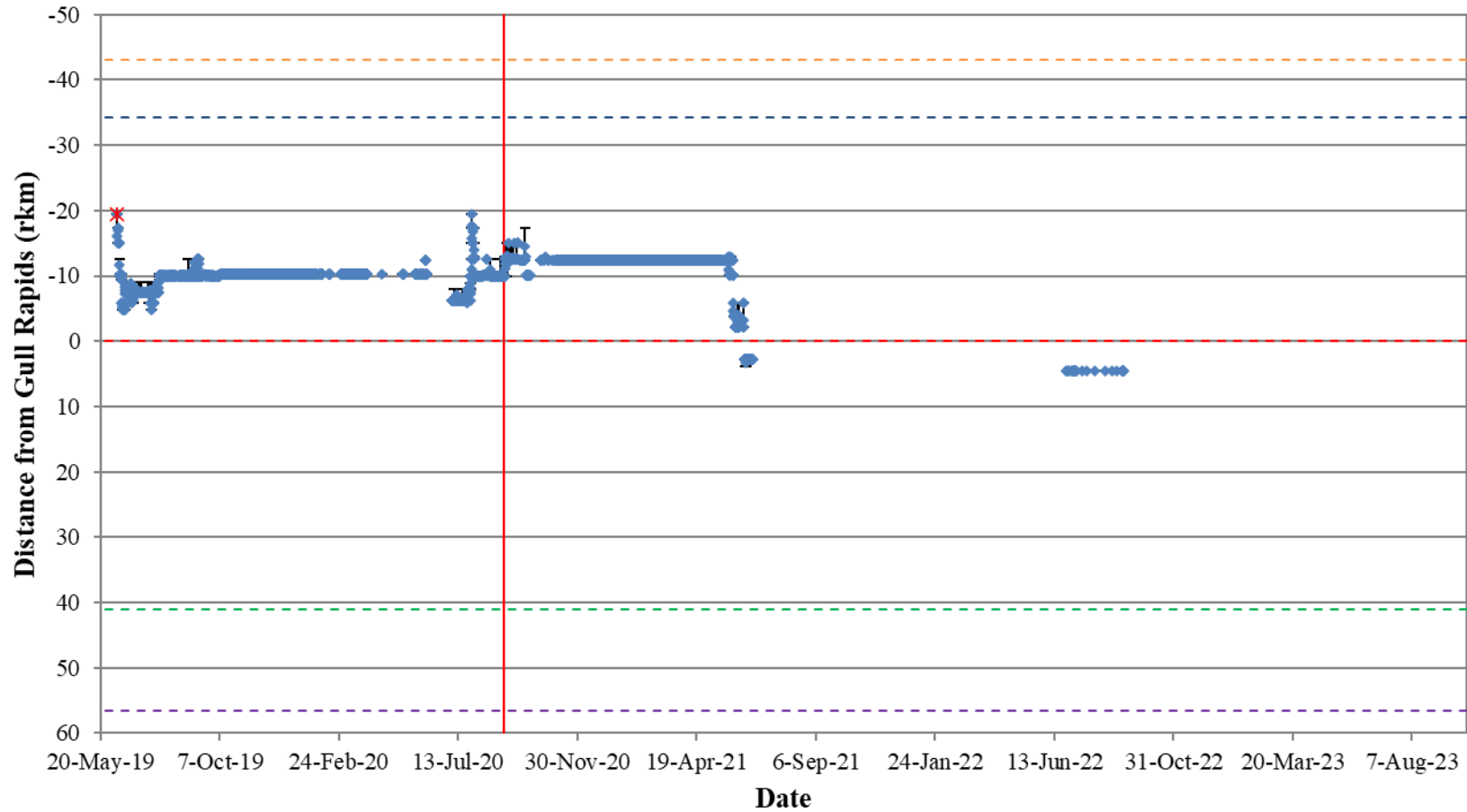


Figure A2-16: Position of a Lake Sturgeon tagged with an acoustic transmitter (code #7031) in the Nelson River between Clark Lake and the Keyyask GS in relation to the Keyyask GS (rkm 0), from May 1, 2019 to October 2, 2023. Date and location of tagging is indicated by a star. Completion of reservoir impoundment is indicated by a vertical solid red line. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keyyask GS; green = Kettle GS; purple = Long Spruce GS).

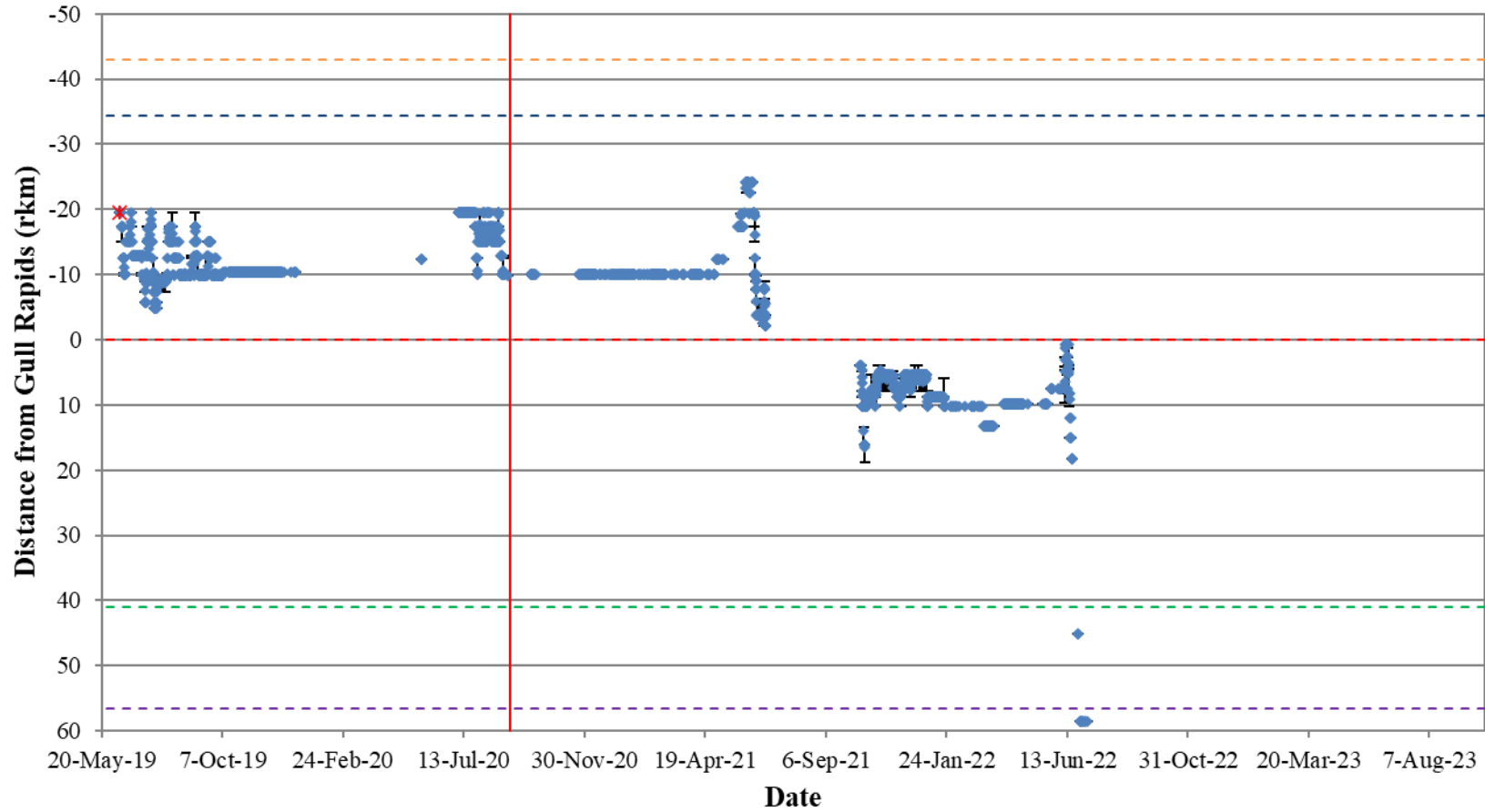


Figure A2-17: Position of a Lake Sturgeon tagged with an acoustic transmitter (code #7032) in the Nelson River between Clark Lake and the Keyyask GS in relation to the Keyyask GS (rkm 0), from May 1, 2019 to October 2, 2023. Date and location of tagging is indicated by a star. Completion of reservoir impoundment is indicated by a vertical solid red line. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keyyask GS; green = Kettle GS; purple = Long Spruce GS).

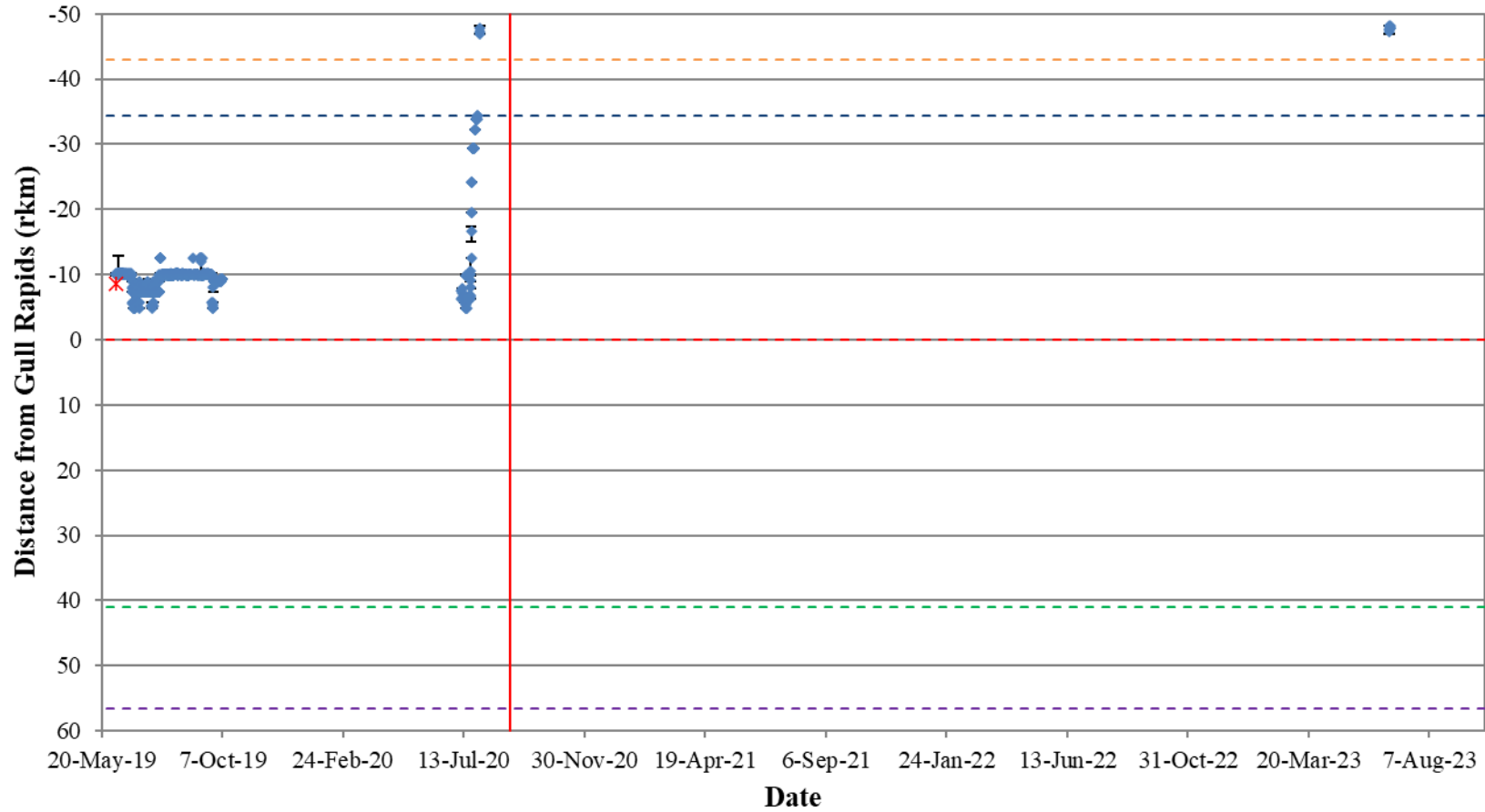


Figure A2-18: Position of a Lake Sturgeon tagged with an acoustic transmitter (code #7033) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0), from May 1, 2019 to October 2, 2023. Date and location of tagging is indicated by a star. Completion of reservoir impoundment is indicated by a vertical solid red line. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keeyask GS; green = Kettle GS; purple = Long Spruce GS).

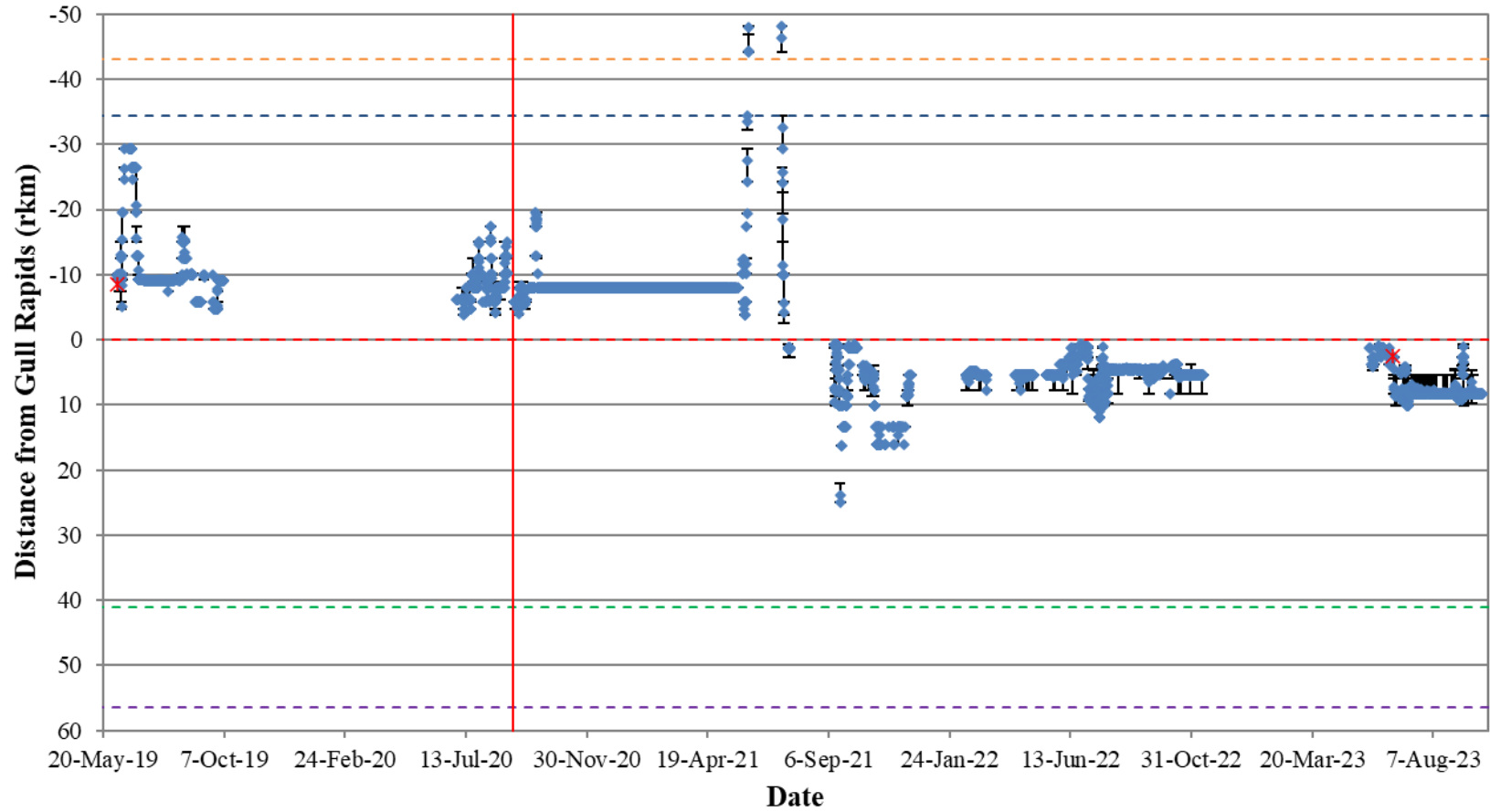


Figure A2-19: Position of a Lake Sturgeon tagged with an acoustic transmitter (code #7034) in the Nelson River between Clark Lake and the Keyeyask GS in relation to the Keyeyask GS (rkm 0), from May 1, 2019 to October 2, 2023. Date and location of tagging is indicated by a star. Completion of reservoir impoundment is indicated by a vertical solid red line. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keyeyask GS; green = Kettle GS; purple = Long Spruce GS).

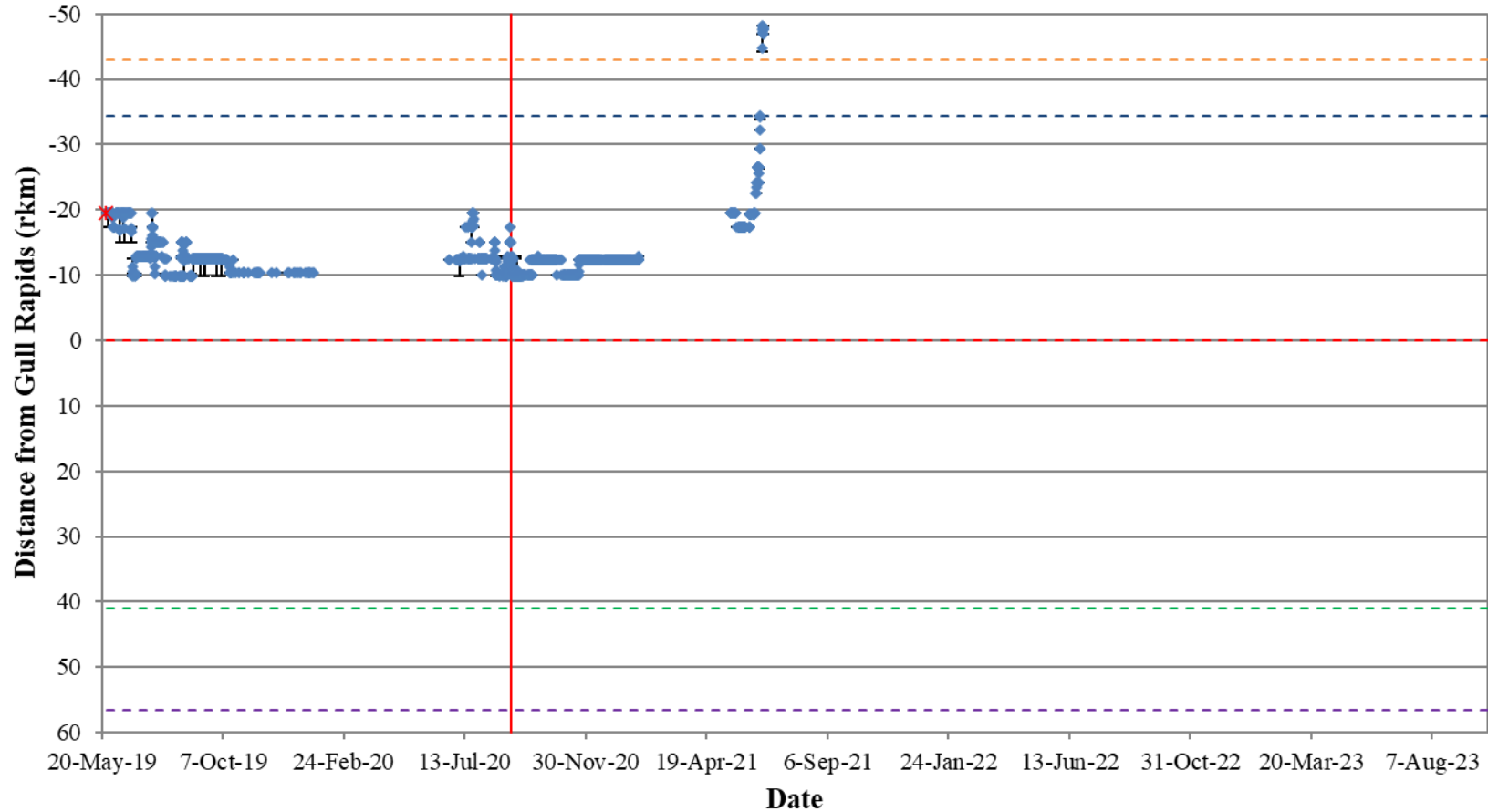


Figure A2-20: Position of a Lake Sturgeon tagged with an acoustic transmitter (code #7053) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0), from May 1, 2019 to October 2, 2023. Date and location of tagging is indicated by a star. Completion of reservoir impoundment is indicated by a vertical solid red line. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keeyask GS; green = Kettle GS; purple = Long Spruce GS).

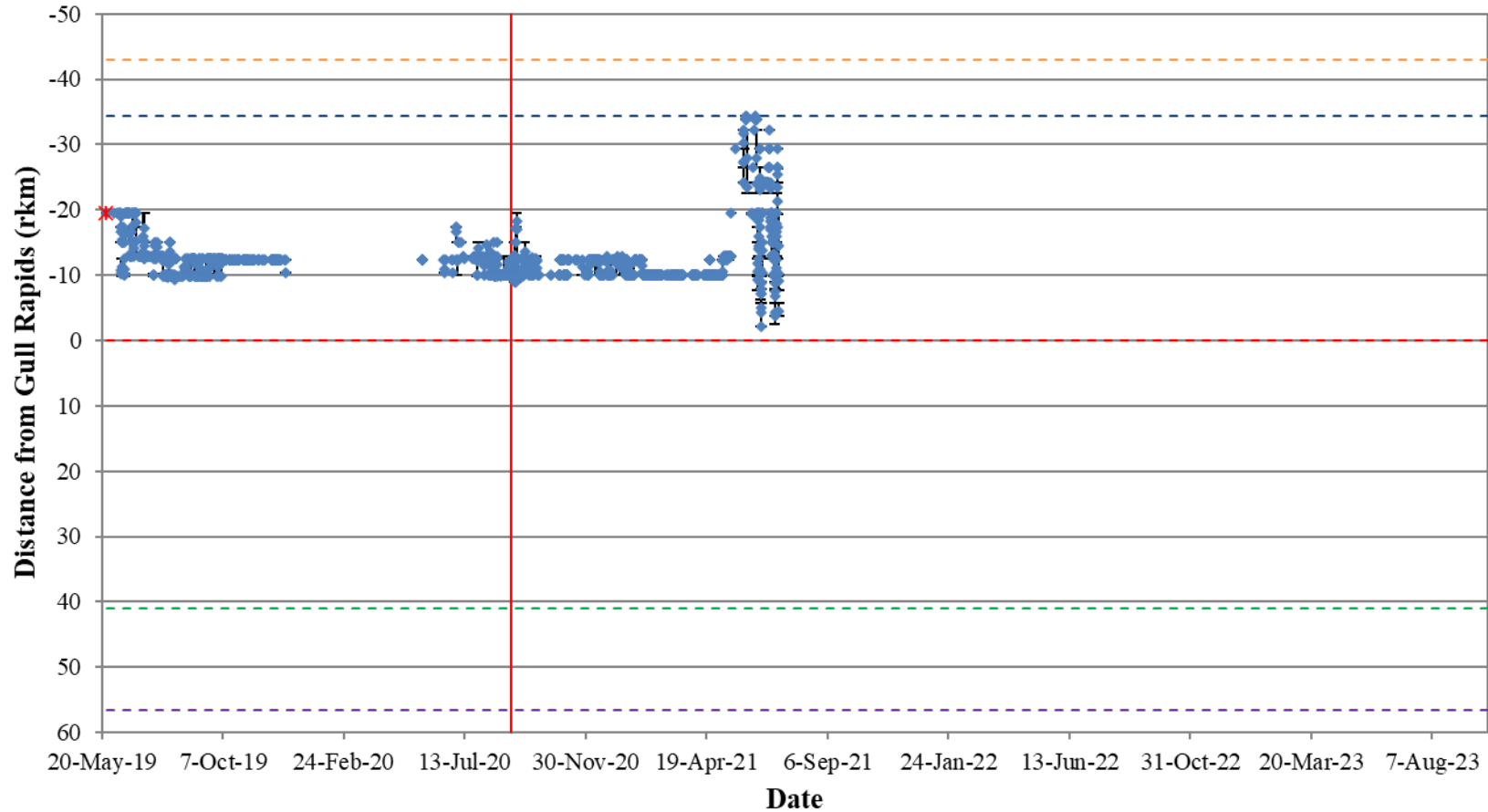


Figure A2-21: Position of a Lake Sturgeon tagged with an acoustic transmitter (code #7056) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0), from May 1, 2019 to October 2, 2023. Date and location of tagging is indicated by a star. Completion of reservoir impoundment is indicated by a vertical solid red line. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keeyask GS; green = Kettle GS; purple = Long Spruce GS).

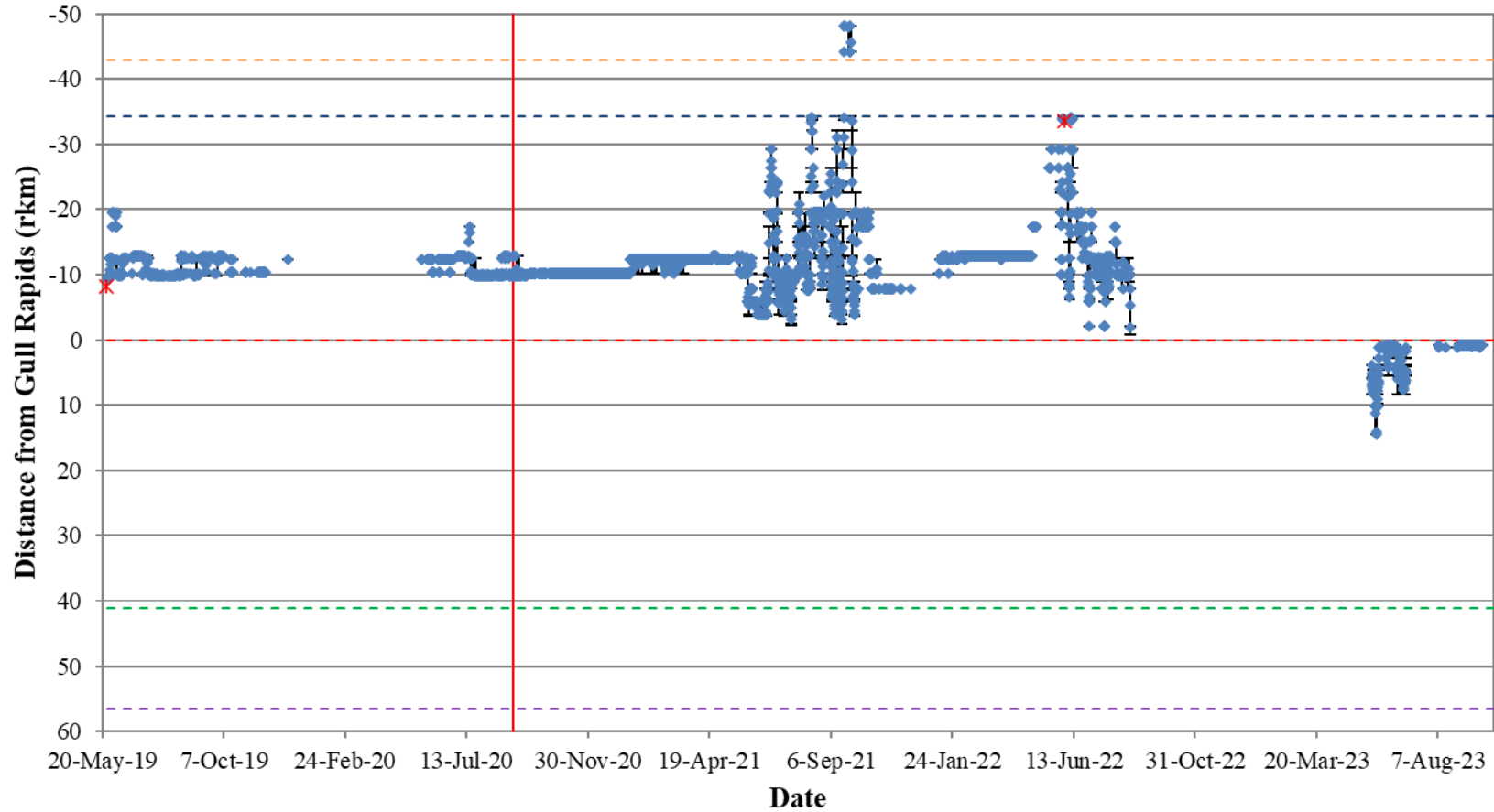


Figure A2-22: Position of a Lake Sturgeon tagged with an acoustic transmitter (code #7059) in the Nelson River between Clark Lake and the Keyyask GS in relation to the Keyyask GS (rkm 0), from May 1, 2019 to October 2, 2023. Date and location of tagging is indicated by a star. Completion of reservoir impoundment is indicated by a vertical solid red line. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keyyask GS; green = Kettle GS; purple = Long Spruce GS).

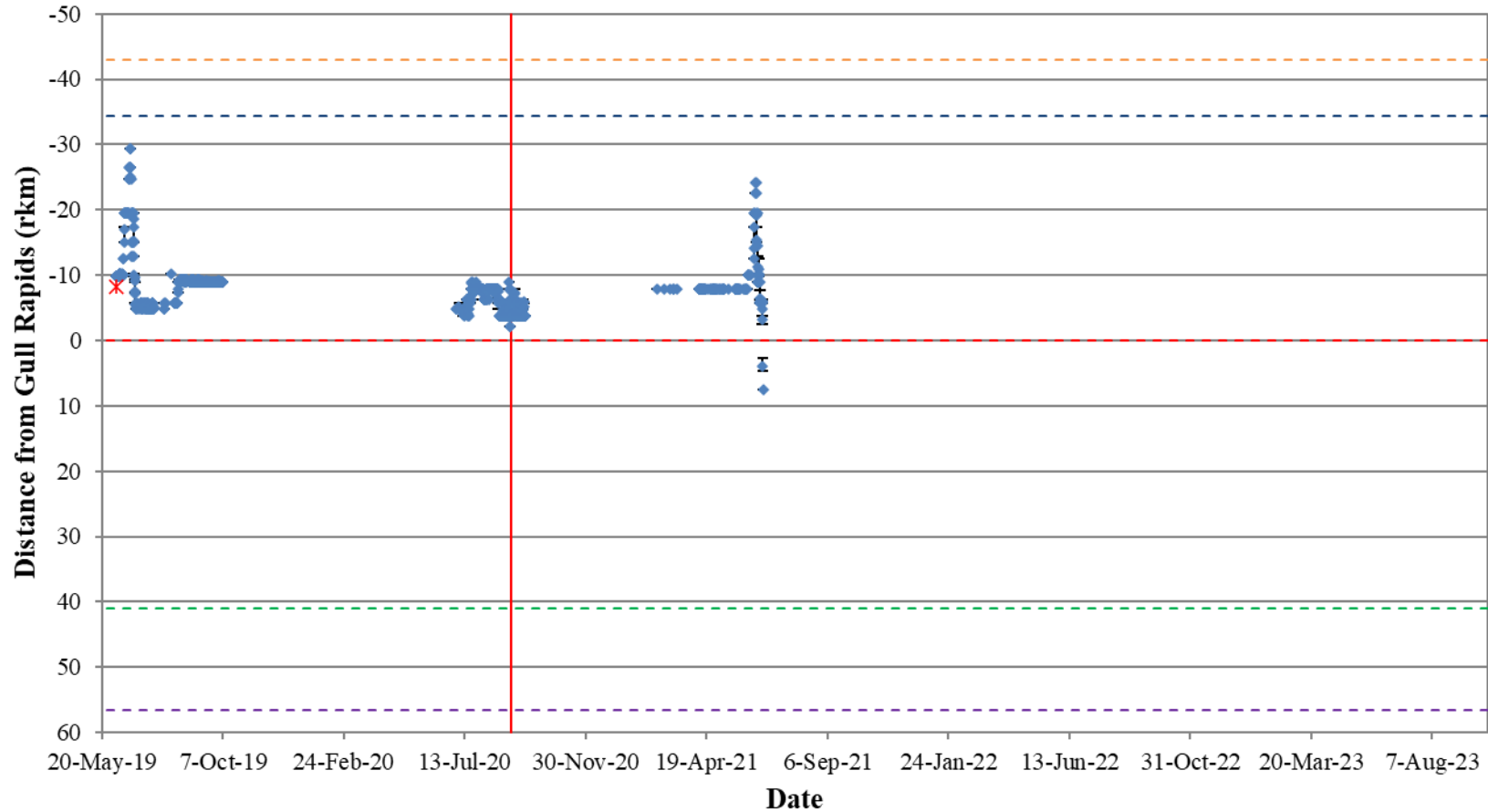


Figure A2-23: Position of a Lake Sturgeon tagged with an acoustic transmitter (code #7061) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0), from May 1, 2019 to October 2, 2023. Date and location of tagging is indicated by a star. Completion of reservoir impoundment is indicated by a vertical solid red line. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keeyask GS; green = Kettle GS; purple = Long Spruce GS).

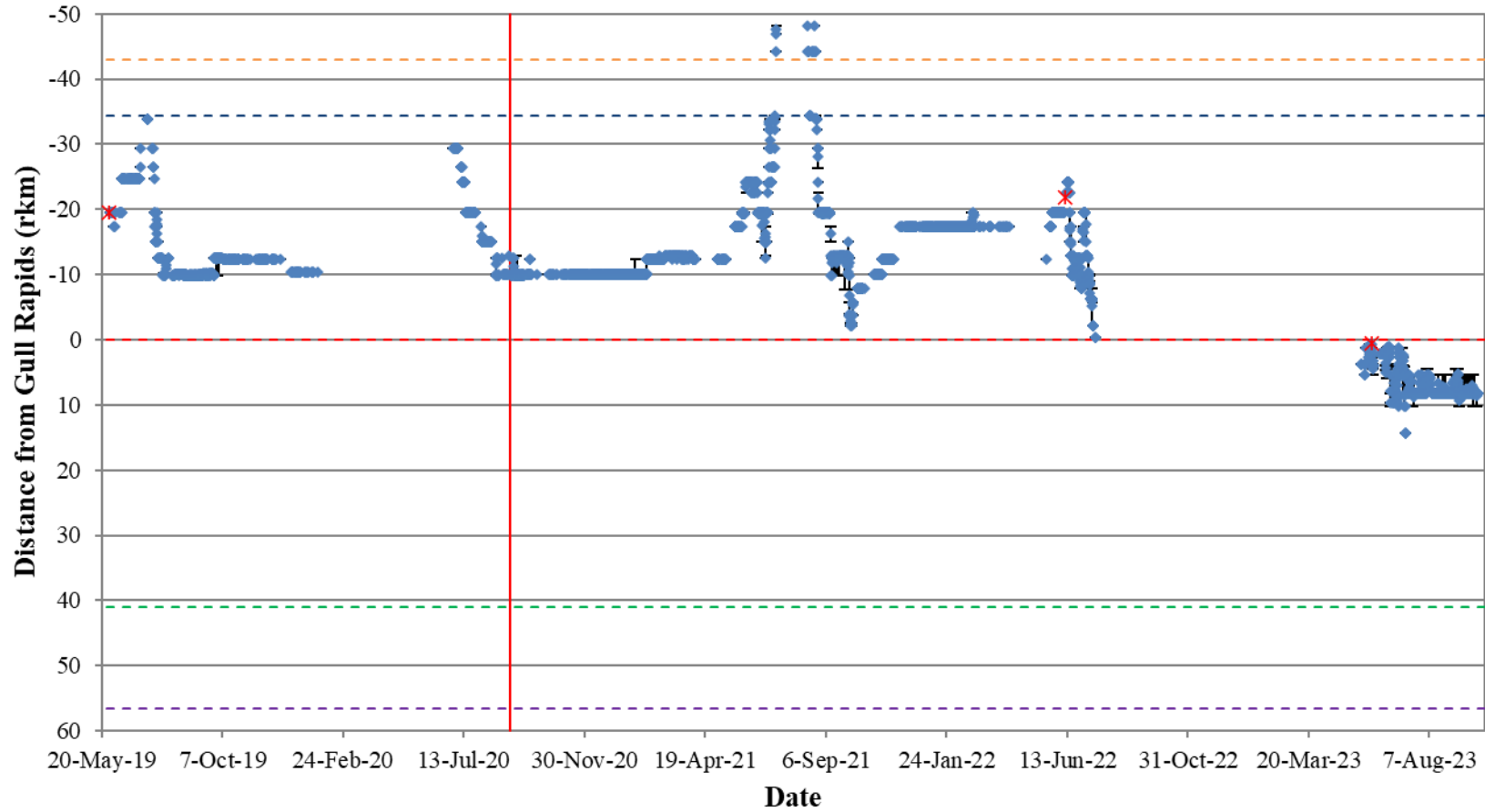


Figure A2-24: Position of a Lake Sturgeon tagged with an acoustic transmitter (code #7064) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0), from May 1, 2019 to October 2, 2023. Date and location of tagging is indicated by a star. Completion of reservoir impoundment is indicated by a vertical solid red line. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keeyask GS; green = Kettle GS; purple = Long Spruce GS).

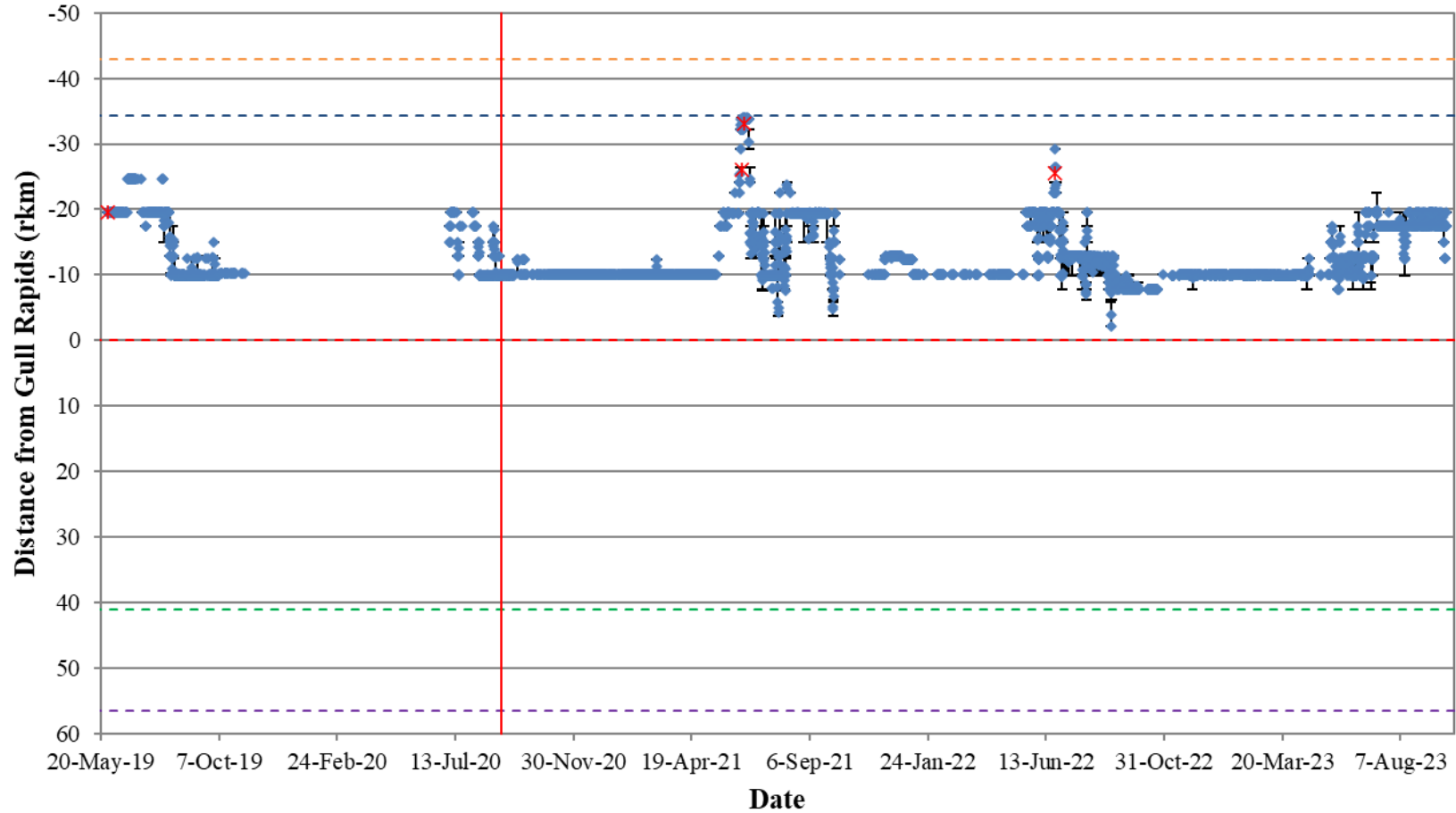


Figure A2-25: Position of a Lake Sturgeon tagged with an acoustic transmitter (code #7065) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0), from May 1, 2019 to October 2, 2023. Date and location of tagging is indicated by a star. Completion of reservoir impoundment is indicated by a vertical solid red line. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keeyask GS; green = Kettle GS; purple = Long Spruce GS).

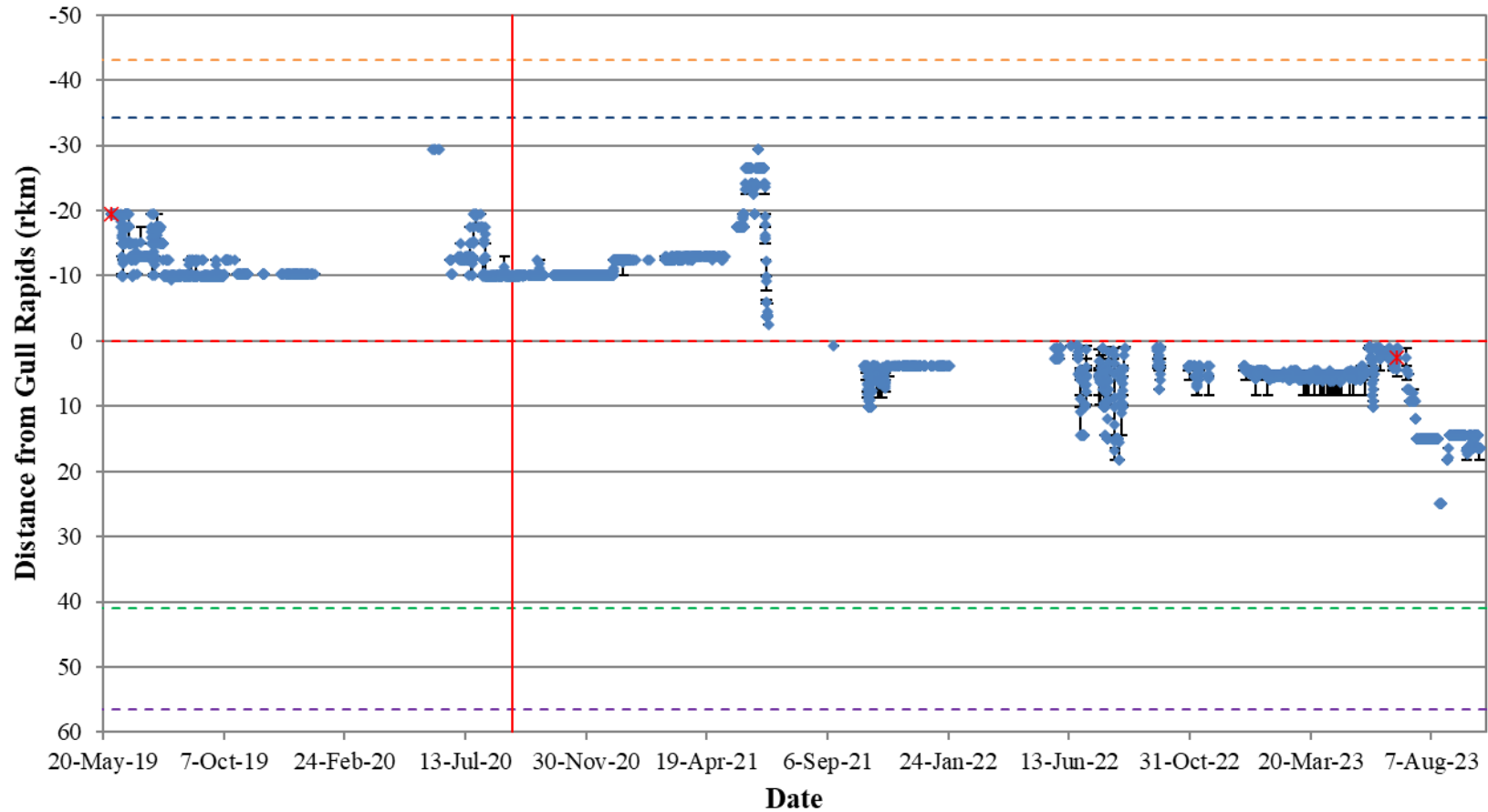


Figure A2-26: Position of a Lake Sturgeon tagged with an acoustic transmitter (code #7066) in the Nelson River between Clark Lake and the Keyeyask GS in relation to the Keyeyask GS (rkm 0), from May 1, 2019 to October 2, 2023. Date and location of tagging is indicated by a star. Completion of reservoir impoundment is indicated by a vertical solid red line. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keyeyask GS; green = Kettle GS; purple = Long Spruce GS).

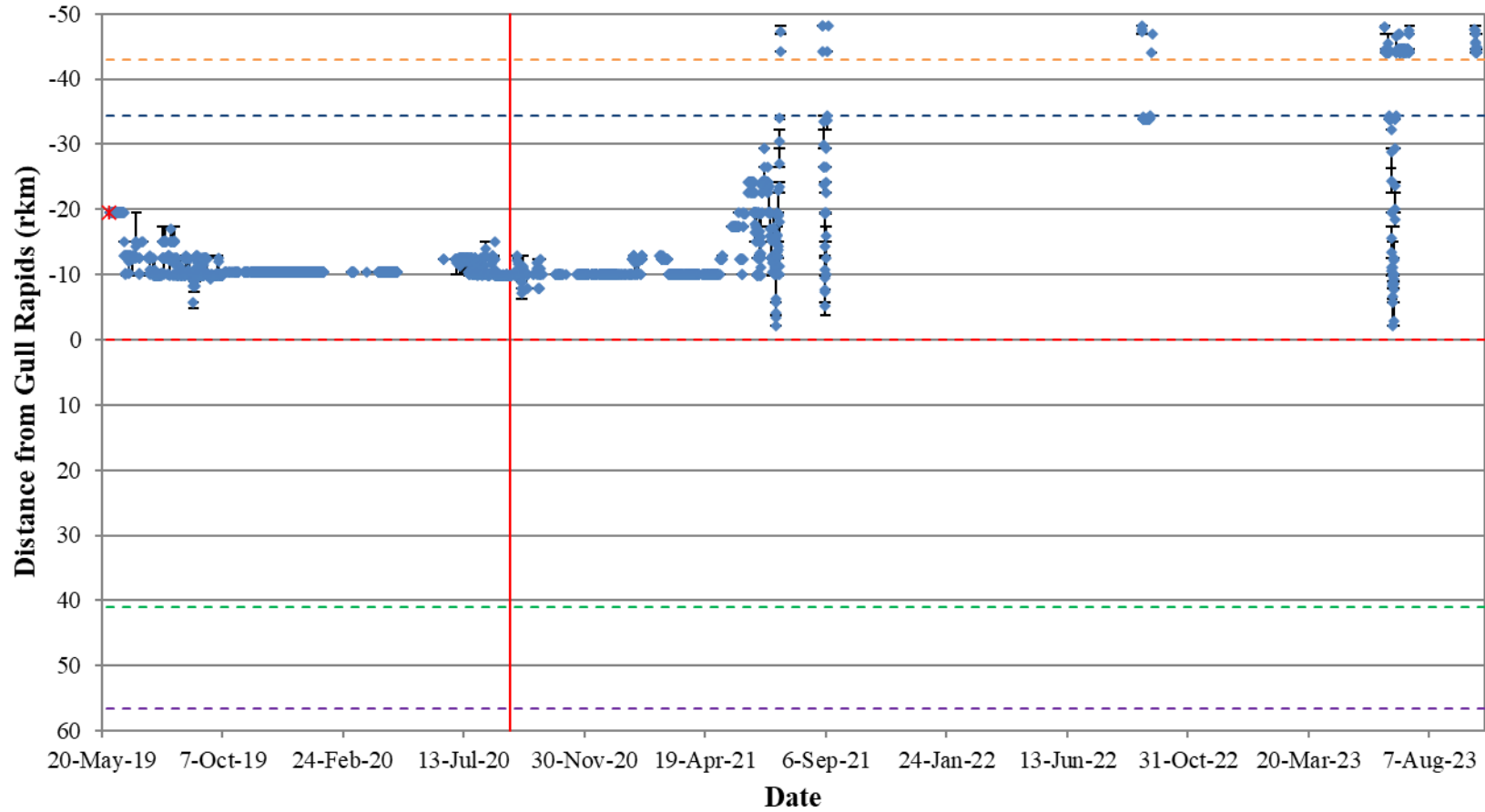


Figure A2-27: Position of a Lake Sturgeon tagged with an acoustic transmitter (code #7067) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0), from May 1, 2019 to October 2, 2023. Date and location of tagging is indicated by a star. Completion of reservoir impoundment is indicated by a vertical solid red line. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keeyask GS; green = Kettle GS; purple = Long Spruce GS).

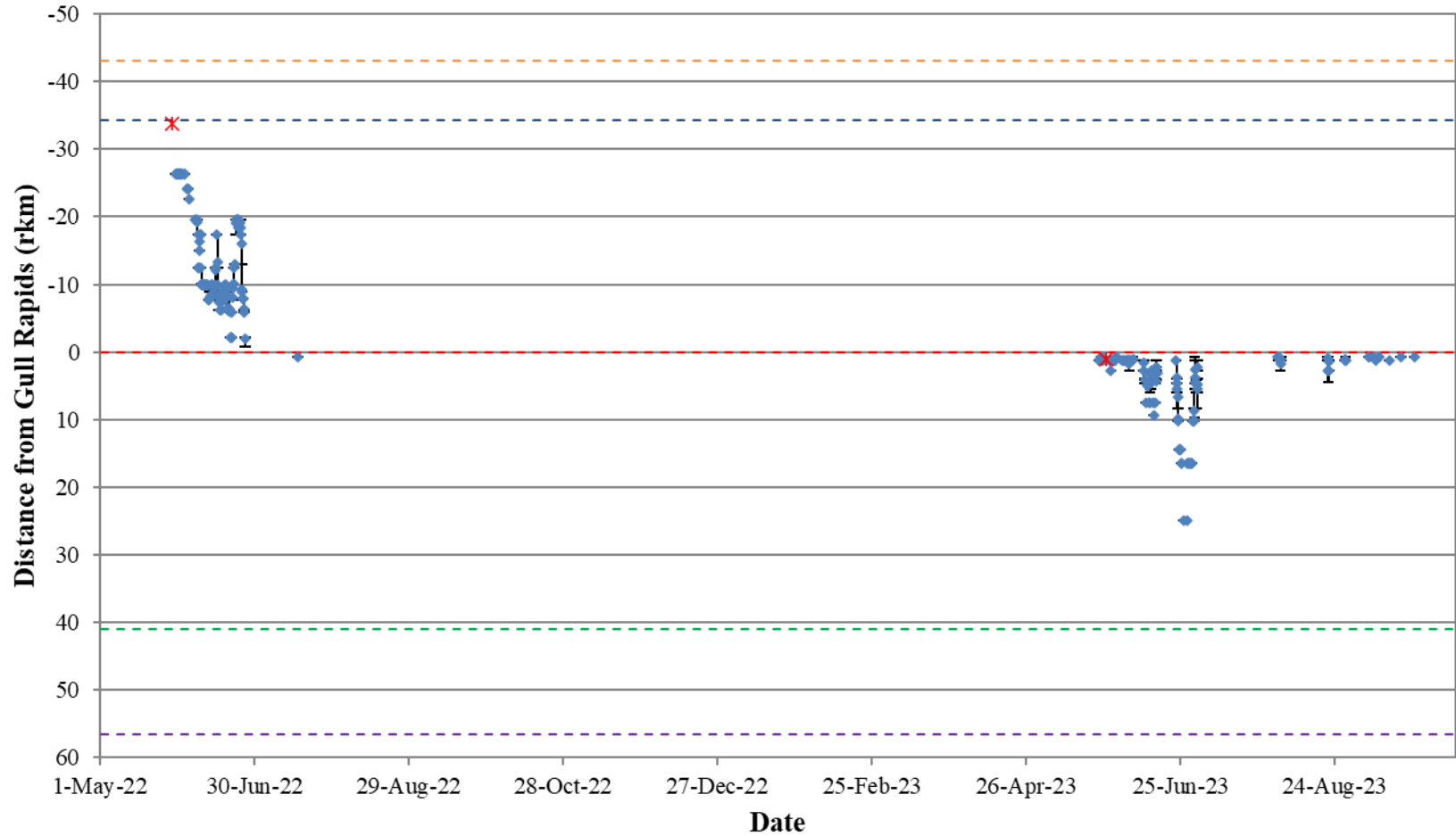


Figure A2-28: Position of a Lake Sturgeon tagged with an acoustic transmitter (code #57478) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0), from May 16, 2022 to October 2, 2023. Date and location of tagging is indicated by a star. Completion of reservoir impoundment is indicated by a vertical solid red line. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keeyask GS; green = Kettle GS; purple = Long Spruce GS).

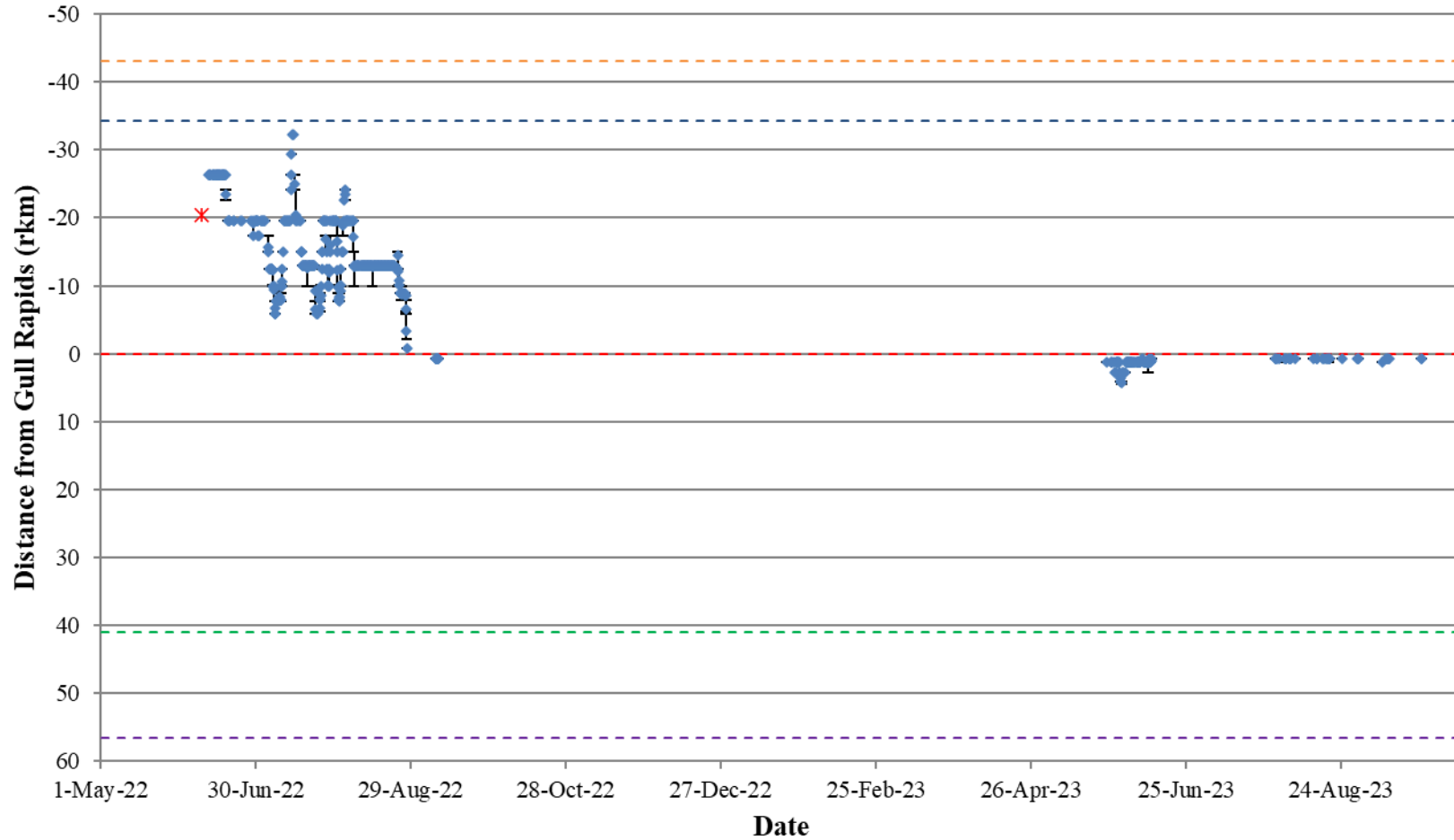


Figure A2-29: Position of a Lake Sturgeon tagged with an acoustic transmitter (code #57479) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0), from May 16, 2022 to October 2, 2023. Date and location of tagging is indicated by a star. Completion of reservoir impoundment is indicated by a vertical solid red line. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keeyask GS; green = Kettle GS; purple = Long Spruce GS).

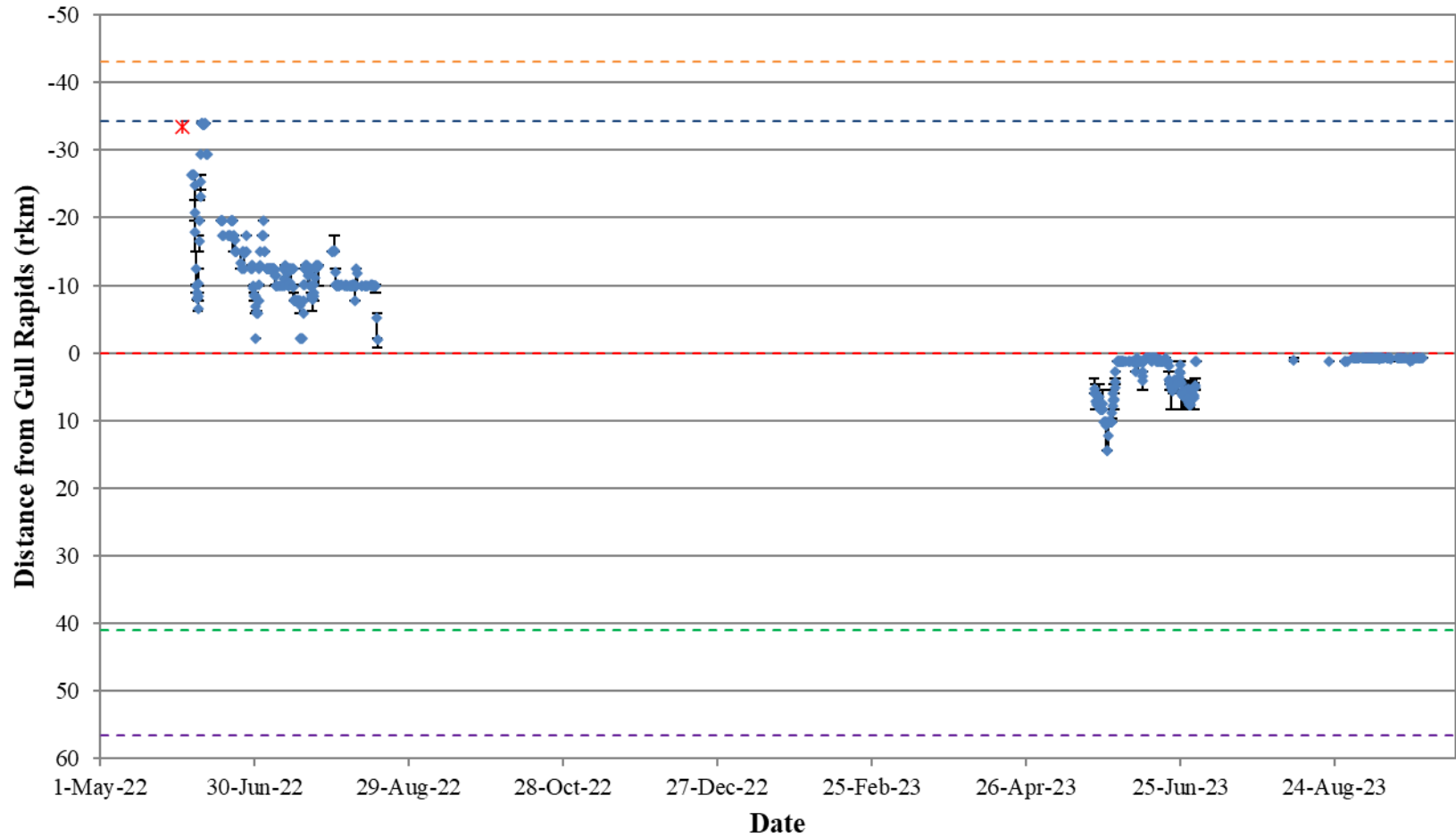


Figure A2-30: Position of a Lake Sturgeon tagged with an acoustic transmitter (code #57480) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0), from May 16, 2022 to October 2, 2023. Date and location of tagging is indicated by a star. Completion of reservoir impoundment is indicated by a vertical solid red line. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keeyask GS; green = Kettle GS; purple = Long Spruce GS).

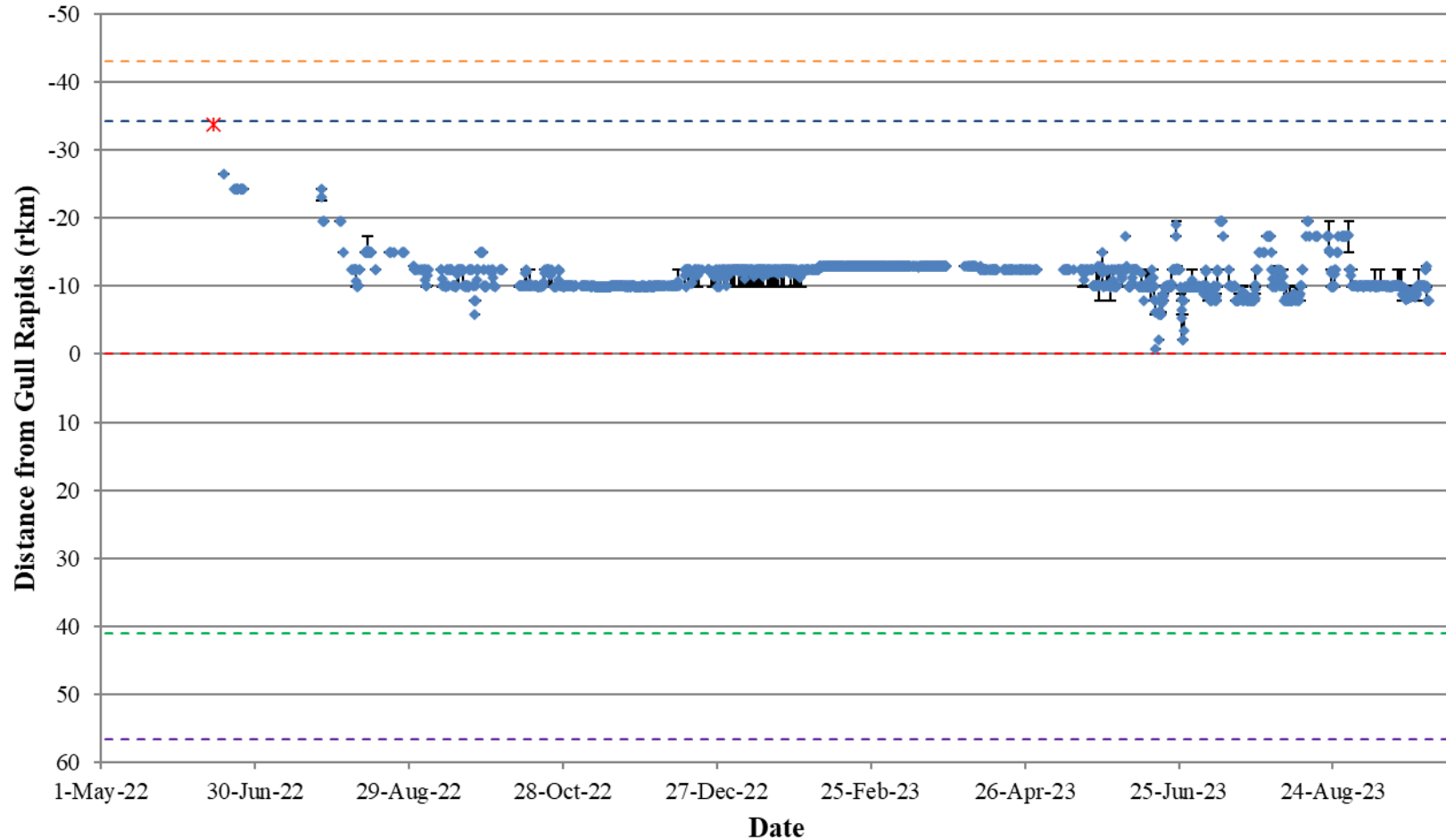


Figure A2-31: Position of a Lake Sturgeon tagged with an acoustic transmitter (code #57481) in the Nelson River between Clark Lake and the Keyyask GS in relation to the Keyyask GS (rkm 0), from May 16, 2022 to October 2, 2023. Date and location of tagging is indicated by a star. Completion of reservoir impoundment is indicated by a vertical solid red line. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keyyask GS; green = Kettle GS; purple = Long Spruce GS).

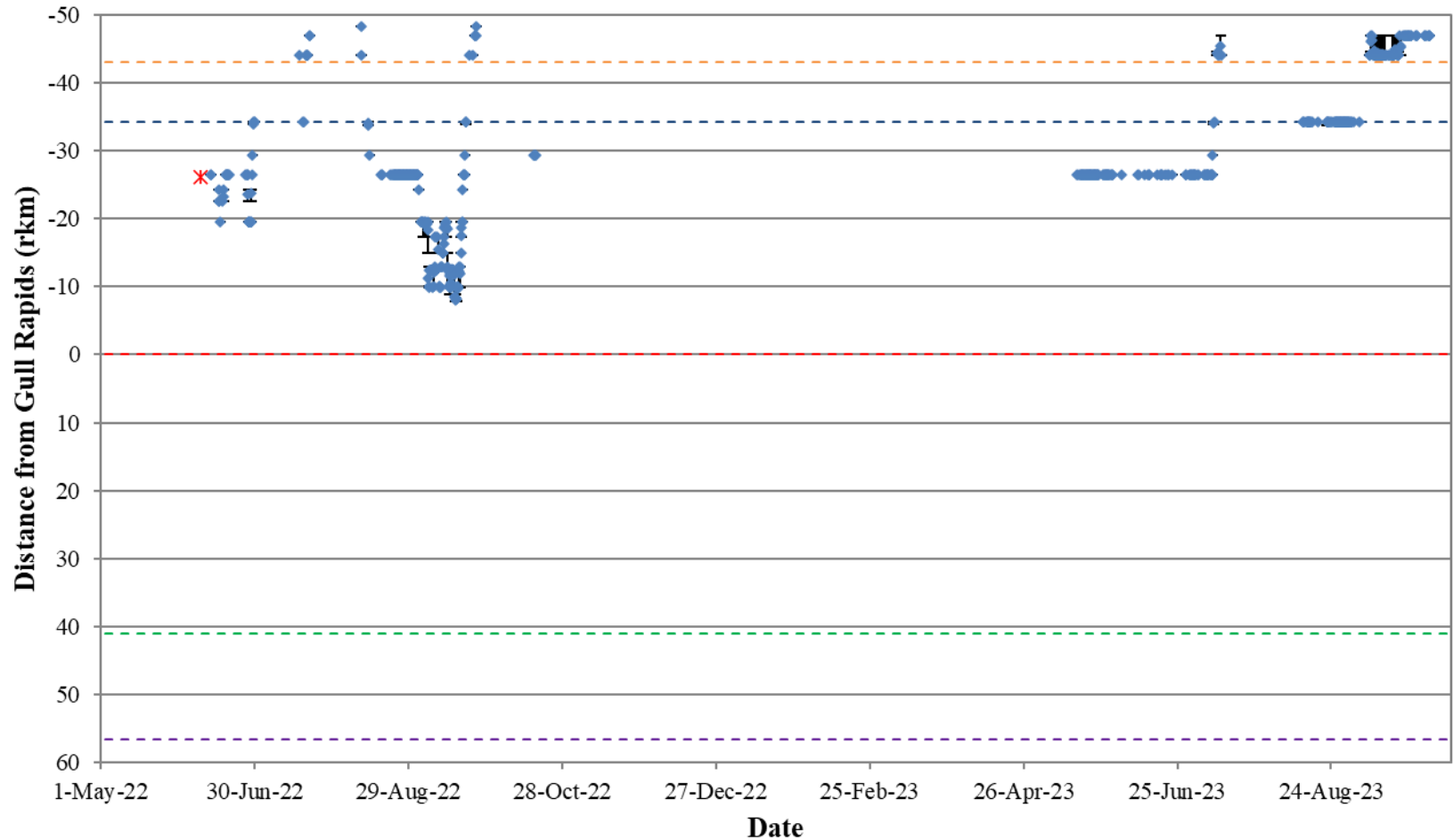


Figure A2-32: Position of a Lake Sturgeon tagged with an acoustic transmitter (code #57482) in the Nelson River between Clark Lake and the Keyyask GS in relation to the Keyyask GS (rkm 0), from May 16, 2022 to October 2, 2023. Date and location of tagging is indicated by a star. Completion of reservoir impoundment is indicated by a vertical solid red line. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keyyask GS; green = Kettle GS; purple = Long Spruce GS).

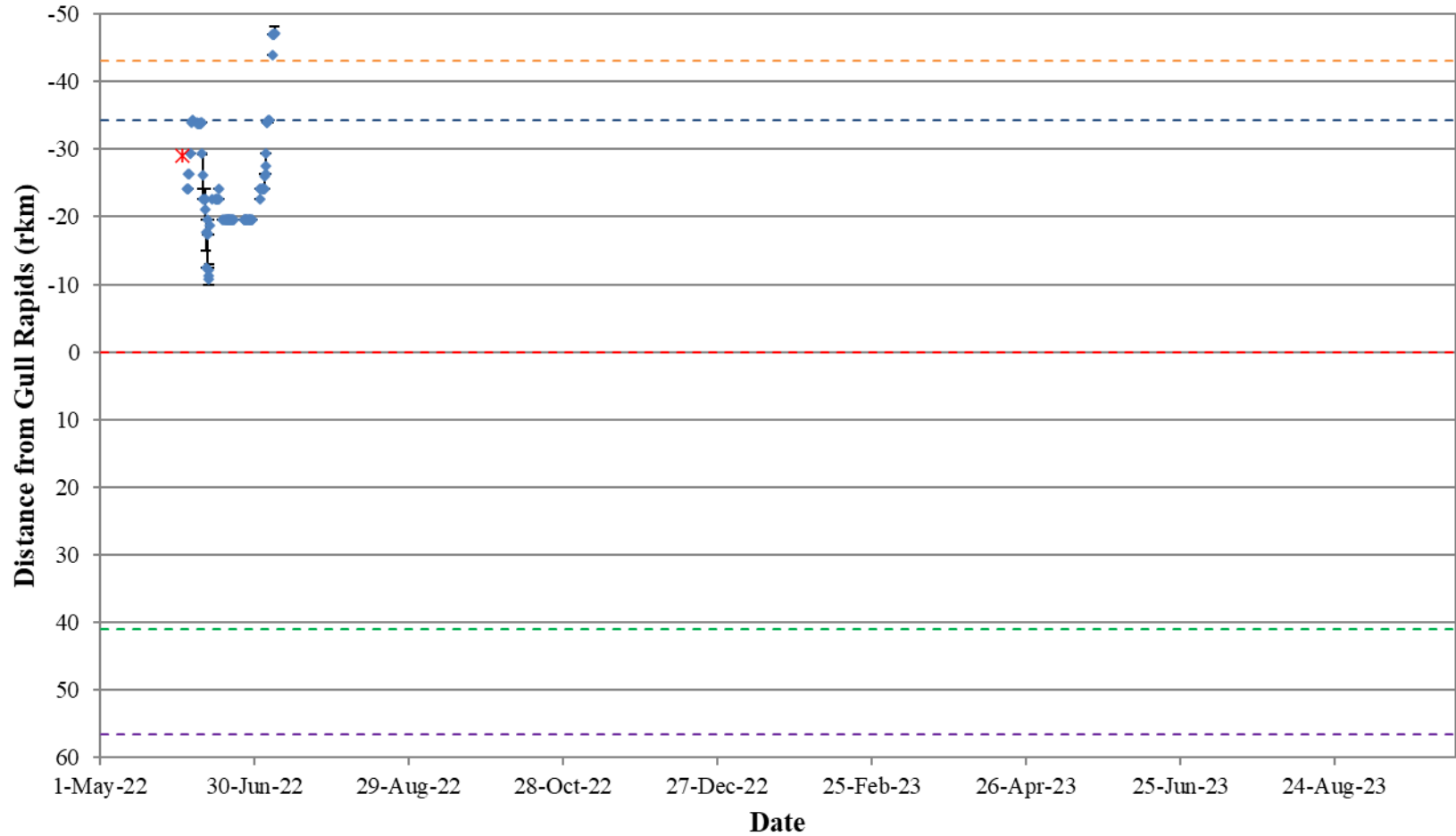


Figure A2-33: Position of a Lake Sturgeon tagged with an acoustic transmitter (code #57483) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0), from May 16, 2022 to October 2, 2023. Date and location of tagging is indicated by a star. Completion of reservoir impoundment is indicated by a vertical solid red line. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keeyask GS; green = Kettle GS; purple = Long Spruce GS).

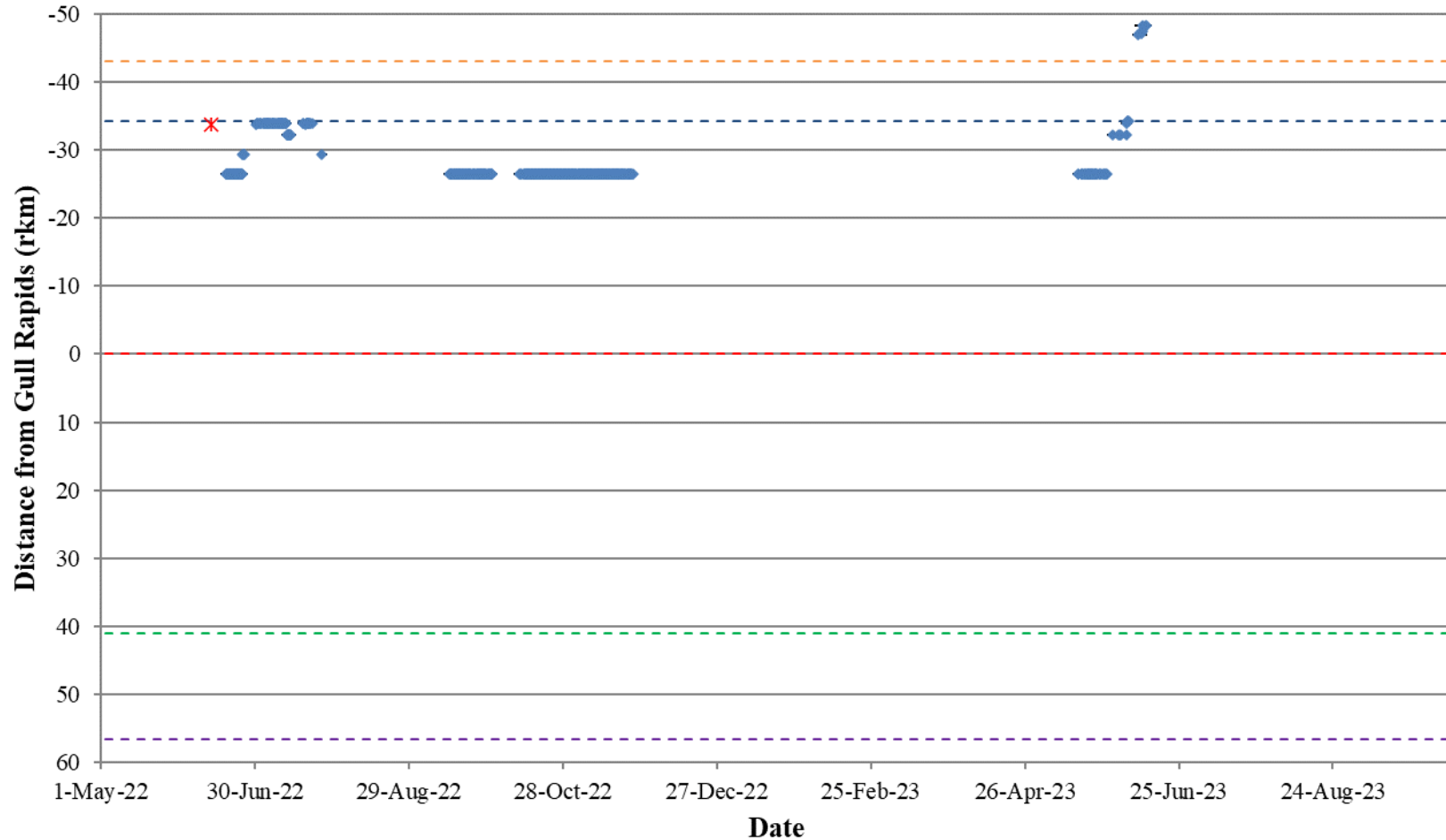


Figure A2-34: Position of a Lake Sturgeon tagged with an acoustic transmitter (code #57484) in the Nelson River between Clark Lake and the Keyyask GS in relation to the Keyyask GS (rkm 0), from May 16, 2022 to October 2, 2023. Date and location of tagging is indicated by a star. Completion of reservoir impoundment is indicated by a vertical solid red line. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keyyask GS; green = Kettle GS; purple = Long Spruce GS).

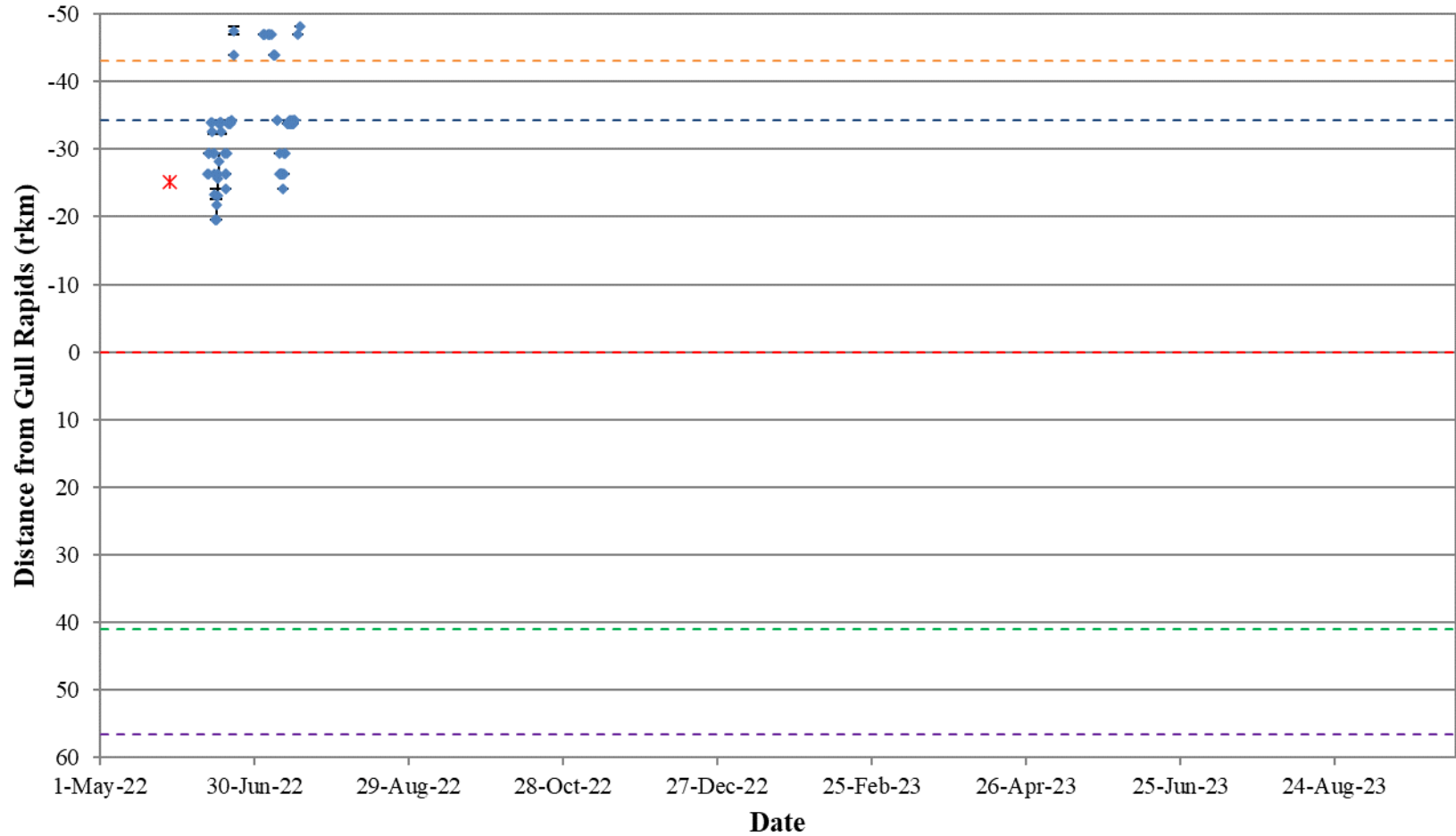


Figure A2-35: Position of a Lake Sturgeon tagged with an acoustic transmitter (code #57485) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0), from May 16, 2022 to October 2, 2023. Date and location of tagging is indicated by a star. Completion of reservoir impoundment is indicated by a vertical solid red line. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keeyask GS; green = Kettle GS; purple = Long Spruce GS).

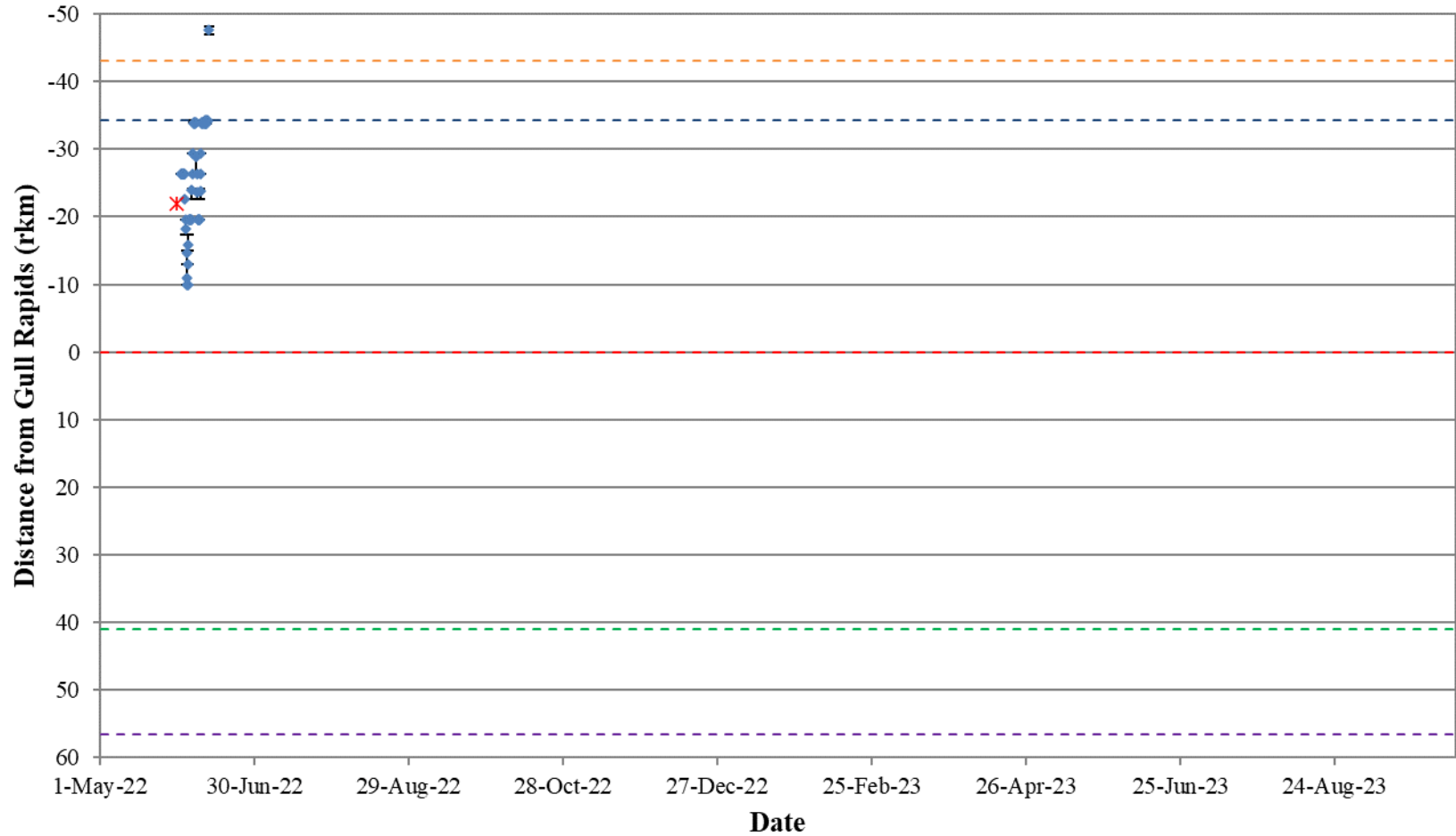


Figure A2-36: Position of a Lake Sturgeon tagged with an acoustic transmitter (code #57486) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0), from May 16, 2022 to October 2, 2023. Date and location of tagging is indicated by a star. Completion of reservoir impoundment is indicated by a vertical solid red line. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keeyask GS; green = Kettle GS; purple = Long Spruce GS).

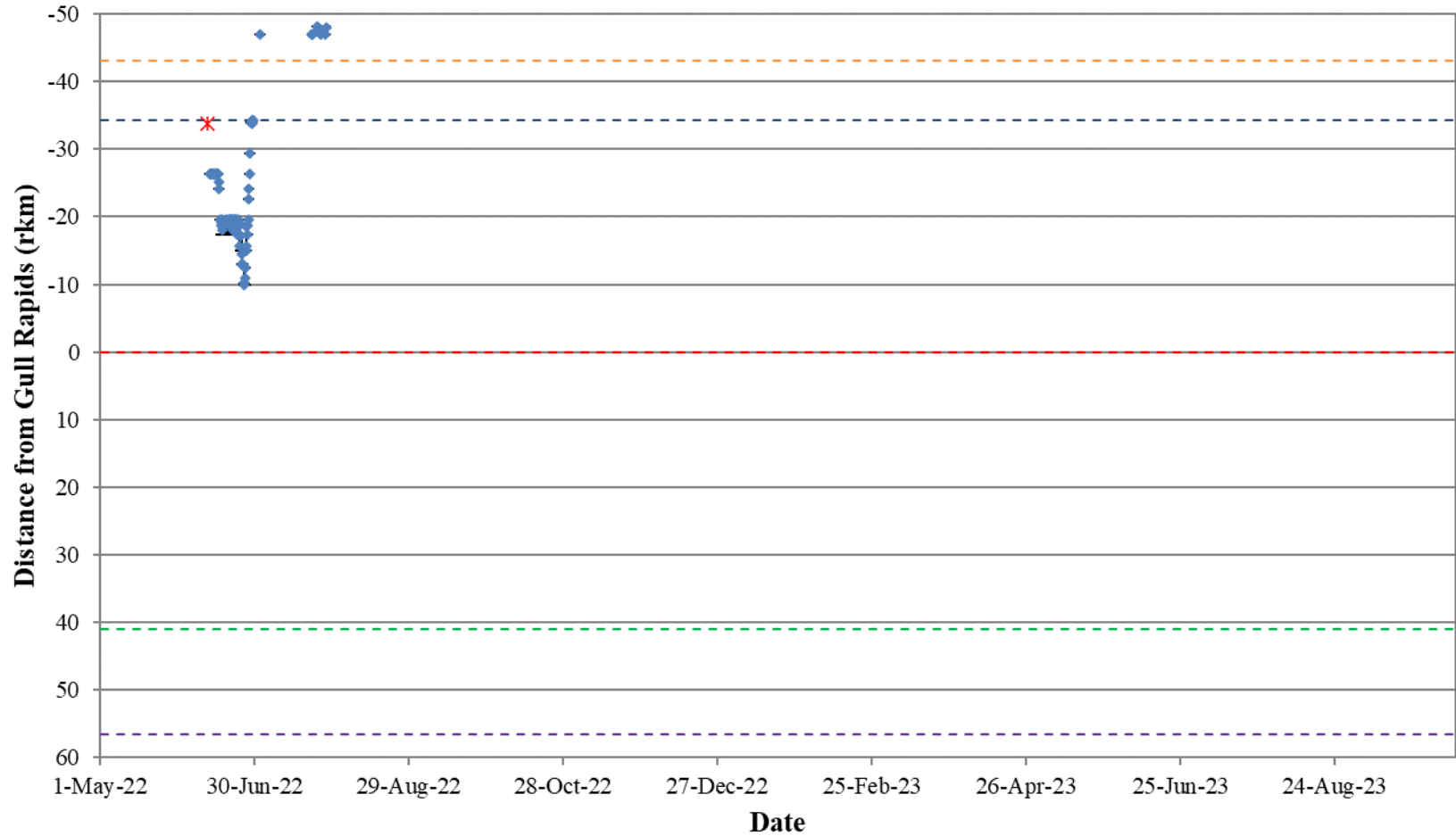


Figure A2-37: Position of a Lake Sturgeon tagged with an acoustic transmitter (code #57487) in the Nelson River between Clark Lake and the Keyyask GS in relation to the Keyyask GS (rkm 0), from May 16, 2022 to October 2, 2023. Date and location of tagging is indicated by a star. Completion of reservoir impoundment is indicated by a vertical solid red line. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keyyask GS; green = Kettle GS; purple = Long Spruce GS).

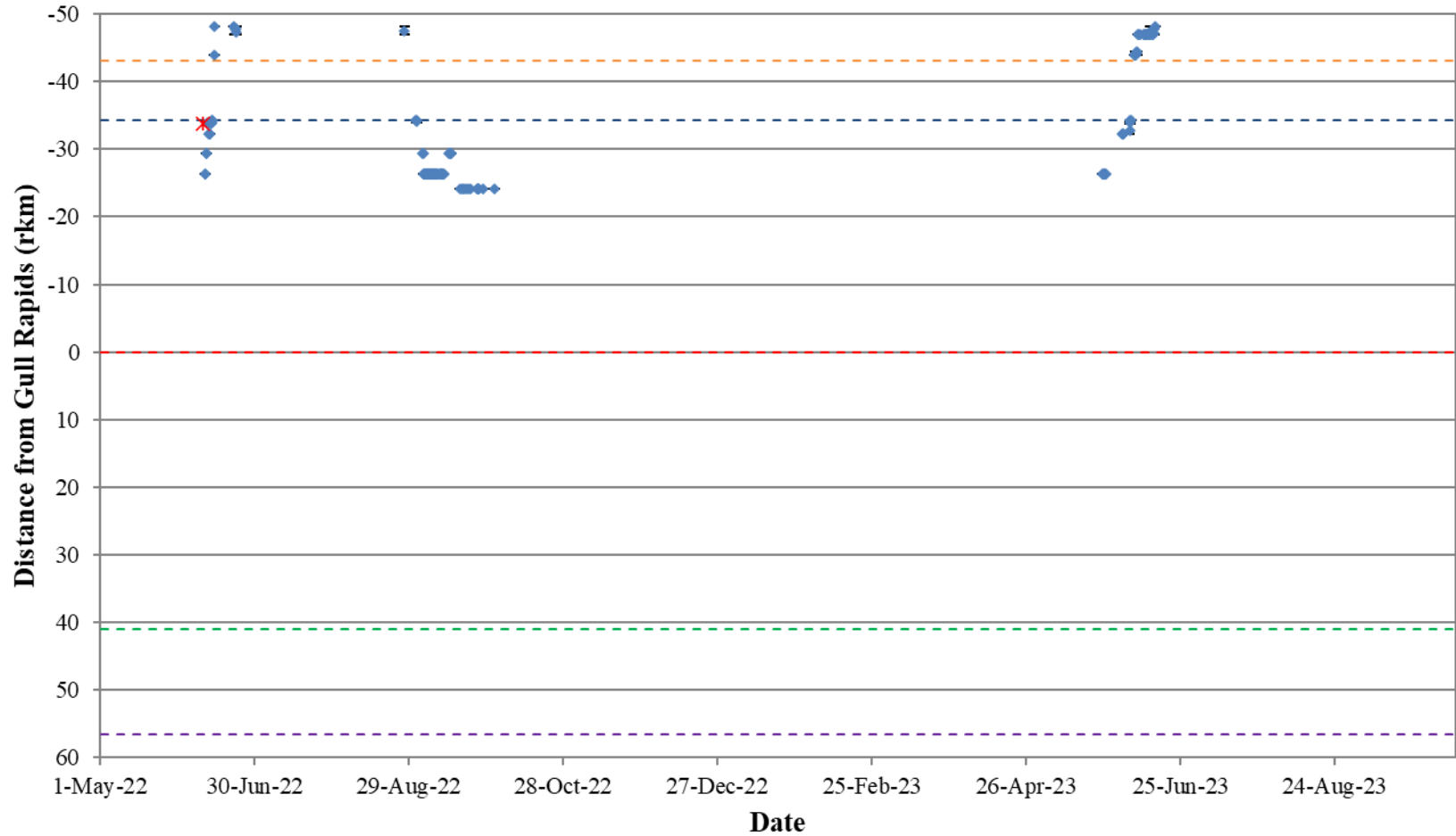


Figure A2-38: Position of a Lake Sturgeon tagged with an acoustic transmitter (code #57488) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0), from May 16, 2022 to October 2, 2023. Date and location of tagging is indicated by a star. Completion of reservoir impoundment is indicated by a vertical solid red line. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keeyask GS; green = Kettle GS; purple = Long Spruce GS).

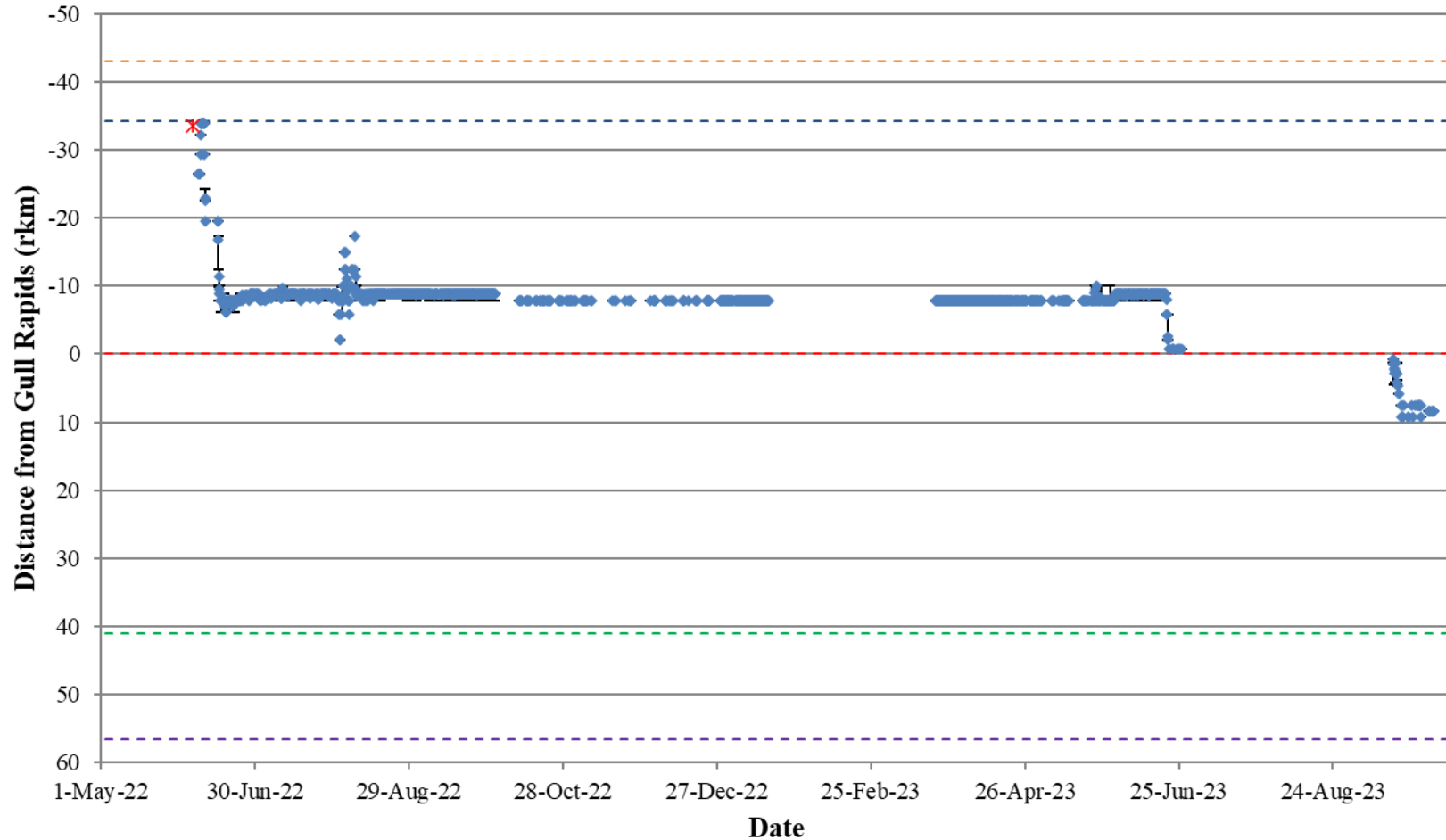


Figure A2-39: Position of a Lake Sturgeon tagged with an acoustic transmitter (code #57489) in the Nelson River between Clark Lake and the Keyyask GS in relation to the Keyyask GS (rkm 0), from May 16, 2022 to October 2, 2023. Date and location of tagging is indicated by a star. Completion of reservoir impoundment is indicated by a vertical solid red line. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keyyask GS; green = Kettle GS; purple = Long Spruce GS).

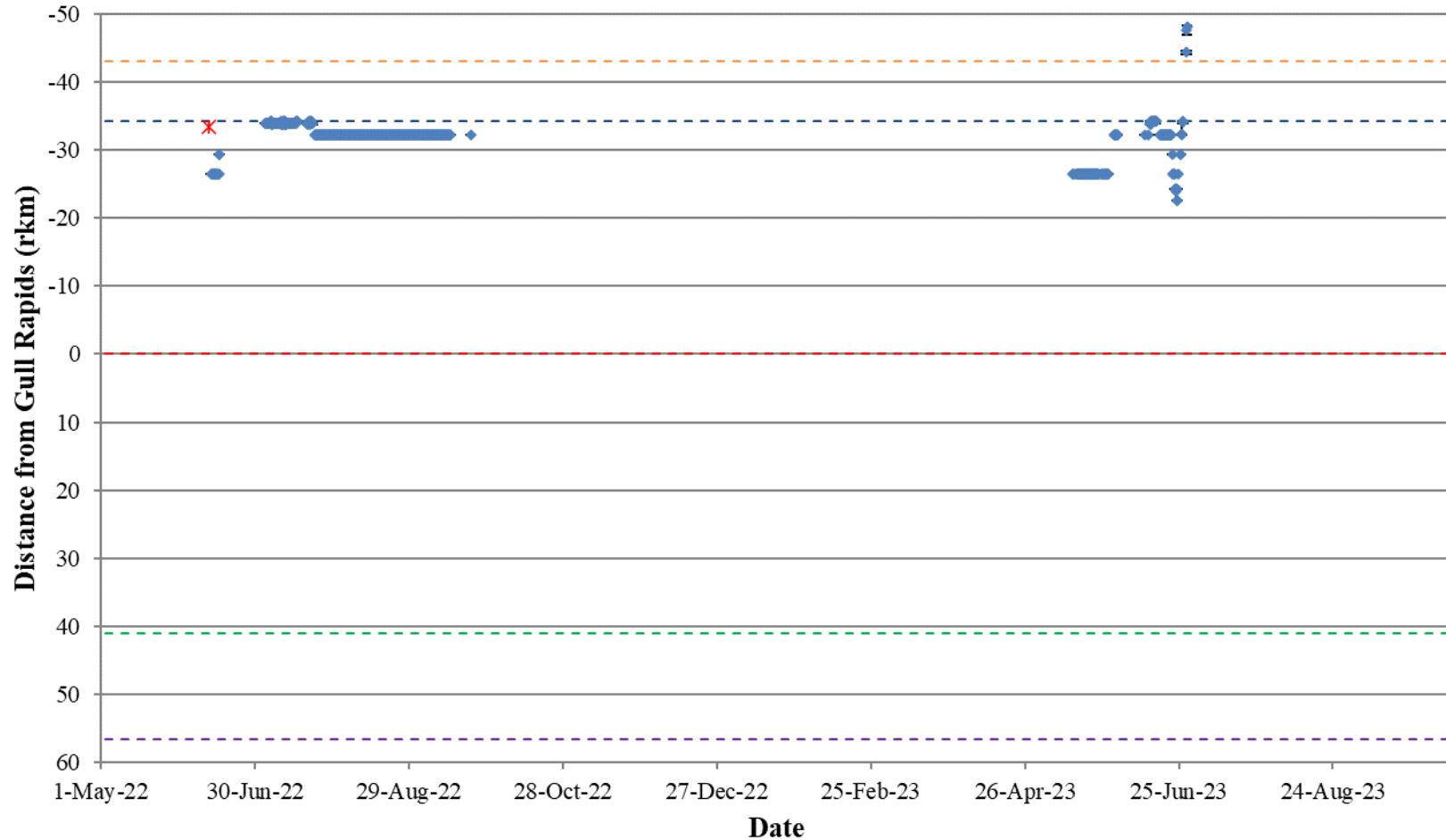


Figure A2-40: Position of a Lake Sturgeon tagged with an acoustic transmitter (code #57490) in the Nelson River between Clark Lake and the Keyyask GS in relation to the Keyyask GS (rkm 0), from May 16, 2022 to October 2, 2023. Date and location of tagging is indicated by a star. Completion of reservoir impoundment is indicated by a vertical solid red line. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keyyask GS; green = Kettle GS; purple = Long Spruce GS).

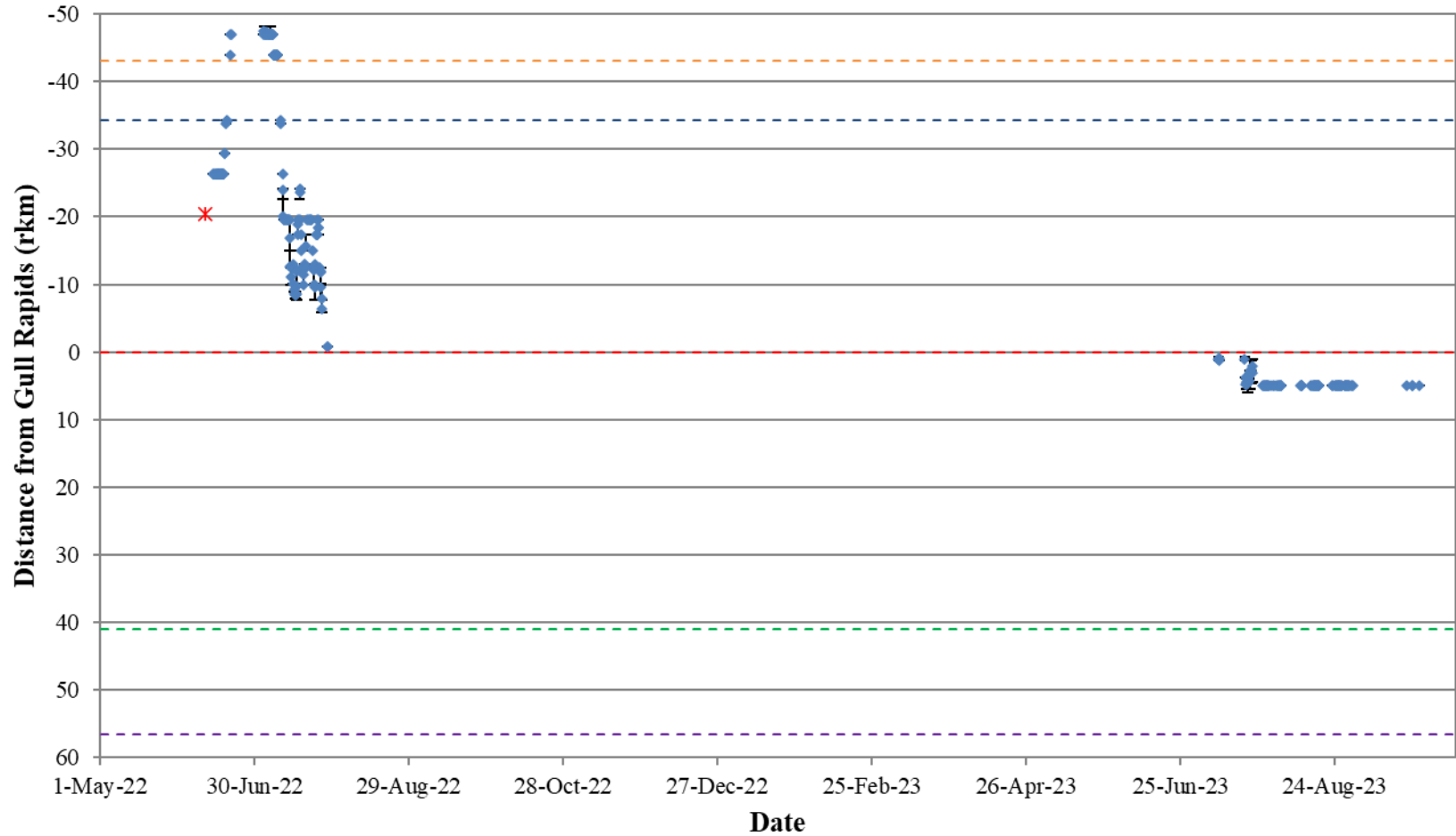


Figure A2-41: Position of a Lake Sturgeon tagged with an acoustic transmitter (code #57491) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0), from May 16, 2022 to October 2, 2023. Date and location of tagging is indicated by a star. Completion of reservoir impoundment is indicated by a vertical solid red line. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keeyask GS; green = Kettle GS; purple = Long Spruce GS).

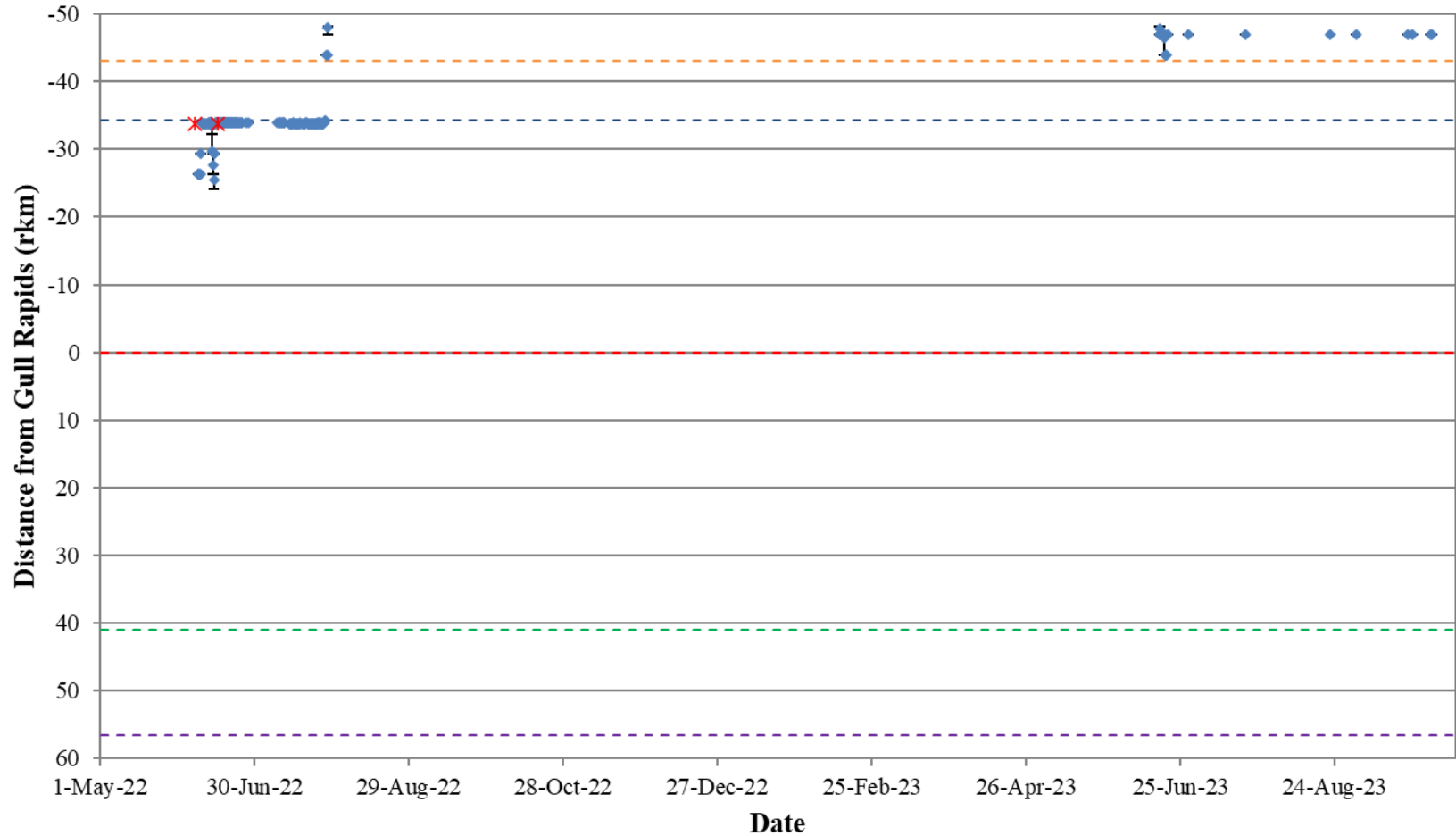


Figure A2-42: Position of a Lake Sturgeon tagged with an acoustic transmitter (code #57492) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0), from May 16, 2022 to October 2, 2023. Date and location of tagging is indicated by a star. Completion of reservoir impoundment is indicated by a vertical solid red line. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keeyask GS; green = Kettle GS; purple = Long Spruce GS).

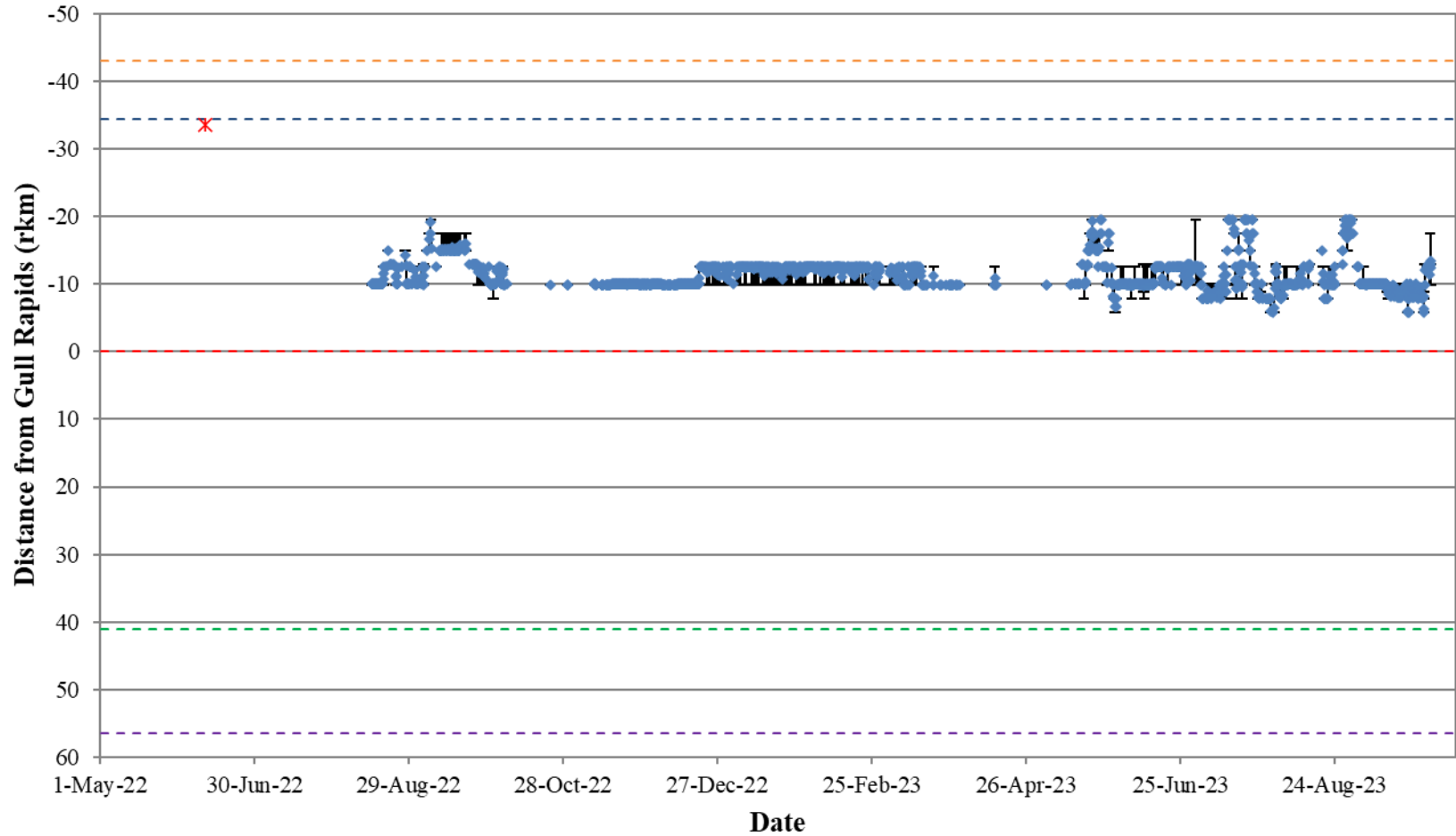


Figure A2-43: Position of a Lake Sturgeon tagged with an acoustic transmitter (code #57493) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0), from May 16, 2022 to October 2, 2023. Date and location of tagging is indicated by a star. Completion of reservoir impoundment is indicated by a vertical solid red line. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keeyask GS; green = Kettle GS; purple = Long Spruce GS).

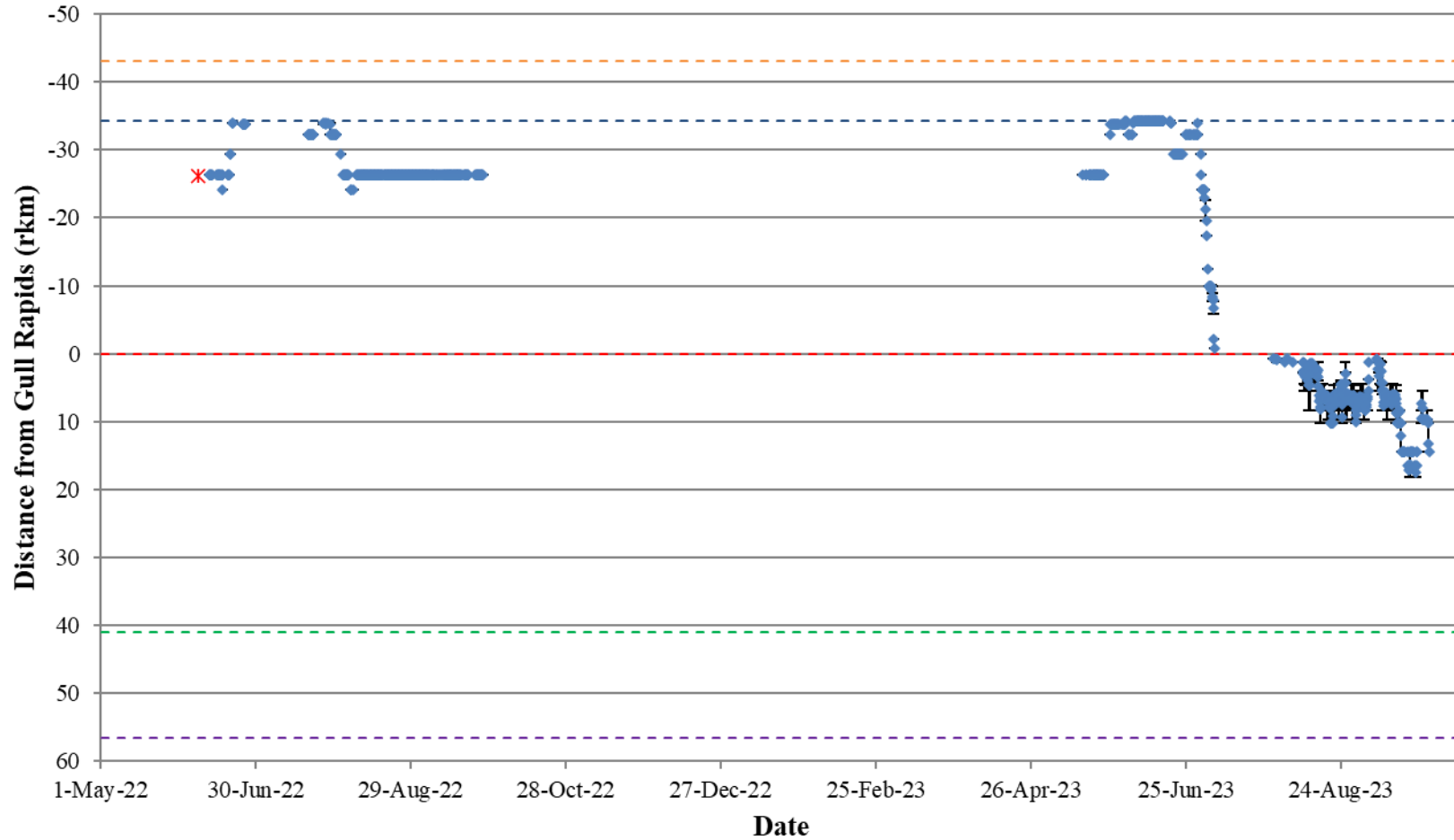


Figure A2-44: Position of a Lake Sturgeon tagged with an acoustic transmitter (code #57494) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0), from May 16, 2022 to October 2, 2023. Date and location of tagging is indicated by a star. Completion of reservoir impoundment is indicated by a vertical solid red line. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keeyask GS; green = Kettle GS; purple = Long Spruce GS).

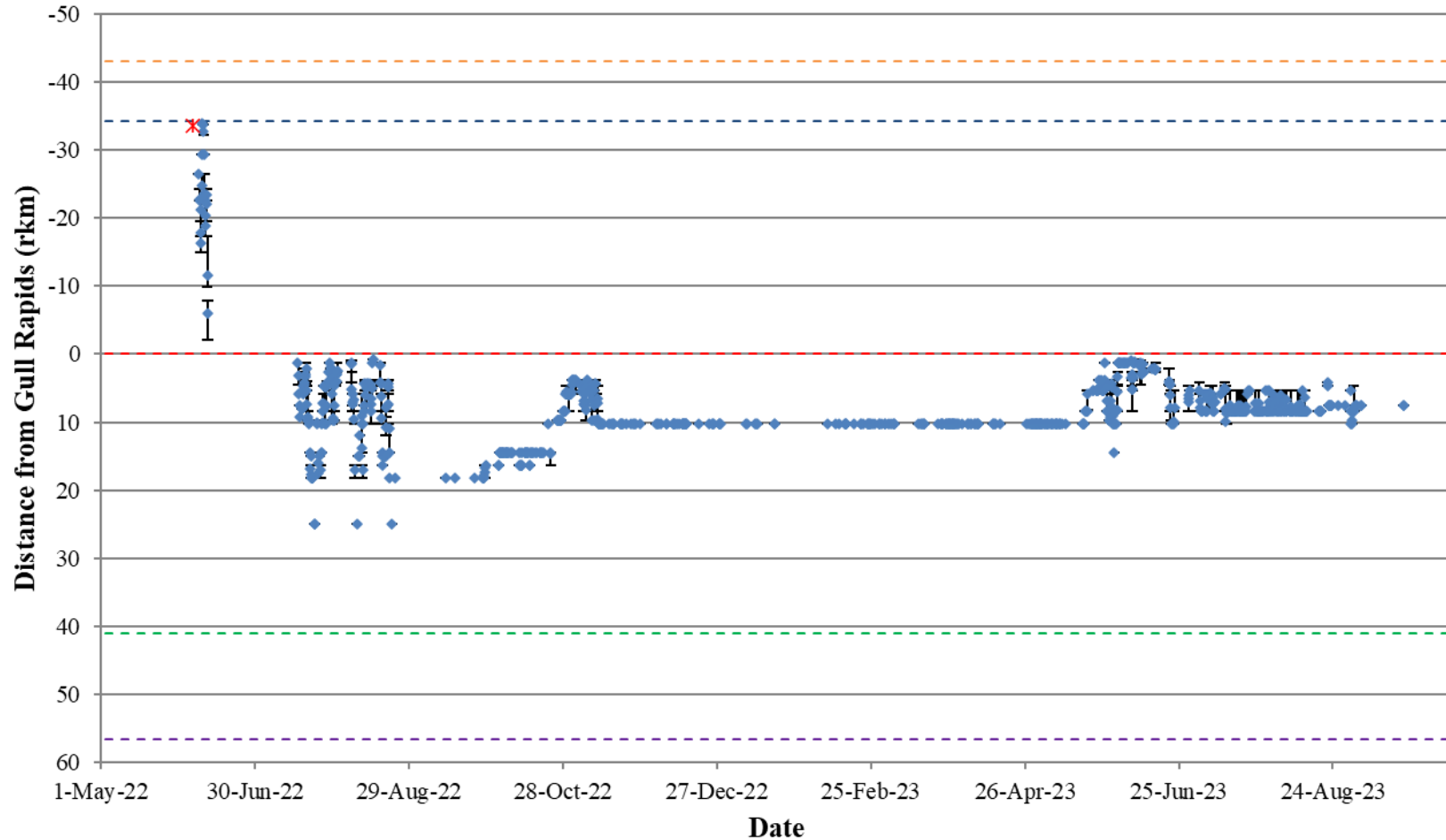


Figure A2-45: Position of a Lake Sturgeon tagged with an acoustic transmitter (code #57495) in the Nelson River between Clark Lake and the Keyeyask GS in relation to the Keyeyask GS (rkm 0), from May 16, 2022 to October 2, 2023. Date and location of tagging is indicated by a star. Completion of reservoir impoundment is indicated by a vertical solid red line. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keyeyask GS; green = Kettle GS; purple = Long Spruce GS).

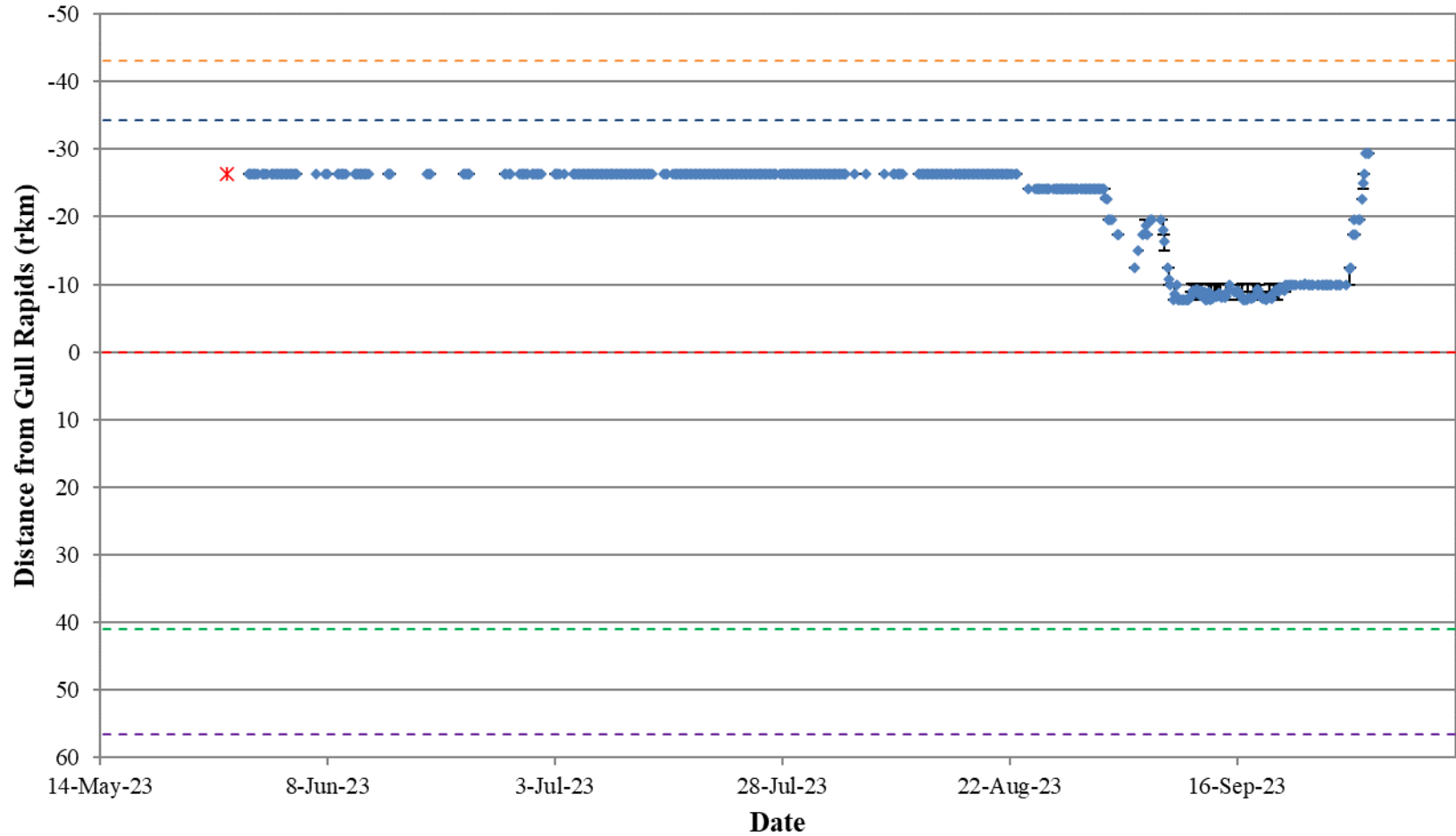


Figure A2-46: Position of a Lake Sturgeon tagged with an acoustic transmitter (code #57496) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0), from May 16, 2023 to October 2, 2023. Date and location of tagging is indicated by a star. Completion of reservoir impoundment is indicated by a vertical solid red line. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keeyask GS; green = Kettle GS; purple = Long Spruce GS).

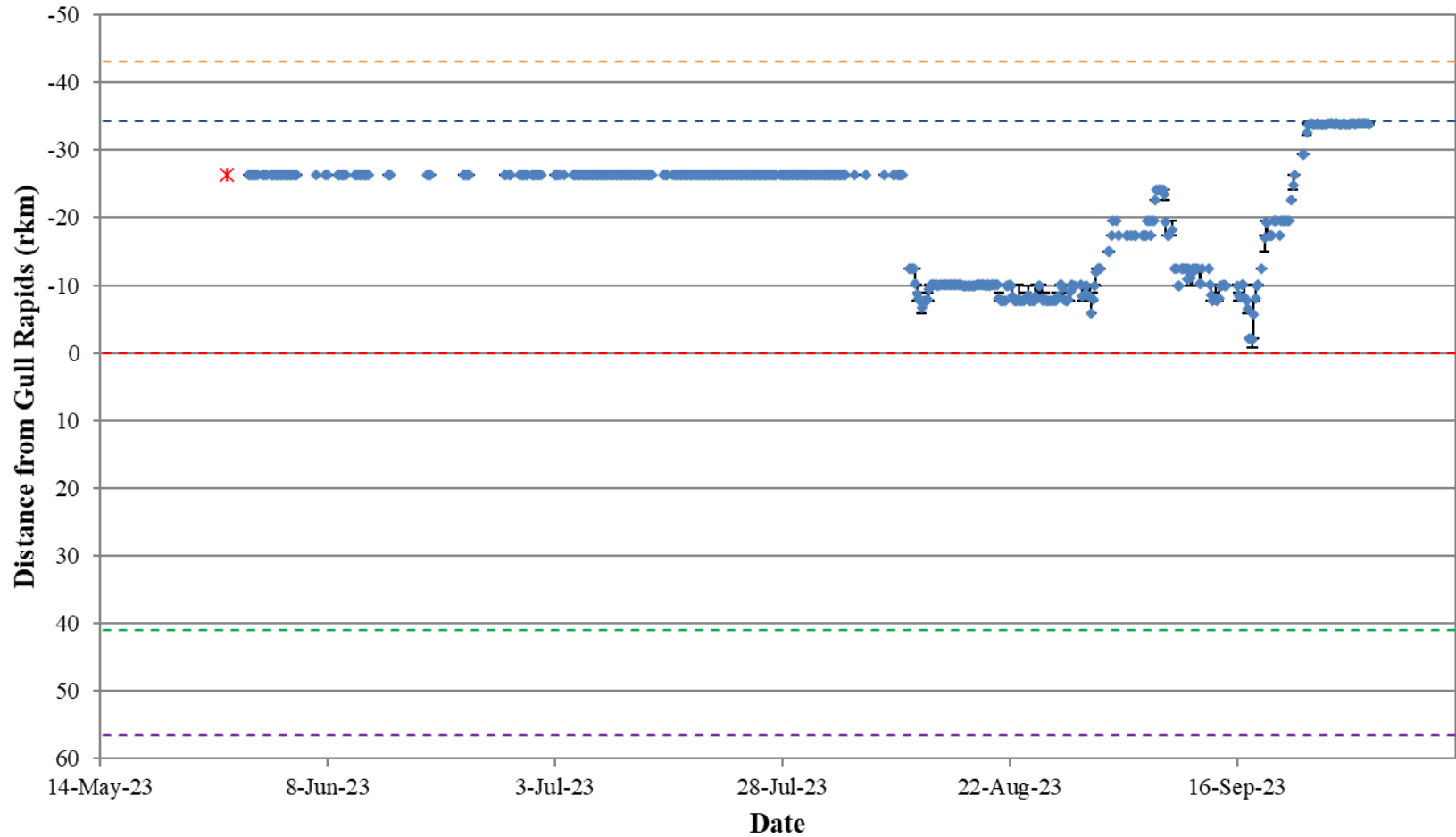


Figure A2-47: Position of a Lake Sturgeon tagged with an acoustic transmitter (code #57497) in the Nelson River between Clark Lake and the Keyyask GS in relation to the Keyyask GS (rkm 0), from May 16, 2023 to October 2, 2023. Date and location of tagging is indicated by a star. Completion of reservoir impoundment is indicated by a vertical solid red line. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keyyask GS; green = Kettle GS; purple = Long Spruce GS).

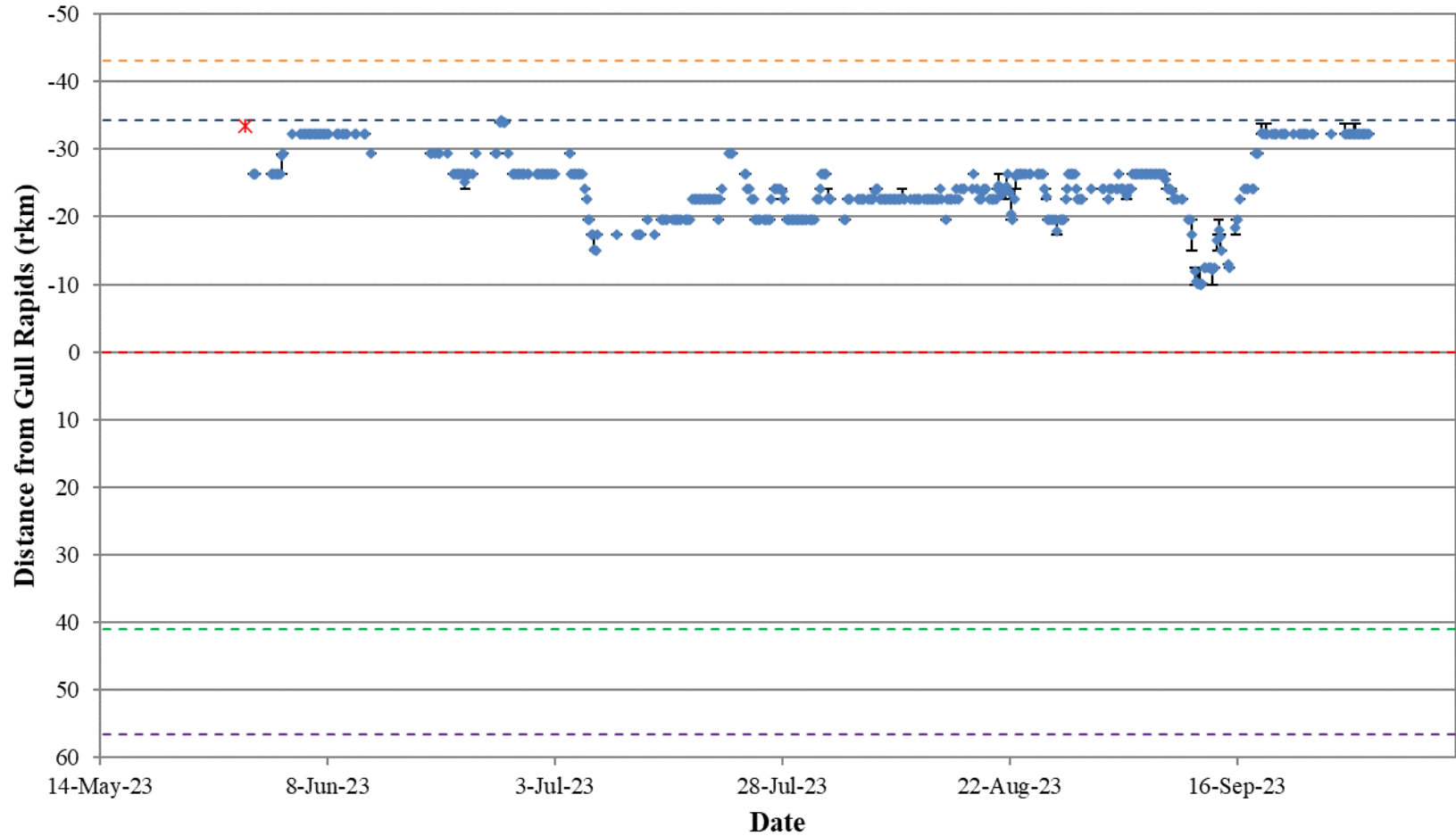


Figure A2-48: Position of a Lake Sturgeon tagged with an acoustic transmitter (code #57498) in the Nelson River between Clark Lake and the Keyyask GS in relation to the Keyyask GS (rkm 0), from May 16, 2023 to October 2, 2023. Date and location of tagging is indicated by a star. Completion of reservoir impoundment is indicated by a vertical solid red line. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keyyask GS; green = Kettle GS; purple = Long Spruce GS).

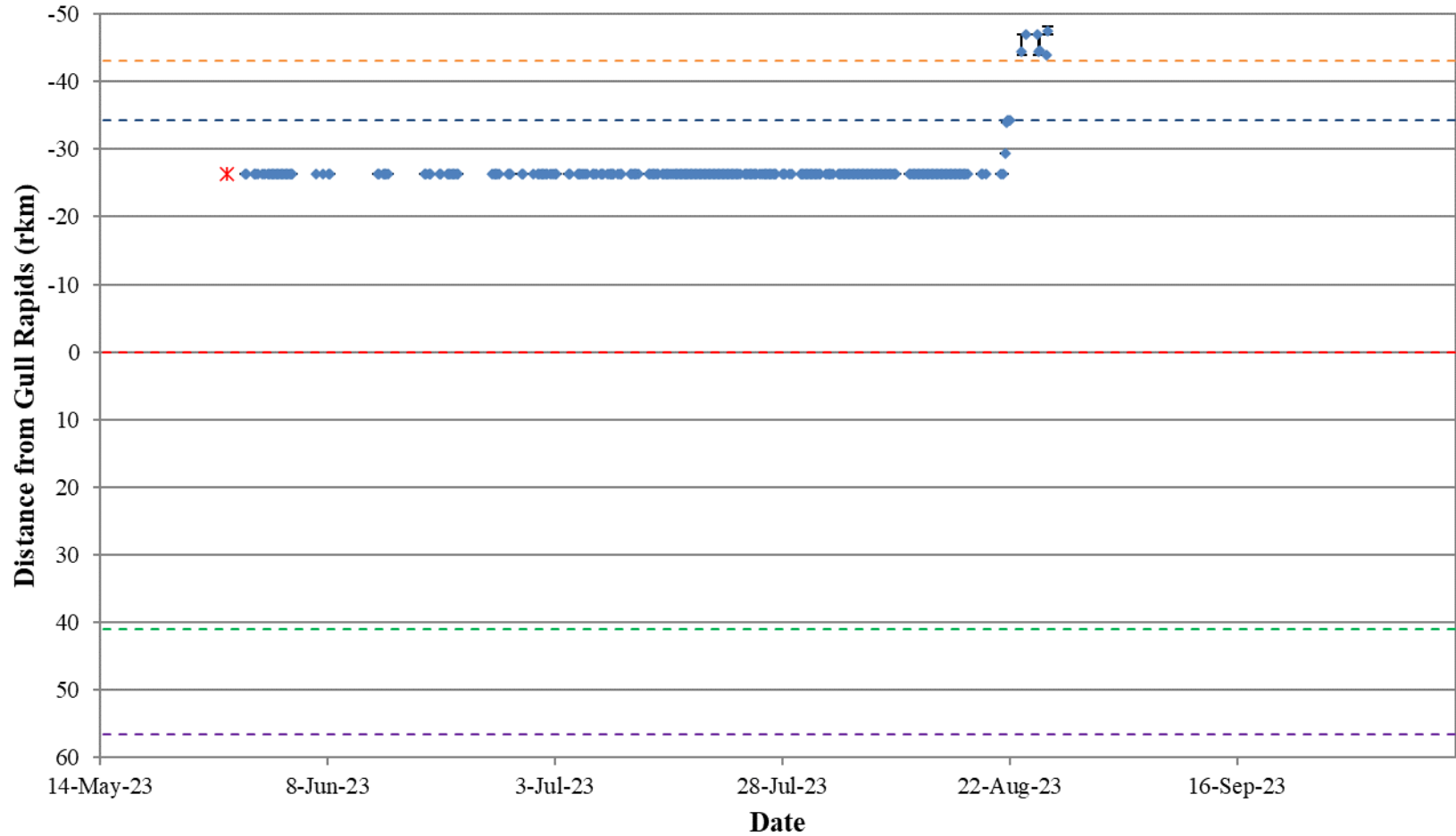


Figure A2-49: Position of a Lake Sturgeon tagged with an acoustic transmitter (code #57499) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0), from May 16, 2023 to October 2, 2023. Date and location of tagging is indicated by a star. Completion of reservoir impoundment is indicated by a vertical solid red line. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keeyask GS; green = Kettle GS; purple = Long Spruce GS).

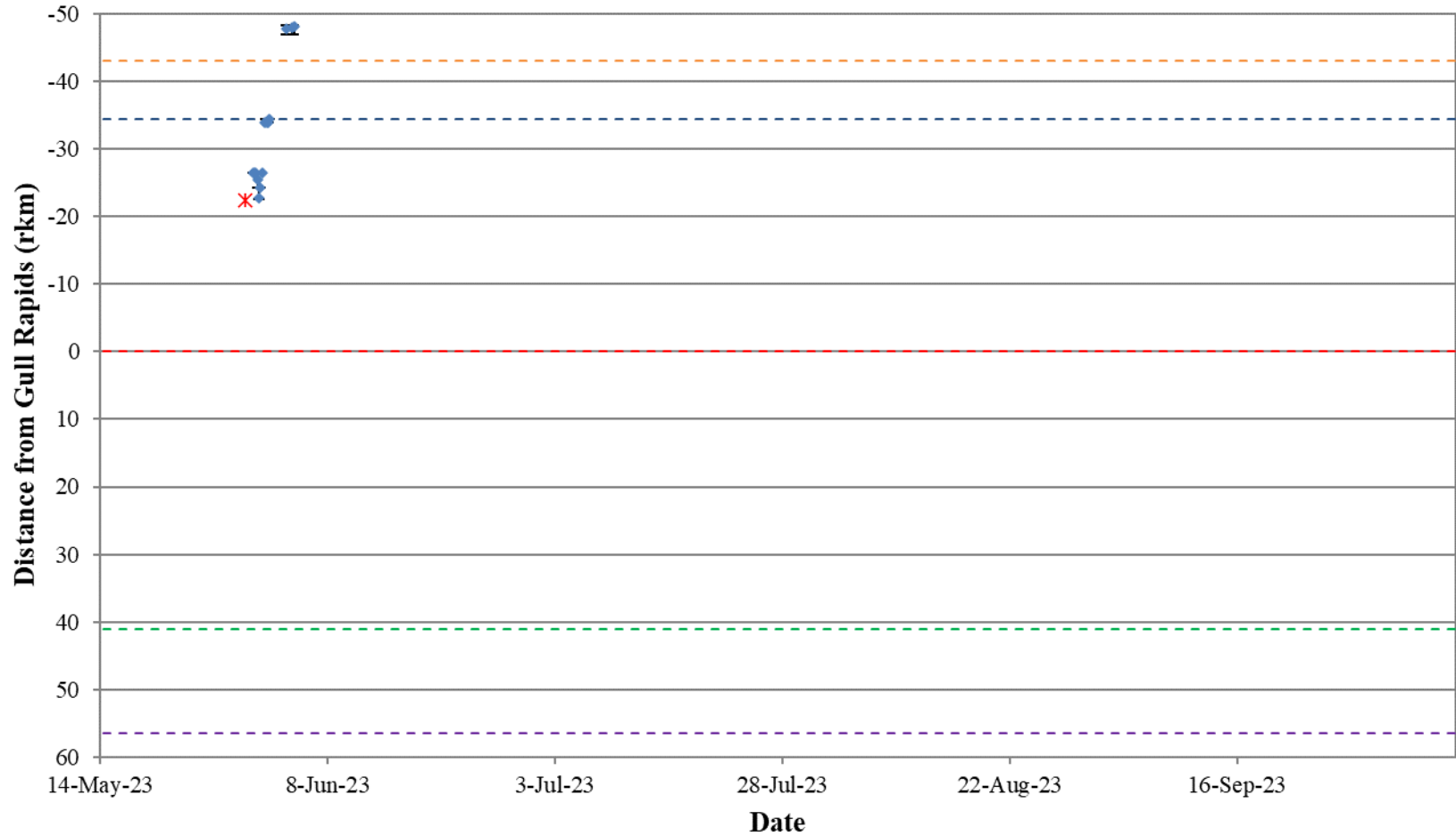


Figure A2-50: Position of a Lake Sturgeon tagged with an acoustic transmitter (code #57500) in the Nelson River between Clark Lake and the Keyyask GS in relation to the Keyyask GS (rkm 0), from May 16, 2023 to October 2, 2023. Date and location of tagging is indicated by a star. Completion of reservoir impoundment is indicated by a vertical solid red line. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keyyask GS; green = Kettle GS; purple = Long Spruce GS).

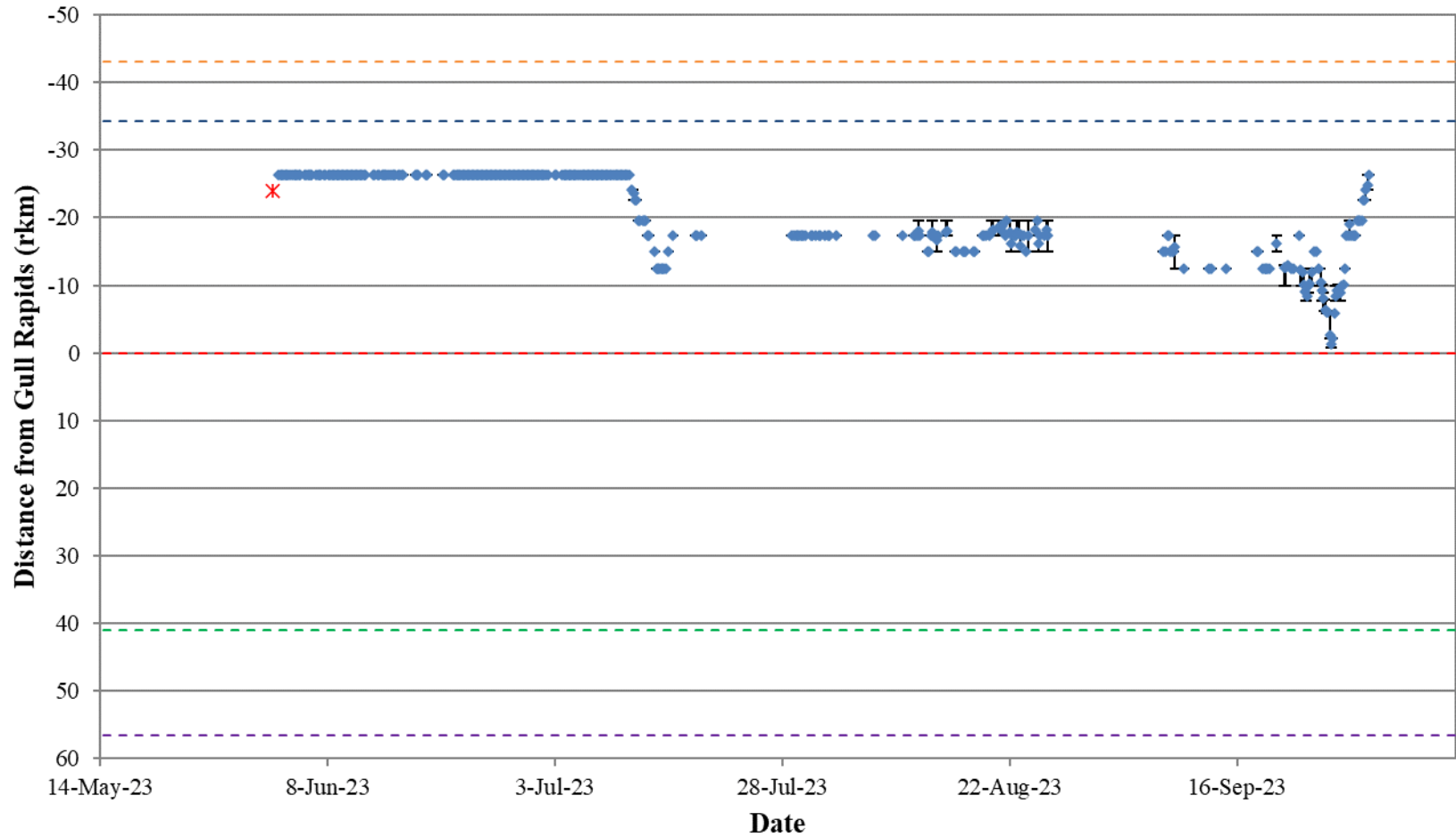


Figure A2-51: Position of a Lake Sturgeon tagged with an acoustic transmitter (code #57501) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0), from May 16, 2023 to October 2, 2023. Date and location of tagging is indicated by a star. Completion of reservoir impoundment is indicated by a vertical solid red line. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keeyask GS; green = Kettle GS; purple = Long Spruce GS).

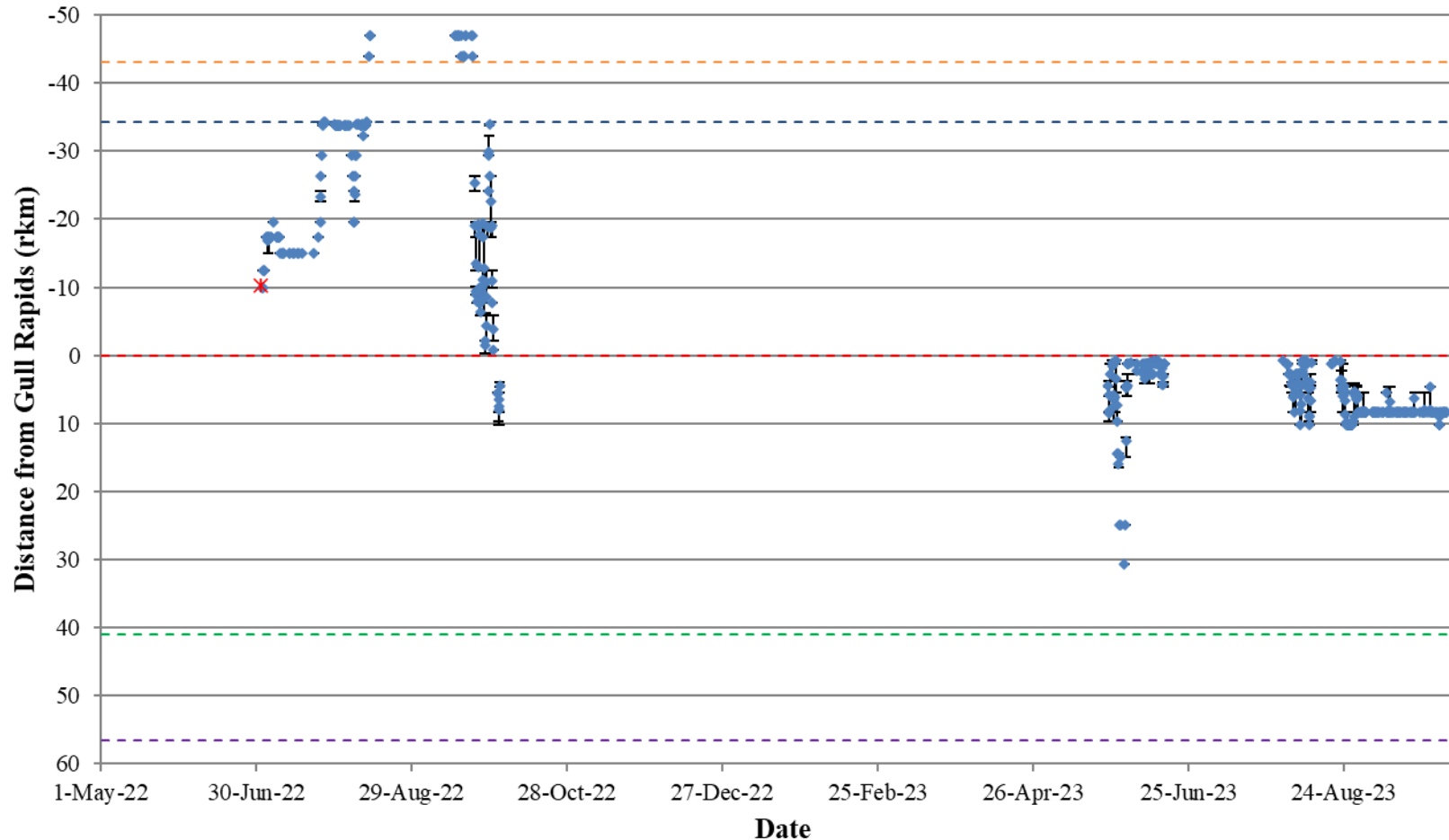


Figure A2-52: Position of a Lake Sturgeon tagged with an acoustic transmitter (code #57502) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0), from May 16, 2022 to October 2, 2023. Date and location of tagging is indicated by a star. Completion of reservoir impoundment is indicated by a vertical solid red line. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keeyask GS; green = Kettle GS; purple = Long Spruce GS).

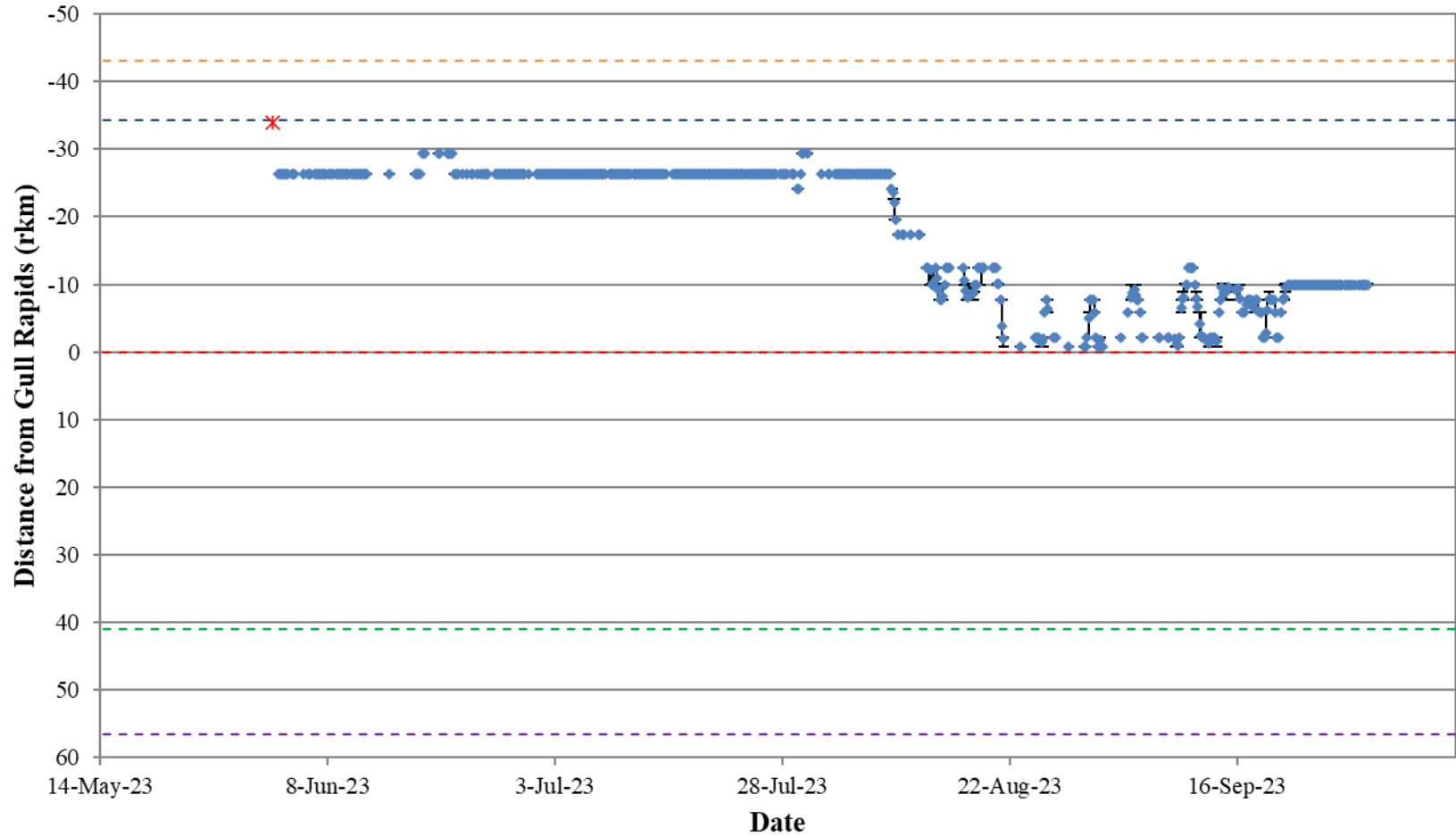


Figure A2-53: Position of a Lake Sturgeon tagged with an acoustic transmitter (code #57503) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0), from May 16 to October 2, 2023. Date and location of tagging is indicated by a star. Completion of reservoir impoundment is indicated by a vertical solid red line. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keeyask GS; green = Kettle GS; purple = Long Spruce GS).

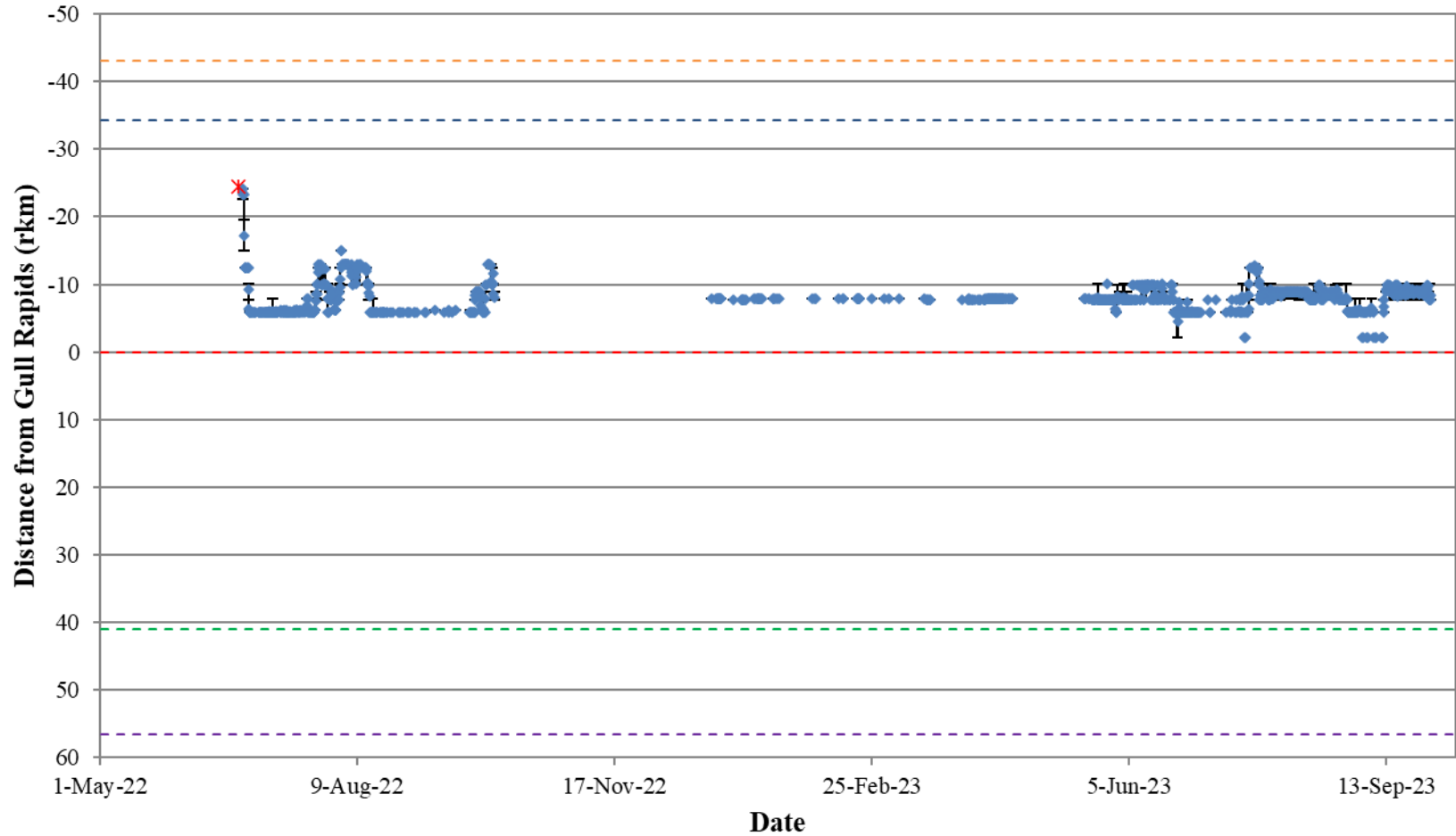


Figure A2-54: Position of a Lake Sturgeon tagged with an acoustic transmitter (code #57504) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0), from May 16, 2022 to October 2, 2023. Date and location of tagging is indicated by a star. Completion of reservoir impoundment is indicated by a vertical solid red line. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keeyask GS; green = Kettle GS; purple = Long Spruce GS).

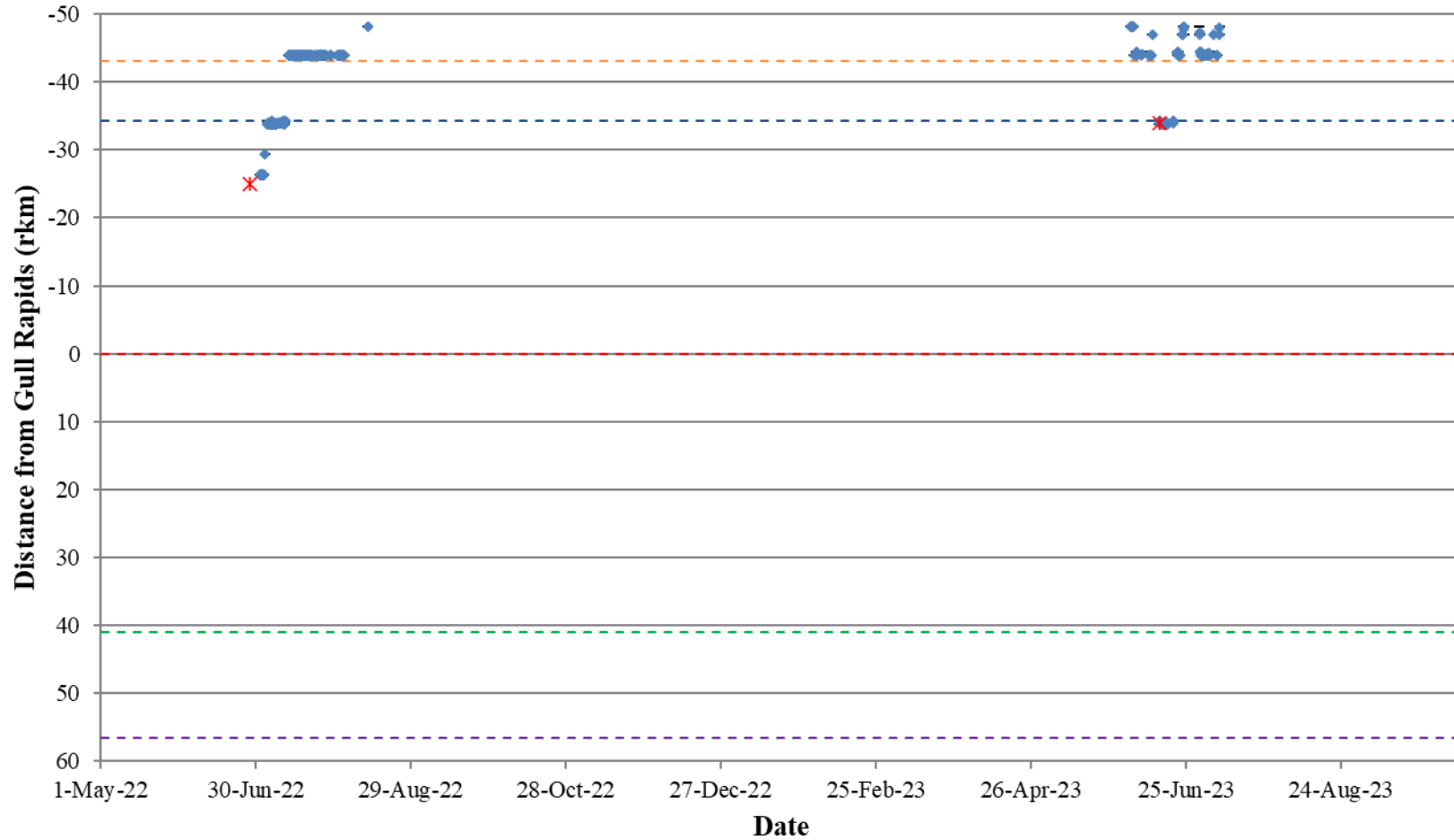


Figure A2-55: Position of a Lake Sturgeon tagged with an acoustic transmitter (code #57505) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0), from May 16, 2022 to October 2, 2023. Date and location of tagging is indicated by a star. Completion of reservoir impoundment is indicated by a vertical solid red line. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keeyask GS; green = Kettle GS; purple = Long Spruce GS).

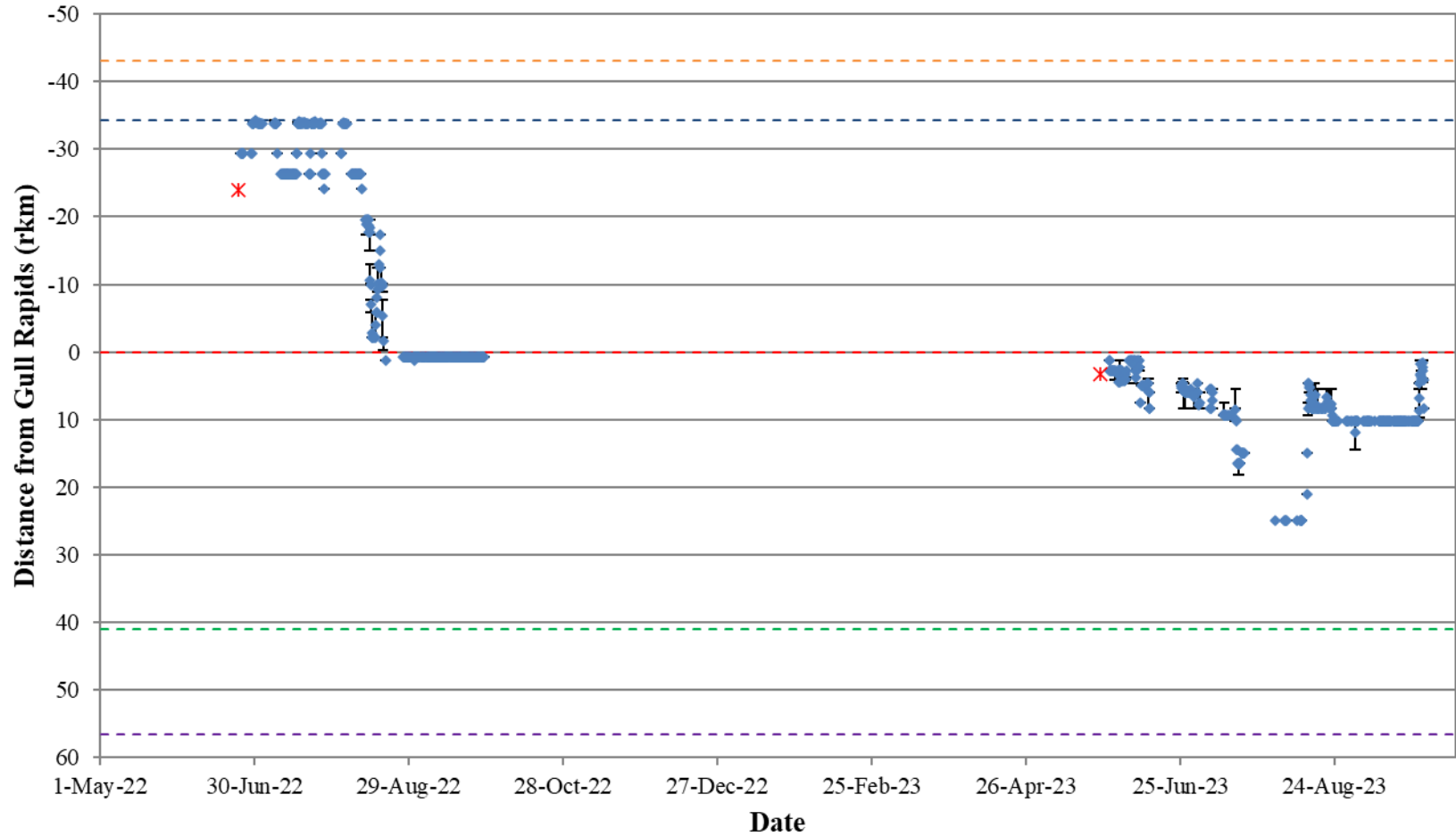


Figure A2-56: Position of a Lake Sturgeon tagged with an acoustic transmitter (code #57506) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0), from May 16, 2022 to October 2, 2023. Date and location of tagging is indicated by a star. Completion of reservoir impoundment is indicated by a vertical solid red line. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keeyask GS; green = Kettle GS; purple = Long Spruce GS).

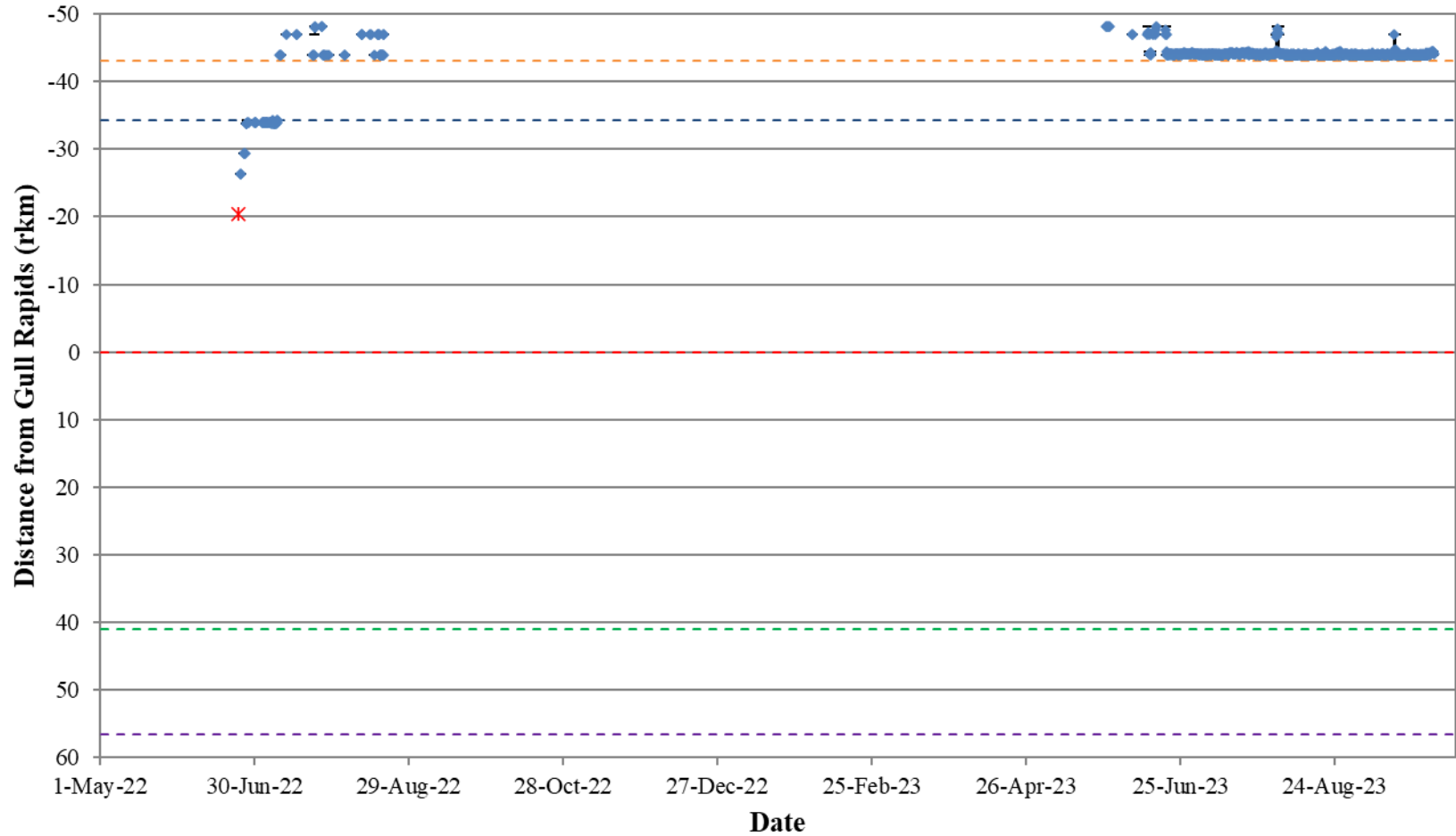


Figure A2-57: Position of a Lake Sturgeon tagged with an acoustic transmitter (code #57507) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0), from May 16, 2022 to October 2, 2023. Date and location of tagging is indicated by a star. Completion of reservoir impoundment is indicated by a vertical solid red line. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keeyask GS; green = Kettle GS; purple = Long Spruce GS).

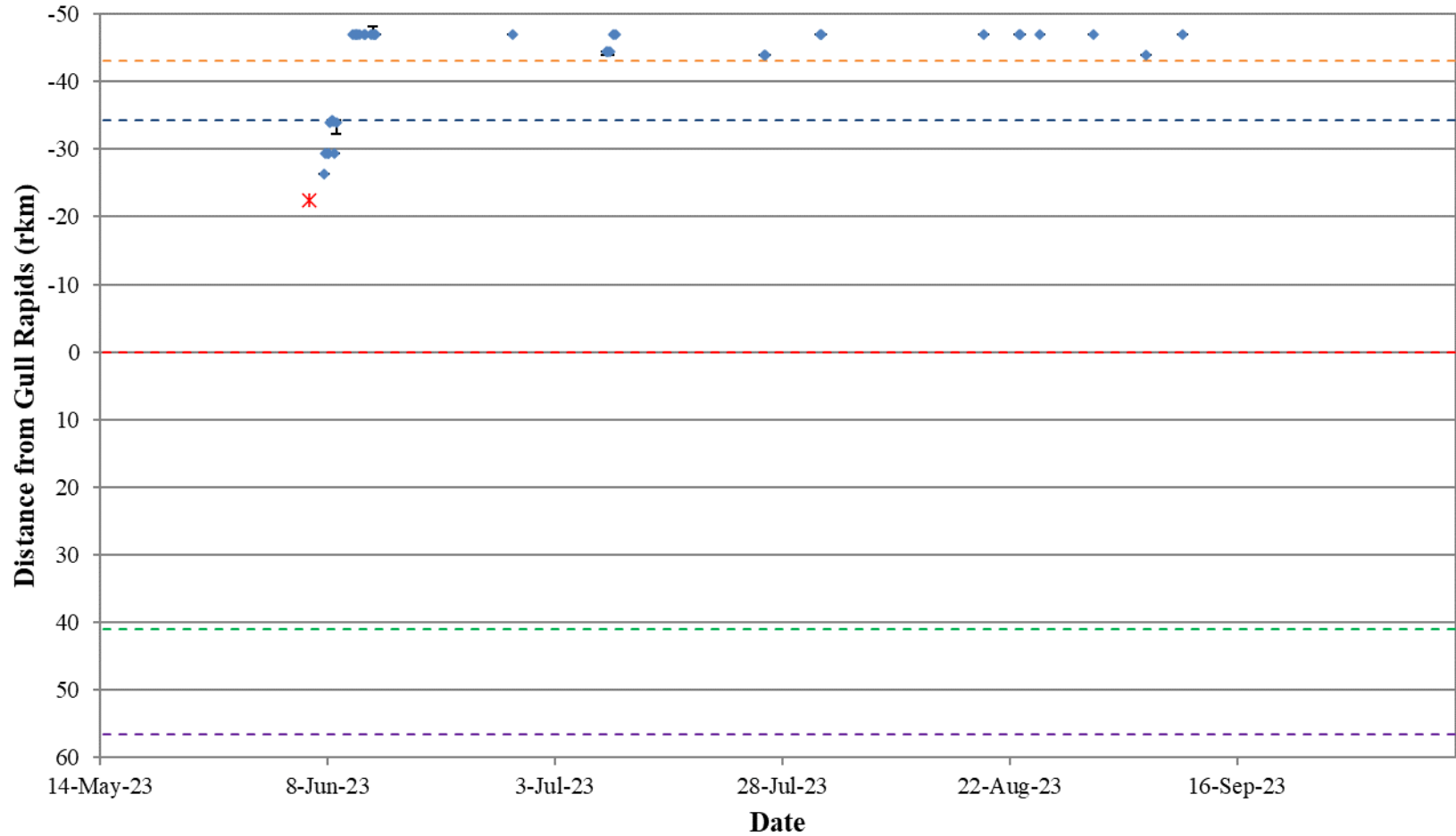


Figure A2-58: Position of a Lake Sturgeon tagged with an acoustic transmitter (code #51939) in the Nelson River between Clark Lake and the Keyyask GS in relation to the Keyyask GS (rkm 0), from May 16 to October 2, 2023. Date and location of tagging is indicated by a star. Completion of reservoir impoundment is indicated by a vertical solid red line. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keyyask GS; green = Kettle GS; purple = Long Spruce GS).

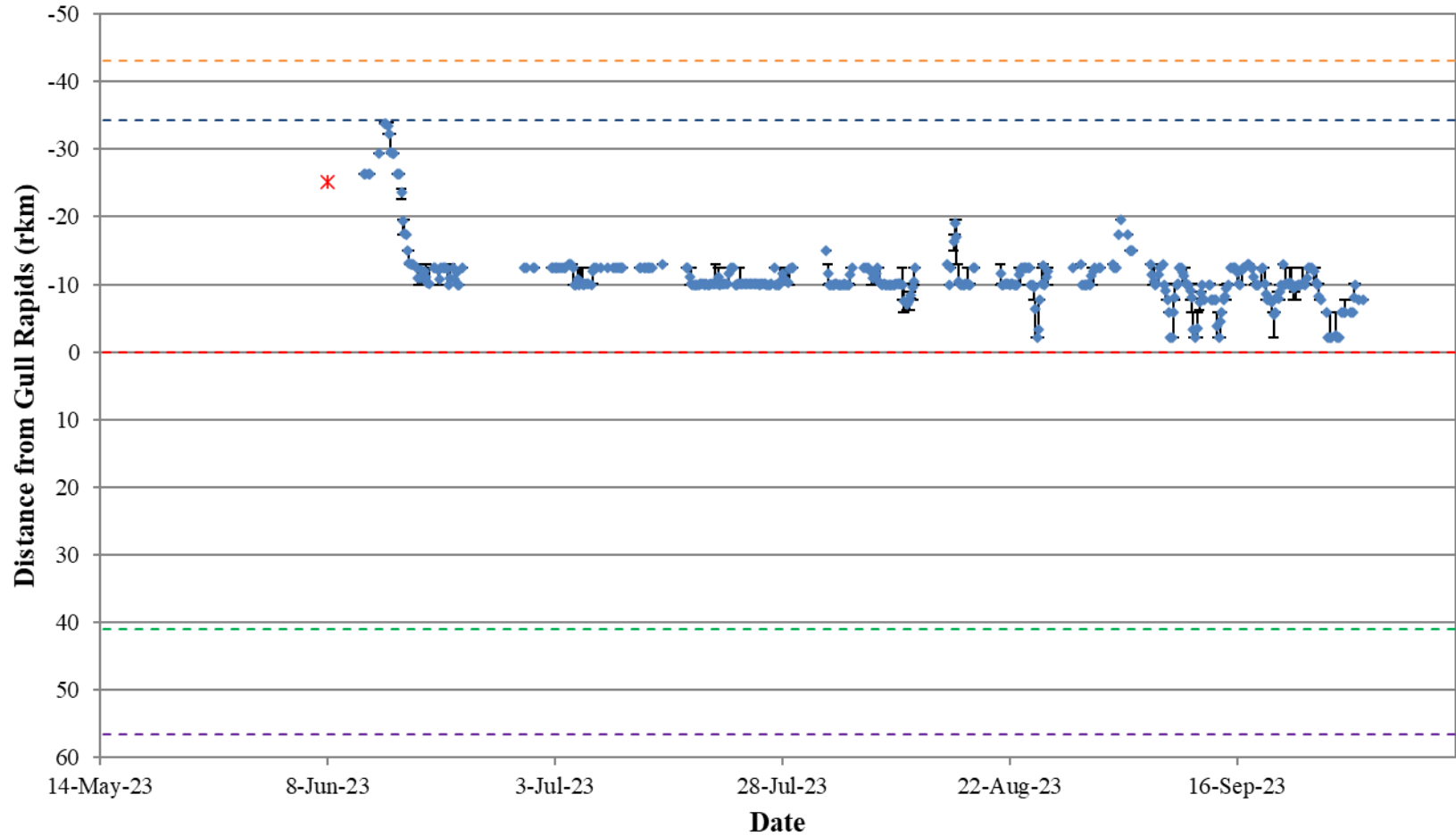


Figure A2-59: Position of a Lake Sturgeon tagged with an acoustic transmitter (code #51940) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0), from May 16 to October 2, 2023. Date and location of tagging is indicated by a star. Completion of reservoir impoundment is indicated by a vertical solid red line. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keeyask GS; green = Kettle GS; purple = Long Spruce GS).

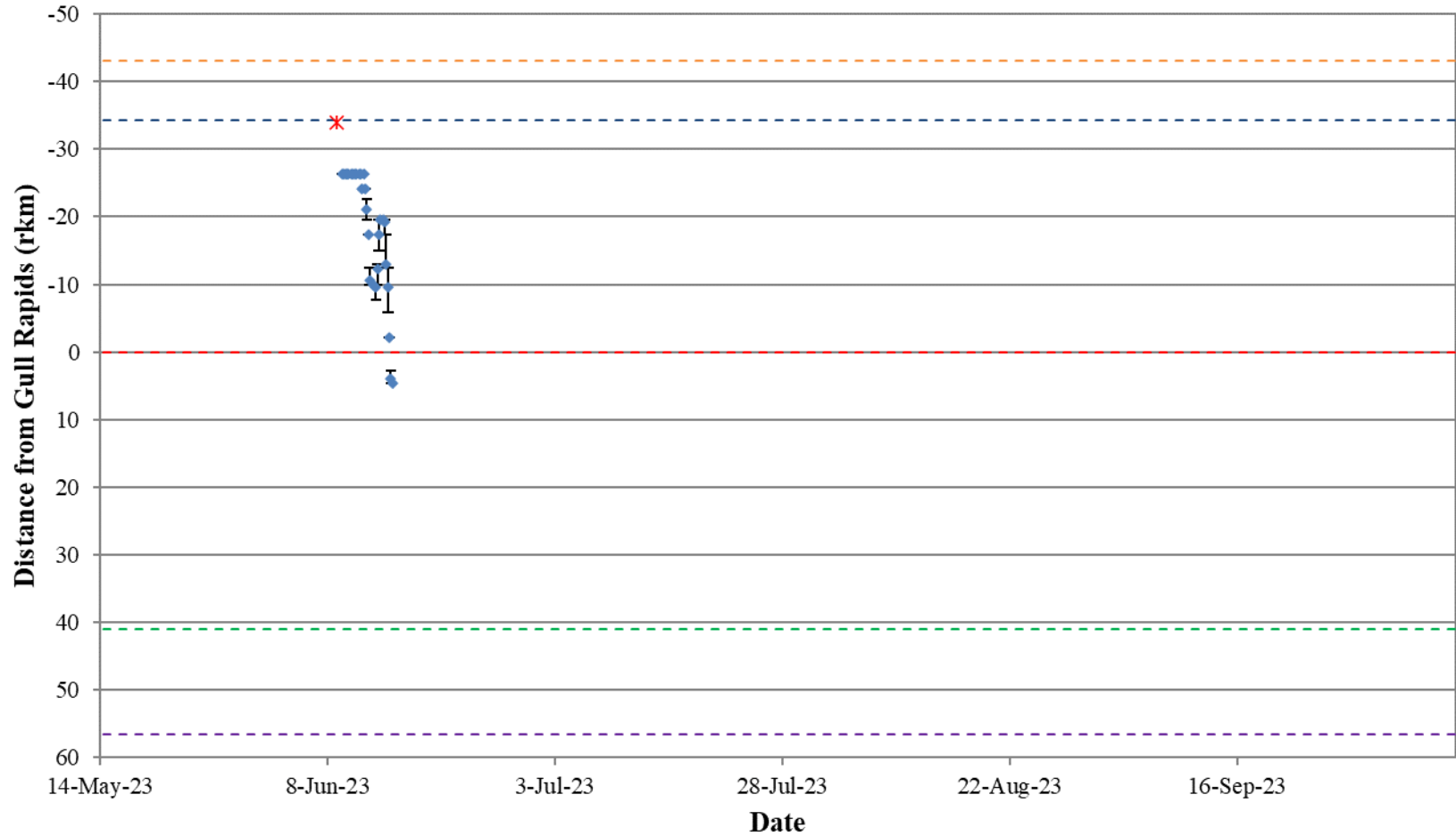


Figure A2-60: Position of a Lake Sturgeon tagged with an acoustic transmitter (code #51941) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0), from May 16 to October 2, 2023. Date and location of tagging is indicated by a star. Completion of reservoir impoundment is indicated by a vertical solid red line. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keeyask GS; green = Kettle GS; purple = Long Spruce GS).

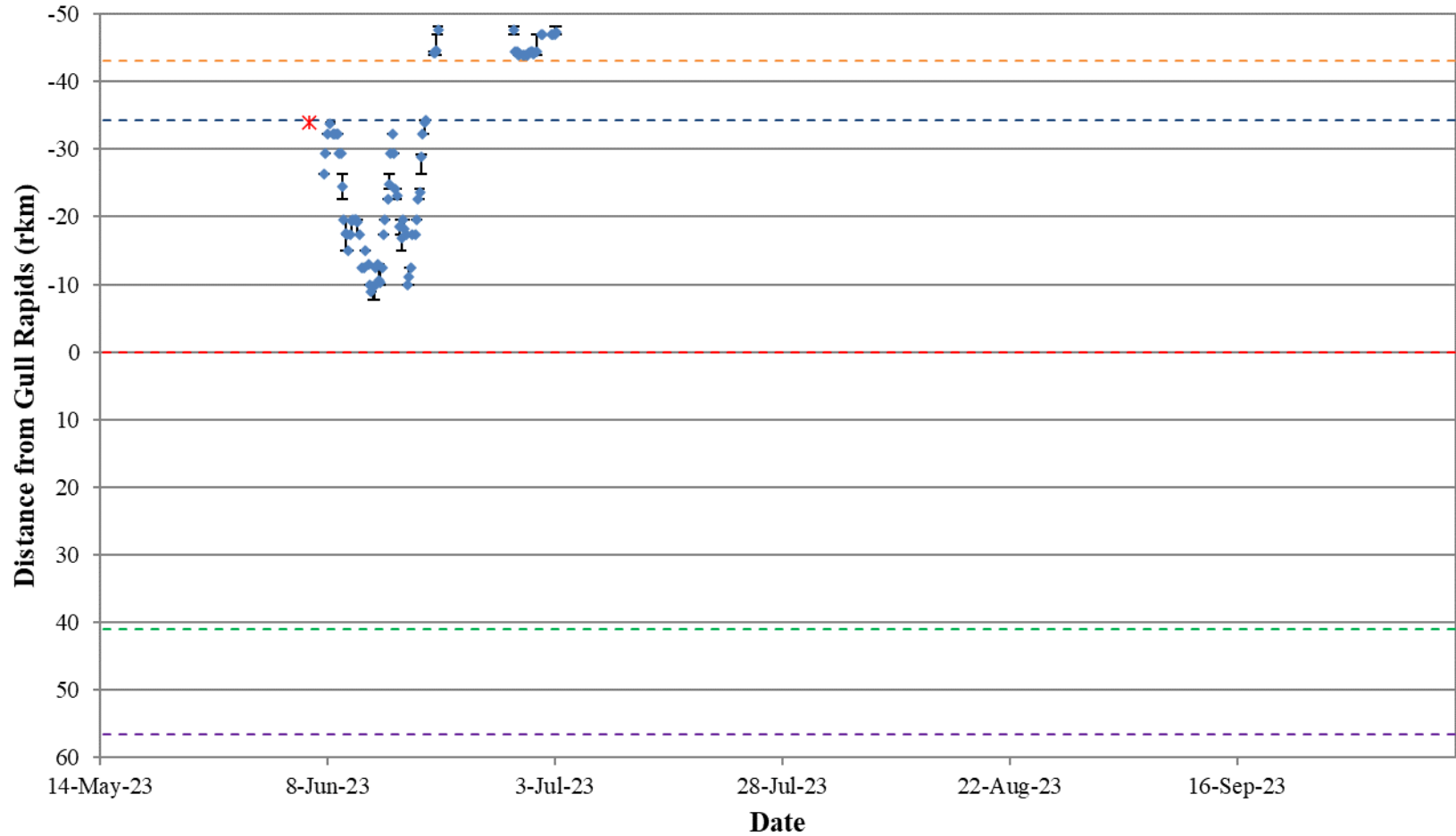


Figure A2-61: Position of a Lake Sturgeon tagged with an acoustic transmitter (code #51942) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0), from May 16 to October 2, 2023. Date and location of tagging is indicated by a star. Completion of reservoir impoundment is indicated by a vertical solid red line. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keeyask GS; green = Kettle GS; purple = Long Spruce GS).

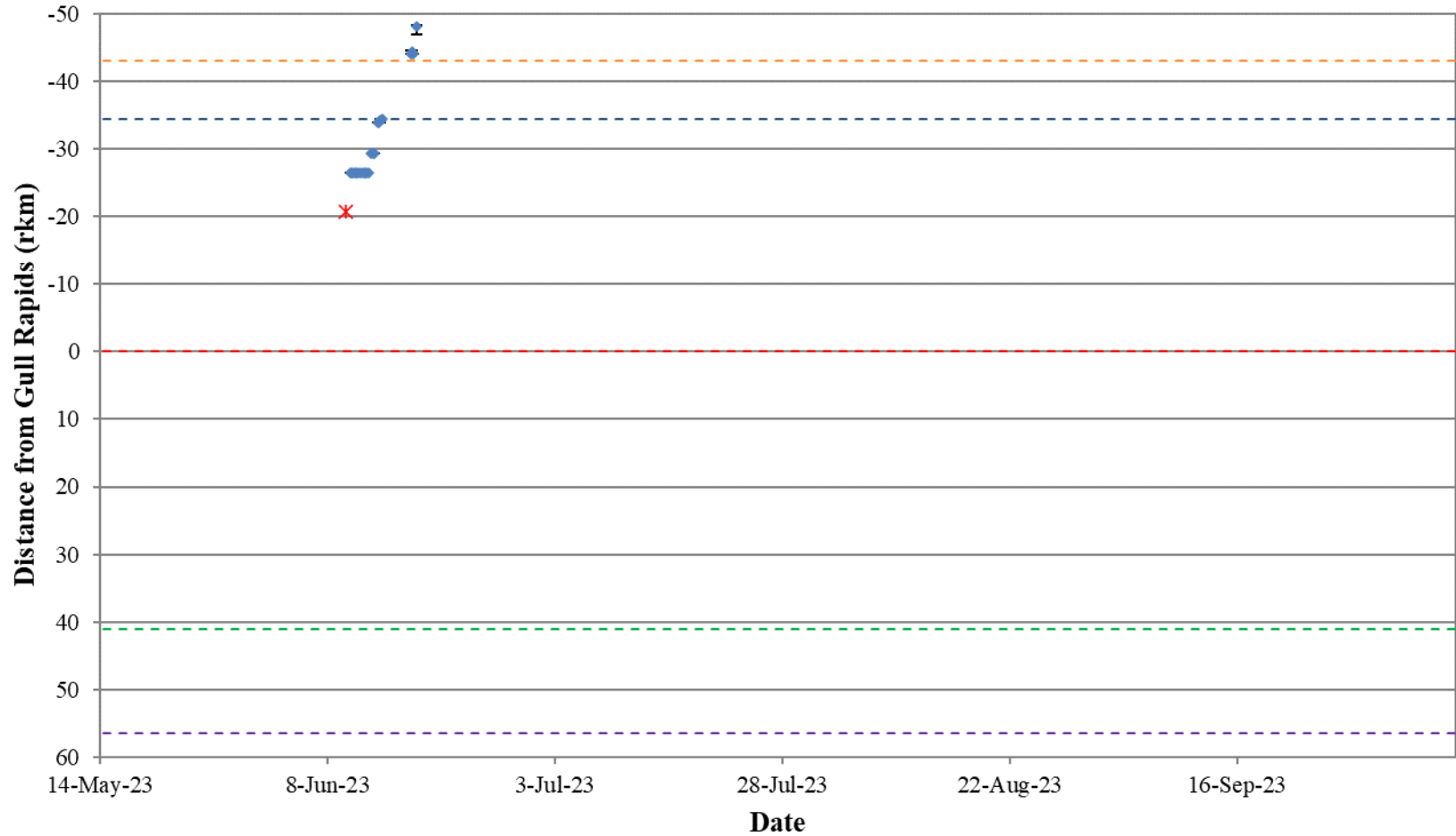


Figure A2-62: Position of a Lake Sturgeon tagged with an acoustic transmitter (code #51952) in the Nelson River between Clark Lake and the Keeyask GS in relation to the Keeyask GS (rkm 0), from May 16 to October 2, 2023. Date and location of tagging is indicated by a star. Completion of reservoir impoundment is indicated by a vertical solid red line. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keeyask GS; green = Kettle GS; purple = Long Spruce GS).

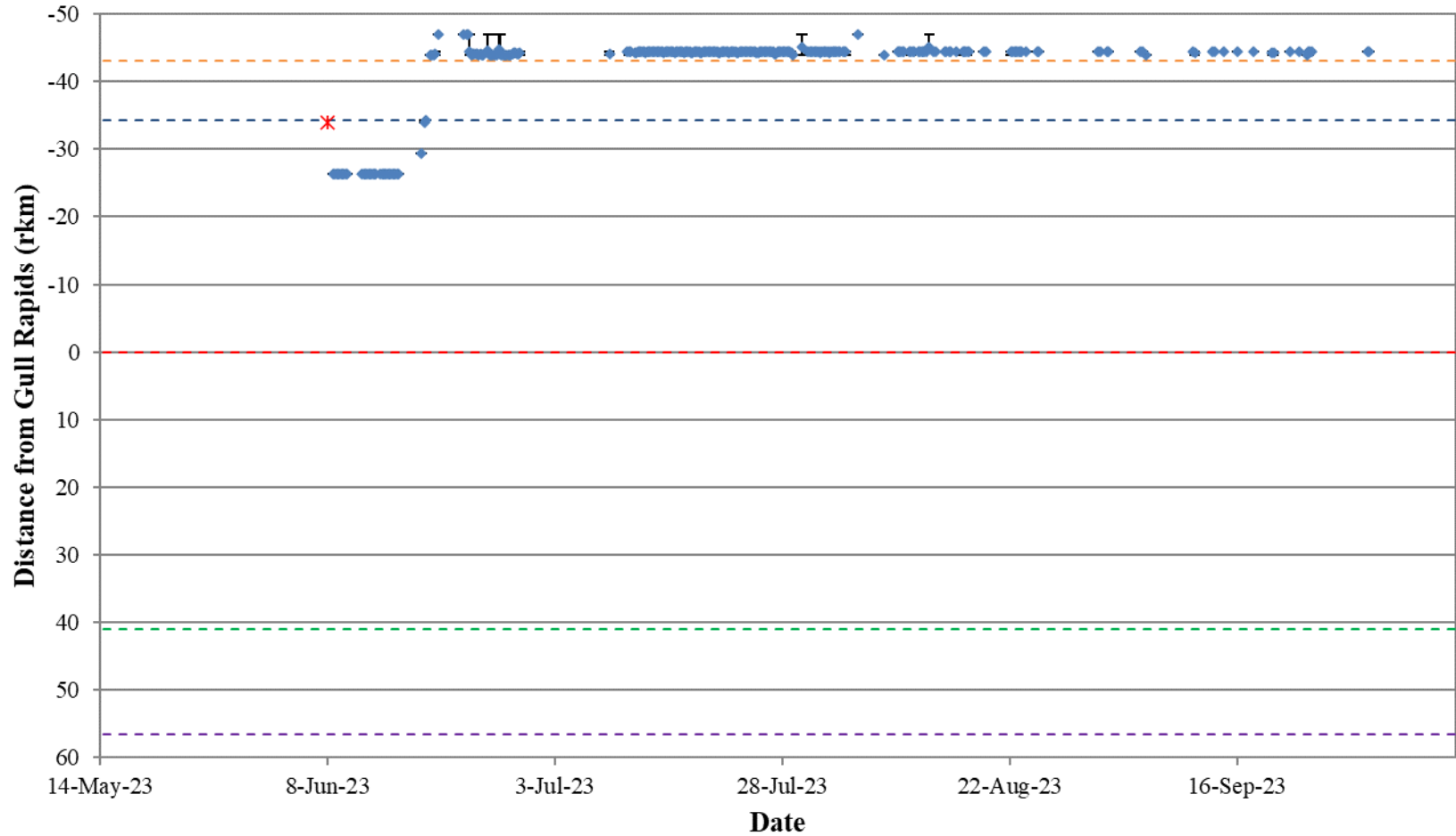


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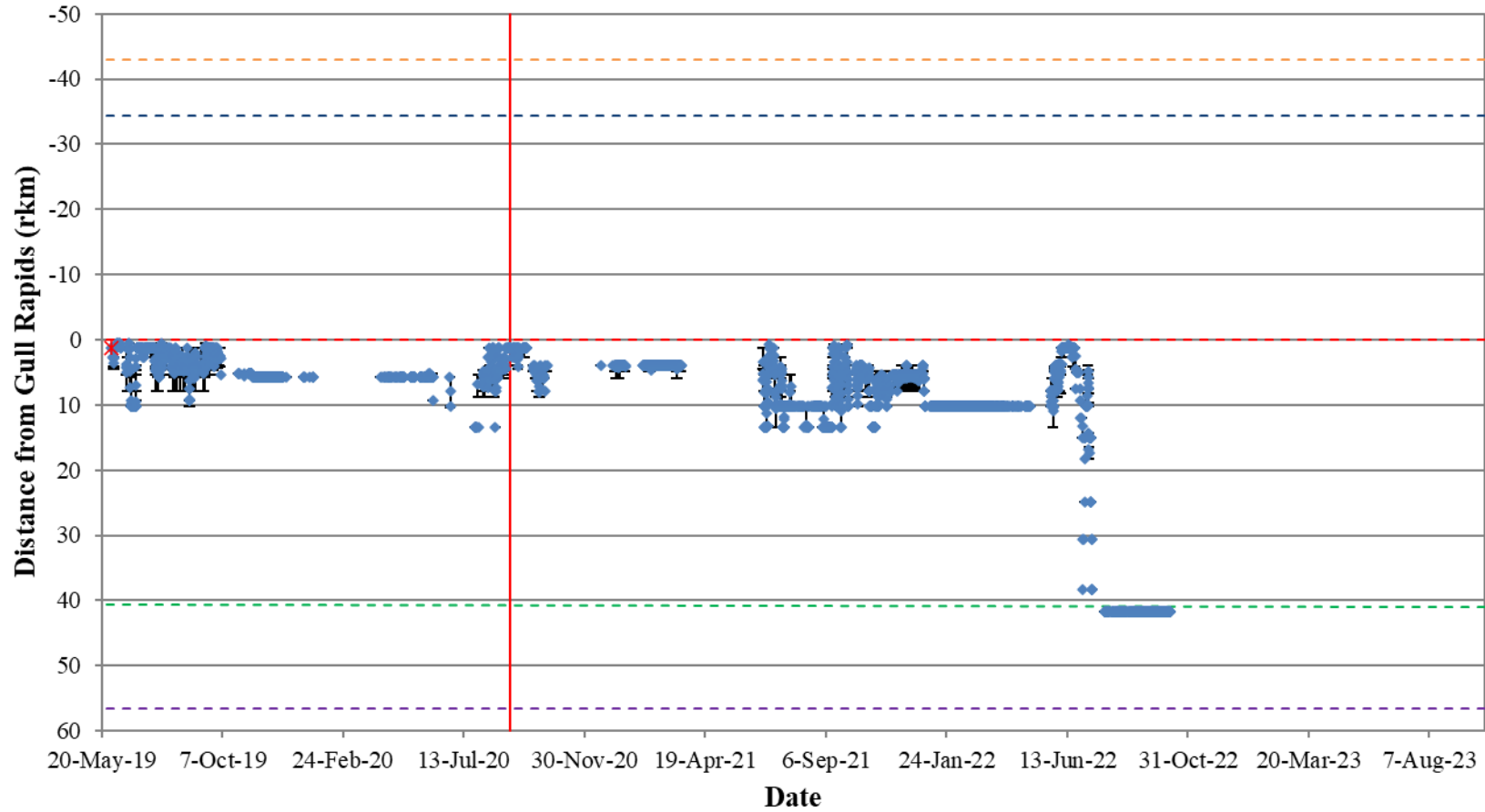


Figure A3-1: Position of a Lake Sturgeon tagged with an acoustic transmitter (code #7035) in Stephens Lake in relation to the Keeyask GS (rkm 0), from May 1, 2019 to October 2, 2023. Date and location of tagging is indicated by a star. Completion of reservoir impoundment is indicated by a vertical solid red line. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keeyask GS; green = Kettle GS; purple = Long Spruce GS).

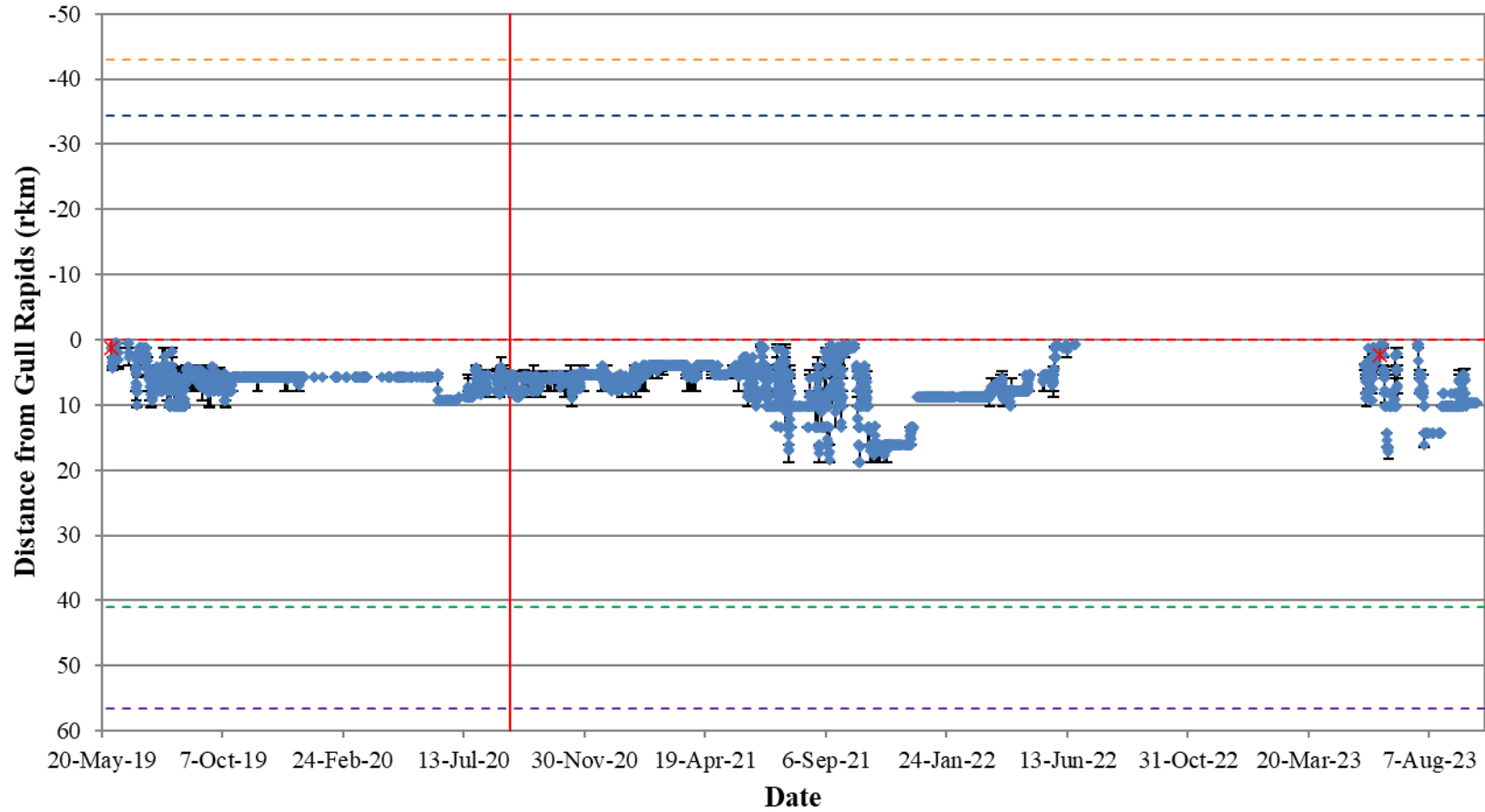


Figure A3-2: Position of a Lake Sturgeon tagged with an acoustic transmitter (code #7036) in Stephens Lake in relation to the Keyyask GS (rkm 0), from May 1, 2019 to October 2, 2023. Date and location of tagging is indicated by a star. Completion of reservoir impoundment is indicated by a vertical solid red line. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keyyask GS; green = Kettle GS; purple = Long Spruce GS).

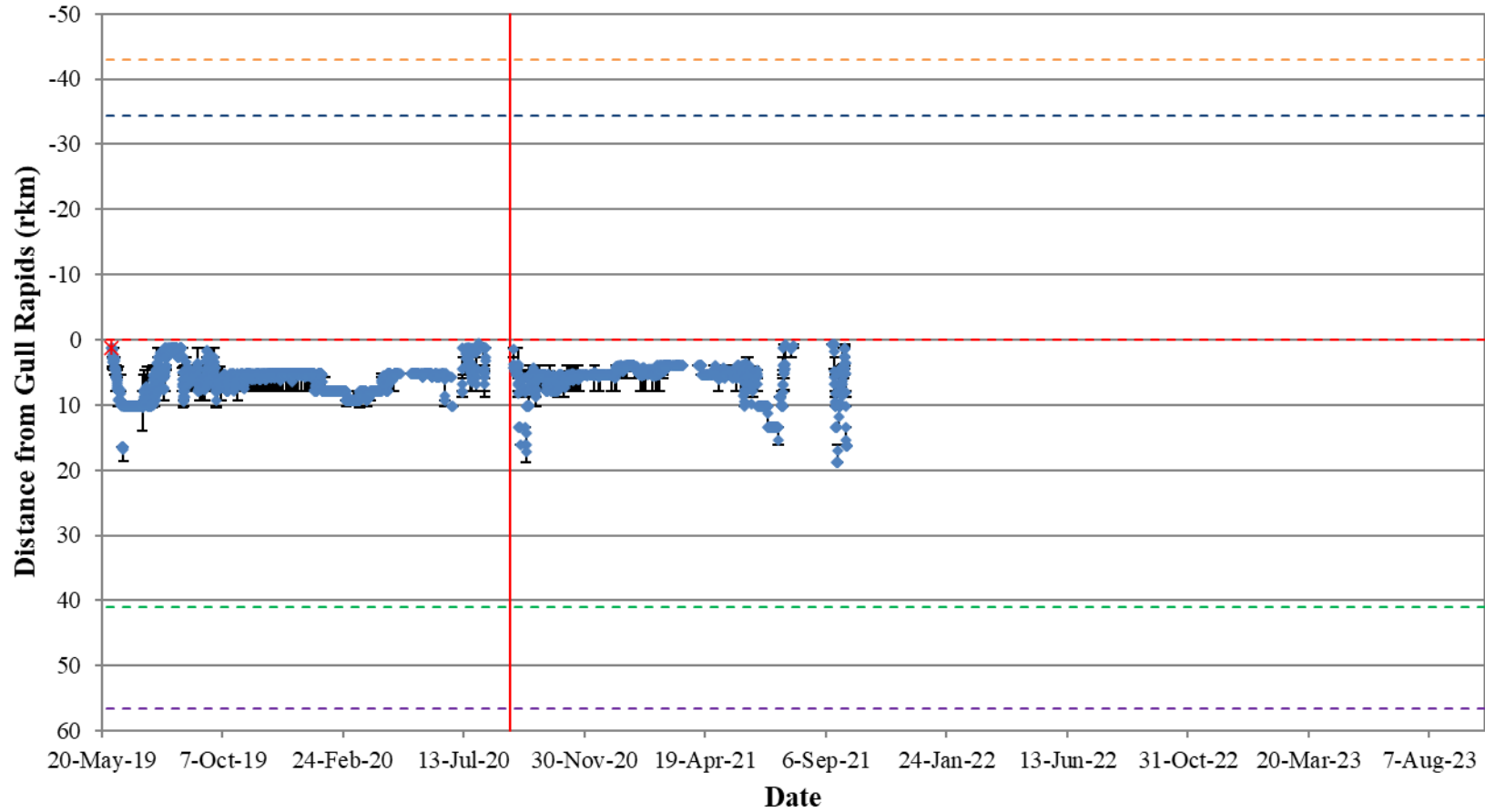


Figure A3-3: Position of a Lake Sturgeon tagged with an acoustic transmitter (code #7037) in Stephens Lake in relation to the Keyyask GS (rkm 0), from May 1, 2019 to October 2, 2023. Date and location of tagging is indicated by a star. Completion of reservoir impoundment is indicated by a vertical solid red line. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keyyask GS; green = Kettle GS; purple = Long Spruce GS).

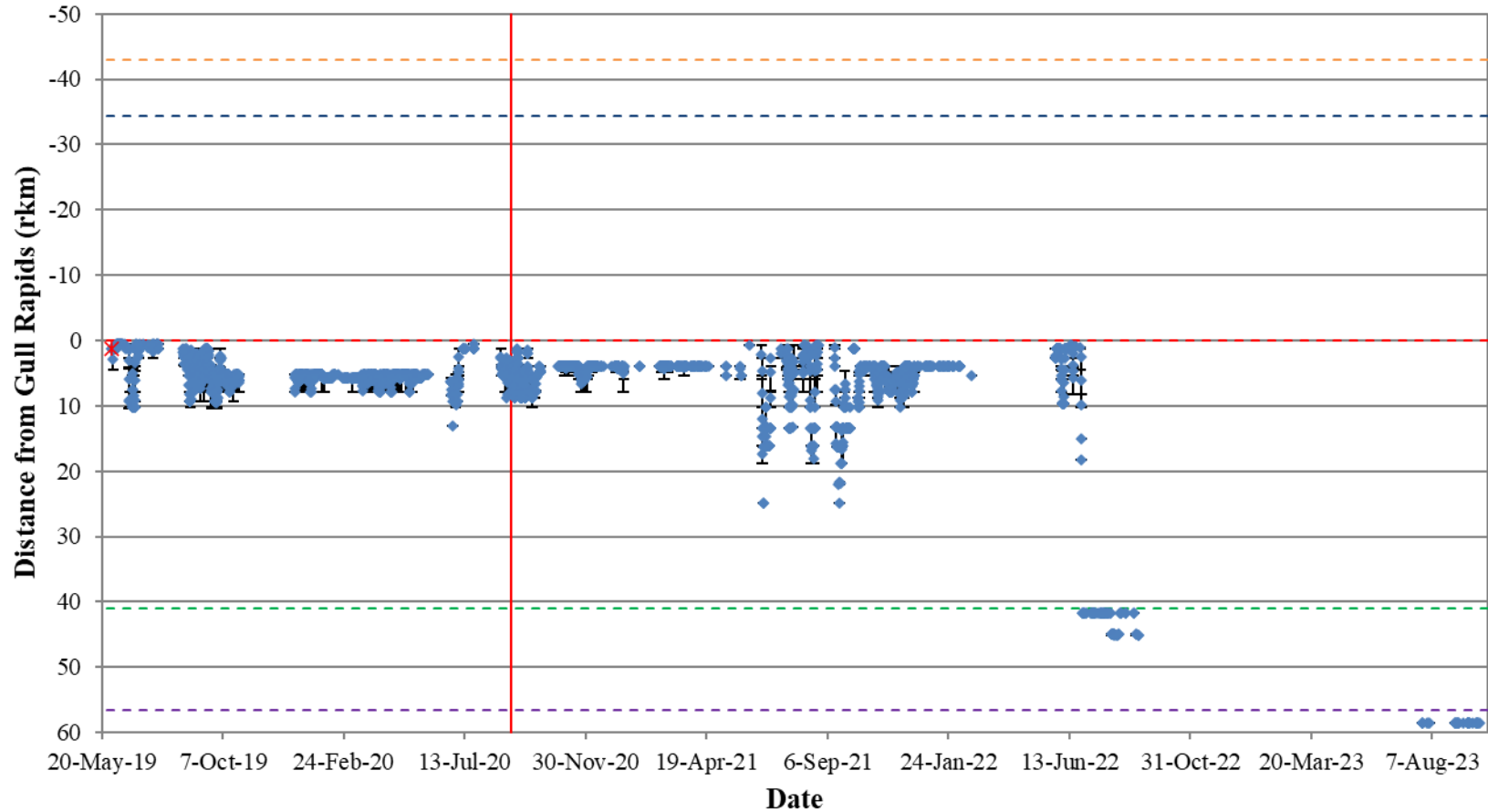


Figure A3-4: Position of a Lake Sturgeon tagged with an acoustic transmitter (code #7038) in Stephens Lake in relation to the Keeyask GS (rkm 0), from May 1, 2019 to October 2, 2023. Date and location of tagging is indicated by a star. Completion of reservoir impoundment is indicated by a vertical solid red line. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keeyask GS; green = Kettle GS; purple = Long Spruce GS).

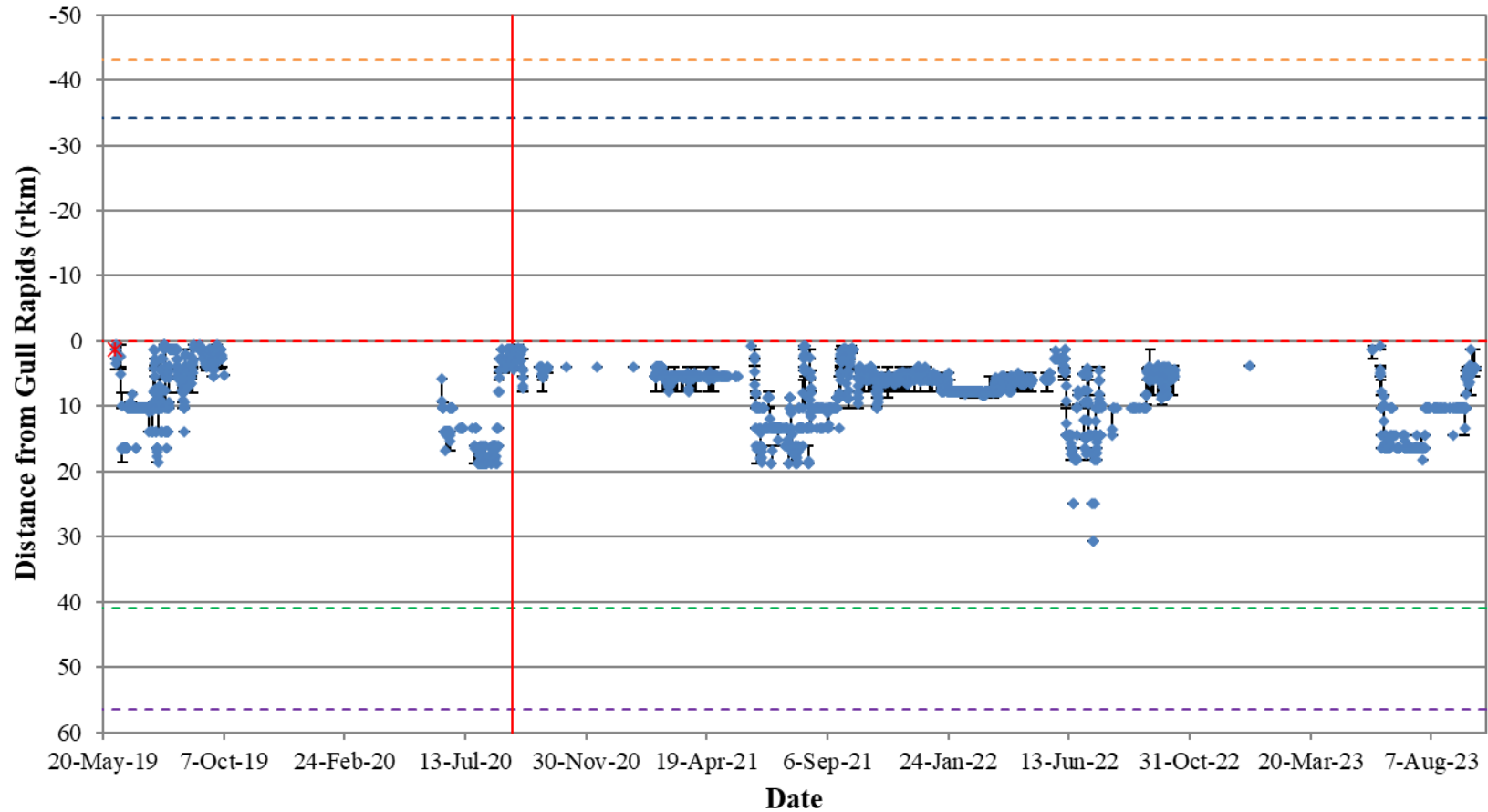


Figure A3-5: Position of a Lake Sturgeon tagged with an acoustic transmitter (code #7039) in Stephens Lake in relation to the Keeyask GS (rkm 0), from May 1, 2019 to October 2, 2023. Date and location of tagging is indicated by a star. Completion of reservoir impoundment is indicated by a vertical solid red line. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keeyask GS; green = Kettle GS; purple = Long Spruce GS).

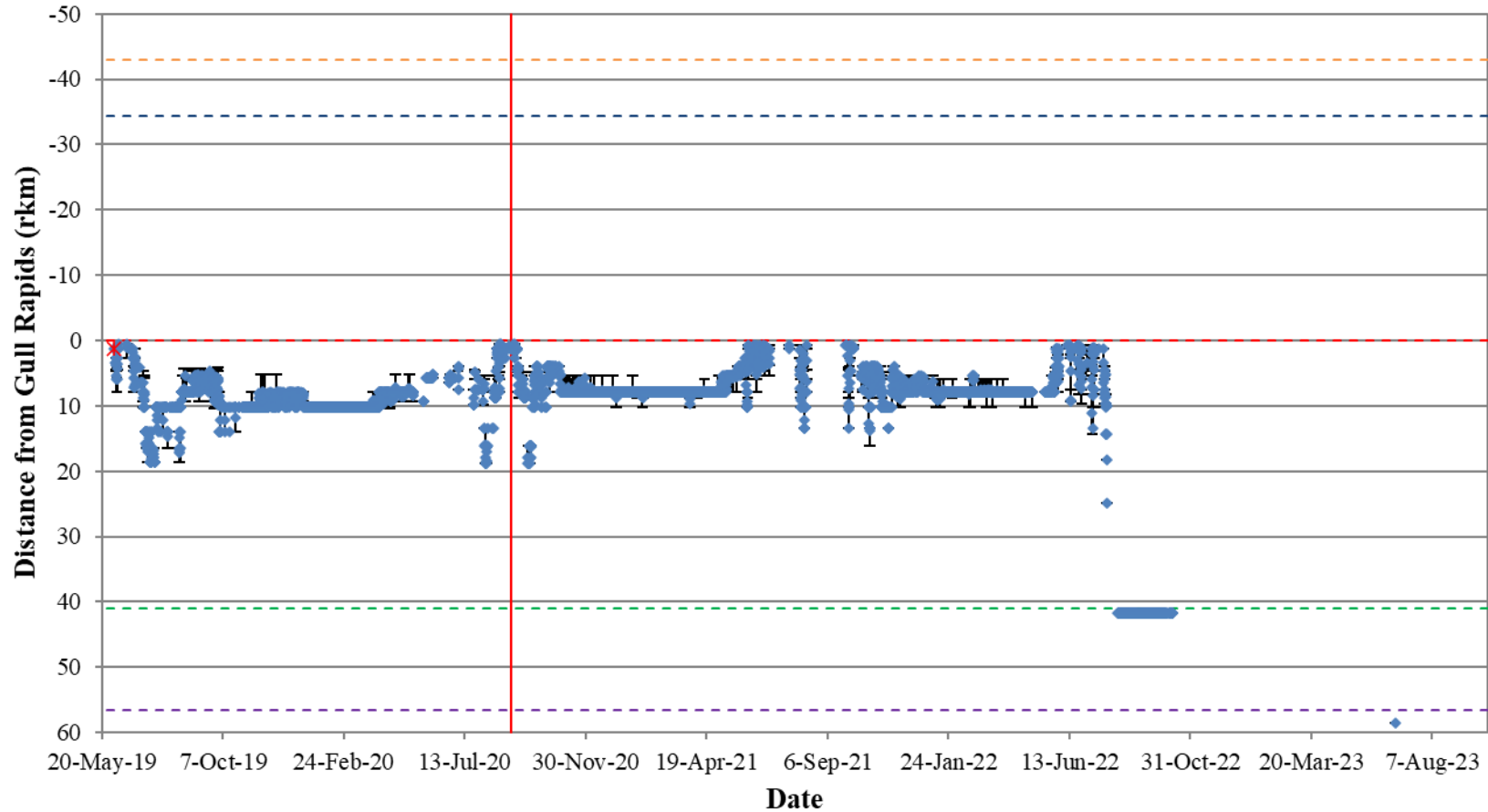


Figure A3-6: Position of a Lake Sturgeon tagged with an acoustic transmitter (code #7040) in Stephens Lake in relation to the Keeyask GS (rkm 0), from May 1, 2019 to October 2, 2023. Date and location of tagging is indicated by a star. Completion of reservoir impoundment is indicated by a vertical solid red line. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keeyask GS; green = Kettle GS; purple = Long Spruce GS).

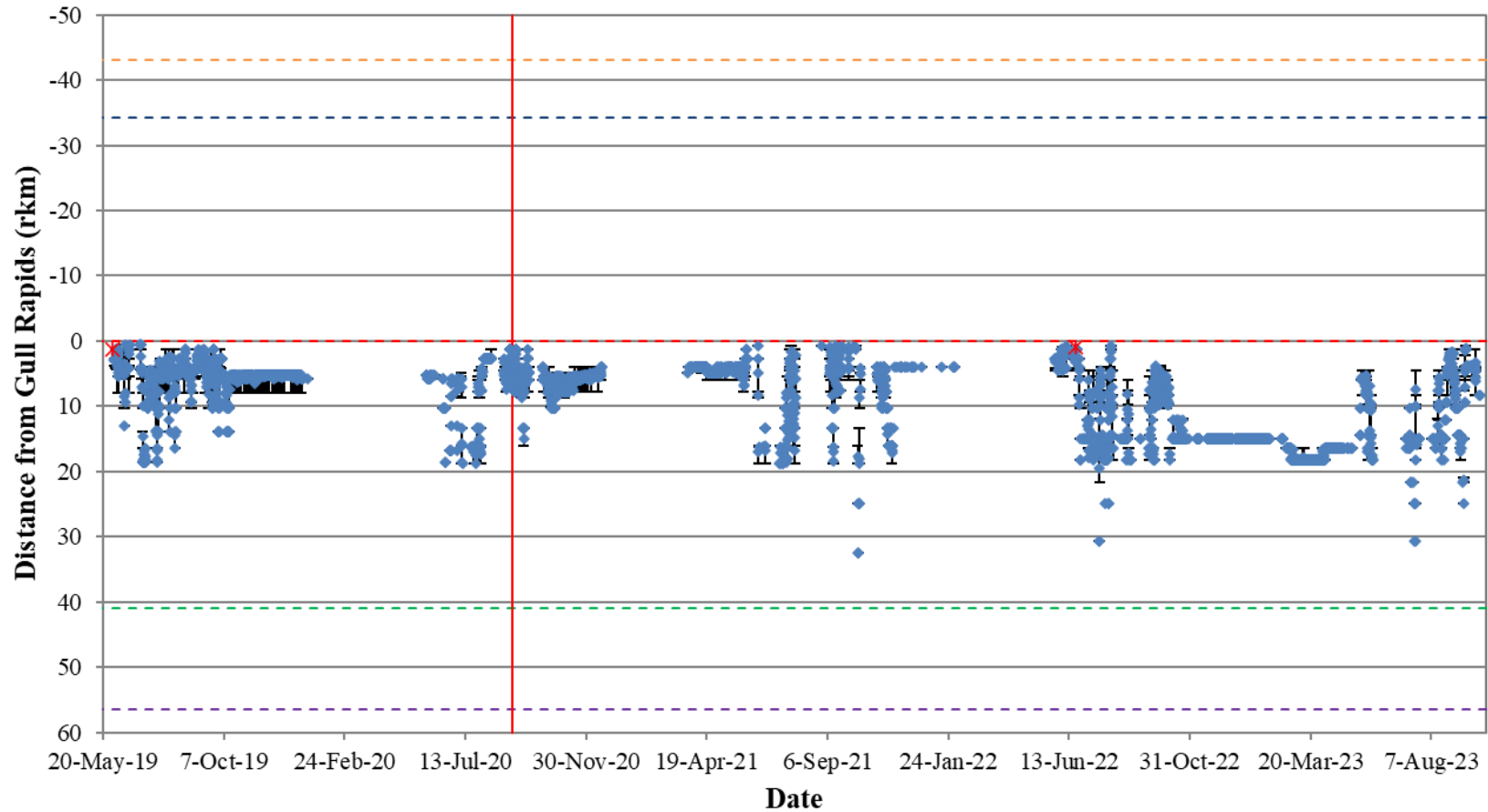


Figure A3-7: Position of a Lake Sturgeon tagged with an acoustic transmitter (code #7041) in Stephens Lake in relation to the Keeyask GS (rkm 0), from May 1, 2019 to October 2, 2023. Date and location of tagging is indicated by a star. Completion of reservoir impoundment is indicated by a vertical solid red line. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keeyask GS; green = Kettle GS; purple = Long Spruce GS).

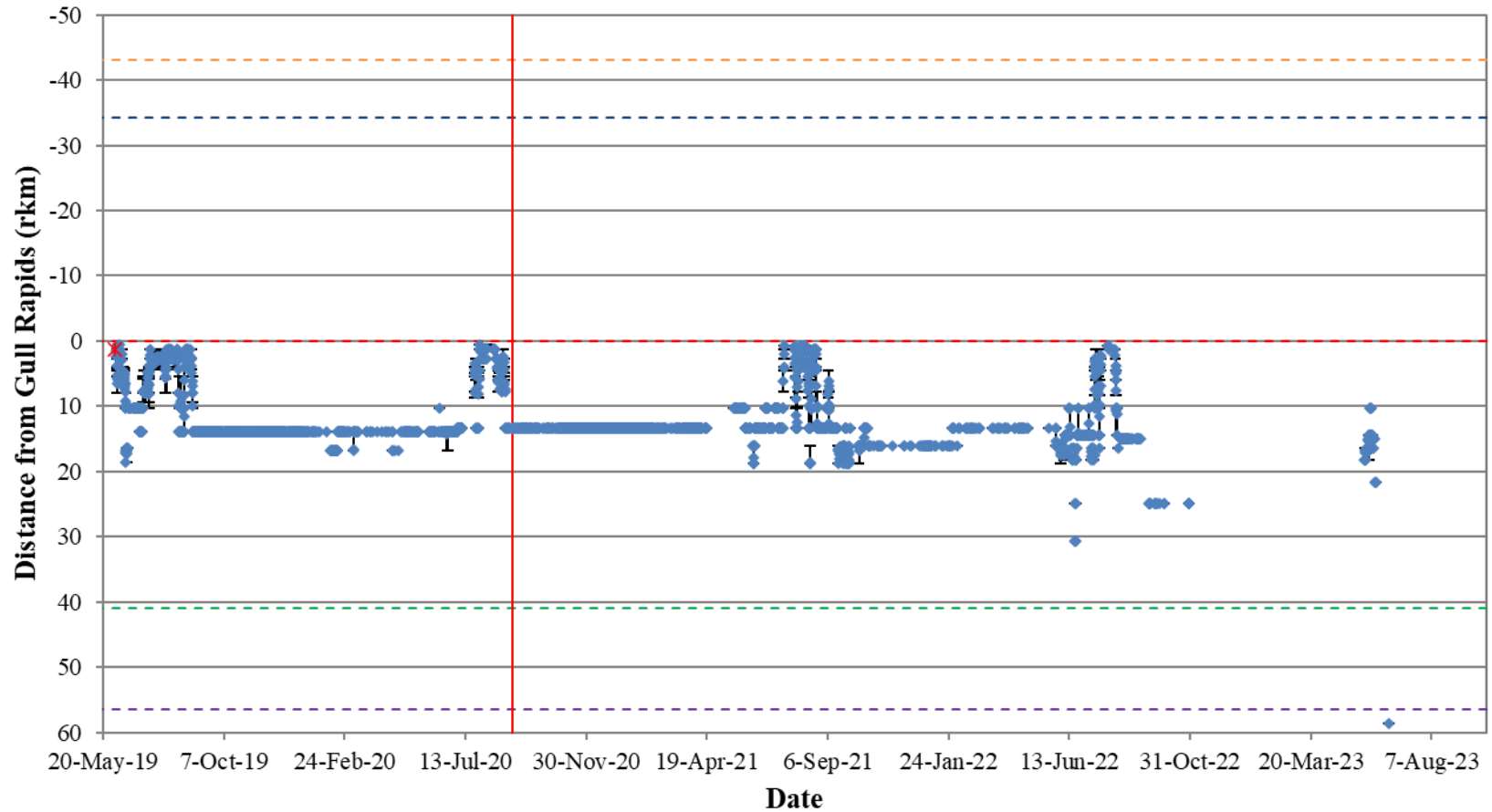


Figure A3-8: Position of a Lake Sturgeon tagged with an acoustic transmitter (code #7042) in Stephens Lake in relation to the Keeyask GS (rkm 0), from May 1, 2019 to October 2, 2023. Date and location of tagging is indicated by a star. Completion of reservoir impoundment is indicated by a vertical solid red line. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keeyask GS; green = Kettle GS; purple = Long Spruce GS).

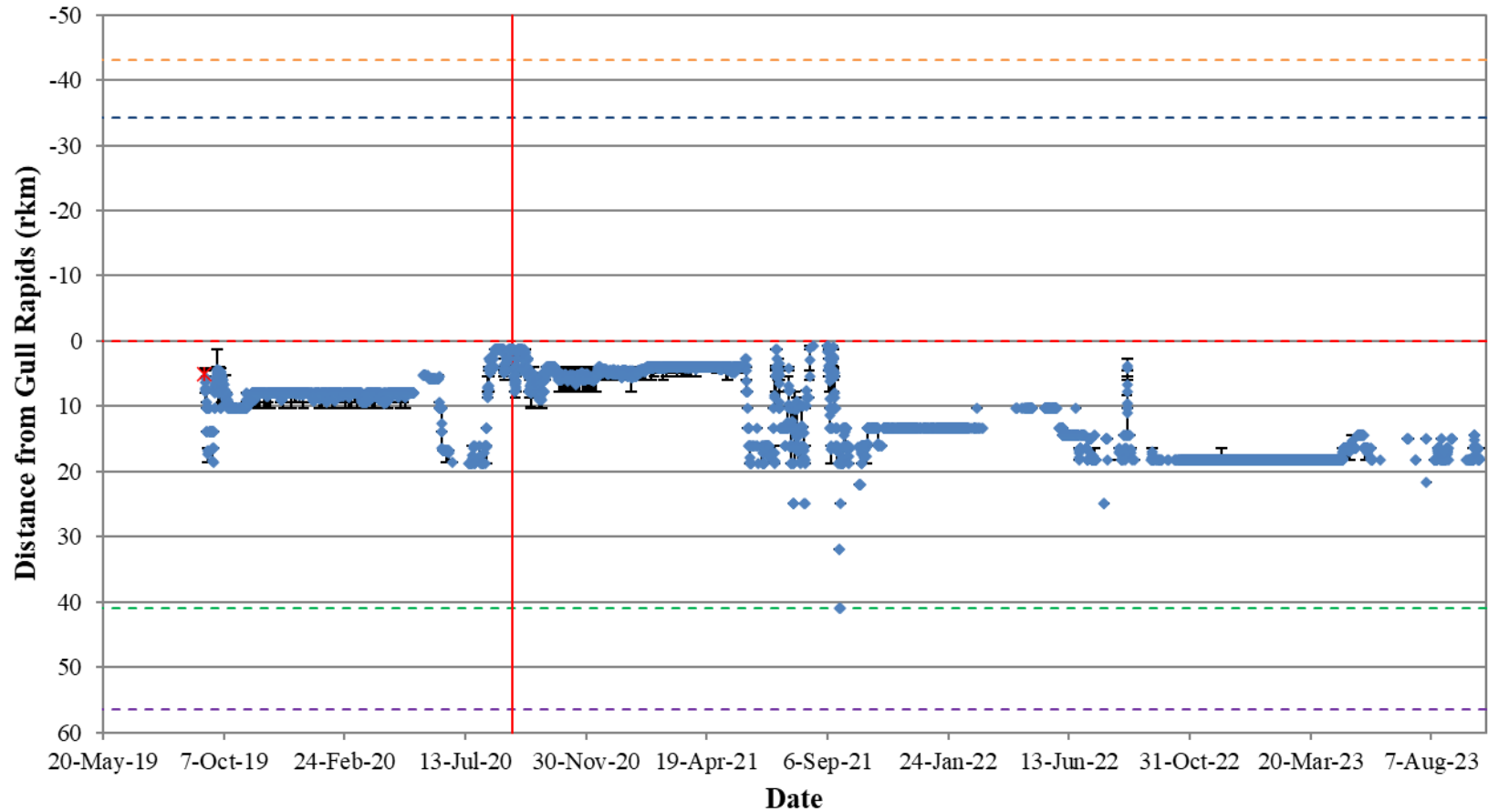


Figure A3-9: Position of a Lake Sturgeon tagged with an acoustic transmitter (code #7043) in Stephens Lake in relation to the Keeyask GS (rkm 0), from May 1, 2019 to October 2, 2023. Date and location of tagging is indicated by a star. Completion of reservoir impoundment is indicated by a vertical solid red line. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keeyask GS; green = Kettle GS; purple = Long Spruce GS).

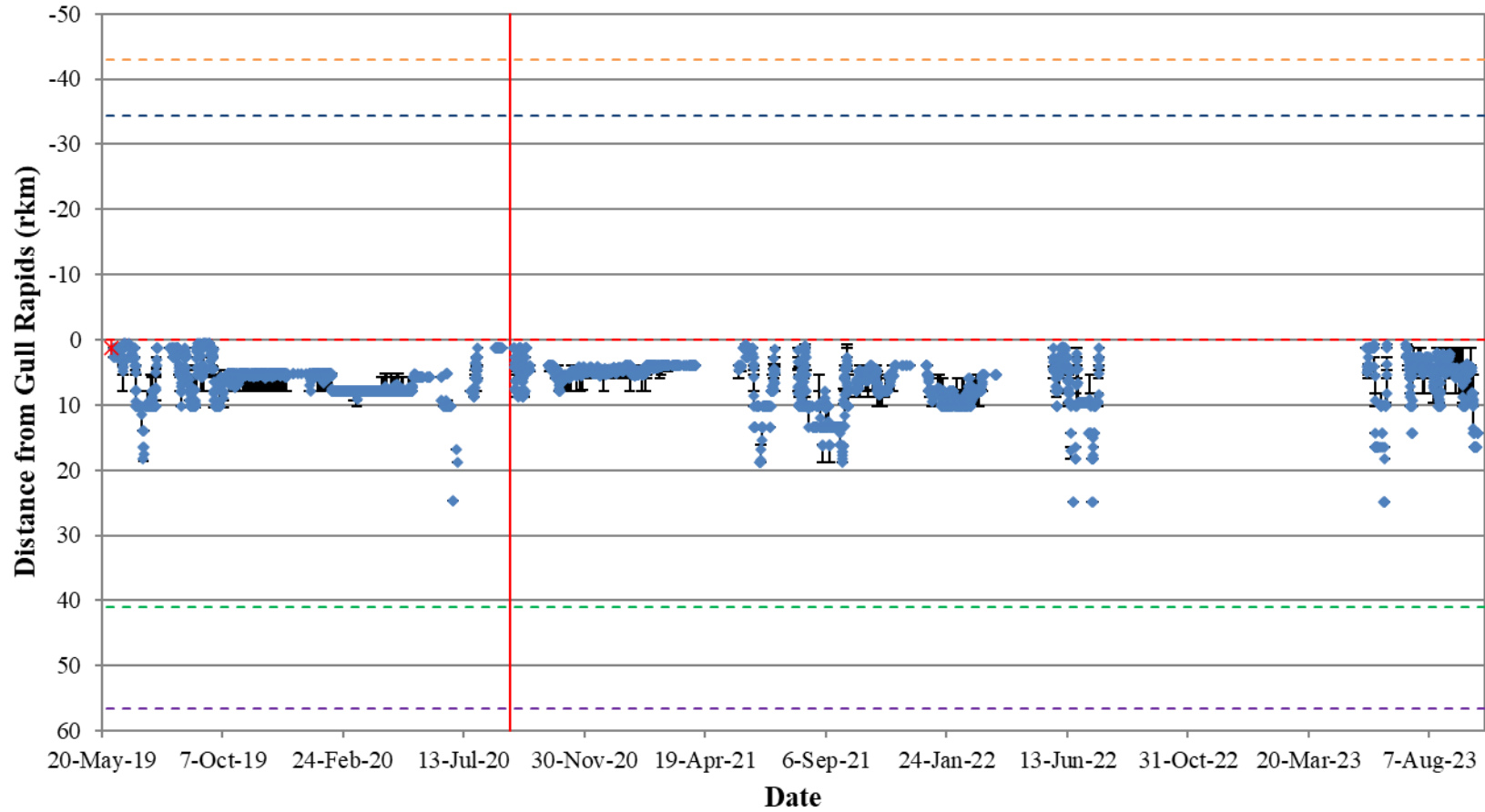


Figure A3-10: Position of a Lake Sturgeon tagged with an acoustic transmitter (code #7044) in Stephens Lake in relation to the Keeyask GS (rkm 0), from May 1, 2019 to October 2, 2023. Date and location of tagging is indicated by a star. Completion of reservoir impoundment is indicated by a vertical solid red line. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keeyask GS; green = Kettle GS; purple = Long Spruce GS).

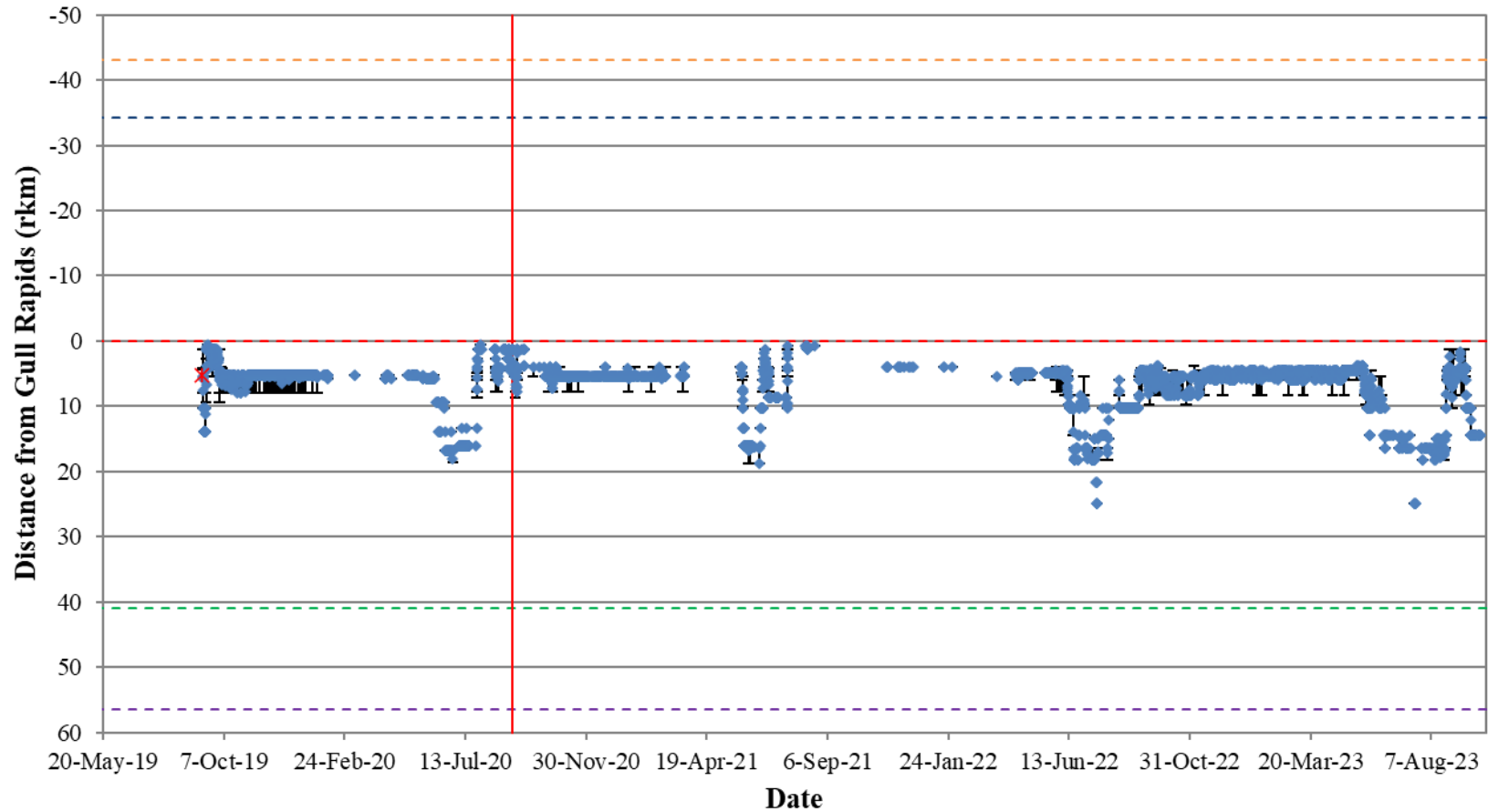


Figure A3-11: Position of a Lake Sturgeon tagged with an acoustic transmitter (code #7045) in Stephens Lake in relation to the Keeyask GS (rkm 0), from May 1, 2019 to October 2, 2023. Date and location of tagging is indicated by a star. Completion of reservoir impoundment is indicated by a vertical solid red line. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keeyask GS; green = Kettle GS; purple = Long Spruce GS).

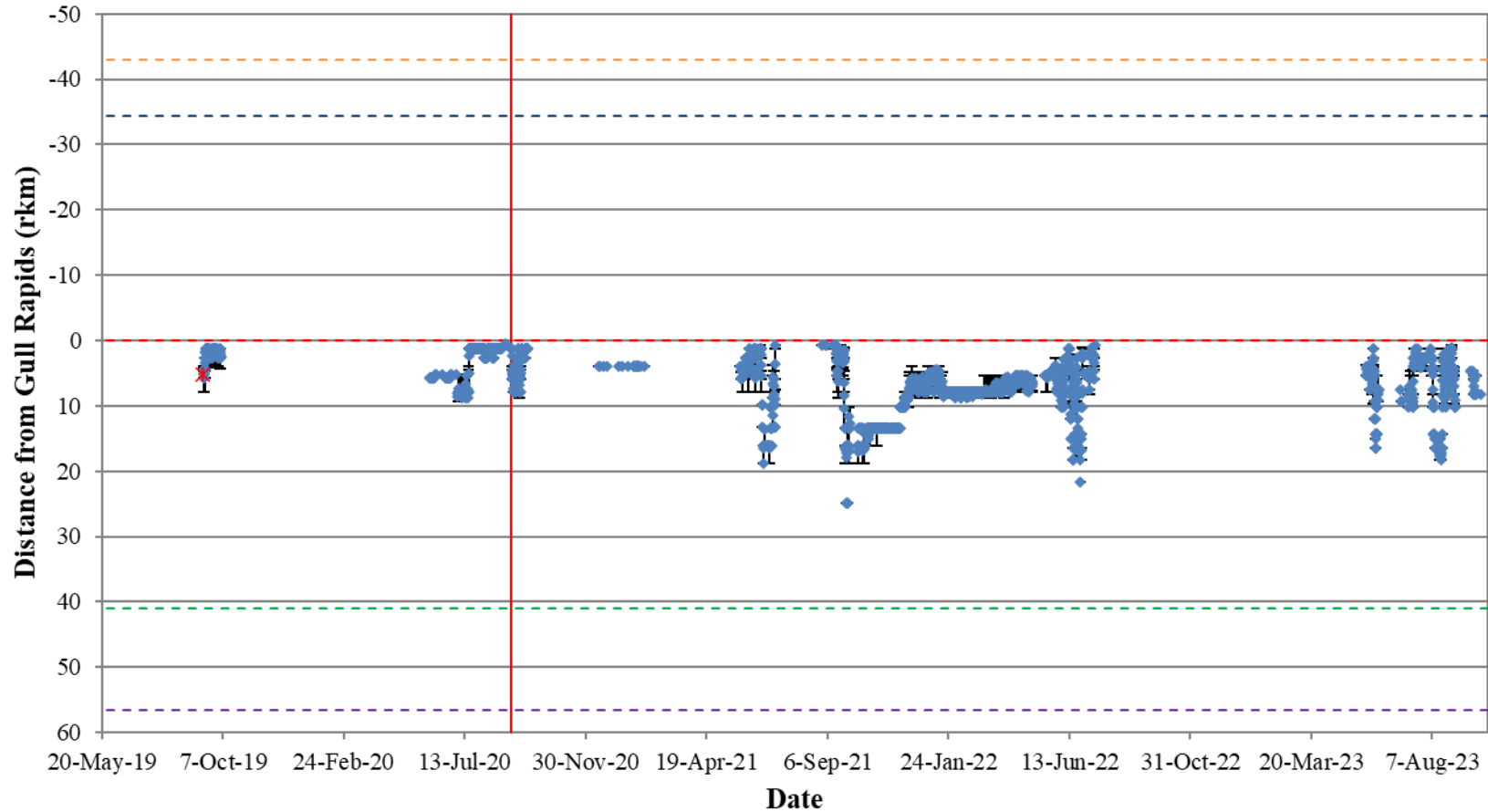


Figure A3-12: Position of a Lake Sturgeon tagged with an acoustic transmitter (code #7046) in Stephens Lake in relation to the Keeyask GS (rkm 0), from May 1, 2019 to October 2, 2023. Date and location of tagging is indicated by a star. Completion of reservoir impoundment is indicated by a vertical solid red line. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keeyask GS; green = Kettle GS; purple = Long Spruce GS).

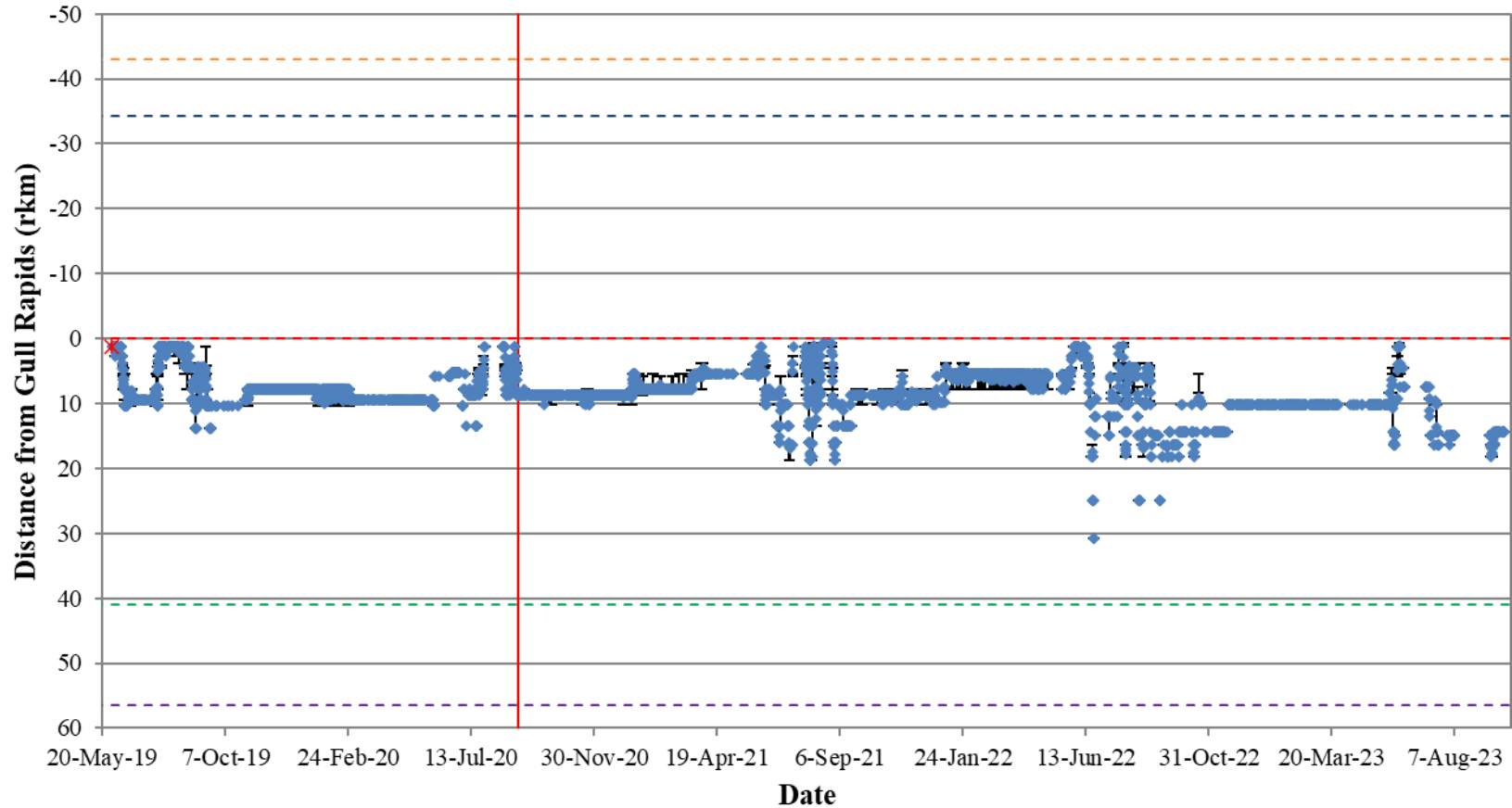


Figure A3-13: Position of a Lake Sturgeon tagged with an acoustic transmitter (code #7047) in Stephens Lake in relation to the Keyyask GS (rkm 0), from May 1, 2019 to October 2, 2023. Date and location of tagging is indicated by a star. Completion of reservoir impoundment is indicated by a vertical solid red line. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keyyask GS; green = Kettle GS; purple = Long Spruce GS).

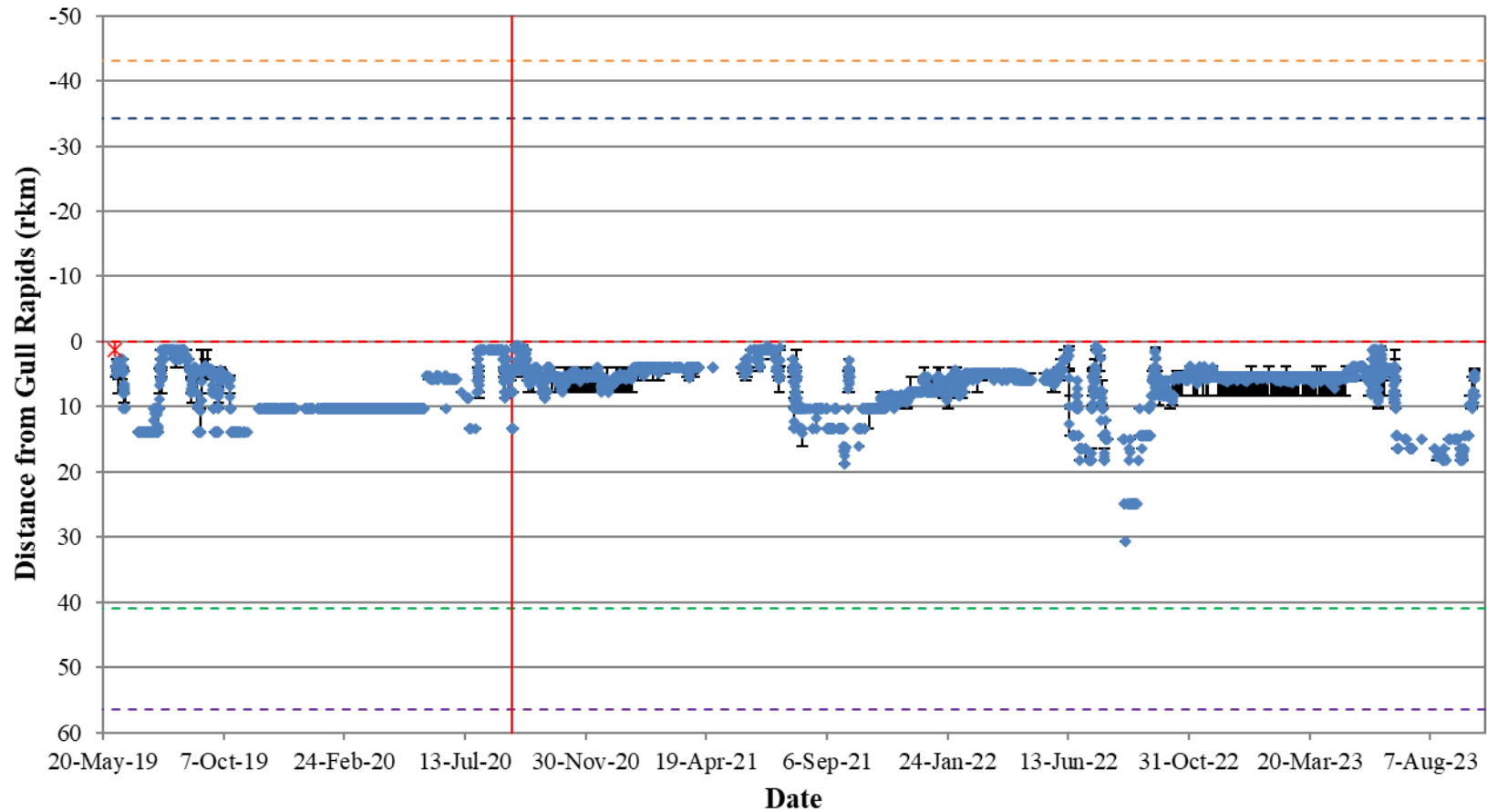


Figure A3-14: Position of a Lake Sturgeon tagged with an acoustic transmitter (code #7048) in Stephens Lake in relation to the Keeyask GS (rkm 0), from May 1, 2019 to October 2, 2023. Date and location of tagging is indicated by a star. Completion of reservoir impoundment is indicated by a vertical solid red line. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keeyask GS; green = Kettle GS; purple = Long Spruce GS).

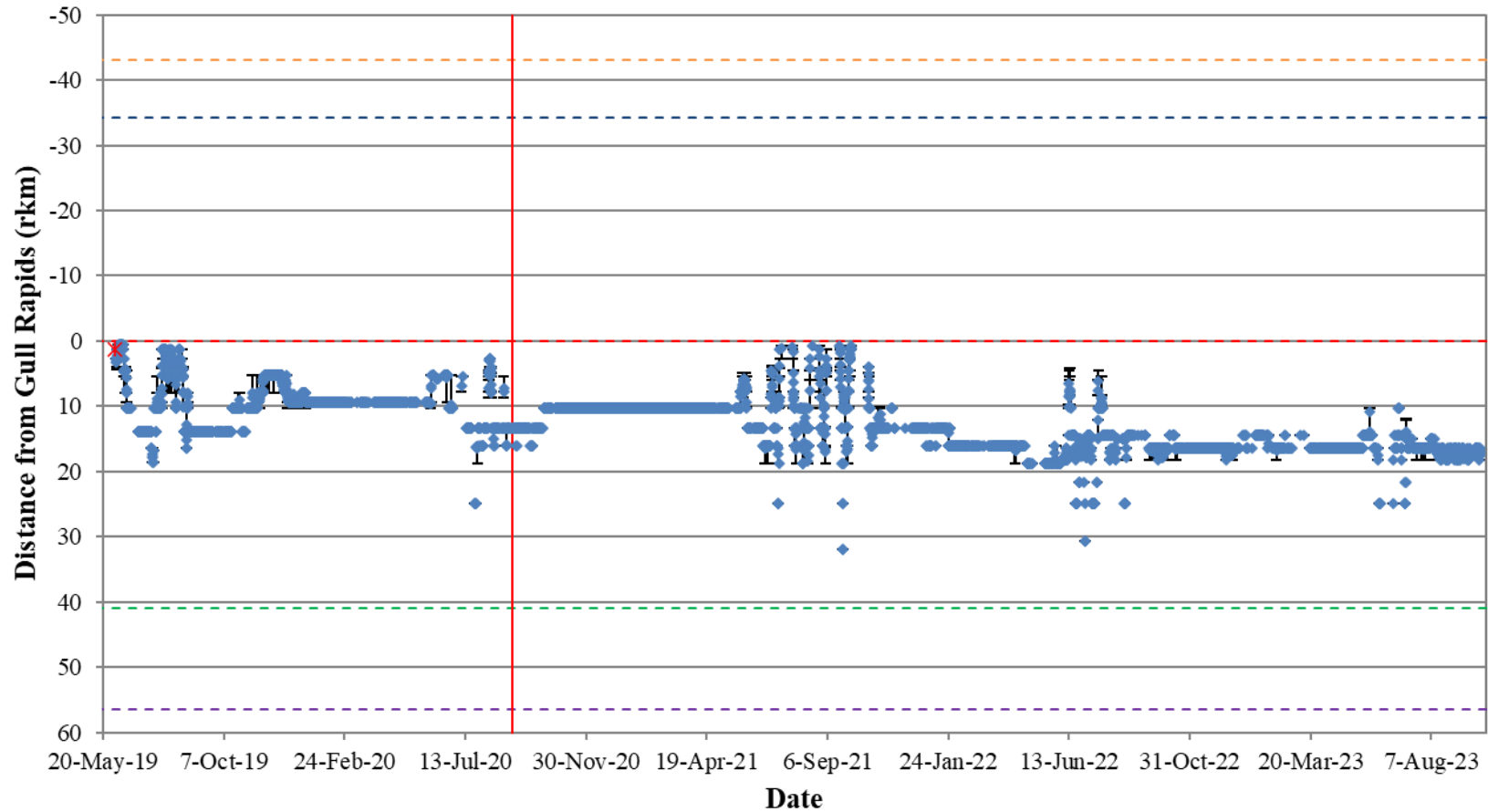


Figure A3-15: Position of a Lake Sturgeon tagged with an acoustic transmitter (code #7049) in Stephens Lake in relation to the Keeyask GS (rkm 0), from May 1, 2019 to October 2, 2023. Date and location of tagging is indicated by a star. Completion of reservoir impoundment is indicated by a vertical solid red line. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keeyask GS; green = Kettle GS; purple = Long Spruce GS).

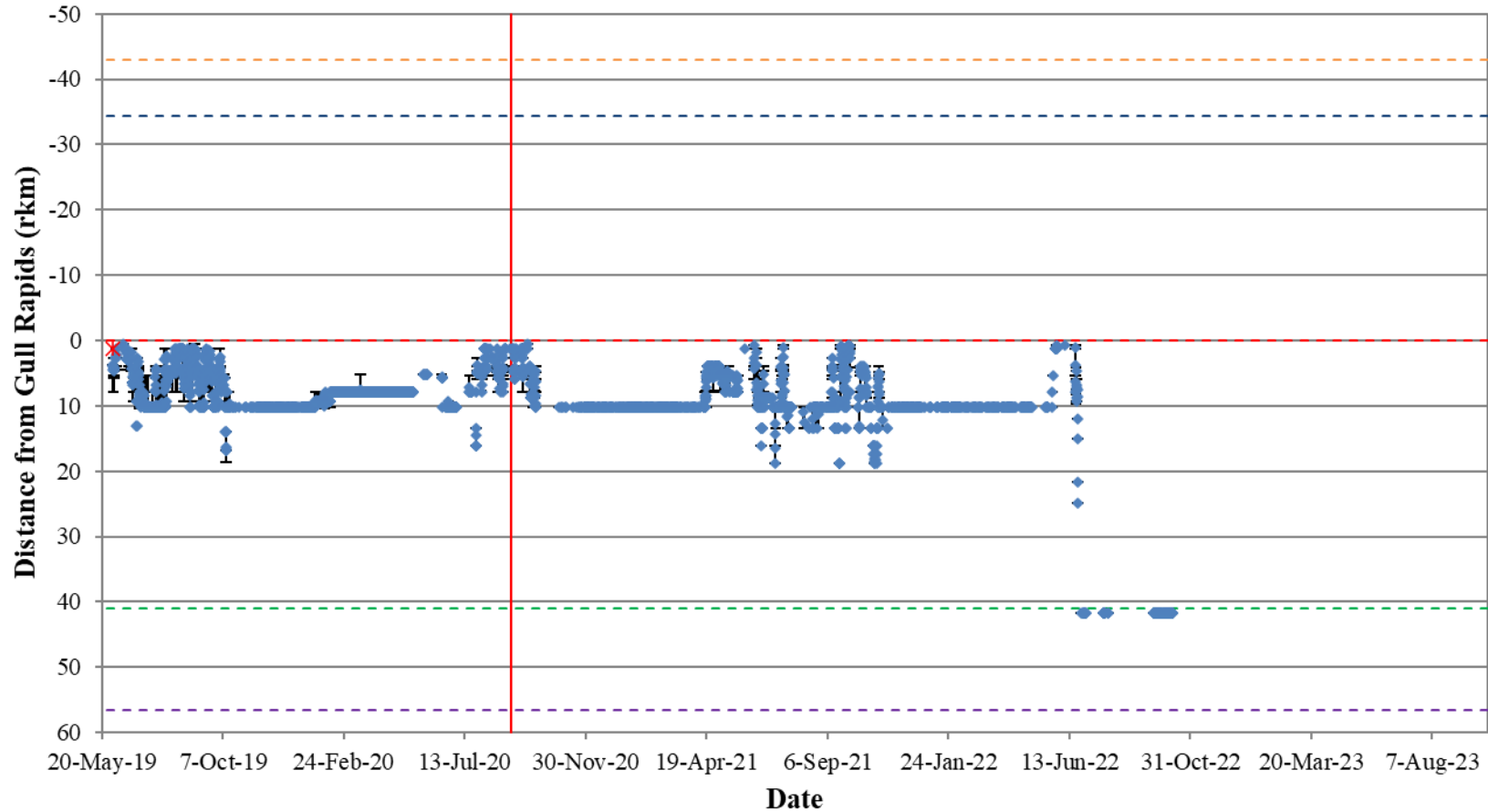


Figure A3-16: Position of a Lake Sturgeon tagged with an acoustic transmitter (code #7050) in Stephens Lake in relation to the Keeyask GS (rkm 0), from May 1, 2019 to October 2, 2023. Date and location of tagging is indicated by a star. Completion of reservoir impoundment is indicated by a vertical solid red line. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keeyask GS; green = Kettle GS; purple = Long Spruce GS).

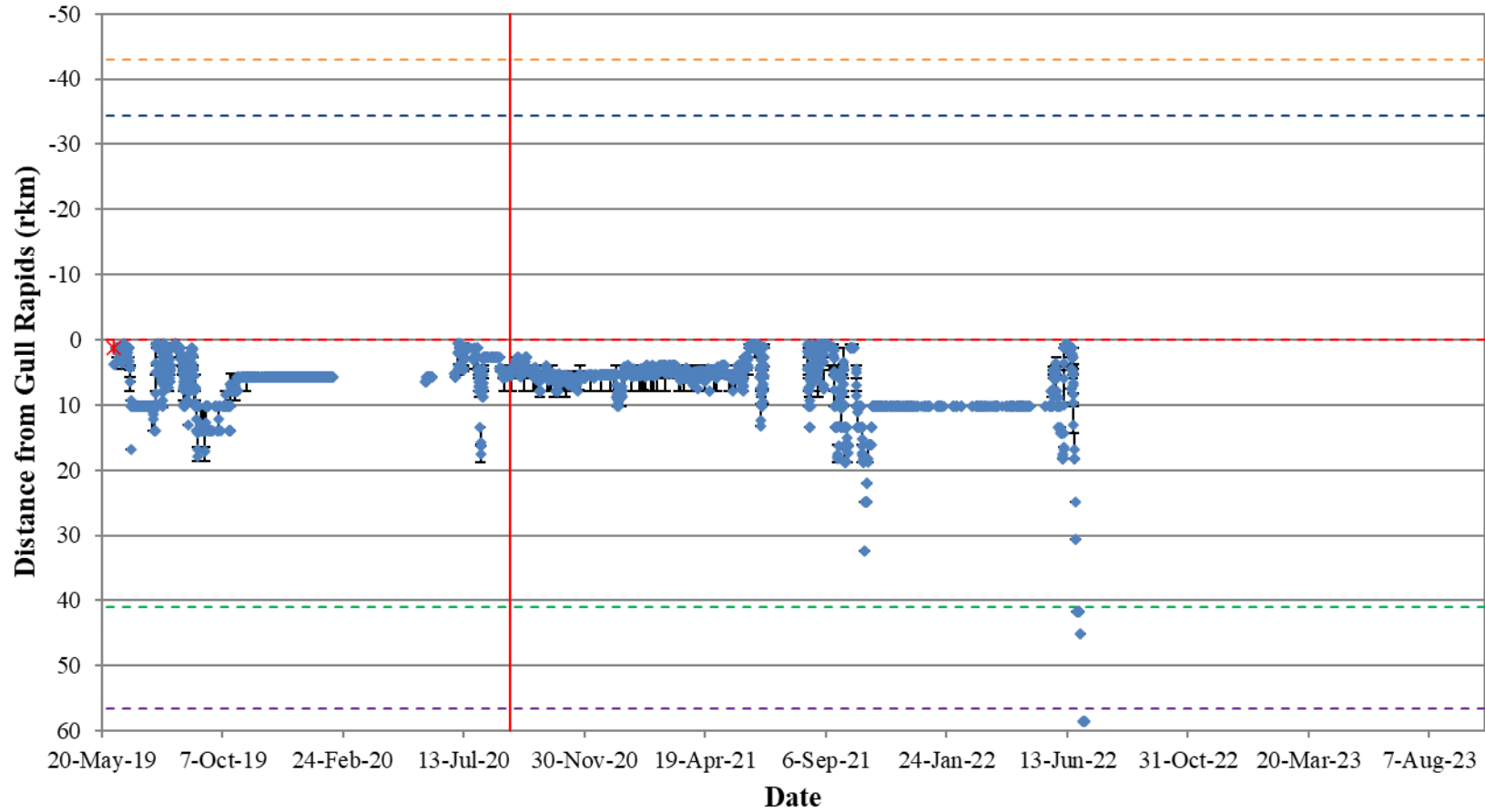


Figure A3-17: Position of a Lake Sturgeon tagged with an acoustic transmitter (code #7051) in Stephens Lake in relation to the Keyyask GS (rkm 0), from May 1, 2019 to October 2, 2023. Date and location of tagging is indicated by a star. Completion of reservoir impoundment is indicated by a vertical solid red line. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keyyask GS; green = Kettle GS; purple = Long Spruce GS).

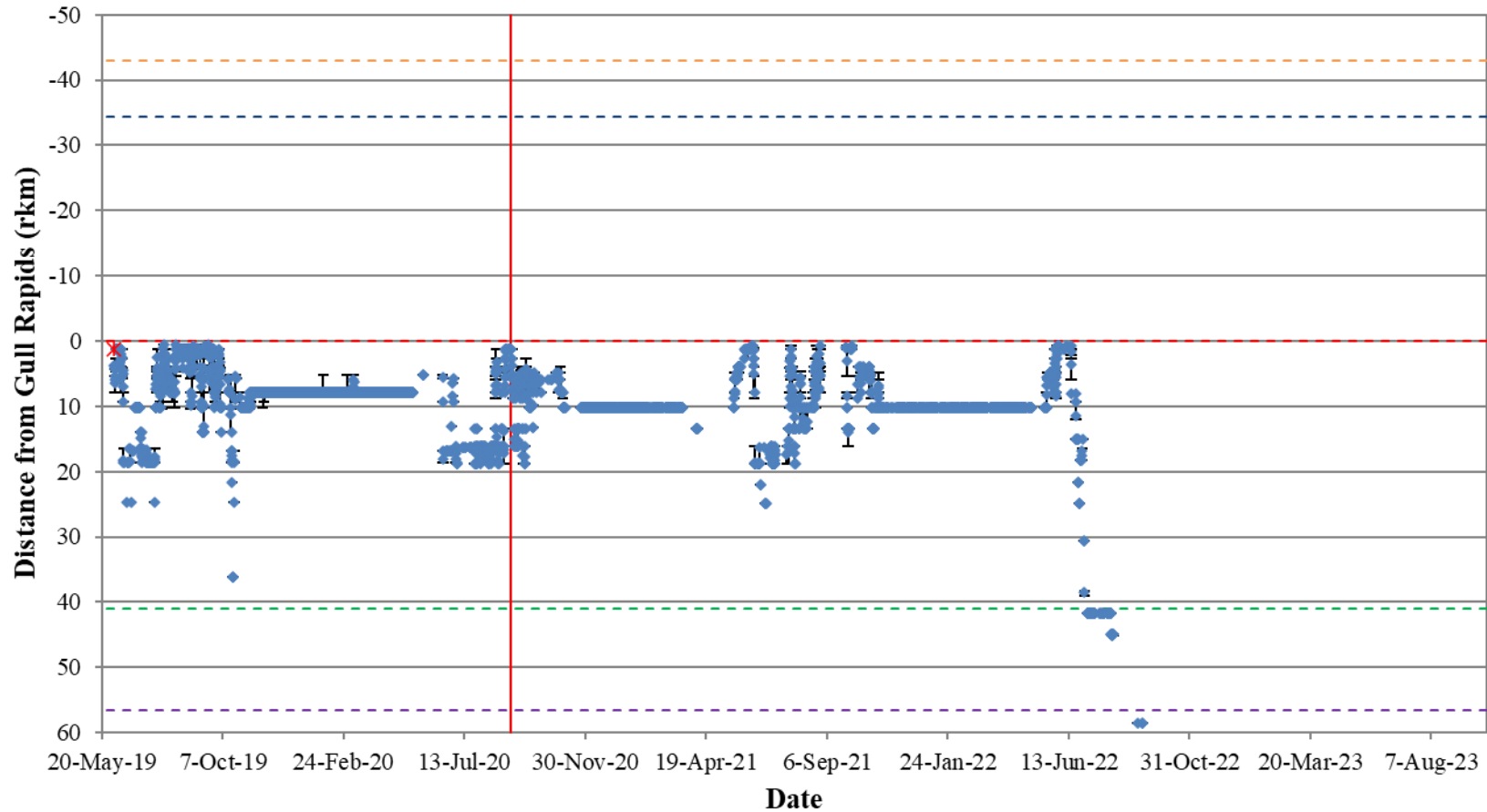


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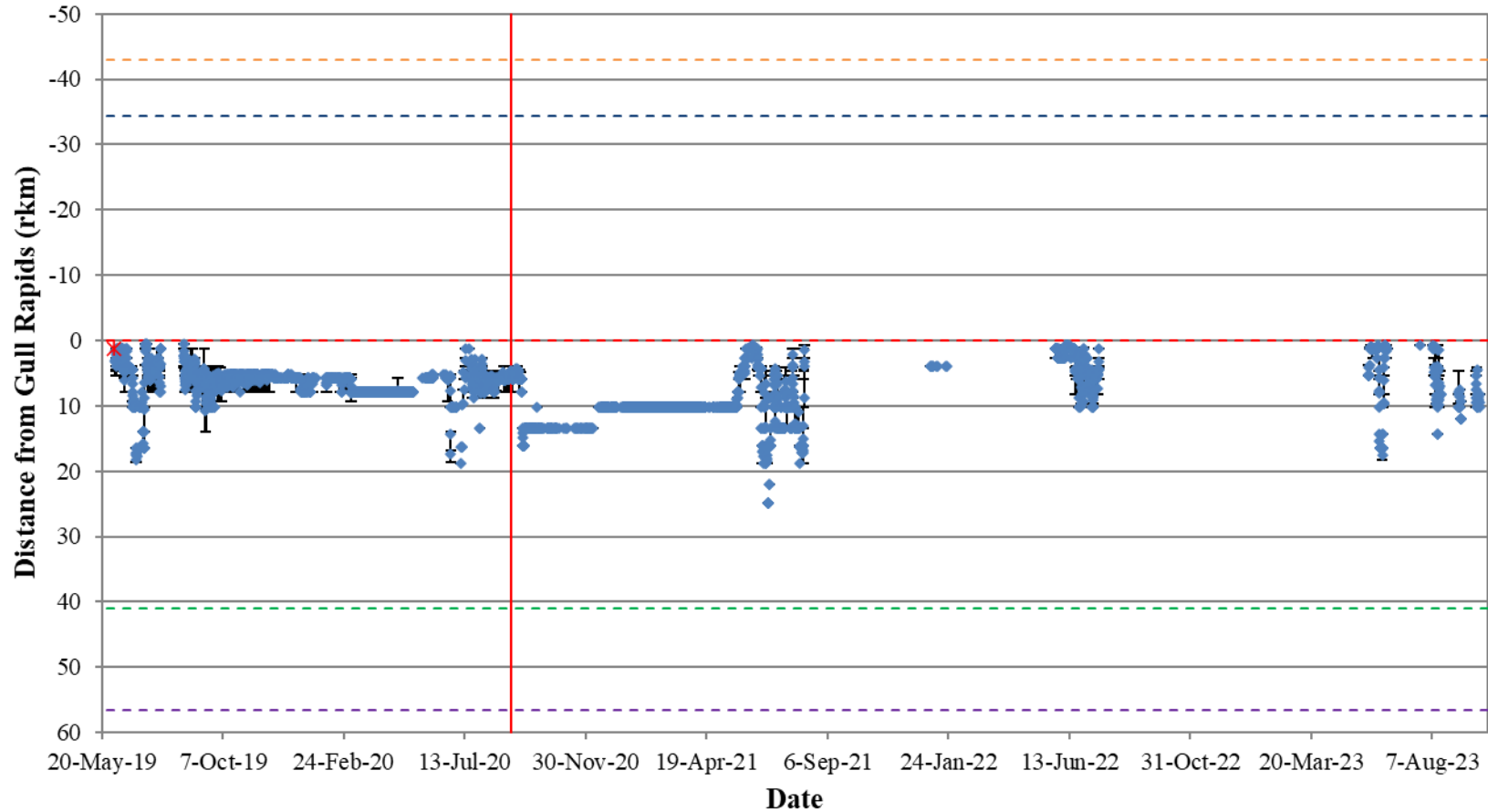


Figure A3-19: Position of a Lake Sturgeon tagged with an acoustic transmitter (code #7054) in Stephens Lake in relation to the Keeyask GS (rkm 0), from May 1, 2019 to October 2, 2023. Date and location of tagging is indicated by a star. Completion of reservoir impoundment is indicated by a vertical solid red line. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keeyask GS; green = Kettle GS; purple = Long Spruce GS).

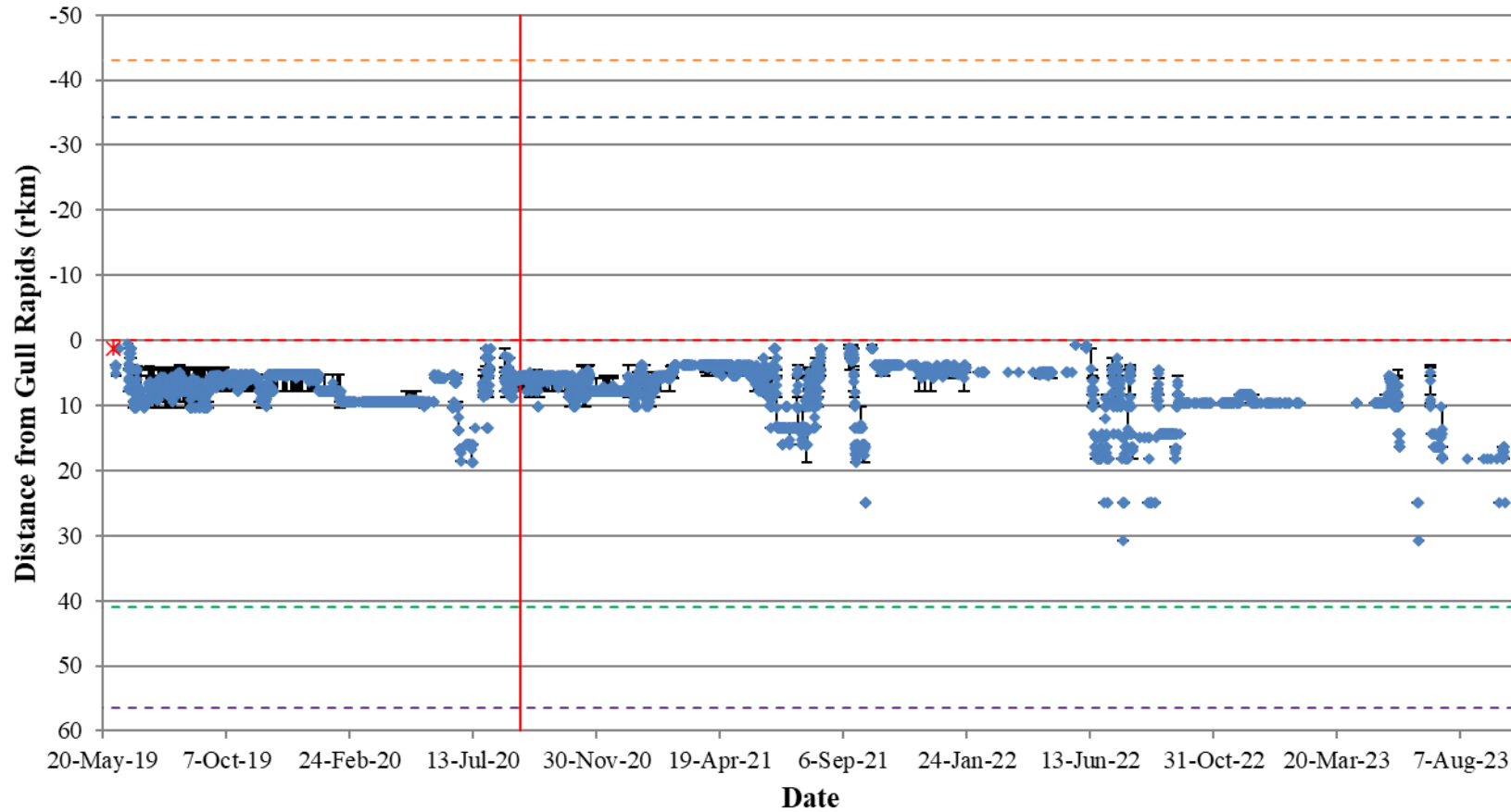


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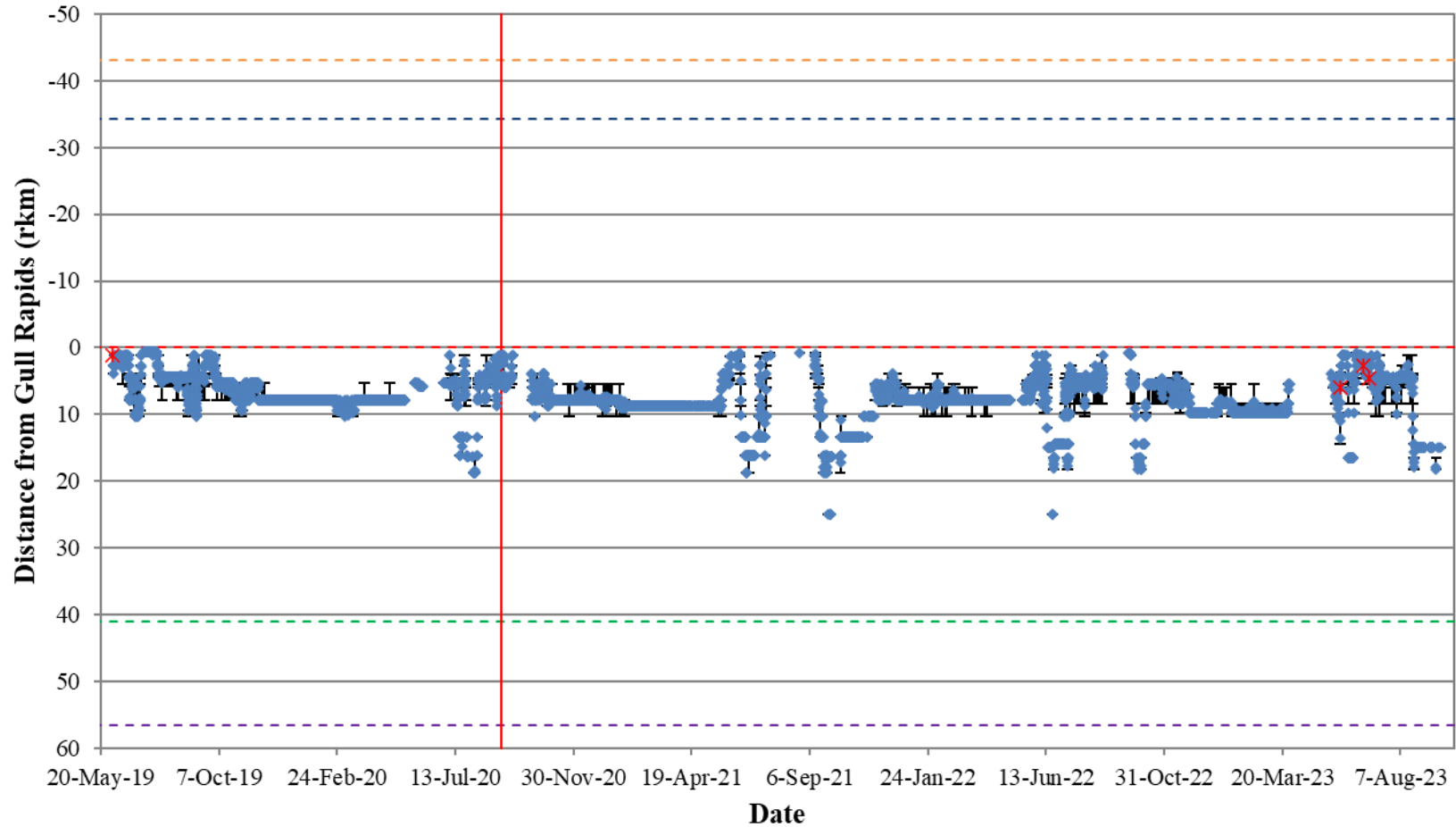


Figure A3-21: Position of a Lake Sturgeon tagged with an acoustic transmitter (code #7057) in Stephens Lake in relation to the Keeyask GS (rkm 0), from May 1, 2019 to October 2, 2023. Date and location of tagging is indicated by a star. Completion of reservoir impoundment is indicated by a vertical solid red line. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keeyask GS; green = Kettle GS; purple = Long Spruce GS).

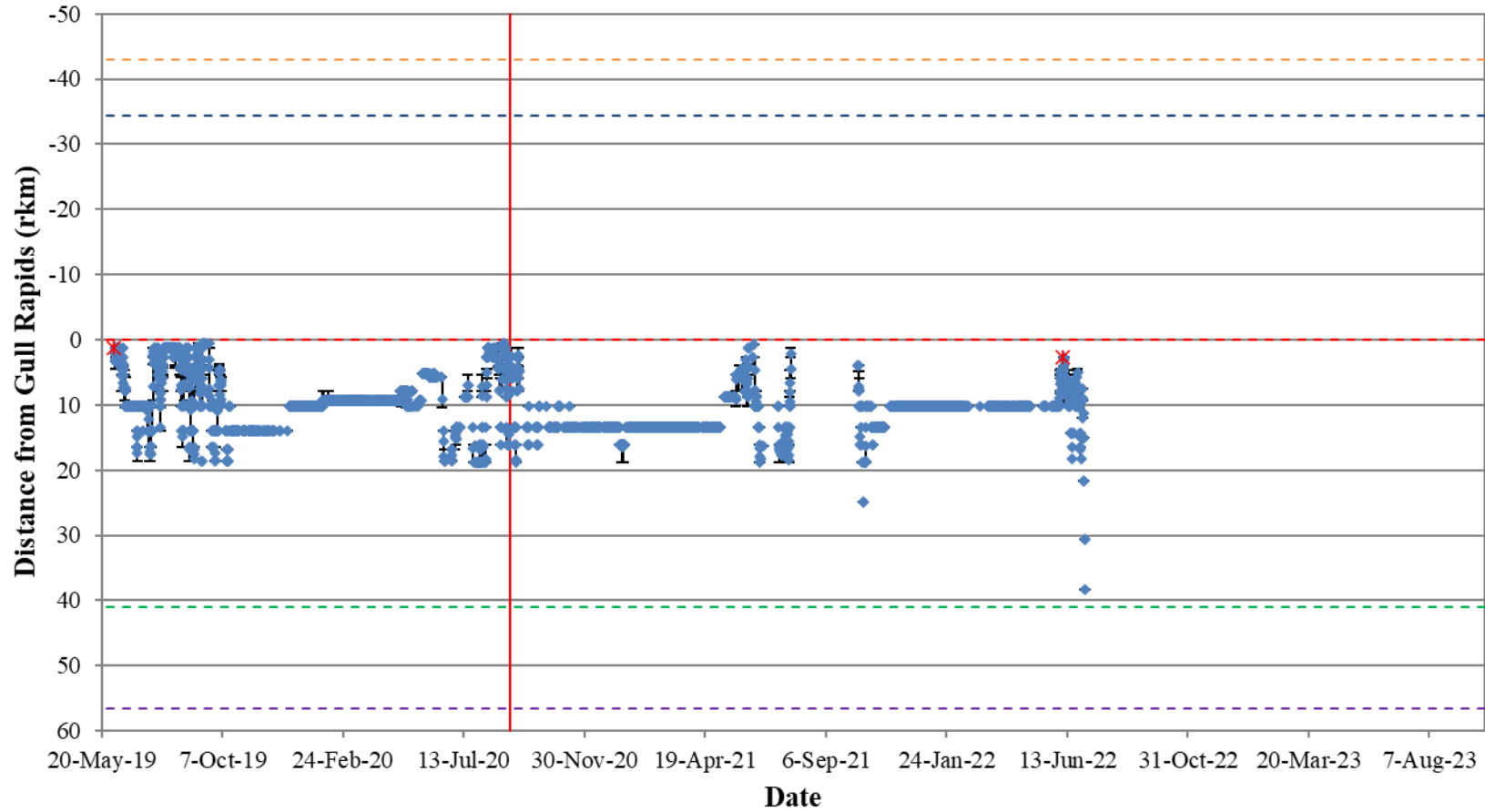


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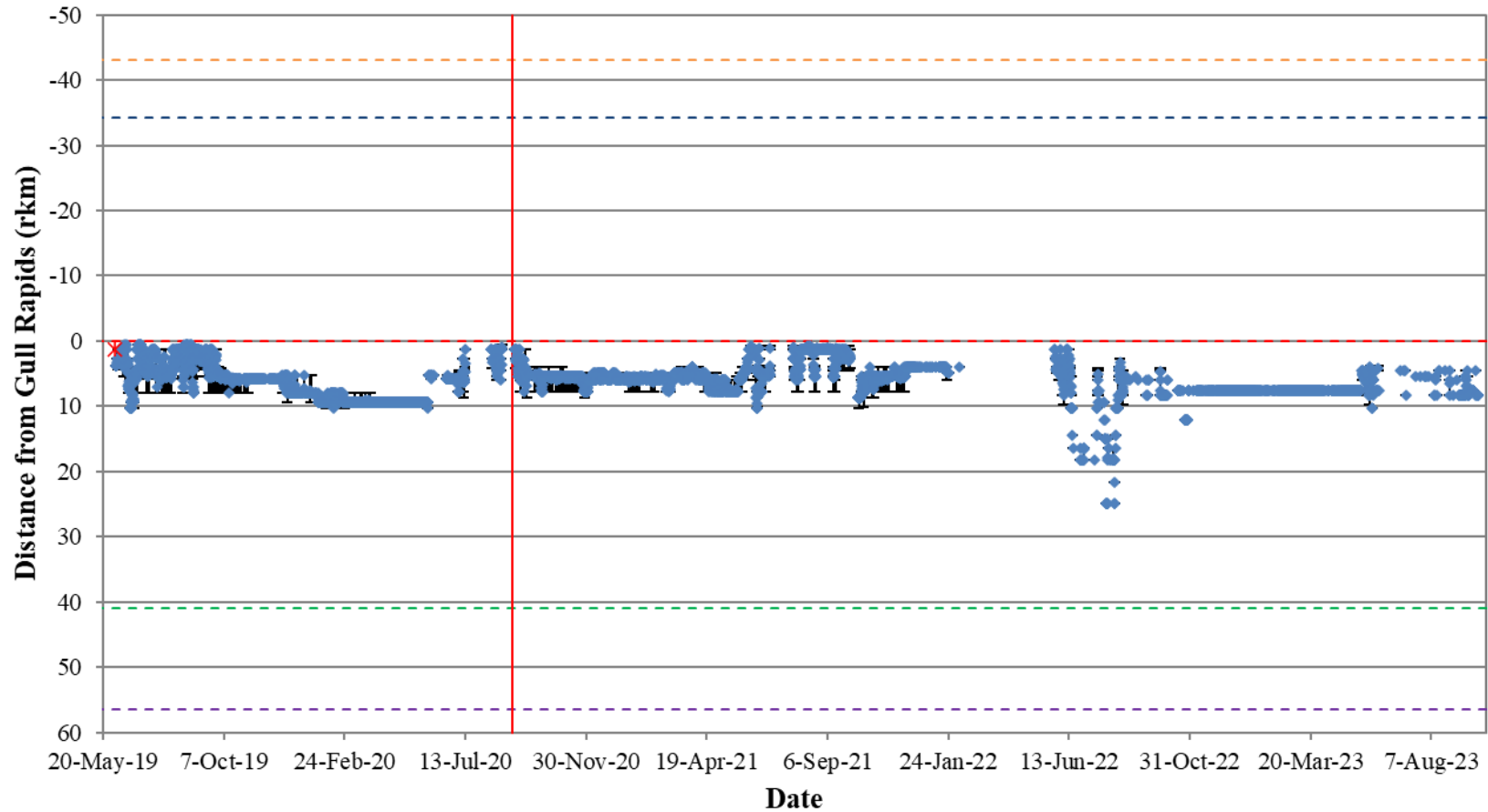


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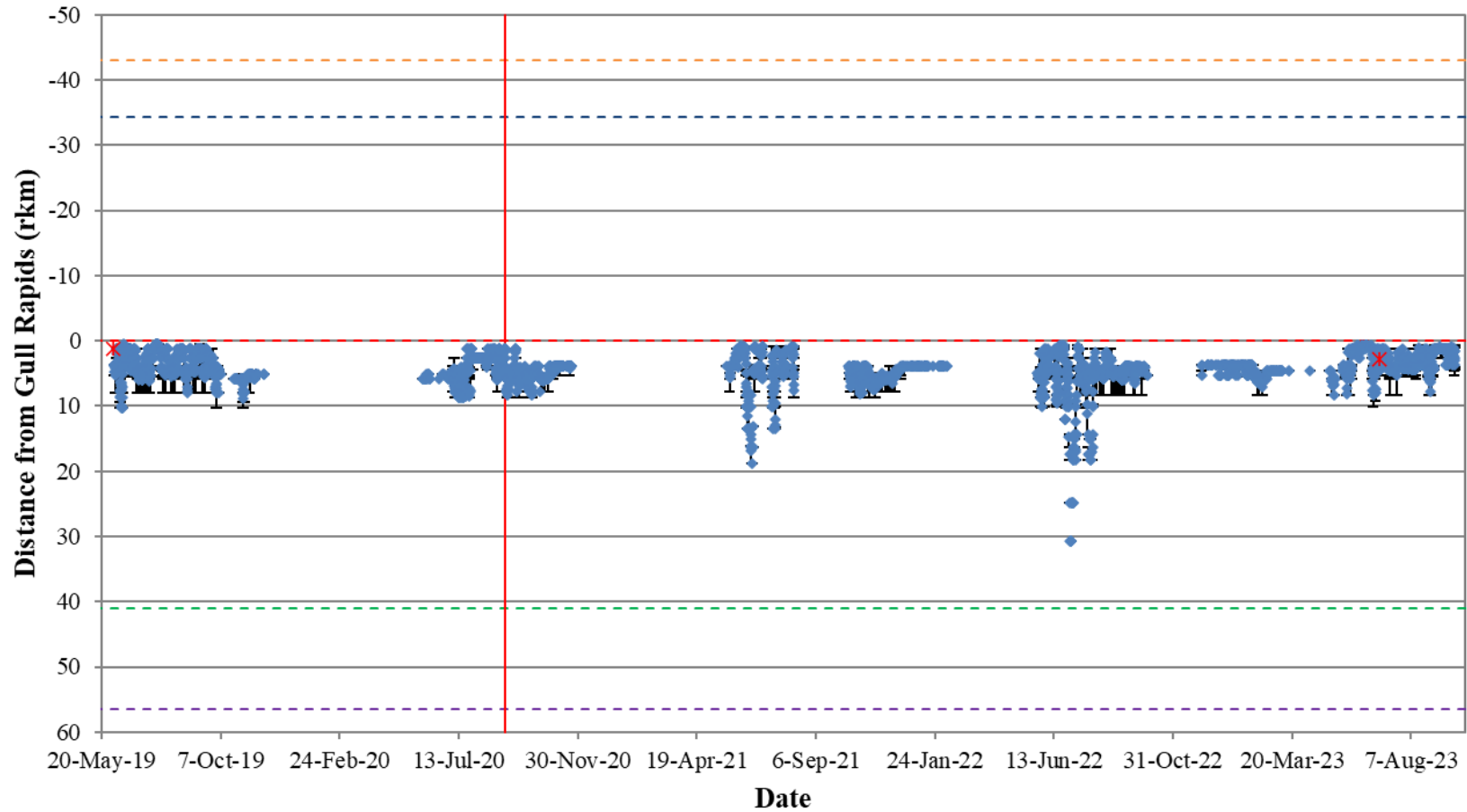


Figure A3-24: Position of a Lake Sturgeon tagged with an acoustic transmitter (code #7062) in Stephens Lake in relation to the Keeyask GS (rkm 0), from May 1, 2019 to October 2, 2023. Date and location of tagging is indicated by a star. Completion of reservoir impoundment is indicated by a vertical solid red line. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keeyask GS; green = Kettle GS; purple = Long Spruce GS).

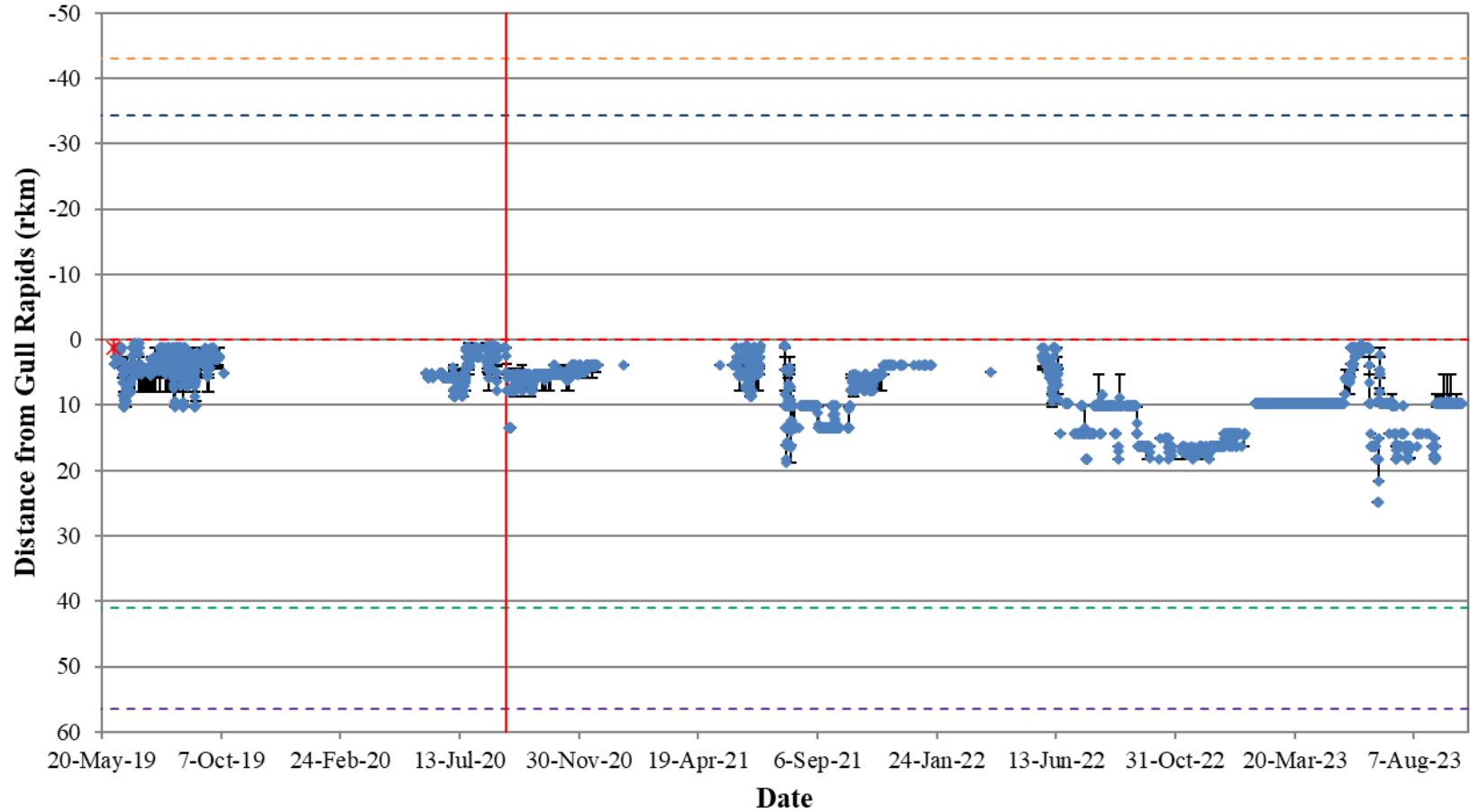


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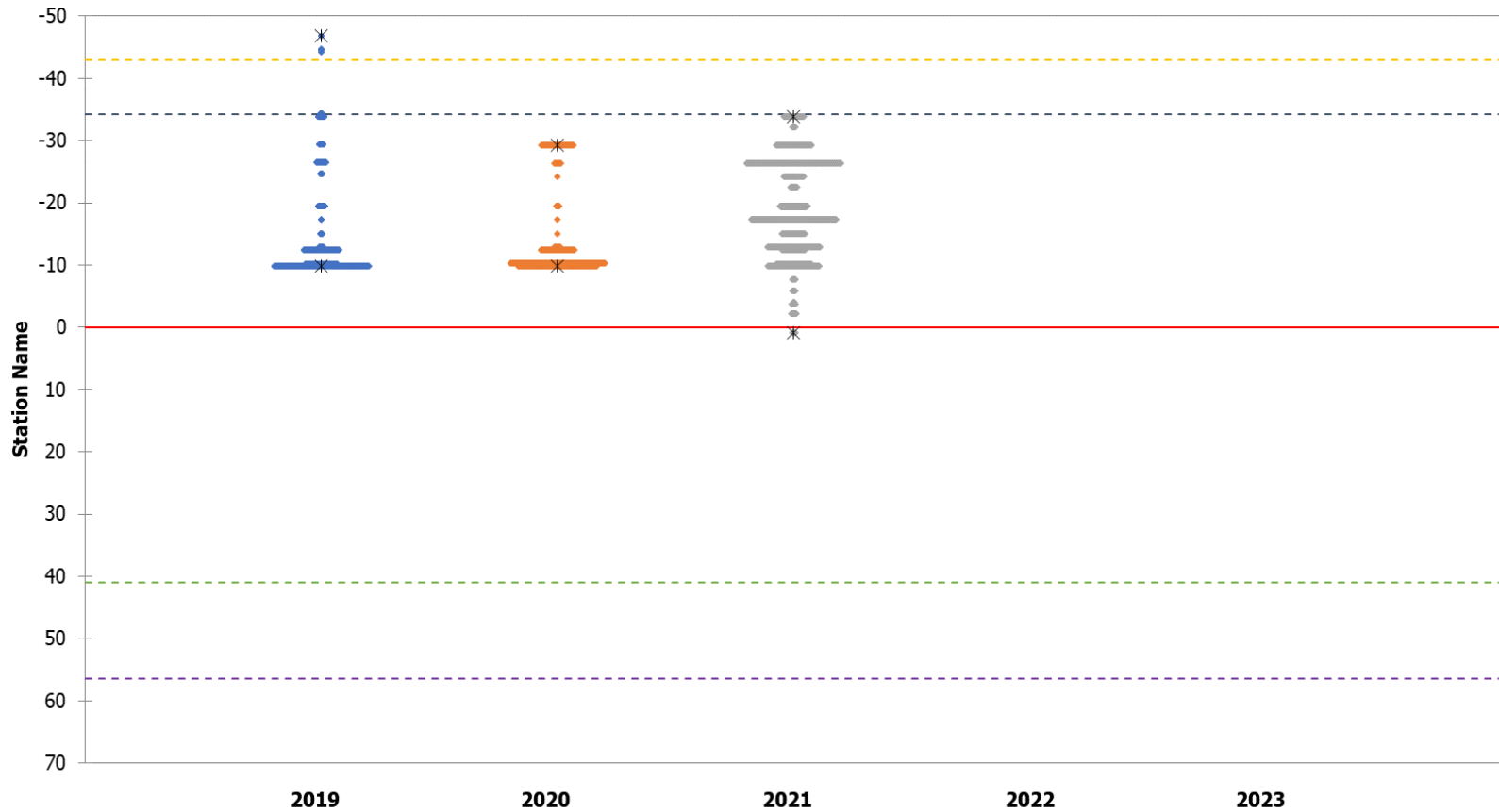


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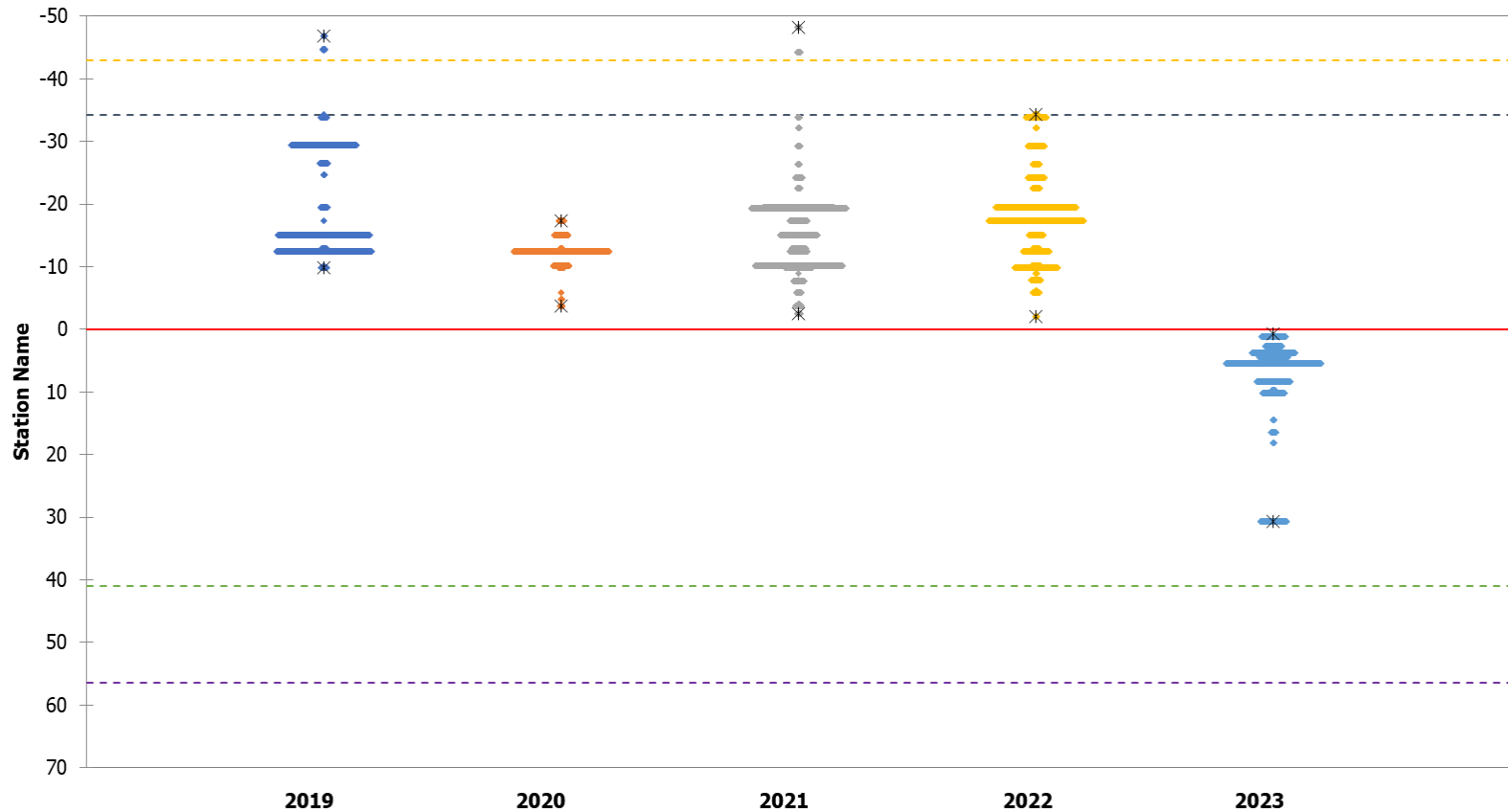


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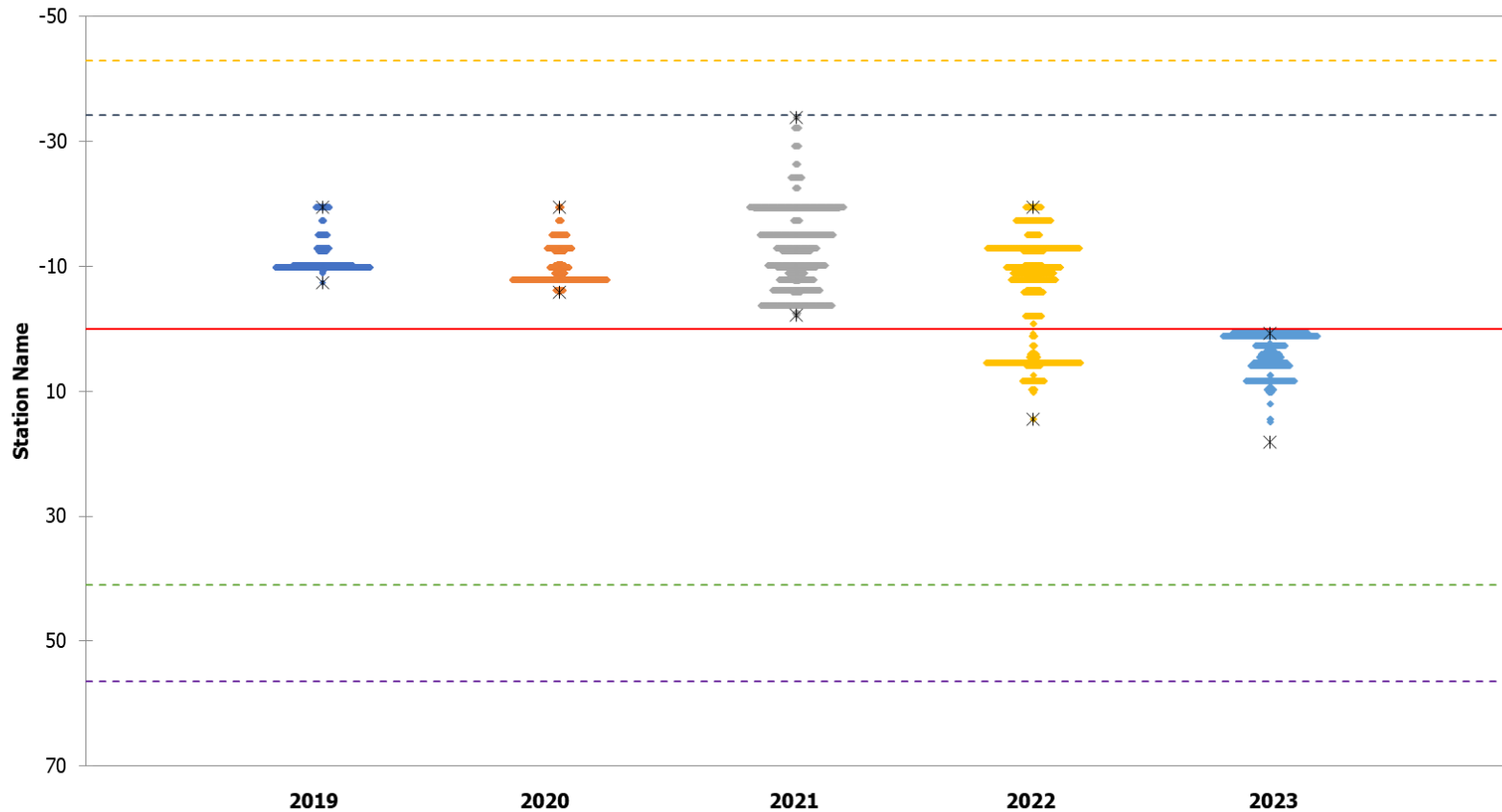


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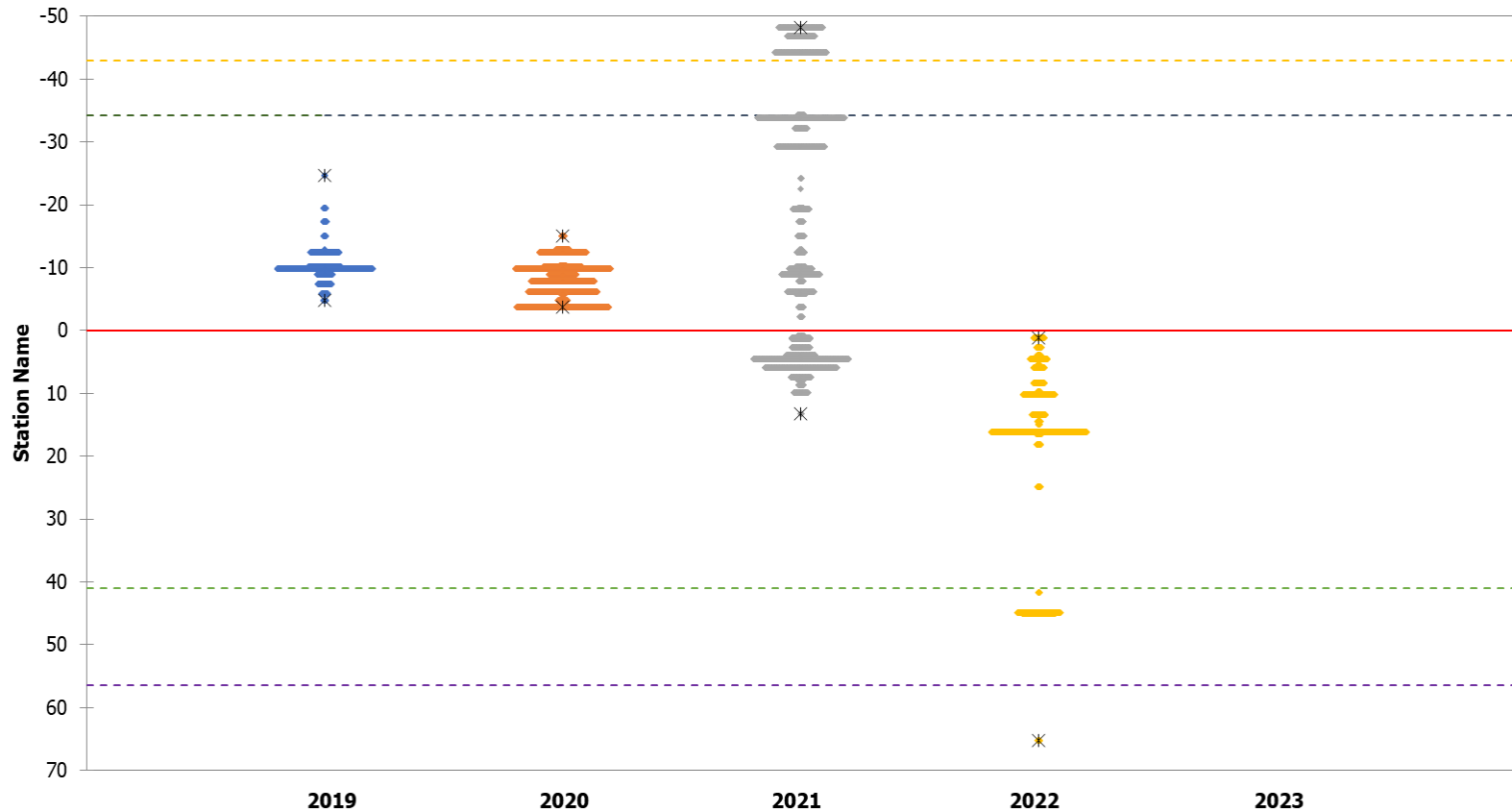


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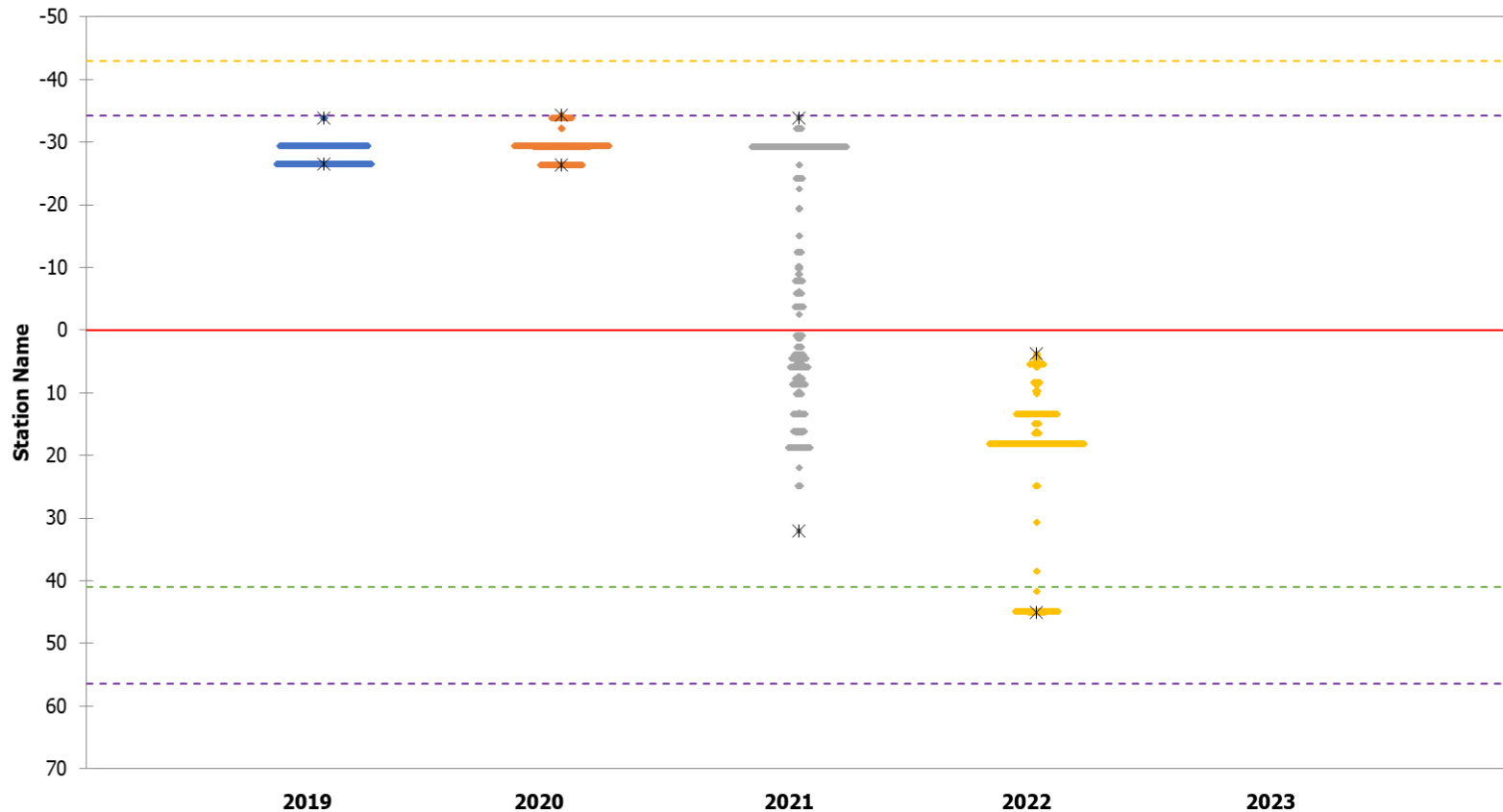


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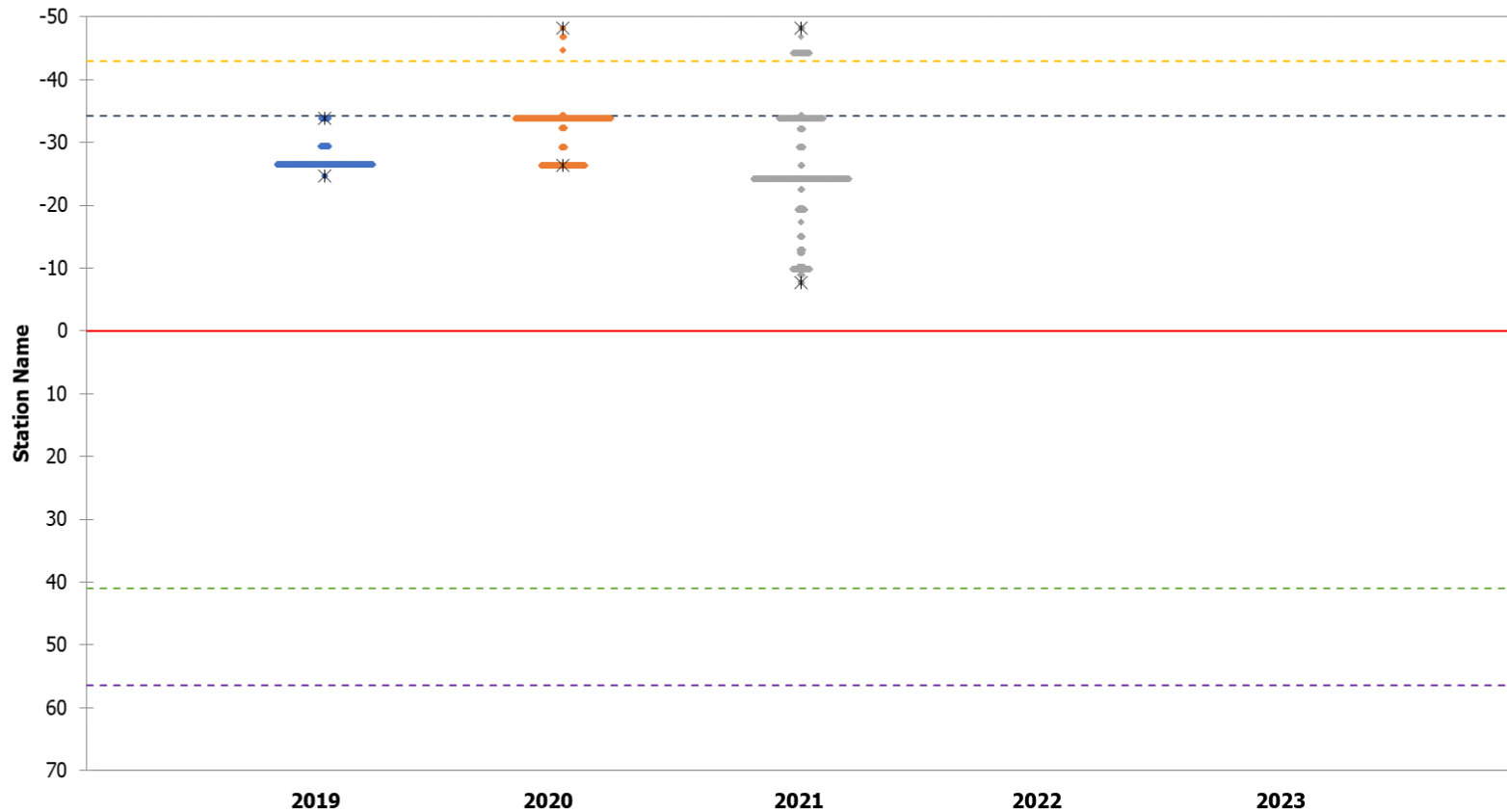


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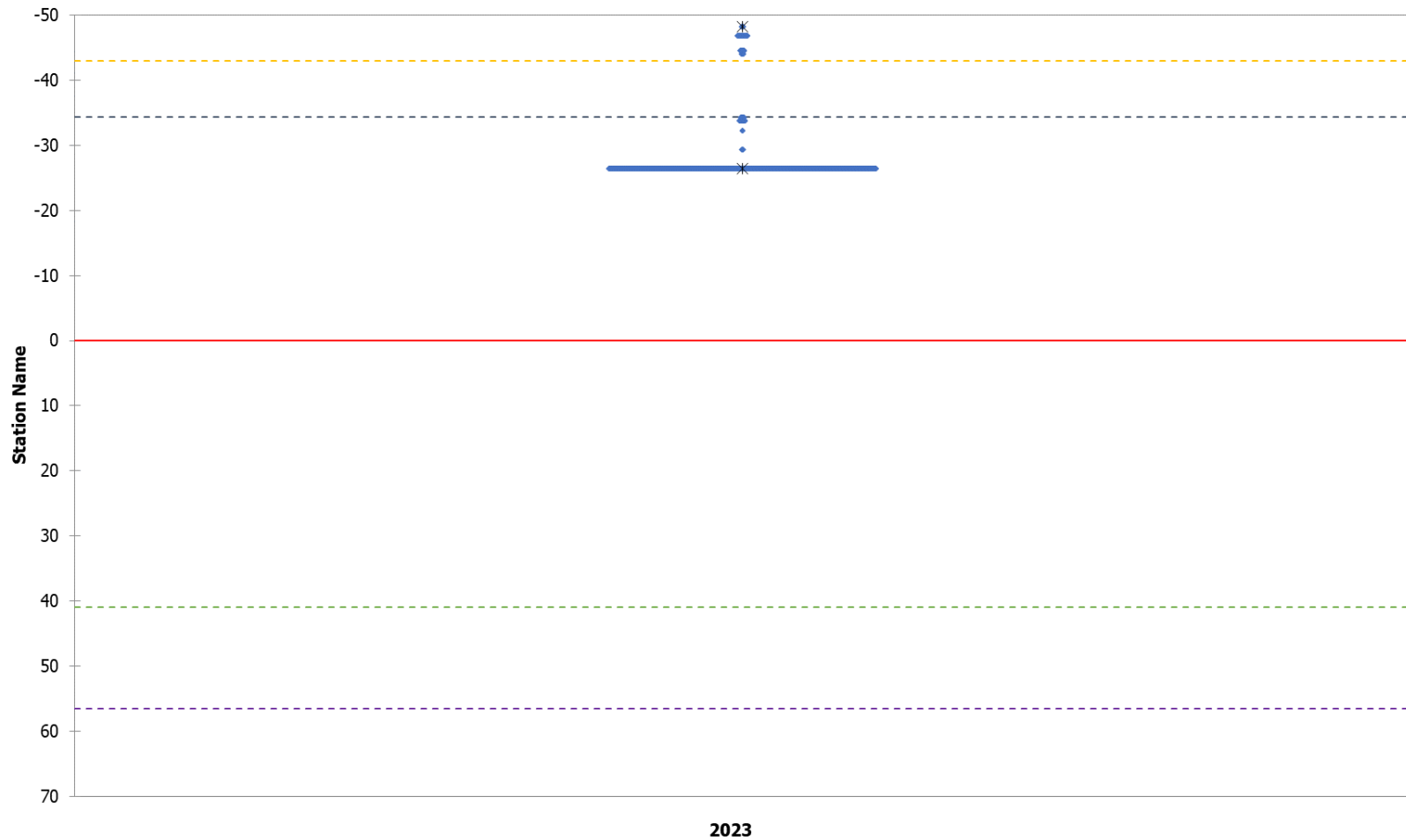


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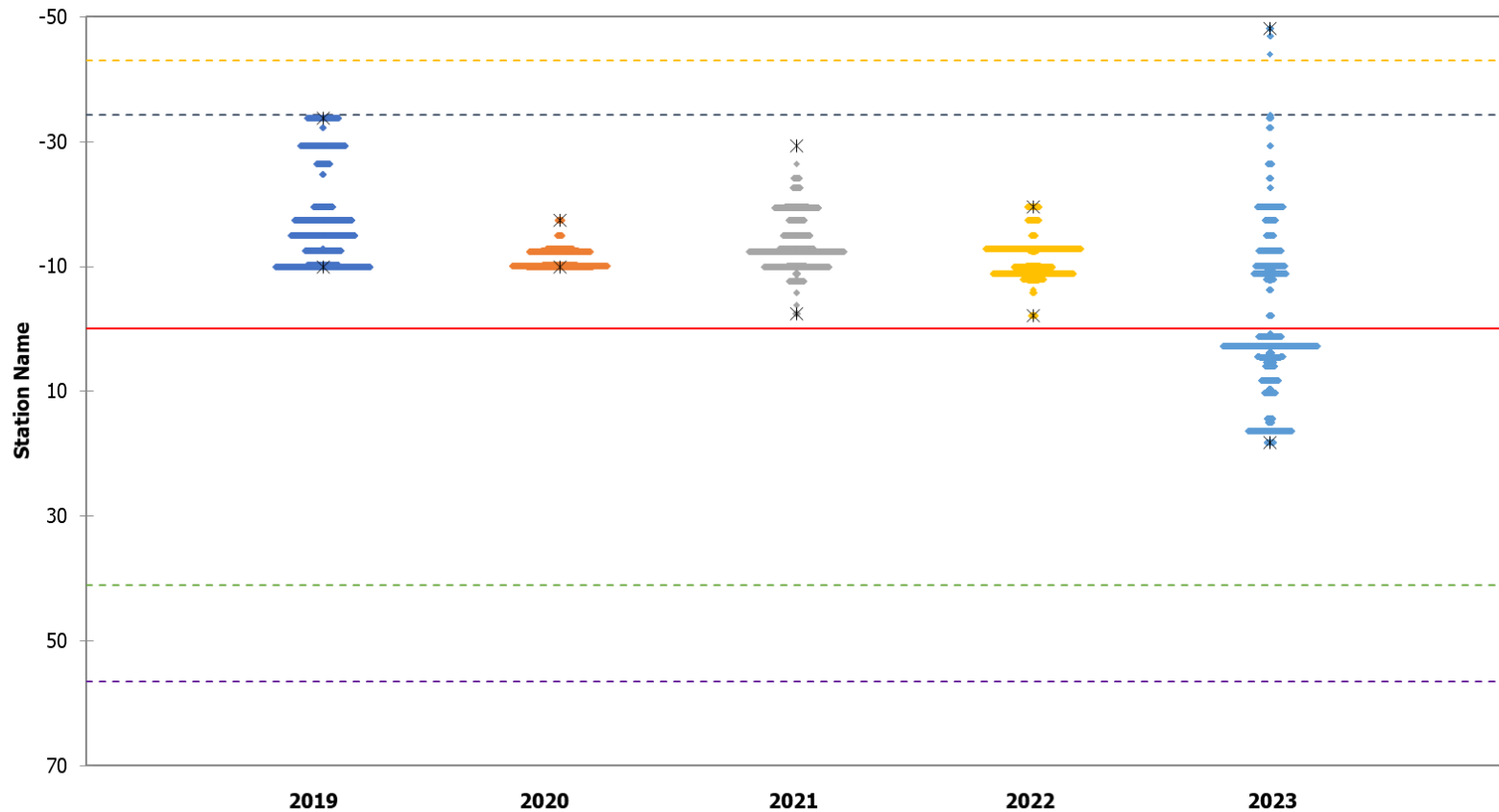


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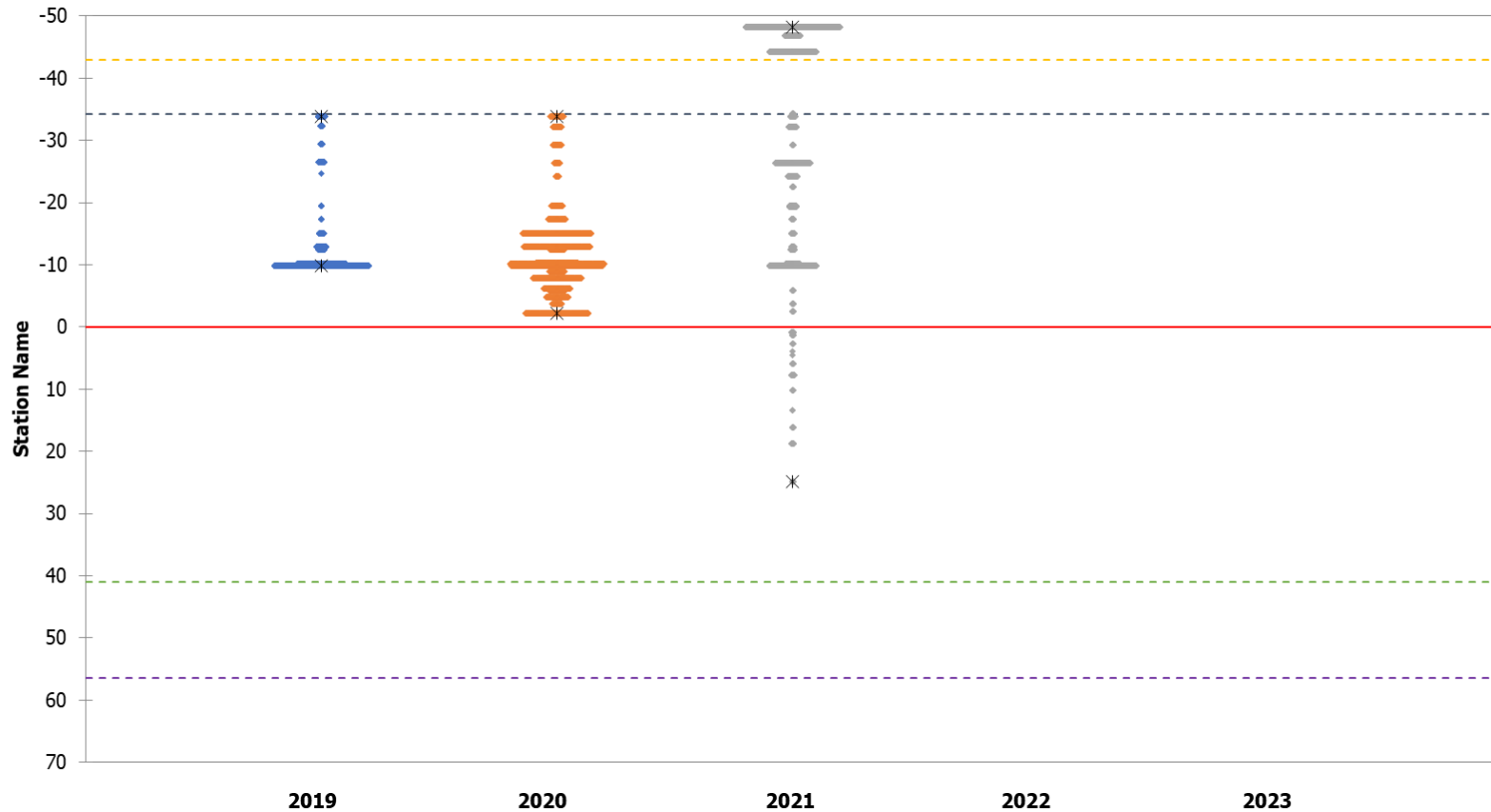


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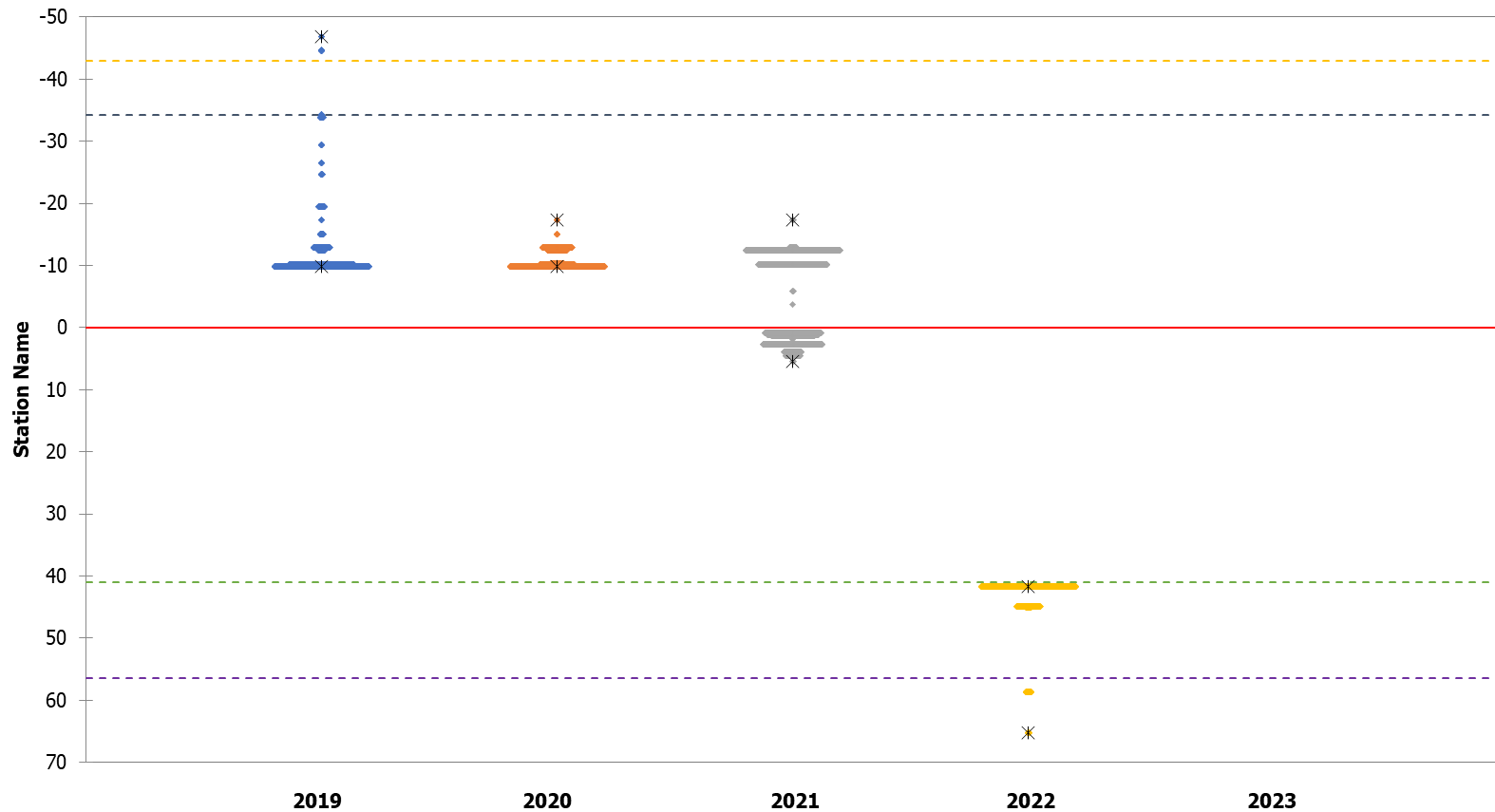


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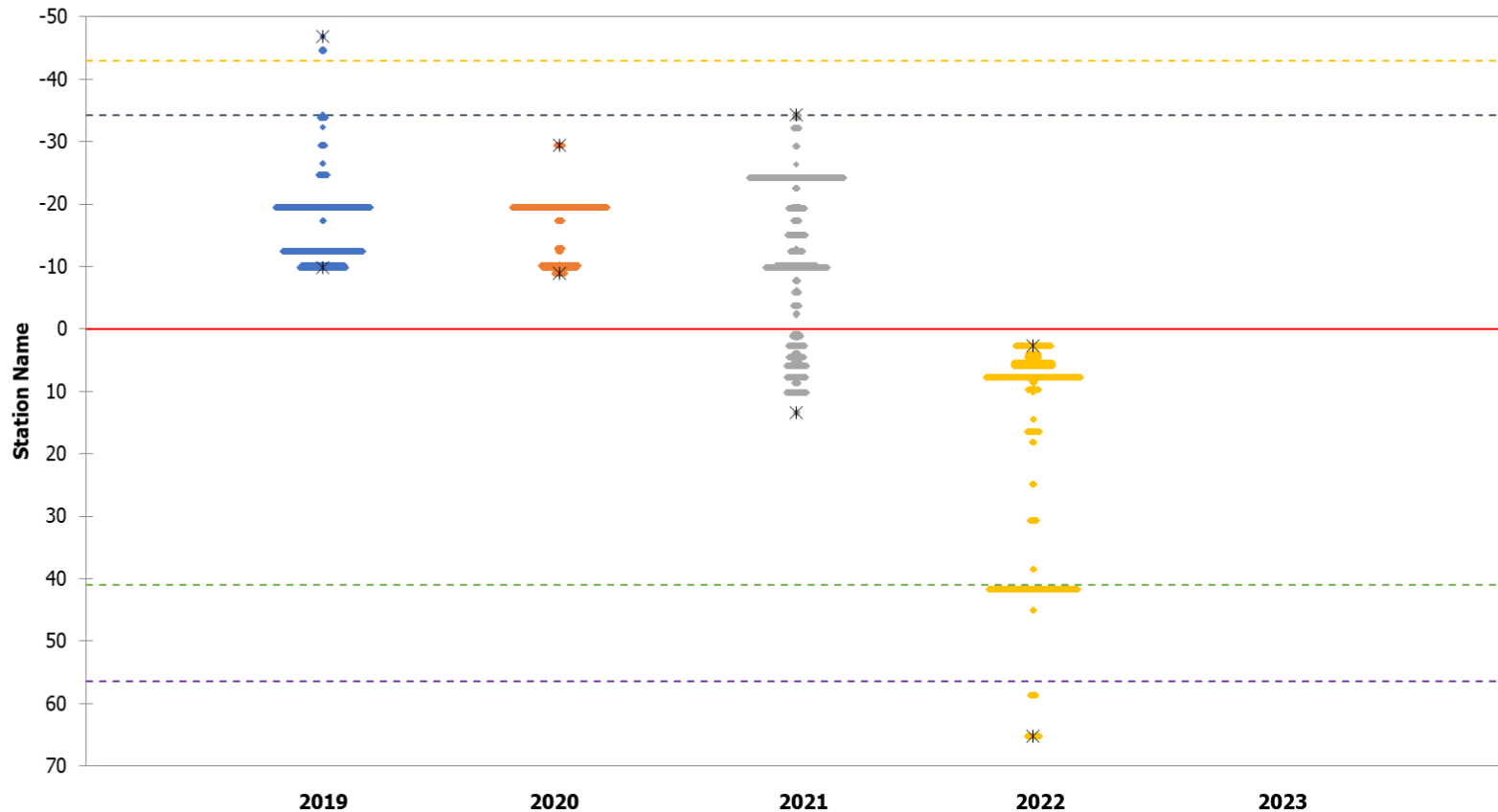


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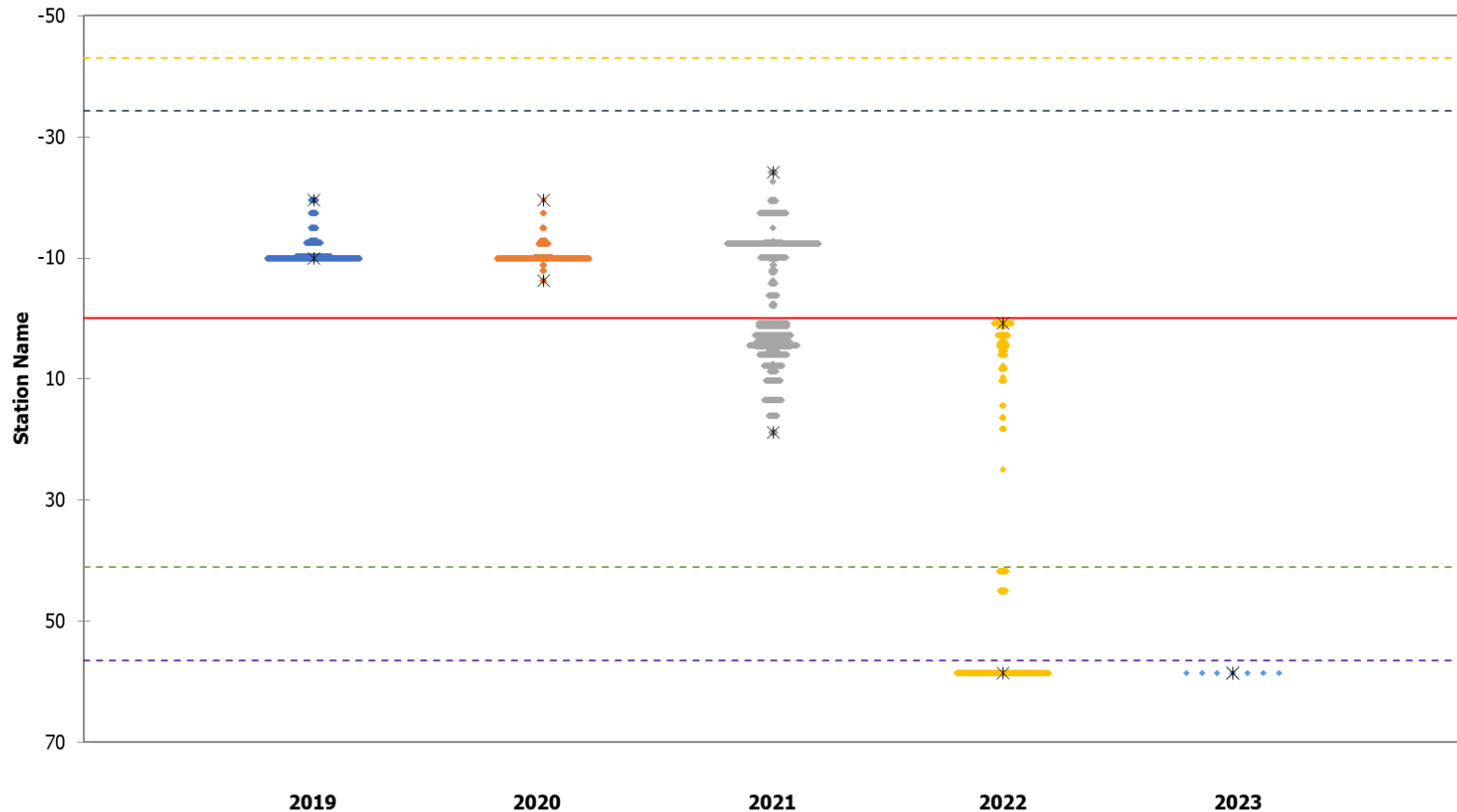


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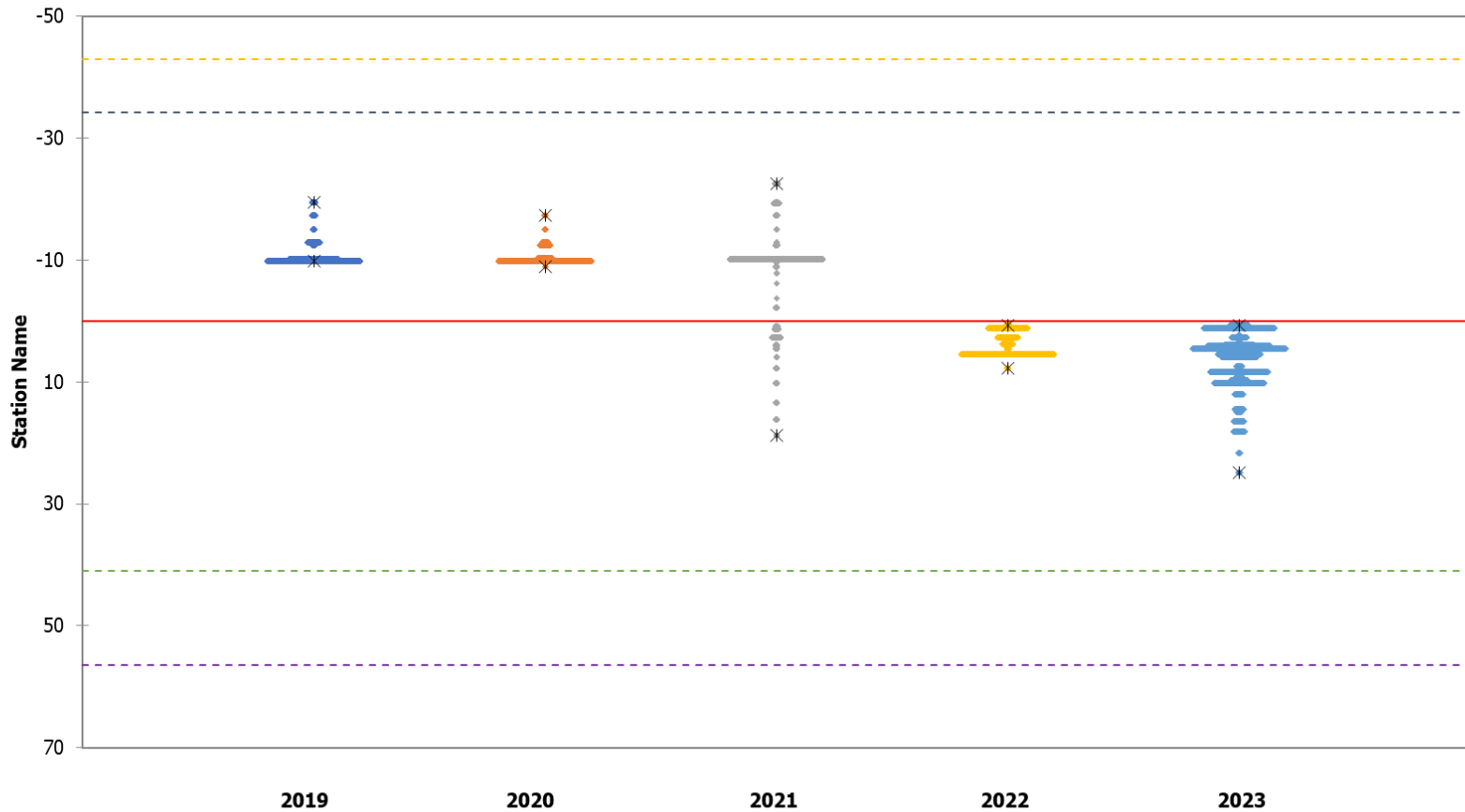


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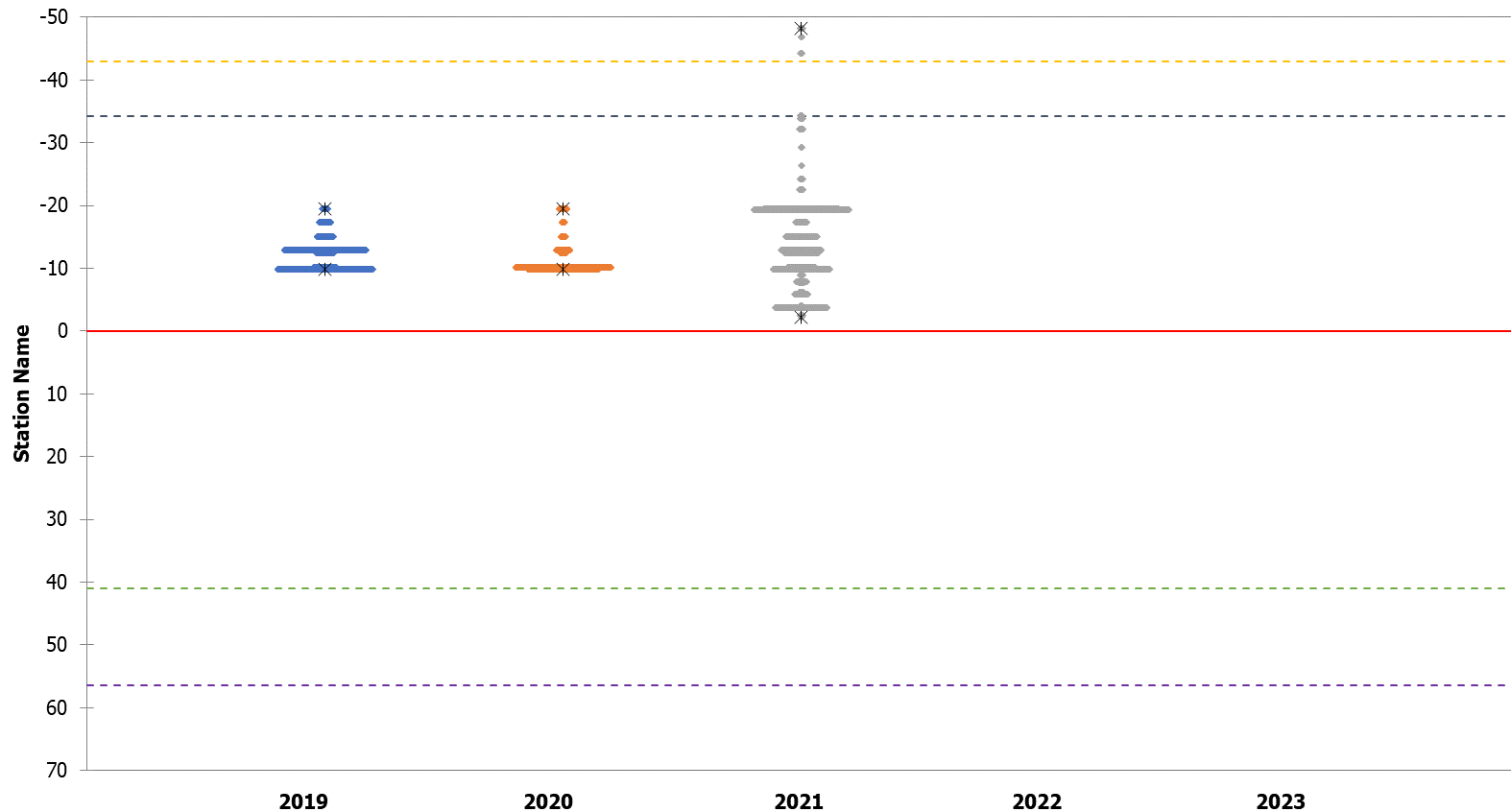


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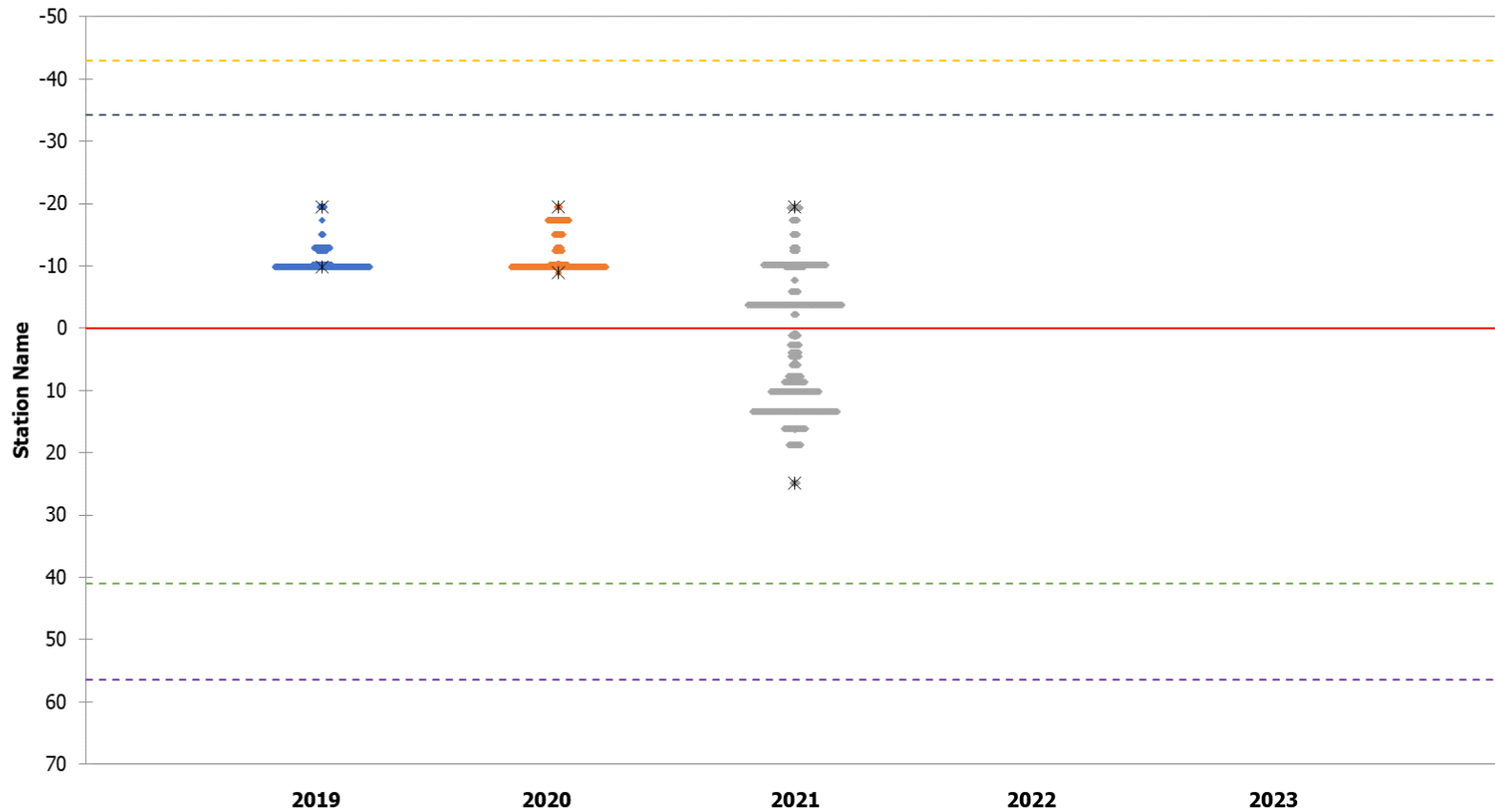


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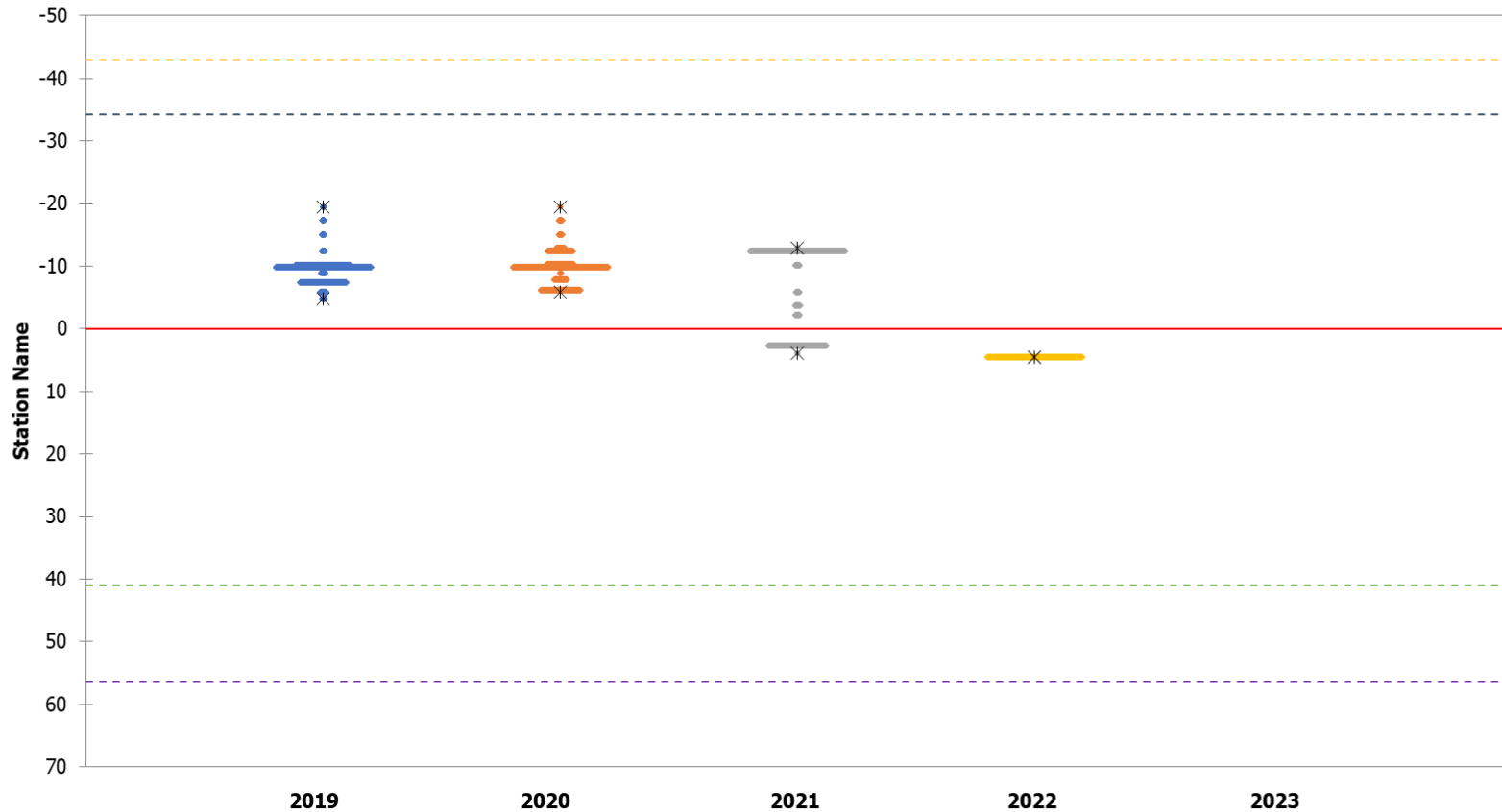


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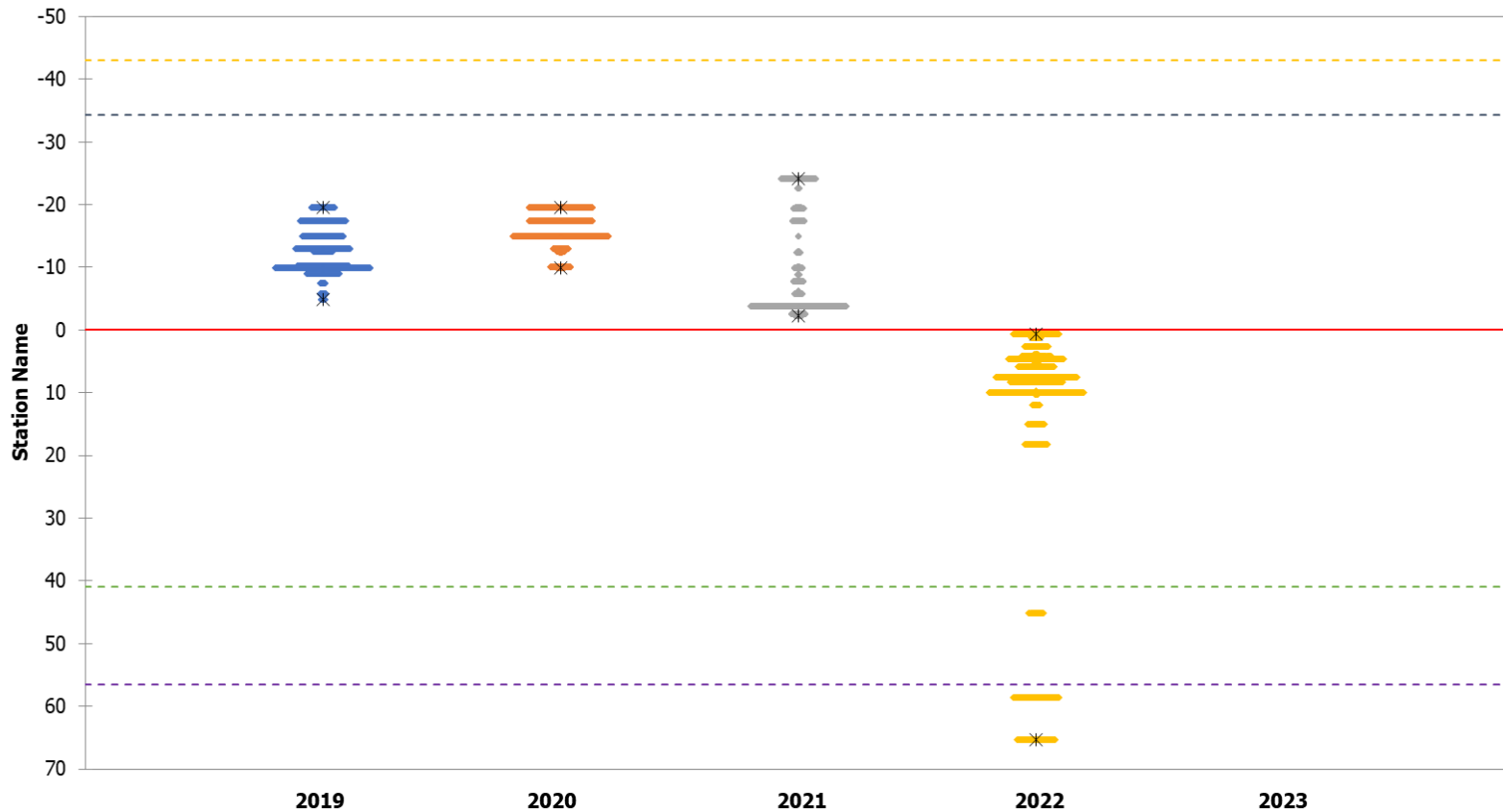


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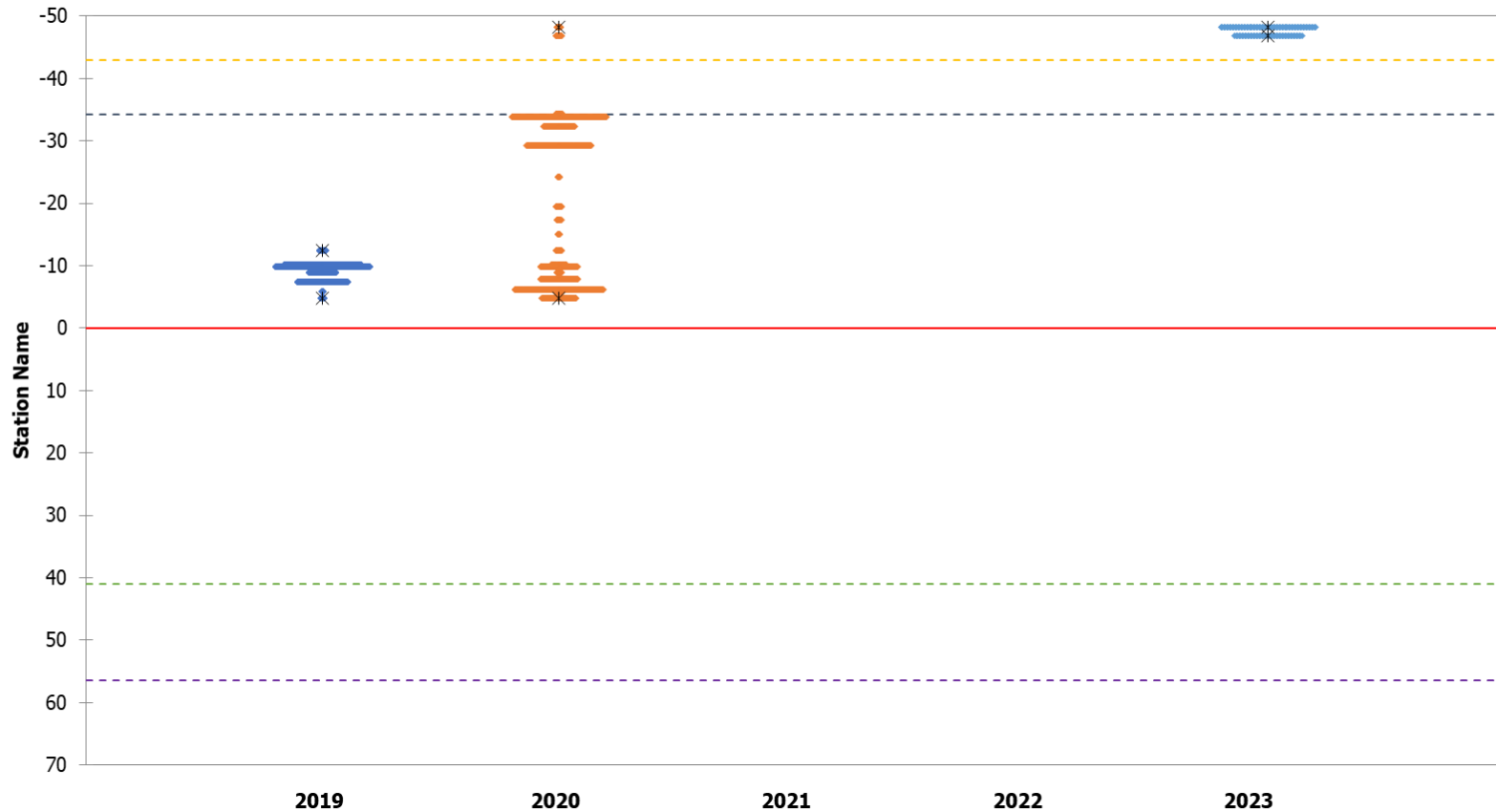


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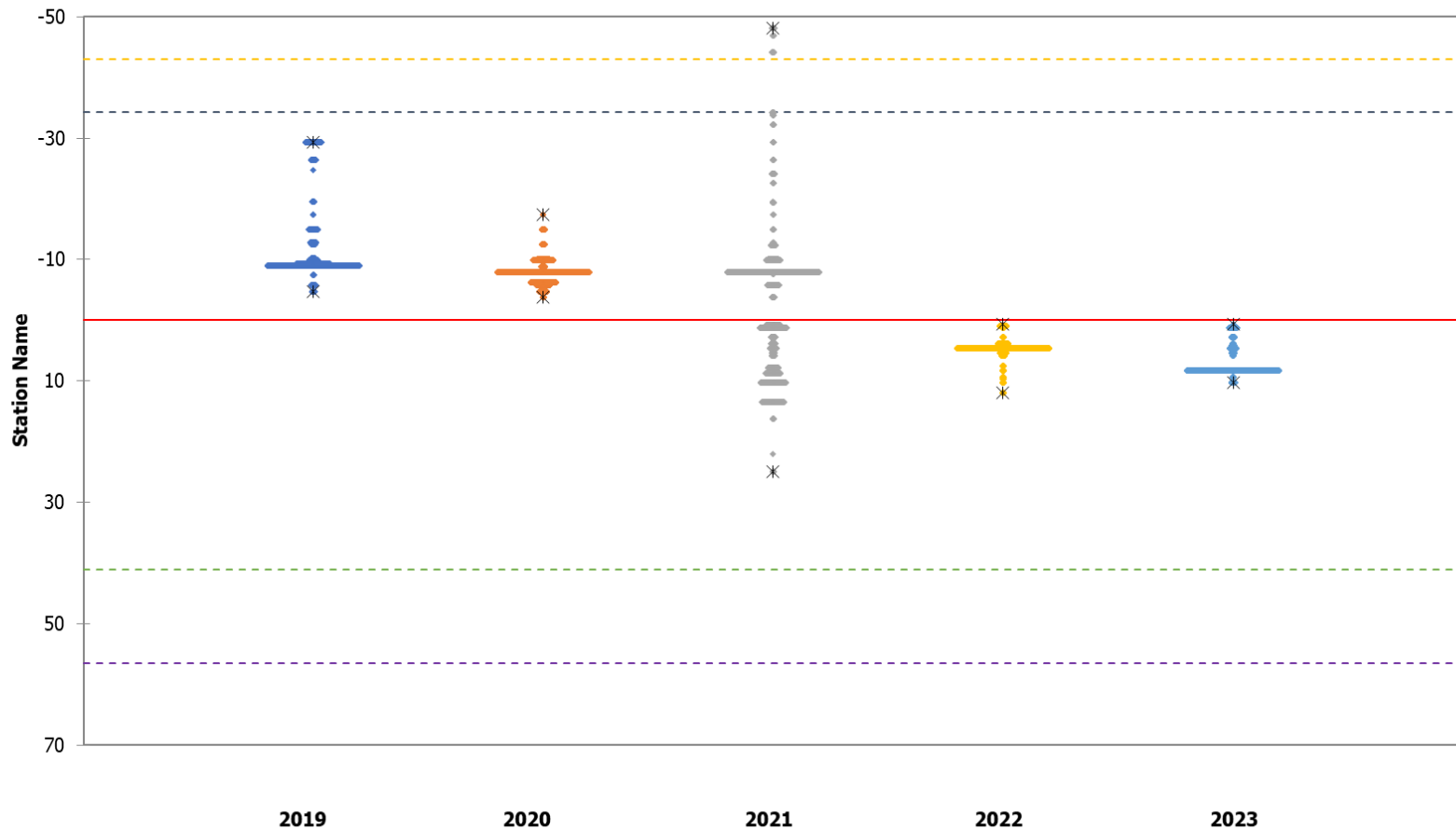


Figure A4-19: Detection ranges and distribution for Lake Sturgeon tagged with an acoustic transmitter (code #7034) in the Keyeyask reservoir in relation to the Keyeyask GS (rkm 0), during each open-water period from May 1, 2019 to October 2, 2023. Minimum and maximum distances from the Keyeyask GS are indicated with a star. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keyeyask GS; green = Kettle GS; purple= Long Spruce GS).

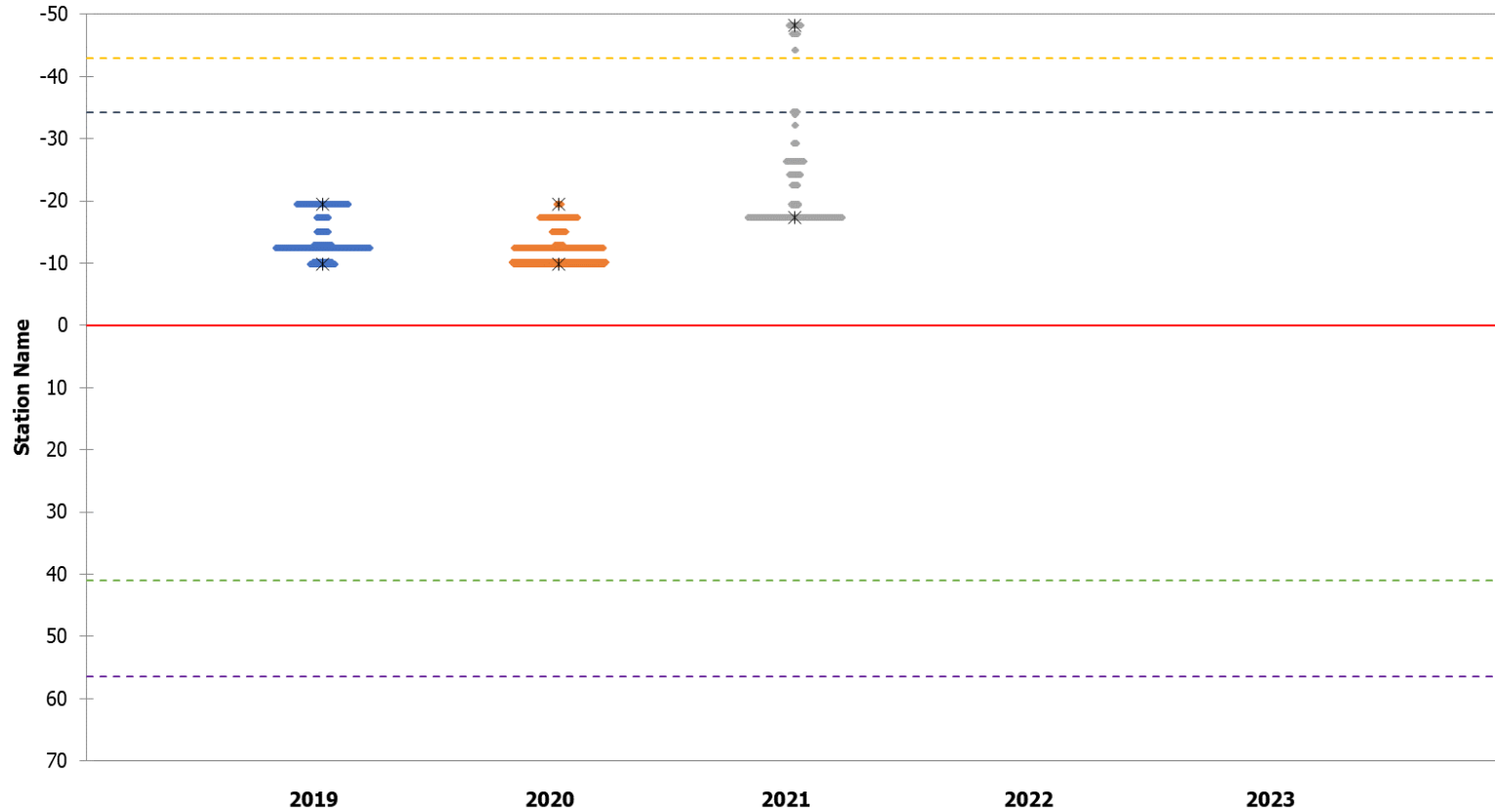


Figure A4-20: Detection ranges and distribution for Lake Sturgeon tagged with an acoustic transmitter (code #7053) in the Keyeyask reservoir in relation to the Keyeyask GS (rkm 0), during each open-water period from May 1, 2019 to October 2, 2023. Minimum and maximum distances from the Keyeyask GS are indicated with a star. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keyeyask GS; green = Kettle GS; purple= Long Spruce GS).

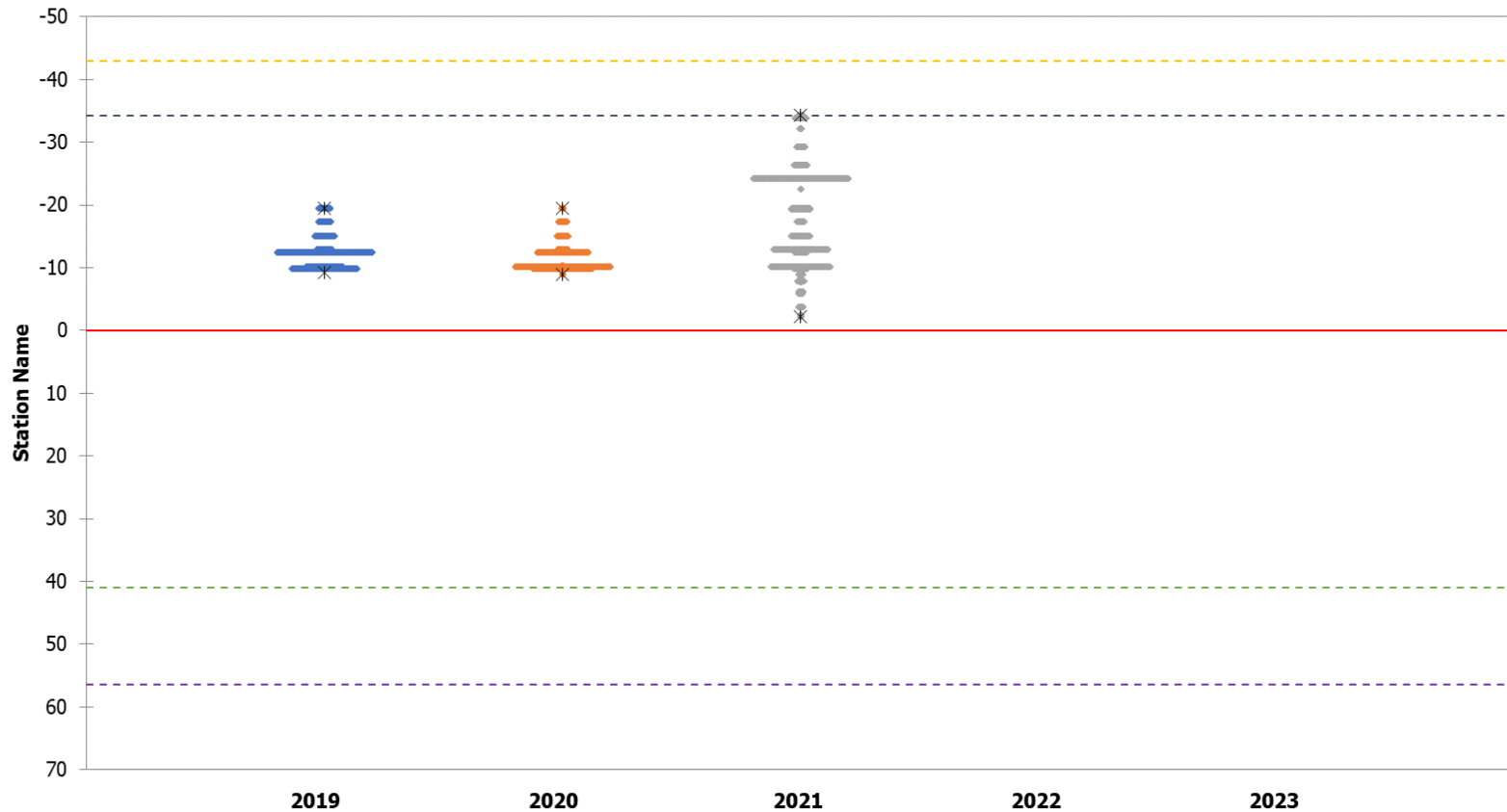


Figure A4-21: Detection ranges and distribution for Lake Sturgeon tagged with an acoustic transmitter (code #7056) in the Keyeyask reservoir in relation to the Keyeyask GS (rkm 0), during each open-water period from May 1, 2019 to October 2, 2023. Minimum and maximum distances from the Keyeyask GS are indicated with a star. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keyeyask GS; green = Kettle GS; purple= Long Spruce GS).

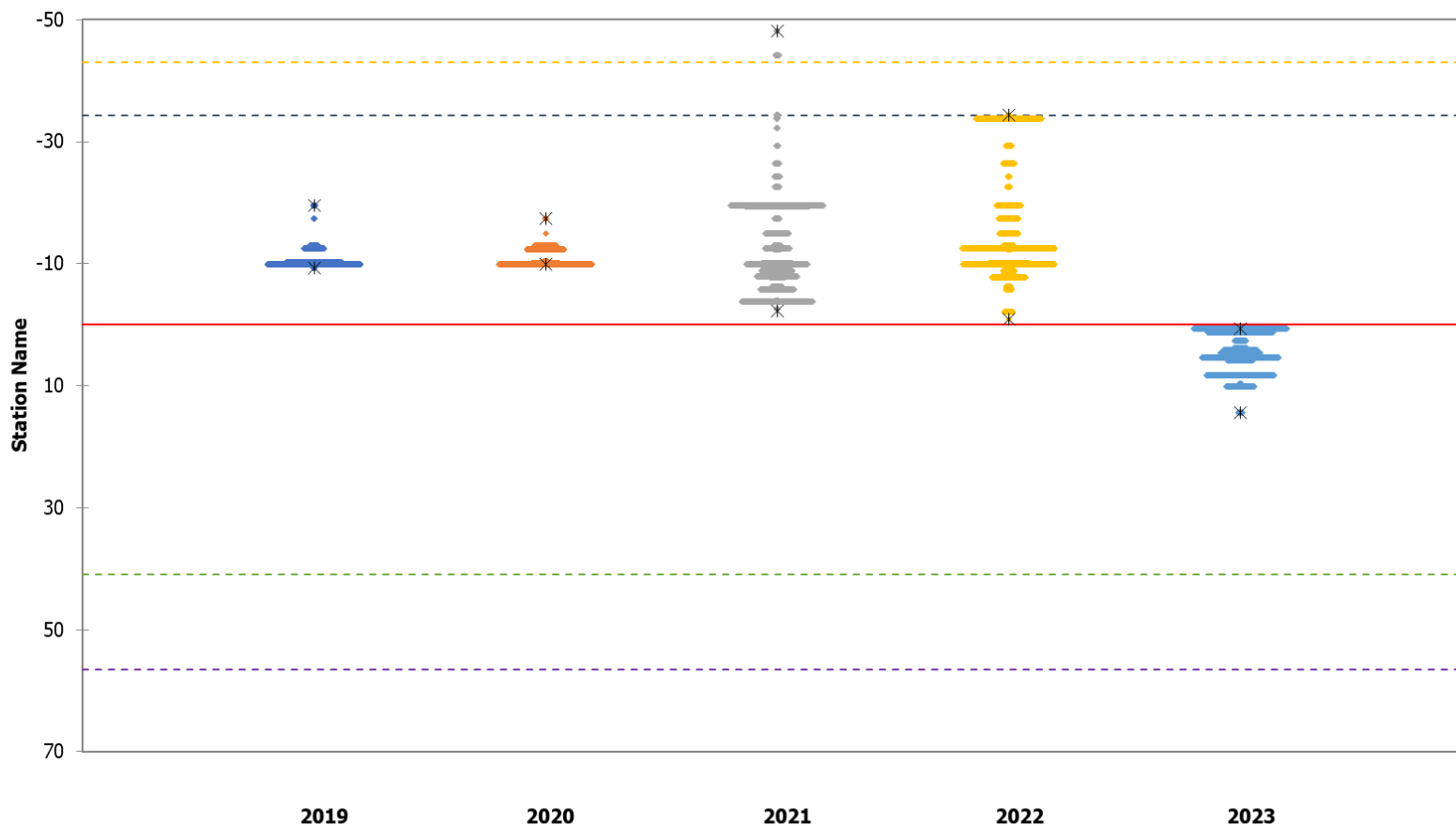


Figure A4-22: Detection ranges and distribution for Lake Sturgeon tagged with an acoustic transmitter (code #7059) in the Keyeyask reservoir in relation to the Keyeyask GS (rkm 0), during each open-water period from May 1, 2019 to October 2, 2023. Minimum and maximum distances from the Keyeyask GS are indicated with a star. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keyeyask GS; green = Kettle GS; purple= Long Spruce GS).

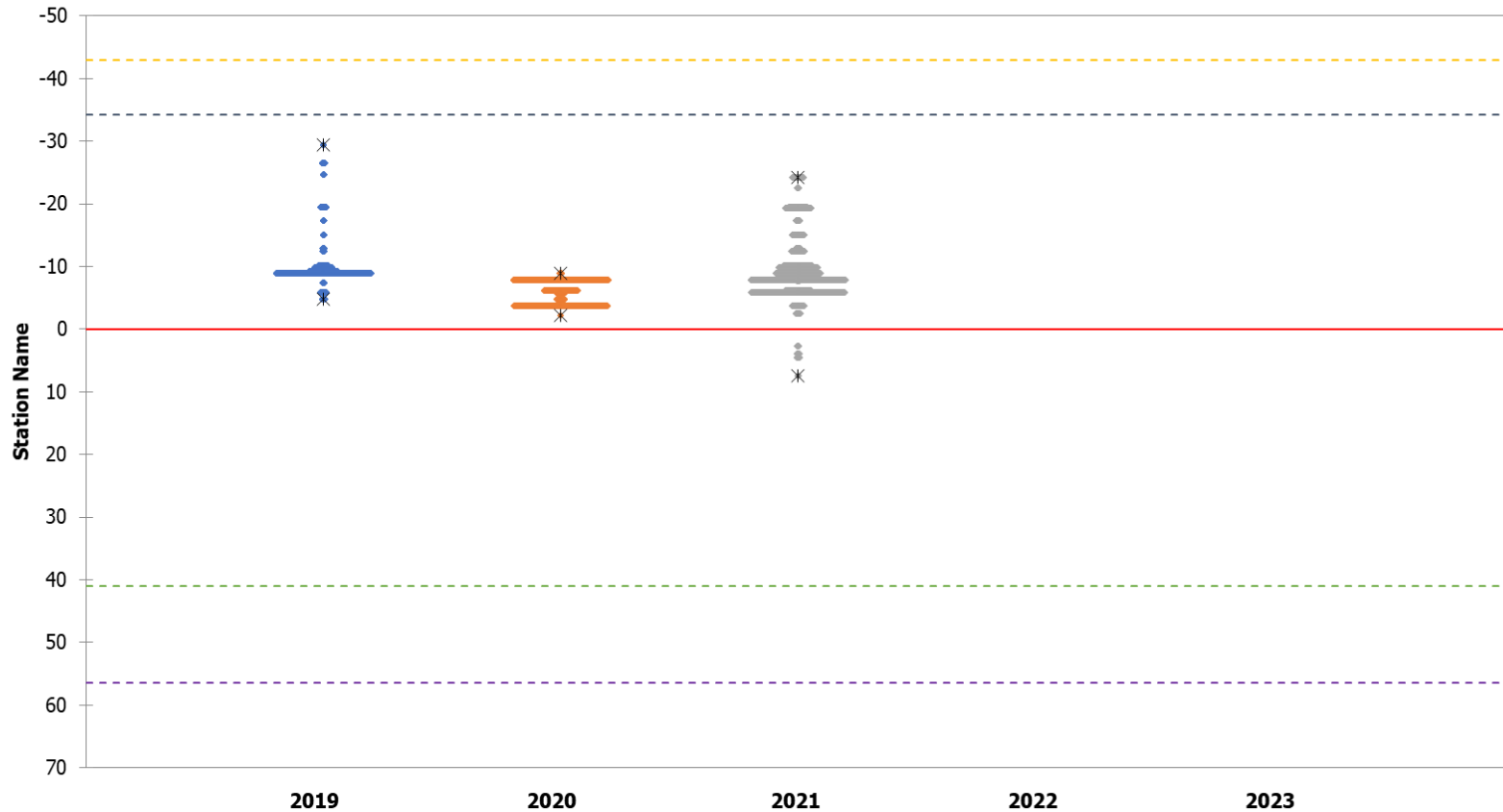


Figure A4-23: Detection ranges and distribution for Lake Sturgeon tagged with an acoustic transmitter (code #7061) in the Keyeyask reservoir in relation to the Keyeyask GS (rkm 0), during each open-water period from May 1, 2019 to October 2, 2023. Minimum and maximum distances from the Keyeyask GS are indicated with a star. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keyeyask GS; green = Kettle GS; purple= Long Spruce GS).

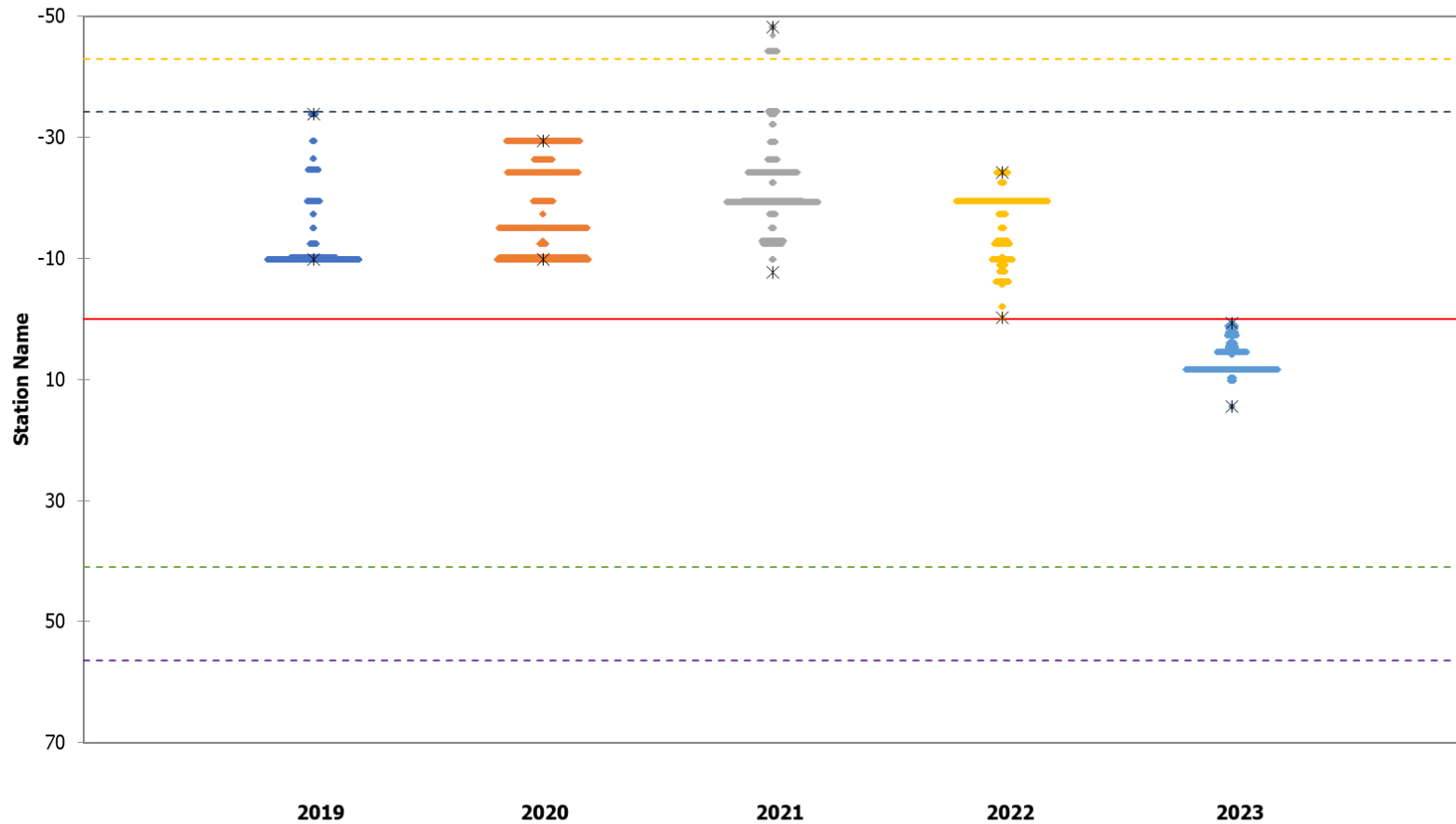


Figure A4-24: Detection ranges and distribution for Lake Sturgeon tagged with an acoustic transmitter (code #7064) in the Keyeyask reservoir in relation to the Keyeyask GS (rkm 0), during each open-water period from May 1, 2019 to October 2, 2023. Minimum and maximum distances from the Keyeyask GS are indicated with a star. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keyeyask GS; green = Kettle GS; purple= Long Spruce GS).

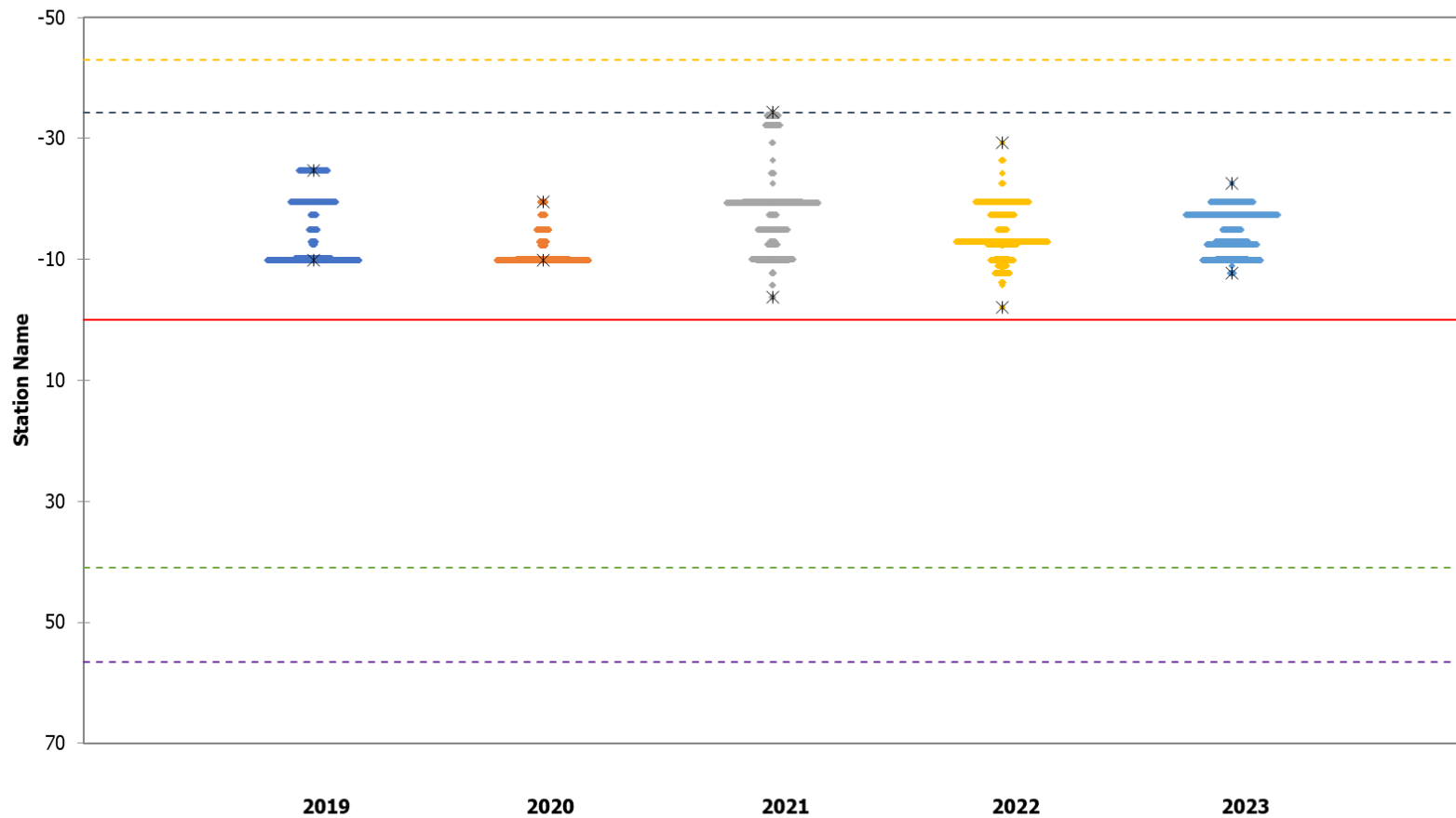


Figure A4-25: Detection ranges and distribution for Lake Sturgeon tagged with an acoustic transmitter (code #7065) in the Keyeyask reservoir in relation to the Keyeyask GS (rkm 0), during each open-water period from May 1, 2019 to October 2, 2023. Minimum and maximum distances from the Keyeyask GS are indicated with a star. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keyeyask GS; green = Kettle GS; purple= Long Spruce GS).

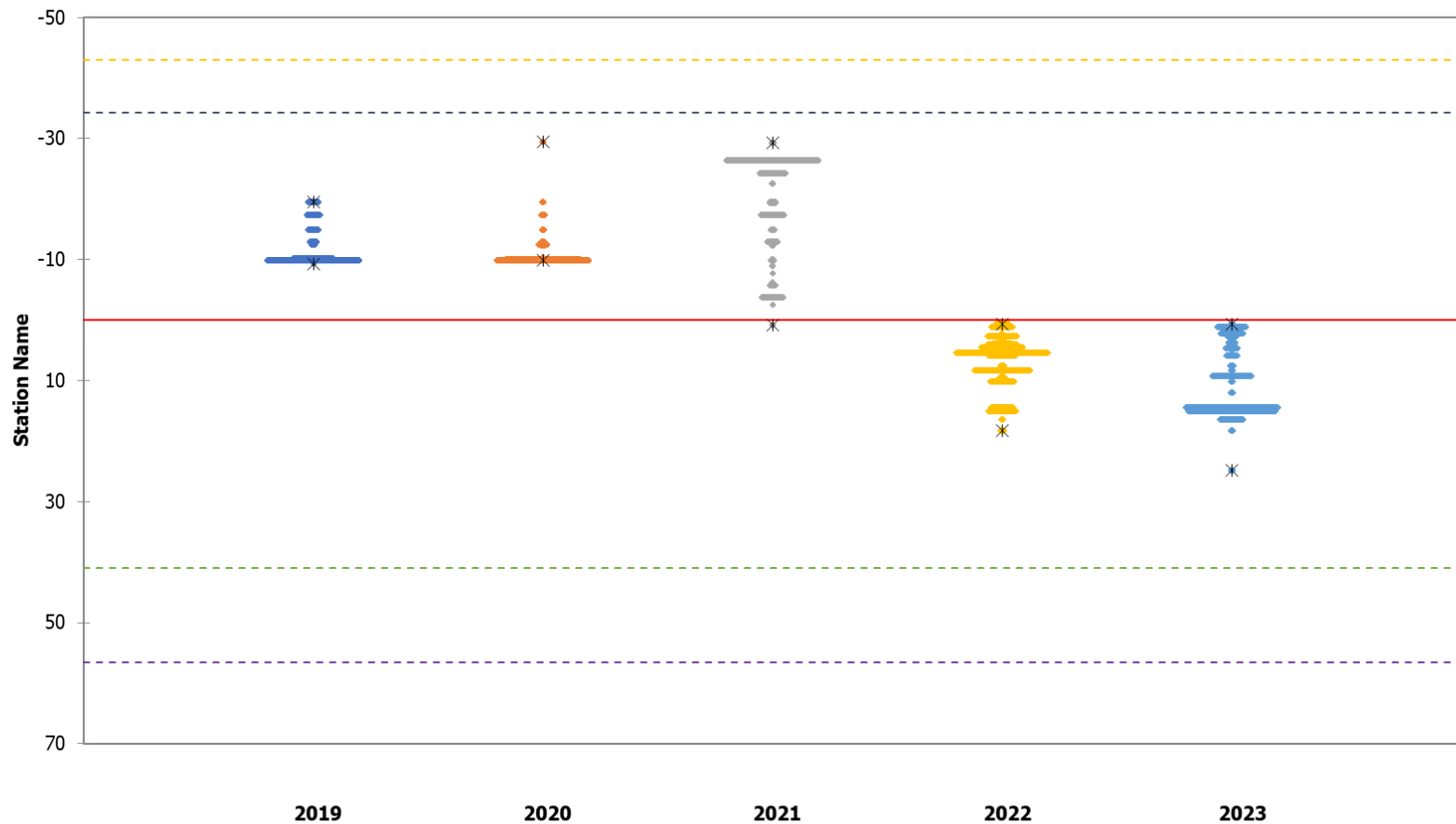


Figure A4-26: Detection ranges and distribution for Lake Sturgeon tagged with an acoustic transmitter (code #7066) in the Keyeyask reservoir in relation to the Keyeyask GS (rkm 0), during each open-water period from May 1, 2019 to October 2, 2022. Minimum and maximum distances from the Keyeyask GS are indicated with a star. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keyeyask GS; green = Kettle GS; purple= Long Spruce GS).



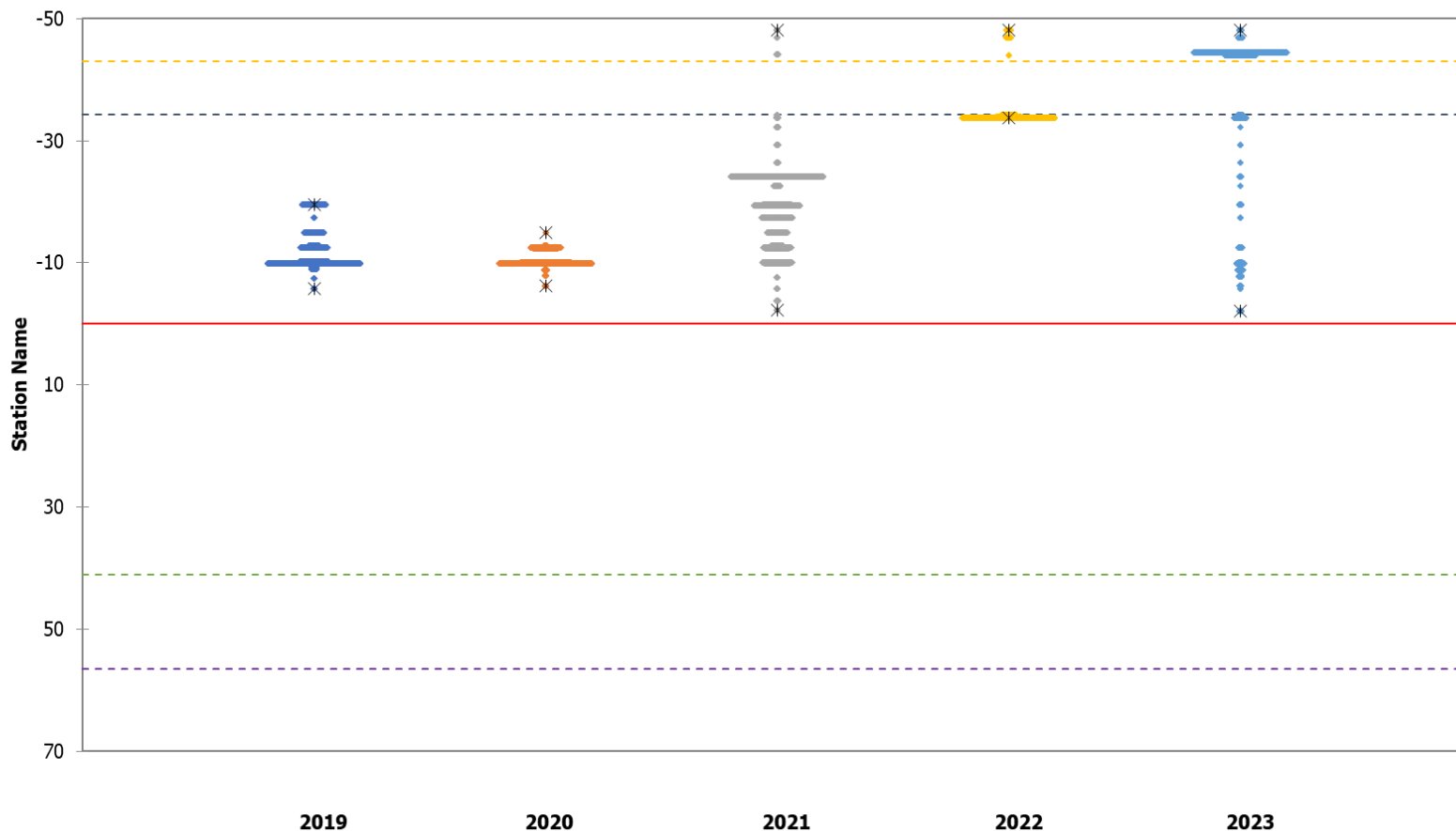


Figure A4-27: Detection ranges and distribution for Lake Sturgeon tagged with an acoustic transmitter (code #7067) in the Keyeyask reservoir in relation to the Keyeyask GS (rkm 0), during each open-water period from May 1, 2019 to October 2, 2023. Minimum and maximum distances from the Keyeyask GS are indicated with a star. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keyeyask GS; green = Kettle GS; purple= Long Spruce GS).

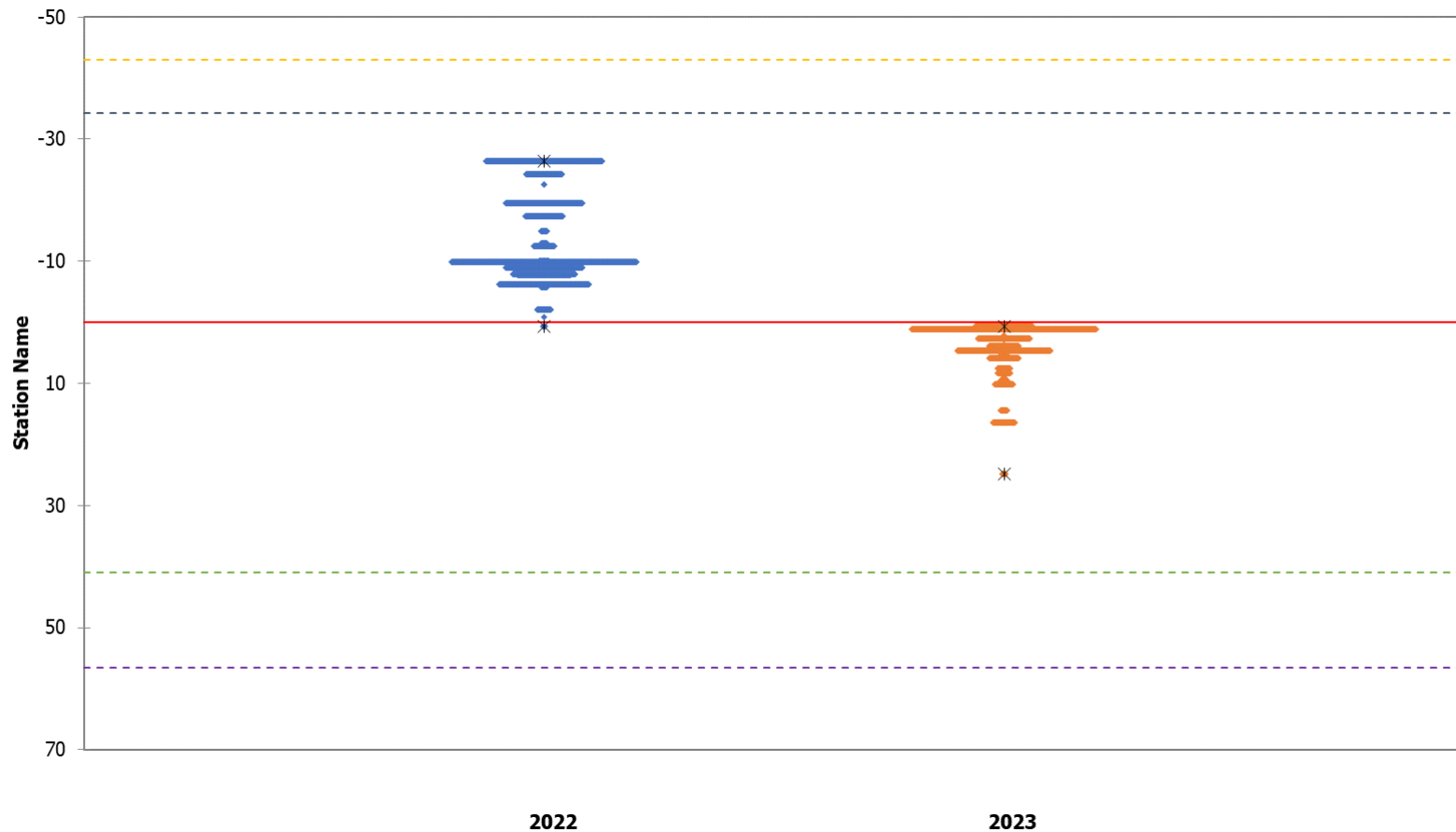


Figure A4-28: Detection ranges and distribution for Lake Sturgeon tagged with an acoustic transmitter (code #57478) in the Keyeyask reservoir in relation to the Keyeyask GS (rkm 0), during each open-water period from May 16, 2022 to October 2, 2022. Minimum and maximum distances from the Keyeyask GS are indicated with a star. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keyeyask GS; green = Kettle GS; purple= Long Spruce GS).

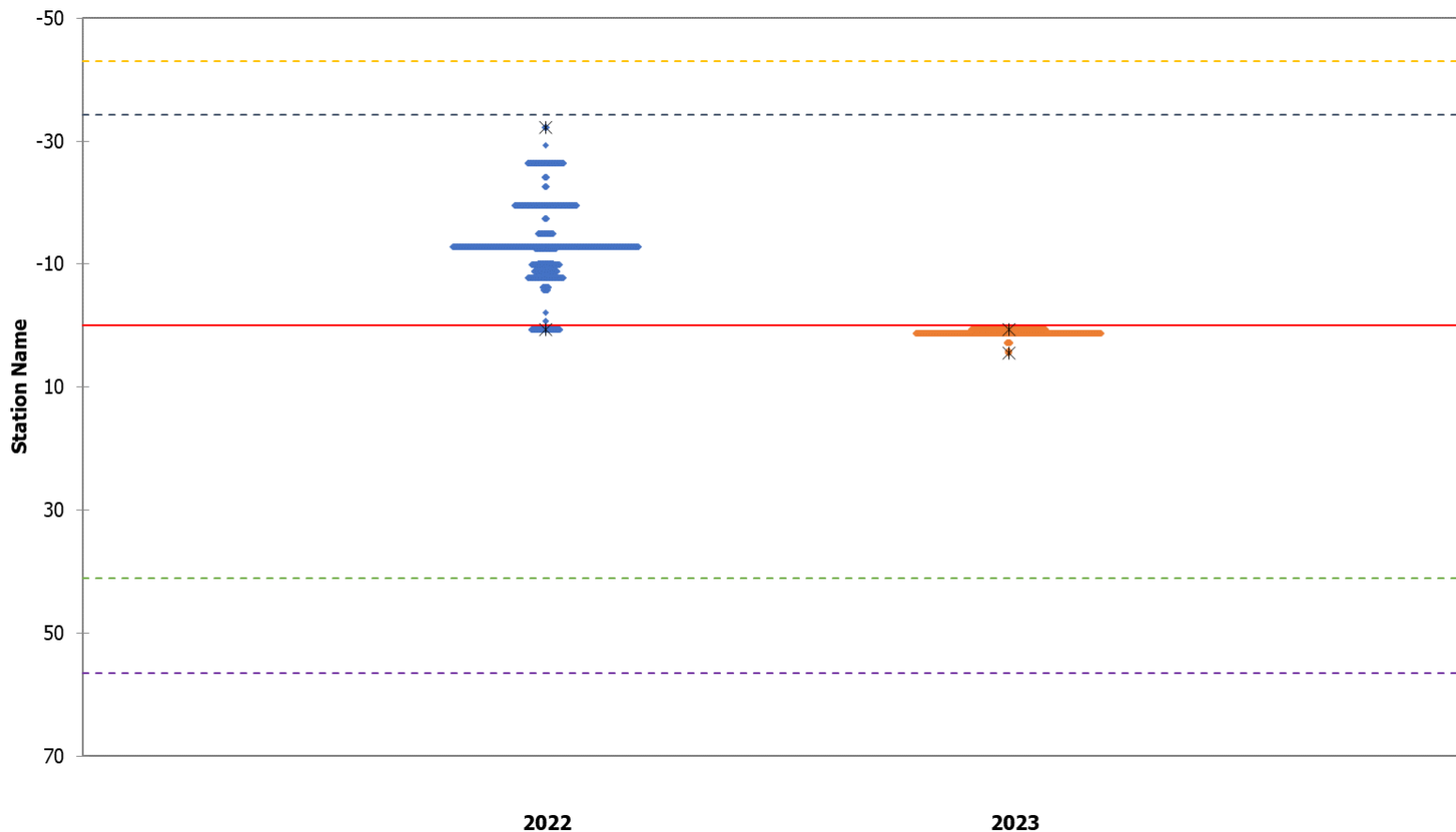


Figure A4-29: Detection ranges and distribution for Lake Sturgeon tagged with an acoustic transmitter (code #57479) in the Keyeyask reservoir in relation to the Keyeyask GS (rkm 0), during each open-water period from May 16, 2022 to October 2, 2023. Minimum and maximum distances from the Keyeyask GS are indicated with a star. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keyeyask GS; green = Kettle GS; purple = Long Spruce GS).

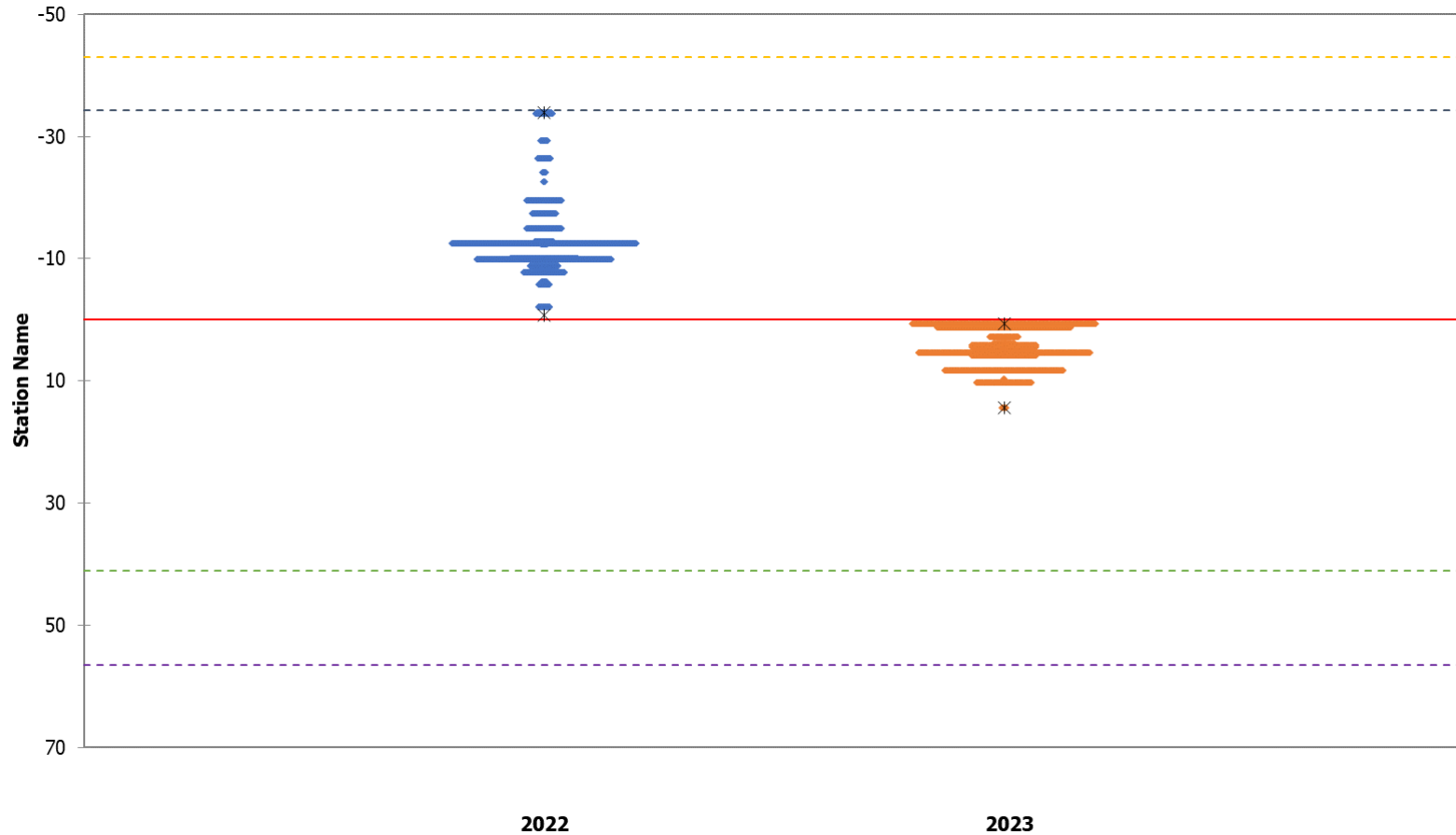


Figure A4-30: Detection ranges and distribution for Lake Sturgeon tagged with an acoustic transmitter (code #57480) in the Keyeyask reservoir in relation to the Keyeyask GS (rkm 0), during each open-water period from May 16, 2022 to October 2, 2023. Minimum and maximum distances from the Keyeyask GS are indicated with a star. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keyeyask GS; green = Kettle GS; purple = Long Spruce GS).

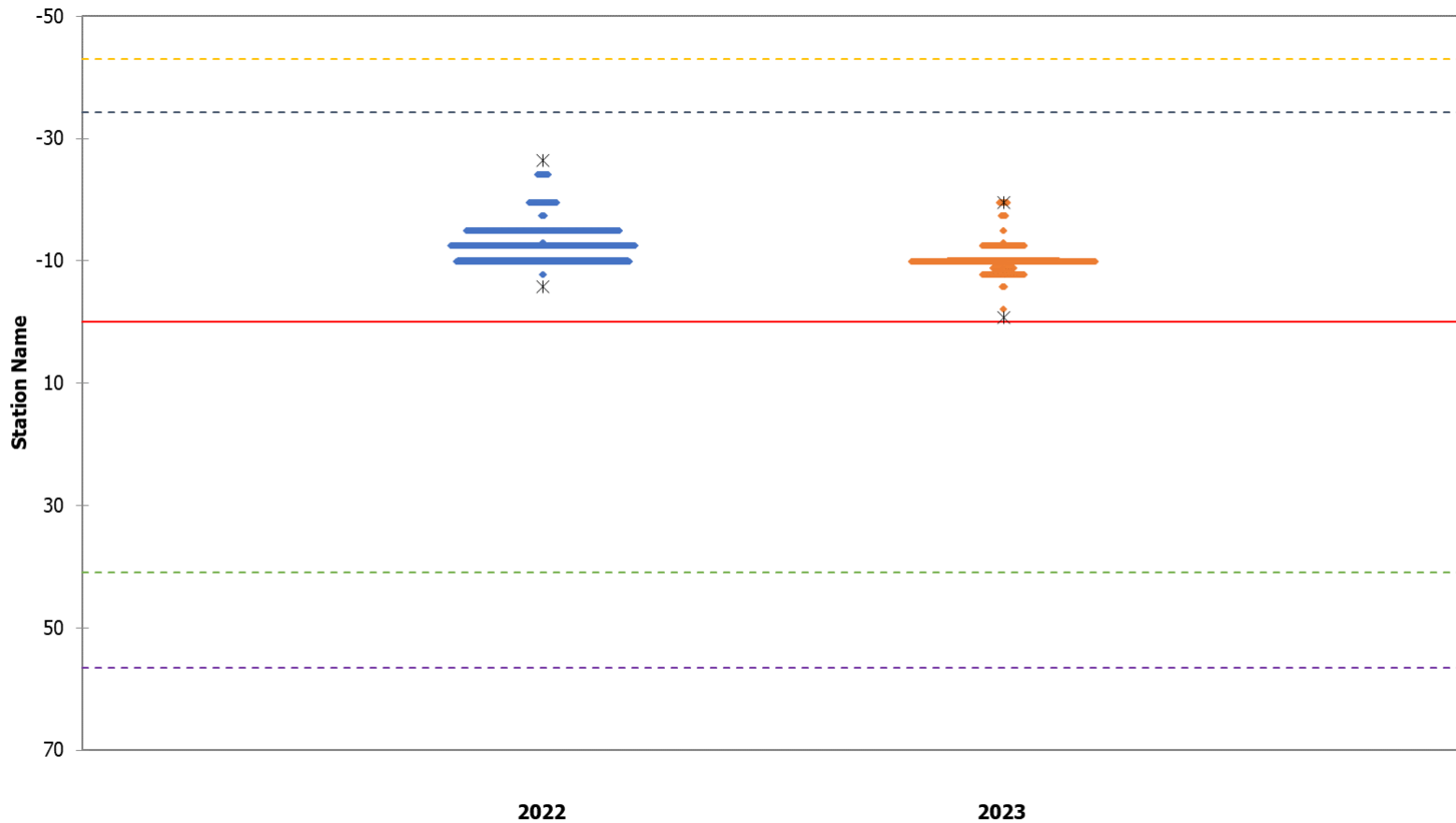


Figure A4-31: Detection ranges and distribution for Lake Sturgeon tagged with an acoustic transmitter (code #57481) in the Keyeyask reservoir in relation to the Keyeyask GS (rkm 0), during each open-water period from May 16, 2022 to October 2, 2023. Minimum and maximum distances from the Keyeyask GS are indicated with a star. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keyeyask GS; green = Kettle GS; purple = Long Spruce GS).

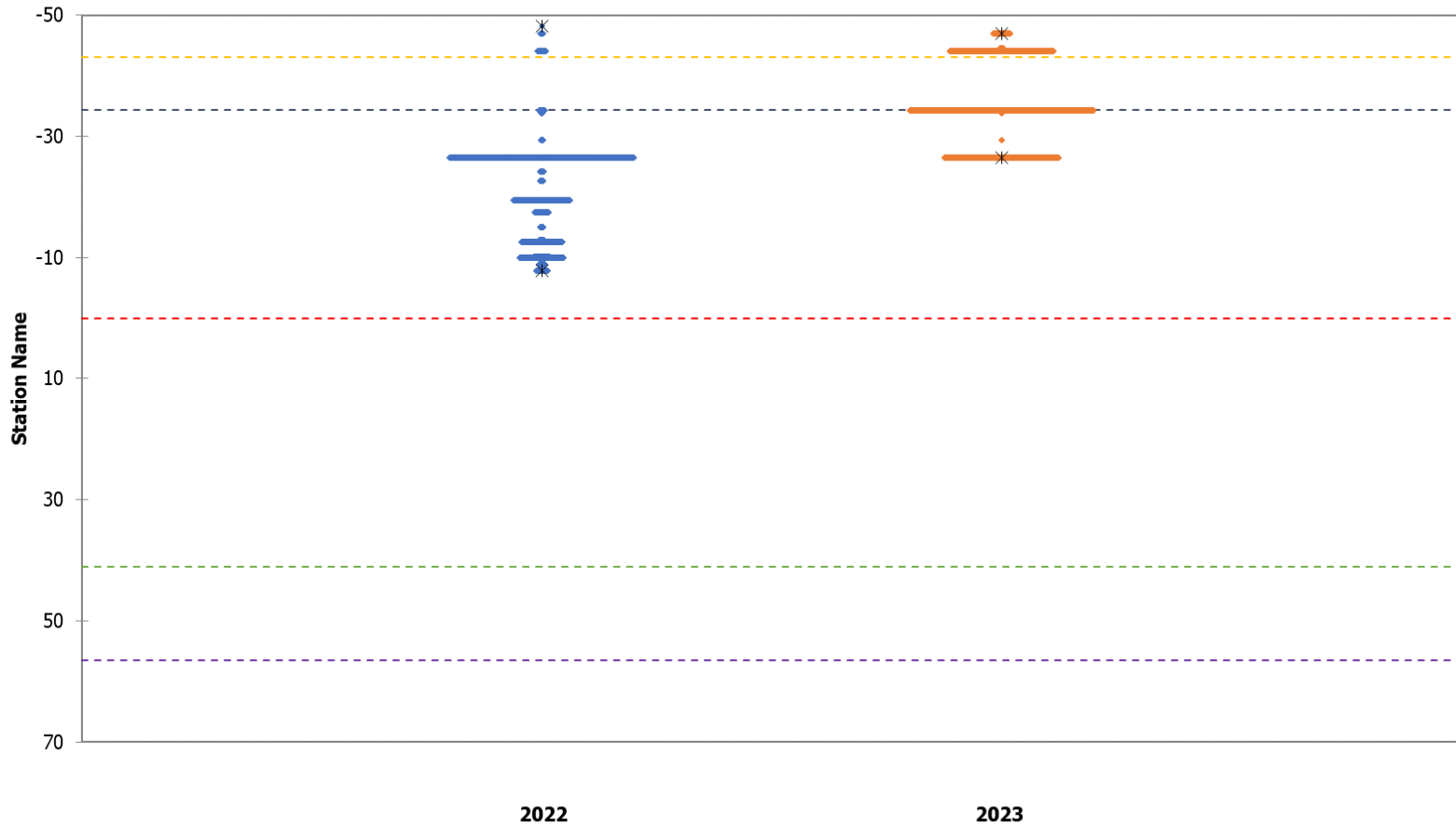


Figure A4-32: Detection ranges and distribution for Lake Sturgeon tagged with an acoustic transmitter (code #57482) in the Keyeyask reservoir in relation to the Keyeyask GS (rkm 0), during each open-water period from May 16, 2022 to October 2, 2023. Minimum and maximum distances from the Keyeyask GS are indicated with a star. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keyeyask GS; green = Kettle GS; purple = Long Spruce GS).

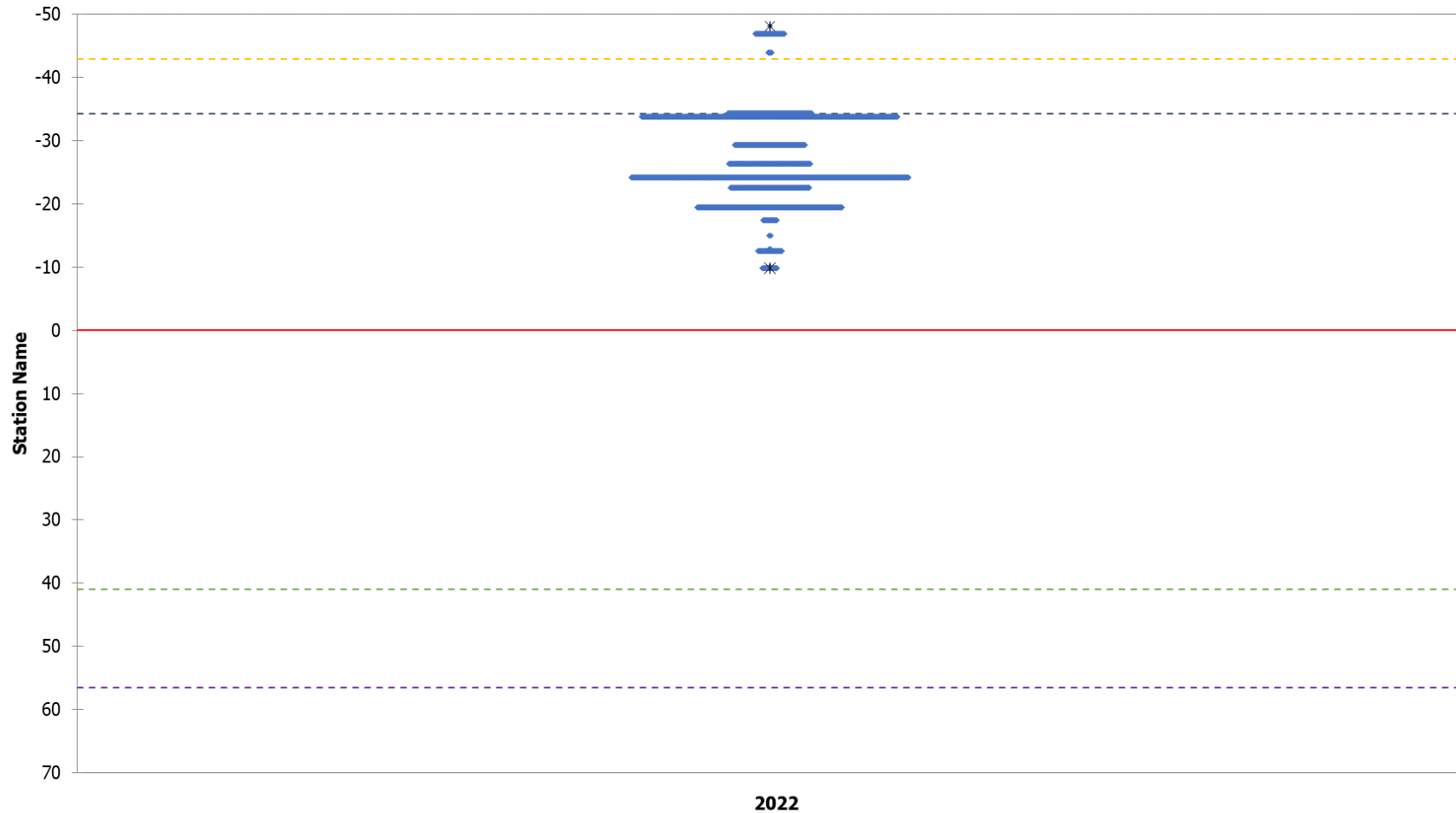


Figure A4-33: Detection ranges and distribution for Lake Sturgeon tagged with an acoustic transmitter (code #57483) in the Keyeyask reservoir in relation to the Keyeyask GS (rkm 0), during each open-water period from May 16, 2022 to October 2, 2023. Minimum and maximum distances from the Keyeyask GS are indicated with a star. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keyeyask GS; green = Kettle GS; purple = Long Spruce GS).

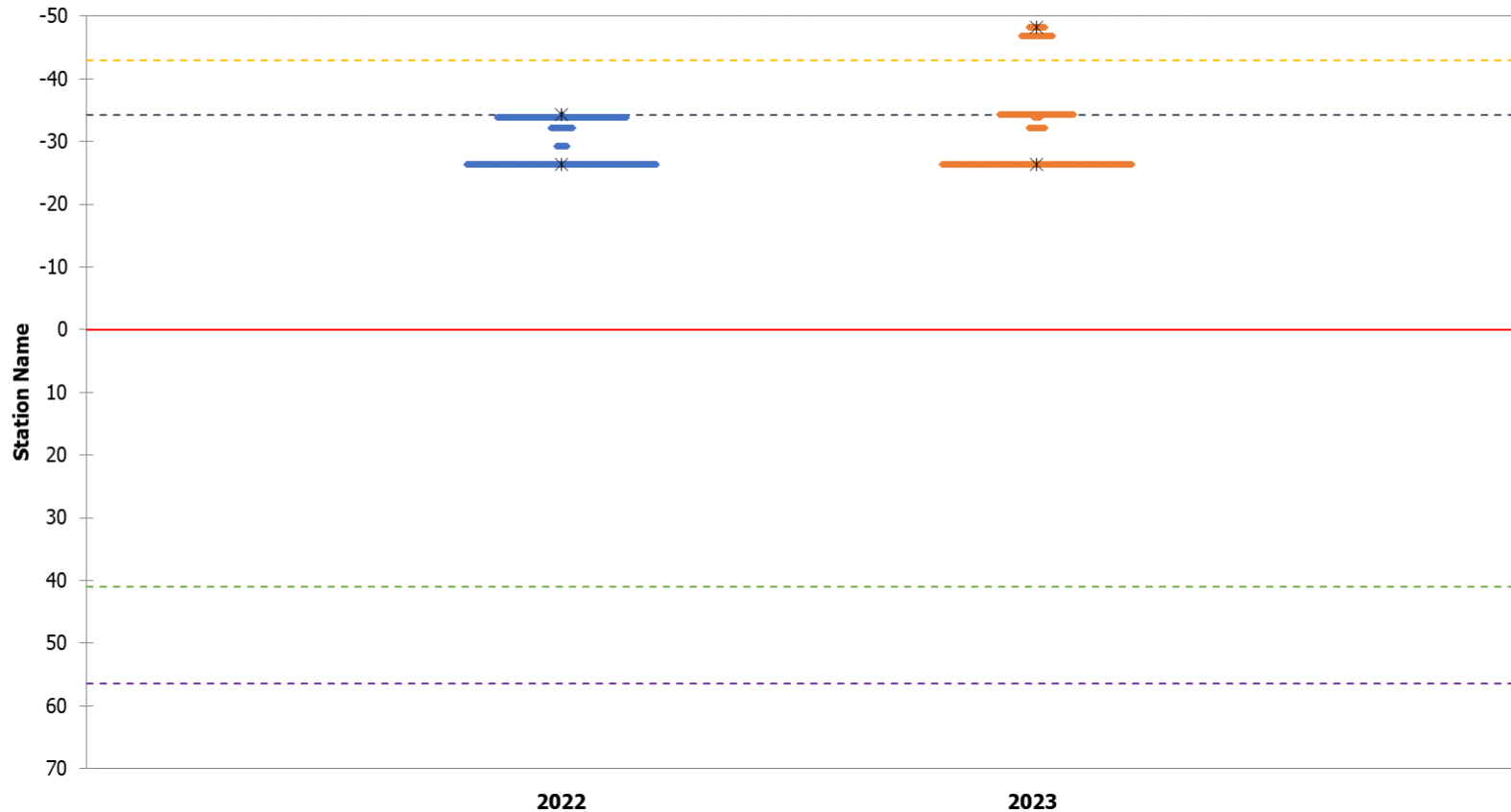


Figure A4-34: Detection ranges and distribution for Lake Sturgeon tagged with an acoustic transmitter (code #57484) in the Keyeyask reservoir in relation to the Keyeyask GS (rkm 0), during each open-water period from May 16, 2022 to October 2, 2023. Minimum and maximum distances from the Keyeyask GS are indicated with a star. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keyeyask GS; green = Kettle GS; purple = Long Spruce GS).

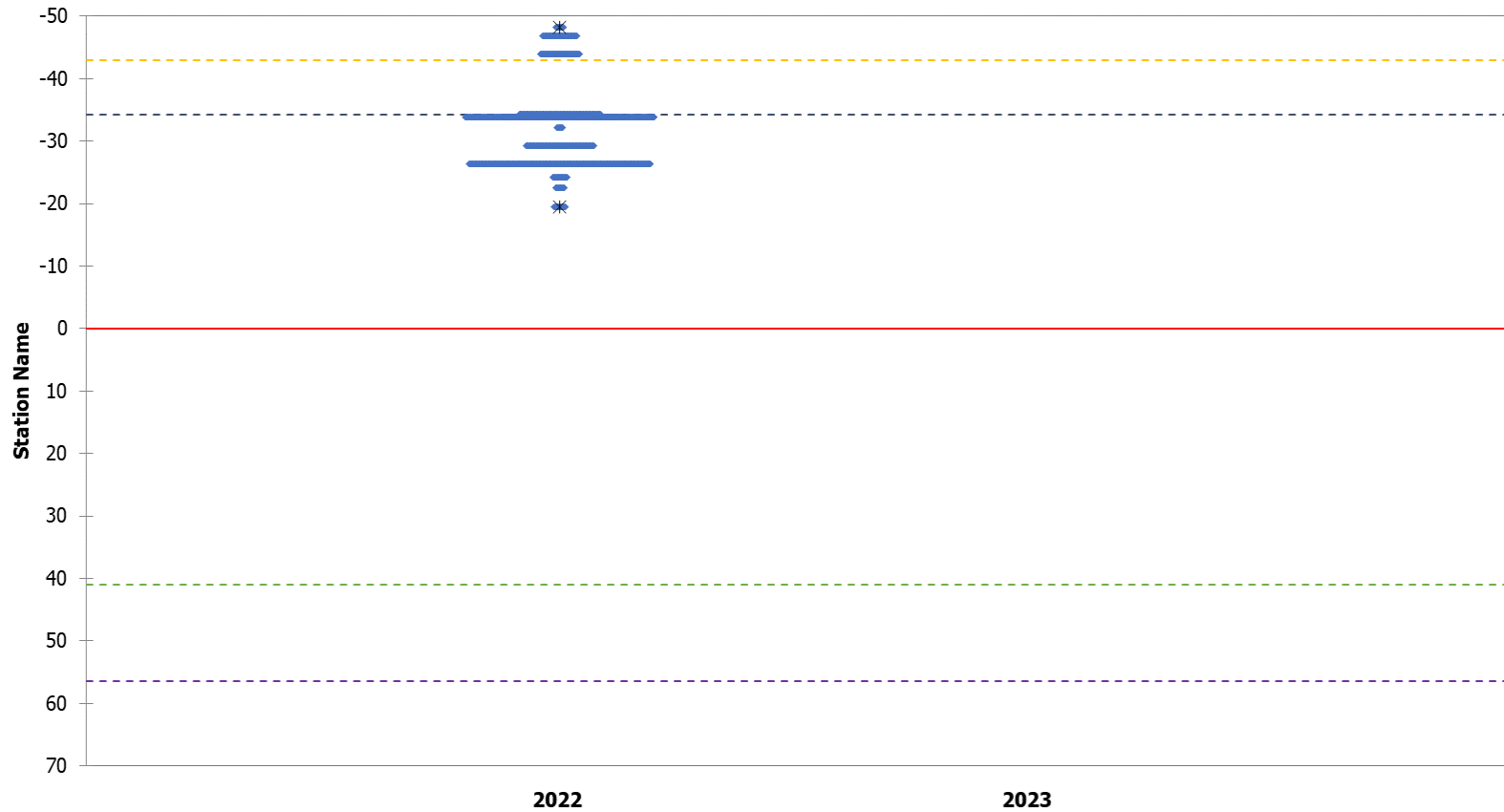


Figure A4-35: Detection ranges and distribution for Lake Sturgeon tagged with an acoustic transmitter (code #57485) in the Keyeyask reservoir in relation to the Keyeyask GS (rkm 0), during each open-water period from May 16, 2022 to October 2, 2023. Minimum and maximum distances from the Keyeyask GS are indicated with a star. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keyeyask GS; green = Kettle GS; purple = Long Spruce GS).

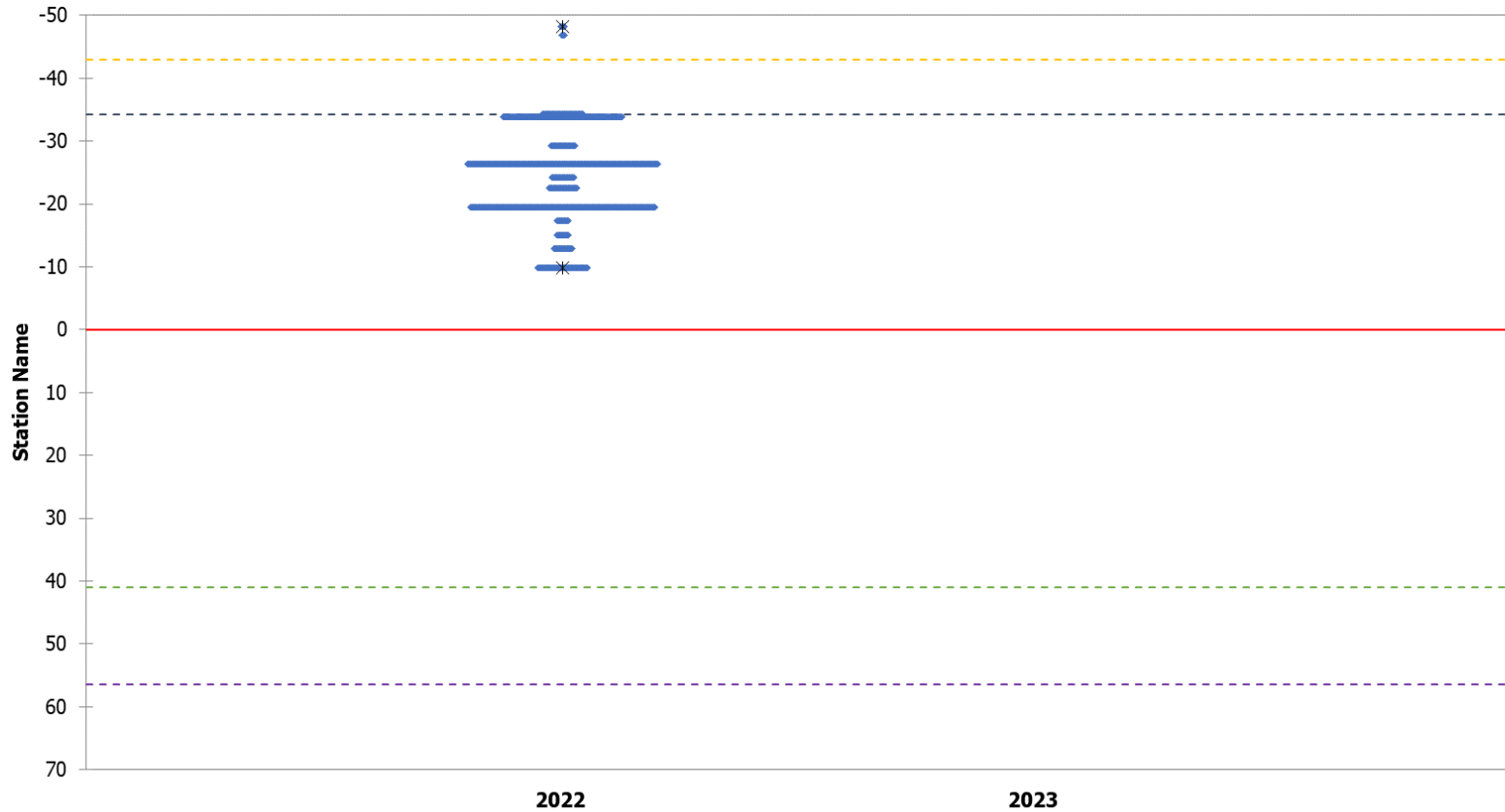


Figure A4-36: Detection ranges and distribution for Lake Sturgeon tagged with an acoustic transmitter (code #57486) in the Keyeyask reservoir in relation to the Keyeyask GS (rkm 0), during each open-water period from May 16, 2022 to October 2, 2023. Minimum and maximum distances from the Keyeyask GS are indicated with a star. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keyeyask GS; green = Kettle GS; purple = Long Spruce GS).

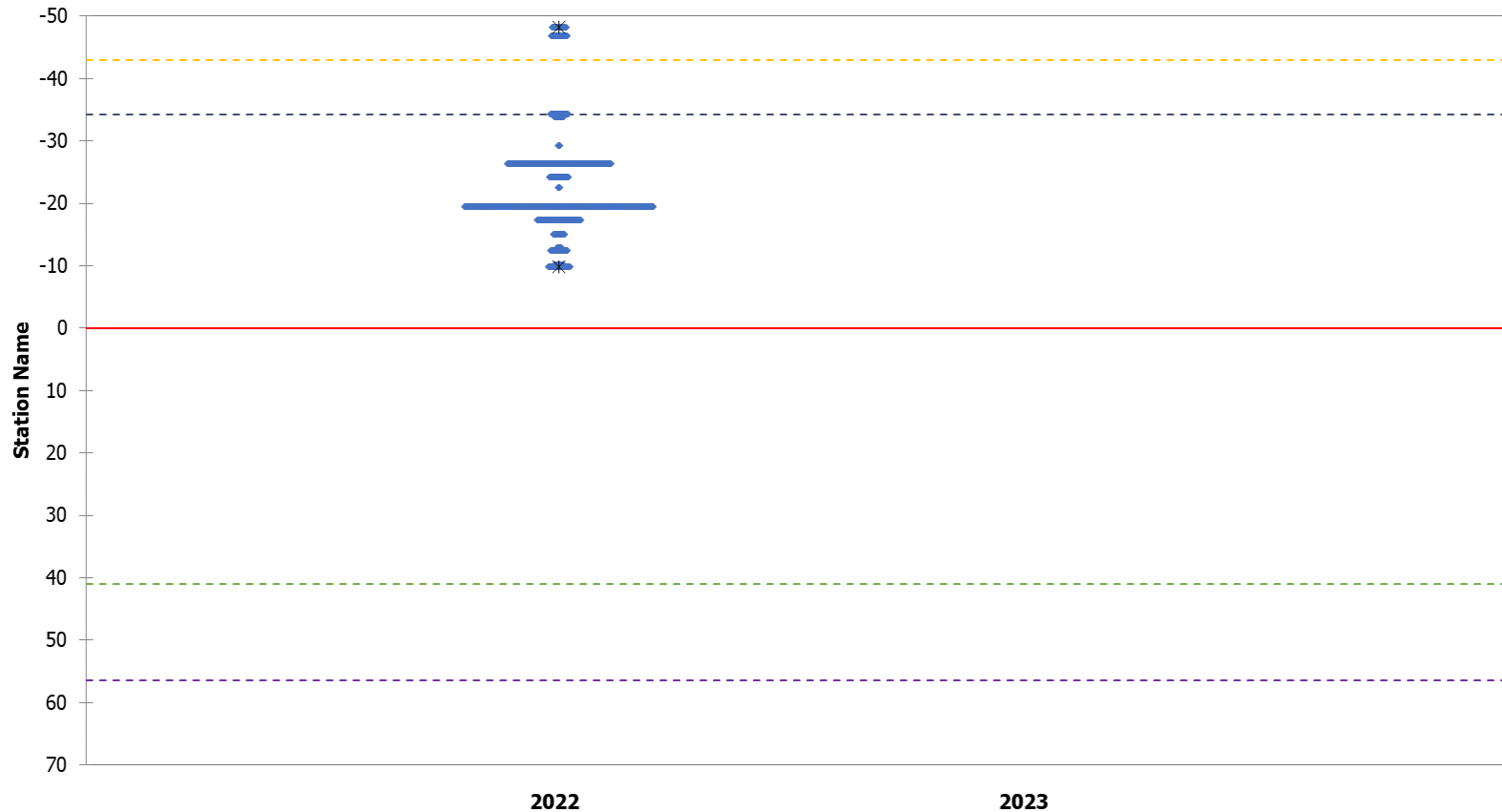


Figure A4-37: Detection ranges and distribution for Lake Sturgeon tagged with an acoustic transmitter (code #57487) in the Keyeyask reservoir in relation to the Keyeyask GS (rkm 0), during each open-water period from May 16, 2022 to October 2, 2023. Minimum and maximum distances from the Keyeyask GS are indicated with a star. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keyeyask GS; green = Kettle GS; purple = Long Spruce GS).

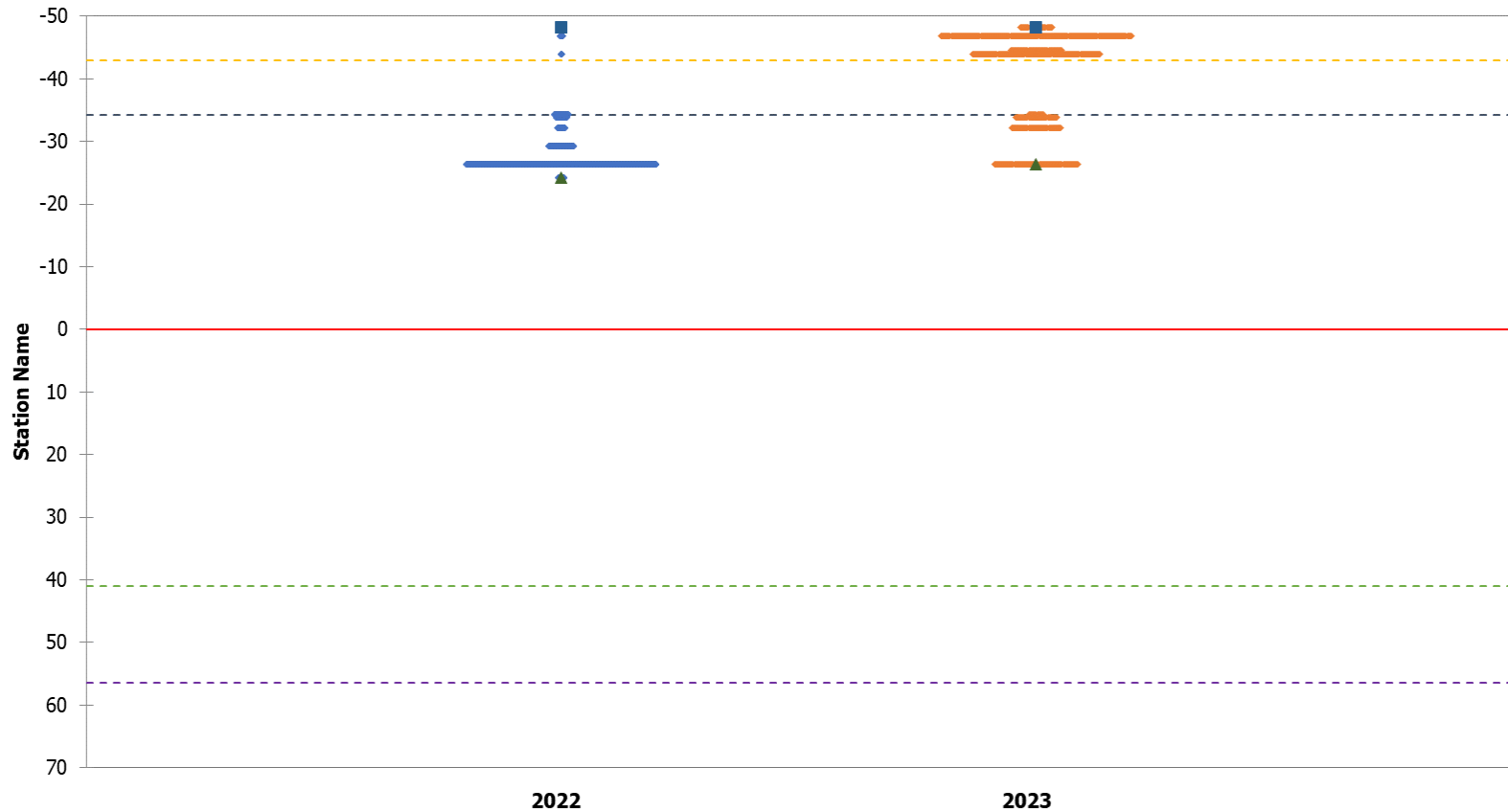


Figure A4-38: Detection ranges and distribution for Lake Sturgeon tagged with an acoustic transmitter (code #57488) in the Keyeyask reservoir in relation to the Keyeyask GS (rkm 0), during each open-water period from May 16, 2022 to October 2, 2023. Minimum and maximum distances from the Keyeyask GS are indicated with a star. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keyeyask GS; green = Kettle GS; purple = Long Spruce GS).

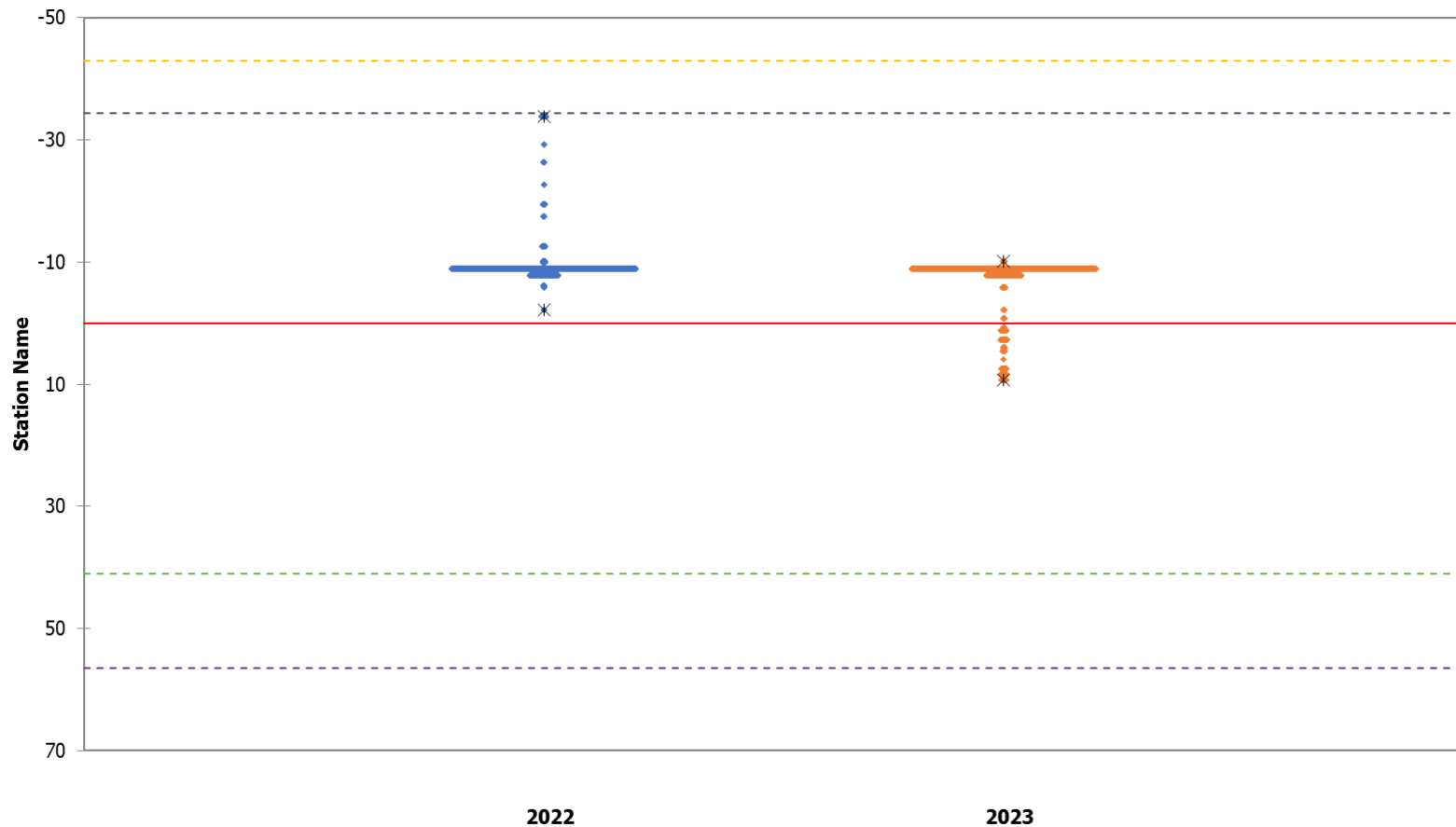


Figure A4-39: Detection ranges and distribution for Lake Sturgeon tagged with an acoustic transmitter (code #57489) in the Keyeyask reservoir in relation to the Keyeyask GS (rkm 0), during each open-water period from May 16, 2022 to October 2, 2023. Minimum and maximum distances from the Keyeyask GS are indicated with a star. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keyeyask GS; green = Kettle GS; purple = Long Spruce GS).

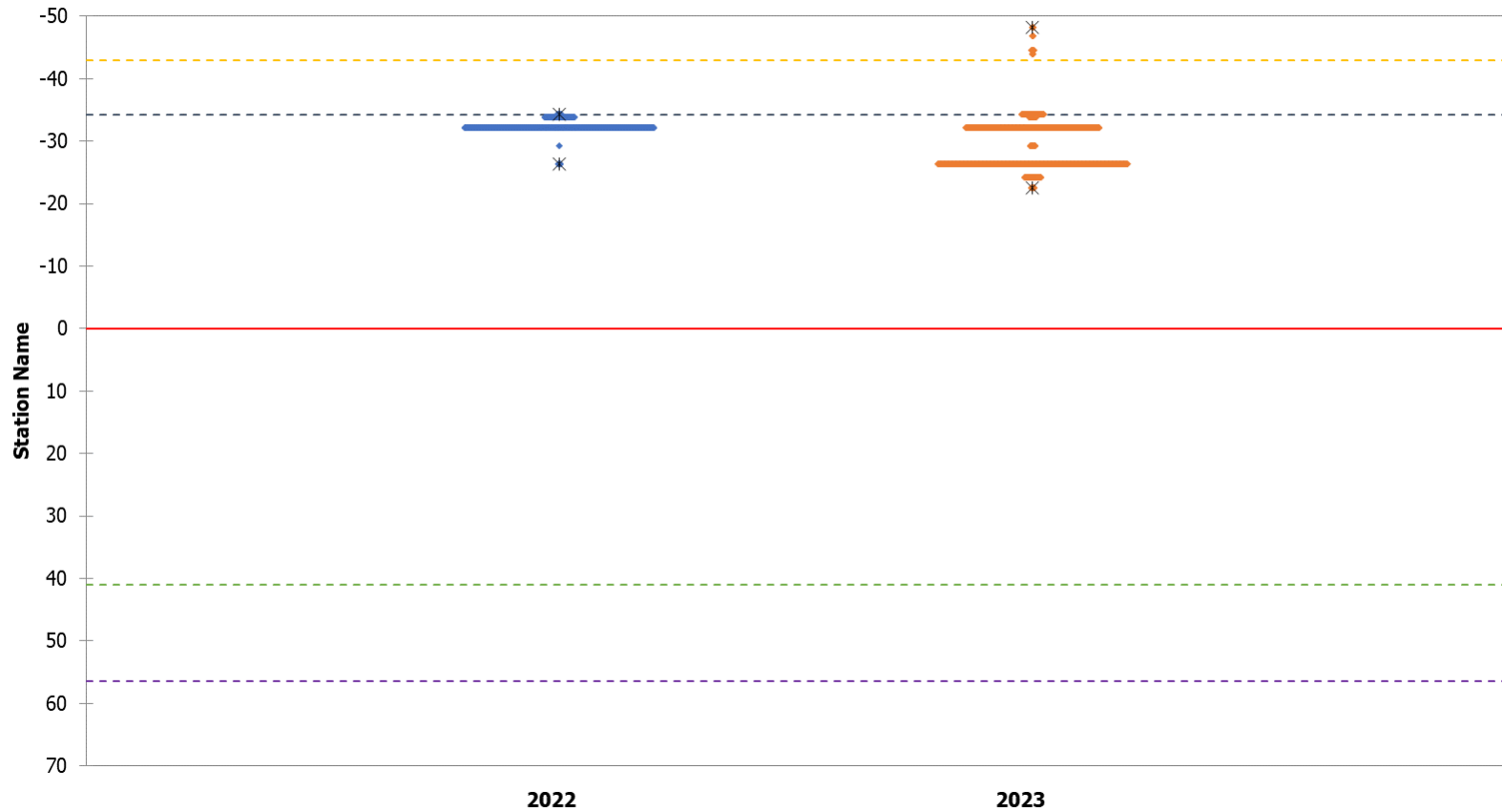


Figure A4-40: Detection ranges and distribution for Lake Sturgeon tagged with an acoustic transmitter (code #57490) in the Keyeyask reservoir in relation to the Keyeyask GS (rkm 0), during each open-water period from May 16, 2022 to October 2, 2023. Minimum and maximum distances from the Keyeyask GS are indicated with a star. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keyeyask GS; green = Kettle GS; purple = Long Spruce GS).

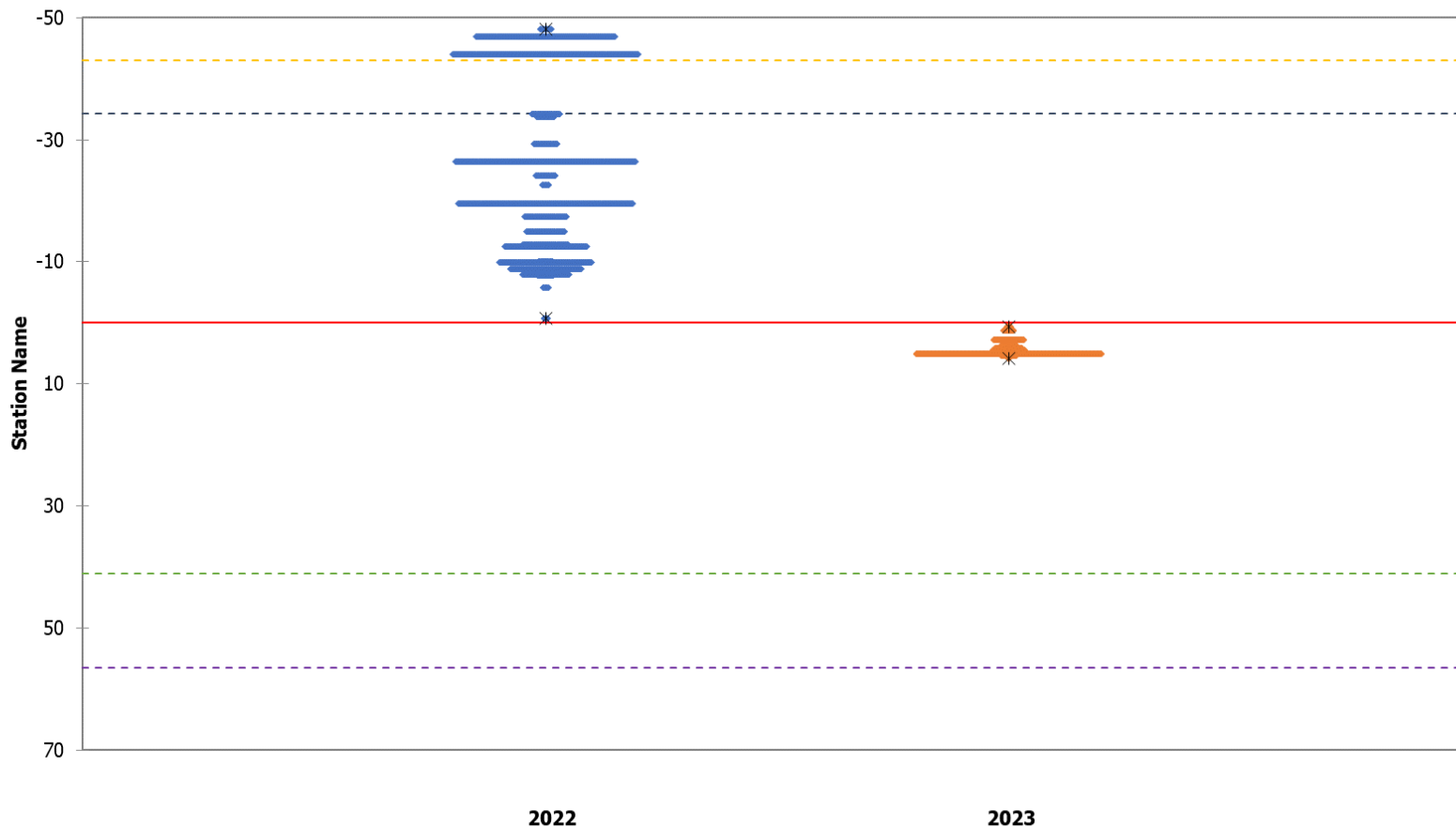


Figure A4-41: Detection ranges and distribution for Lake Sturgeon tagged with an acoustic transmitter (code #57491) in the Keyeyask reservoir in relation to the Keyeyask GS (rkm 0), during each open-water period from May 16, 2022 to October 2, 2023. Minimum and maximum distances from the Keyeyask GS are indicated with a star. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keyeyask GS; green = Kettle GS; purple = Long Spruce GS).

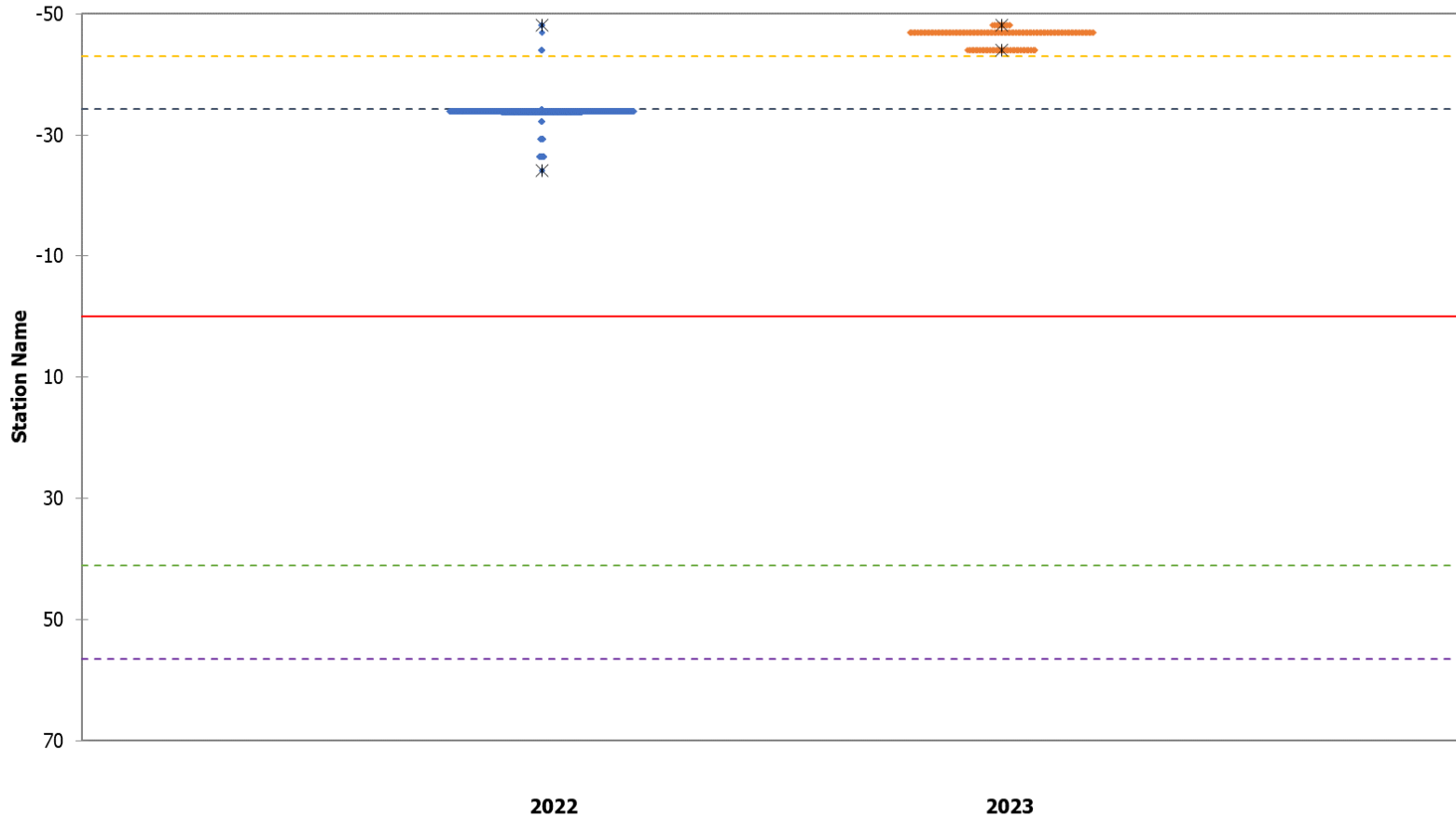


Figure A4-42: Detection ranges and distribution for Lake Sturgeon tagged with an acoustic transmitter (code #57492) in the Keyeyask reservoir in relation to the Keyeyask GS (rkm 0), during each open-water period from May 16, 2022 to October 2, 2023. Minimum and maximum distances from the Keyeyask GS are indicated with a star. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keyeyask GS; green = Kettle GS; purple = Long Spruce GS).

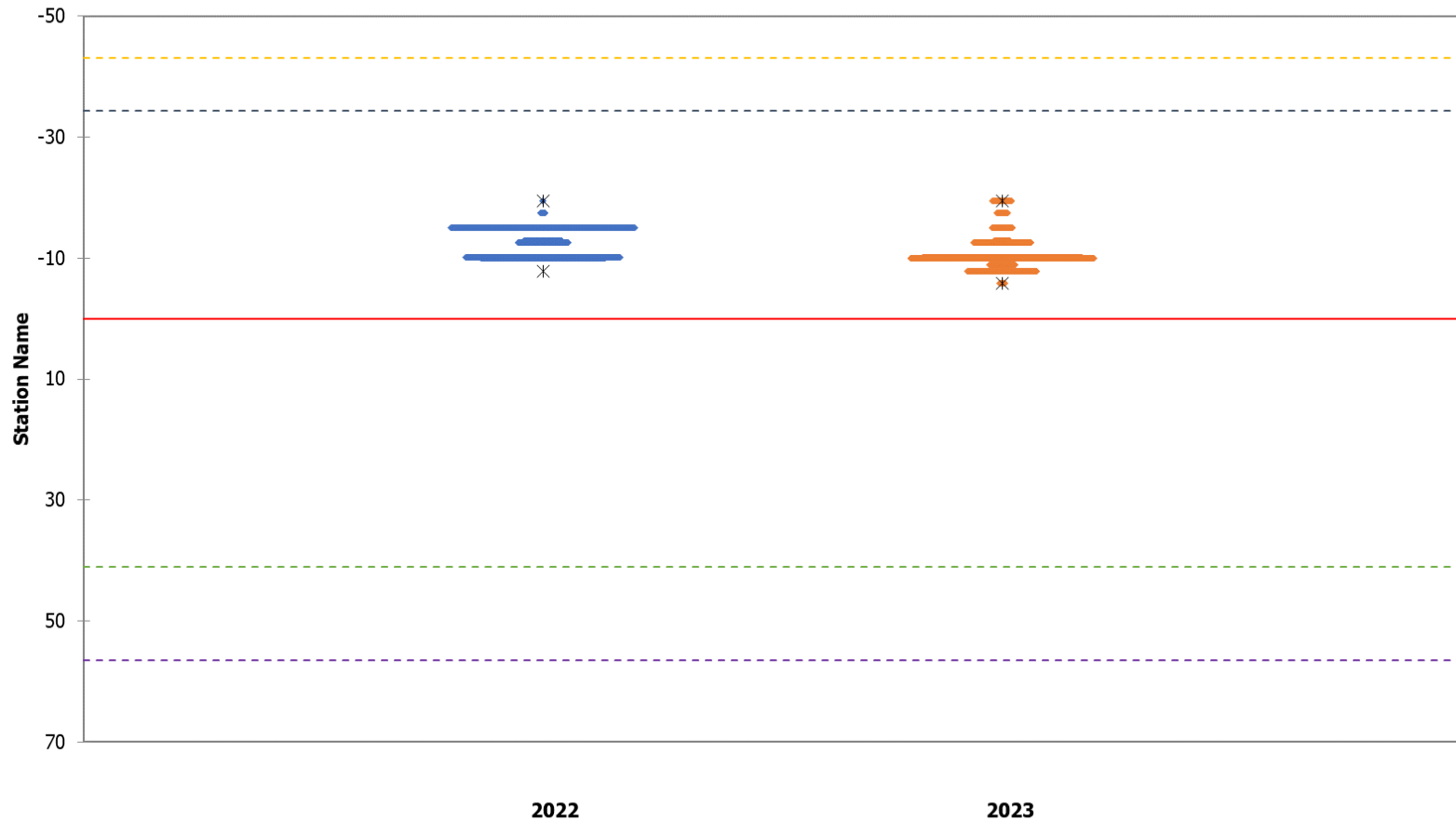


Figure A4-43: Detection ranges and distribution for Lake Sturgeon tagged with an acoustic transmitter (code #57493) in the Keyeyask reservoir in relation to the Keeyask GS (rkm 0), during each open-water period from May 16, 2022 to October 2, 2023. Minimum and maximum distances from the Keeyask GS are indicated with a star. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keeyask GS; green = Kettle GS; purple = Long Spruce GS).

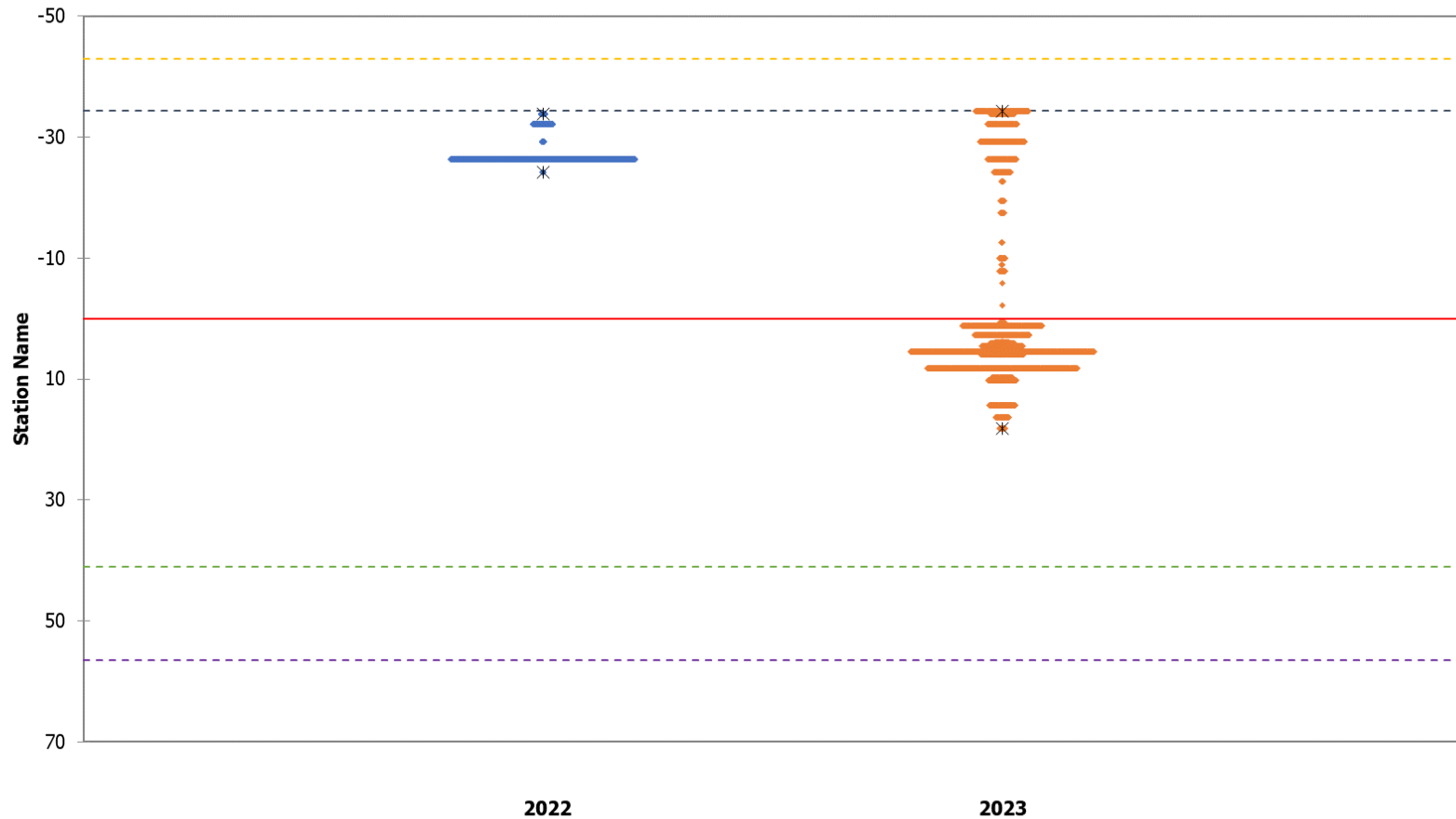


Figure A4-44: Detection ranges and distribution for Lake Sturgeon tagged with an acoustic transmitter (code #57494) in the Keyeyask reservoir in relation to the Keyeyask GS (rkm 0), during each open-water period from May 16, 2022 to October 2, 2023. Minimum and maximum distances from the Keyeyask GS are indicated with a star. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keyeyask GS; green = Kettle GS; purple = Long Spruce GS).

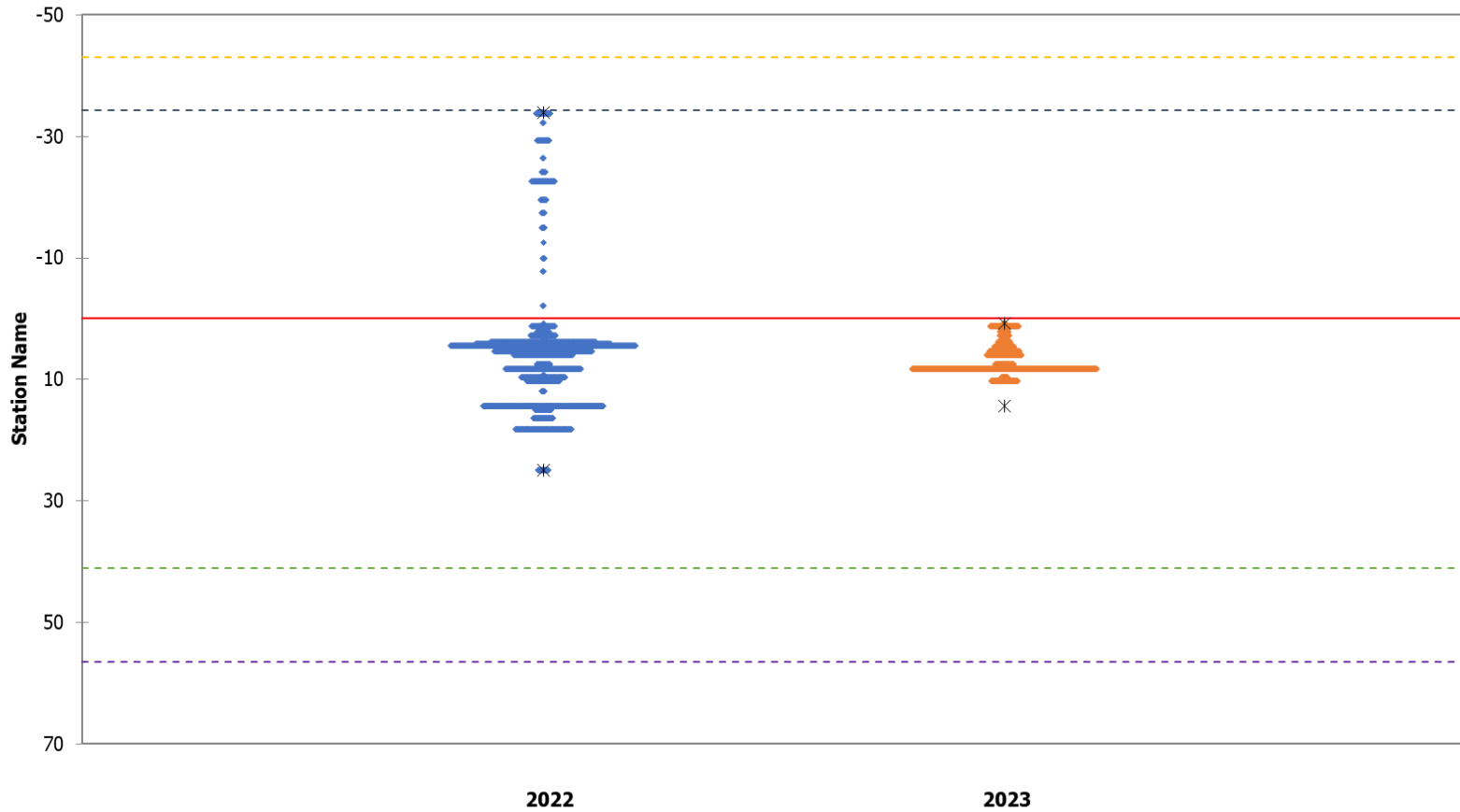


Figure A4-45: Detection ranges and distribution for Lake Sturgeon tagged with an acoustic transmitter (code #57495) in the Keyeyask reservoir in relation to the Keyeyask GS (rkm 0), during each open-water period from May 16, 2022 to October 2, 2023. Minimum and maximum distances from the Keyeyask GS are indicated with a star. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keyeyask GS; green = Kettle GS; purple = Long Spruce GS).

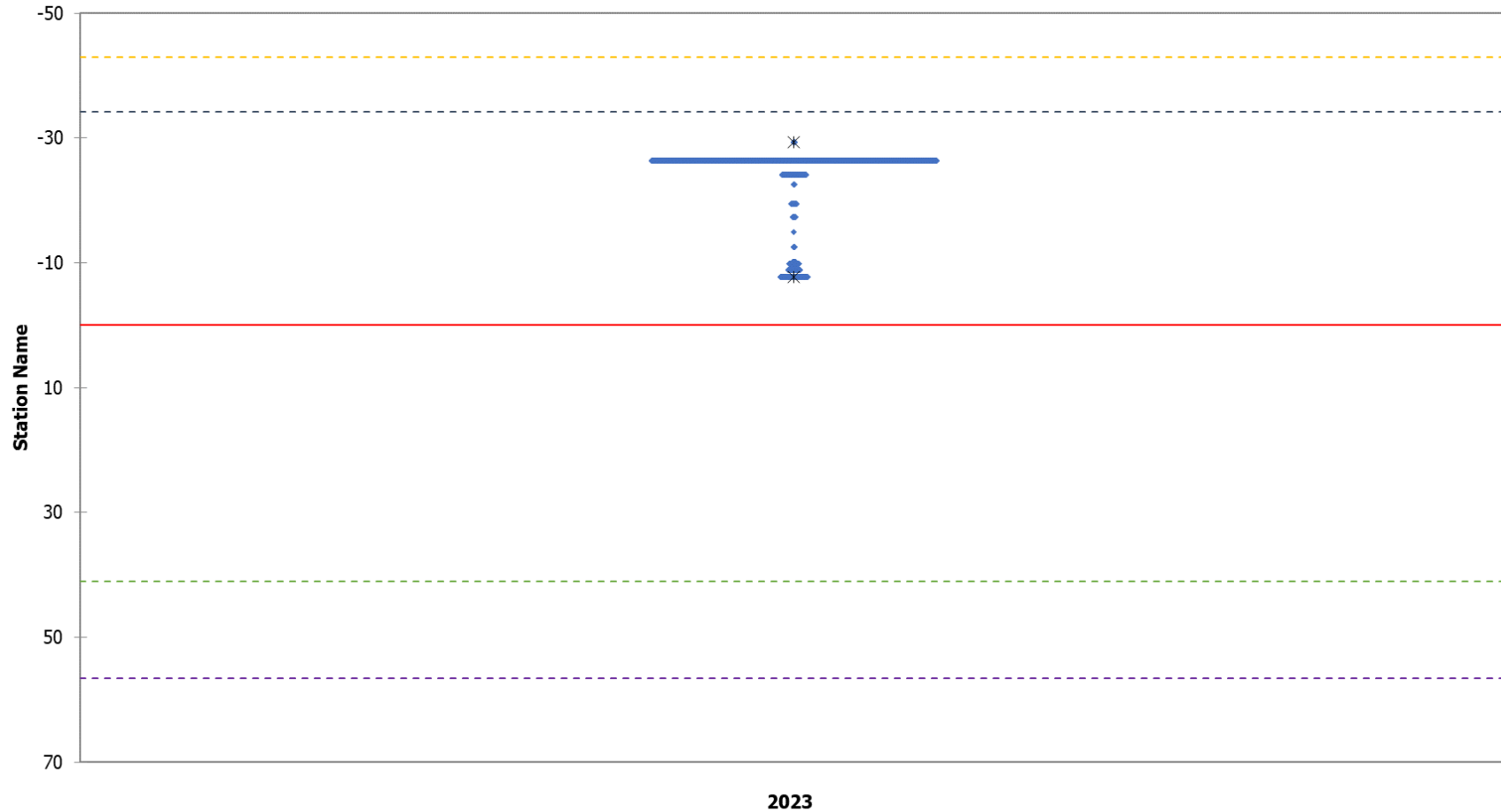


Figure A4-46: Detection ranges and distribution for Lake Sturgeon tagged with an acoustic transmitter (code #57496) in the Keyeyask reservoir in relation to the Keyeyask GS (rkm 0), during each open-water period from May 16 to October 2, 2023. Minimum and maximum distances from the Keyeyask GS are indicated with a star. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keyeyask GS; green = Kettle GS; purple = Long Spruce GS).

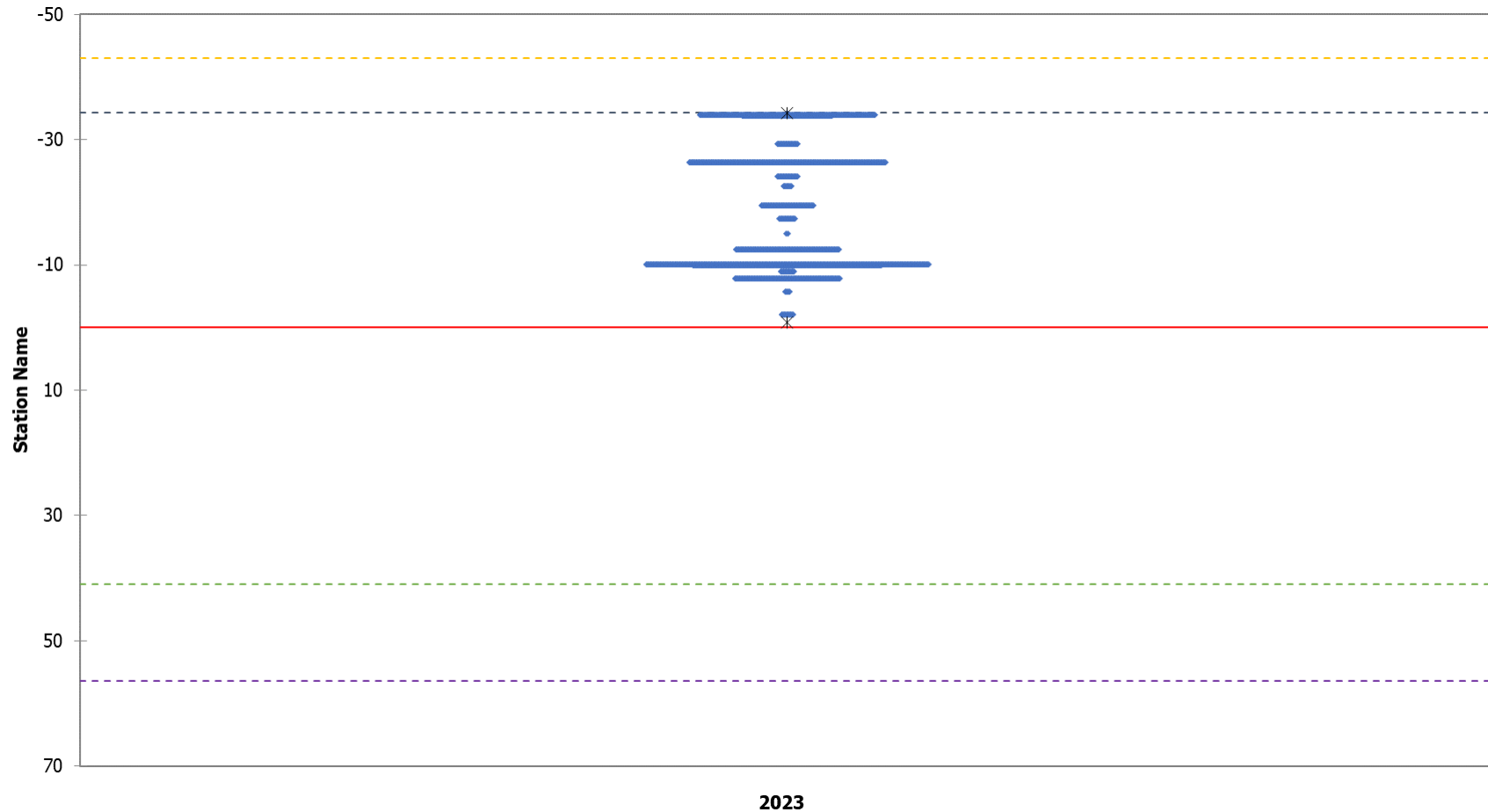


Figure A4-47: Detection ranges and distribution for Lake Sturgeon tagged with an acoustic transmitter (code #57497) in the Keyeyask reservoir in relation to the Keyeyask GS (rkm 0), during each open-water period from May 16 to October 2, 2023. Minimum and maximum distances from the Keyeyask GS are indicated with a star. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keyeyask GS; green = Kettle GS; purple = Long Spruce GS).

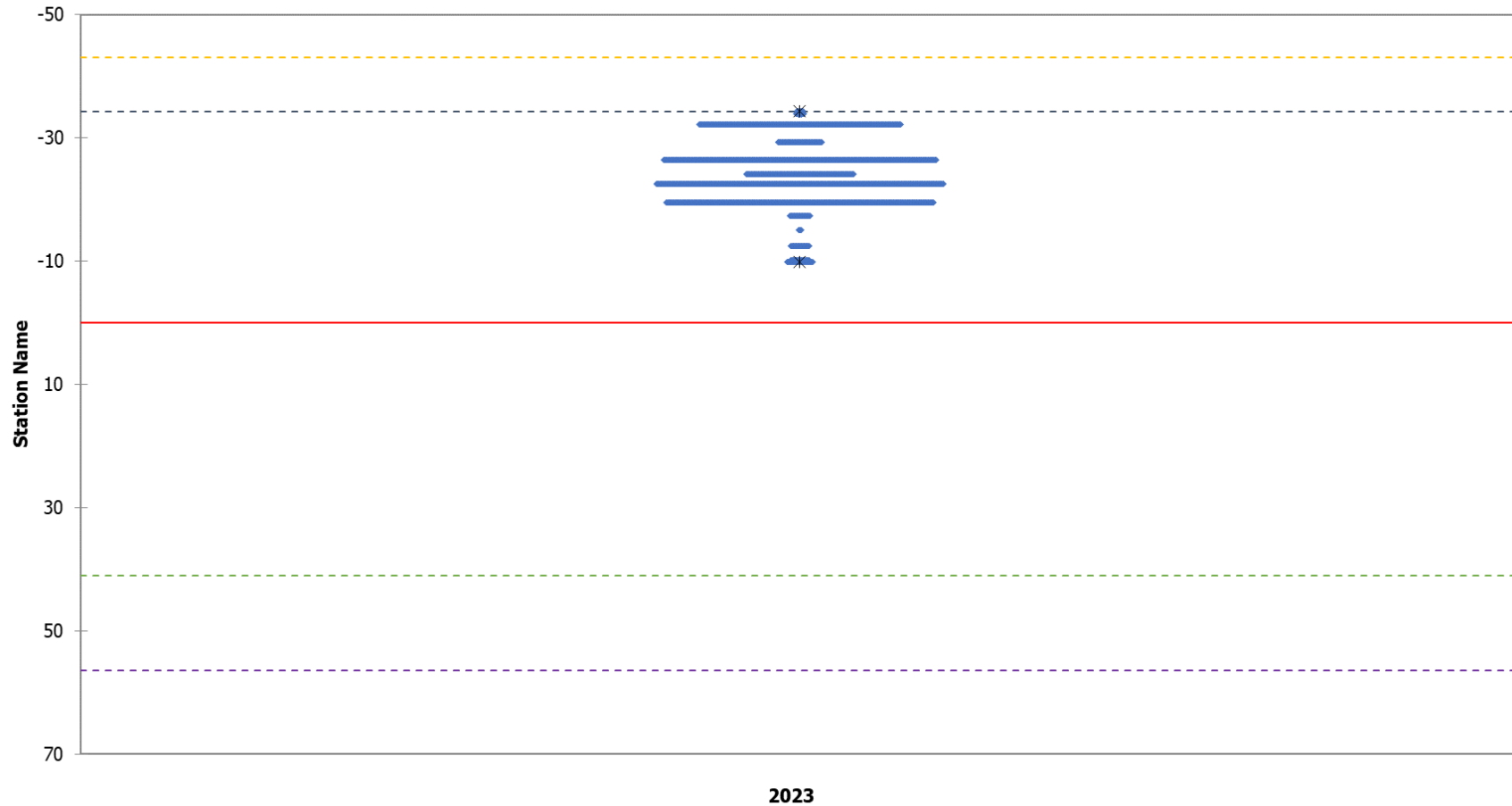


Figure A4-48: Detection ranges and distribution for Lake Sturgeon tagged with an acoustic transmitter (code #57498) in the Keyeyask reservoir in relation to the Keyeyask GS (rkm 0), during each open-water period from May 16 to October 2, 2023. Minimum and maximum distances from the Keyeyask GS are indicated with a star. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keyeyask GS; green = Kettle GS; purple = Long Spruce GS).

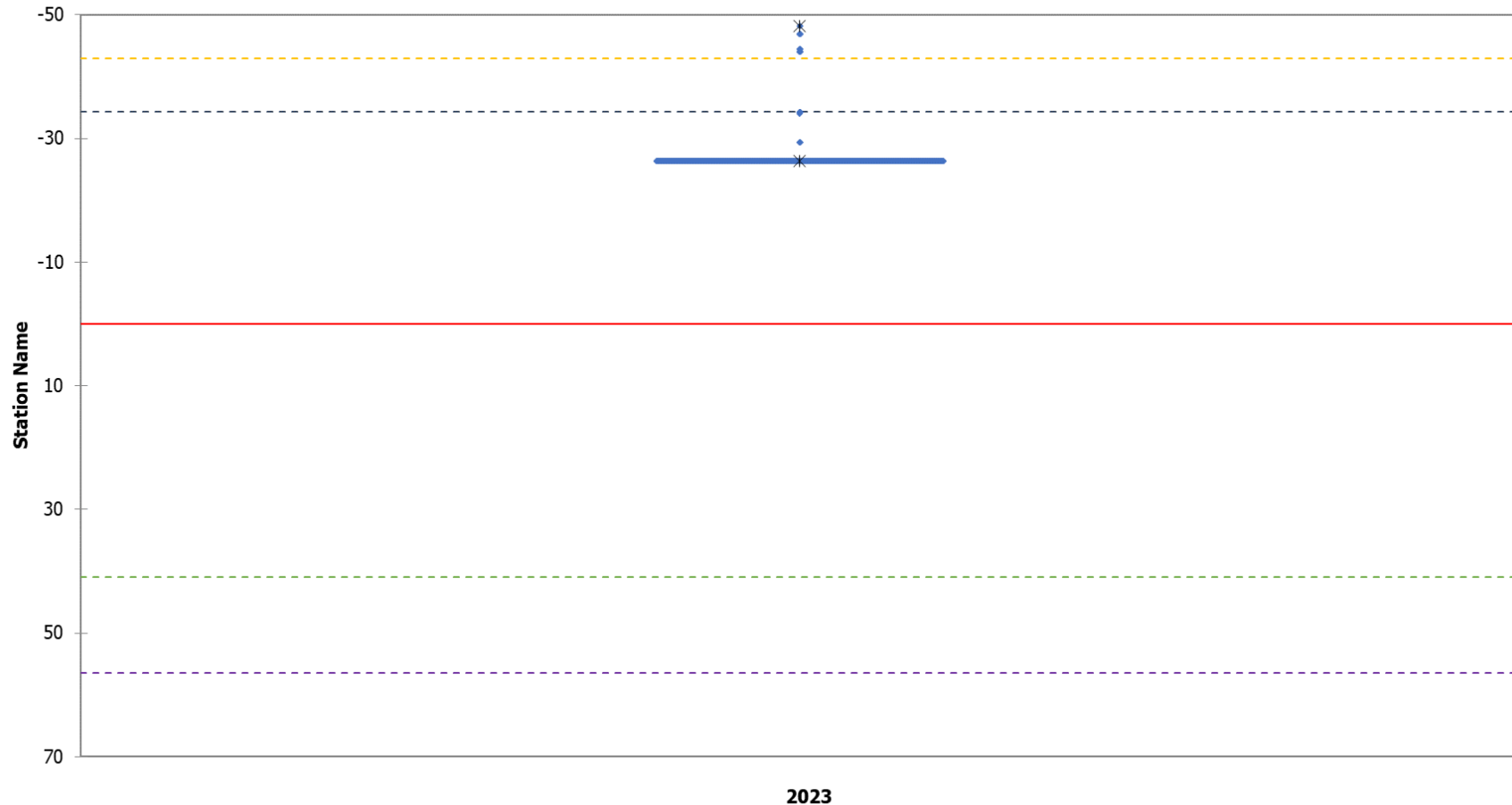


Figure A4-49: Detection ranges and distribution for Lake Sturgeon tagged with an acoustic transmitter (code #57499) in the Keyeyask reservoir in relation to the Keyeyask GS (rkm 0), during each open-water period from May 16 to October 2, 2023. Minimum and maximum distances from the Keyeyask GS are indicated with a star. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keyeyask GS; green = Kettle GS; purple = Long Spruce GS).

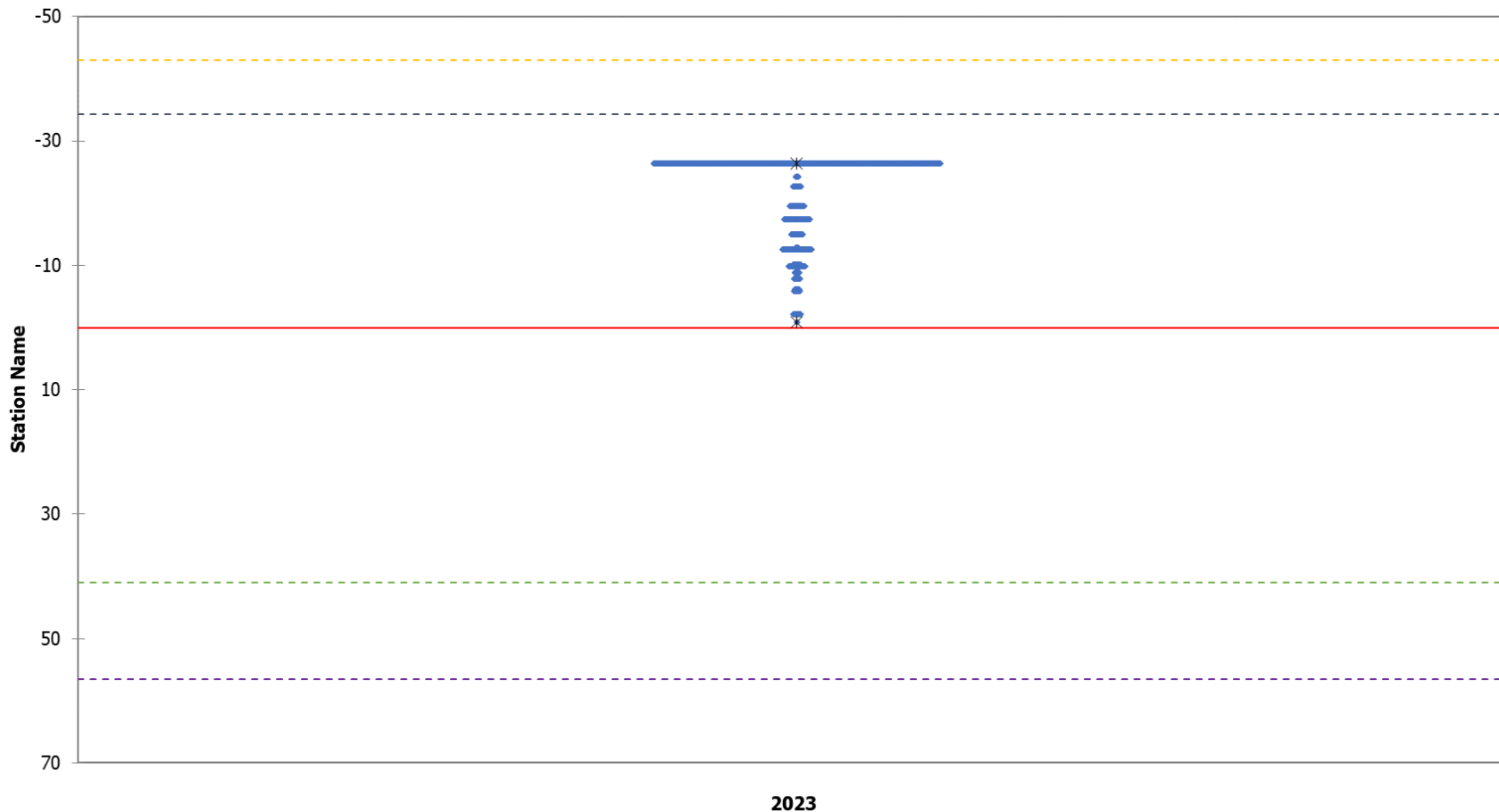


Figure A4-50: Detection ranges and distribution for Lake Sturgeon tagged with an acoustic transmitter (code #57501) in the Keyeyask reservoir in relation to the Keyeyask GS (rkm 0), during each open-water period from May 16 to October 2, 2023. Minimum and maximum distances from the Keyeyask GS are indicated with a star. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keyeyask GS; green = Kettle GS; purple = Long Spruce GS).

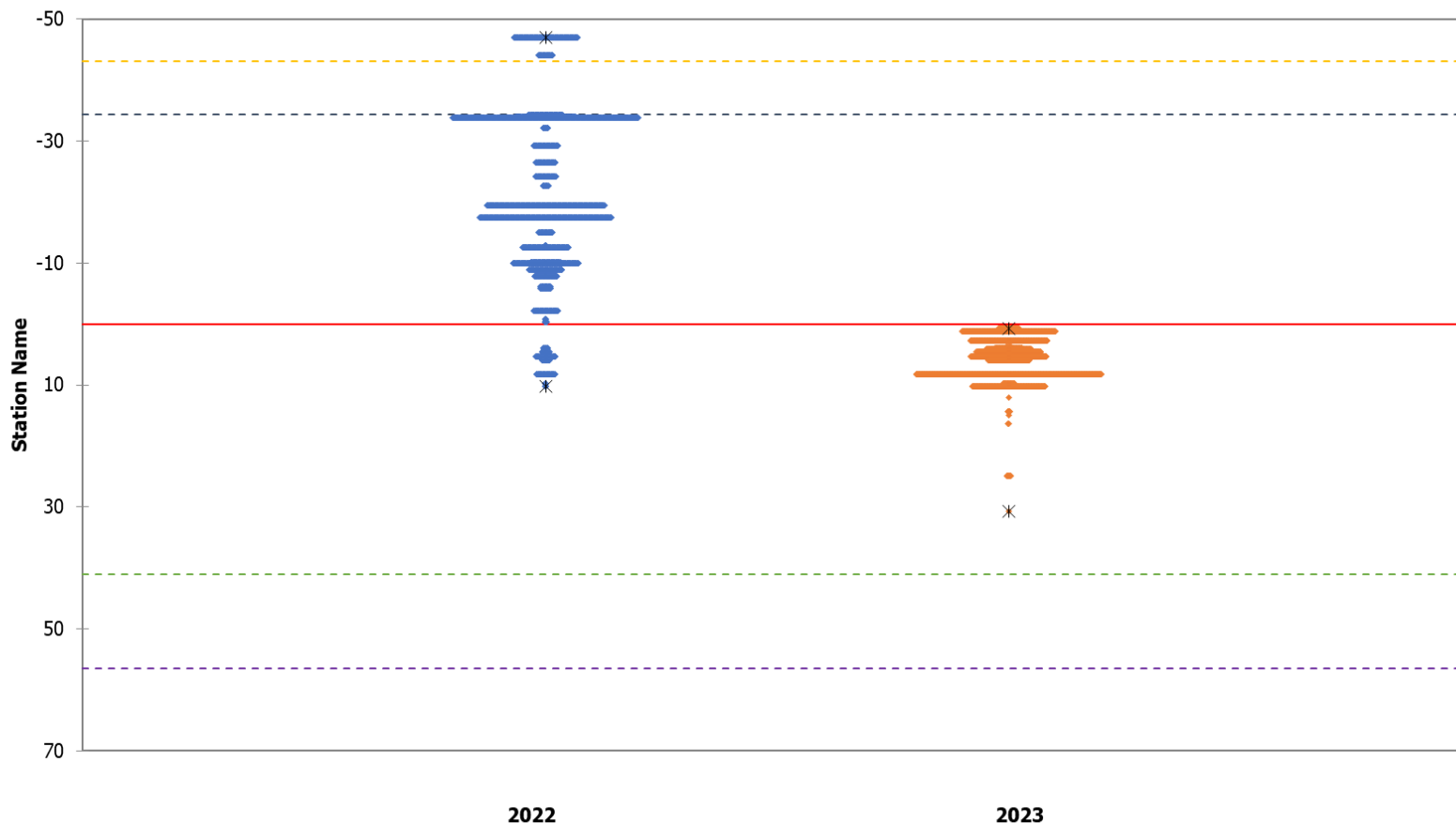


Figure A4-51: Detection ranges and distribution for Lake Sturgeon tagged with an acoustic transmitter (code #57502) in the Keyeyask reservoir in relation to the Keyeyask GS (rkm 0), during each open-water period from May 16, 2022 to October 2, 2023. Minimum and maximum distances from the Keyeyask GS are indicated with a star. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keyeyask GS; green = Kettle GS; purple = Long Spruce GS).

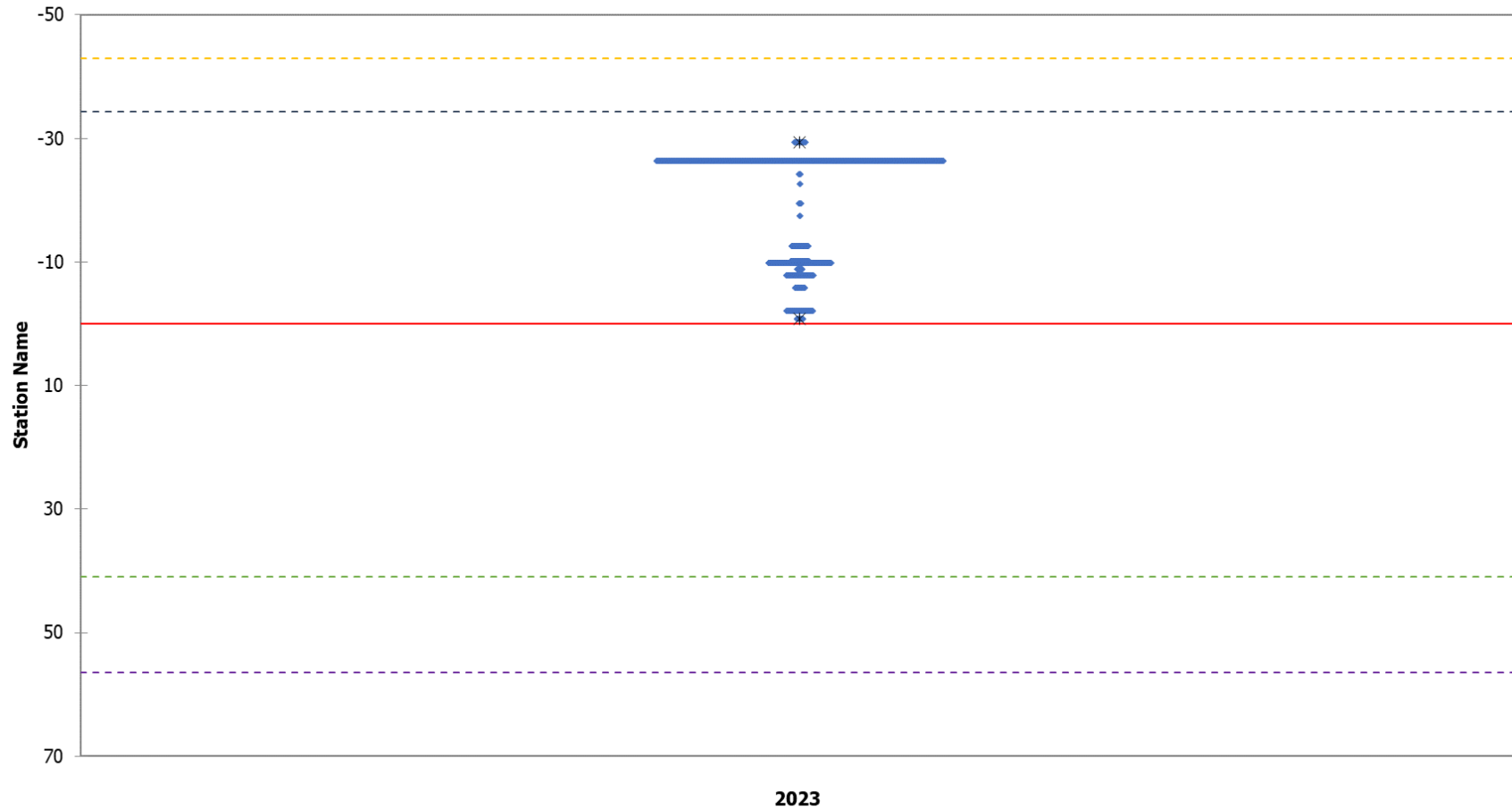


Figure A4-52: Detection ranges and distribution for Lake Sturgeon tagged with an acoustic transmitter (code #57503) in the Keyeyask reservoir in relation to the Keyeyask GS (rkm 0), during each open-water period from May 16 to October 2, 2023. Minimum and maximum distances from the Keyeyask GS are indicated with a star. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keyeyask GS; green = Kettle GS; purple = Long Spruce GS).

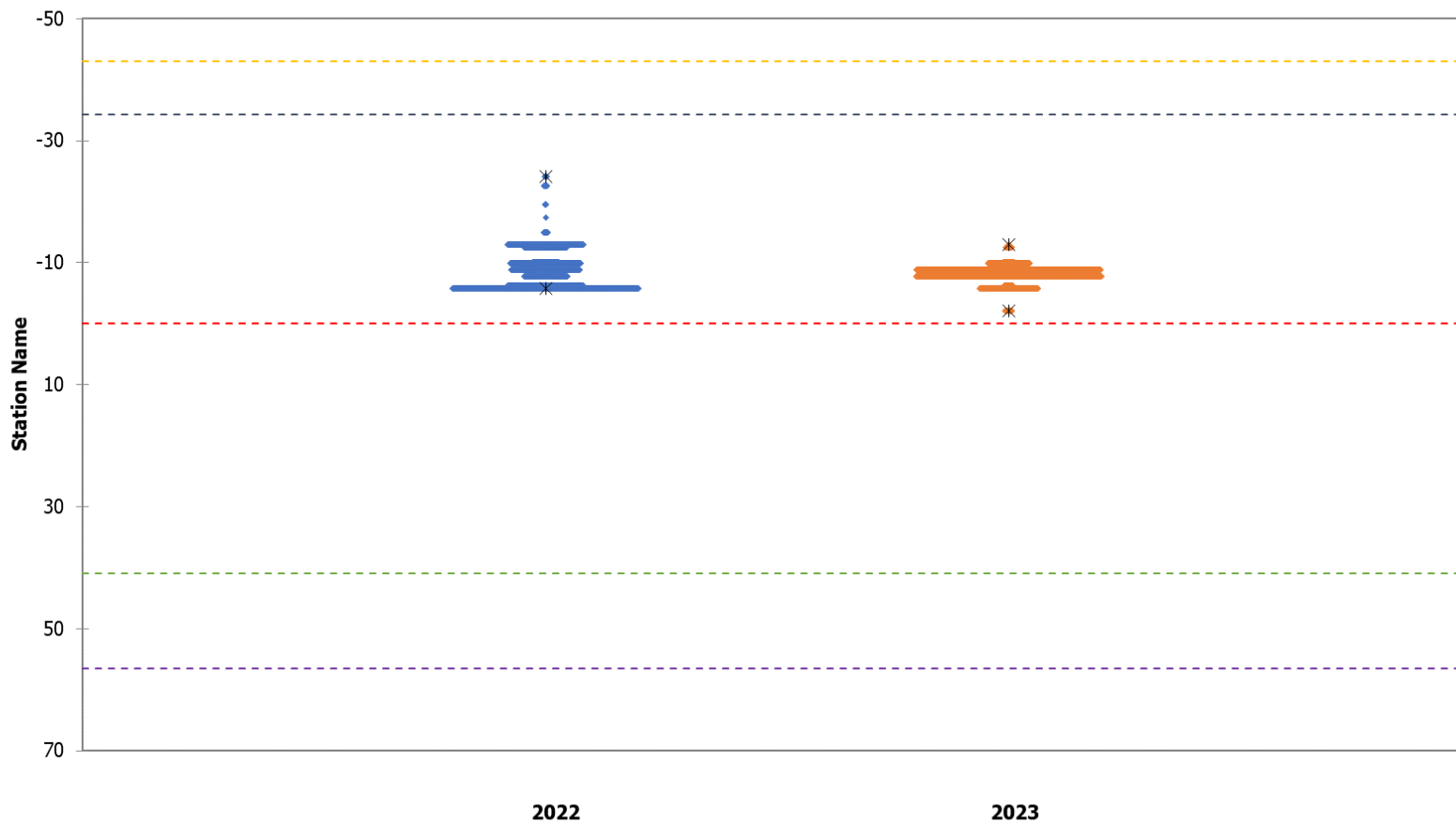


Figure A4-53: Detection ranges and distribution for Lake Sturgeon tagged with an acoustic transmitter (code #57504) in the Keyeyask reservoir in relation to the Keyeyask GS (rkm 0), during each open-water period from May 16, 2022 to October 2, 2023. Minimum and maximum distances from the Keyeyask GS are indicated with a star. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keyeyask GS; green = Kettle GS; purple = Long Spruce GS).

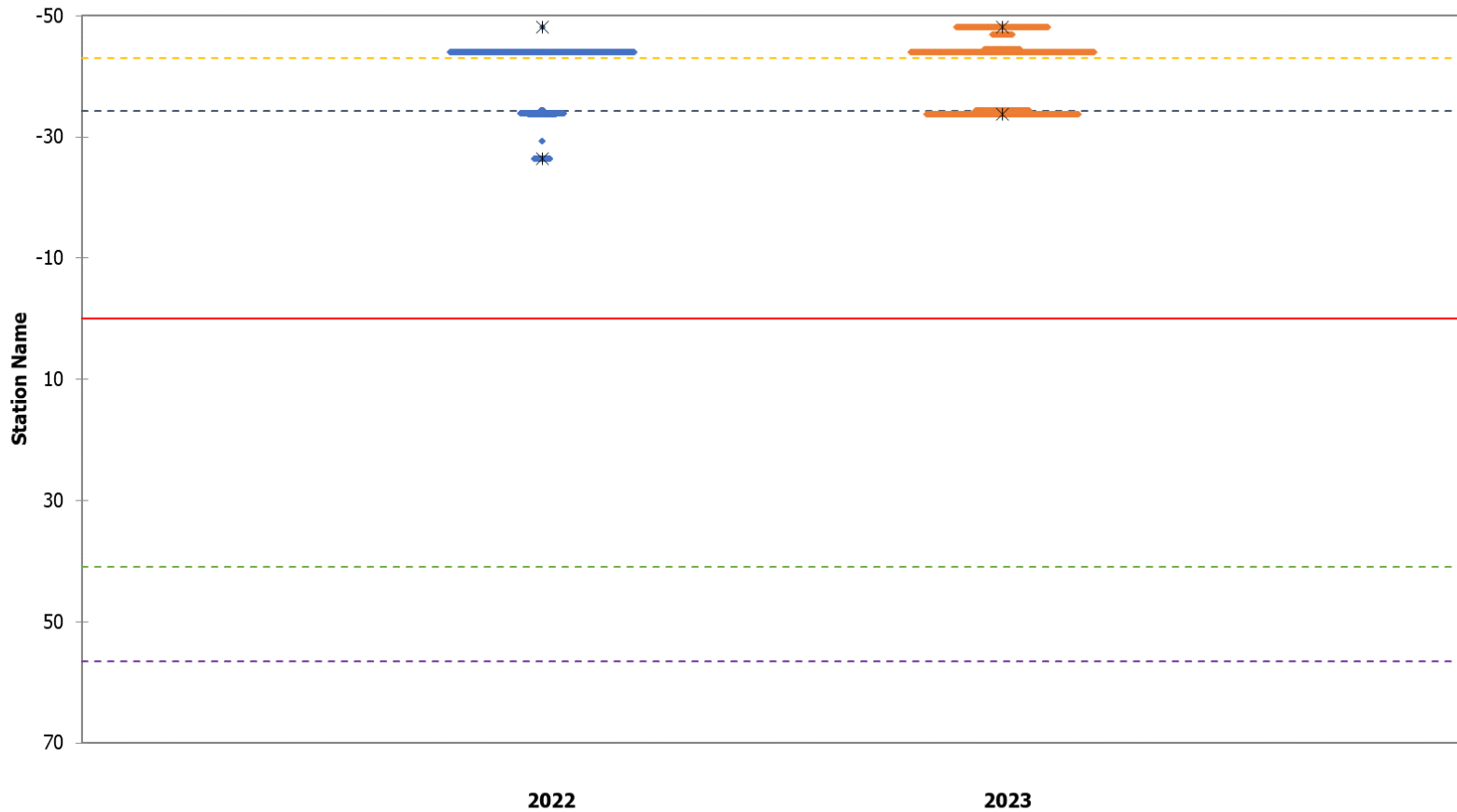


Figure A4-54: Detection ranges and distribution for Lake Sturgeon tagged with an acoustic transmitter (code #57505) in the Keyeyask reservoir in relation to the Keyeyask GS (rkm 0), during each open-water period from May 16, 2022 to October 2, 2023. Minimum and maximum distances from the Keyeyask GS are indicated with a star. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keyeyask GS; green = Kettle GS; purple = Long Spruce GS).

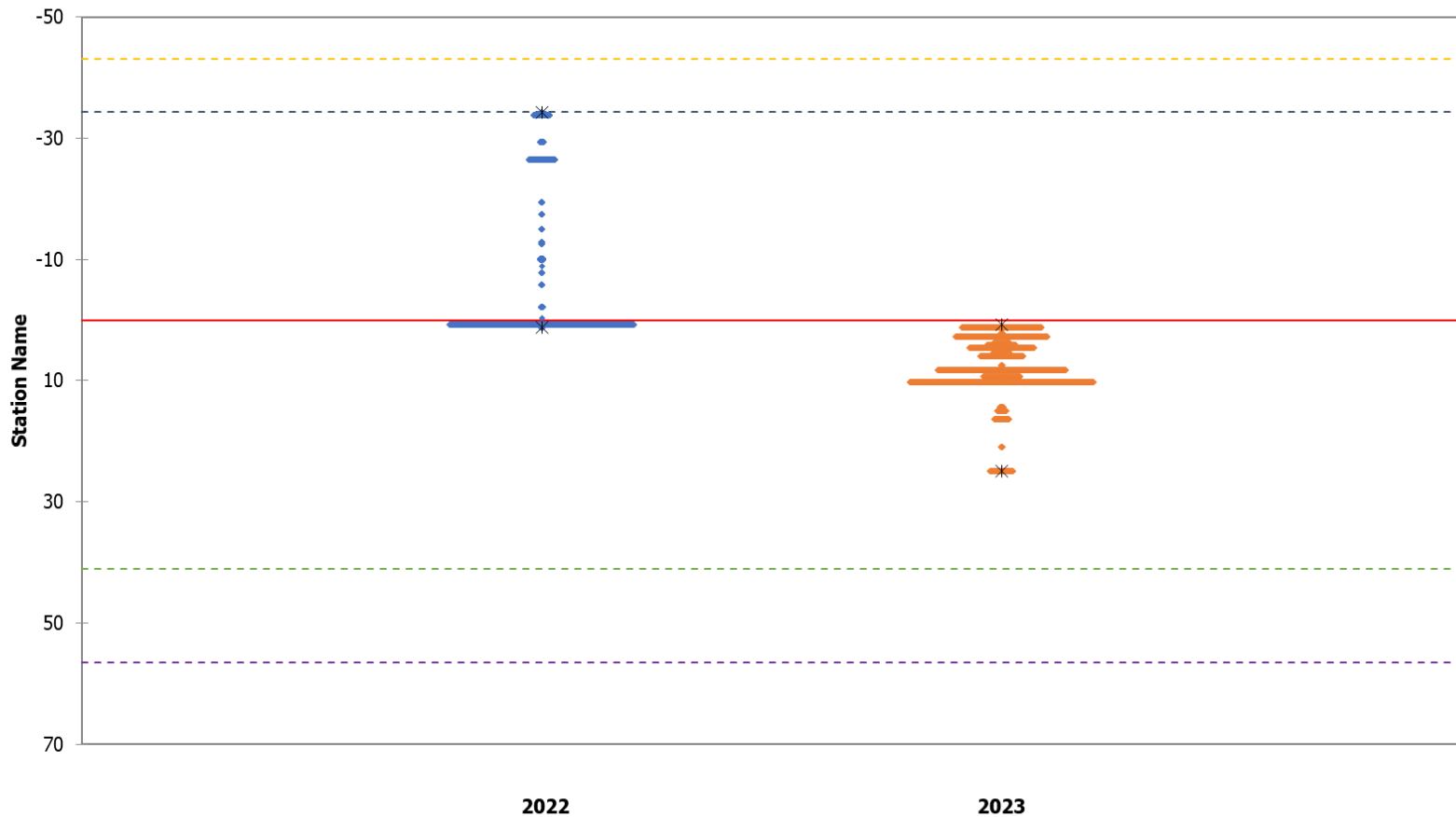


Figure A4-55: Detection ranges and distribution for Lake Sturgeon tagged with an acoustic transmitter (code #57506) in the Keyeyask reservoir in relation to the Keyeyask GS (rkm 0), during each open-water period from May 16, 2022 to October 2, 2023. Minimum and maximum distances from the Keyeyask GS are indicated with a star. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keyeyask GS; green = Kettle GS; purple = Long Spruce GS).

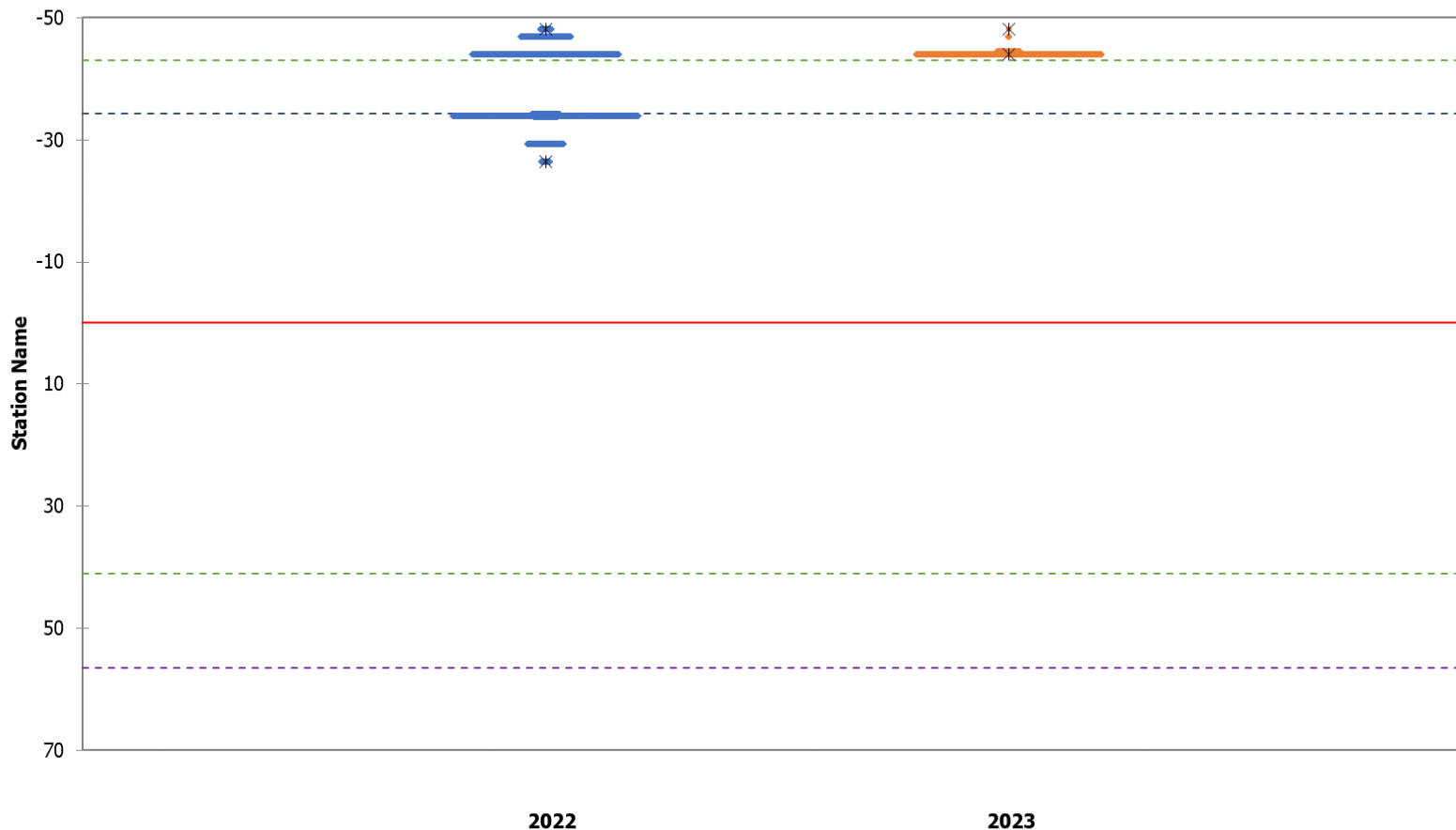


Figure A4-56: Detection ranges and distribution for Lake Sturgeon tagged with an acoustic transmitter (code #57507) in the Keyeyask reservoir in relation to the Keyeyask GS (rkm 0), during each open-water period from May 16, 2022 to October 2, 2023. Minimum and maximum distances from the Keyeyask GS are indicated with a star. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keyeyask GS; green = Kettle GS; purple = Long Spruce GS).

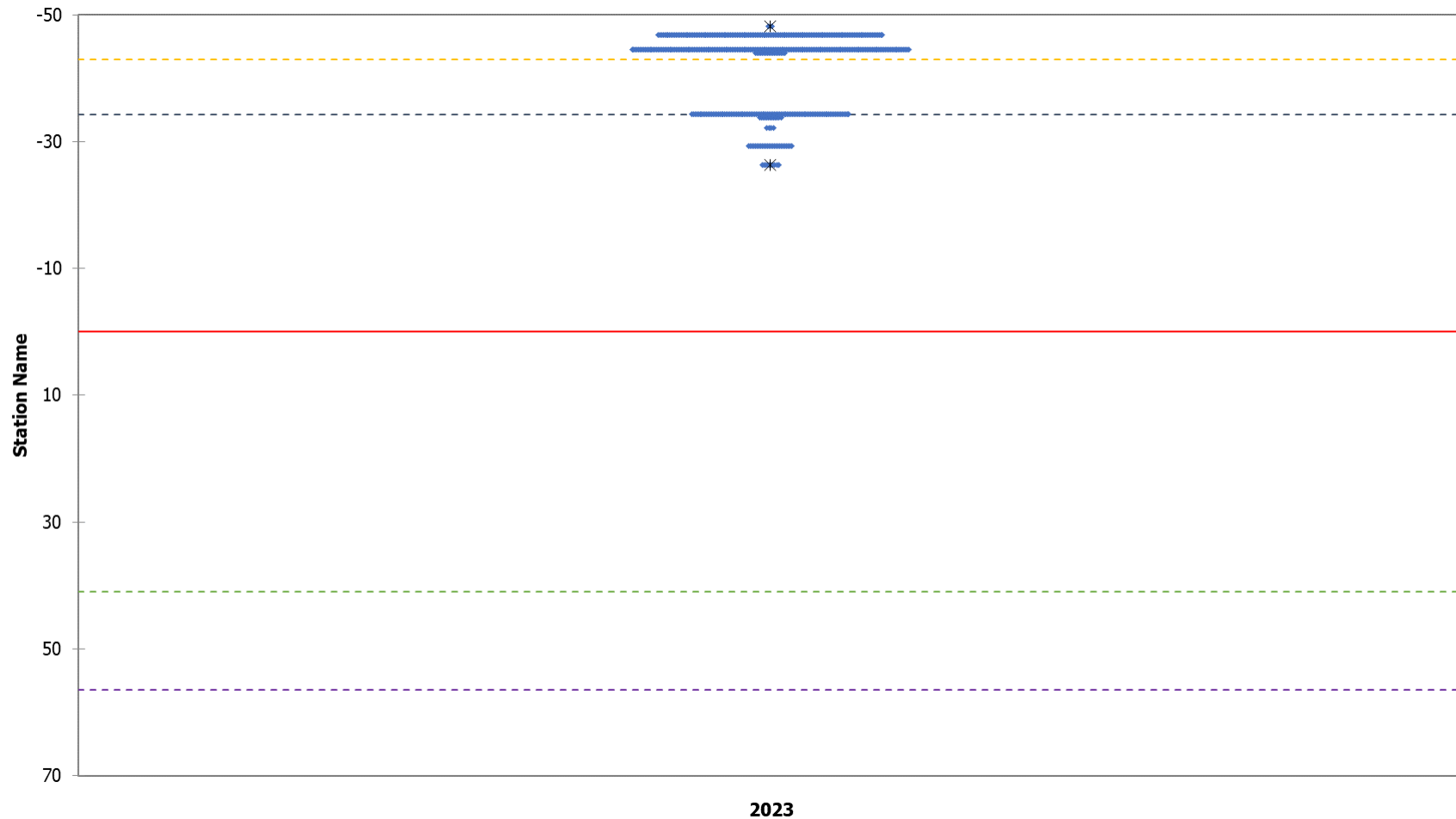


Figure A4-57: Detection ranges and distribution for Lake Sturgeon tagged with an acoustic transmitter (code #51939) in the Keyeyask reservoir in relation to the Keyeyask GS (rkm 0), during each open-water period from May 16, 2023 to October 2, 2023. Minimum and maximum distances from the Keyeyask GS are indicated with a star. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keyeyask GS; green = Kettle GS; purple = Long Spruce GS).

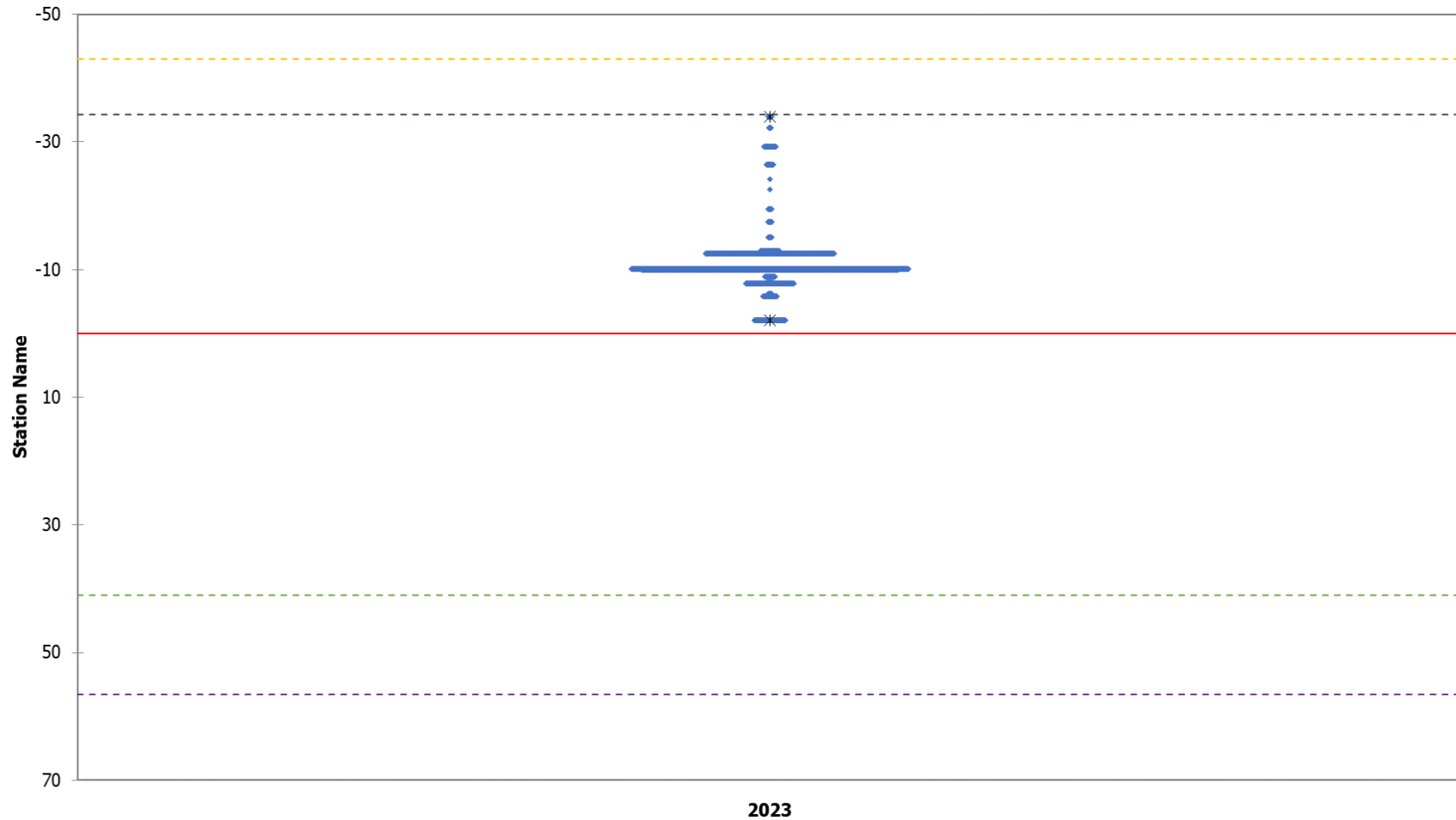


Figure A4-58: Detection ranges and distribution for Lake Sturgeon tagged with an acoustic transmitter (code #51940) in the Keyeyask reservoir in relation to the Keyeyask GS (rkm 0), during each open-water period from May 16, 2023 to October 2, 2023. Minimum and maximum distances from the Keyeyask GS are indicated with a star. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keyeyask GS; green = Kettle GS; purple = Long Spruce GS).

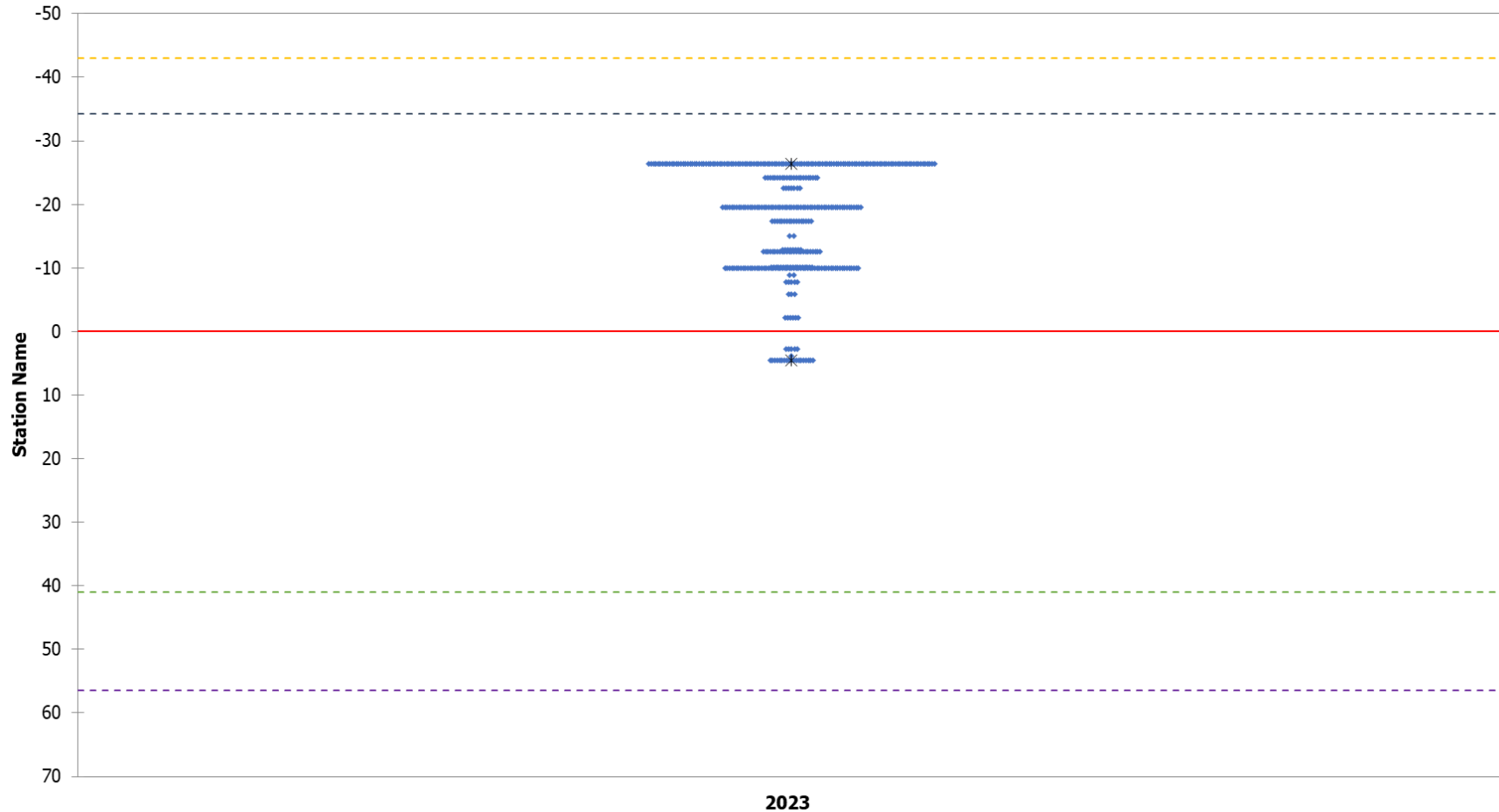


Figure A4-59: Detection ranges and distribution for Lake Sturgeon tagged with an acoustic transmitter (code #51941) in the Keyeyask reservoir in relation to the Keyeyask GS (rkm 0), during each open-water period from May 16, 2023 to October 2, 2023. Minimum and maximum distances from the Keyeyask GS are indicated with a star. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keyeyask GS; green = Kettle GS; purple = Long Spruce GS).

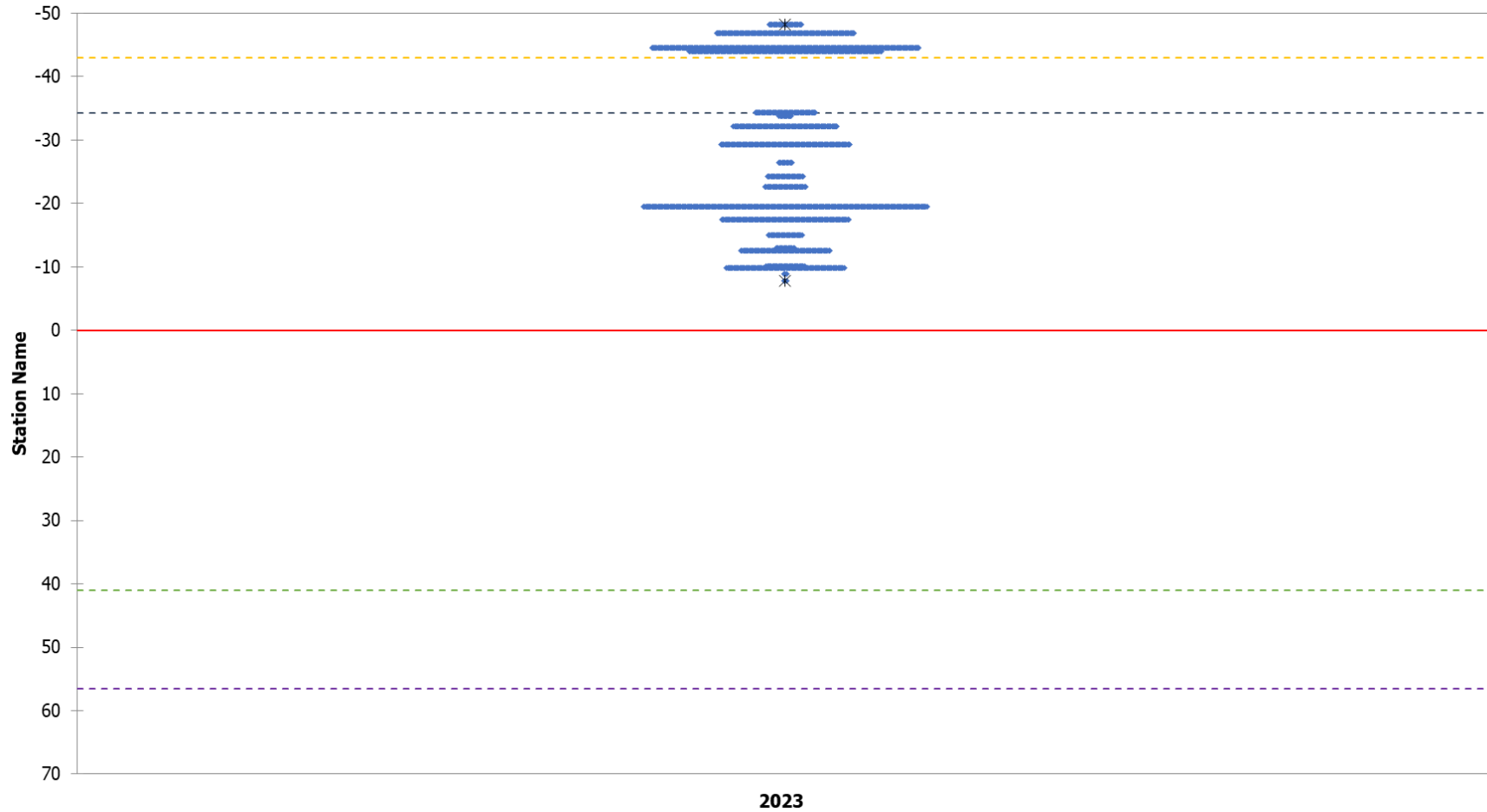


Figure A4-60: Detection ranges and distribution for Lake Sturgeon tagged with an acoustic transmitter (code #51942) in the Keyyask reservoir in relation to the Keyyask GS (rkm 0), during each open-water period from May 16, 2023 to October 2, 2023. Minimum and maximum distances from the Keyyask GS are indicated with a star. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keyyask GS; green = Kettle GS; purple = Long Spruce GS).

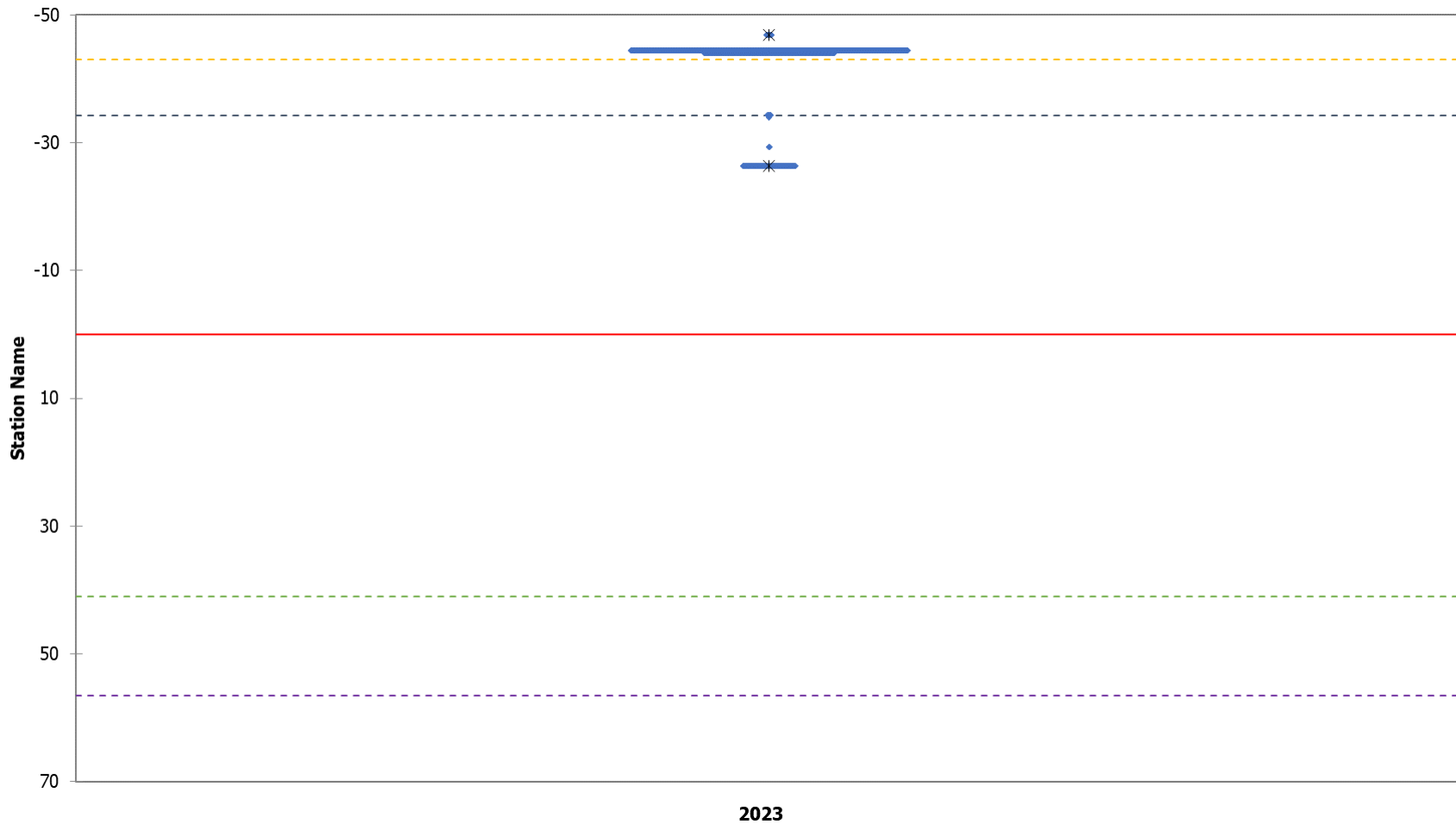


Figure A4-61: Detection ranges and distribution for Lake Sturgeon tagged with an acoustic transmitter (code #51953) in the Keyeyask reservoir in relation to the Keyeyask GS (rkm 0), during each open-water period from May 16, 2023 to October 2, 2023. Minimum and maximum distances from the Keyeyask GS are indicated with a star. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keyeyask GS; green = Kettle GS; purple = Long Spruce GS).

APPENDIX 5: DETECTION RANGES FOR LAKE STURGEON TAGGED AND MONITORED BETWEEN 2019 AND 2023 IN STEPHENS LAKE

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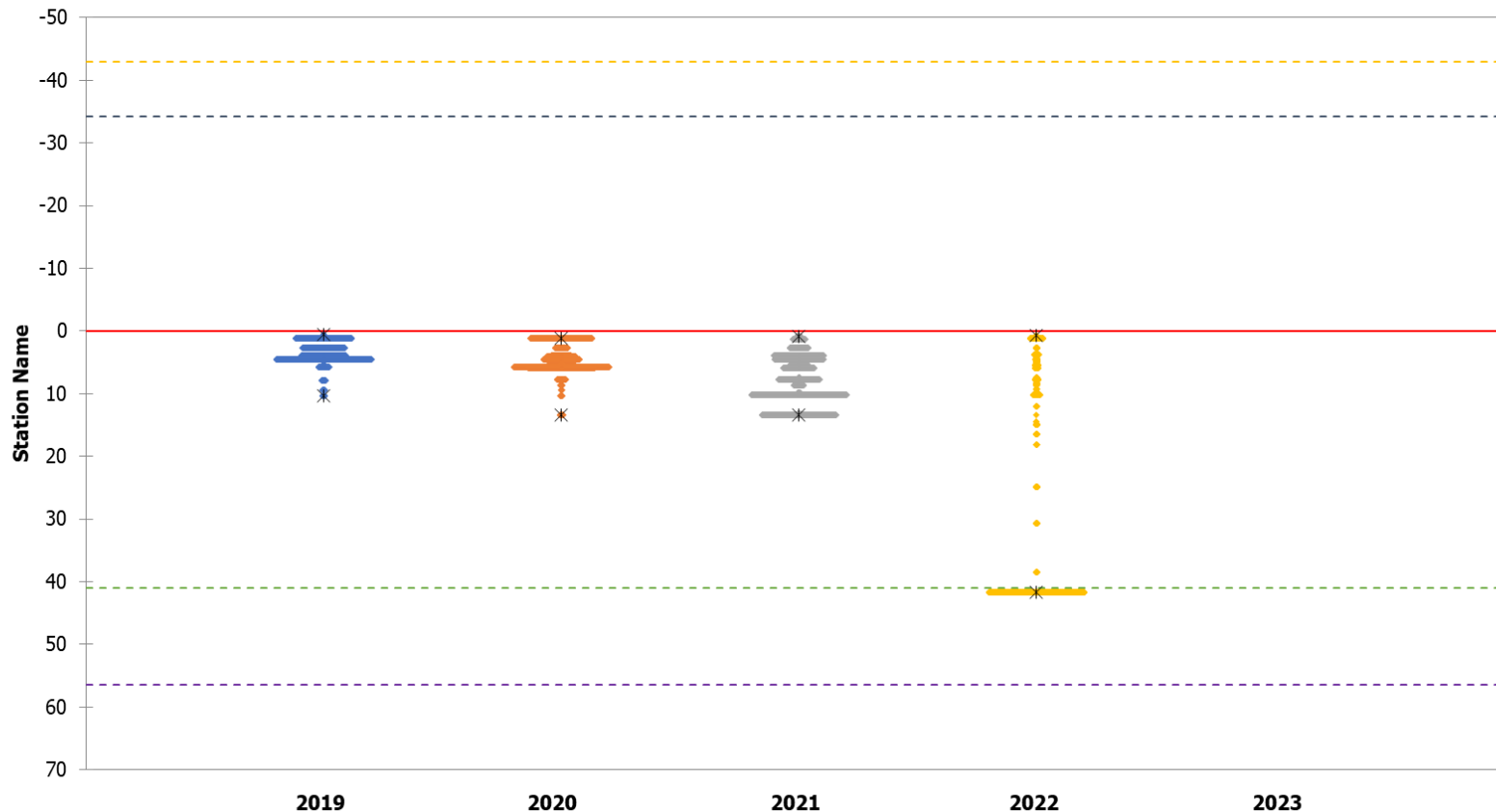


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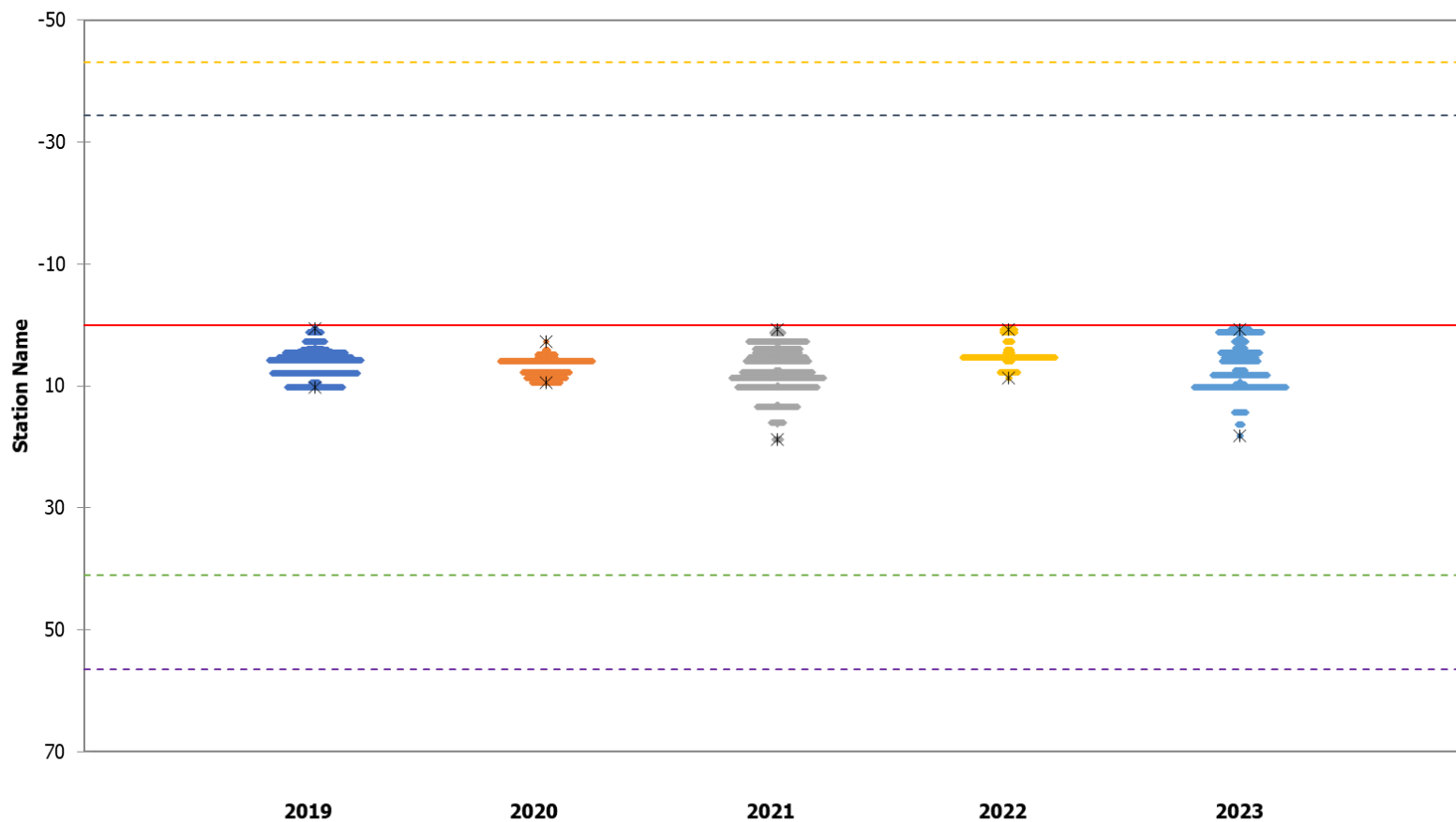


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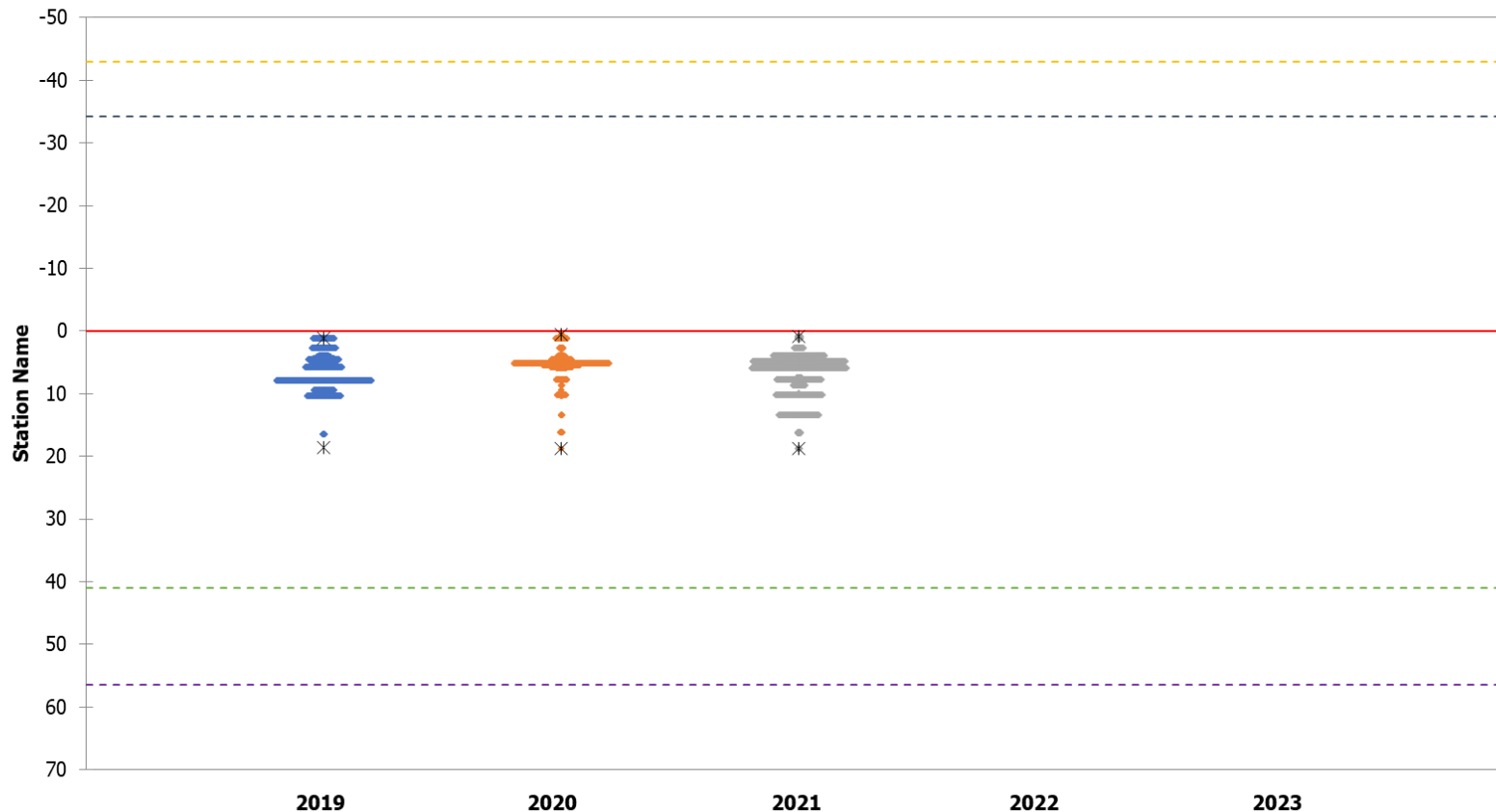


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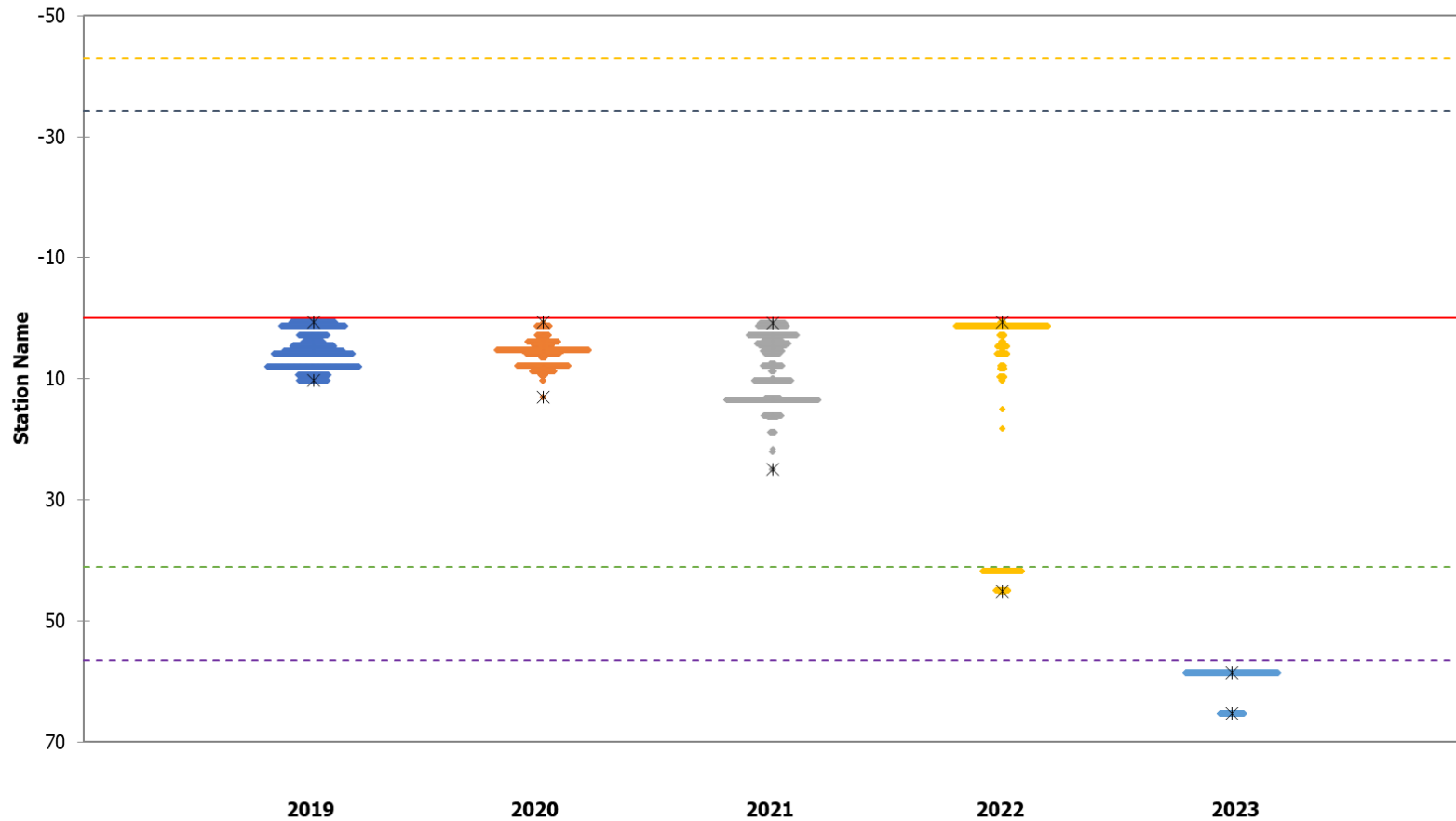


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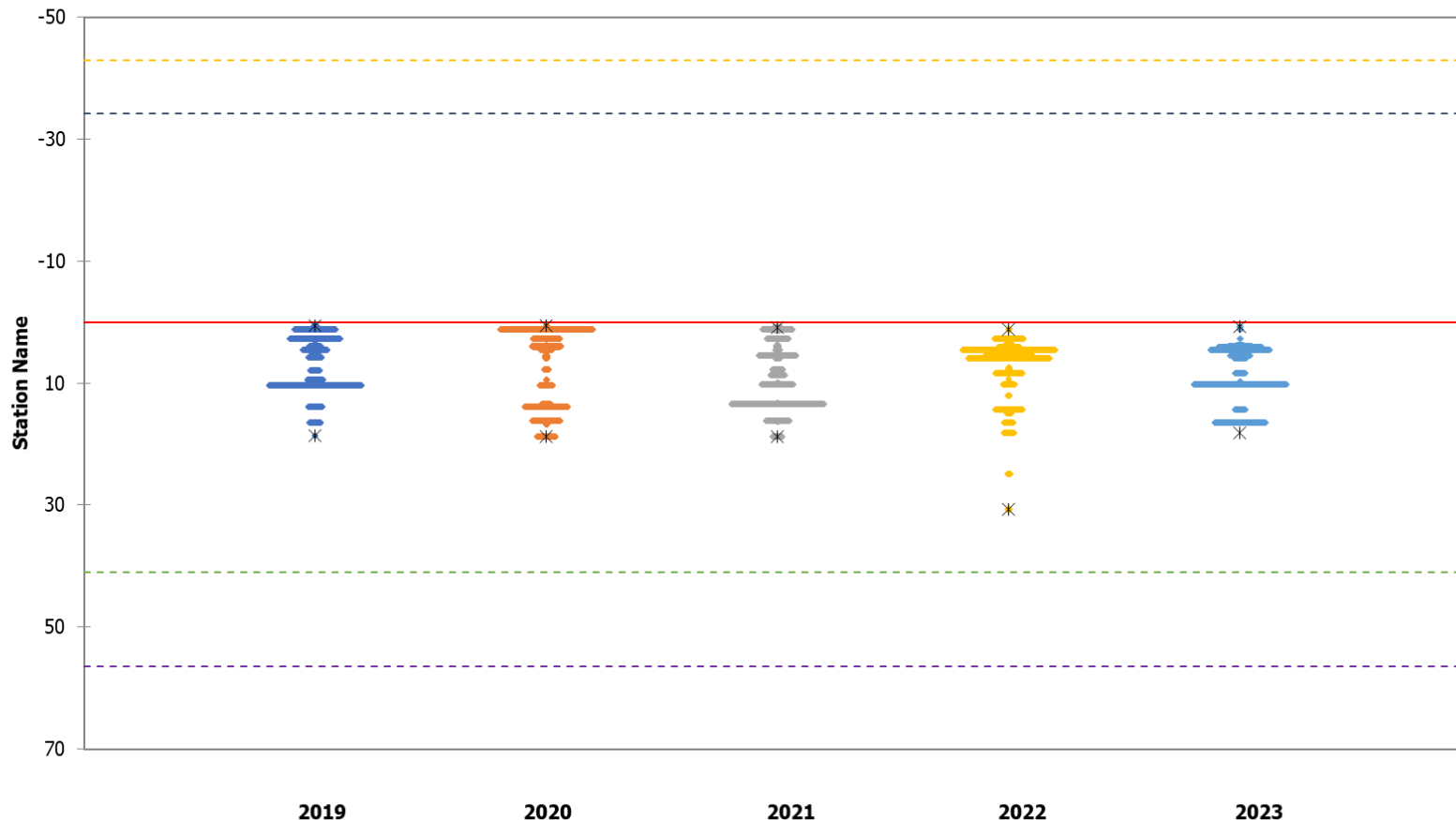


Figure A5-5: Detection ranges and distribution for Lake Sturgeon tagged with an acoustic transmitter (code #7039) in Stephens Lake in relation to the Keeyask GS (rkm 0), during each open-water period from May 1, 2019 to October 2, 2023. Minimum and maximum distances from the Keeyask GS are indicated with a star. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keeyask GS; green = Kettle GS; purple= Long Spruce GS).

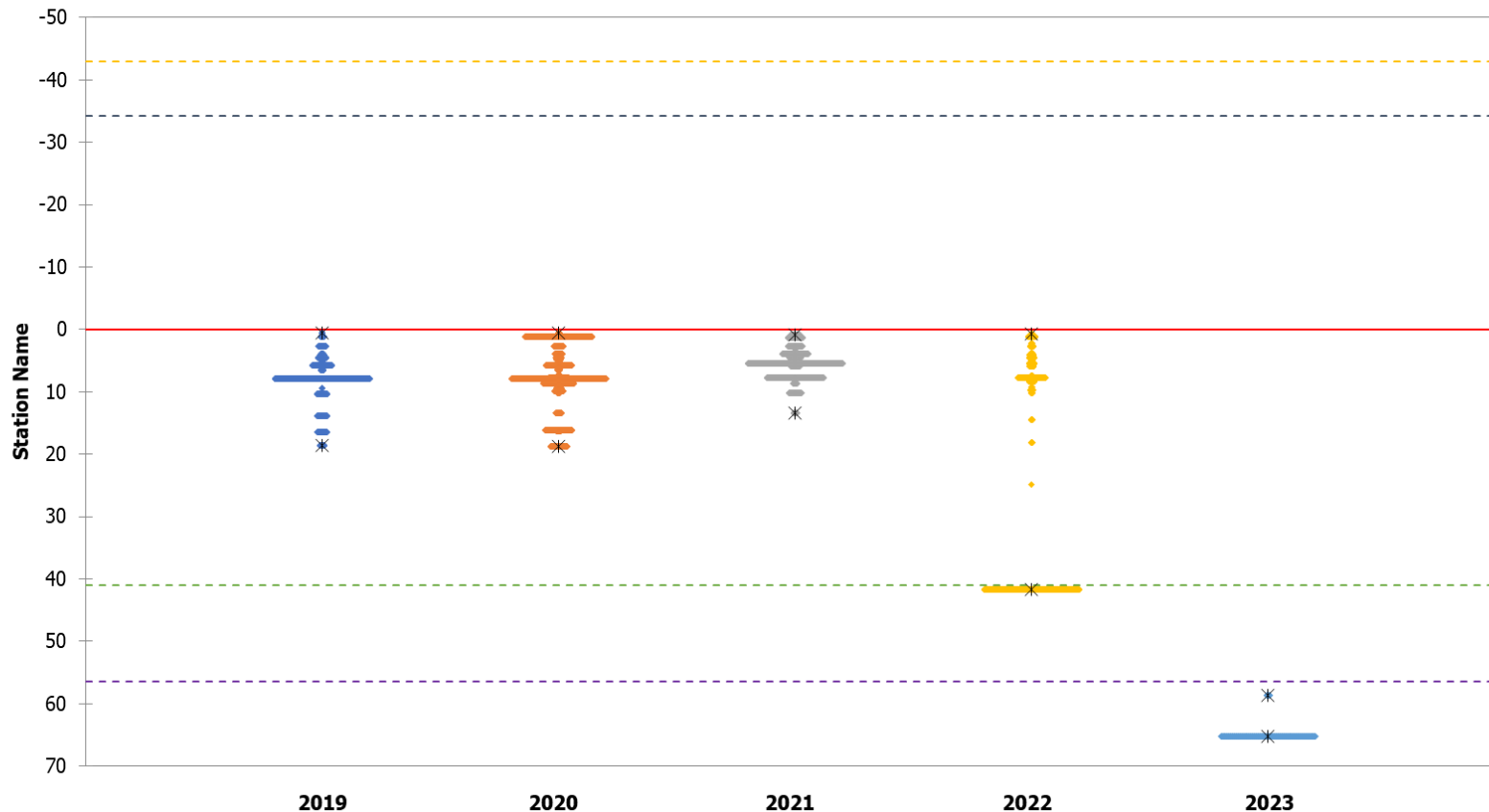


Figure A5-6: Detection ranges and distribution for Lake Sturgeon tagged with an acoustic transmitter (code #7040) in Stephens Lake in relation to the Keeyask GS (rkm 0), during each open-water period from May 1, 2019 to October 2, 2023. Minimum and maximum distances from the Keeyask GS are indicated with a star. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keeyask GS; green = Kettle GS; purple= Long Spruce GS).

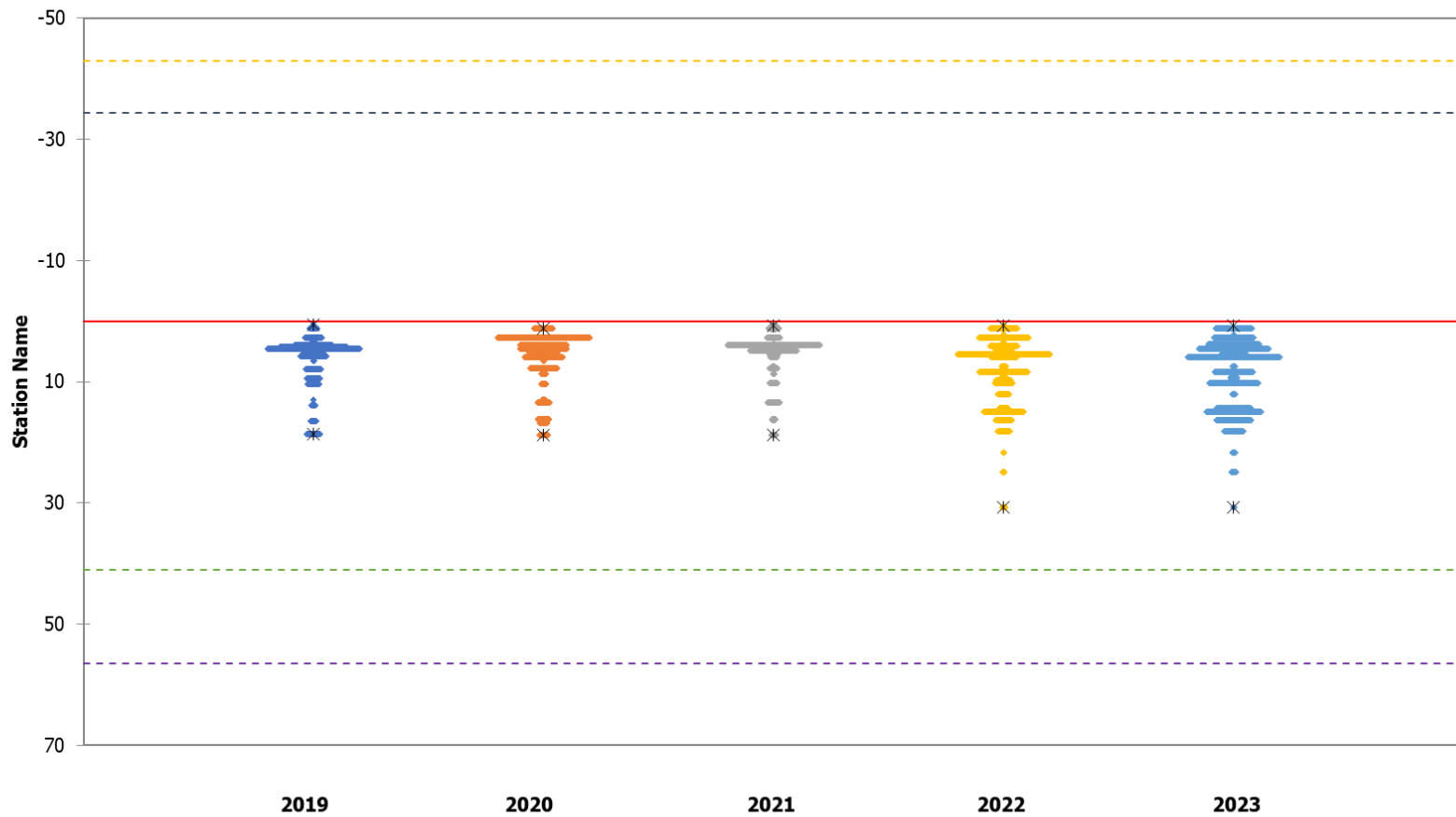


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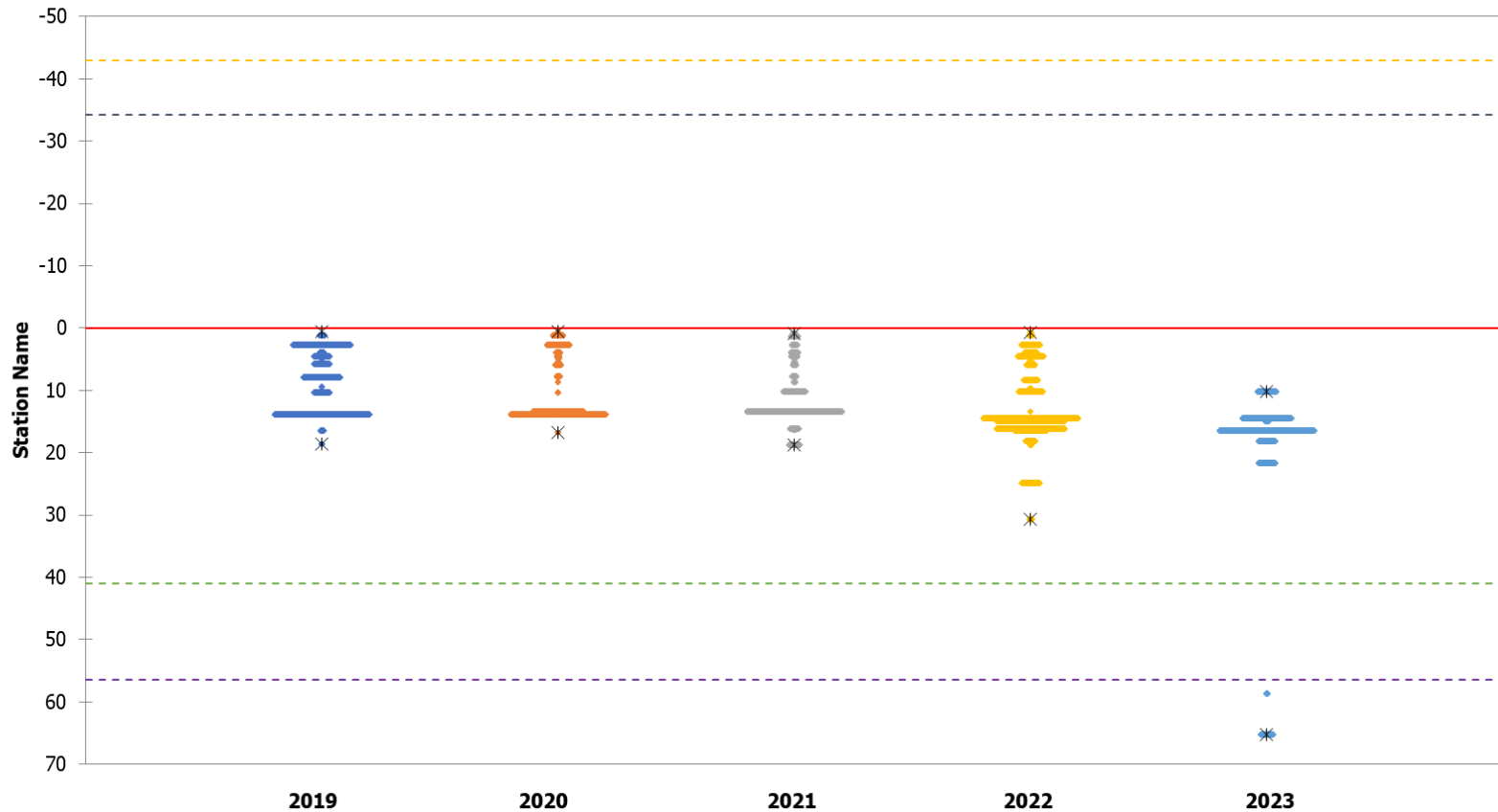


Figure A5-8: Detection ranges and distribution for Lake Sturgeon tagged with an acoustic transmitter (code #7042) in Stephens Lake in relation to the Keeyask GS (rkm 0), during each open-water period from May 1, 2019 to October 2, 2023. Minimum and maximum distances from the Keeyask GS are indicated with a star. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keeyask GS; green = Kettle GS; purple= Long Spruce GS).

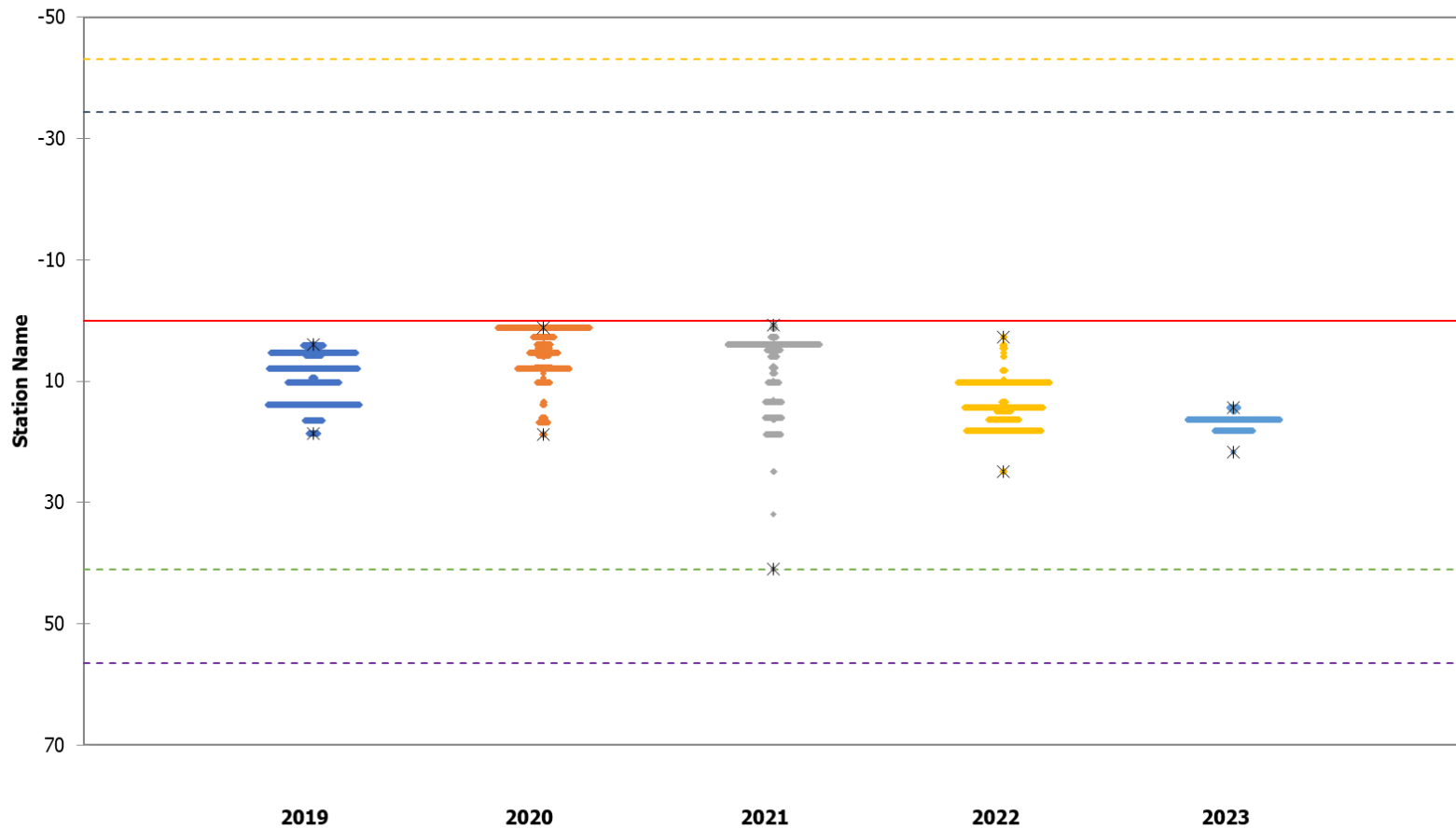


Figure A5-9: Detection ranges and distribution for Lake Sturgeon tagged with an acoustic transmitter (code #7043) in Stephens Lake in relation to the Keeyask GS (rkm 0), during each open-water period from May 1, 2019 to October 2, 2023. Minimum and maximum distances from the Keeyask GS are indicated with a star. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keeyask GS; green = Kettle GS; purple= Long Spruce GS).

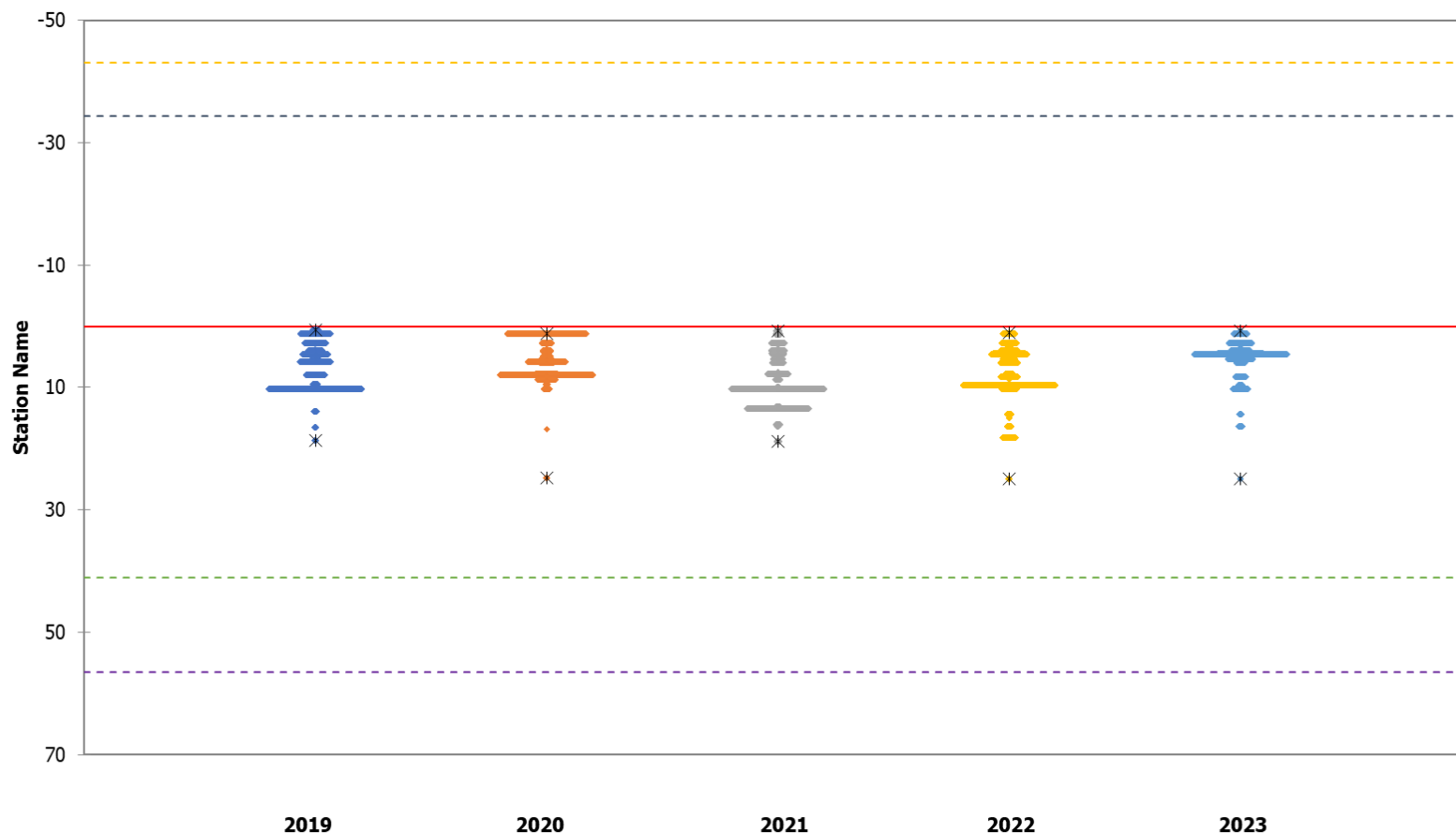


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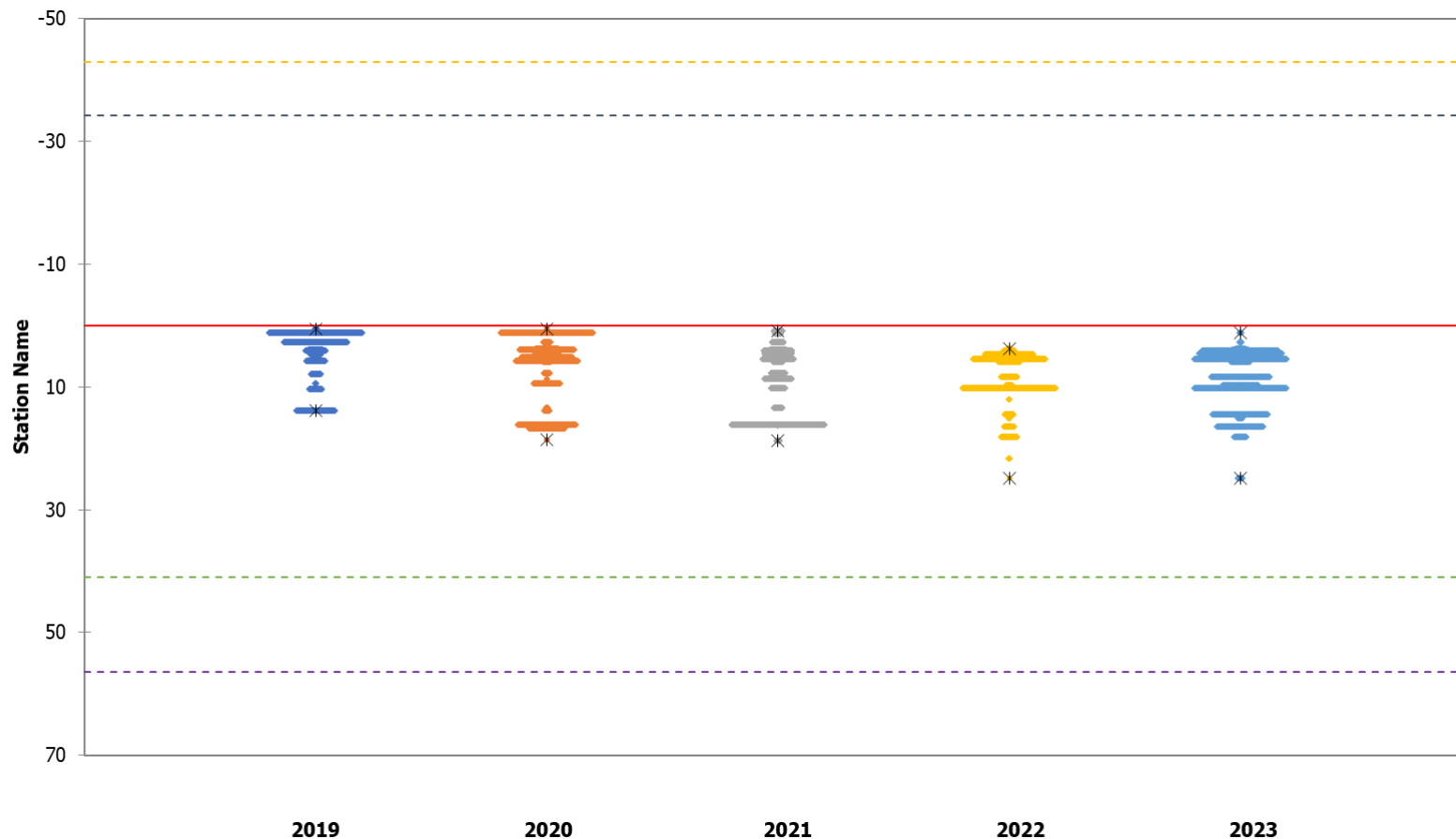


Figure A5-11: Detection ranges and distribution for Lake Sturgeon tagged with an acoustic transmitter (code #7045) in Stephens Lake in relation to the Keeyask GS (rkm 0), during each open-water period from May 1, 2019 to October 2, 2023. Minimum and maximum distances from the Keeyask GS are indicated with a star. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keeyask GS; green = Kettle GS; purple= Long Spruce GS).

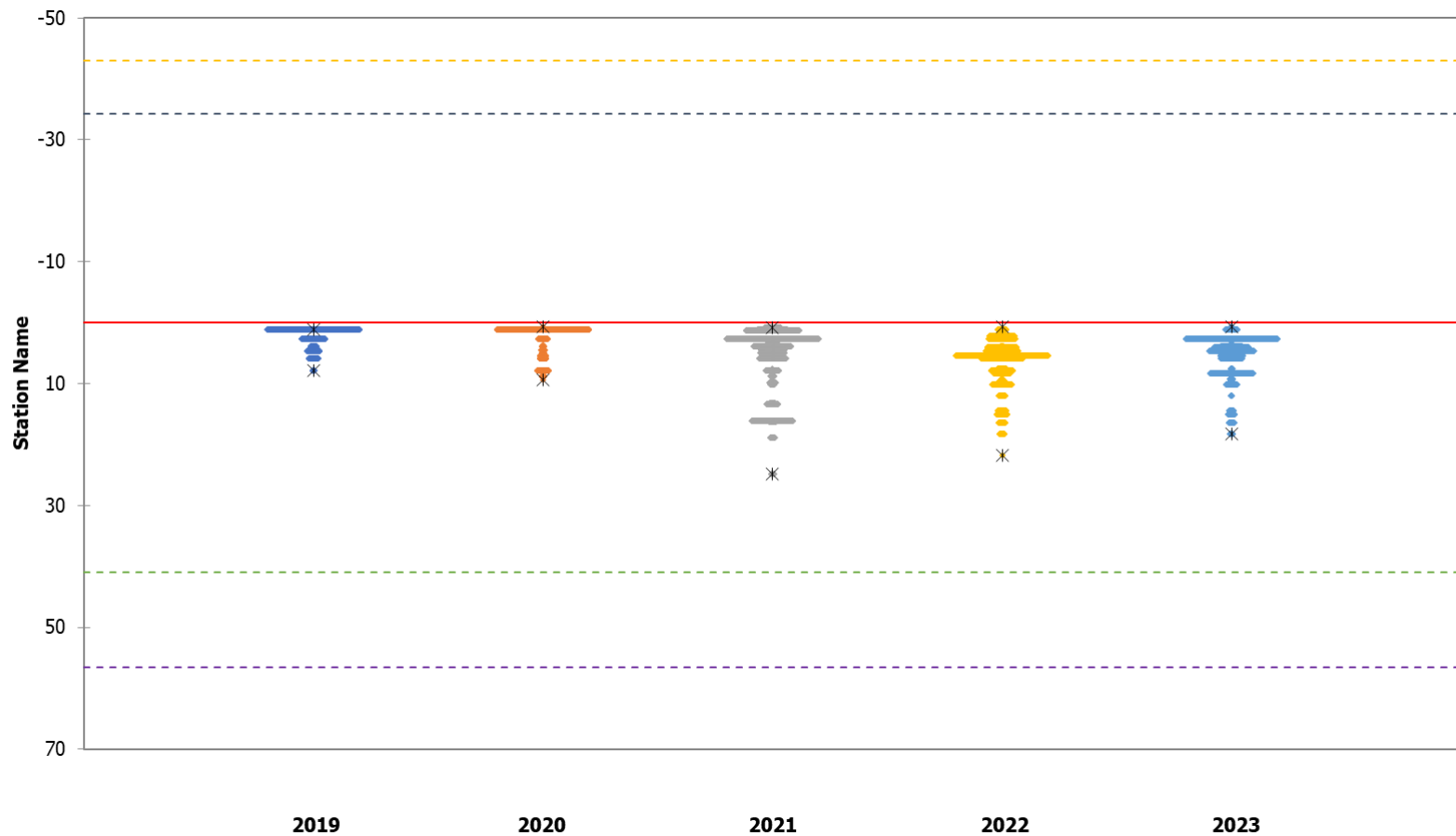


Figure A5-12: Detection ranges and distribution for Lake Sturgeon tagged with an acoustic transmitter (code #7046) in Stephens Lake in relation to the Keeyask GS (rkm 0), during each open-water period from May 1, 2019 to October 2, 2023. Minimum and maximum distances from the Keeyask GS are indicated with a star. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keeyask GS; green = Kettle GS; purple= Long Spruce GS).

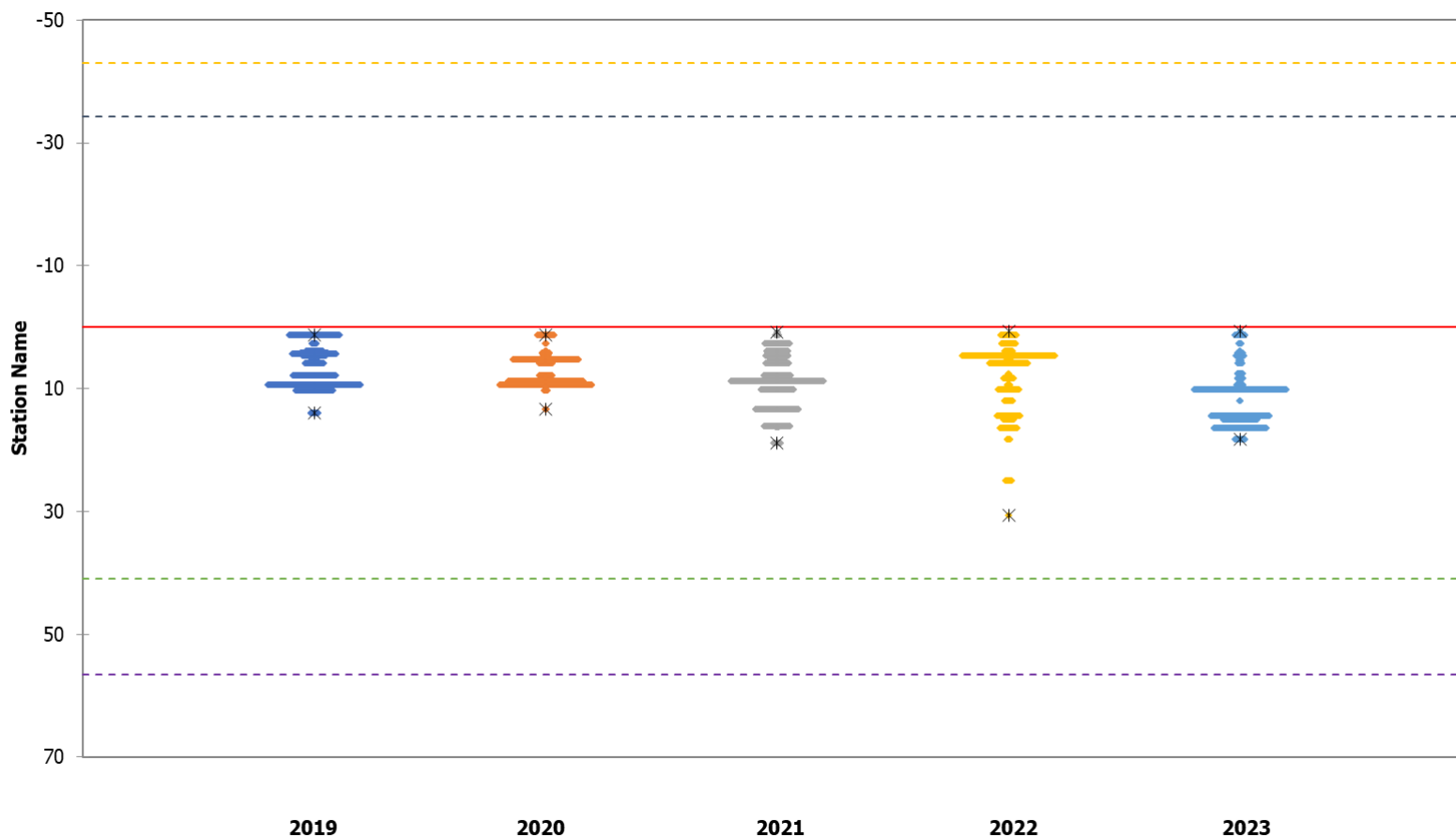


Figure A5-13: Detection ranges and distribution for Lake Sturgeon tagged with an acoustic transmitter (code #7047) in Stephens Lake in relation to the Keeyask GS (rkm 0), during each open-water period from May 1, 2019 to October 2, 2023. Minimum and maximum distances from the Keeyask GS are indicated with a star. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keeyask GS; green = Kettle GS; purple= Long Spruce GS).

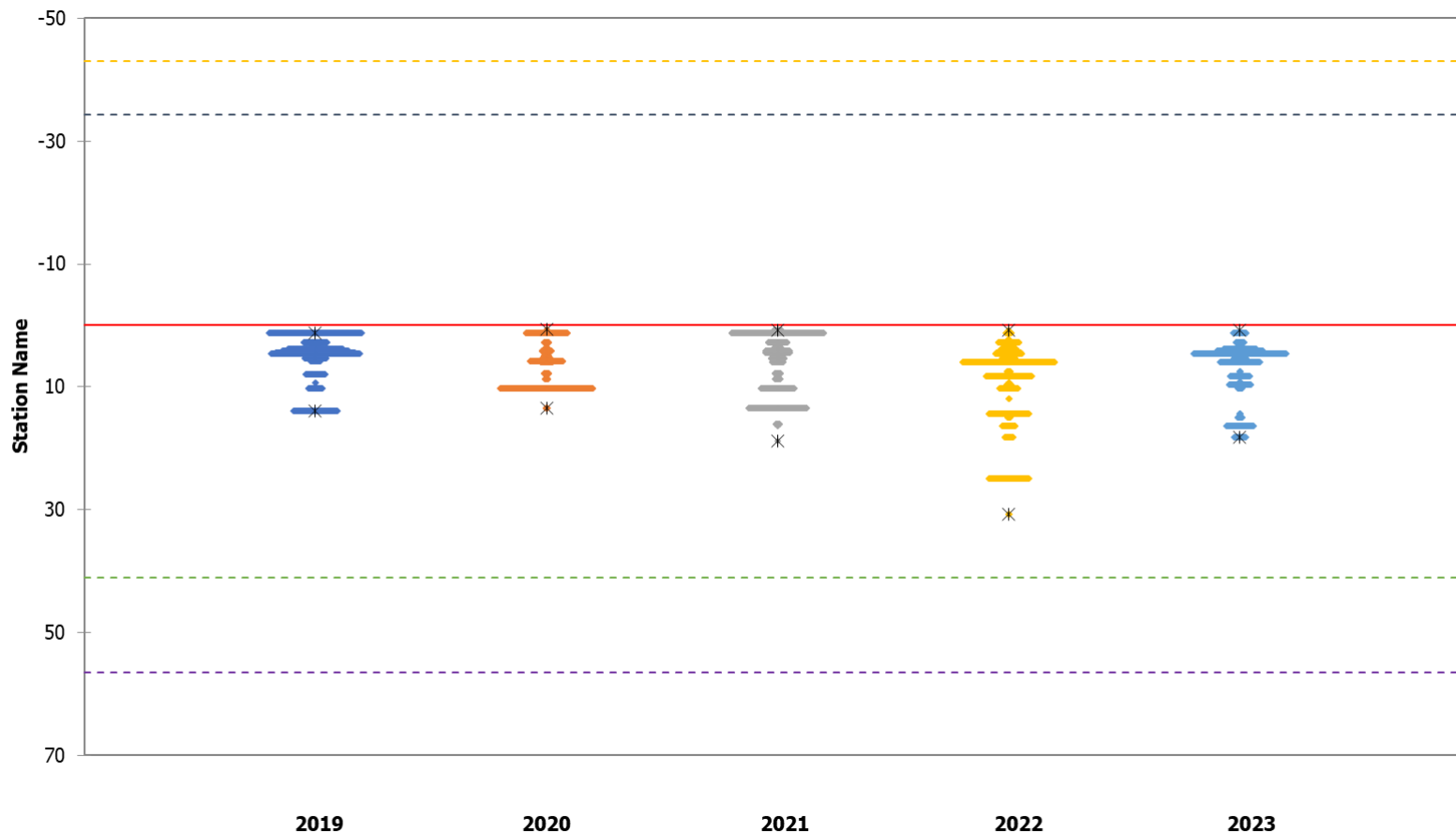


Figure A5-14: Detection ranges and distribution for Lake Sturgeon tagged with an acoustic transmitter (code #7048) in Stephens Lake in relation to the Keeyask GS (rkm 0), during each open-water period from May 1, 2019 to October 2, 2023. Minimum and maximum distances from the Keeyask GS are indicated with a star. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keeyask GS; green = Kettle GS; purple= Long Spruce GS).

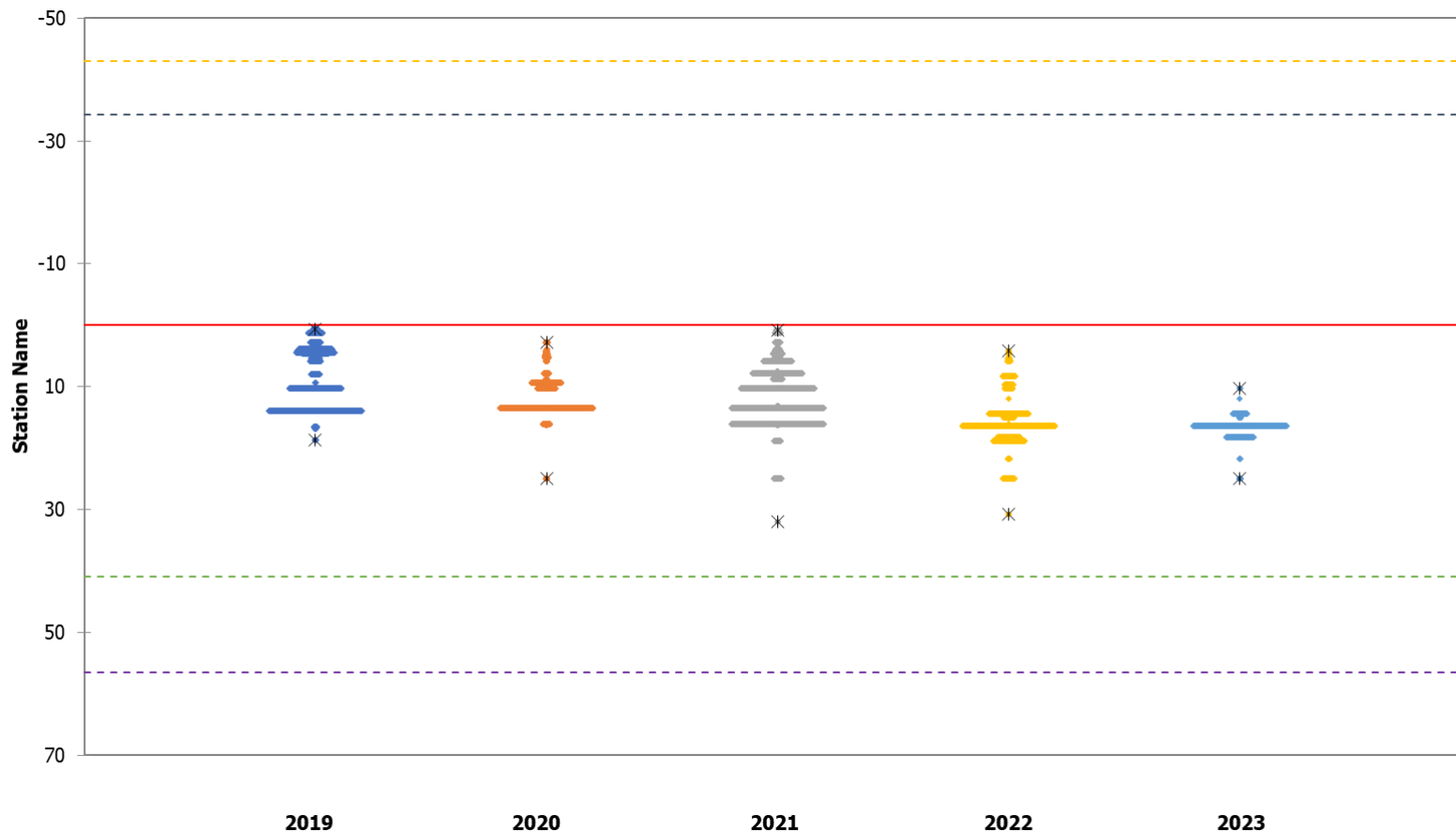


Figure A5-15: Detection ranges and distribution for Lake Sturgeon tagged with an acoustic transmitter (code #7049) in Stephens Lake in relation to the Keeyask GS (rkm 0), during each open-water period from May 1, 2019 to October 2, 2023. Minimum and maximum distances from the Keeyask GS are indicated with a star. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keeyask GS; green = Kettle GS; purple= Long Spruce GS).

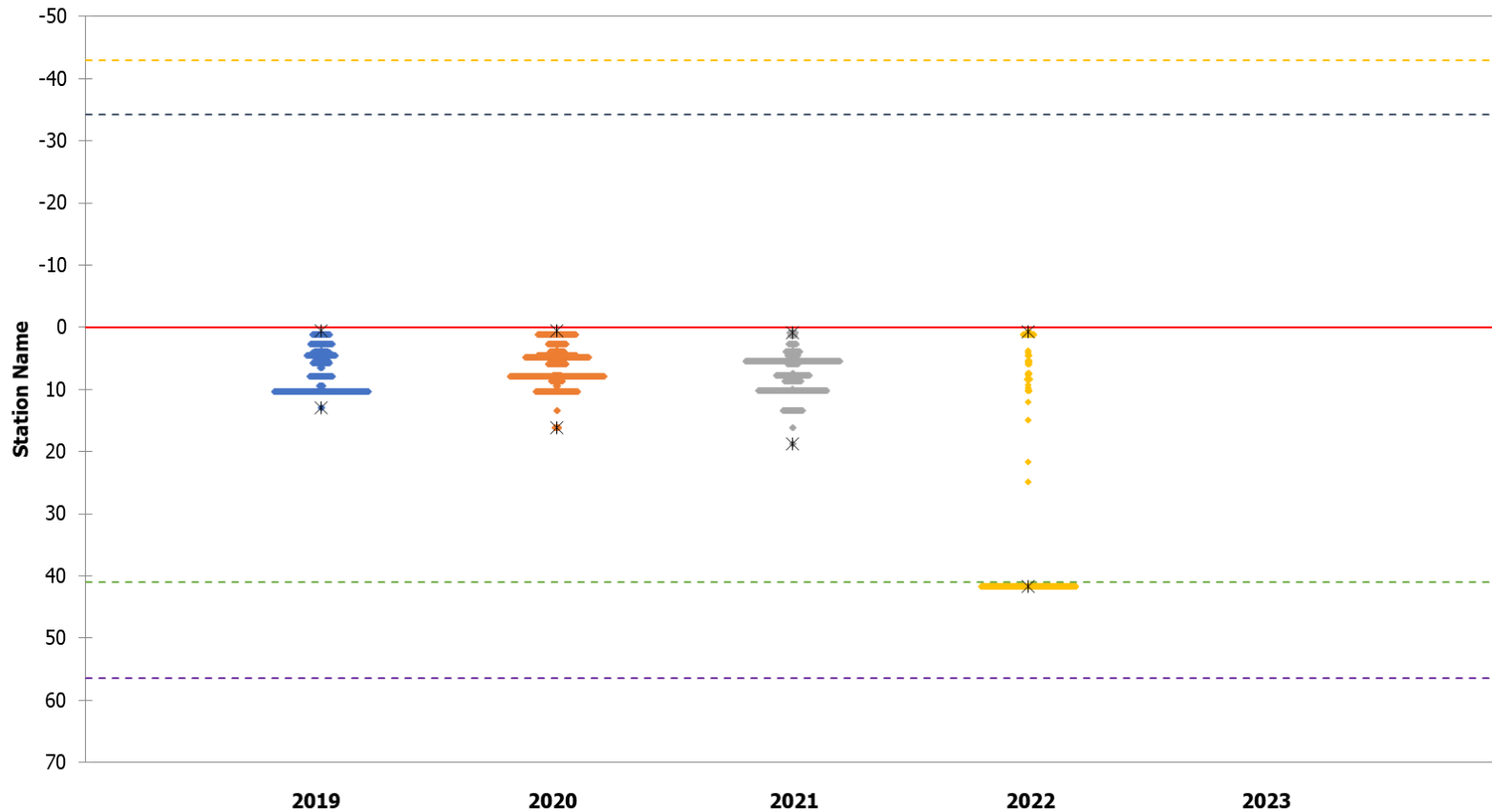


Figure A5-16: Detection ranges and distribution for Lake Sturgeon tagged with an acoustic transmitter (code #7050) in Stephens Lake in relation to the Keeyask GS (rkm 0), during each open-water period from May 1, 2019 to October 2, 2023. Minimum and maximum distances from the Keeyask GS are indicated with a star. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keeyask GS; green = Kettle GS; purple= Long Spruce GS).

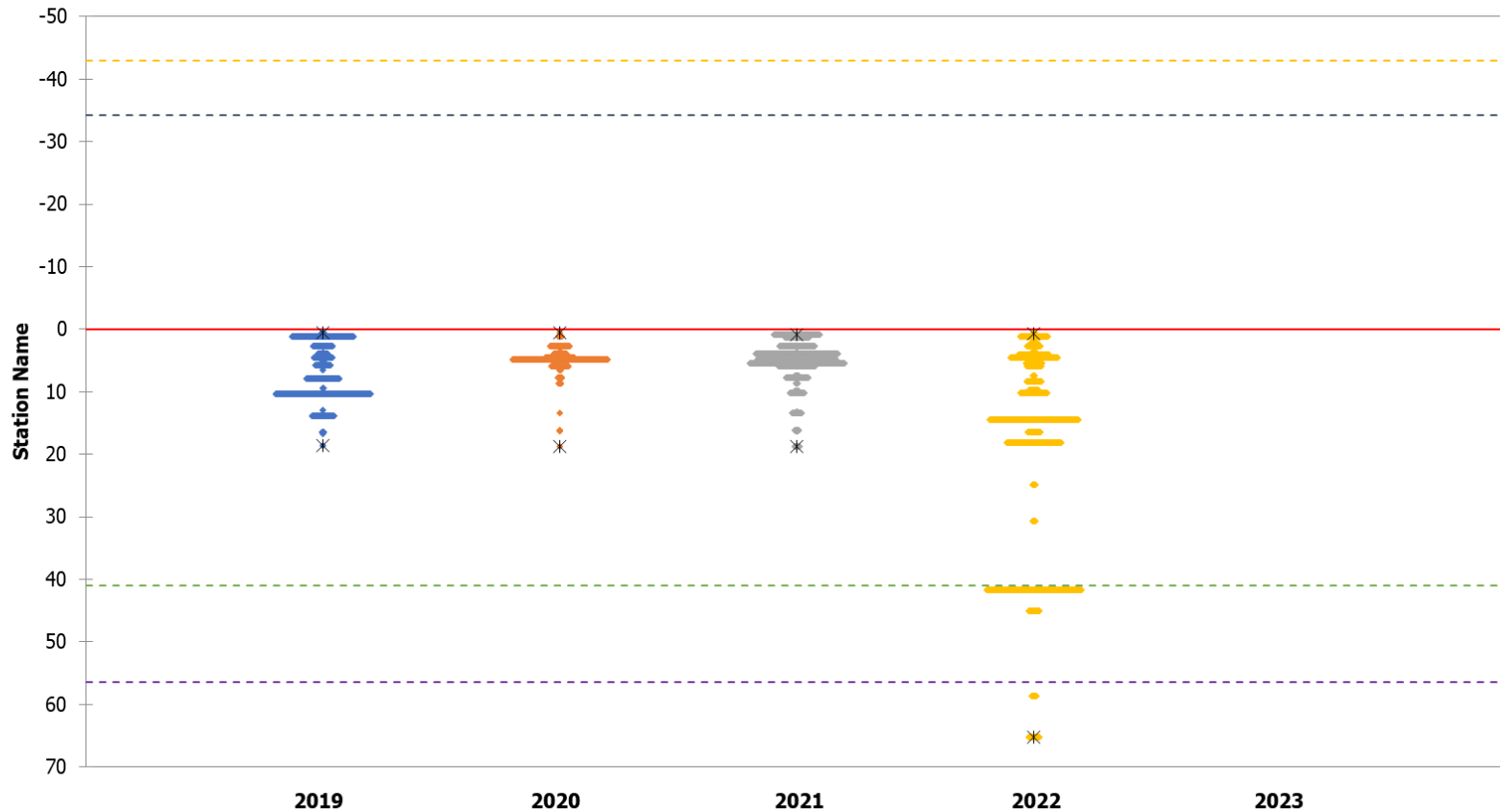


Figure A5-17: Detection ranges and distribution for Lake Sturgeon tagged with an acoustic transmitter (code #7051) in Stephens Lake in relation to the Keeyask GS (rkm 0), during each open-water period from May 1, 2019 to October 2, 2023. Minimum and maximum distances from the Keeyask GS are indicated with a star. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keeyask GS; green = Kettle GS; purple= Long Spruce GS).

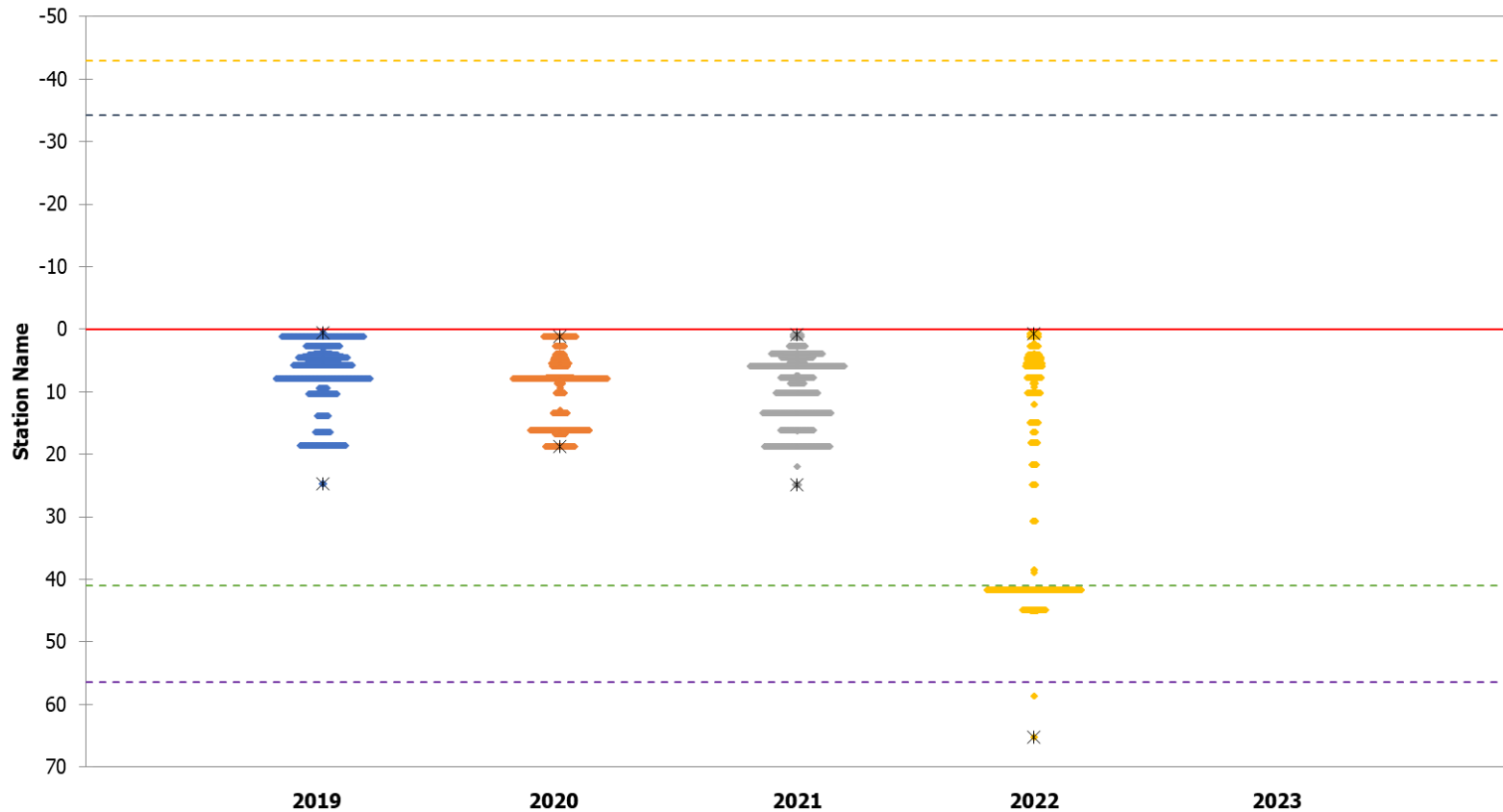


Figure A5-18: Detection ranges and distribution for Lake Sturgeon tagged with an acoustic transmitter (code #7052) in Stephens Lake in relation to the Keeyask GS (rkm 0), during each open-water period from May 1, 2019 to October 2, 2023. Minimum and maximum distances from the Keeyask GS are indicated with a star. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keeyask GS; green = Kettle GS; purple= Long Spruce GS).

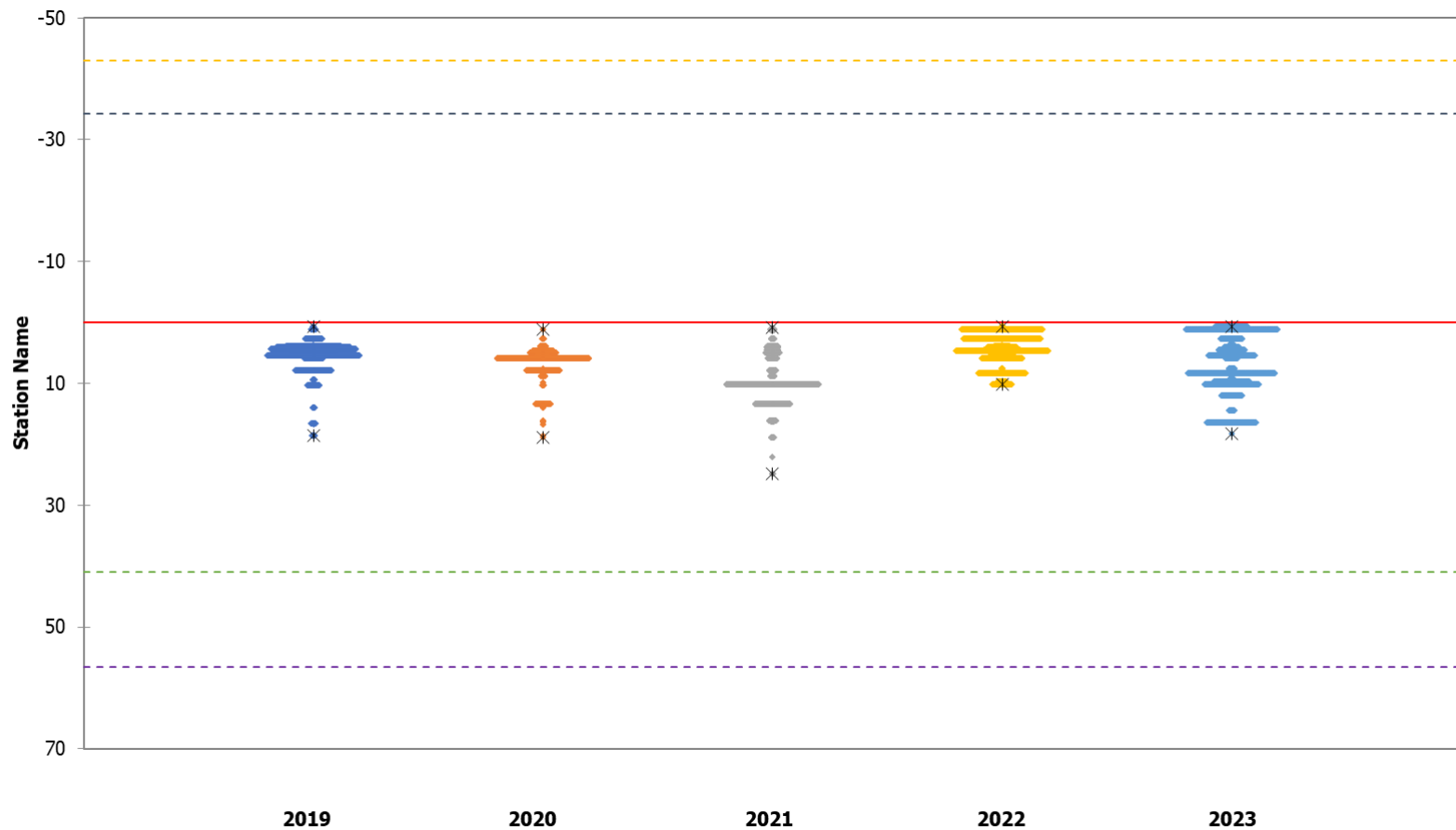


Figure A5-19: Detection ranges and distribution for Lake Sturgeon tagged with an acoustic transmitter (code #7054) in Stephens Lake in relation to the Keeyask GS (rkm 0), during each open-water period from May 1, 2019 to October 2, 2023. Minimum and maximum distances from the Keeyask GS are indicated with a star. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keeyask GS; green = Kettle GS; purple= Long Spruce GS).

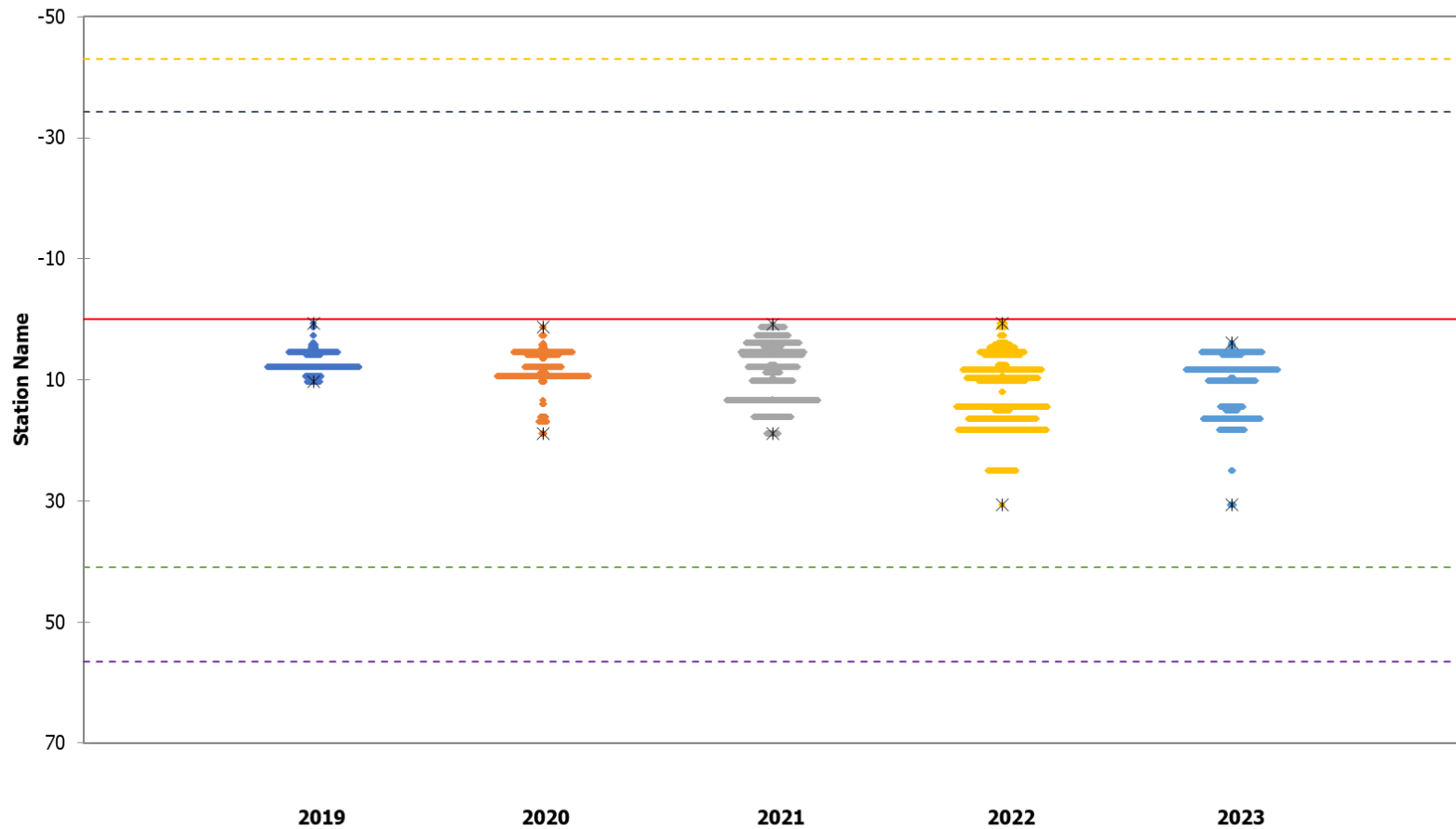


Figure A5-20: Detection ranges and distribution for Lake Sturgeon tagged with an acoustic transmitter (code #7055) in Stephens Lake in relation to the Keeyask GS (rkm 0), during each open-water period from May 1, 2019 to October 2, 2023. Minimum and maximum distances from the Keeyask GS are indicated with a star. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keeyask GS; green = Kettle GS; purple= Long Spruce GS).



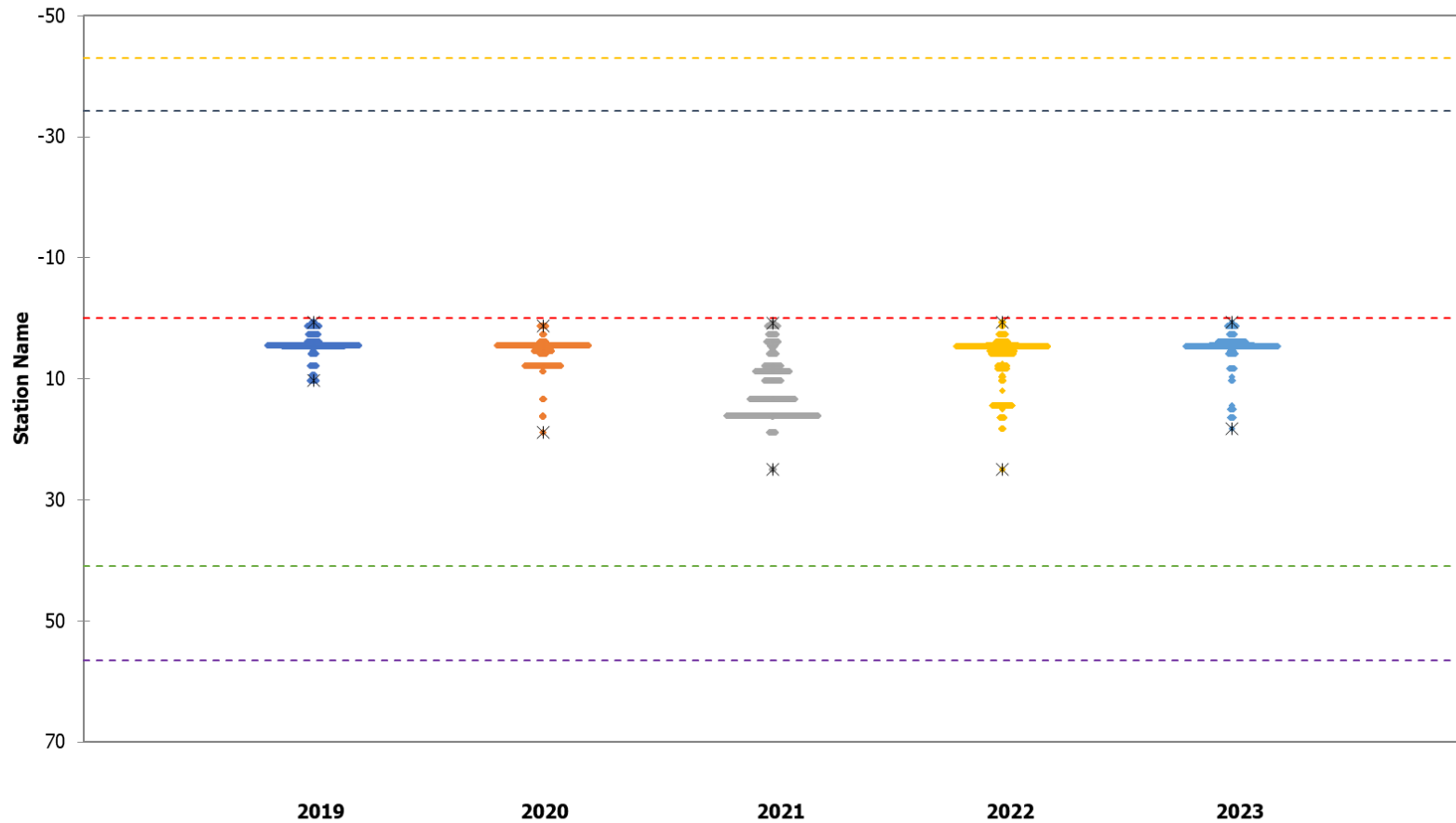


Figure A5-21: Detection ranges and distribution for Lake Sturgeon tagged with an acoustic transmitter (code #7057) in Stephens Lake in relation to the Keeyask GS (rkm 0), during each open-water period from May 1, 2019 to October 2, 2023. Minimum and maximum distances from the Keeyask GS are indicated with a star. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keeyask GS; green = Kettle GS; purple= Long Spruce GS).

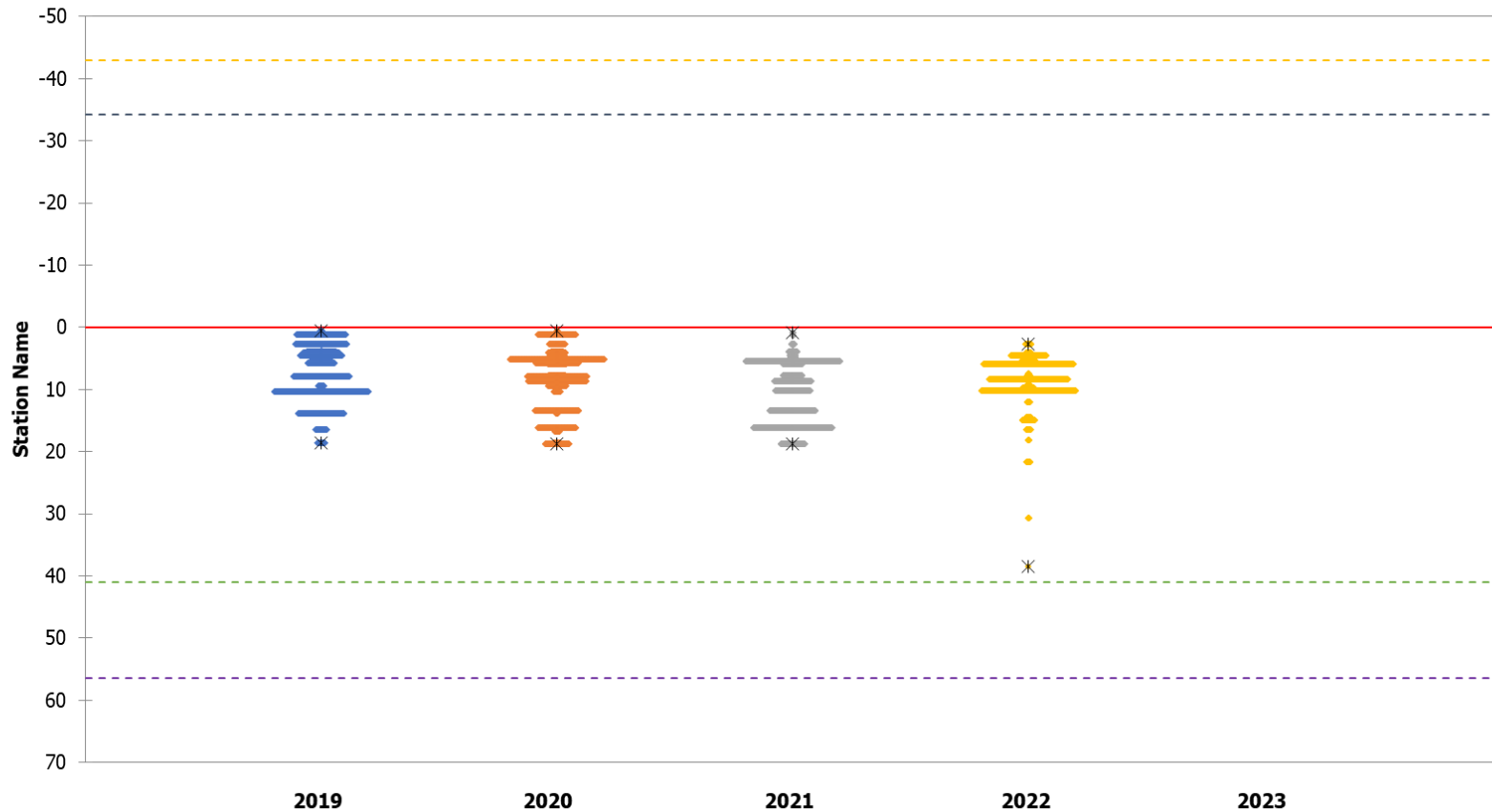


Figure A5-22: Detection ranges and distribution for Lake Sturgeon tagged with an acoustic transmitter (code #7058) in Stephens Lake in relation to the Keeyask GS (rkm 0), during each open-water period from May 1, 2019 to October 2, 2023. Minimum and maximum distances from the Keeyask GS are indicated with a star. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keeyask GS; green = Kettle GS; purple= Long Spruce GS).

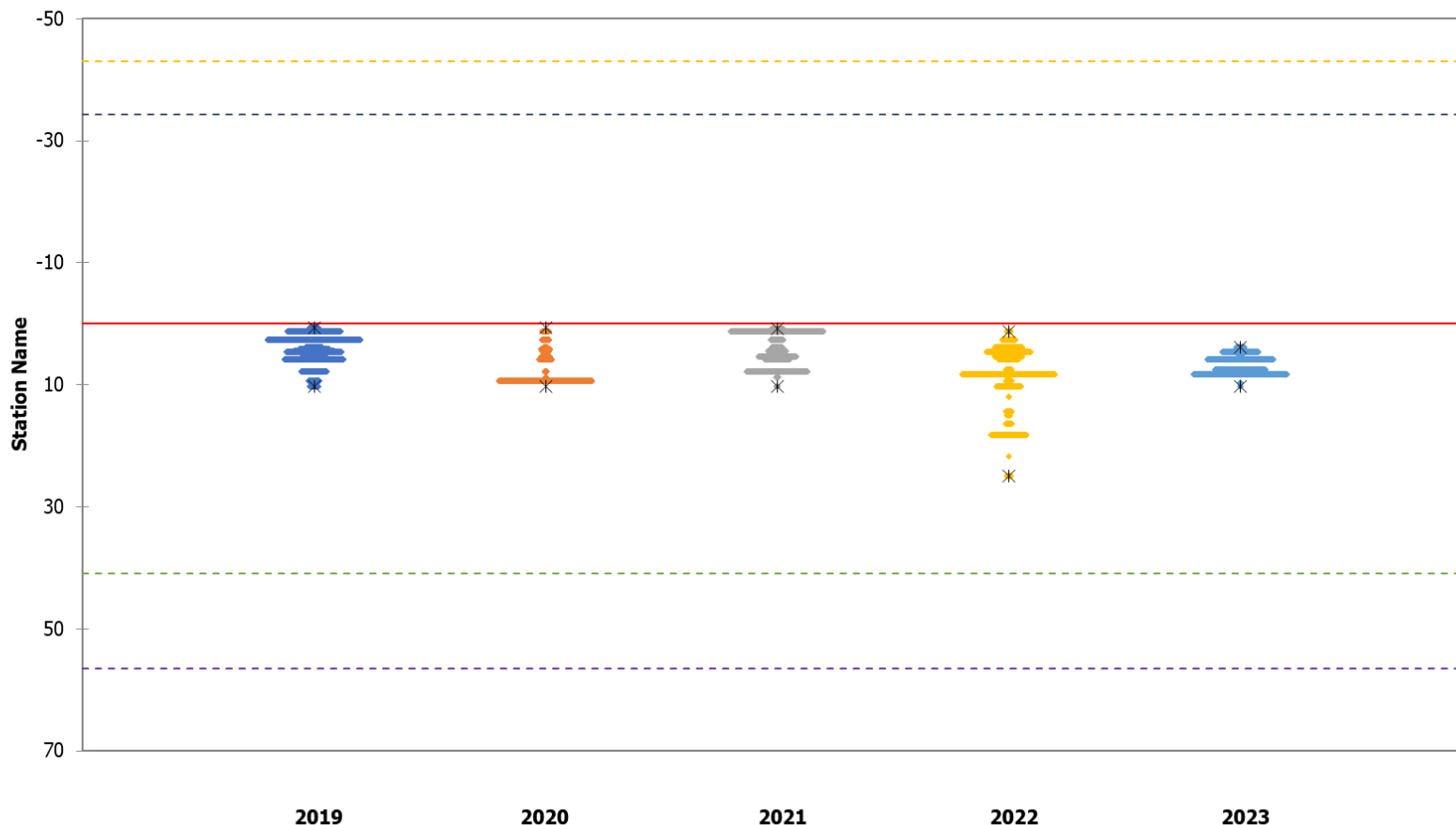


Figure A5-23: Detection ranges and distribution for Lake Sturgeon tagged with an acoustic transmitter (code #7060) in Stephens Lake in relation to the Keeyask GS (rkm 0), during each open-water period from May 1, 2019 to October 2, 2023. Minimum and maximum distances from the Keeyask GS are indicated with a star. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keeyask GS; green = Kettle GS; purple= Long Spruce GS).

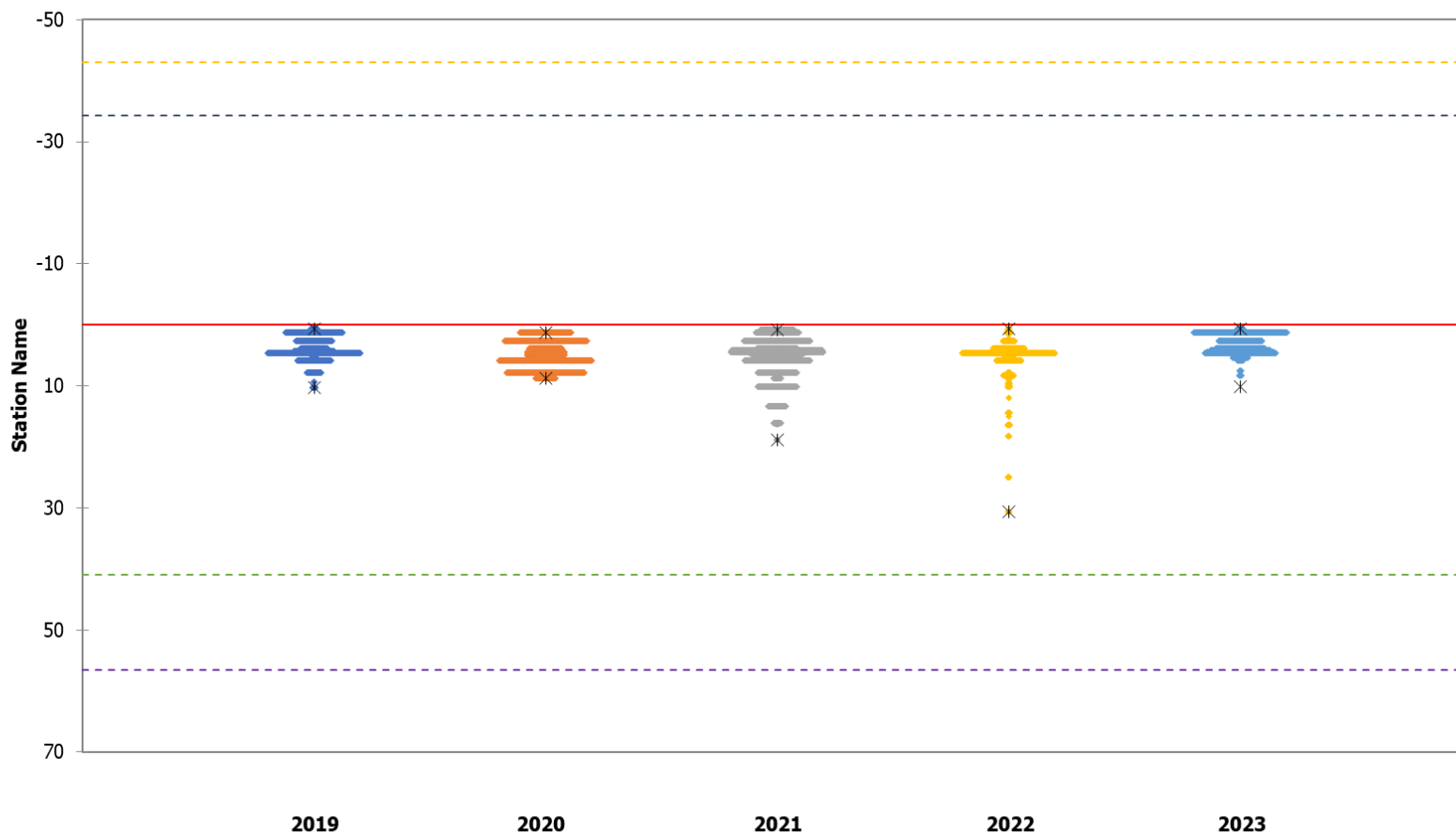


Figure A5-24: Detection ranges and distribution for Lake Sturgeon tagged with an acoustic transmitter (code #7062) in Stephens Lake in relation to the Keeyask GS (rkm 0), during each open-water period from May 1, 2019 to October 2, 2023. Minimum and maximum distances from the Keeyask GS are indicated with a star. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keeyask GS; green = Kettle GS; purple= Long Spruce GS).

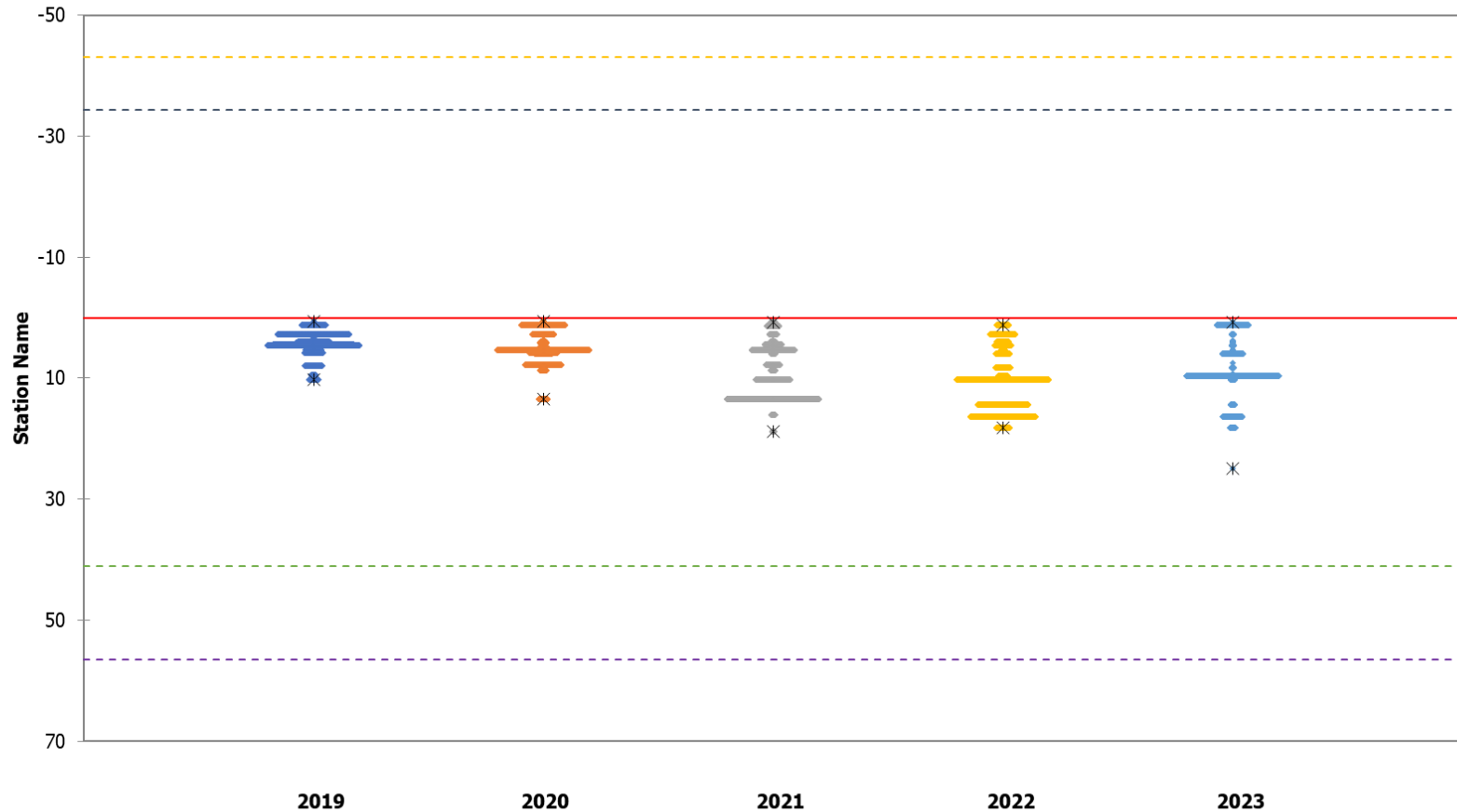


Figure A5-25: Detection ranges and distribution for Lake Sturgeon tagged with an acoustic transmitter (code #7063) in Stephens Lake in relation to the Keeyask GS (rkm 0), during each open-water period from May 1, 2019 to October 2, 2023. Minimum and maximum distances from the Keeyask GS are indicated with a star. Landmarks are indicated with horizontal dotted lines (orange = Clark Lake outlet; blue = Birthday Rapids; red = Keeyask GS; green = Kettle GS; purple= Long Spruce GS).



**APPENDIX 6:
TAGGING AND RECAPTURE INFORMATION
ASSOCIATED WITH ADULT LAKE STURGEON
IMPLANTED WITH ACOUSTIC TRANSMITTERS
THAT HAVE EXPIRED BETWEEN 2011 AND 2022.**

Table A6-1: Tagging, tag expiry, and subsequent recapture information for adult Lake Sturgeon tagged with acoustic transmitters in the Keeyask reservoir following tag expiry.276

Table A6-2: Tagging, tag expiry, and subsequent recapture information for adult Lake Sturgeon tagged with acoustic transmitters in Stephens Lake following tag expiry.278

Table A6-1: Tagging, tag expiry, and subsequent recapture information for adult Lake Sturgeon tagged with acoustic transmitters in the Keeyask reservoir following tag expiry.

Acoustic Tag	Floy Tag	Tagging Date	Estimated Tag Expiry Date	Date of Last Detection	Location of Last Detection	Recapture Date	Recapture Location	Recapture Program
16026	100450	12-Jun-11	17-Jun-22	17-Jun-22	Stephens Lake	-	-	-
16036	74400	05-Jun-11	02-Jun-21	02-Jun-21	Gull Lake	-	-	-
16039	48596	05-Jun-11	02-Jun-21	02-Jun-21	Gull Lake	-	-	-
16042	74399	05-Jun-11	02-Jun-21	08-Aug-14	Clark Lake	-	-	-
16045	77516	18-Aug-11	07-Jun-21	10-Jun-11	Gull Lake	-	-	-
16048	94396	07-Jun-11	04-Jun-21	25-Sep-20	Stephens Lake	-	-	-
16051	74394	10-Jun-11	07-Jun-21	04-Jun-21	Gull Lake	-	-	-
16054	74398	06-Jun-11	03-Jun-21	03-Jun-21	Upstream Birthday Rapids	-	-	-
16055	74396	06-Jun-11	03-Jun-21	03-Jun-21	Gull Lake	-	-	-
16056	77515	10-Jun-11	07-Jun-21	04-Jun-21	Gull Lake	-	-	-
16057	77509	16-Jun-11	13-Jun-21	17-Jun-14	Clark Lake	-	-	-
16058	82631	09-Jun-11	06-Jun-21	06-Oct-19	Clark Lake	-	-	-
16059	64718	16-Jun-11	13-Jun-21	07-Jun-21	Birthday Rapids	-	-	-
16060	80188	21-Jun-11	18-Jun-21	03-Aug-20	Stephens Lake	-	-	-
16061	77503	21-Jun-11	18-Jun-21	21-Jun-11	Gull Lake	15-Jun-12	Gull Lake	2012 Adult Lake Sturgeon Population Monitoring (Hrenchuk 2013)
						13-Jun-18	Gull Lake	2018 Adult Lake Sturgeon Population Monitoring (Holm and Hrenchuk 2019)
						18-Jun-21	Birthday Rapids	2021 Adult Lake Sturgeon Population Monitoring (Loeppky and Hrenchuk 2022)
						27-Jun-21	Gull Lake (rkm -12.9)	2021 Adult Lake Sturgeon Population Monitoring (Loeppky and Hrenchuk 2022)
16062	77510	12-Jun-11	09-Jun-21	04-Jun-21	Nelson River between Birthday Rapids and Gull Lake	-	-	-
16063	77514	11-Jun-11	08-Jun-21	02-Jul-19	Clark Lake	-	-	-
16064	80370	12-Jun-11	09-Jun-21	02-Jun-16	Gull Lake	-	-	-
16065	77511	12-Jun-11	09-Jun-21	18-Jan-21	Gull Lake	27-May-23	Stephens Lake	2023 Adult Lake Sturgeon Population Monitoring (Dowd and Hrenchuk 2024a)
16066	77507	20-Jun-11	17-Jun-21	04-Jun-21	Nelson River between Birthday Rapids and Gull Lake	17-Jun-23	Birthday Rapids	2023 Adult Lake Sturgeon Population Monitoring (Dowd and Hrenchuk 2024a)

Table A6-1: Tagging, tag expiry, and subsequent recapture information for adult Lake Sturgeon tagged with acoustic transmitters in the Keeyask reservoir following tag expiry (continued).

Acoustic Tag	Floy Tag	Tagging Date	Estimated Tag Expiry Date	Date of Last Detection	Location of Last Detection	Recapture Date	Recapture Location	Recapture Program
16067	50826	19-Jun-11	16-Jun-21	24-Jun-19	Clark Lake	16-Jun-20	Kelsey GS	Tag returned by a local resource user in September 2020 and was expired.
16068	80368	19-Jun-11	16-Jun-21	06-Jun-21	Birthday Rapids	-	-	-
16069	48909	17-Jun-11	14-Jun-21	03-Jun-21	Birthday Rapids	-	-	-
16070	77508	16-Jun-11	13-Jun-21	13-Dec-19	Gull Lake	18-Jun-21	Birthday Rapids	2021 Adult Lake Sturgeon Population Monitoring (Loeppky and Hrenchuk 2022)
16071	76484	16-Jun-11	13-Jun-21	08-Jun-21	Gull Lake	-	-	-
16072	77506	21-Jun-11	18-Jun-21	08-Jul-20	Gull Lake	-	-	-
16073	77512	12-Jun-11	09-Jun-21	03-Oct-20	Gull Lake	22-Jun-22	Stephens Lake	2022 Adult Lake Sturgeon Population Monitoring (Ambrose <i>et al.</i> 2023)
16074	94030	13-Jun-11	10-Jun-21	19-Jul-20	Gull Lake	-	-	-
16075	50888	10-Jun-11	07-Jun-21	20-Sep-20	Gull Lake	-	-	-
16076	50808	16-Jun-11	13-Jun-21	06-Jun-21	Stephens Lake	-	-	-
16077	80265	10-Jun-11	07-Jun-21	21-Jun-11	Gull Lake	-	-	-
32174	94117	18-Jun-14	15-Jun-24	25-Aug-20	Stephens Lake	-	-	-
32175	105480	18-Jun-14	15-Jun-24	25-Aug-20	Gull Lake	-	-	-
32176	50853	18-Jun-14	15-Jun-24	25-Aug-20	Gull Lake	29-May-23 31-May-23	Stephens Lake Stephens Lake	2023 Adult Lake Sturgeon Population Monitoring (Dowd and Hrenchuk 2024a) 2023 Adult Lake Sturgeon Population Monitoring (Dowd and Hrenchuk 2024a)
32177	105479	18-Jun-14	15-Jun-24	14-Jun-15	Gull Lake	-	-	-
54799	111765	6-Jun-18	7-Mar-21	16-Jun-21	Gull Lake	-	-	-

Table A6-2: Tagging, tag expiry, and subsequent recapture information for adult Lake Sturgeon tagged with acoustic transmitters in Stephens Lake following tag expiry.

Acoustic Tag	Floy Tag	Tagging Date	Estimated Tag Expiry Date	Date of Last Detection	Location of Last Detection	Recapture Date	Recapture Location	Recapture Program
16018	93923	13-Jun-12	11-Jun-22	02-Jul-12	Upstream Kettle GS	-	-	-
16019	93922	13-Jun-12	11-Jun-22	10-Jun-22	Stephens Lake	-	-	-
16020	55557	08-Jun-12	06-Jun-22	05-Jun-22	Stephens Lake	-	-	-
16021	91705	28-Sep-11	25-Sep-21	05-Sep-16	Long Spruce Reservoir	-	-	-
16022	81628	13-Jun-12	11-Jun-22	10-Jun-22	Stephens Lake	-	-	-
16024	74416	13-Jun-12	11-Jun-22	25-Jun-12	Stephens Lake	-	-	-
16025	80374	15-Jun-12	13-Jun-22	14-Jul-14	Long Spruce Reservoir	-	-	-
16027	93921	13-Jun-12	11-Jun-22	11-Jun-22	Stephens Lake	-	-	-
16028	93924	13-Jun-12	11-Jun-22	02-Oct-21	Stephens Lake	-	-	-
16029	56202	21-Jun-11	18-Jun-21	17-Jun-21	Nelson River between Birthday Rapids and Gull Lake	-	-	-
16030	56152	12-Jun-11	09-Jun-21	08-Jun-21	Stephens Lake	-	-	-
16031	92925	13-Jun-12	11-Jun-22	10-Jun-22	Stephens Lake	-	-	-
16032	46892	11-Jun-11	08-Jun-21	21-Jan-19	Stephens Lake	-	-	-
16033	74419	18-Jun-11	15-Jun-21	30-Jul-12	Gull Lake	01-Aug-12	Unknown	Tag returned by a local resource user
16033b	103230	16-Sep-13	15-Jun-21	10-Sep-21	Stephens Lake	-	-	-
16034	74418	18-Jun-11	15-Jun-21	19-Jun-17	Limestone Reservoir	-	-	-
16035	69868	26-Sep-11	23-Sep-21	08-Aug-18	Long Spruce Reservoir	-	-	-
16037	-	08-Jun-11	05-Jun-21	23-May-21	Stephens Lake	-	-	-
16038	74415	12-Jun-11	09-Jun-21	03-Jun-21	Gull Lake	-	-	-
16040	74411	09-Jun-11	06-Jun-21	26-Apr-21	Stephens Lake	29-May-23	Stephens Lake	2023 Adult Lake Sturgeon Population Monitoring (Dowd and Hrenchuk 2024a)
16041	74421	26-Jun-11	23-Jun-21	23-Jun-21	Stephens Lake	-	-	-
16043	88788	10-Jun-11	07-Jun-21	17-Sep-12	Stephens Lake	06-Jun-21	Stephens Lake	2021 Adult Lake Sturgeon Population Monitoring (Loepky and Hrenchuk 2022)
16044	56208	09-Jun-11	06-Jun-21	17-Sep-12	Stephens Lake	-	-	-
16046	74413	11-Jun-11	08-Jun-21	08-Jun-13	Gull Lake	-	-	-
16047	88789	26-Jun-11	23-Jun-21	28-Jun-11	Stephens Lake	-	-	-

Table A6-2: Tagging, tag expiry, and subsequent recapture information for adult Lake Sturgeon tagged with acoustic transmitters in Stephens Lake following tag expiry.

Acoustic Tag	Floy Tag	Tagging Date	Estimated Tag Expiry Date	Date of Last Detection	Location of Last Detection	Recapture Date	Recapture Location	Recapture Program
16049	91174	24-Sep-11	21-Sep-21	25-Jun-20	Stephens Lake	-	-	-
16050	74415	13-Jun-11	10-Jun-21	07-Jun-21	Stephens Lake	-	-	-
16052	69865	26-Sep-11	23-Sep-21	03-Sep-21	Stephens Lake	-	-	-
16053	69867	26-Sep-11	23-Sep-21	23-Sep-21	Stephens Lake	-	-	-
32167	-	11-Jun-14	08-Jun-24	18-Aug-20	Stephens Lake	-	-	-
32168	94234	11-Jun-14	08-Jun-24	18-Aug-20	Stephens Lake	-	-	-
32169	-	13-Jun-14	10-Jun-24	20-Aug-20	Stephens Lake	-	-	-
32170	46844	11-Jun-14	08-Jun-24	30-Oct-16	Stephens Lake	04-Jun-18 08-Jun-18	Base of Keeyask GS Stephens Lake	2018 Adult Lake Sturgeon Population Monitoring (Holm and Hrenchuk 2019) 2018 Adult Lake Sturgeon Population Monitoring (Holm and Hrenchuk 2019)
32171	-	13-Jun-14	10-Jun-24	20-Aug-20	Stephens Lake	-	-	-
32172	86136	13-Jun-14	10-Jun-24	18-Aug-20	Stephens Lake	-	-	-
32173	-	13-Jun-14	10-Jun-24	20-Aug-20	Stephens Lake	-	-	-