

## **Site C Clean Energy Project**

### **Site C Reservoir (Mon-8) and Peace River (Mon-9) Water and Sediment Quality Monitoring Program**

#### ***Task 2b – Water Temperature***

#### **Construction Year 8 (2022)**

**Kevin Ganshorn, M.Sc., R.P.Bio.**  
**Ecofish Research Ltd.**

**Dan Greenacre, M.Sc.**  
**Ecofish Research Ltd.**

**Joseph Desmarais, M.Sc.**  
**Ecofish Research Ltd.**

**Casey Beel, Ph.D.**  
**Ecofish Research Ltd.**

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## Site C Reservoir (Mon-8) and Peace River (Mon-9) Water and Sediment Quality Monitoring Program Task 2b – Water Temperature Construction Year 8 (2022)



Prepared for:

**BC Hydro**  
333 Dunsmuir St, 13<sup>th</sup> Floor  
Vancouver, BC V6B 5R3

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For inquiries contact: Technical lead [documentcontrol@ecofishresearch.com](mailto:documentcontrol@ecofishresearch.com) 250-334-3042

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**Senior Reviewer:**

Kevin Ganshorn, M.Sc., R.P.Bio. No. 2448  
Biologist

**Technical Leads:**

Dan Greenacre, M.Sc.  
Hydrologist

Joseph Desmarais, M.Sc.  
Hydrologist, Data Analyst

Casey Beel, Ph.D.  
Environmental Scientist

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## EXECUTIVE SUMMARY

In accordance with Provincial Environmental Assessment Certificate (EAC) Schedule B Condition No. 7<sup>1</sup> and Federal Decision Statement (FDS) Condition Nos. 8.4.3<sup>2</sup> and 8.4.4<sup>3</sup> for BC Hydro’s Site C Clean Energy Project (the Project), BC Hydro has developed the Site C Fisheries and Aquatic Habitat Monitoring and Follow-up Program (FAHMFP; BC Hydro 2015). The FAHMFP is designed to monitor different aspects of Peace River fish habitat or the response of the Peace River fish community to the construction and operation of the Project. The Site C Reservoir Water and Sediment Quality Monitoring Program (Mon-8) and the Peace River Water and Sediment Quality Monitoring Program (Mon-9) represent two components of the FAHMFP, and data collection for Site C Reservoir and Peace River Water Temperature Monitoring represents one task within Mon-8/9 (Task 2b). Task 2b is not intended to address specific management questions or hypotheses under the FAHMFP. Temperature data collected under Task 2b provides information to diagnose causes of observed changes in other FAHMFP programs (i.e., Site C Reservoir Fish Community Monitoring Program (Mon-1a), Site C Reservoir Tributaries Fish Community and Spawning Monitoring Program (Mon-1b), and Peace River Fish Community Monitoring Program (Mon-2)) which are designed to monitor key indicator species of the Peace River.

The Peace River Water Temperature Database houses water temperature data collected between 2008 and 2014 by Diversified Environmental Services as part of BC Hydro’s Water License Requirement (WLR) Peace River Baseline Total Dissolved Gas (TDG) and Temperature Program (GMSWORKS-2) and data collected during the first eight years (2015 to 2022) of Mon-8/9. Ecofish has also collected water temperature data at all Peace River turbidity monitoring stations operated under the Peace River Turbidity and SEV Monitoring Program since 2017. These data were used to assist QA/QC of Mon-8 and Mon-9 water temperature data from locations in the same vicinity on the Peace River. Prior to 2022 the Peace River Water Temperature Database was largely limited to raw data records to which corrections had to be applied using a separate R script developed by WSP. Following monitoring in 2022, the database has been updated to include complete records of both raw and corrected water temperature time series collected at each monitoring station for the entire period of record at each station.

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<sup>1</sup> The EAC Holder must develop a Fisheries and Aquatic Habitat Monitoring and Follow-up Program to assess the effectiveness of measures to mitigate Project effects on healthy fish populations in the Peace River and tributaries, and, if recommended by a QEP or FLNR, to assess the need to adjust those measures to adequately mitigate the Project’s effects.

<sup>2</sup> “The plan shall include: an approach to monitor changes to fish and fish habitat baseline conditions in the Local Assessment Area.”

<sup>3</sup> “The plan shall include: an approach to monitor and evaluate the effectiveness of mitigation or offsetting measures and to verify the accuracy of the predictions made during the environmental assessment on fish and fish habitat.”

In 2022, FAHMFP water temperature stations situated on the Peace River (including sites on Dinosaur and Williston reservoirs) upstream of Hudson’s Hope were maintained under BC Hydro’s WUP and serviced by Diversified Environmental Services. FAHMFP water temperature stations in the Peace River mainstem downstream of Hudson’s Hope were maintained by Ecofish Research Ltd. and Aski Reclamation, while both FAHMFP and non-FAHMFP water temperature stations in tributary watersheds were maintained by WSP. This report presents data collected at the FAHMFP water temperature stations in Williston and Dinosaur reservoirs and in the Peace River from the date of station establishment until the end of 2022. Documentation of non-FAHMFP tributary water temperature stations is included in this report for the sake of demonstrating the extent of BC Hydro’s water temperature monitoring network associated with Site C. While the FAHMFP tributary water temperature stations in the Pine and Beatton rivers are documented in this report, the data are maintained and filed by WSP.

A total of 17 different FAHMFP water temperature stations were maintained on the Peace River between the WAC Bennett Dam (GMS) forebay and near the Pouce Coupe River’s confluence with the Peace River; an additional three stations upstream and downstream of the Moberly River confluence and were decommissioned in 2020. Five different stations were maintained on the following Peace River tributaries: Maurice Creek (non-FAHMFP), Farrell Creek (non-FAHMFP), Moberly River (non-FAHMFP), Pine River (FAHMFP), and Beatton River (FAHMFP). Five more non-FAHMFP water temperature stations were maintained on tributaries to the Halfway River: Fiddes Creek, Cypress Creek, Chowade River, Colt Creek (a tributary to the Graham River), and Kobes Creek. Both FAHMFP and non-FAHMFP tributary stations continue to be maintained by WSP who have the data on file.

Water temperature loggers were serviced opportunistically when field crews were in the vicinity conducting other Project-related work, or during dedicated station visits. Data are 100% complete from all stations in 2022 that are located between gmsUP1 and pcnDN2. Downstream of this, data are nearly complete (i.e., record is  $\geq 99.5\%$  complete) or 100% complete except for stations located at Bear Flats left bank (BFlats\_LDB, 96.3% complete record), Bear Flats right bank (BFlats\_RDB, 69.4% complete record), and Pouce Coupe River Confluence (pouceUP1; 26.8% complete record) which had extended data gaps. Short data gaps are typically present where recorded data was indicative of the logger being out of water, frozen in ice, or buried by sediment; long gaps are typically due to a sensor being lost.

Historical data collected between 2008 and 2014 under GMSWORKS-2, coupled with data collected under the FAHMFP between 2015 and 2022, provide a near-continuous 15-year dataset of water temperature data at select locations.

**ACKNOWLEDGEMENTS**

We acknowledge this research was conducted on the traditional territory of Treaty 8 First Nations of Dunne Zaa, Cree, and Tse’khene cultural descent.

Site C Reservoir and Peace River Water Temperature Monitoring (Task 2b) is funded by BC Hydro’s Site C Clean Energy Project. Ecofish Research Ltd. and Aski Reclamation LP would like to thank the following individuals for their contributions to the program:

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The following employees of Ecofish Research Ltd. and Aski Reclamation LP contributed to the collection of data and preparation of this report:

Kevin Ganshorn	Biologist/Project Director/Reviewer	Luke Storey	Environmental Technician
Duane Coombs	Project Manager	Brendan Armstrong	Environmental Technician
Agoziem Okoye	Project Manager	Thomas Brown	Environmental Technician/Task Manager
Regina Krohn (Aski)	Project Manager	Nicole Wolsey (Aski)	Environmental Technician
Dan Greenacre	Hydrologist, Task Manager	Joseph Desmarais	Hydrologist, Data Analyst
Julian Krick	Senior Environmental Technician	Tess Ward	Environmental Technician
Patrick Beaupre (Aski)	Biological Technician	John Humphries	Project Coordinator
Brad Minielly	GIS Analyst/Environmental Technician	Tera Kasubuchi	Environmental Technician/Data Manager
Leah Hull	Environmental Technician/Task Manager	Sarah Kennedy	Environmental Technician/Task Manager
Casey Beel	Environmental Scientist	Larissa Clayton (Aski)	Environmental Technician
Paula Lane	Office Administration		

### ACRONYMS AND ABBREVIATIONS

Acronym	Description
%	Percent
°C	Degrees Celsius
Aski	Aski Reclamation LP
BC	British Columbia
DES	Diversified Environmental Services
EAC	Environmental Assessment Certificate
Ecofish	Ecofish Research Ltd.
FAHMFP	Fisheries and Aquatic Habitat Monitoring and Follow-up Program
FDS	Federal Decision Statement
GMS	WAC Bennett Dam
GMSWORKS-2	Peace River Baseline Total Dissolved Gas and Temperature Program
masl	Metres above sea level
Mon-1b	Site C Reservoir Tributaries Fish Community and Spawning Monitoring Program
Mon-2	Peace River Fish Community Monitoring Program
Mon-8	Site C Reservoir Water and Sediment Quality Monitoring Program
Mon-9	Peace River Water and Sediment Quality Monitoring Program
MST	Mountain Standard Time
PCN	Peace Canyon Dam
Project	Site C Clean Energy Project
Task 2b	Site C Reservoir and Peace River Water Temperature Monitoring
TDG	Total dissolved gas
UTM	Universal Transverse Mercator
WLR	Water License Requirements
WUP	Peace Project Water Use Plan

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## 1. INTRODUCTION

In accordance with Provincial Environmental Assessment Certificate (EAC) Schedule B Condition No. 7<sup>1</sup> and Federal Decision Statement (FDS) Condition Nos. 8.4.3<sup>2</sup> and 8.4.4<sup>3</sup> for BC Hydro's Site C Clean Energy Project (the Project), BC Hydro has developed the Site C Fisheries and Aquatic Habitat Monitoring and Follow-up Program (FAHMFP; BC Hydro 2015). The FAHMFP is designed to monitor different aspects of Peace River fish habitat or the response of the Peace River fish community to the construction and operation of the Project. The Site C Reservoir Water and Sediment Quality Monitoring Program (Mon-8) and the Peace River Water and Sediment Quality Monitoring Program (Mon-9) represent two components of the FAHMFP, and data collection for Site C Reservoir and Peace River Water Temperature Monitoring represents one task within Mon-8/9 (Task 2b). Task 2b is not intended to address specific management questions or hypotheses under the FAHMFP. Temperature data collected under Task 2b provides information to diagnose causes of observed changes in other FAHMFP programs (i.e., Site C Reservoir Fish Community Monitoring Program (Mon-1a), Site C Reservoir Tributaries Fish Community and Spawning Monitoring Program (Mon-1b), and Peace River Fish Community Monitoring Program (Mon-2)) designed to monitor key indicator species of the Peace River.

In 2008, as part of the BC Hydro Peace Project Water Use Plan (WUP; BC Hydro 2007), Diversified Environmental Services (DES) began maintaining an array of water temperature loggers in the Peace River between the WAC Bennett Dam (GMS) forebay and 6.5 km downstream of the Pine River's confluence with the Peace River (GMSWORKS-2; e.g., DES 2010). Areas monitored under the array included upstream and downstream of GMS and Peace Canyon Dam (PCN) and upstream and downstream of the confluences of the following Peace River tributaries: the Halfway River, the Moberly River, and the Pine River. In 2016, management of the array was transitioned from the WUP to the FAHMFP (DES 2017, 2018, 2019, 2020; Golder 2021, 2022).

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<sup>1</sup> The EAC Holder must develop a Fisheries and Aquatic Habitat Monitoring and Follow-up Program to assess the effectiveness of measures to mitigate Project effects on healthy fish populations in the Peace River and tributaries, and, if recommended by a QEP or FLNR, to assess the need to adjust those measures to adequately mitigate the Project's effects.

<sup>2</sup> "The plan shall include: an approach to monitor changes to fish and fish habitat baseline conditions in the Local Assessment Area."

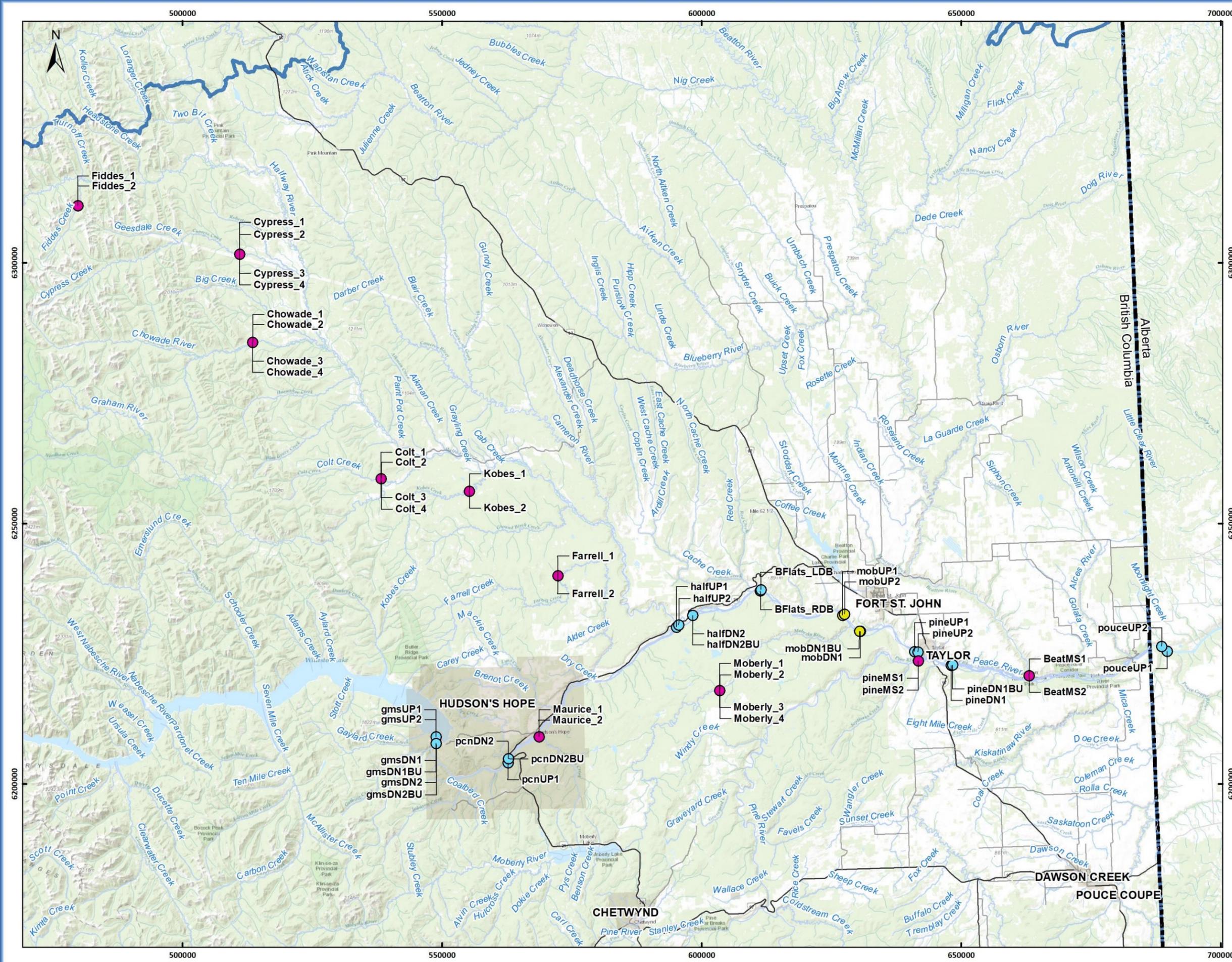
<sup>3</sup> "The plan shall include: an approach to monitor and evaluate the effectiveness of mitigation or offsetting measures and to verify the accuracy of the predictions made during the environmental assessment on fish and fish habitat."

In 2022, FAHMFP water temperature stations situated on the Peace River (including sites on Dinosaur and Williston reservoirs) upstream of Hudson’s Hope were maintained under BC Hydro’s WUP and serviced by Diversified Environmental Services. FAHMFP water temperature stations in the Peace River mainstem downstream of Hudson’s Hope were maintained by Ecofish Research Ltd. and Aski Reclamation, while both FAHMFP and non-FAHMFP water temperature stations in tributary watersheds were maintained by WSP. This report presents data collected at the FAHMFP water temperature stations in Williston and Dinosaur reservoirs and in the Peace River from the date of station establishment until the end of 2022. Documentation of non-FAHMFP tributary water temperature stations is included in this report for the sake of demonstrating the extent of BC Hydro’s water temperature monitoring network associated with Site C. While the FAHMFP tributary water temperature stations in the Pine and Beatton rivers are documented in this report, the data are maintained and filed by WSP.

Data from GMSWORKS-2 and the FAHMFP combined provide a continuous dataset of water temperature values at the above locations from 2008 to 2022. Data collection under Task 2b is currently scheduled through the remainder of Project construction and the first 10 years of Project operation.

With the transition from the WUP to the FAHMFP in 2016, three new monitoring stations were added to the FAHMFP water temperature monitoring network (i.e., the Peace River upstream of the Pouce Coupe River confluence and the mainstems of the Beatton and Pine rivers). These stations were added to Task 2b to collect the temperature data needed to help interpret results of the Peace River Fish Community Monitoring Program (Mon-2). In 2019 and 2020, the non-FAHMFP portion of this array was established to include Site C reservoir tributary sampling as part of the Site C Reservoir Tributaries Fish Community and Spawning Monitoring Program (Mon-1b): the mainstems of the Chowade and Moberly rivers, and Maurice, Colt, Cypress, Farrell, Kobes, and Fiddes creeks. Both FAHMFP and non-FAHMFP station locations are shown in Map 1 through Map 6.

This report summarizes the status of water temperature monitoring under Task 2b from 1 January to 31 December 2022 for the FAHMFP stations in the mainstem of the Peace River from the forebay in Williston Reservoir downstream to the stations located just upstream of the Pouce Coupe River confluence with the Peace River in Alberta. However, because data from late 2022 were not retrieved from some stations until early 2023, this report includes information from those 2023 station visits where appropriate.



**SITE C CLEAN ENERGY PROJECT**  
**Overview of Peace River and**  
**Tributary Water Temperature**  
**Monitoring Station Locations**  
**for Mon-8/9 (Task 2b)**

- Legend**
- Peace River Mainstem Water Temperature Monitoring Station
  - Peace River Tributary Water Temperature Monitoring Station
  - Decommissioned (2020) Peace River Mainstem Water Temperature Monitoring Station
  - BC-Alberta Border
  - Peace River Watershed
  - Municipalities
  - Highway
  - Road
  - Watercourse
  - Waterbody



**MAP SHOULD NOT BE USED FOR LEGAL OR NAVIGATIONAL PURPOSES**

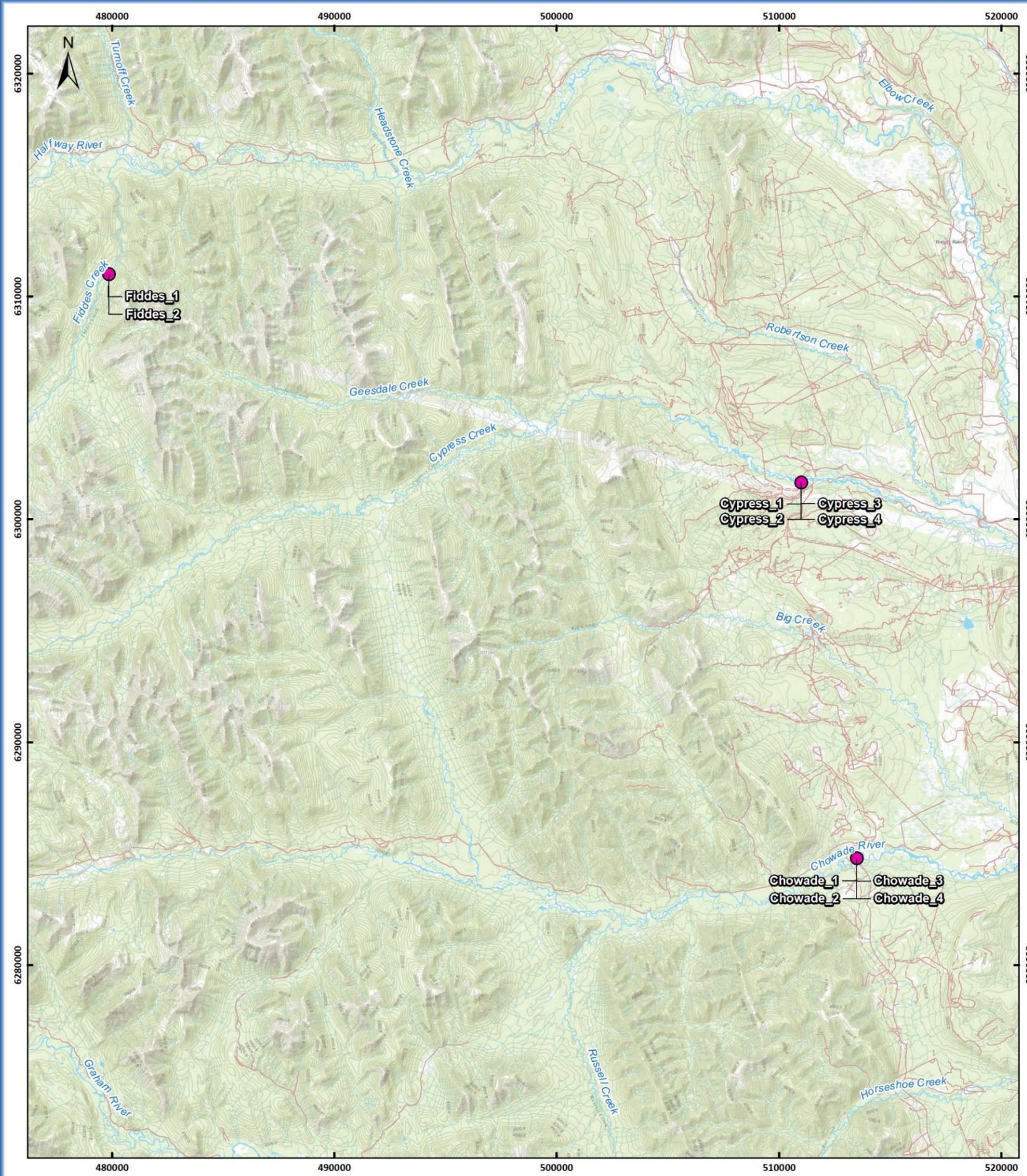
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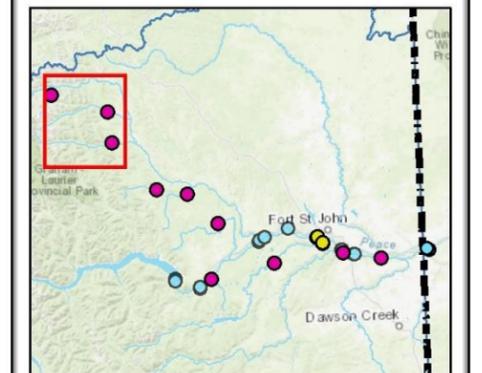
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 Coordinate System: NAD 1983 UTM Zone 10N

Map 1



**SITE C CLEAN ENERGY PROJECT**  
**Tributary (Fiddes, Cypress, and Chowade)**  
**Water Temperature Monitoring**  
**Station Locations for Mon-8/9 (Task 2b)**

- Legend**
- Peace River Mainstem Water Temperature Monitoring Station
  - Peace River Tributary Water Temperature Monitoring Station
  - Decommissioned (2020) Peace River Mainstem Water Temperature Monitoring Station
  - BC-Alberta Border
  - Roads**
    - Paved Road
    - Rough/Loose Road
    - Forest Service Road
  - ▬ Waterbody
  - ▬ Watercourse
  - Peace River Watershed

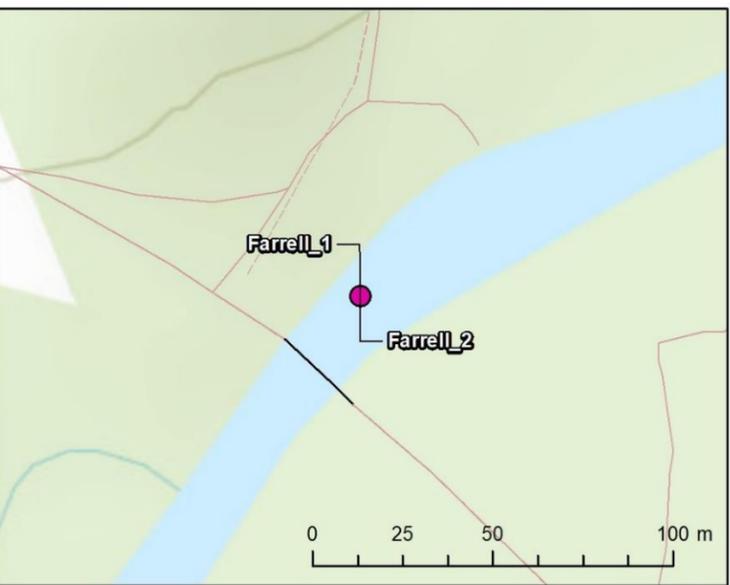
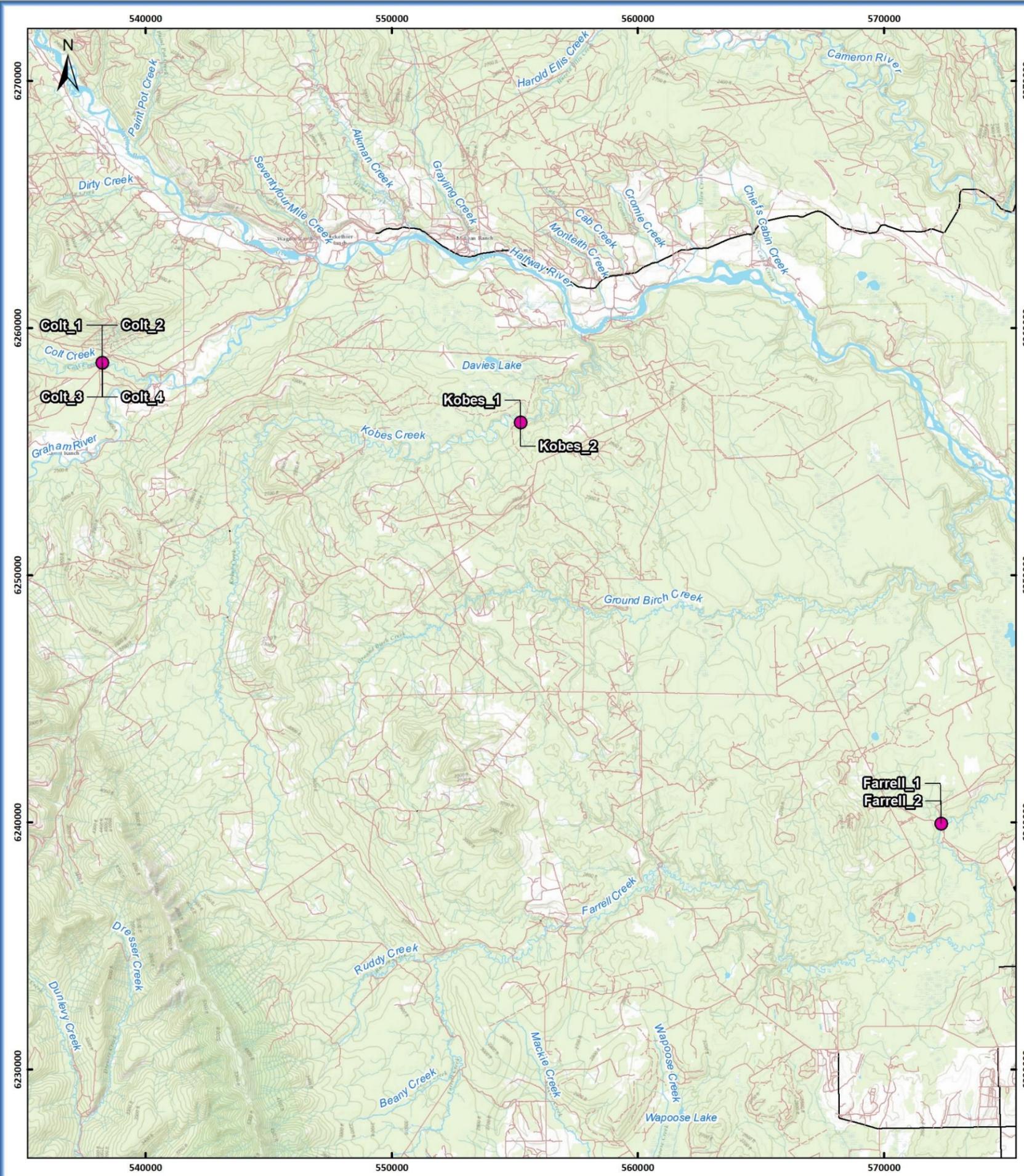


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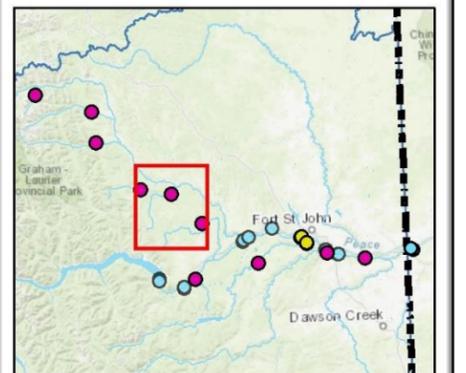
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 Coordinate System: NAD 1983 UTM Zone 10N



**SITE C CLEAN ENERGY PROJECT**  
**Tributary (Colt, Kobes, and Farrell)**  
**Water Temperature Monitoring**  
**Station Locations for Mon-8/9 (Task 2b)**

- Legend**
- Peace River Mainstem Water Temperature Monitoring Station
  - Peace River Tributary Water Temperature Monitoring Station
  - Decommissioned (2020) Peace River Mainstem Water Temperature Monitoring Station
  - BC-Alberta Border
  - Peace River Watershed
  - Paved Road
  - Rough/Loose Road
  - Forest Service Road
  - Waterbody
  - Watercourse

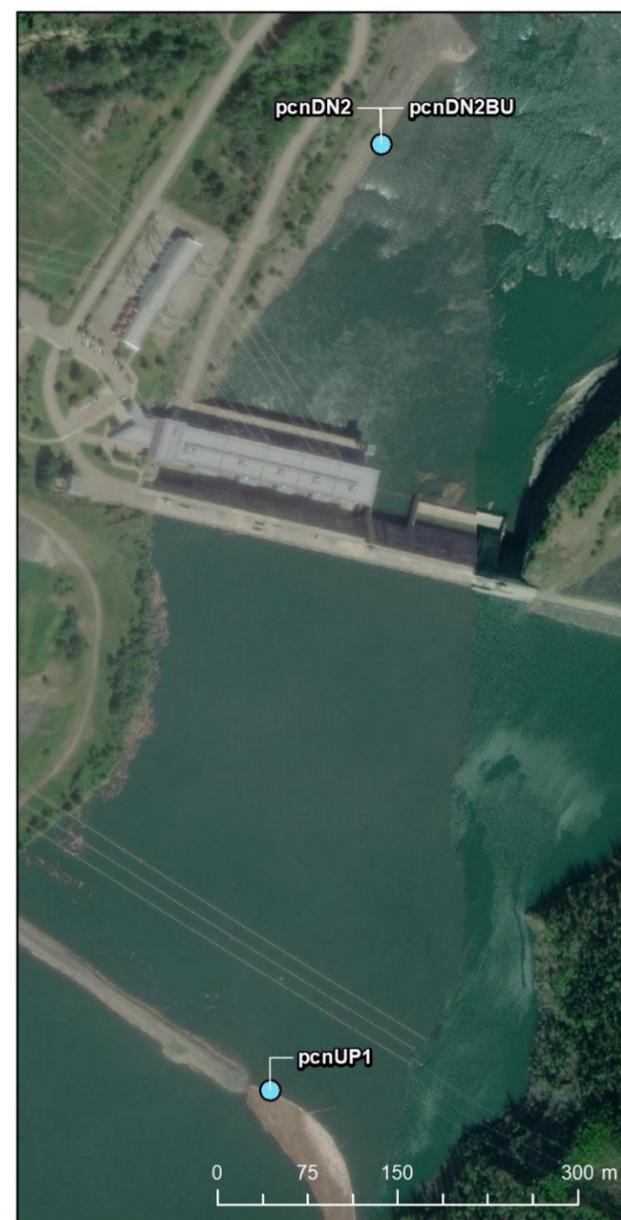
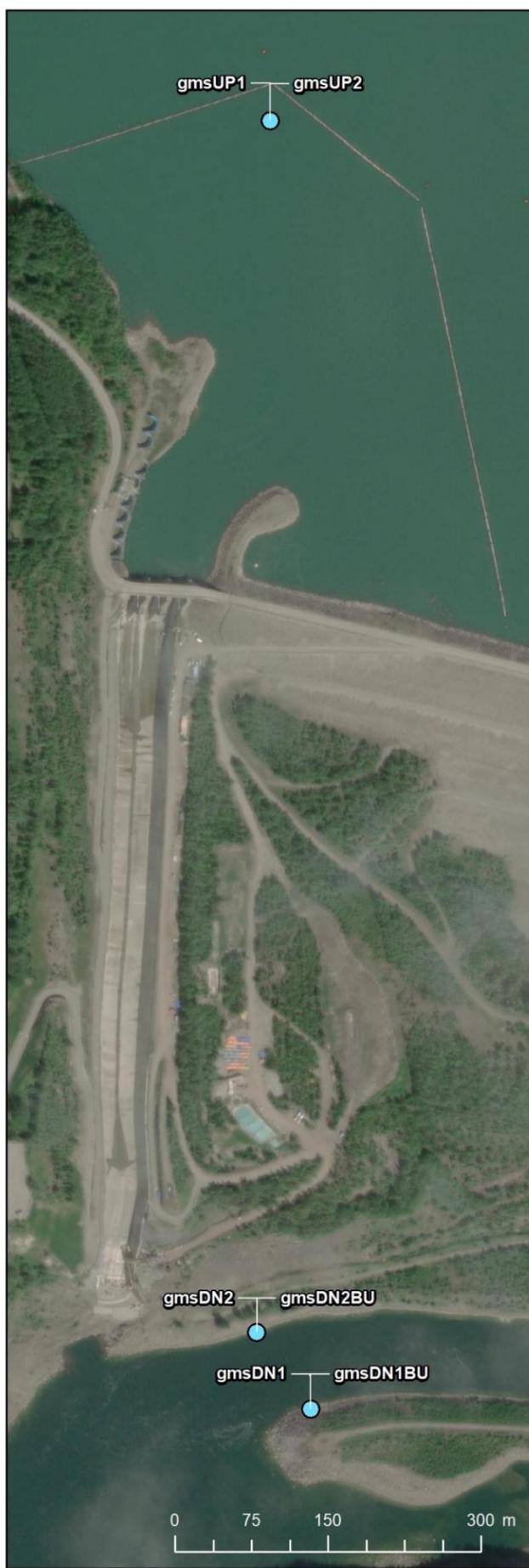
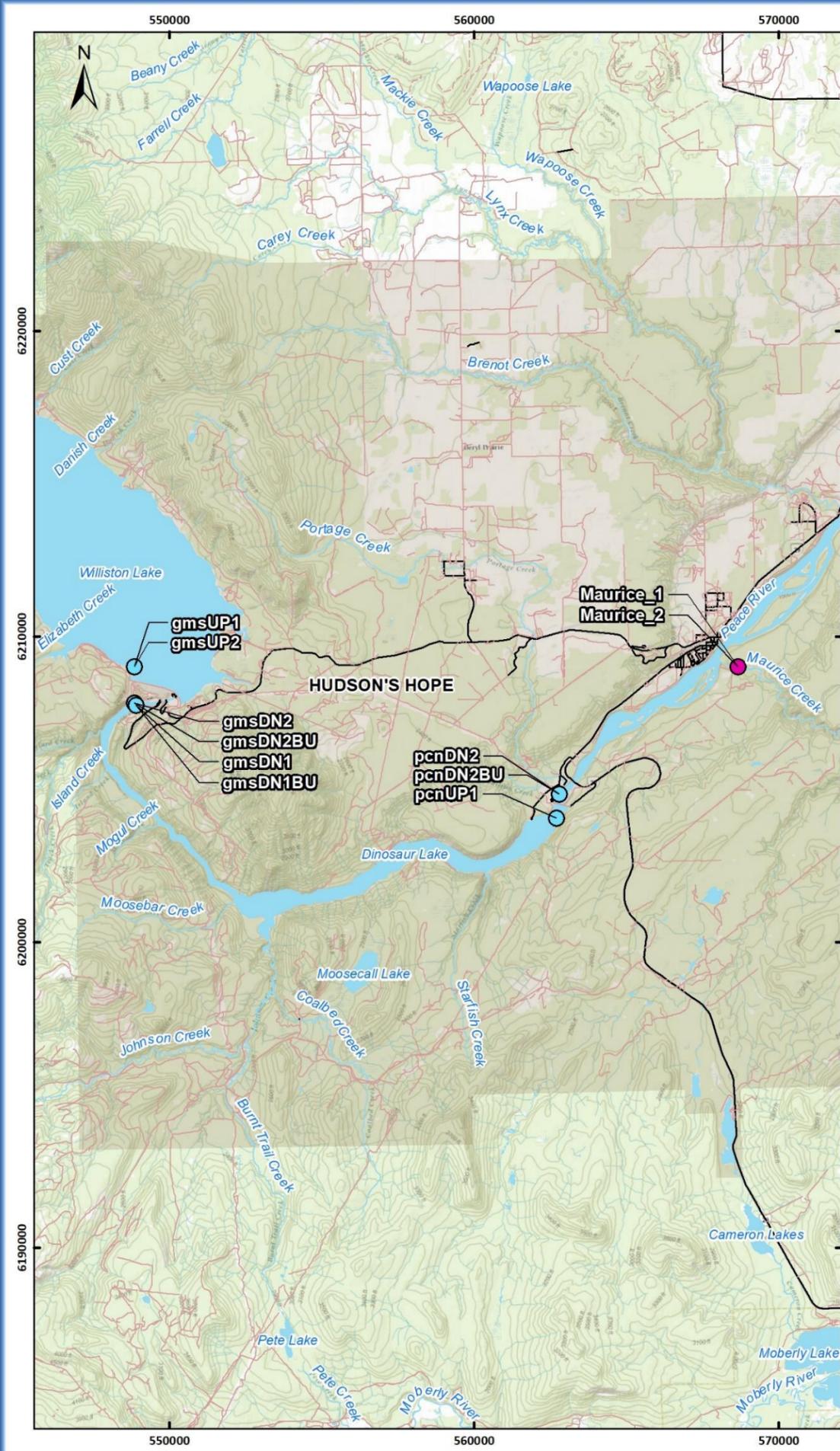


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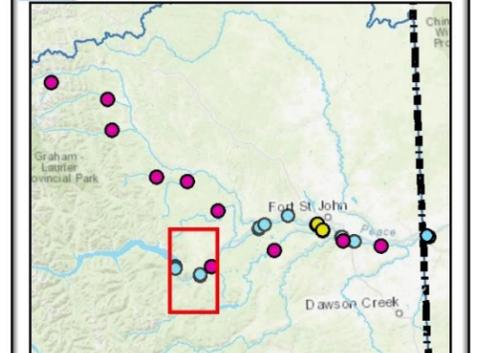
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 Coordinate System: NAD 1983 UTM Zone 10N



**SITE C CLEAN ENERGY PROJECT**  
**Water Temperature Monitoring Station Locations for Mon-8/9 (Task 2b) in Williston and Dinosaur Reservoirs, the Peace River, and Maurice Creek near Hudson's Hope**

- Legend**
- Peace River Mainstem Water Temperature Monitoring Station
  - Peace River Tributary Water Temperature Monitoring Station
  - Decommissioned (2020) Peace River Mainstem Water Temperature Monitoring Station
  - Municipalities
  - BC-Alberta Border
  - Roads**
  - Paved Road
  - Rough/Loose Road
  - Forest Service Road
  - Waterbody
  - Watercourse
  - Peace River Watershed

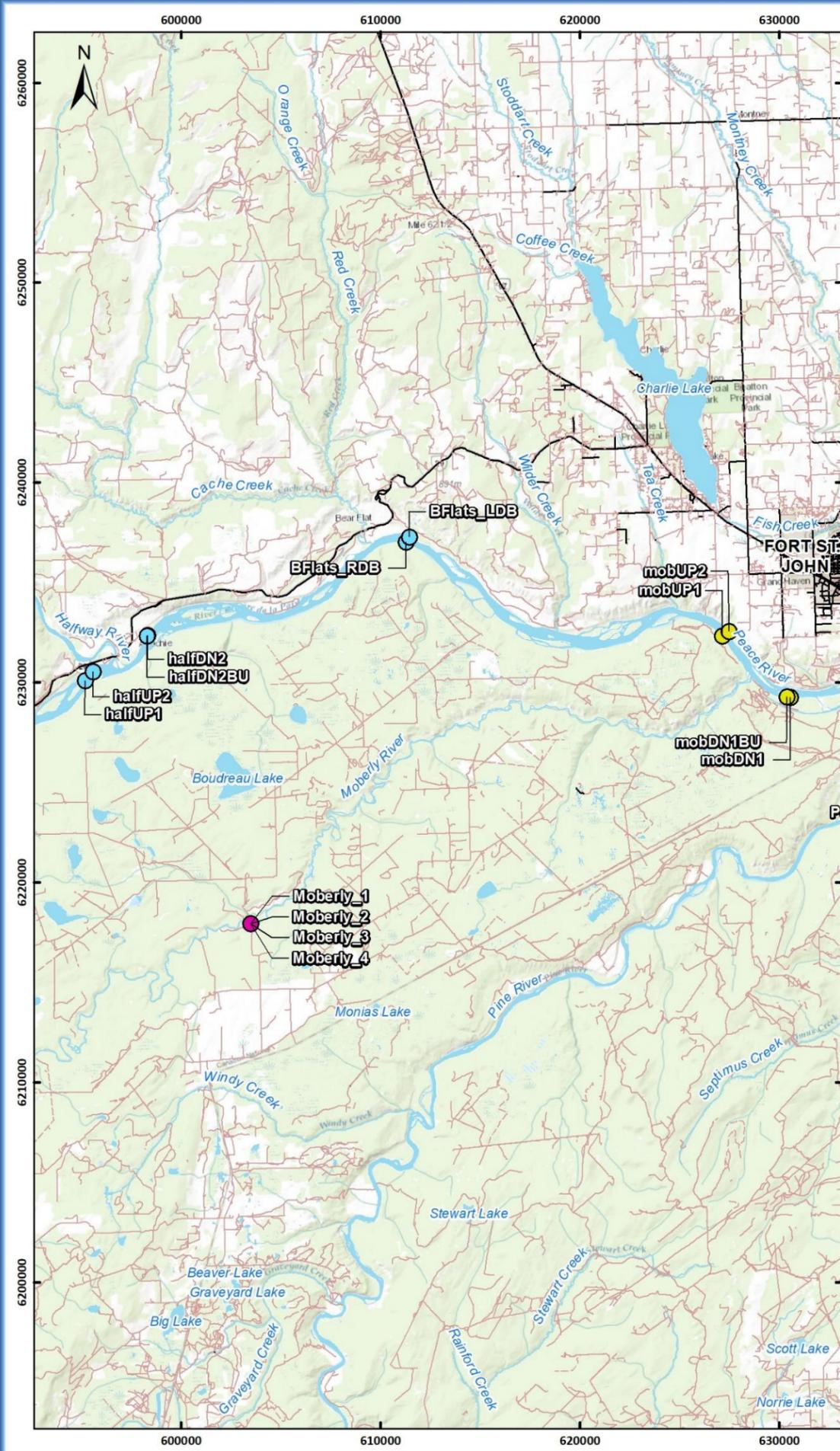


**MAP SHOULD NOT BE USED FOR LEGAL OR NAVIGATIONAL PURPOSES**

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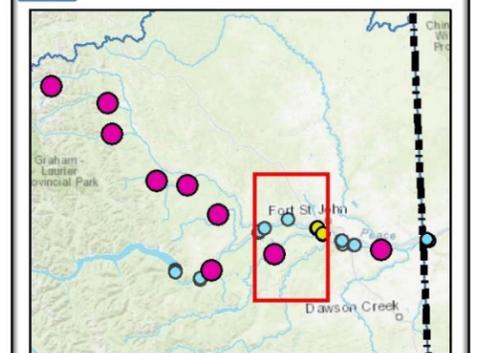
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 Coordinate System: NAD 1983 UTM Zone 10N



**SITE C CLEAN ENERGY PROJECT**  
**Water Temperature Monitoring Station Locations for Mon-8/9 (Task 2b) in the Peace River and the Moberly River Upstream of the Site C Dam**

- Legend**
- Peace River Mainstem Water Temperature Monitoring Station
  - Peace River Tributary Water Temperature Monitoring Station
  - Decommissioned (2020) Peace River Mainstem Water Temperature Monitoring Station
  - Municipalities
  - BC-Alberta Border
  - Paved Road
  - Rough/Loose Road
  - Forest Service Road
  - Waterbody
  - Watercourse
  - Peace River Watershed

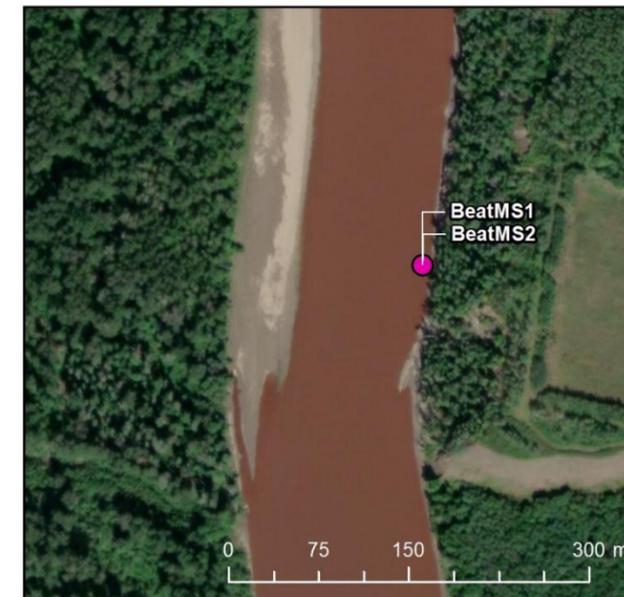
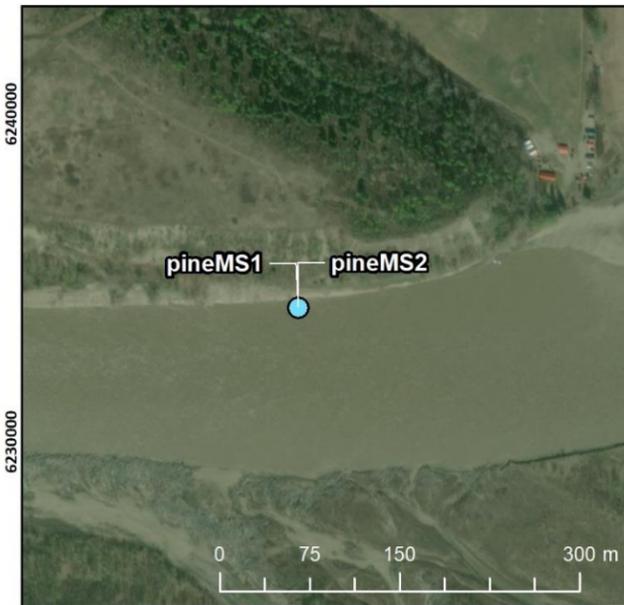
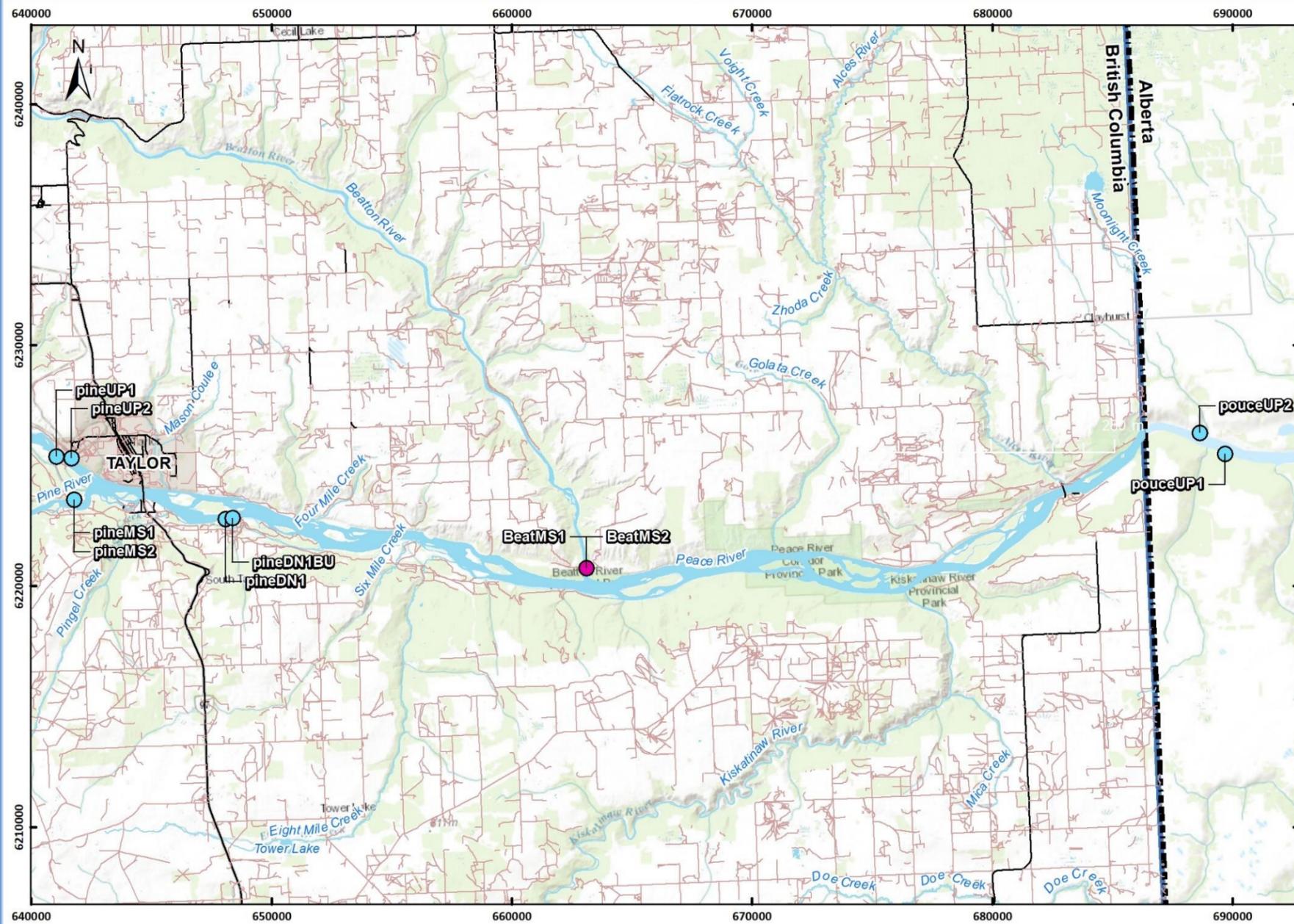


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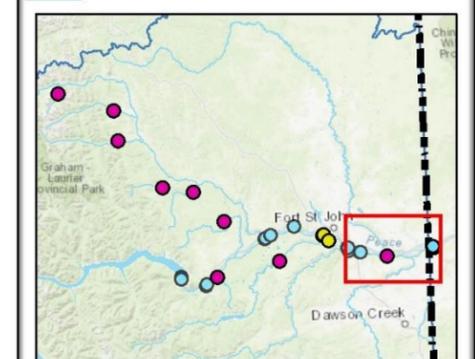
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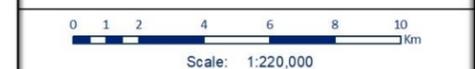


**SITE C CLEAN ENERGY PROJECT**  
**Water Temperature Monitoring**  
 Station Locations for Mon-8/9 (Task 2b)  
 In the Peace River Downstream of the Site C Dam  
 from Upstream of the confluence with the Pine River  
 to just Upstream of the Confluence with the  
 Pouce Coupe River in Alberta, as well as  
 Station Locations in the Pine River and Beatton River

- Legend**
- Peace River Mainstem Water Temperature Monitoring Station
  - Peace River Tributary Water Temperature Monitoring Station
  - Decommissioned (2020) Peace River Mainstem Water Temperature Monitoring Station
  - Municipalities
  - BC-Alberta Border
  - Roads**
  - Paved Road
  - Rough/Loose Road
  - Forest Service Road
  - Waterbody
  - Watercourse
  - Peace River Watershed



**MAP SHOULD NOT BE USED FOR LEGAL OR NAVIGATIONAL PURPOSES**



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## 2. METHODS

### 2.1. Study Area

A station is defined as a single location where water temperature is monitored as part of the monitoring network. A single station can have a single temperature logger or multiple temperature loggers (e.g., to record temperature at different depths or to provide a backup data source).

A total of 17 different FAHMFP water temperature stations were maintained on the Peace River between the WAC Bennett Dam (GMS) forebay and near the Pouce Coupe River's confluence with the Peace River; an additional three stations upstream and downstream of the Moberly River confluence and were decommissioned in 2020. Station locations are summarized in Table 1 of Appendix A, and Map 1 through Map 6. Five different stations were maintained on the following Peace River tributaries: Maurice Creek (non-FAHMFP), Farrell Creek (non-FAHMFP), Moberly River (non-FAHMFP), Pine River (FAHMFP), and Beatton River (FAHMFP). Five more non-FAHMFP water temperature stations were maintained on tributaries to the Halfway River: Fiddes Creek, Cypress Creek, Chowade River, Colt Creek (a tributary to the Graham River), and Kobes Creek. Both FAHMFP and non-FAHMFP tributary stations continue to be maintained by WSP who have the data on file.

In 2022, temperature loggers in the Peace River situated upstream of Hudson's Hope were maintained under BC Hydro's WUP. These loggers were downloaded and serviced by Diversified Environmental Services and the data were provided to Ecofish and Aski for analysis. In the first half of 2022, temperature loggers in the mainstem of the Peace River downstream of Hudson's Hope were downloaded and serviced by WSP and the data were provided to Ecofish and Aski for analysis. Aski and Ecofish maintained the mainstem Peace River stations downstream of Hudson's Hope after mid-2022. Appendix B provides representative photos of all stations that are serviced by Ecofish and Aski.

### 2.2. Station Setup

At each station reported on herein, a HOBO TidbiT v2 temperature logger (Model # UTBI-001; Onset Computer Corporation, Bourne, MA, USA) was deployed. The v2 temperature loggers have an accuracy of  $\pm 0.2^{\circ}\text{C}$ . Temperature loggers are initiated and downloaded using a HOBO waterproof optical shuttle (Model # U-DTW-1) or a splash resistant HOBO optic USB base station (Model # BASE-U-4). All temperature loggers are programmed to record water temperature in one-hour intervals, except for those installed in the Chowade and Moberly rivers and Colt, Cypress, Farrell, Fiddes, Kobes, and Maurice creeks, which were set to record at 15-minute intervals.

Temperature loggers were contained in metal 38 mm wide x 100 mm long perforated cylinders with threaded metal end caps (initially deployed during GMSWORKS-2) or in 102 mm diameter ABS (plastic) container with a single threaded end cap (initially deployed by WSP under Task 2b; Figure 1). Holes were drilled through the housing body and end caps to allow water to flow through them. The

housings were ballasted with either 5 kg metal or concrete anchors and secured to shore with a metal cable or chain.

**Figure 1. Temperature logger housings: metal perforated cylinder (left), and black ABS plastic housing (right).**



### 2.3. Data Compilation and Analysis

Raw water temperature records collected up to the end of 2021 were obtained from the Peace River Water Temperature Database provided to BC Hydro by WSP (formerly Golder). Prior to 2022 the Peace River Water Temperature Database was largely limited to raw data records to which corrections had to be applied using a separate R script (R Core Team 2023) developed by WSP. Using the records in the database and the R script from WSP, raw and cleaned time series data obtained up to the end of 2021 were compiled with raw and cleaned time series data collected in 2022. Ecofish uses AQUARIUS Time-series software (Aquatic Informatics Inc.) to manage and clean time series data.

Erroneous data collected in 2022 were removed and additional corrections to the pre-2022 dataset were made where deemed necessary. The complete dataset at each station was QA/QC'd to ensure that any suspect or unreliable data were excluded from analysis and presentation. Excluded data consisted of data where the sensor was out-of-water/dry, buried in sediment, being serviced, or not functioning correctly. This was done for each sensor by comparing water temperature data from the sensors at the nearest stations, as well as comparing the station water temperature data to concurrent river flows and water and/or air temperature data from three WSC stations in the Peace River (07FA004, 07FD010, 07EF001). Water temperature data have been collected by Ecofish at Peace River turbidity monitoring stations under the Peace River Turbidity and SEV Monitoring Program since 2017; these data were also used to assist QA/QC of Mon-8/9 temperature data from nearby stations on the Peace River. Water temperature records from stations with multiple loggers at the same general location in 2022 (i.e., where one logger was identified as the backup logger) were

averaged whenever concurrent data were available. Additionally, stations with excluded data may have been gap-filled with water temperature data from nearby stations to maintain data continuity. This occurred in specific instances in which nearby stations had similar water temperature magnitudes and trends, allowing for gap-filled data to maintain accurate results at the corrected station. Gap-filled data were graded in the database as being estimated. Finally, the water temperature records were validated by comparing the data to in situ spot measurements of water temperature to the station sensor data. These spot measurements were taken at the time of sensor installation/servicing and during subsequent station visits. The data QA ensured that there was good agreement between spot measurements and continuous station records as shown in Appendix C. Following monitoring in 2022, the Peace River Water Temperature Database was updated to include complete records of both raw and corrected series collected at each monitoring station for the entire period of record at each station.

Daily average temperature values were calculated from the cleaned dataset and plotted. To facilitate annual comparisons, the mean, minimum, and maximum daily average temperature were calculated for each day of the year for all other years with available data for each station.

### 3. RESULTS

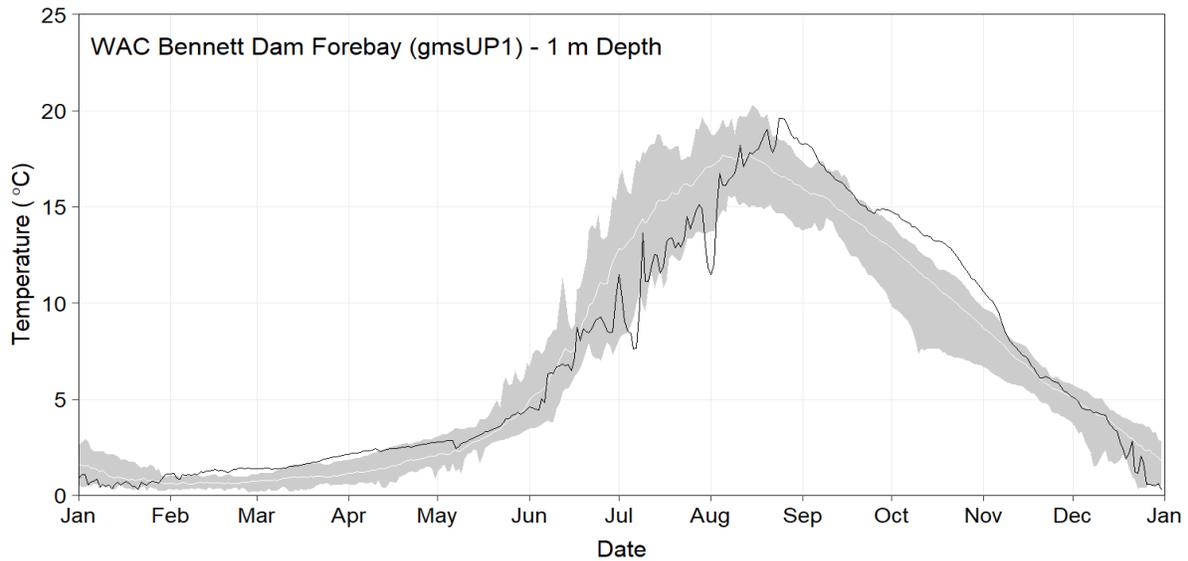
At times, water temperature loggers were buried in sediment or out of the water when crews arrived on site to download them. These instances are detailed in the following sections.

#### 3.1. Upstream of Peace Canyon Dam

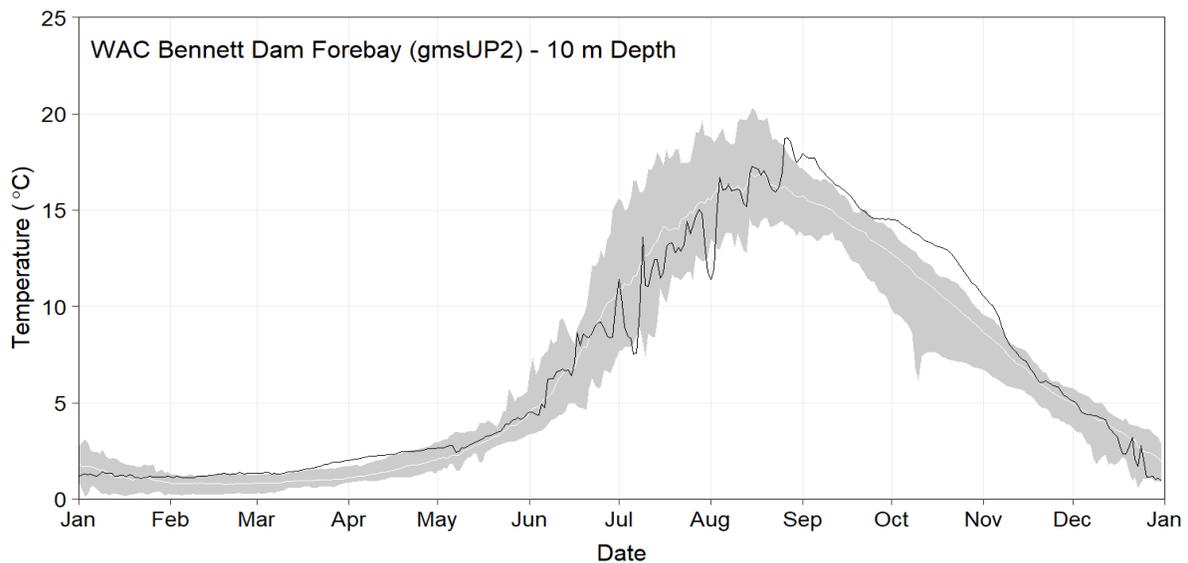
##### 3.1.1. WAC Bennett Dam Forebay

Water temperature in the GMS forebay is measured at two different water depths. Both temperature loggers are suspended from the northernmost steel buoy along the GMS spillway log boom. Station gmsUP1 is a logger suspended 1 m below the water surface (Figure 2) and station gmsUP2 is a logger suspended 10 m below the water surface (Figure 3). Data were available for the entire 2022 study period for both gmsUP1 and gmsUP2. Interannual comparisons of water temperature data for gmsUP1 and gmsUP2 are presented in Appendix D, Figure 48 and Figure 49, respectively.

**Figure 2.** Mean daily water temperature (°C) for the WAC Bennett Dam (GMS) forebay 1 m below the water surface (gmsUP1; black line), 2022. The shaded area represents minimum and maximum water temperature recorded at the station between 2008 and 2021. The white line represents average mean daily water temperature over the same period.



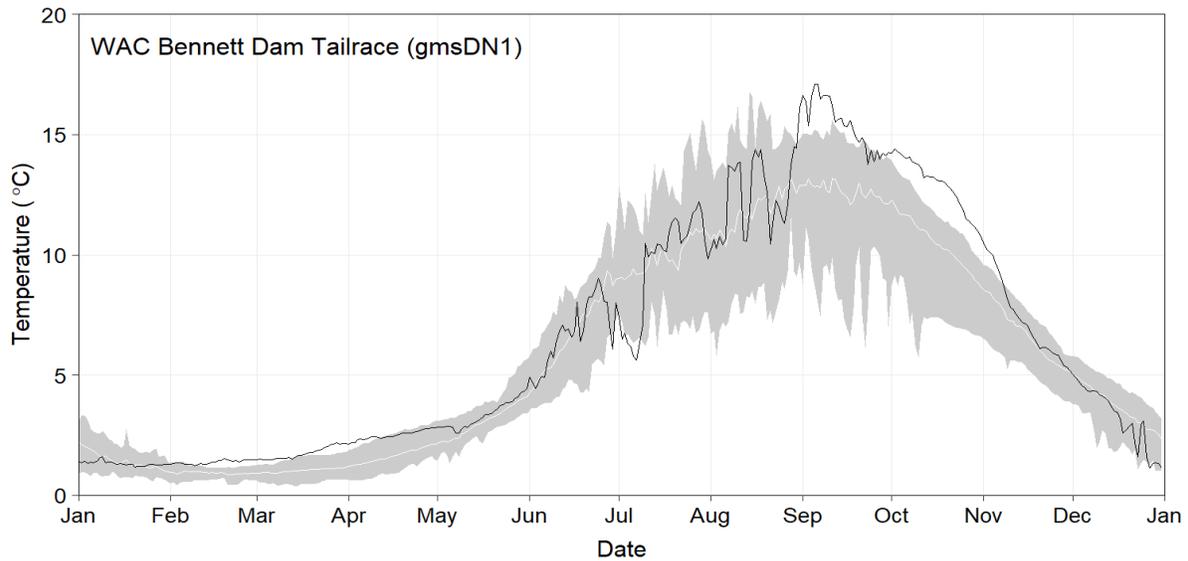
**Figure 3.** Mean daily water temperature (°C) for the WAC Bennett Dam (GMS) forebay 10 m below the water surface (gmsUP2; black line), 2022. The shaded area represents minimum and maximum water temperature recorded at the station between 2008 and 2021. The white line represents average mean daily water temperature over the same period.



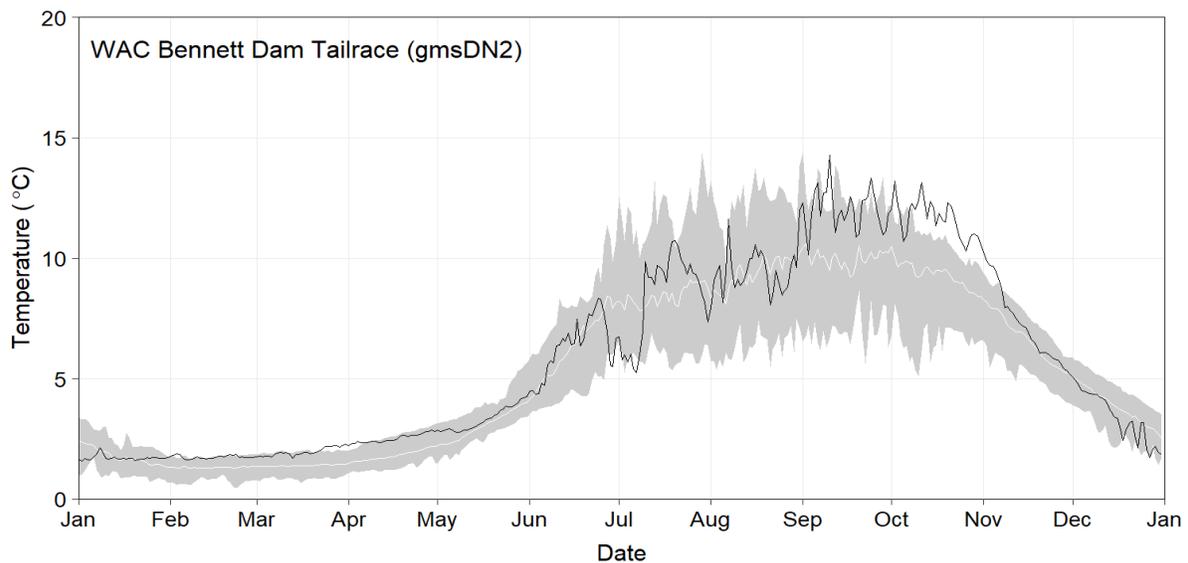
### 3.1.2. WAC Bennett Dam Tailrace

GMS tailrace water temperature is monitored by two different stations. Both stations are situated approximately 700 m downstream of the dam. Station gmsDN1 is located on the left bank and is positioned to monitor water flowing out of the south tailrace manifold. Station gmsDN2 is located on the right bank and is positioned to monitor water flowing out of the north tailrace manifold. Each of these stations have a backup temperature logger (gmsDN1BU and gmsDN2BU). Data from stations gmsDN1 and gmsDN2 were available for all of 2022 (Figure 4 and Figure 5). Data from the primary loggers (gmsDN1, gmsDN2) were averaged with the backup logger (gmsDN1BU, gmsDN2BU) when these data were available. Interannual comparisons of water temperature data for gmsDN1 and gmsDN2 are presented in Appendix D, Figure 50 and Figure 51, respectively.

**Figure 4.** Mean daily water temperature (°C) for the left bank (as viewed facing downstream) of the WAC Bennett Dam tailrace (gmsDN1; black line), 2022. The shaded area represents minimum and maximum water temperature recorded at the station between 2008 and 2021. The white line represents average mean daily water temperature over the same period.



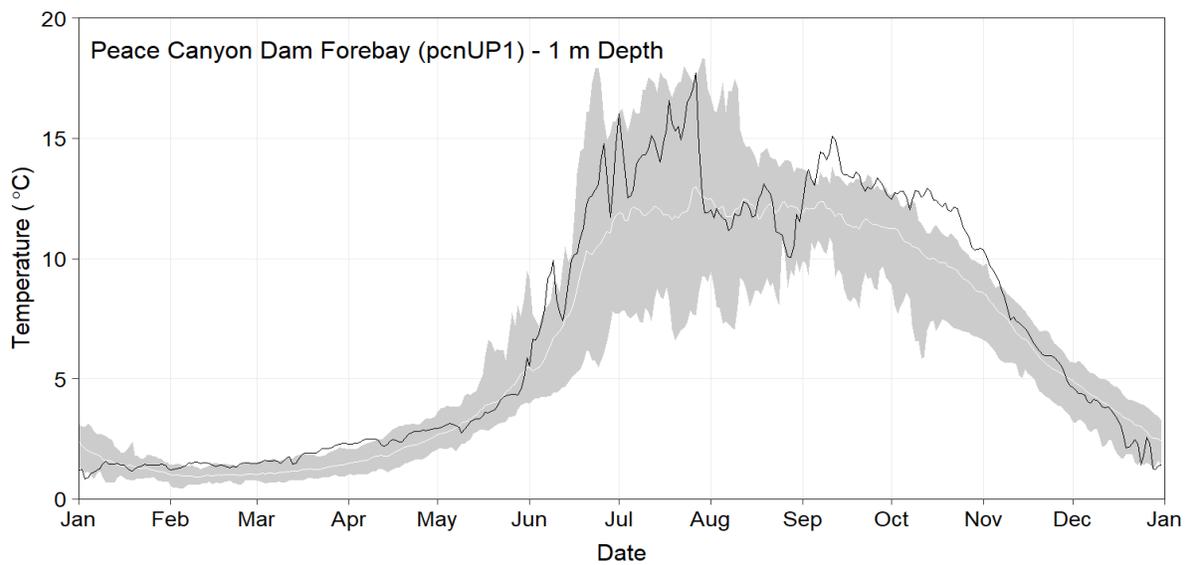
**Figure 5.** Mean daily water temperature (°C) for the right bank (as viewed facing downstream) of the WAC Bennett Dam tailrace (gmsDN2; black line), 2022. The shaded area represents minimum and maximum water temperature recorded at the station between 2008 and 2021. The white line represents average mean daily water temperature over the same period.



3.1.3. Peace Canyon Dam Forebay

Water temperature in the PCN forebay (pcnUP1) is measured 1 m below the water surface at the anti-vortex log boom, which is located approximately 450 m upstream of the dam. Data are available for the entire 2022 study period for pcnUP1 (Figure 6). Interannual comparisons of water temperature data for pcnUP1 are presented in Appendix D, Figure 52.

**Figure 6.** Mean daily water temperature (°C) for the Peace Canyon Dam forebay 1 m below the water surface (pcnUP1; black line), 2022. The shaded area represents minimum and maximum water temperature recorded at the station between 2008 and 2021. The white line represents average mean daily water temperature over the same period.

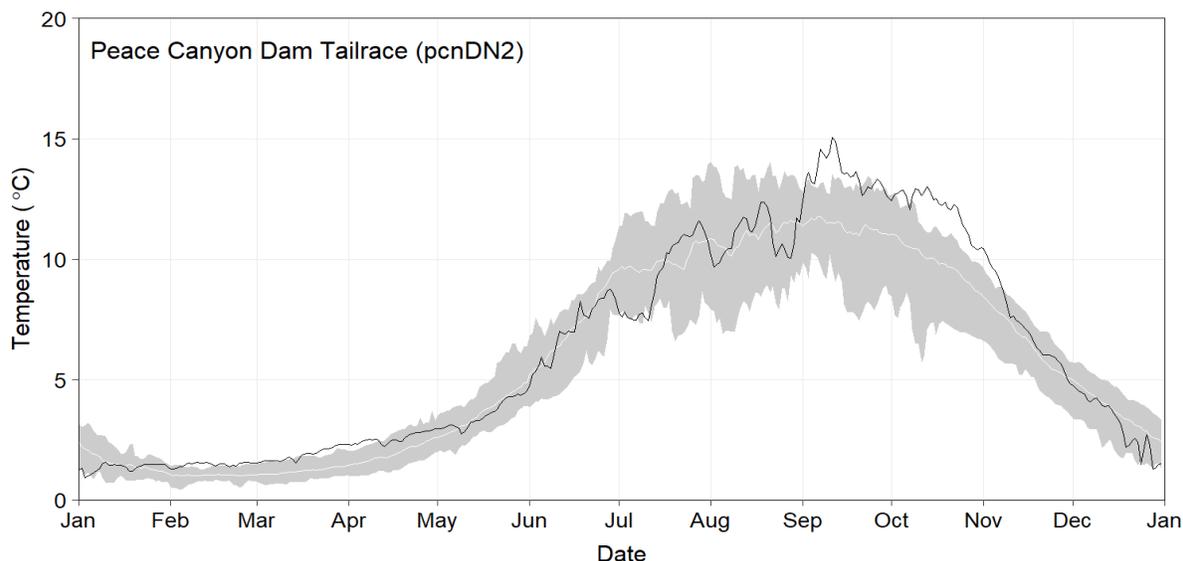


### 3.2. Downstream of Peace Canyon Dam

#### 3.2.1. Peace Canyon Dam Tailrace

PCN tailrace water temperature is monitored by a single station (pcnDN2). The station is situated on the left bank approximately 200 m downstream of the dam. This station has a backup temperature logger (pcnDN2BU). Data from the primary logger (pcnDN2) was averaged with the backup logger (pcnDN2BU) when these data were available. Data were available for the entire 2022 study period for pcnDN2 (Figure 7). Interannual comparisons of water temperature data for pcnDN2 are presented in Appendix D, Figure 53.

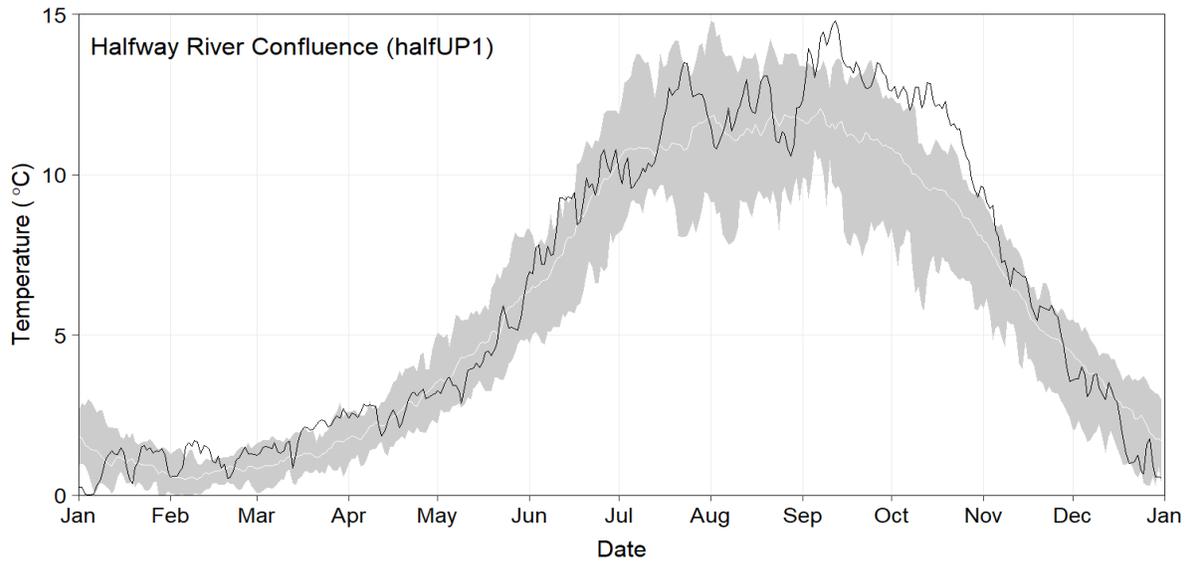
**Figure 7. Mean daily water temperature (°C) for the left bank (as viewed facing downstream) of the Peace Canyon Dam (PCN) tailrace (pcnDN2; black line), 2022. The shaded area represents minimum and maximum water temperature recorded at the station between 2008 and 2021. The white line represents average mean daily water temperature over the same period.**



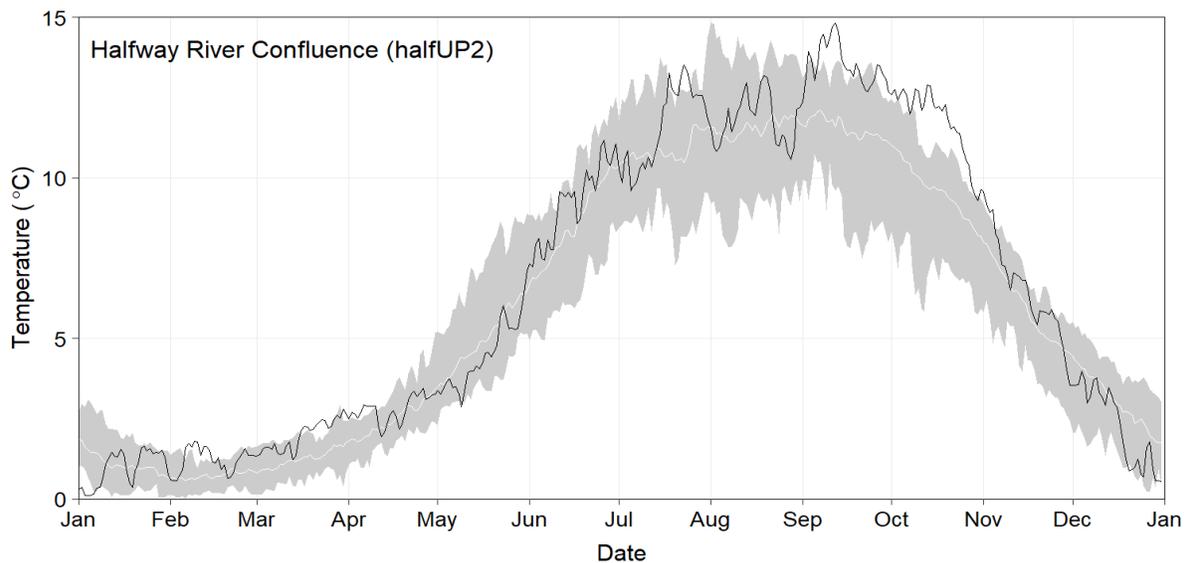
### 3.2.2. Halfway River Confluence Area

Water temperature in the Peace River is monitored at two different locations situated approximately 1 km upstream of the Halfway River’s confluence with the Peace River. Station halfUP1 is located on the right bank and station halfUP2 is located on the left bank. WSP field crews visited both stations on May 3, 2022 and successfully downloaded data; a replacement temperature logger was installed at halfUP2 (serial # 21199315 replacing serial # 20030829). Both stations had metal housings prior to this date, and WSP replaced them both with black ABS housings on May 3, 2022. Field crews from Aski/Ecofish returned to the stations on August 21, 2022 and on March 21, 2023 and water temperature loggers from both stations were successfully downloaded and redeployed. Data were available throughout 2022 for station halfUP1 (Figure 8) and station halfUP2 (Figure 9); approximately 0.3% and 0.5%, respectively, of the data for each station were removed during QA/QC. Interannual comparisons of water temperature data for halfUP1 and halfUP2 are presented in Appendix D, Figure 54 and Figure 55, respectively.

**Figure 8.** Mean daily water temperature (°C) for the right bank of the Peace River upstream of the Halfway River’s confluence with the Peace River (halfUP1; black line), 2022. The shaded area represents minimum and maximum water temperature recorded at the station between 2008 and 2021. The white line represents average mean daily water temperature over the same period.

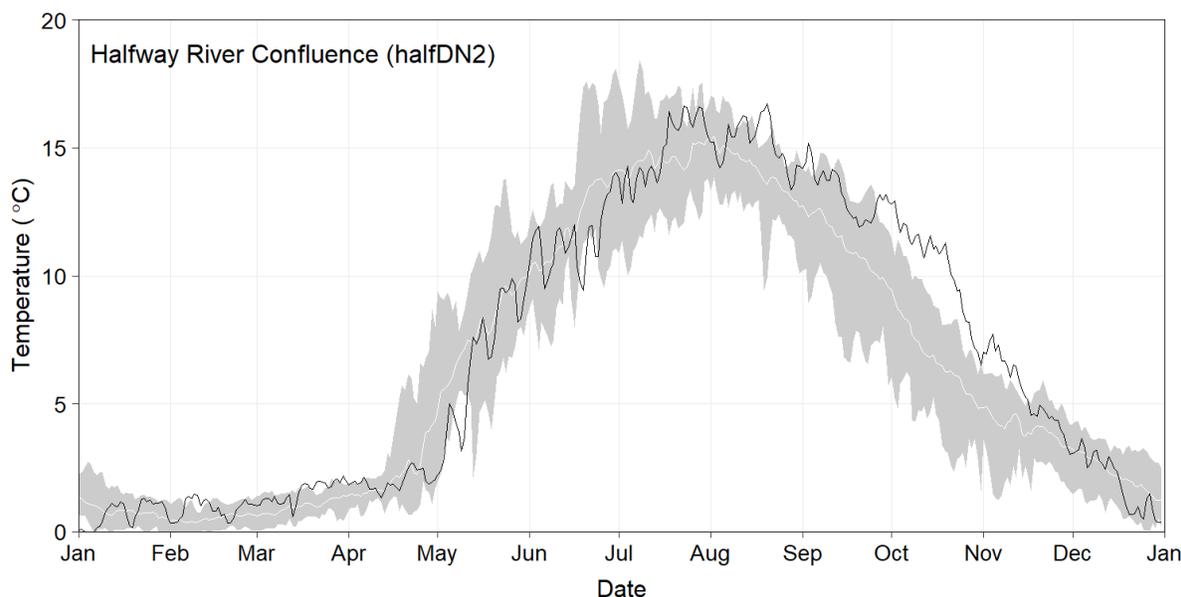


**Figure 9.** Mean daily water temperature (°C) for the left bank of the Peace River upstream of the Halfway River’s confluence with the Peace River (halfUP2; black line), 2022. The shaded area represents minimum and maximum water temperature recorded at the station between 2008 and 2021. The white line represents average mean daily water temperature over the same period.



Water temperature in the Peace River was monitored at a single station on the left bank approximately 2.5 km downstream of the Halfway River’s confluence with the Peace River (halfDN2), with a backup temperature logger nearby at halfDN2BU. During a station visit on May 3, 2022, the halfDN2 and halfDN2BU stations were recovered and downloaded by WSP. During this station visit, the halfDN2 temperature logger (serial # 10669748) was replaced with a new logger (serial # 21199302) and the halfDN2BU logger (serial # 20182030) was replaced with a new logger (serial #21199387); metal housings for both loggers were removed and the replacement loggers were each installed in a black ABS housing. Ecofish and Aski downloaded and redeployed both loggers on March 21, 2023. Data from the primary logger (halfDN2) were averaged with the backup logger (halfDN2BU) when these data were available. The logger at the halfDN2BU station briefly dewatered on March 13, 2022, on several days in July, on a few days in August, and briefly on October 30, 2022; data from dewatered periods were removed, resulting in only data from halfDN2 to be used in the average temperature calculation. Figure 10 presents the resulting timeseries data for the entirety of 2022; approximately 0.1% of the data from the averaged timeseries were removed during QA/QC and was not gap-filled. Interannual comparisons of water temperature data for halfDN2 are presented in Appendix D, Figure 56.

**Figure 10.** Mean daily water temperature (°C) for the left bank of the Peace River downstream of the Halfway River’s confluence with the Peace River (halfDN2; black line), 2022. The shaded area represents minimum and maximum water temperature recorded at the station between 2008 and 2021. The white line represents average mean daily water temperature over the same period.

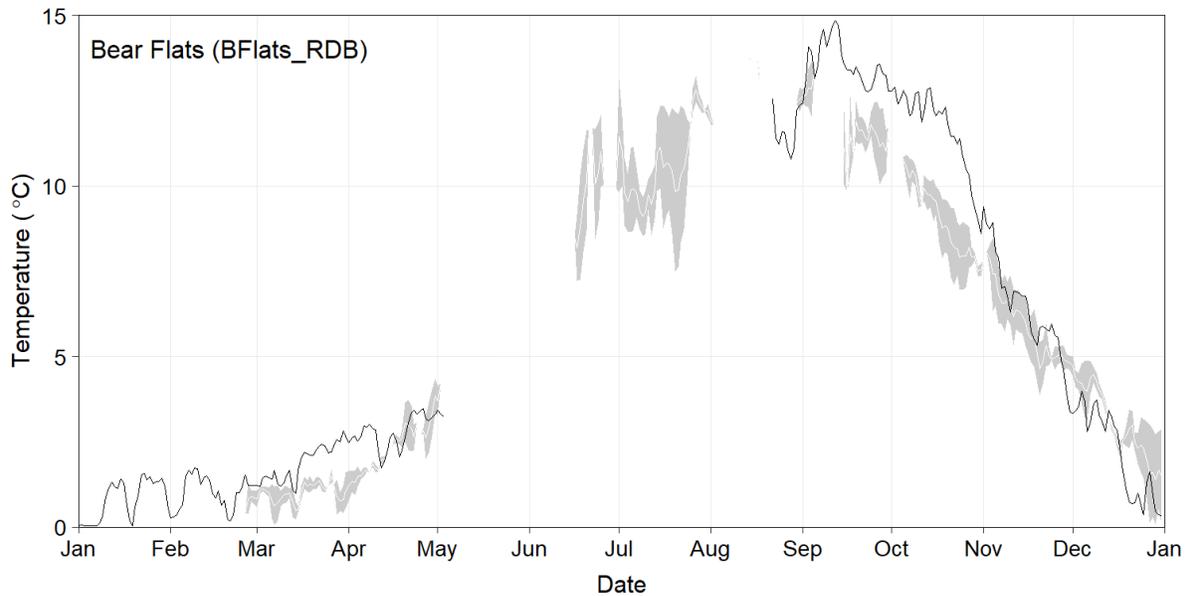


### 3.2.3. Bear Flats Area

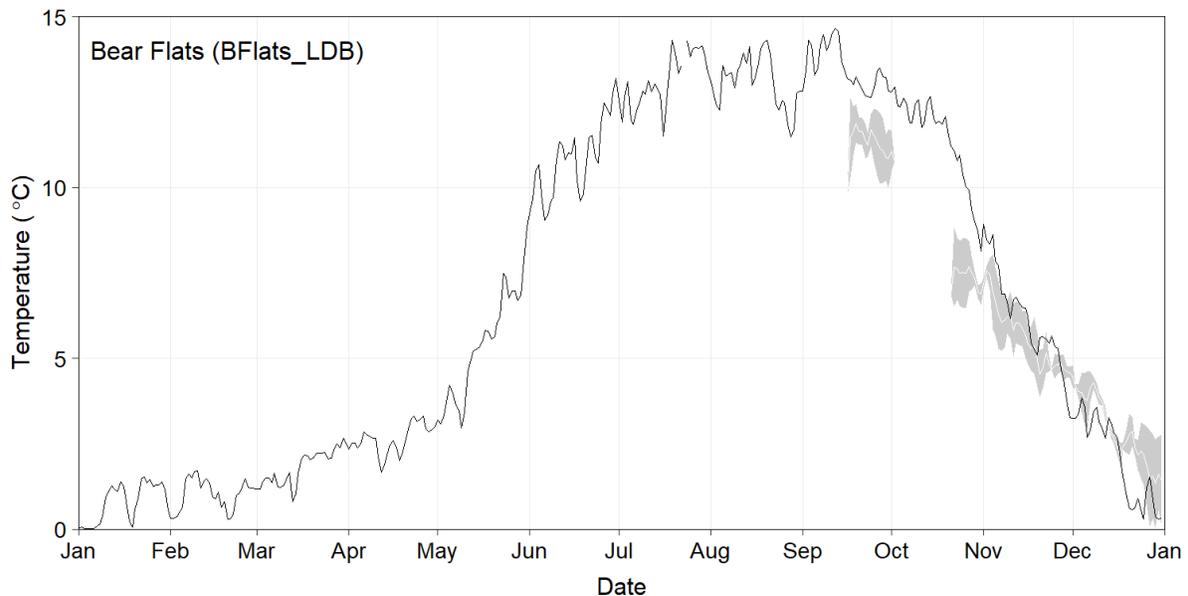
In 2022, water temperature in the Peace River was monitored at two different locations in the Bear Flats area situated approximately 18.0 km downstream of the Halfway River’s confluence with the Peace River and 20.9 km upstream of the Moberly River’s confluence with the Peace River. Station BFlats\_RDB is located on the right bank and station BFlats\_LDB is located on the left bank. These stations were first installed on 15 September 2020 (Golder 2021). These stations replace the previous stations mobUP1 and mobUP2 (Appendix B: Figure 57 and Figure 58), which were located closer to Site C but needed to be removed prior to river diversion because of construction activities. The two stations near Bear Flats provide an alternative location to monitor water temperature in the Peace River between the Halfway River and the Moberly River.

WSP field crews visited both stations on May 3, 2022 and successfully downloaded and redeployed both temperature loggers; serial #10887852 was replaced at BFlats\_RDB with serial #21164321. Field crews from Aski/Ecofish returned to the stations on August 21, 2022 during which they successfully downloaded and redeployed the logger at BFlats\_LDB, however the anchoring cable at BFlats\_RDB was broken and the logger (serial # 21164321) was missing; a new logger (serial # 21356781) was deployed at BFlats\_RDB on August 22, 2022. Consequently, data were not available at BFlats\_RDB from May 3 to August 22, 2022. Near continuous data are available from BFlats\_RDB during the remainder of the year (Figure 11), except for March 13, 2022 when the logger appeared to be dewatered. Near continuous data were available from BFlats\_LDB throughout 2022 (Figure 12), except for intermittent periods between May 22 to 23, and July 13 to August 19 when the sensor was temporarily dewatered by fluctuations in flow. Interannual comparisons of water temperature data for BFlats\_RDB and BFlats\_LDB are presented in Appendix D, Figure 57 and Figure 58, respectively.

**Figure 11.** Mean daily water temperature (°C) for the right bank of the Peace River downstream of the Halfway River’s confluence with the Peace River (BFlats\_RDB; black line), 2022. This station was first installed in 2020.



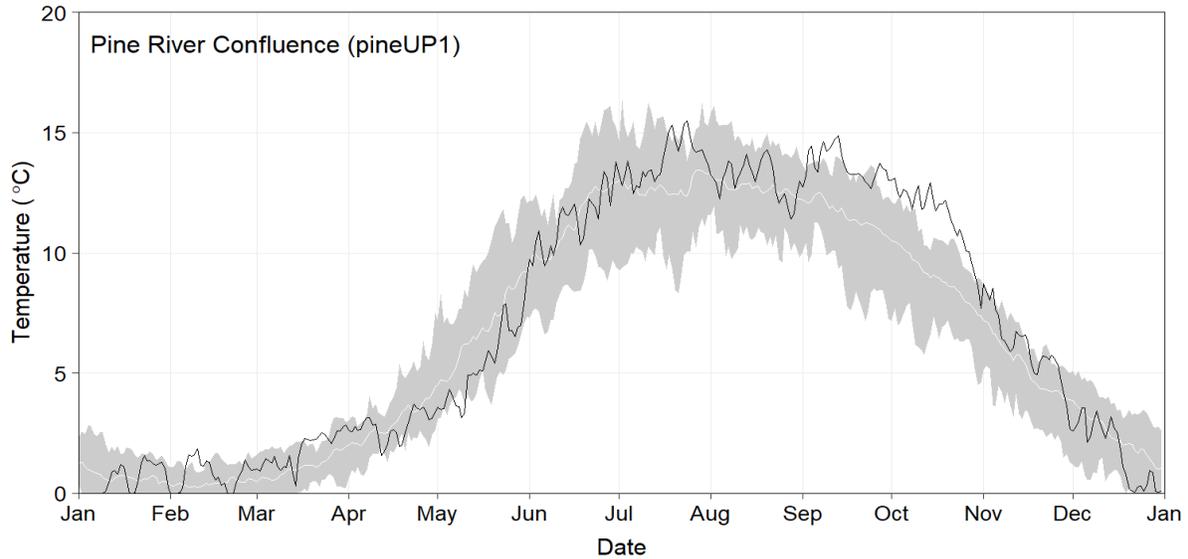
**Figure 12.** Mean daily water temperature (°C) for the left bank of the Peace River downstream of the Halfway River’s confluence with the Peace River (BFlats\_LDB; black line), 2022. This station was first installed in 2020.



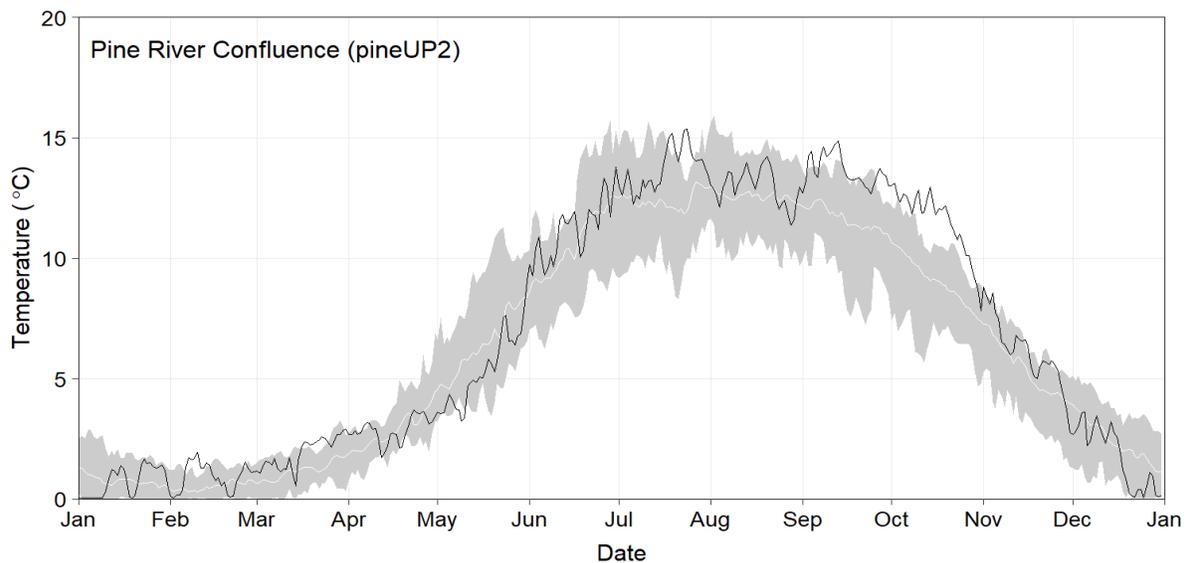
#### 3.2.4. Pine River Confluence Area

Water temperature in the Peace River is monitored at two different locations situated approximately 2.0 km upstream of the Pine River's confluence with the Peace River. Station pineUP1 is located on the right bank and station pineUP2 is located on the left bank. WSP visited these stations on May 17, 2022 and successfully downloaded temperature data from both. On this date, WSP swapped out the logger at pineUP1 due to a low battery (serial # 10669747 removed, serial #10635067 was installed). On May 17, 2022 WSP also replaced the metal housings at both stations with black ABS housings. Aski/Ecofish field crews visited these stations on September 22, 2022 and January 3, 2023. During each station visit loggers at both stations were successfully located, downloaded, and redeployed. Continuous data were available throughout 2022 at both pineUP1 (Figure 13) and pineUP2 (Figure 14). Interannual comparisons of water temperature data for pineUP1 and pineUP2 are presented in Appendix D, Figure 62 and Figure 63, respectively.

**Figure 13.** Mean daily water temperature (°C) for the right bank of the Peace River upstream of the Pine River’s confluence with the Peace River (pineUP1; black line), 2022. The shaded area represents minimum and maximum water temperature recorded at the station between 2008 and 2021. The white line represents average mean daily water temperature over the same period.



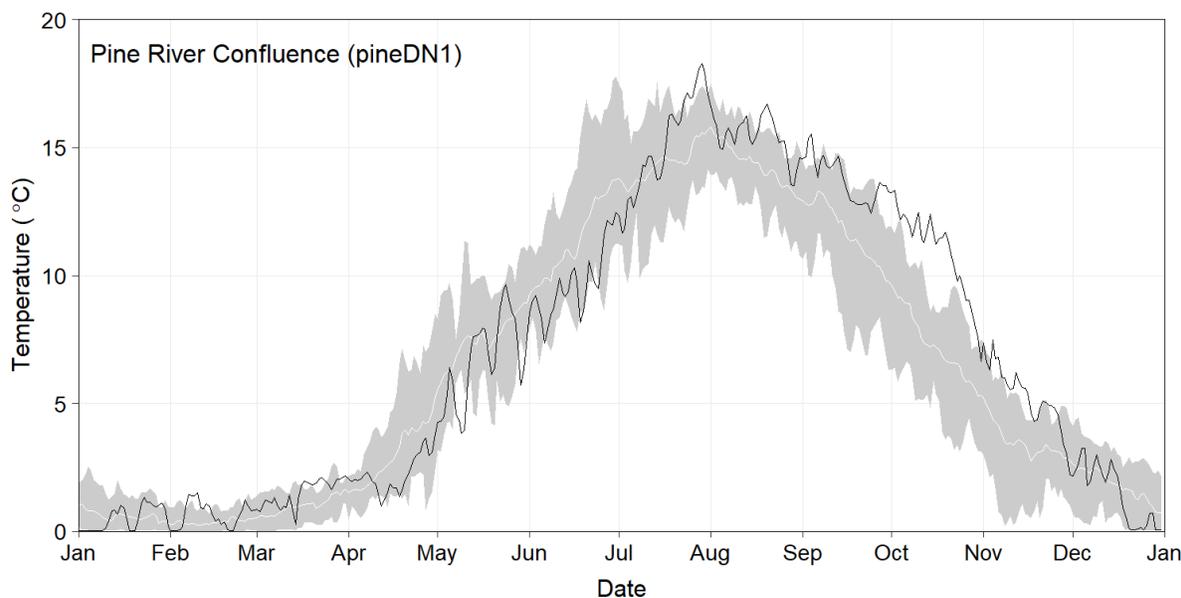
**Figure 14.** Mean daily water temperature (°C) for the left bank of the Peace River upstream of the Pine River’s confluence with the Peace River (pineUP2; black line), 2022. The shaded area represents minimum and maximum water temperature recorded at the station between 2008 and 2021. The white line represents average mean daily water temperature over the same period.



Water temperature in the Peace River is monitored at a single station on the right bank approximately 6.5 km downstream of the Pine River’s confluence with the Peace River (at pineDN1). A second temperature logger (pineDN1BU) provides a backup data source for this station. Temperature loggers were recovered, downloaded, and redeployed during station visits conducted by WSP on May 17, 2022, and by Aski/Ecofish on September 22, 2022 and April 7, 2023. During the May 17, 2022 station visit, WSP replaced each station’s metal housing with a black ABS housing. On April 7, 2023, the primary temperature logger at the station (pineDN1) was successfully downloaded, and redeployed, however the backup logger (serial # 10893055) could not be located. Considering data from both temperature loggers, there is a complete period of record at this station in 2022.

Data from the primary logger (pineDN1) were averaged with the backup logger (pineDN1BU) when these data were available to provide better characterization of water temperature conditions in this location; data are shown in Figure 15. Interannual comparisons of water temperature data for pineDN1 are presented in Appendix D, Figure 64.

**Figure 15. Mean daily water temperature (°C) for the right bank of the Peace River downstream of the Pine River’s confluence with the Peace River (pineDN1; black line), 2022. The shaded area represents minimum and maximum water temperature recorded at the station between 2008 and 2021. The white line represents average mean daily water temperature over the same period.**



### 3.2.5. Pouce Coupe River Confluence Area

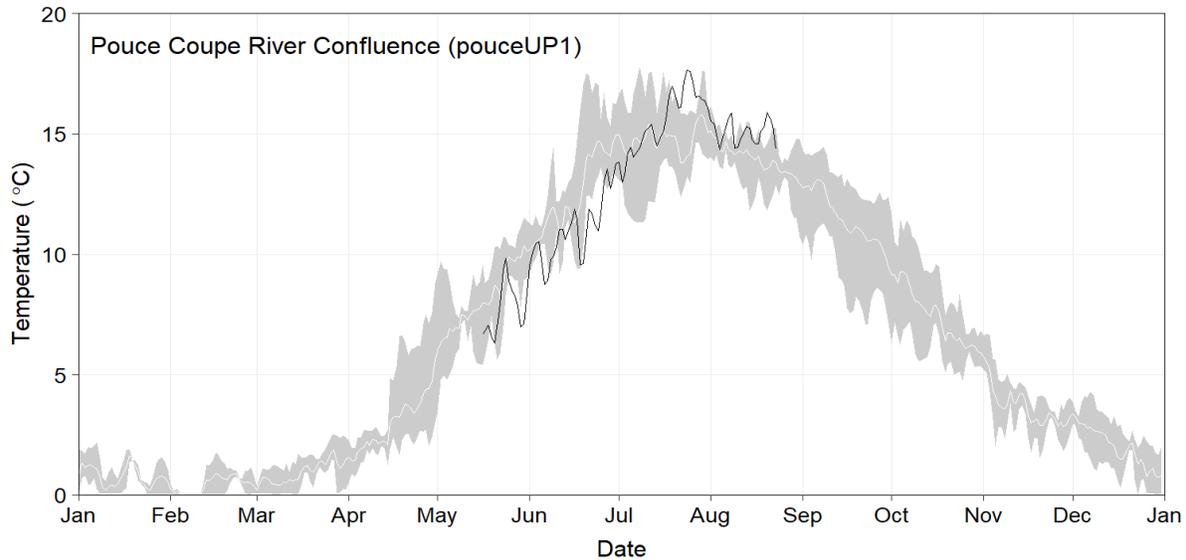
In 2022, water temperature in the Peace River was monitored at two different locations upstream of the Pouce Coupe River's confluence with the Peace River. Station pouceUP1 is located approximately 2.4 km upstream of the confluence on the right bank and station pouceUP2 is located approximately 3.3 km upstream of the confluence on the left bank.

During a station visit conducted on May 16, 2022 by WSP, the field crew noted that the metal cable securing the pouceUP1 temperature logger was severed; this temperature logger was not recovered, and a replacement logger was installed (serial # 10887852). The pouceUP2 temperature logger was recovered, downloaded, and redeployed during this May 2022 station visit. Additional station visits to both locations were completed by Ecofish/Aski field crews on August 23, 2022 and April 7, 2023. During the station visit on August 23, 2022, temperature loggers at both locations were successfully retrieved, downloaded, and redeployed. During a station visit on April 7, 2023, the pouceUP2 temperature logger was again recovered, downloaded, and redeployed, however the field crew found the metal cable securing the pouceUP1 temperature logger (serial # 10887852) was again sheared off and the temperature logger was lost; a replacement logger was installed (serial # 21356782).

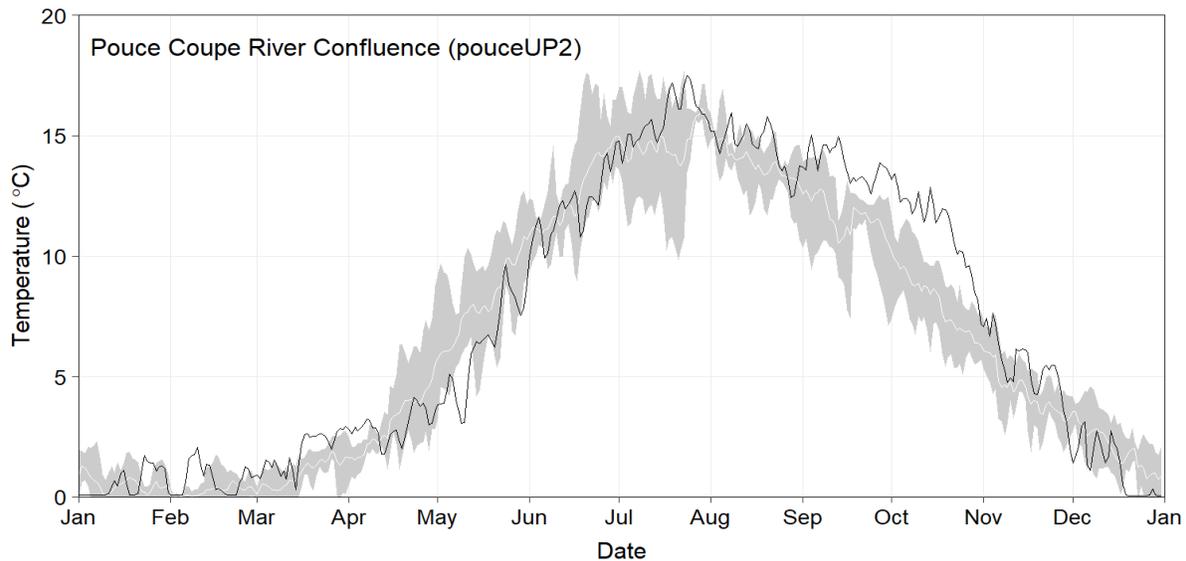
Due to repeated loss of temperature sensors at pouceUP1, data were not available from this station from May 4, 2021 to May 16, 2022 and after August 23, 2022 (Figure 16). Collected data from pouceUP1 between May 16 and August 23, 2022 included several periods with large diurnal fluctuations in temperature, that based on concurrent air temperature data were indicative of intermittent dewatering. Temperature data at pouceUP1 during instances of dewatering from May 16 to August 23, 2022, were estimated using data from the pouceUP2 station, which were unaffected. The resulting timeseries provides temperature data at pouceUP1 for 26.8% of the entire 2022 year.

Continuous data were available from pouceUP2 throughout 2022 (Figure 17). Interannual comparisons of water temperature data for pouceUP1 and pouceUP2 are presented in Appendix D, Figure 65 and Figure 66, respectively.

**Figure 16.** Mean daily water temperature (°C) for the right bank of the Peace River upstream of the Pouce Coupe River’s confluence with the Peace River (pouceUP1; black line), 2022. The shaded area represents minimum and maximum water temperature recorded at the station between 2008 and 2021. The white line represents average mean daily water temperature over the same period.



**Figure 17.** Mean daily water temperature (°C) for the left bank of the Peace River upstream of the Pouce Coupe River’s confluence with the Peace River (pouceUP2; black line), 2022. The shaded area represents minimum and maximum water temperature recorded at the station between 2008 and 2021. The white line represents average mean daily water temperature over the same period.



### 3.3. Peace River Tributaries

In the spring of 2016, temperature loggers were installed in the mainstems of the Pine and Beatton rivers under the FAHMFP. In the summer of 2019, additional non-FAHMFP water temperature loggers were installed in the mainstems of the Moberly River and Farrell Creek and in the mainstems of the following Halfway River tributaries: the Chowade River and Colt (a tributary to the Graham River), Cypress, Kobes, and Fiddes creeks. In the summer of 2020, temperature loggers were installed in the mainstem of Maurice Creek (non-FAHMFP station). Due to the remote location of most of these tributaries, some stations are only visited once per year in the summer when crews are in the area. Both FAHMFP and non-FAHMFP tributary stations continue to be maintained by WSP who have the data on file.

## 4. DISCUSSION

The 2022 study was the eighth year of the Site C Reservoir and Peace River Water Temperature Monitoring Program (Task 2b), a multi-year water temperature monitoring program at select Peace River mainstem and Peace River tributary locations. When coupled with water temperature data collected under BC Hydro's WLR Peace River Baseline TDG and Temperature Monitoring Program (GMSWORK-2), a near-continuous water temperature dataset exists for select locations from 2008 through to 2022. Task 2b is not intended to address specific management questions or hypotheses under the FAHMFP. Instead, temperature data collected under Task 2b provides information to diagnose causes of observed changes in other FAHMFP programs (i.e., Site C Reservoir Fish Community Monitoring Program (Mon-1a), Site C Reservoir Tributaries Fish Community and Spawning Monitoring Program (Mon-1b), and Peace River Fish Community Monitoring Program (Mon-2)) designed to monitor key indicator species of the Peace River.

## 5. CLOSURE

We trust that this report meets your requirements with respect to a 2022 annual data summary of water temperature data collected under the Mon-8 and Mon-9 programs at stations in the mainstem of the Peace River from the forebay in Williston Reservoir downstream to the stations located just upstream of the Pouce Coupe River confluence with the Peace River in Alberta.

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## APPENDICES

**Appendix A. Water Temperature Monitoring Station Location Data**

**Table 1. Summary of Peace River Water temperature monitoring station locations, 2022. Stations are presented in upstream to downstream order.**

Station Name <sup>1</sup>	River Km <sup>2</sup>	FAHMF <sup>3</sup> Station?	Stream Name <sup>3</sup>	Location Description	First Year of Monitoring	Current Serial Number	Temperature Logger Type	UTM Coordinates			Comment
								Zone	Easting	Northing	
gmsUP1	-1	Yes	Peace River	WAC Bennett Forebay - Shallow	2008	20823636	Tidbit V2	10V	548,841	6,209,022	
gmsUP2	-1	Yes	Peace River	WAC Bennett Forebay - Deep	2008	20823637	Tidbit V2	10V	548,841	6,209,022	
gmsDN1	0.7	Yes	Peace River	GMS Tailrace - Left Bank	2008	20655136	Tidbit V2	10V	548,881	6,207,761	
gmsDN1BU	0.7	Yes	Peace River	GMS Tailrace - Left Bank, Backup	2008	10676155	Tidbit V2	10V	548,881	6,207,761	
gmsDN2	0.7	Yes	Peace River	GMS Tailrace - Right Bank	2008	21199346	Tidbit V2	10V	548,828	6,207,836	
gmsDN2BU	0.7	Yes	Peace River	GMS Tailrace - Right Bank Backup	2008	20332121	Tidbit V2	10V	548,828	6,207,836	
pcnUP1	19.9	Yes	Peace River	Peace Canyon Forebay - Shallow (1 m depth)	2008	20823638	Tidbit V2	10V	562,710	6,204,068	
pcnDN2	20.8	Yes	Peace River	Peace Canyon Tailrace - Left Bank	2008	20332187	Tidbit V2	10V	562,803	6,204,854	
pcnDN2BU	20.8	Yes	Peace River	Peace Canyon Tailrace - Left Bank Backup	2008	21199347	Tidbit V2	10V	562,803	6,204,854	
halfUP1	64	Yes	Peace River	Upstream of Halfway Confluence - Right Bank	2008	20332123	Tidbit V2	10V	595,165	6,230,094	
halfUP2	64.3	Yes	Peace River	Upstream of Halfway Confluence - Left Bank	2008	21199315	Tidbit V2	10V	595,569	6,230,541	WSP replaced Serial # 20030829 on May 3, 2022
halfDN2	68.3	Yes	Peace River	Downstream of Halfway Confluence - Left Bank	2008	21199302	Tidbit V2	10V	598,313	6,232,378	WSP replaced Serial # 10669748 on May 3, 2022
halfDN2BU	68.3	Yes	Peace River	Downstream of Halfway Confluence - Left Bank, Backup	2008	21199387	Tidbit V2	10V	598,286	6,232,332	WSP replaced Serial # 20182030 on May 3, 2022
BFlats_RDB	83.5	Yes	Peace River	Bear Flats Right Bank	2020	21356781	Tidbit V2	10V	611,280	6,237,044	WSP replaced Serial # 10887852 in May 2022; Serial #21164321 was found lost on Aug. 22, 2022 and a replacement logger was installed
BFlats_LDB	83.5	Yes	Peace River	Bear Flats Left Bank	2020	20655180	Tidbit V2	10V	611,453	6,237,303	
mobUP1	102.1	Yes	Peace River	Upstream of the Moberly Confluence - Left Bank	2008	-	-	10V	627,158	6,232,349	Decommissioned in 2020, replaced by BFlats_LDB
mobUP2	102.1	Yes	Peace River	Upstream of the Moberly Confluence - Right Bank	2008	-	-	10V	627,501	6,232,563	Decommissioned in 2020, replaced by BFlats_RDB
mobDN1	106.9	Yes	Peace River	Downstream of the Moberly Confluence - Right Bank	2008	-	-	10V	630,583	6,229,281	Decommissioned in 2020
pineUP1	119.5	Yes	Peace River	Upstream of Pine Confluence - Right Bank	2008	10635067	Tidbit V2	10V	641,034	6,225,375	WSP replaced Serial # 10669747 on May 17, 2022
pineUP2	120	Yes	Peace River	Upstream of Pine Confluence - Left Bank	2008	20655135	Tidbit V2	10V	641,653	6,225,304	
pineDN1	126.8	Yes	Peace River	Downstream of Pine Confluence - Right Bank	2008	20655185	Tidbit V2	10V	648,073	6,222,796	
pineDN1BU	126.9	Yes	Peace River	Downstream of Pine Confluence - Right Bank, Backup	2008	10893055	Tidbit V2	10V	648,362	6,222,796	Tidbit could not be located on April 7, 2023; a new one may need to be installed
pouceUP1	171.4	Yes	Peace River	Upstream of Pouce Coupe Confluence - Right Bank	2016	21356782	Tidbit V2	11V	316,874	6,225,211	Serial # 20655184 was replaced on May 16, 2022 with serial # 10887852. Serial #10887852 lost, replaced on Apr. 7, 2023
pouceUP2	170.5	Yes	Peace River	Upstream of Pouce Coupe confluence - Left Bank	2016	21163914	Tidbit V2	11V	315,887	6,226,158	
Maurice_1	0.8	No	Maurice Creek	Approximately 1.0 km upstream from confluence	2020	-	-	10V	568,663	6,209,018	

<sup>1</sup> Duplicate tidbits are installed at select sites for redundancy, as indicated by "BU" in the site name which stands for "backup".

<sup>2</sup> Peace River River Km values are measured downstream from the base of WAC Bennett Dam. Tributary River km values are measured upstream from the stream's confluence with the Peace River.

<sup>3</sup> Peace River sites are reported on by Ecofish/Aski; all other sites are reported on by WSP.

<sup>4</sup> Tributary River km values are measured upstream from the stream's or river's confluence with the Graham or Halfway River.

Table 1. Continued.

Station Name <sup>1</sup>	River Km <sup>2</sup>	FAHMFP Station?	Stream Name <sup>3</sup>	Location Description	First Year of Monitoring	Current Serial Number	Temperature Logger Type	UTM Coordinates			Comment
								Zone	Easting	Northing	
Maurice_2	0.8	No	Maurice Creek	Approximately 1.0 km upstream from confluence	2020	-	-	10V	568,663	6,209,018	
Farrell_1	62.5	No	Farrell Creek	Downstream of Kobes Creek Road Bridge	2019	-	-	10V	572,332	6,239,949	
Farrell_2	62.5	No	Farrell Creek	Downstream of Kobes Creek Road Bridge	2019	-	-	10V	572,332	6,239,949	
Fiddes_1 <sup>4</sup>	7.2	No	Fiddes Creek	Approximately 7.2 km upstream from confluence	2019	-	-	10V	479,836	6,311,013	
Fiddes_2 <sup>4</sup>	7.7	No	Fiddes Creek	Approximately 7.2 km upstream from confluence	2019	-	-	10V	479,836	6,311,013	
Cypress_1 <sup>4</sup>	17.6	No	Cypress Creek	Upstream of Cypress Creek bridge	2019	-	-	10V	511,008	6,301,673	
Cypress_2 <sup>4</sup>	17.6	No	Cypress Creek	Upstream of Cypress Creek bridge	2019	-	-	10V	511,008	6,301,673	
Cypress_3 <sup>4</sup>	17.6	No	Cypress Creek	Upstream of Cypress Creek bridge	2021	-	-	10V	511,008	6,301,673	
Cypress_4 <sup>4</sup>	17.6	No	Cypress Creek	Upstream of Cypress Creek bridge	2021	-	-	10V	511,008	6,301,673	
Chowade_1 <sup>4</sup>	20.9	No	Chowade Creek	Downstream of Chowade River bridge	2019	-	-	10V	513,503	6,284,788	
Chowade_2 <sup>4</sup>	20.9	No	Chowade Creek	Downstream of Chowade River bridge	2019	-	-	10V	513,507	6,284,799	
Chowade_3 <sup>4</sup>	20.9	No	Chowade Creek	Downstream of Chowade River bridge	2021	-	-	10V	513,507	6,284,799	
Chowade_4 <sup>4</sup>	20.9	No	Chowade Creek	Downstream of Chowade River bridge	2021	-	-	10V	513,507	6,284,799	
Colt_1 <sup>4</sup>	3.1	No	Colt Creek	Upstream of Mile 95 Road bridge	2019	-	-	10V	538,236	6,258,610	
Colt_2 <sup>4</sup>	3.1	No	Colt Creek	Upstream of Mile 95 Road bridge	2019	-	-	10V	538,236	6,258,610	
Colt_3 <sup>4</sup>	3.1	No	Colt Creek	Upstream of Mile 95 Road bridge	2021	-	-	10V	538,236	6,258,610	
Colt_4 <sup>4</sup>	3.1	No	Colt Creek	Upstream of Mile 95 Road bridge	2021	-	-	10V	538,236	6,258,610	
Kobes_1 <sup>4</sup>	11.5	No	Kobes Creek	Bridge near River Km 11.0	2020	-	-	10V	555,239	6,256,203	
Kobes_2 <sup>4</sup>	11.5	No	Kobes Creek	Bridge near River Km 11.0	2020	-	-	10V	555,239	6,256,203	
Moberly_1	42.6	No	Moberly River	Downstream of North Monias Road Bridge	2019	-	-	10V	603,472	6,217,933	
Moberly_2	42.6	No	Moberly River	Downstream of North Monias Road Bridge	2019	-	-	10V	603,472	6,217,933	
Moberly_3	42.6	No	Moberly River	Downstream of North Monias Road Bridge	2021	-	-	10V	603,472	6,217,933	
Moberly_4	42.6	No	Moberly River	Downstream of North Monias Road Bridge	2021	-	-	10V	603,472	6,217,933	
pineMS1	2.2	Yes	Pine River	Left Bank upstream of confluence	2016	-	-	10V	641,762	6,223,599	
pineMS2	2.2	Yes	Pine River	Left Bank upstream of confluence	2016	-	-	10V	641,762	6,223,599	
BeatMS1	0.9	Yes	Beatton River	Left Bank upstream of confluence	2016	-	-	10V	663,101	6,220,759	
BeatMS2	0.9	Yes	Beatton River	Left Bank upstream of confluence	2016	-	-	10V	663,101	6,220,759	

<sup>1</sup> Duplicate tidbits are installed at select sites for redundancy, as indicated by "BU" in the site name which stands for "backup".

<sup>2</sup> Peace River River Km values are measured downstream from the base of WAC Bennett Dam. Tributary River km values are measured upstream from the stream's confluence with the Peace River.

<sup>3</sup> Peace River sites are reported on by Ecofish/Aski; all other sites are reported on by WSP.

<sup>4</sup> Tributary River km values are measured upstream from the stream's or river's confluence with the Graham or Halfway River.

**Appendix B. 2022 Representative Station Photos**

Figure 18. Downstream view of site halfUP1 on Aug 21, 2022.



Figure 19. Downstream view of site halfUP2 on August 22, 2022.



**Figure 20.** Upstream view of site halfDN2 on August 21, 2022.



**Figure 21.** Upstream view of site halfDN2BU on July 27, 2022.



**Figure 22.** Downstream view of site BFlats\_RDB on August 22, 2022.



**Figure 23.** Upstream view of site BFlats\_LDB on August 22, 2022.



Figure 24. Downstream view of site pineUP1 on September 22, 2022.



Figure 25. Upstream view of site pineUP2 on September 22, 2022.



Figure 26. Upstream view of site pineDN1 on September 22, 2022.



Figure 27. Downstream view of site pineDN1BU on September 22, 2022.



Figure 28. Downstream view of site pouceUP1 on August 23, 2022.



Figure 29. Upstream view of site pouceUP2 on April 7, 2023.



## Appendix C. Water Temperature Data QA

**Table 2. Summary of water temperature period of record at monitoring stations in the Peace River, January 1 to December 31, 2022.**

Station	UTM Coordinates		Elevation (masl) <sup>1</sup>	Start of Record	End of Record	Number of Days with Valid Data <sup>2,3</sup>	Gaps in Record <sup>3</sup> (% Complete)	
	Zone	Easting (m)						Northing (m)
gmsUP1	10V	548,841	6,209,022	672	01-Jan-2022	31-Dec-2022	365	100.0
gmsUP2	10V	548,841	6,209,022	672	01-Jan-2022	31-Dec-2022	365	100.0
gmsDN1	10V	548,881	6,207,761	506	01-Jan-2022	31-Dec-2022	365	100.0
gmsDN2	10V	548,828	6,207,836	503	01-Jan-2022	31-Dec-2022	365	100.0
pcnUP1	10V	562,710	6,204,068	503	01-Jan-2022	31-Dec-2022	365	100.0
pcnDN2	10V	562,803	6,204,854	466	01-Jan-2022	31-Dec-2022	365	100.0
halfUP1	10V	595,165	6,230,094	439	01-Jan-2022	31-Dec-2022	363	99.7
halfUP2	10V	595,569	6,230,541	446	01-Jan-2022	31-Dec-2022	362	99.5
halfDN2	10V	598,313	6,232,378	439	01-Jan-2022	31-Dec-2022	364	99.9
BFlats_LDB	10V	611,453	6,237,303	427	01-Jan-2022	31-Dec-2022	342	96.3
BFlats_RDB	10V	611,280	6,237,044	427	01-Jan-2022	31-Dec-2022	252	69.4
pineUP1	10V	641,034	6,225,375	405	01-Jan-2022	31-Dec-2022	365	100.0
pineUP2	10V	641,653	6,225,304	408	01-Jan-2022	31-Dec-2022	365	100.0
pineDN1	10V	648,073	6,222,796	405	01-Jan-2022	31-Dec-2022	365	100.0
pouceUP1	11V	316,874	6,225,211	427	16-May-2022	23-Aug-2022	98	26.8%
pouceUP2	11V	315,887	6,226,158	386	01-Jan-2022	31-Dec-2022	365	100.0

<sup>1</sup> Estimated using Google Earth

<sup>2</sup> A minimum of 20 hours of data is required for a day to be considered "valid". Excluded data due to sensor suspected of being out-of-water/dry, buried in sediment, servicing or malfunctioning, etc.

<sup>3</sup> Gaps in continuous records at all sites due to sensor loss, or out-of-water/dry, sensors servicing, and malfunctioning events.

**Table 3. Comparison of water temperature between spot measurements and in-stream sensors in the Peace River during 2022.**

Station	Date/Time (MST)	Water Temperature (°C)		Difference	
		Spot Measurements	In-Stream Sensor*	(°C)	(%)
gmsUP1	2023-01-19 12:50	0.20	0.27	-0.07	30.87
gmsUP2	2023-01-19 12:45	1.00	0.96	0.04	3.87
gmsDN1	2023-01-19 12:15	1.00	1.04	-0.04	4.31
gmsDN2	2023-01-19 12:00	1.40	1.59	-0.19	12.58
pcnUP1	2023-01-19 10:40	0.80	0.55	0.25	37.04
pcnDN2	2022-08-20 12:12	12.32	12.24	0.07	0.59
	2023-01-19 11:02	1.20	1.04	0.16	13.90
halfUP1	2022-08-21 16:40	14.43	13.76	0.67	4.74
	2023-03-21 14:05	2.07	1.64	0.43	23.19
halfUP2	2022-08-21 17:15	14.19	13.67	0.53	3.79
	2023-03-21 13:38	2.53	1.81	0.73	33.45
halfDN2	2022-08-21 17:37	17.56	16.76	0.79	4.62
	2023-03-21 13:05	2.32	1.52	0.80	41.47
halfDN2BU	2022-08-21 18:02	17.61	16.76	0.84	4.89
	2023-03-21 12:40	2.45	1.52	0.93	46.82
BFlats_RDB	2022-08-21 18:49	13.06	12.63	0.43	3.38
	2023-03-21 11:40	1.78	1.32	0.46	29.79
BFlats_LDB	2022-08-21 18:49	15.03	14.81	0.22	1.45
	2023-03-21 11:40	1.97	1.40	0.57	33.82
pineUP1	2022-09-22 12:35	13.07	12.94	0.13	0.97
	2023-01-03 16:20	-0.02	0.25	-0.27	235.40
pineUP2	2022-09-22 12:00	12.88	12.81	0.07	0.53
	2023-01-03 16:20	-0.02	0.44	-0.46	219.09
pineDN1	2022-09-22 13:30	12.88	12.92	-0.04	0.31
	2023-04-07 12:04	2.46	2.48	-0.02	0.69
pineDN1BU	2022-09-22 13:10	12.79	12.67	0.12	0.97
pouceUP1	2022-08-23 11:26	14.72	14.35	0.37	2.56
pouceUP2	2022-08-23 11:49	14.98	14.29	0.69	4.74
	2023-04-07 09:37	2.91	2.88	0.03	1.14
Average		7.23	6.94	0.28	27.62
Standard Deviation		6.48	6.36	0.36	56.24

\* In-stream sensor measurements for the stations denoted with BU (backup) is derived from the primary station average temperature timeseries.

Figure 30. Comparison of water temperature between spot measurements and in-stream sensors at gmsUP1.

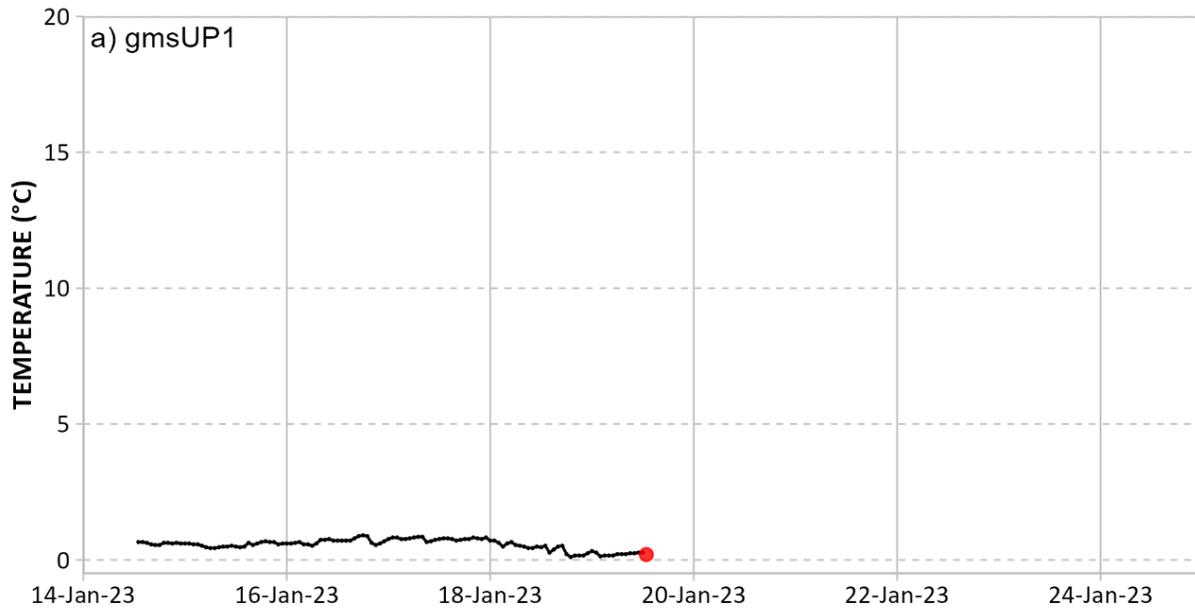


Figure 31. Comparison of water temperature between spot measurements and in-stream sensors at gmsUP2.

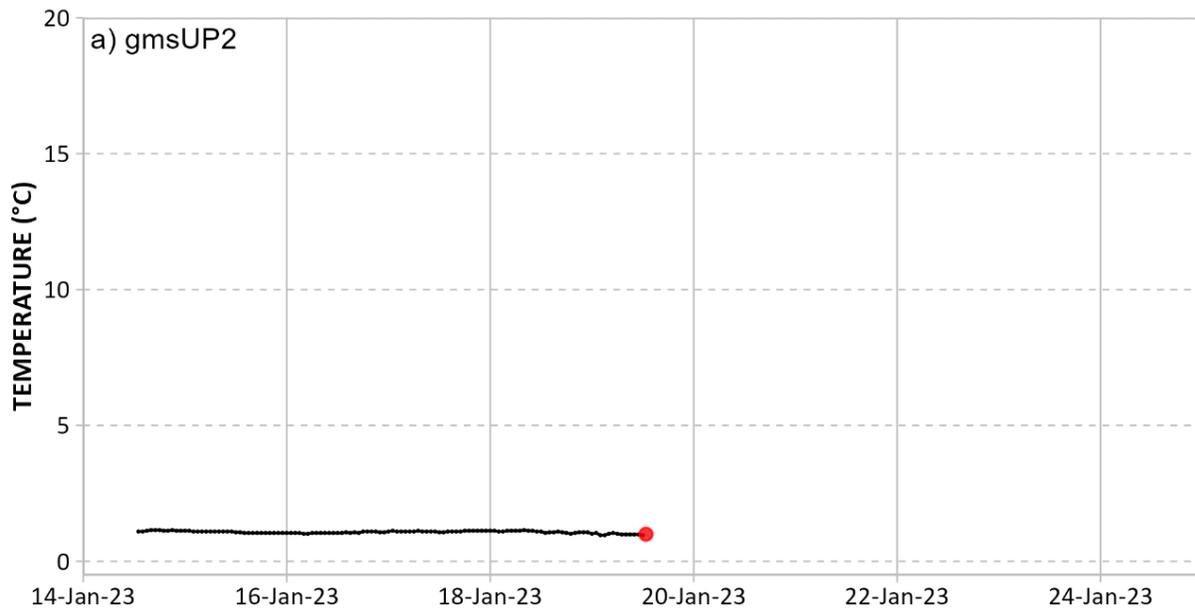


Figure 32. Comparison of water temperature between spot measurements and in-stream sensors at gmsDN1.

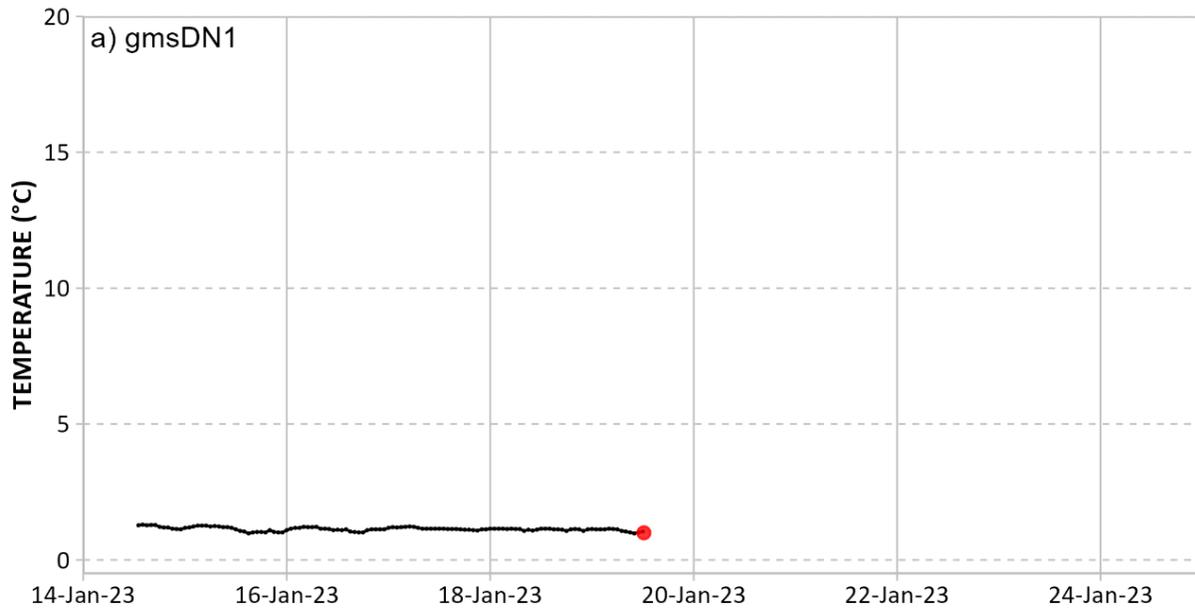


Figure 33. Comparison of water temperature between spot measurements and in-stream sensors at gmsDN2.

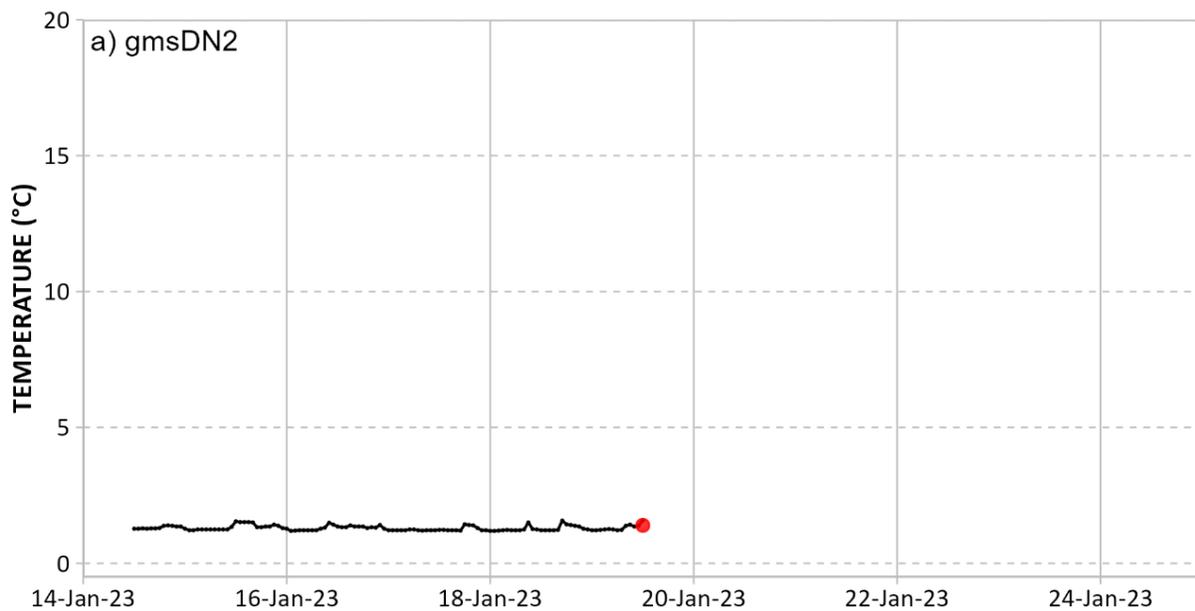


Figure 34. Comparison of water temperature between spot measurements and in-stream sensors at pcnUP1.

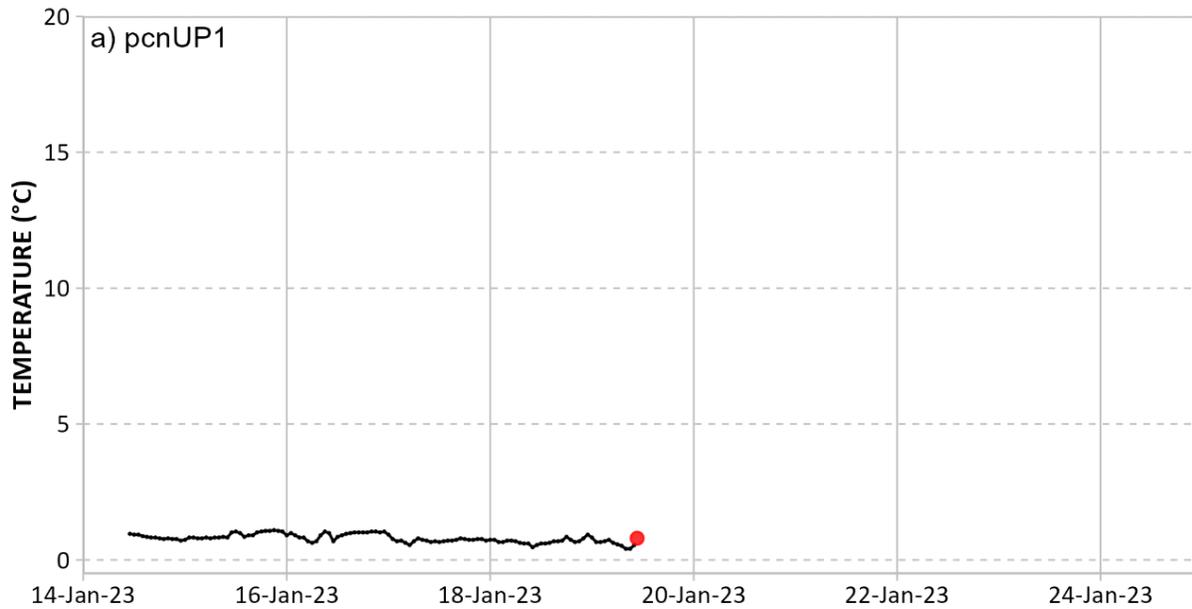


Figure 35. Comparison of water temperature between spot measurements and in-stream sensors at pcnDN2.

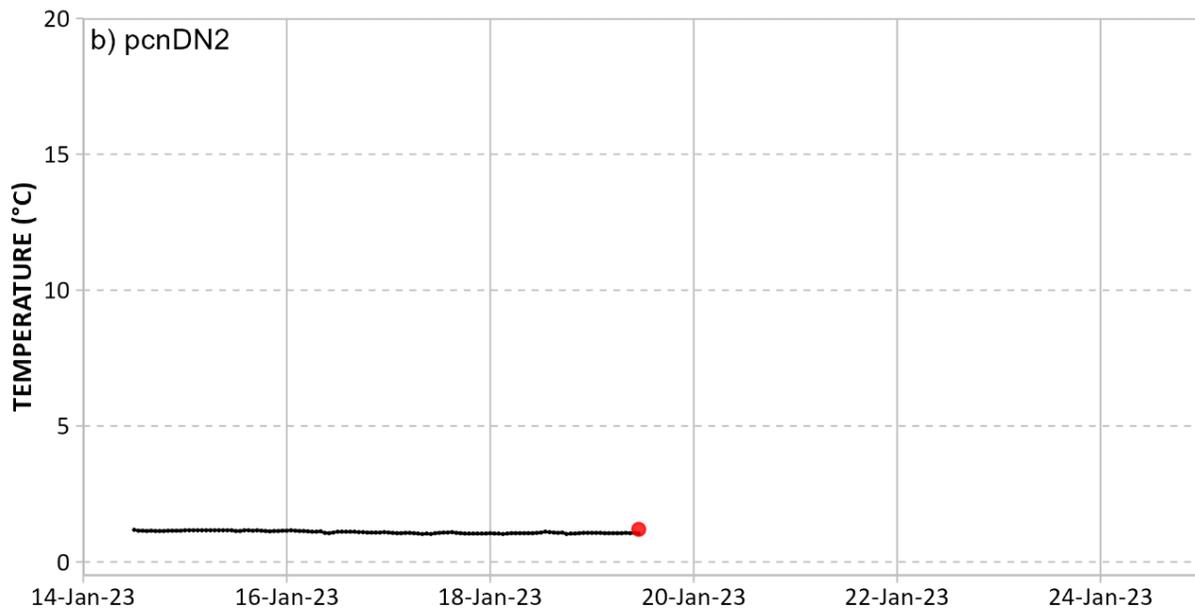
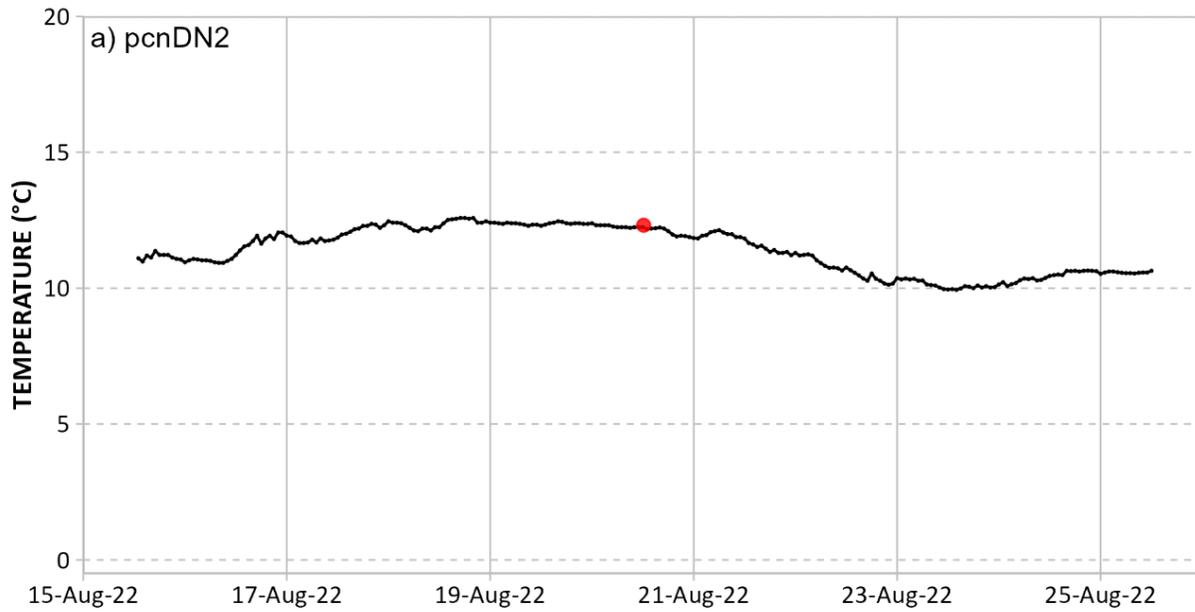


Figure 36. Comparison of water temperature between spot measurements and in-stream sensors at halfUP1.

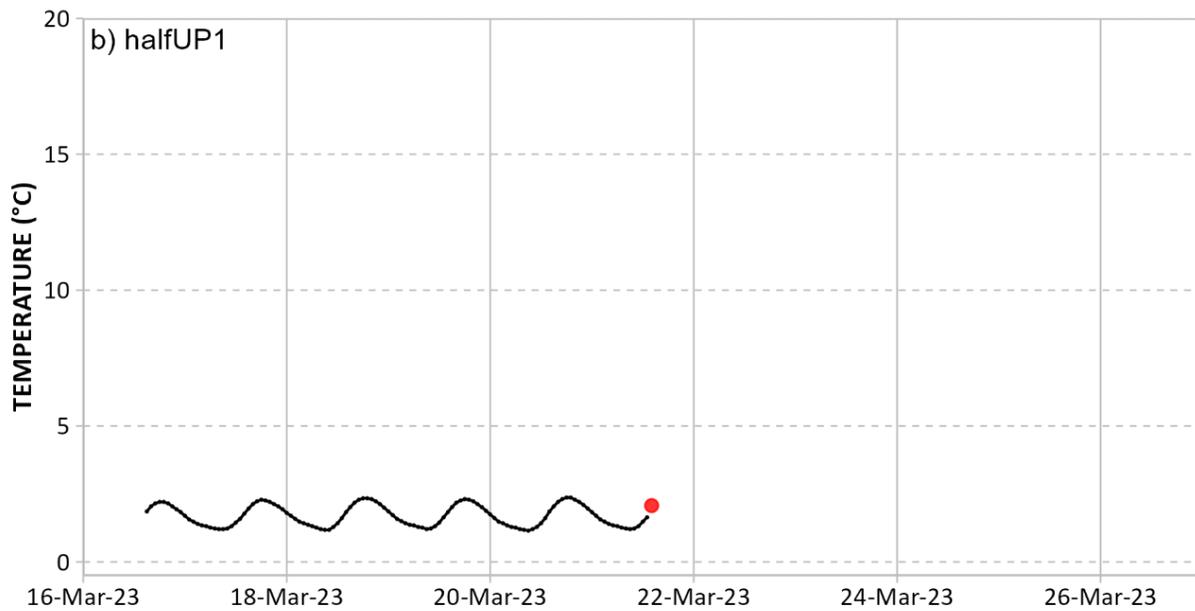
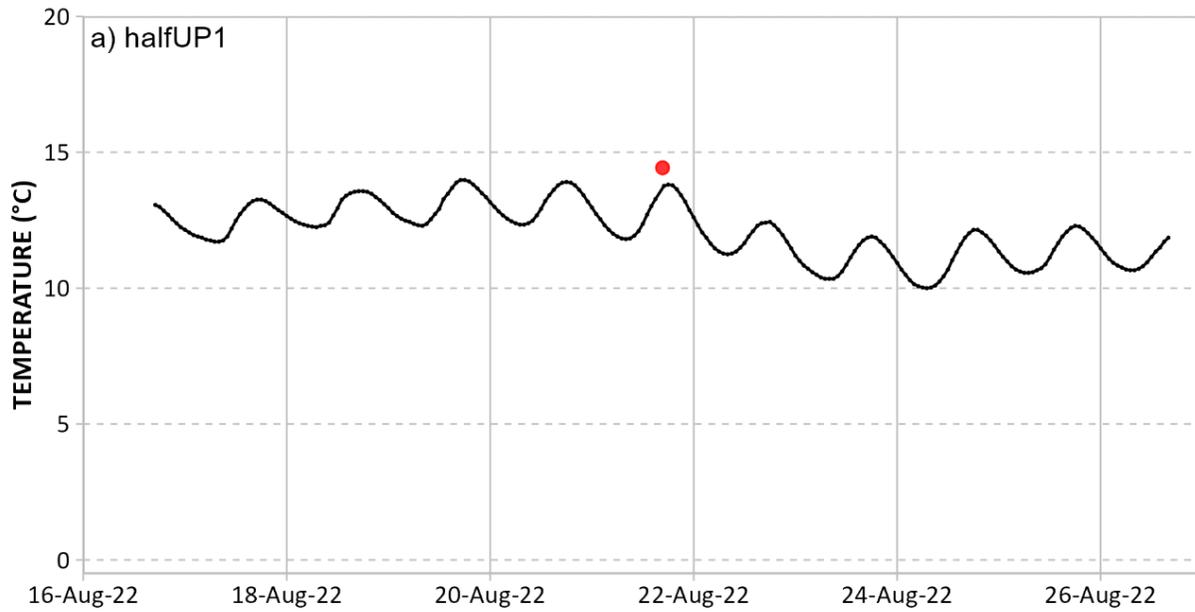


Figure 37. Comparison of water temperature between spot measurements and in-stream sensors at halfUP2.

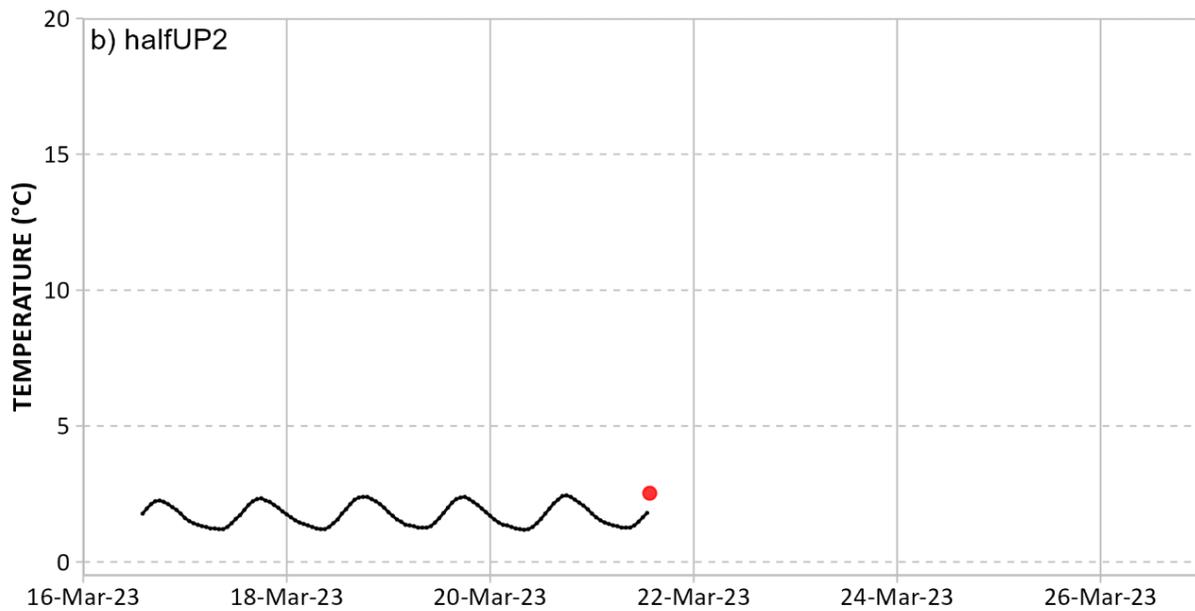
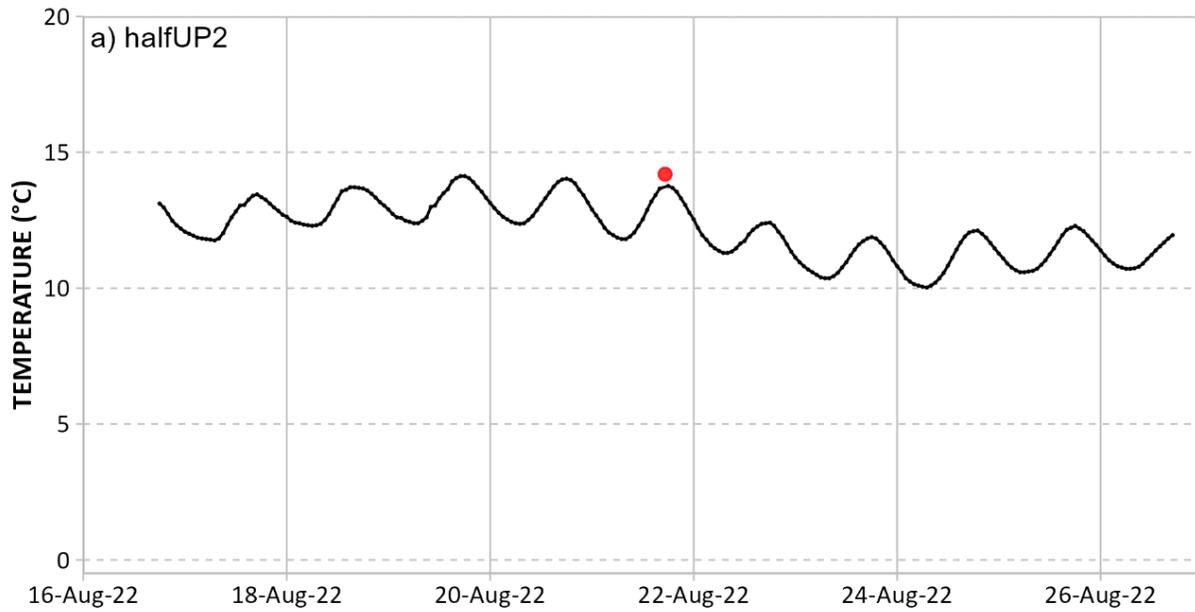


Figure 38. Comparison of water temperature between spot measurements and in-stream sensors at halfDN2.

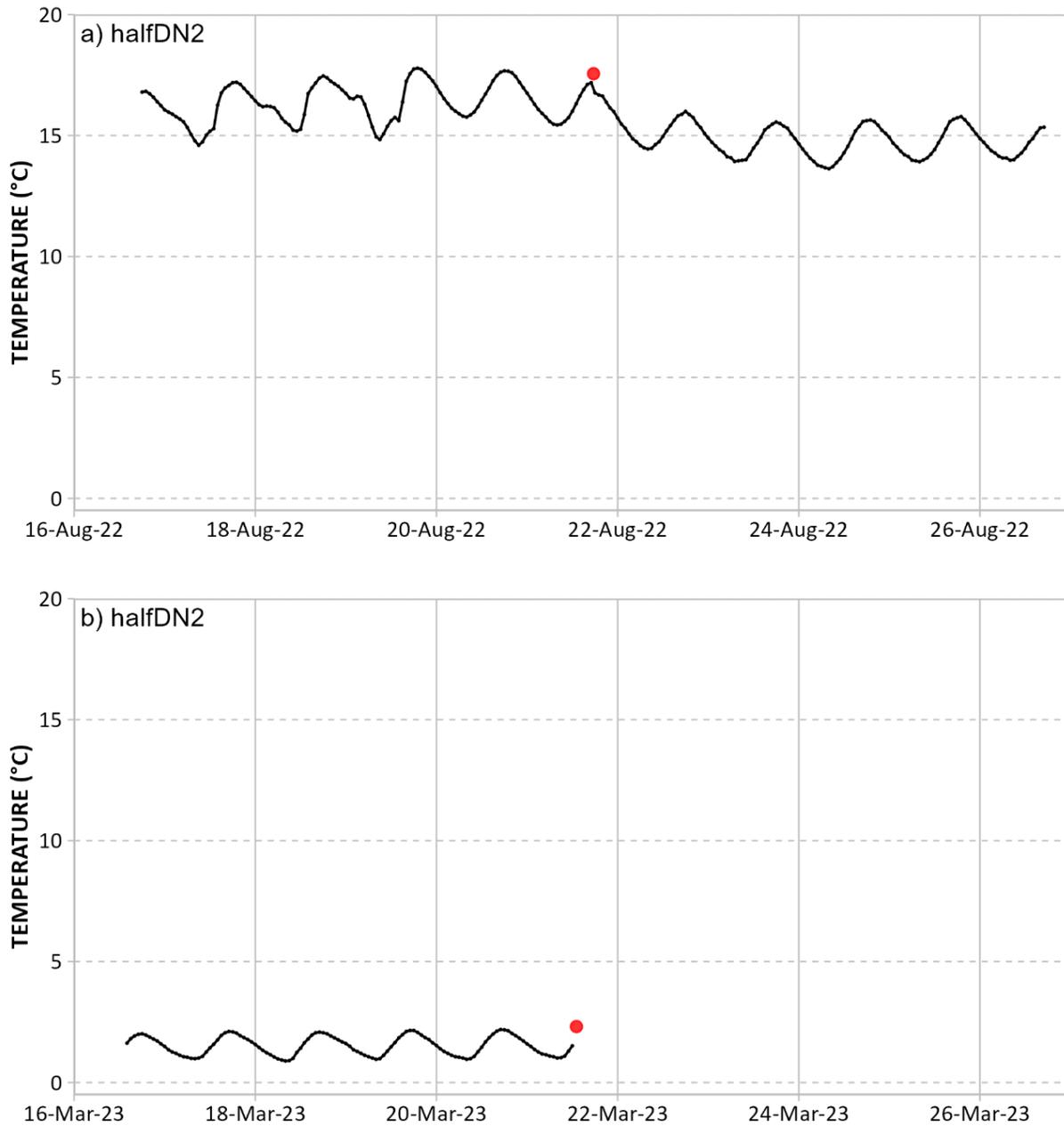


Figure 39. Comparison of water temperature between spot measurements and in-stream sensors at halfDN2BU.

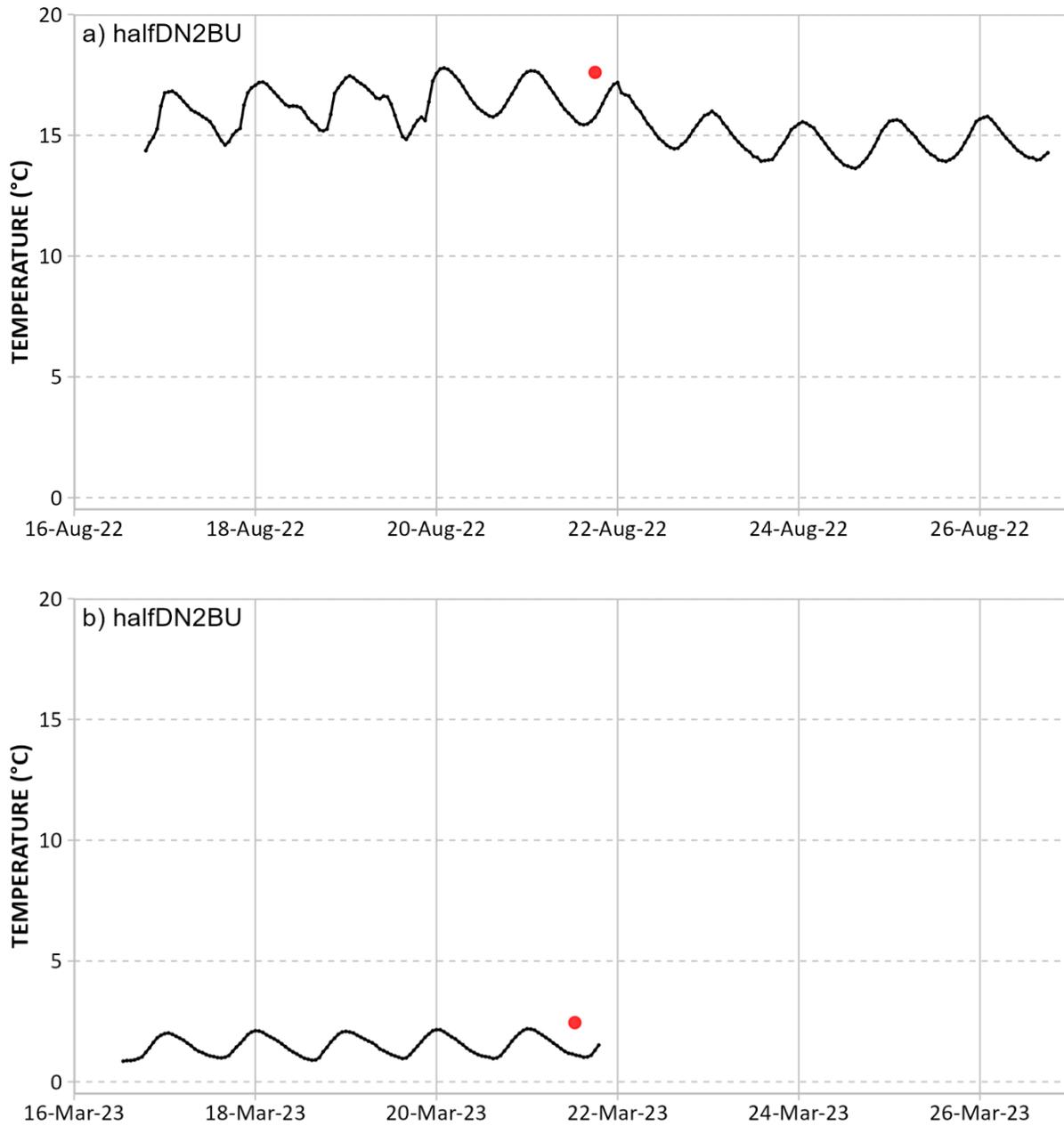


Figure 40. Comparison of water temperature between spot measurements and in-stream sensors at BFlats\_RDB.

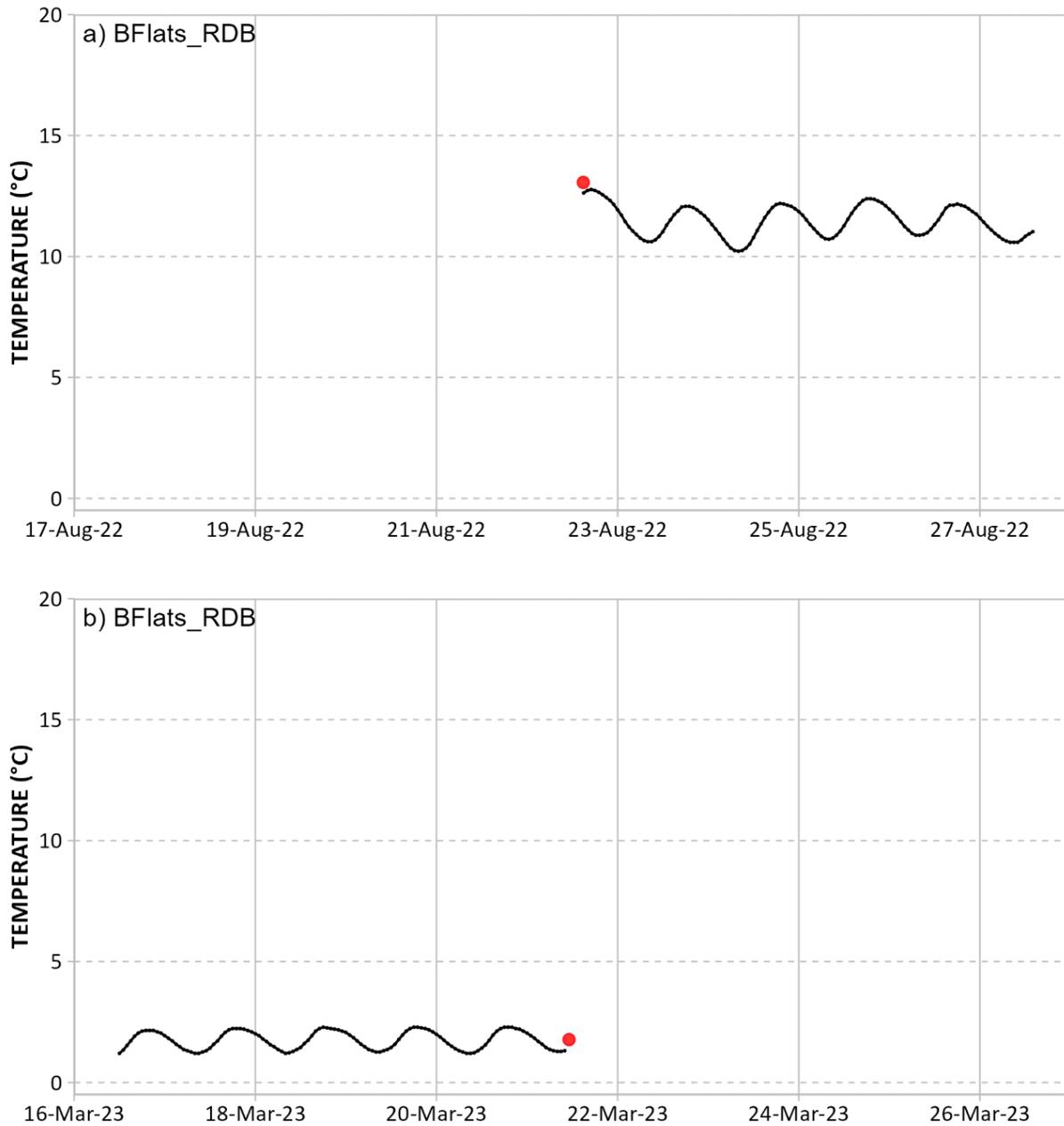


Figure 41. Comparison of water temperature between spot measurements and in-stream sensors at BFlats\_LDB.

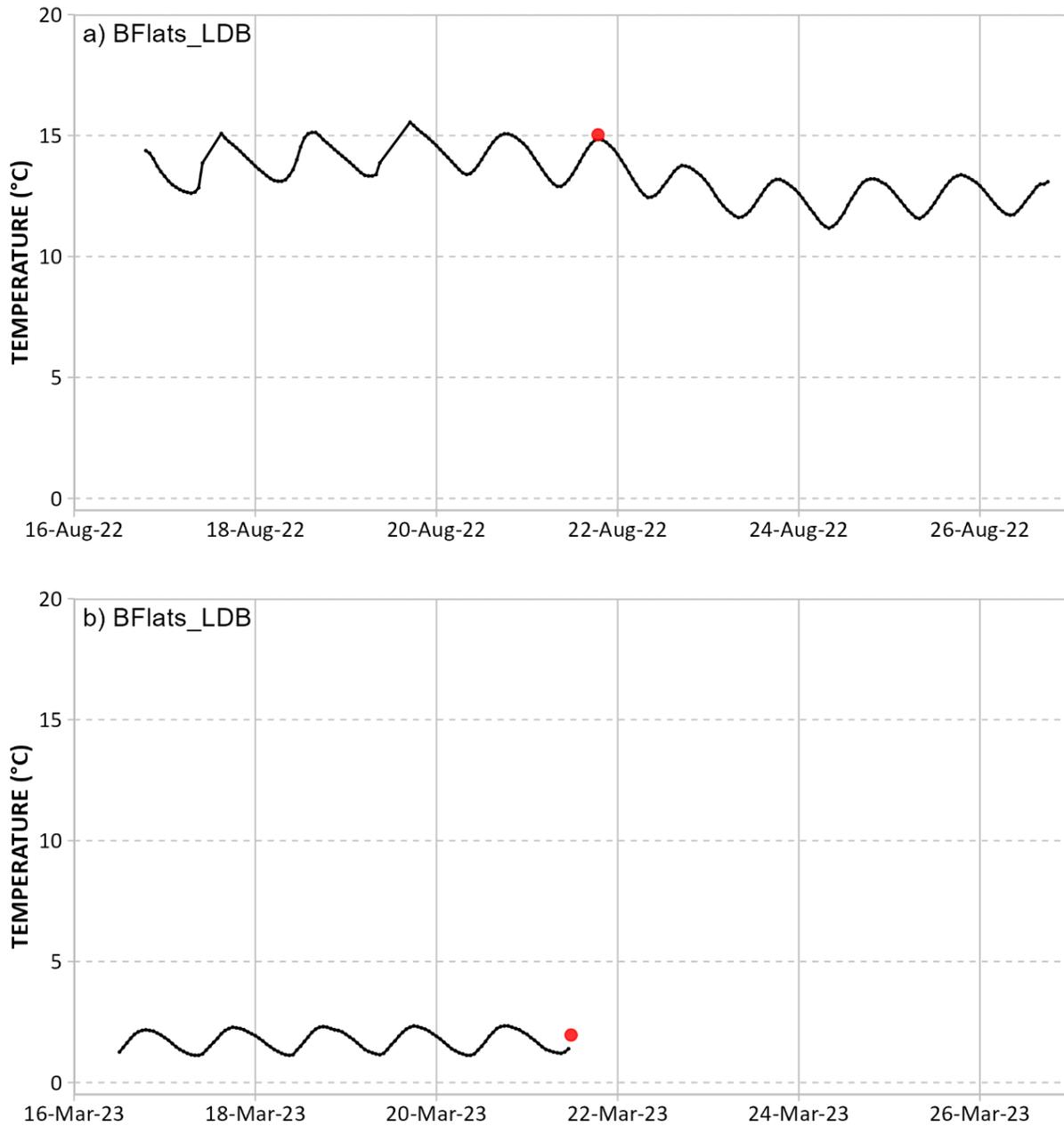


Figure 42. Comparison of water temperature between spot measurements and in-stream sensors at pineUP1.

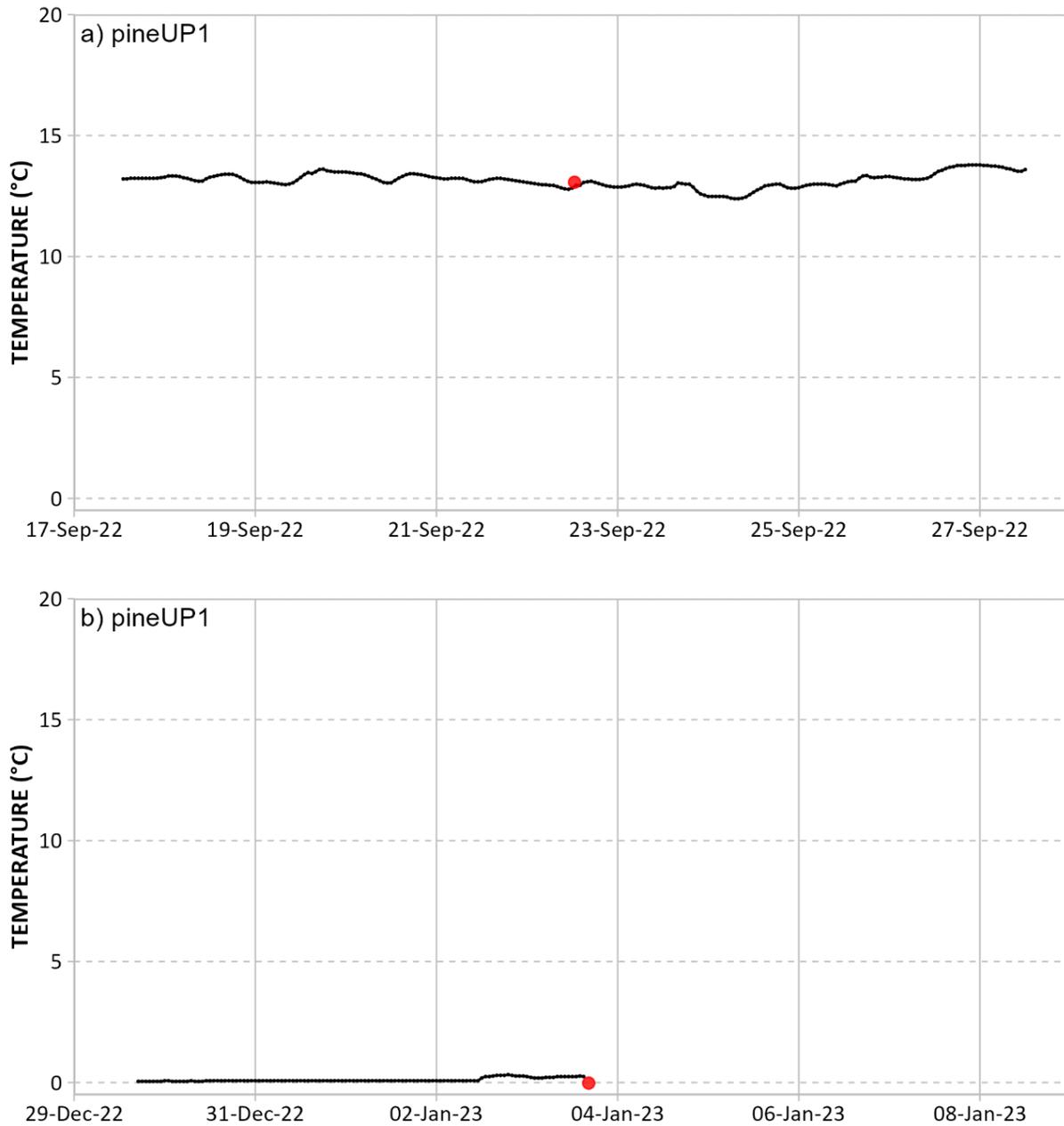


Figure 43. Comparison of water temperature between spot measurements and in-stream sensors at pineUP2.

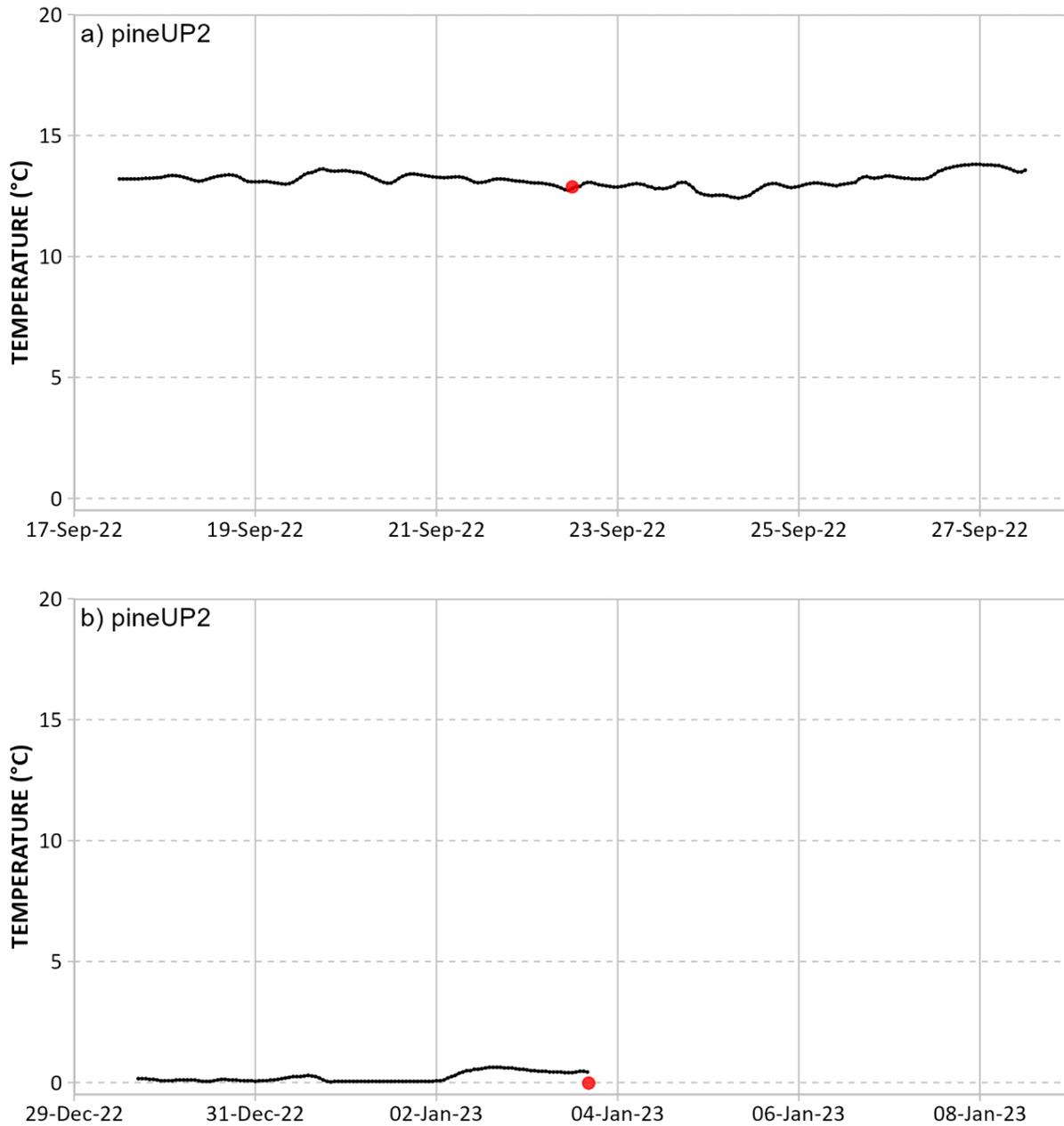


Figure 44. Comparison of water temperature between spot measurements and in-stream sensors at pineDN1.

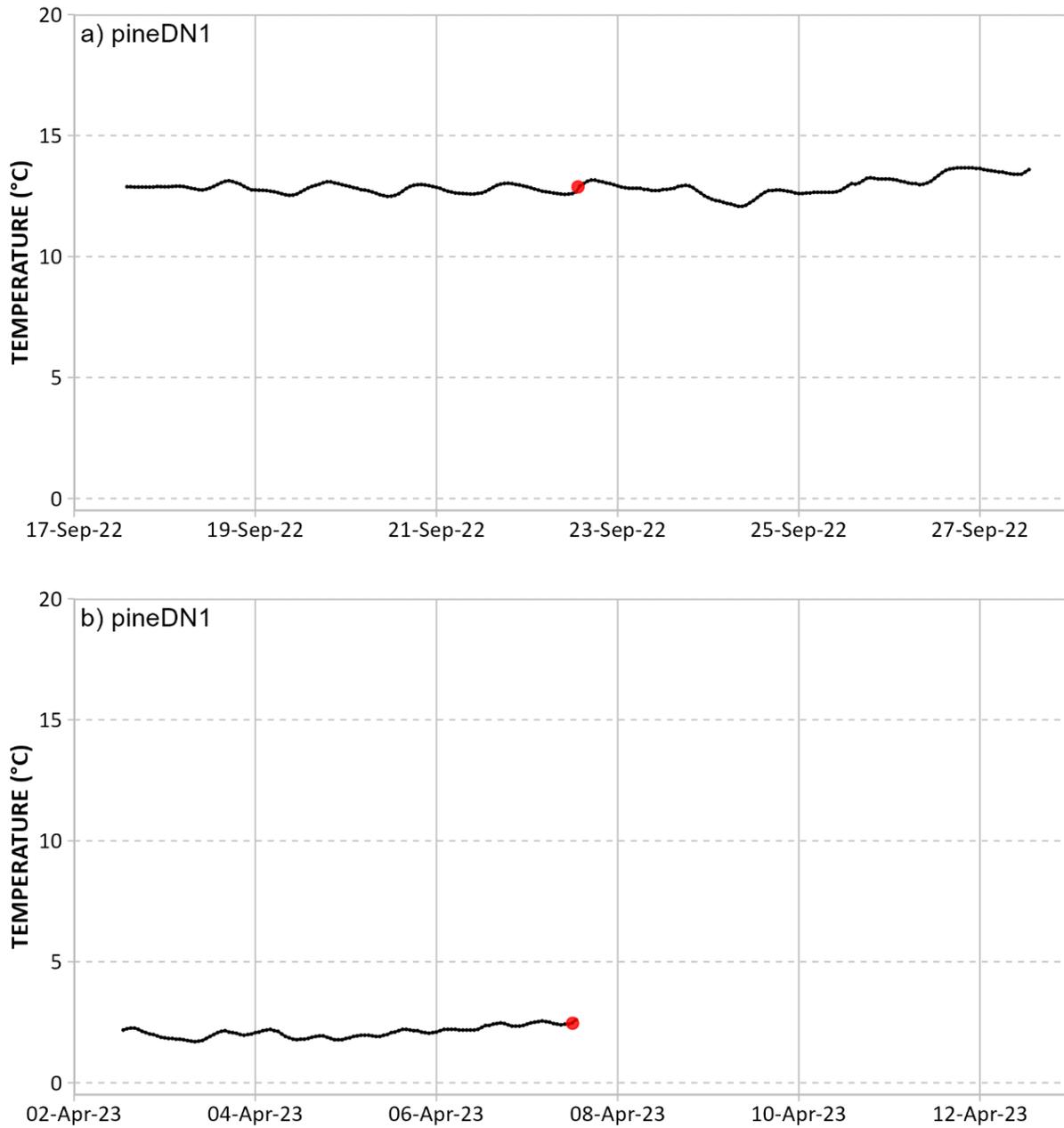


Figure 45. Comparison of water temperature between spot measurements and in-stream sensors at pineDN1BU.

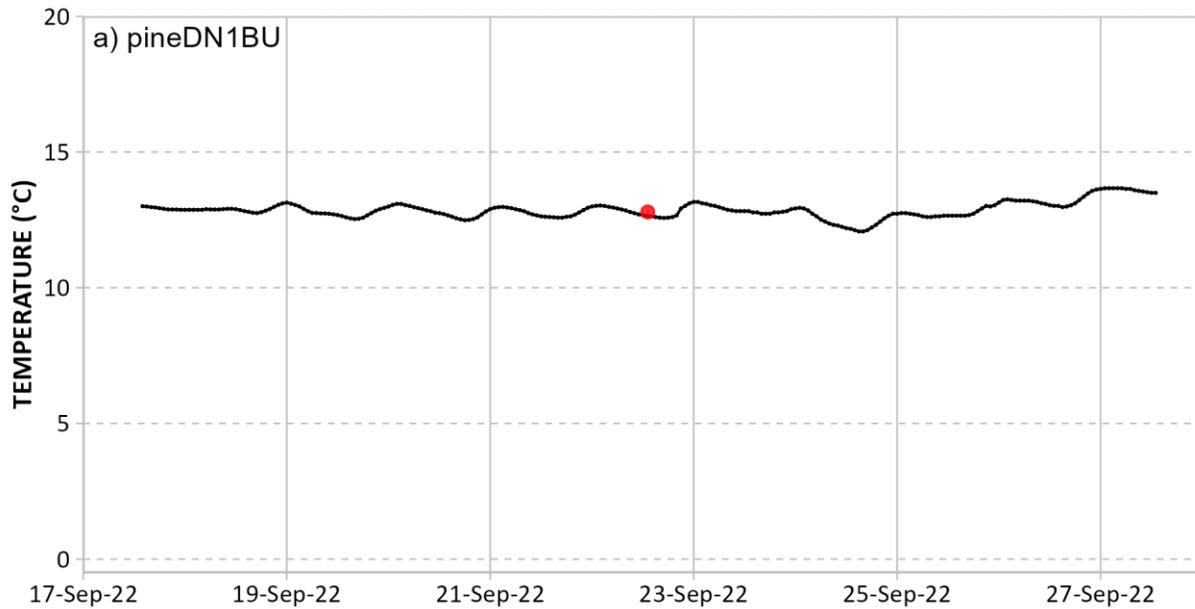


Figure 46. Comparison of water temperature between spot measurements and in-stream sensors at pounceUP1.

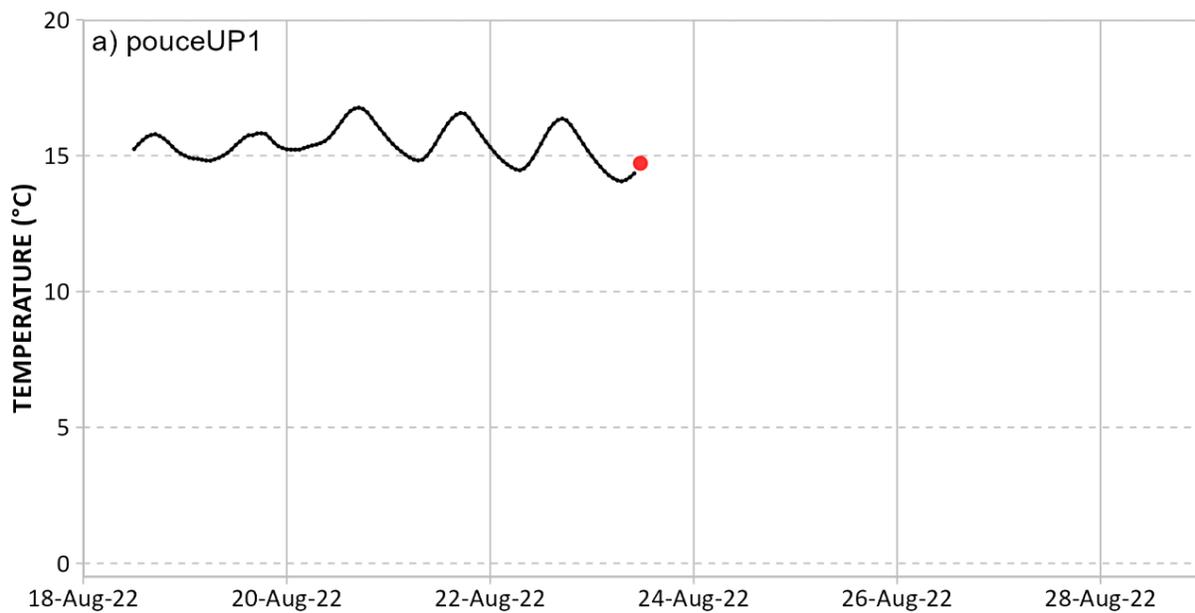
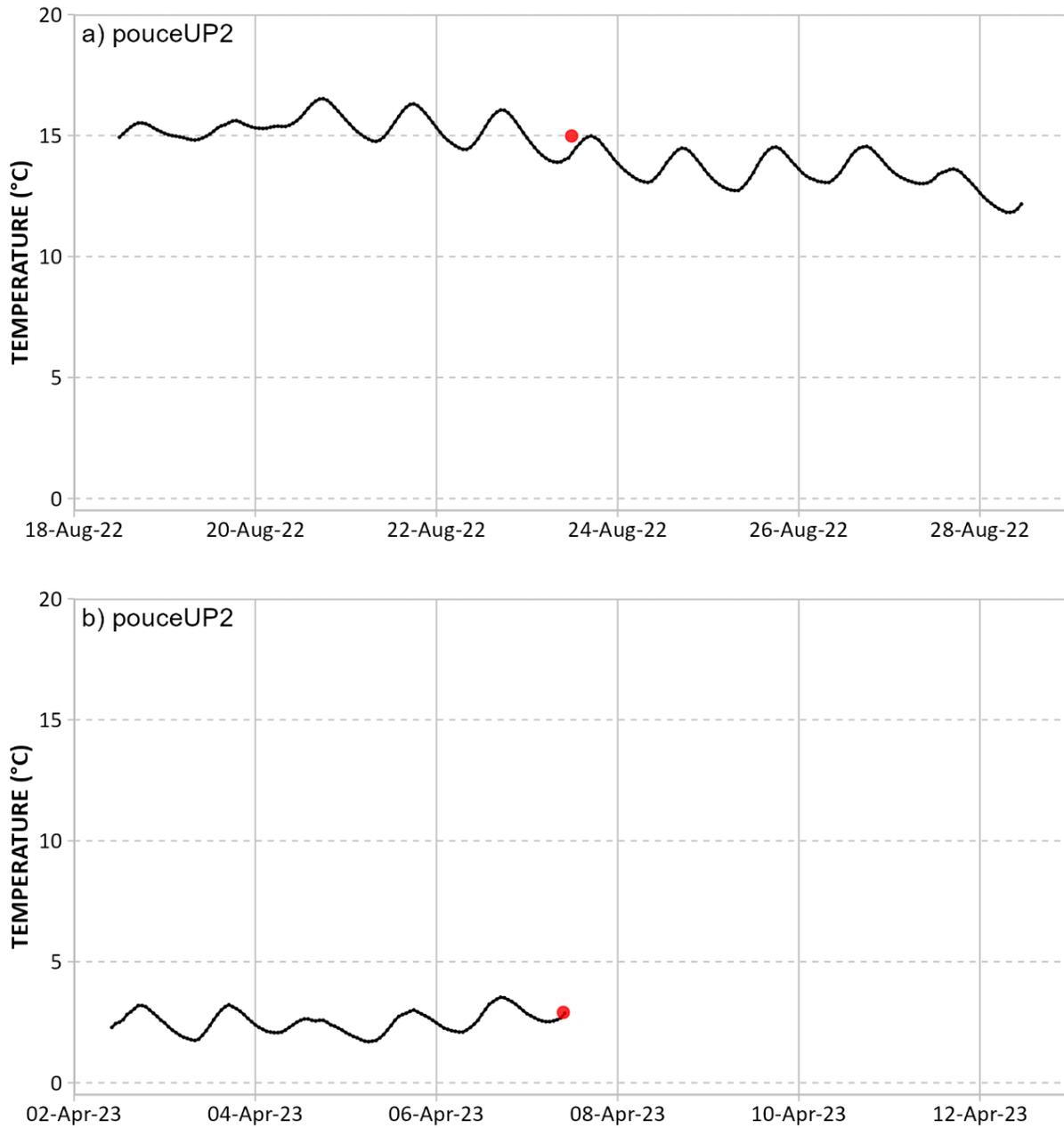


Figure 47. Comparison of water temperature between spot measurements and in-stream sensors at pouceUP2.



**Appendix D. Water Temperature Summary Data – Interannual Comparison**

Figure 48. Mean daily water temperature (°C) for WAC Bennett Dam Forebay 1 m below the water surface (gmsUP1; black line), 2008 to 2022. The shaded area represents minimum and maximum water temperature recorded at the station during other study years between 2008 and 2022. The white line represents average mean daily water temperature over the same period.

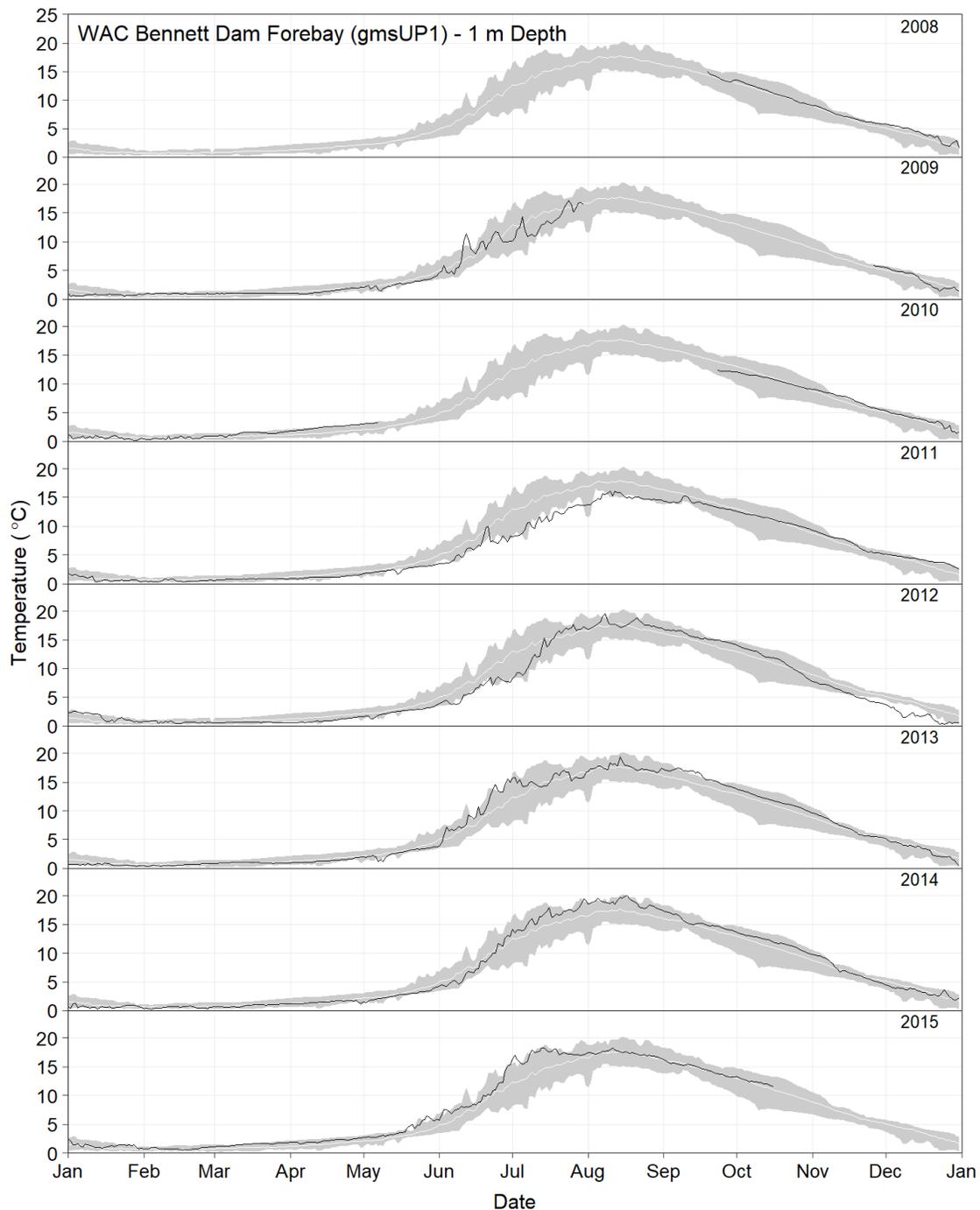
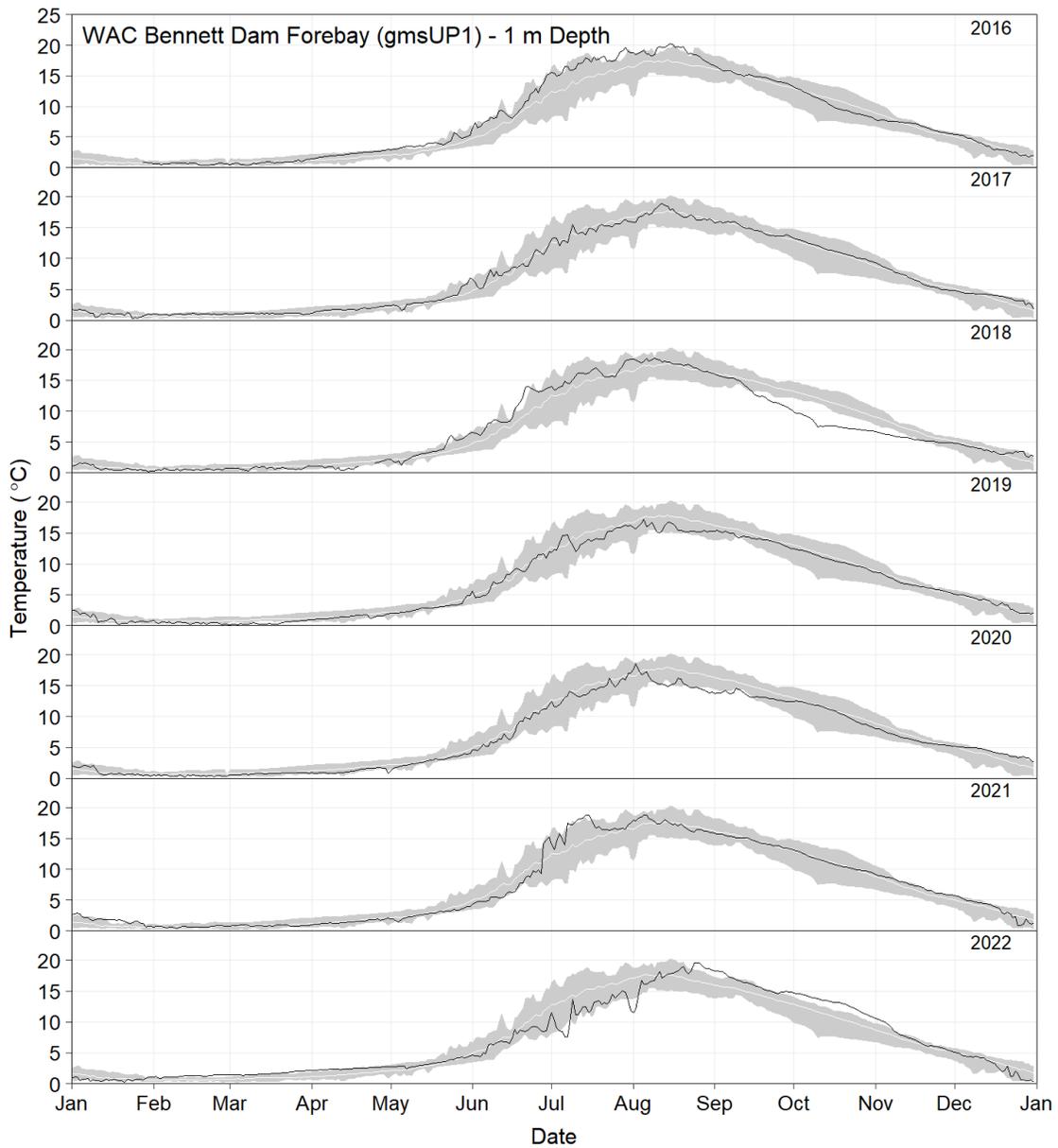


Figure 48. Continued.



**Figure 49.** Mean daily water temperature (°C) for WAC Bennett Dam Forebay 10 m below the water surface (gmsUP2; black line), 2008 to 2022. The shaded area represents minimum and maximum water temperature recorded at the station during other study years between 2008 and 2022. The white line represents average mean daily water temperature over the same period.

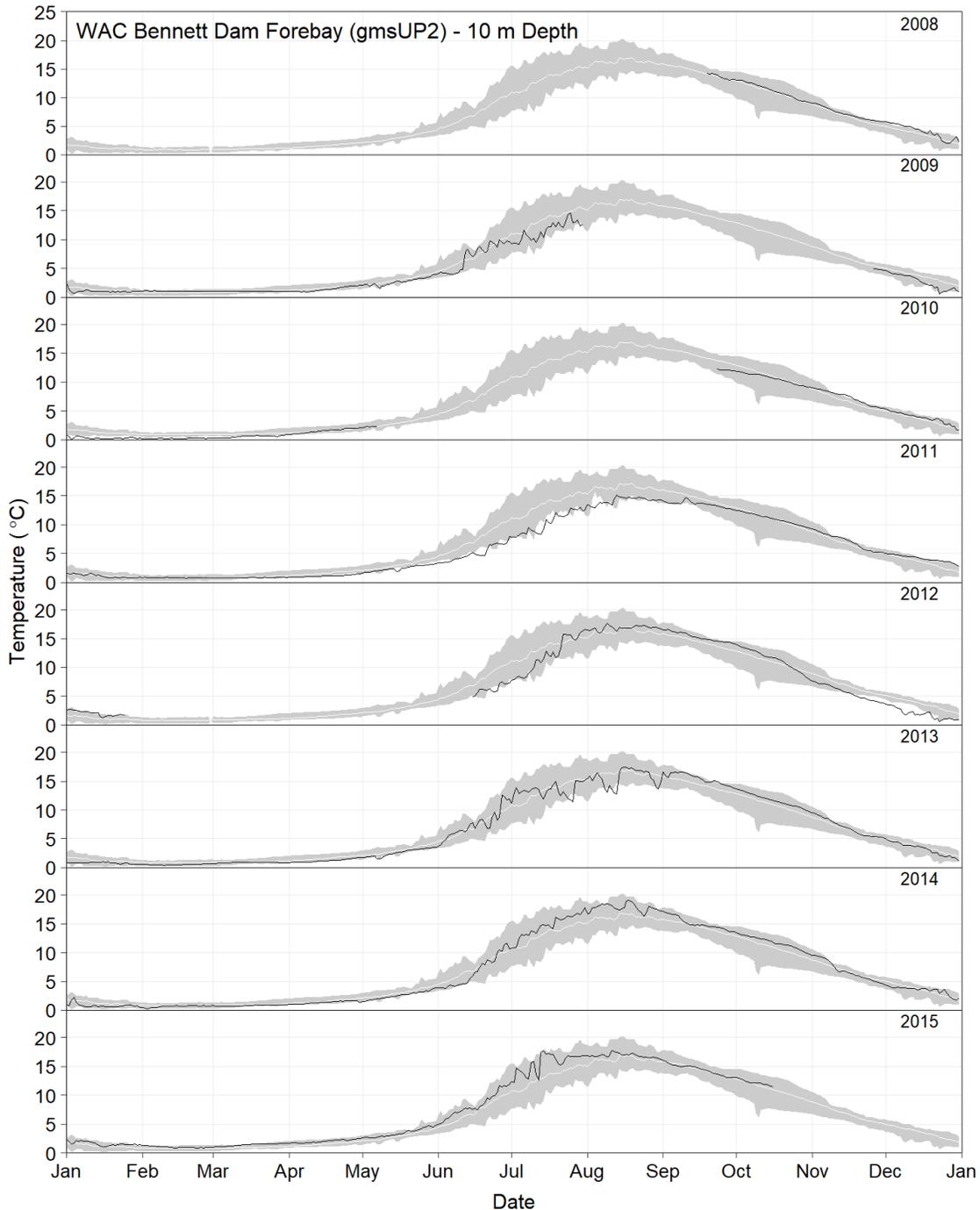
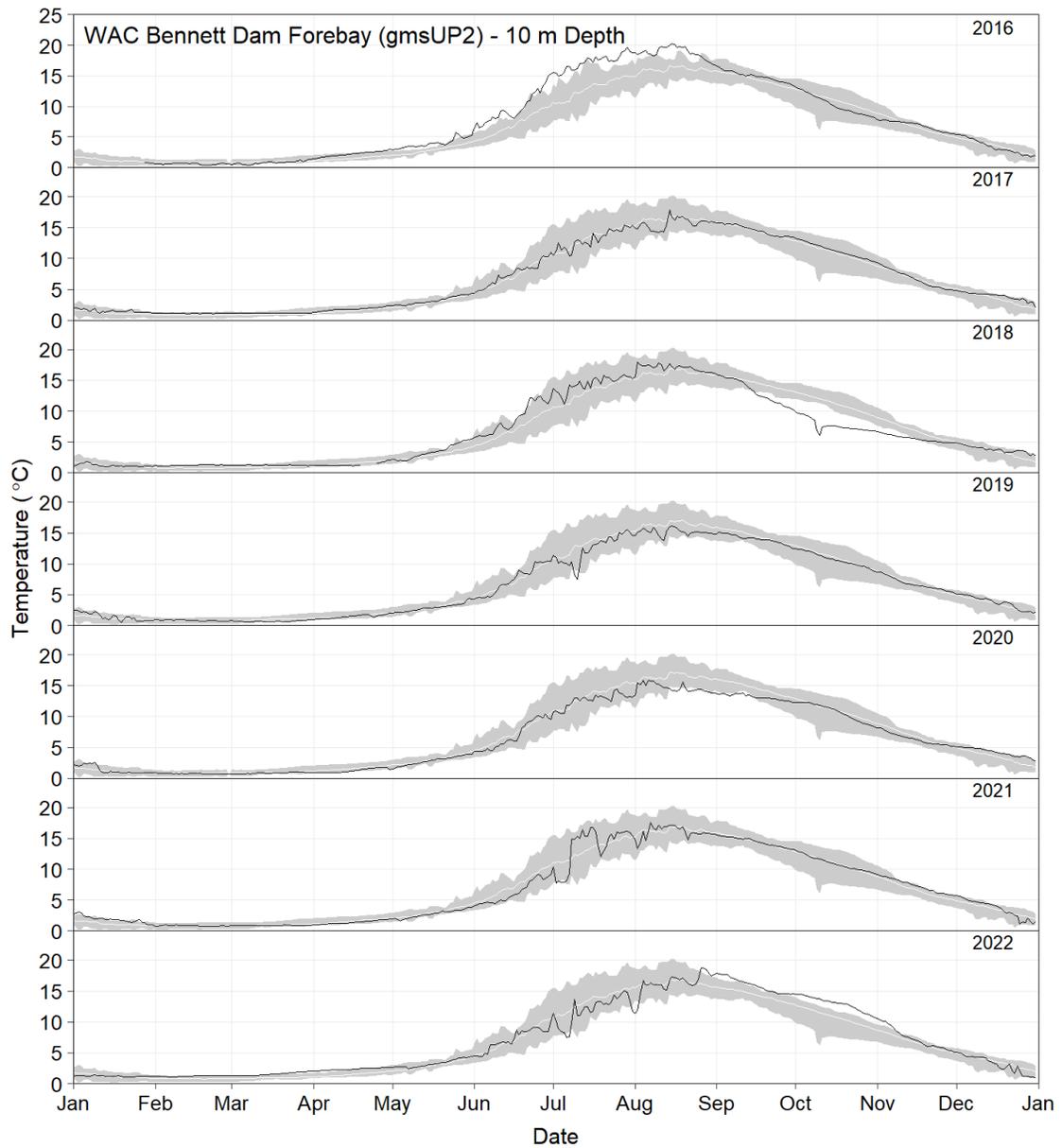


Figure 49. Continued.



**Figure 50.** Mean daily water temperature (°C) for the left bank (as viewed facing downstream) of the Peace River downstream of the WAC Bennett Dam Tailrace (gmsDN1; black line), 2008 to 2022. The shaded area represents minimum and maximum water temperature recorded at the station during other study years between 2008 and 2022. The white line represents average mean daily water temperature over the same period.

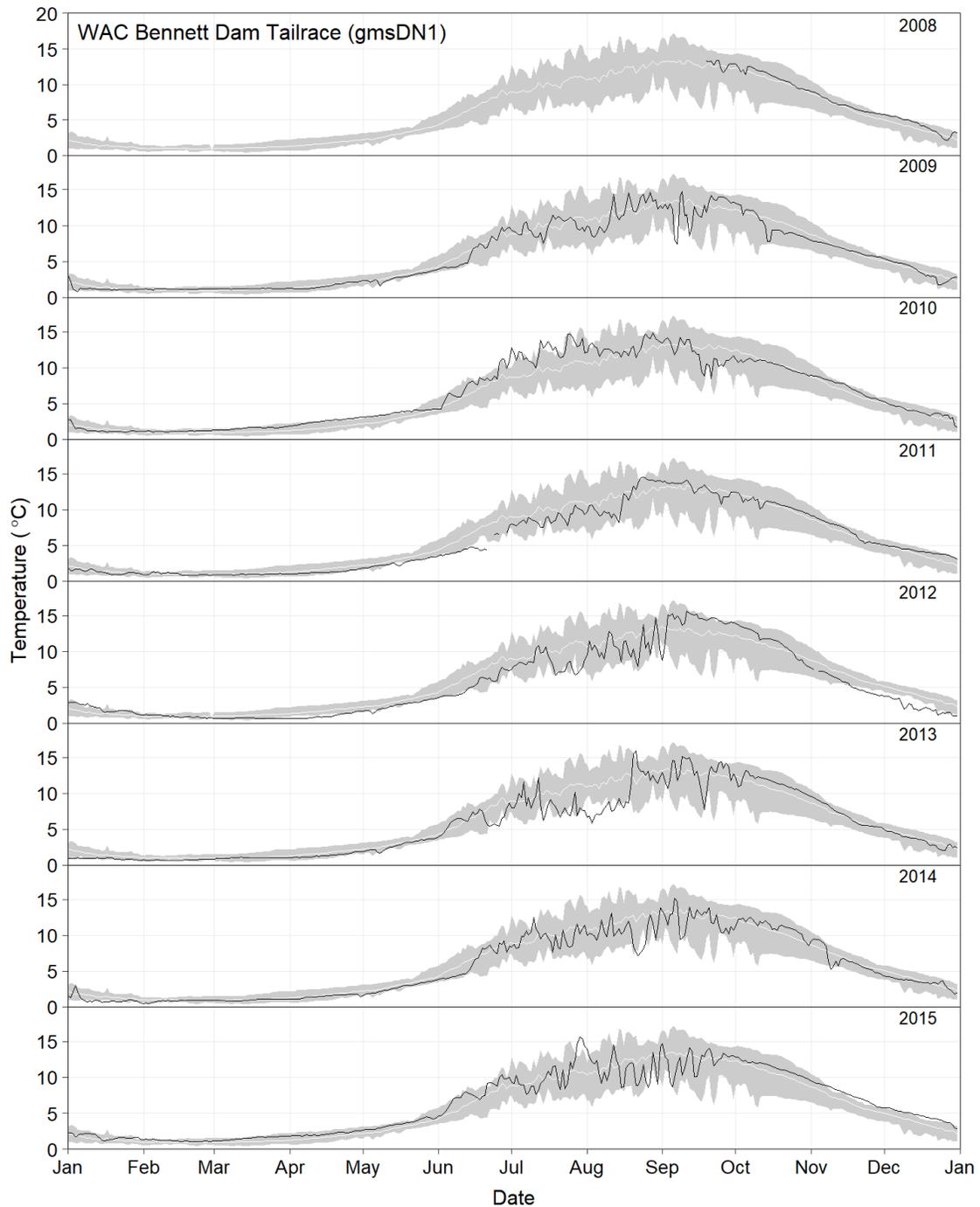
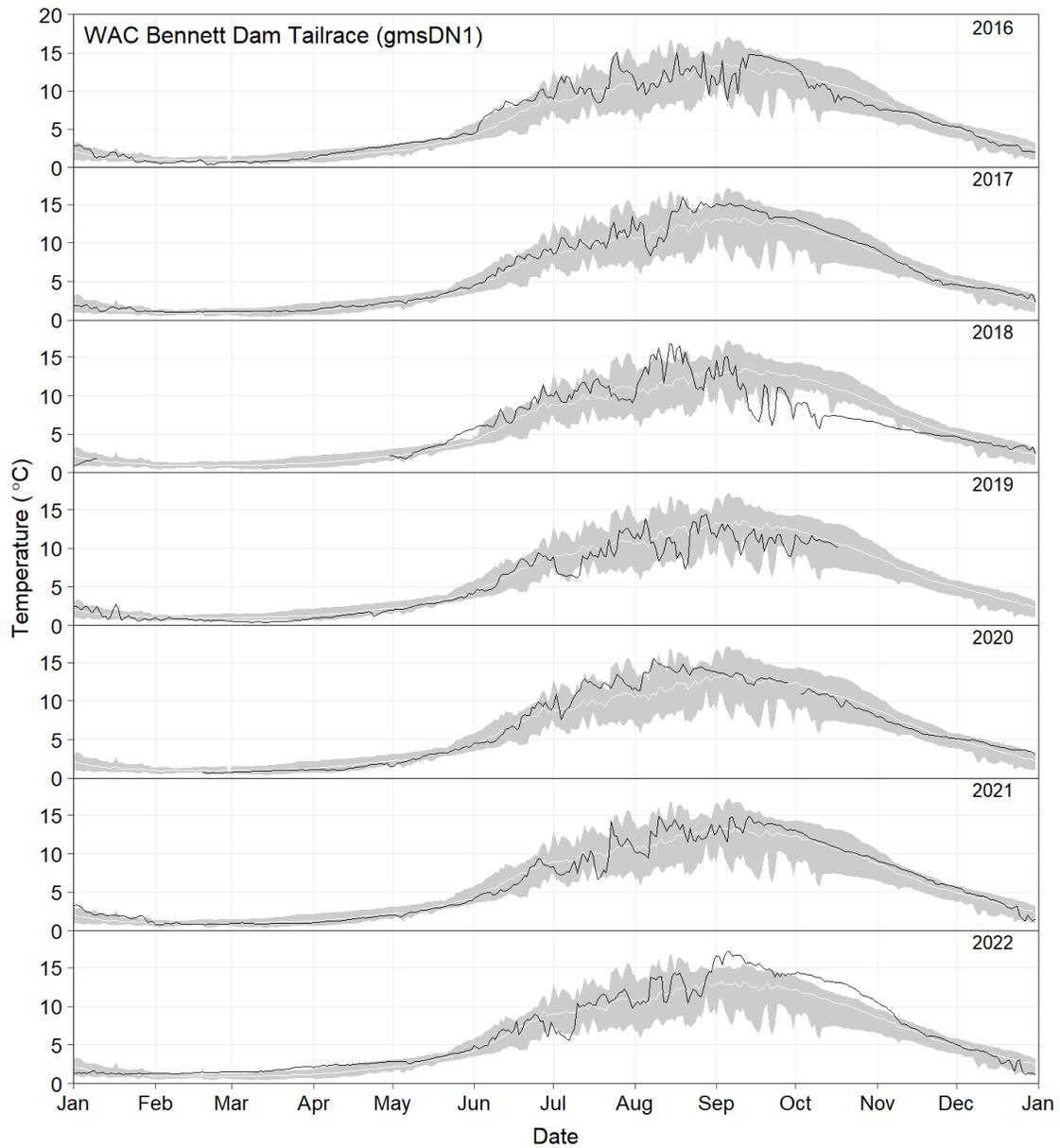


Figure 50. Continued.



**Figure 51.** Mean daily water temperature (°C) for the right bank (as viewed facing downstream) of the Peace River downstream of the WAC Bennett Dam Tailrace (gmsDN2; black line), 2008 to 2022. The shaded area represents minimum and maximum water temperature recorded at the station during other study years between 2008 and 2022. The white line represents average mean daily water temperature over the same period.

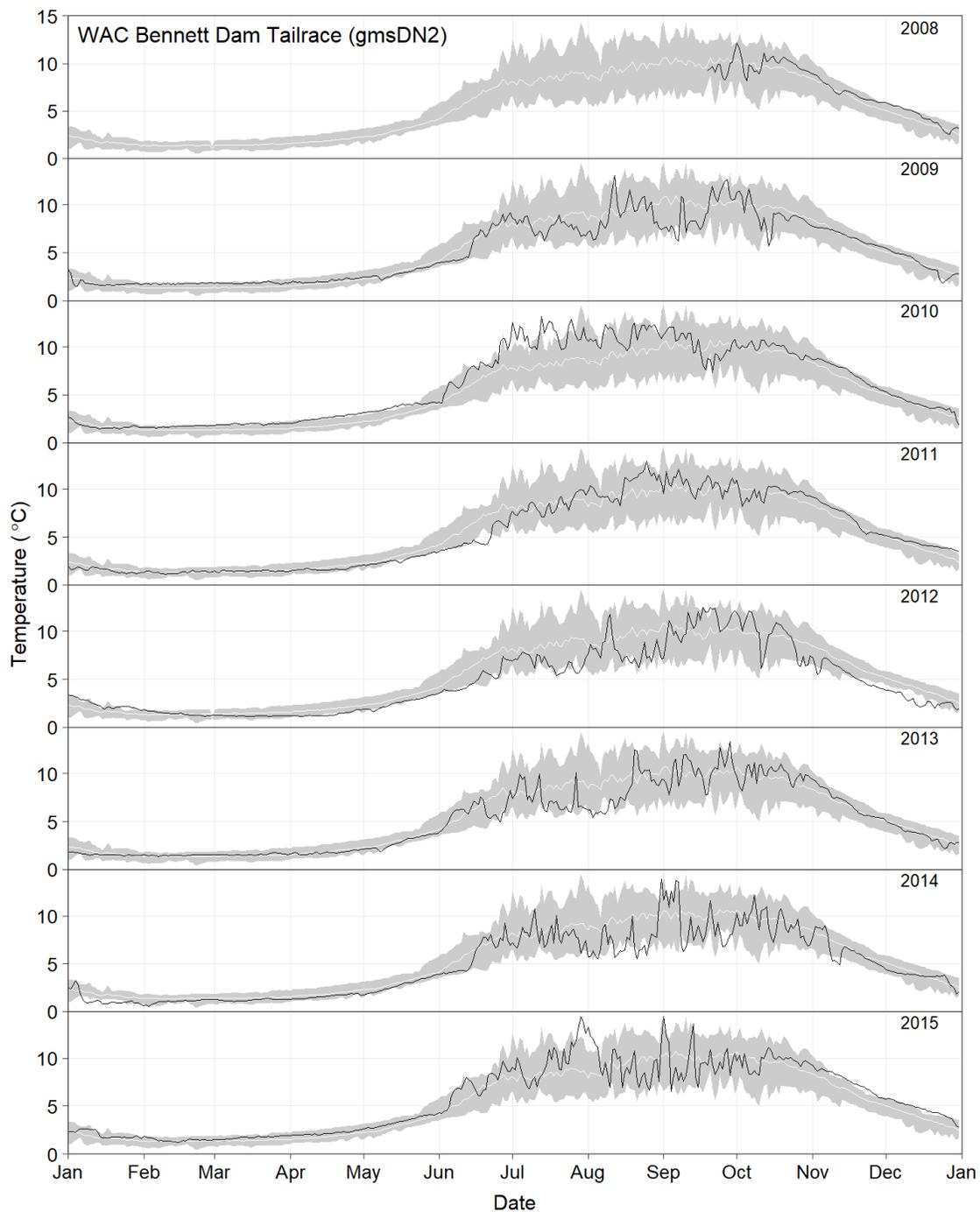
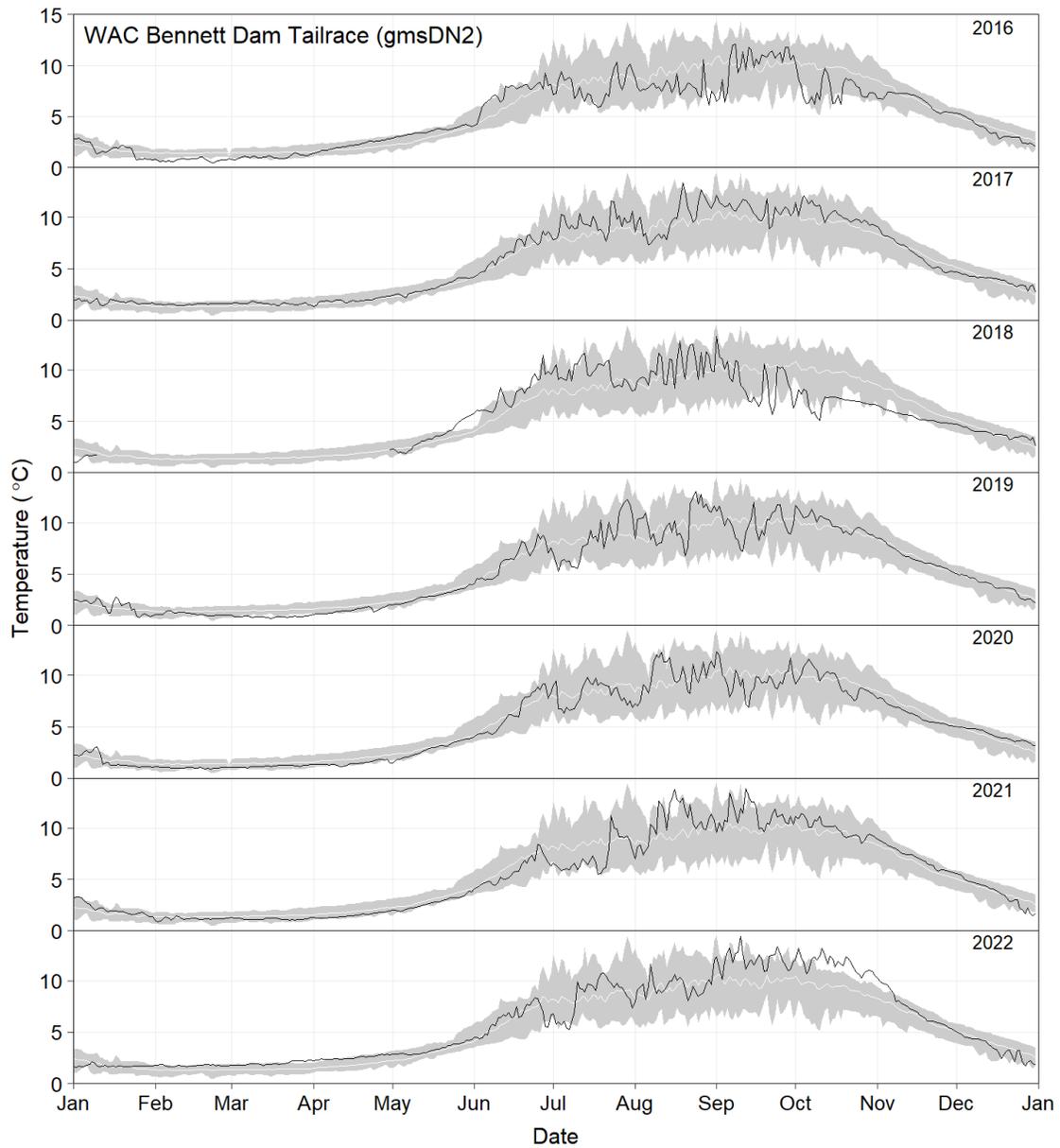


Figure 51. Continued.



**Figure 52.** Mean daily water temperature (°C) for Peace Canyon Dam Forebay 1 m below the water surface (pcnUP1; black line), 2008 to 2022. The shaded area represents minimum and maximum water temperature recorded at the station during other study years between 2008 and 2022. The white line represents average mean daily water temperature over the same period.

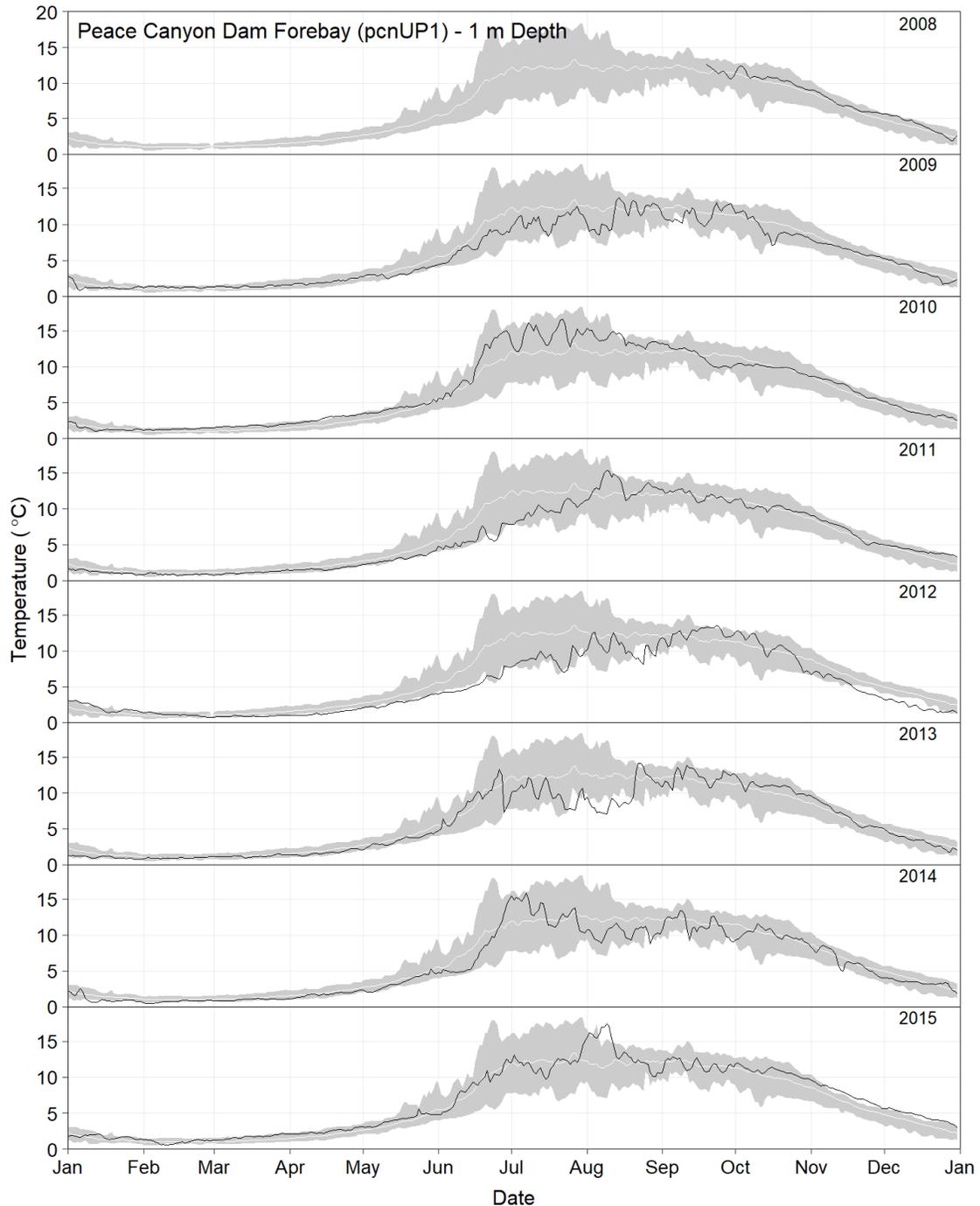
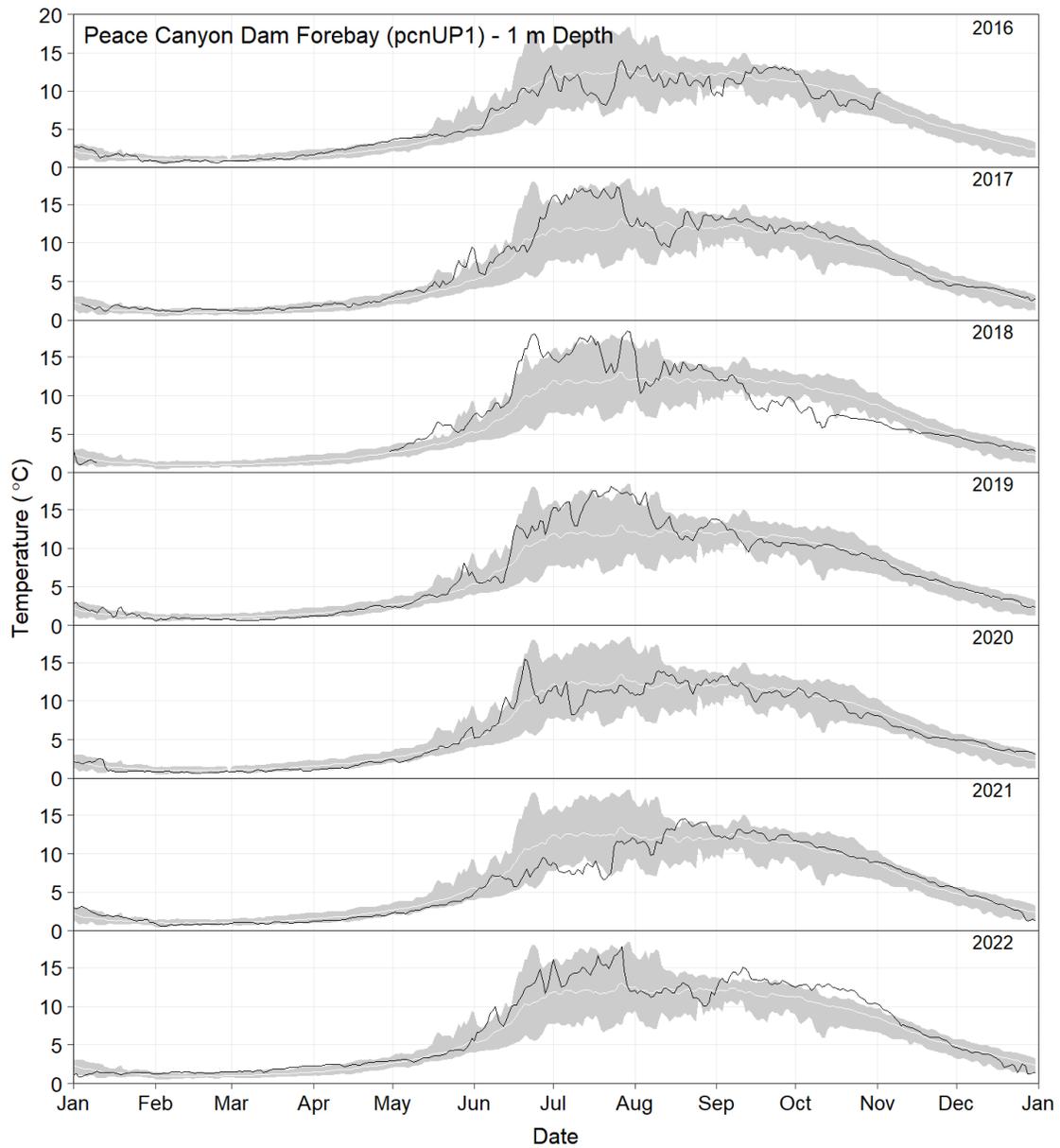


Figure 52. Continued.



**Figure 53.** Mean daily water temperature (°C) for the left bank of the Peace River downstream of the Peace Canyon Dam Tailrace (pcnDN2; black line), 2008 to 2022. The shaded area represents minimum and maximum water temperature recorded at the station during other study years between 2008 and 2022. The white line represents average mean daily water temperature over the same period.

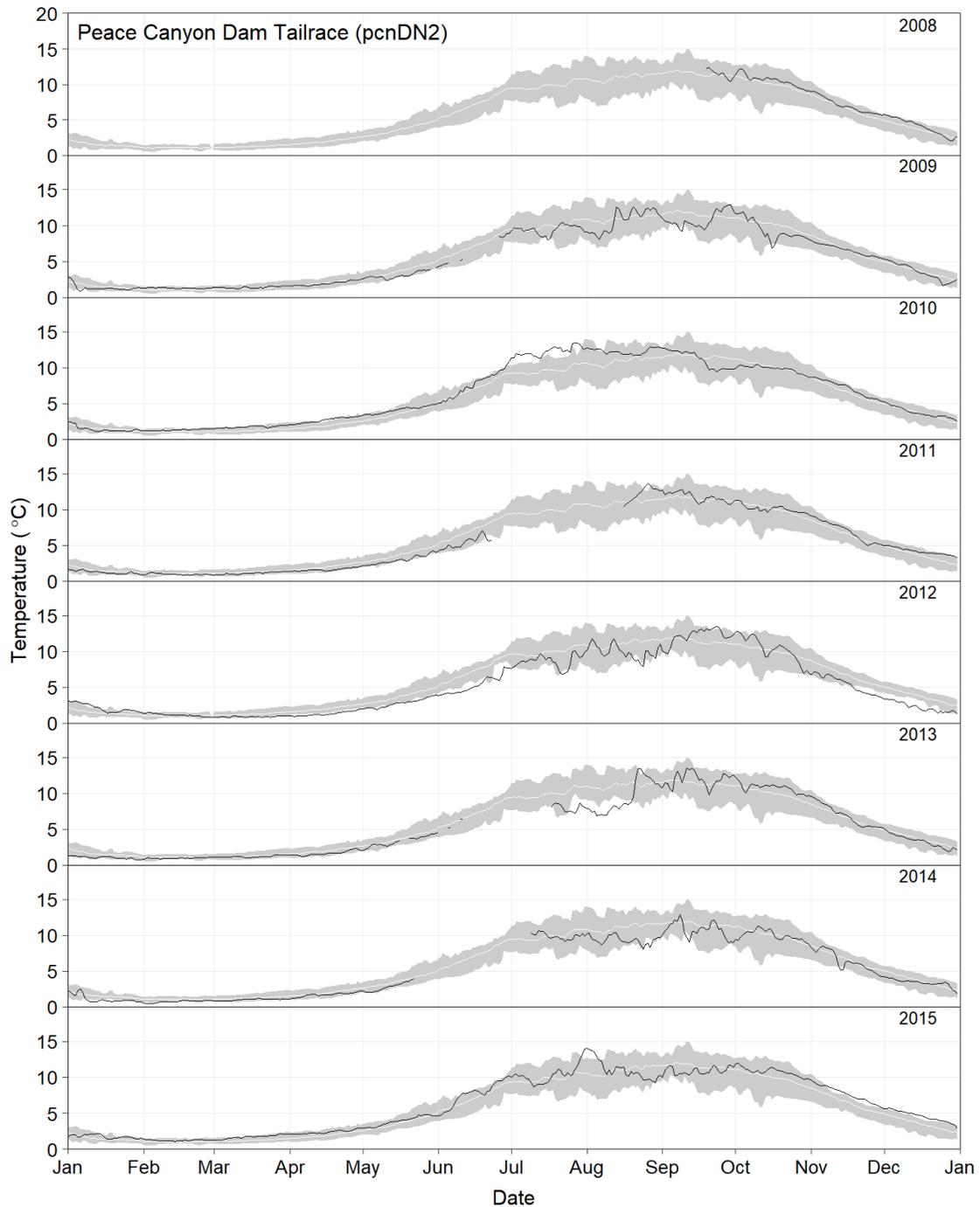


Figure 53. Continued.

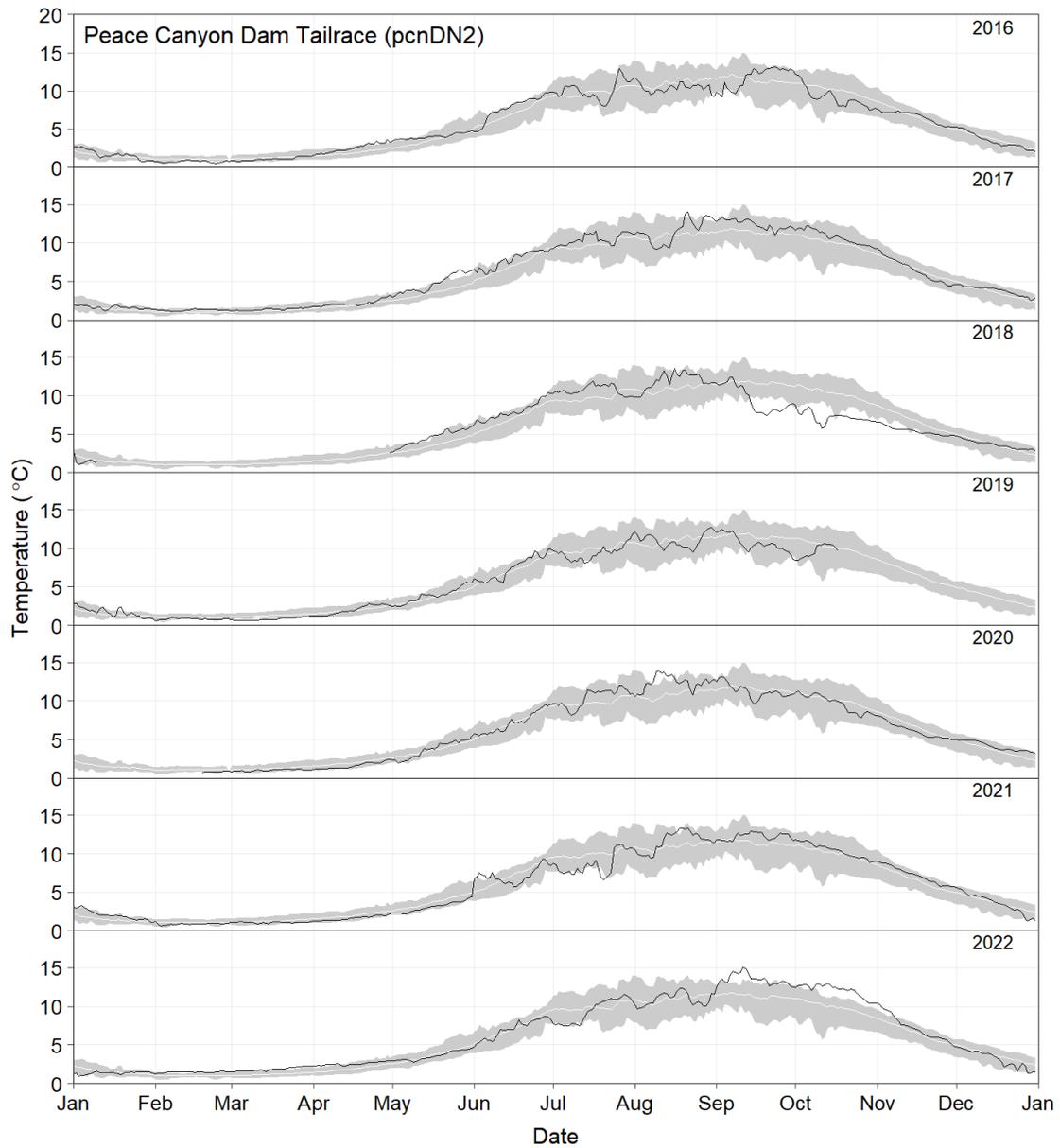


Figure 54. Mean daily water temperature (°C) for the right bank of the Peace River upstream of the Halfway River’s confluence with the Peace River (halfUP1; black line), 2008 to 2022. The shaded area represents minimum and maximum water temperature recorded at the station during other study years between 2008 and 2022. The white line represents average mean daily water temperature over the same period.

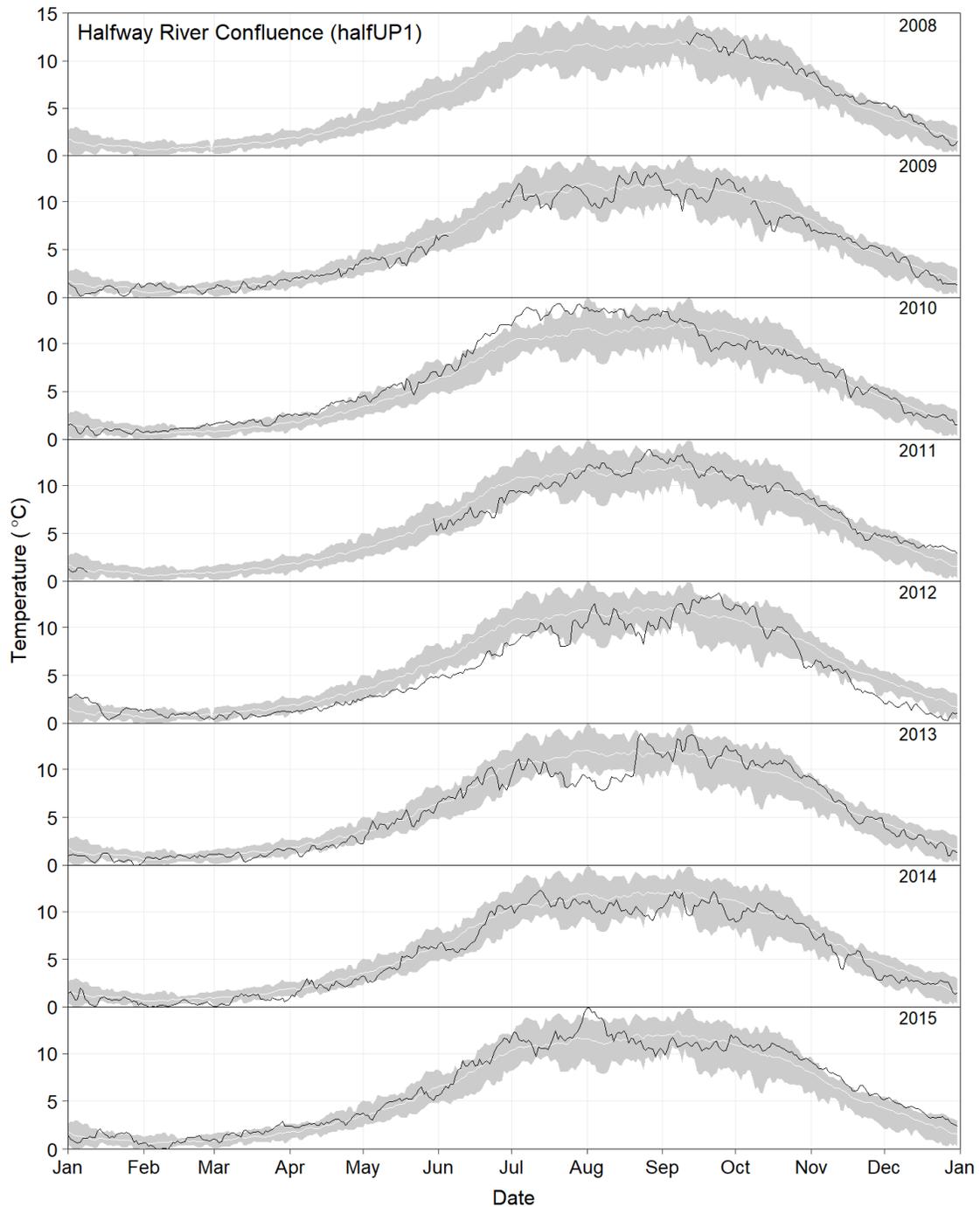
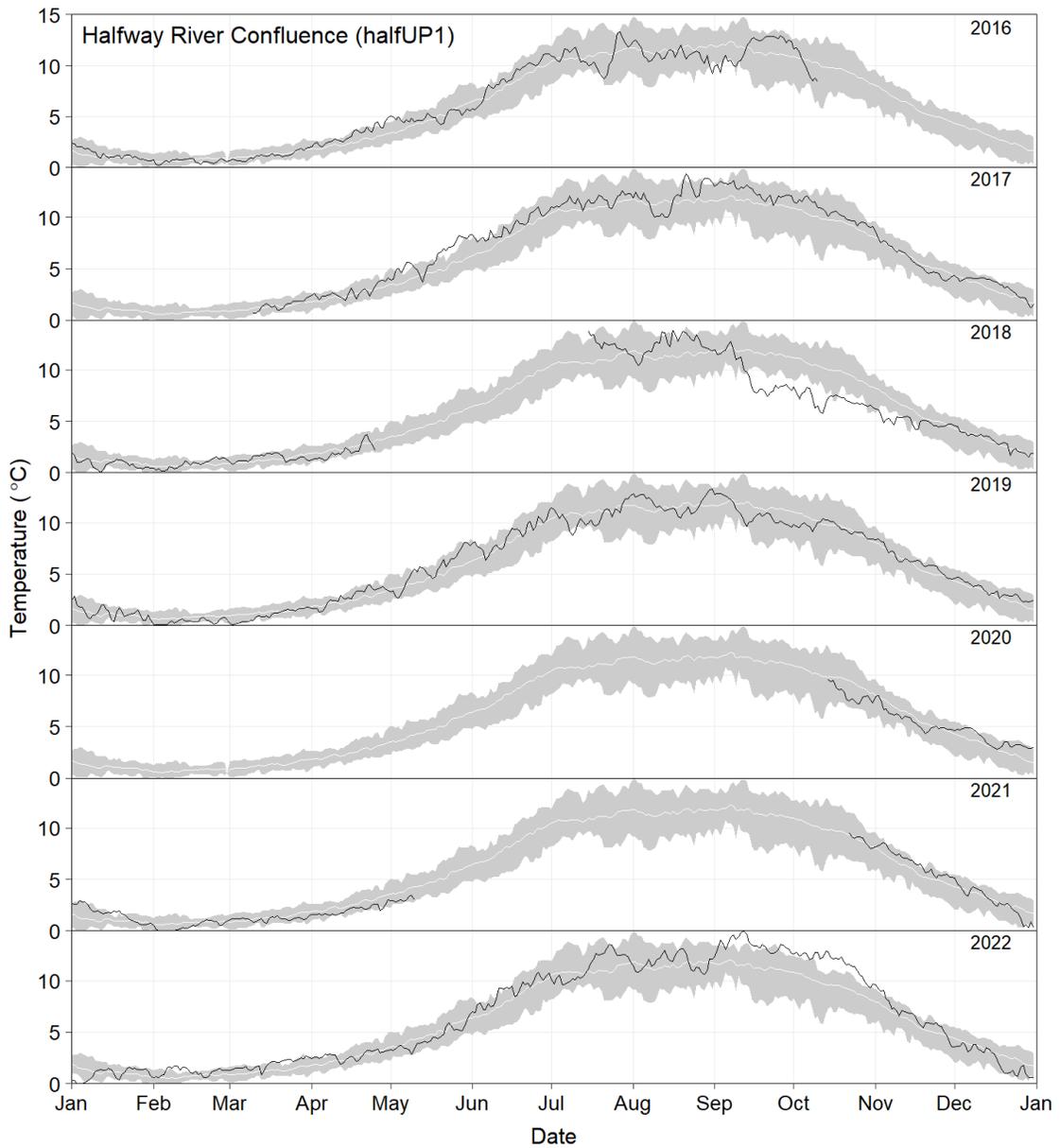


Figure 54. Continued.



**Figure 55.** Mean daily water temperature (°C) for the left bank of the Peace River upstream of the Halfway River’s confluence with the Peace River (halfUP2; black line), 2008 to 2022. The shaded area represents minimum and maximum water temperature recorded at the station during other study years between 2008 and 2022. The white line represents average mean daily water temperature over the same period.

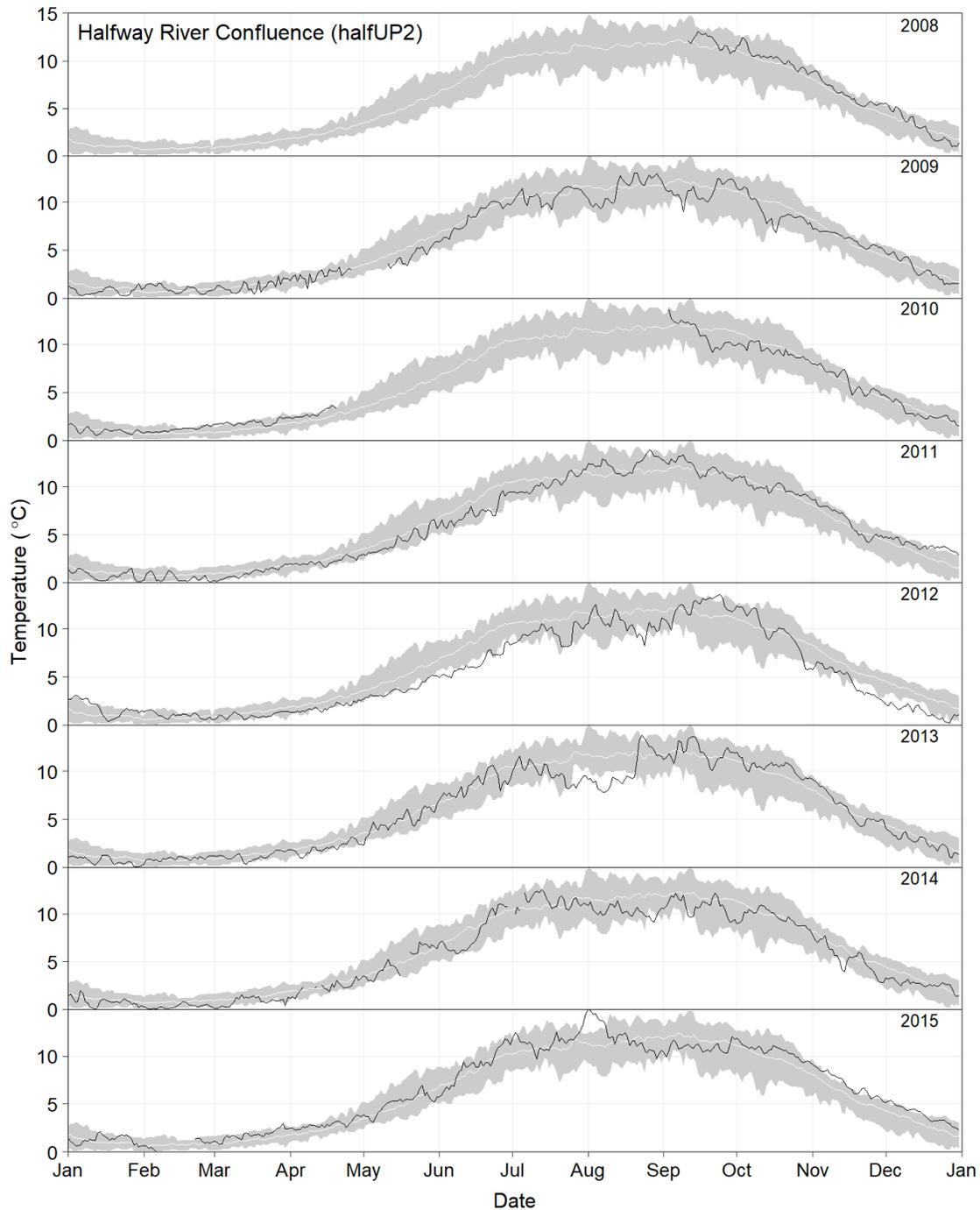


Figure 55. Continued.

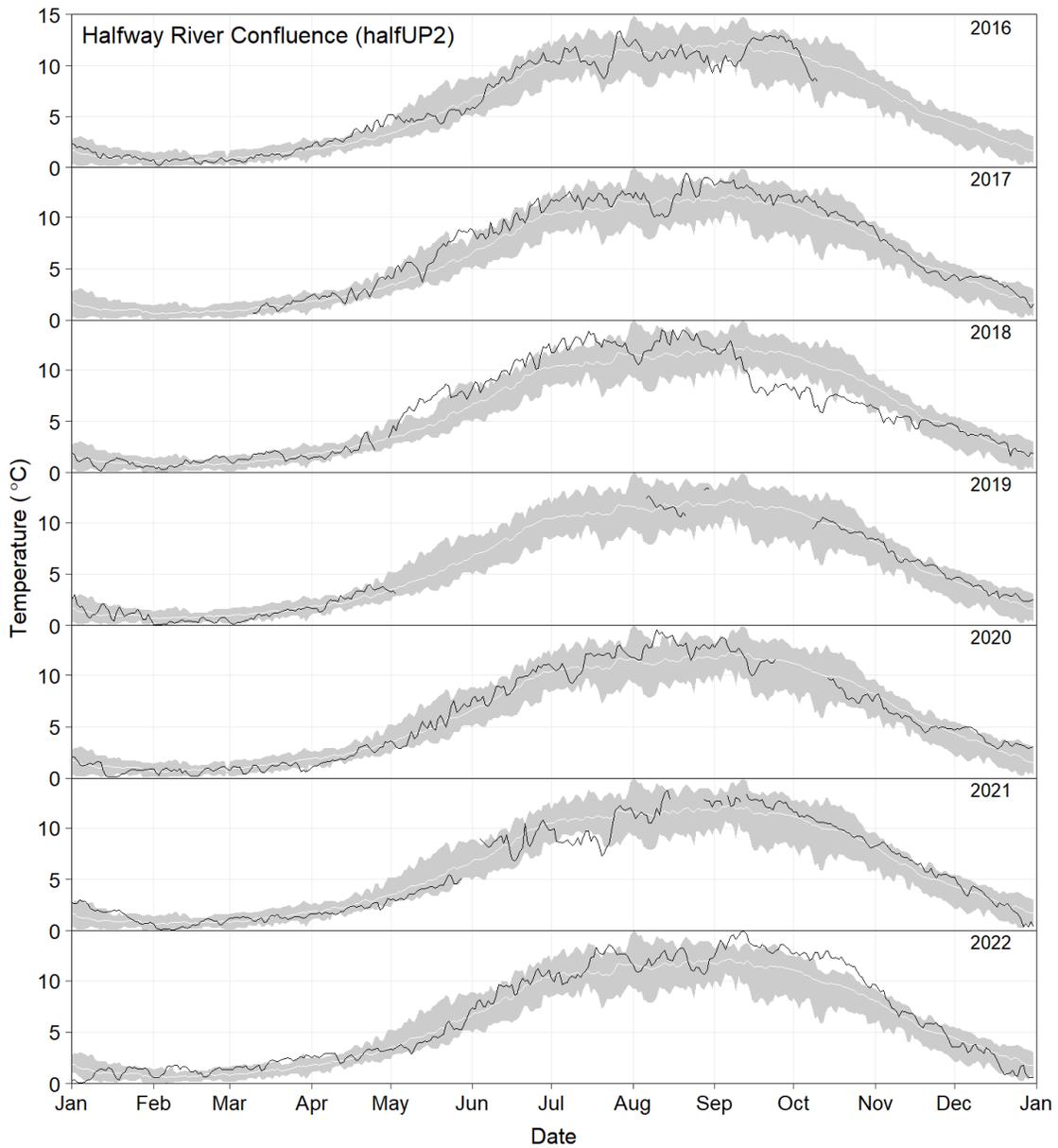


Figure 56. Mean daily water temperature (°C) for the left bank of the Peace River downstream of the Halfway River’s confluence with the Peace River (halfDN2; black line), 2008 to 2022. The shaded area represents minimum and maximum water temperature recorded at the station during other study years between 2008 and 2022. The white line represents average mean daily water temperature over the same period.

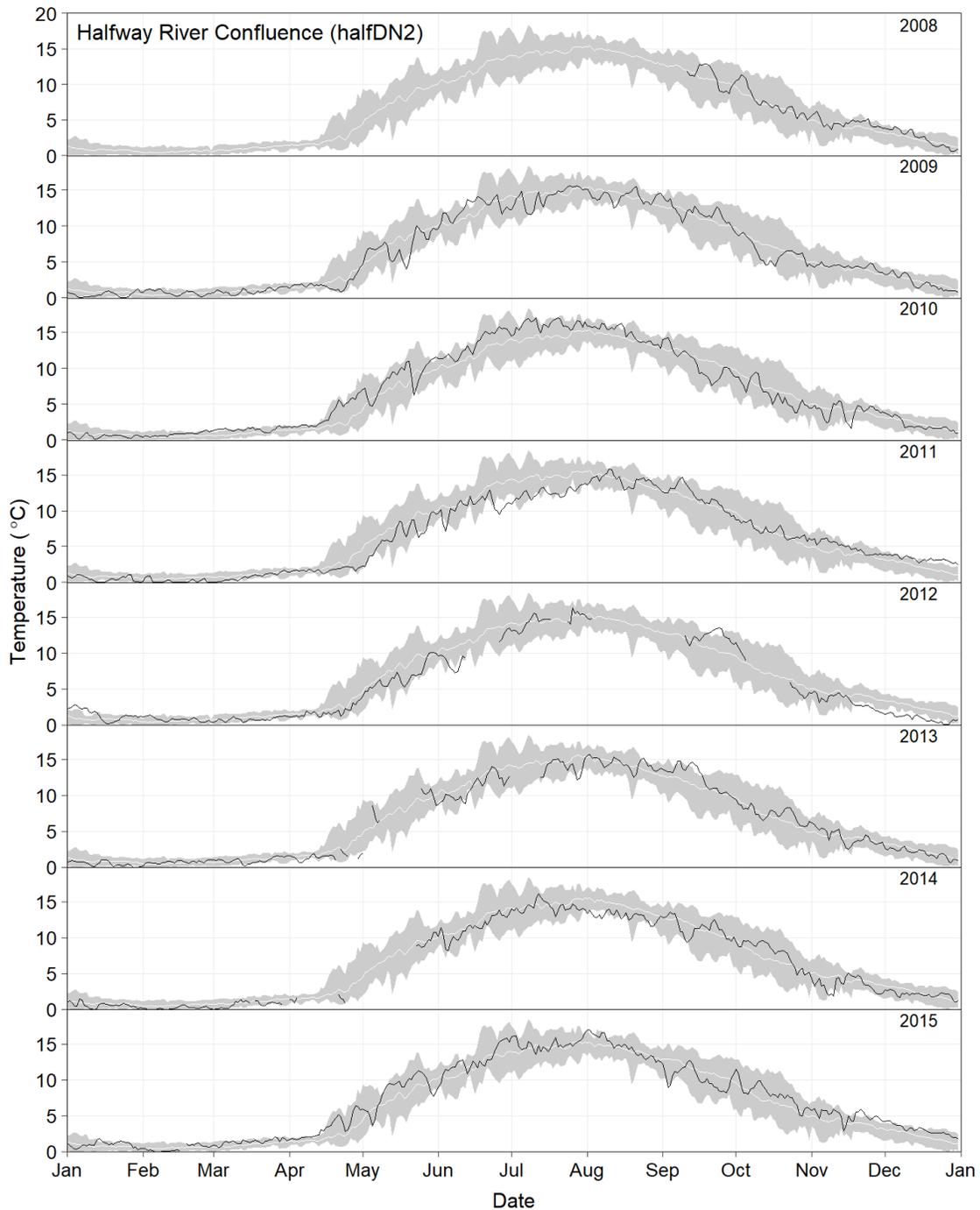
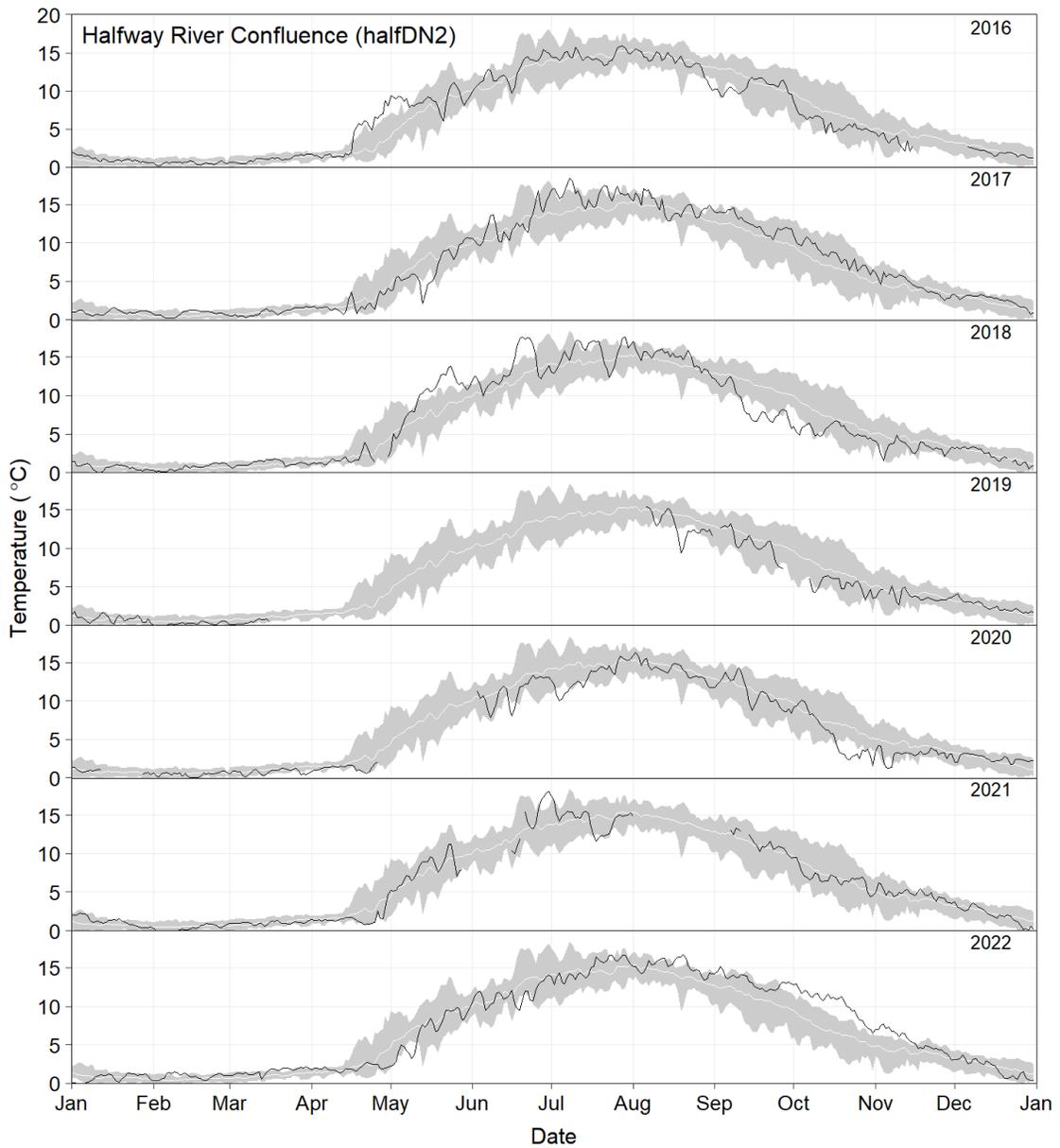
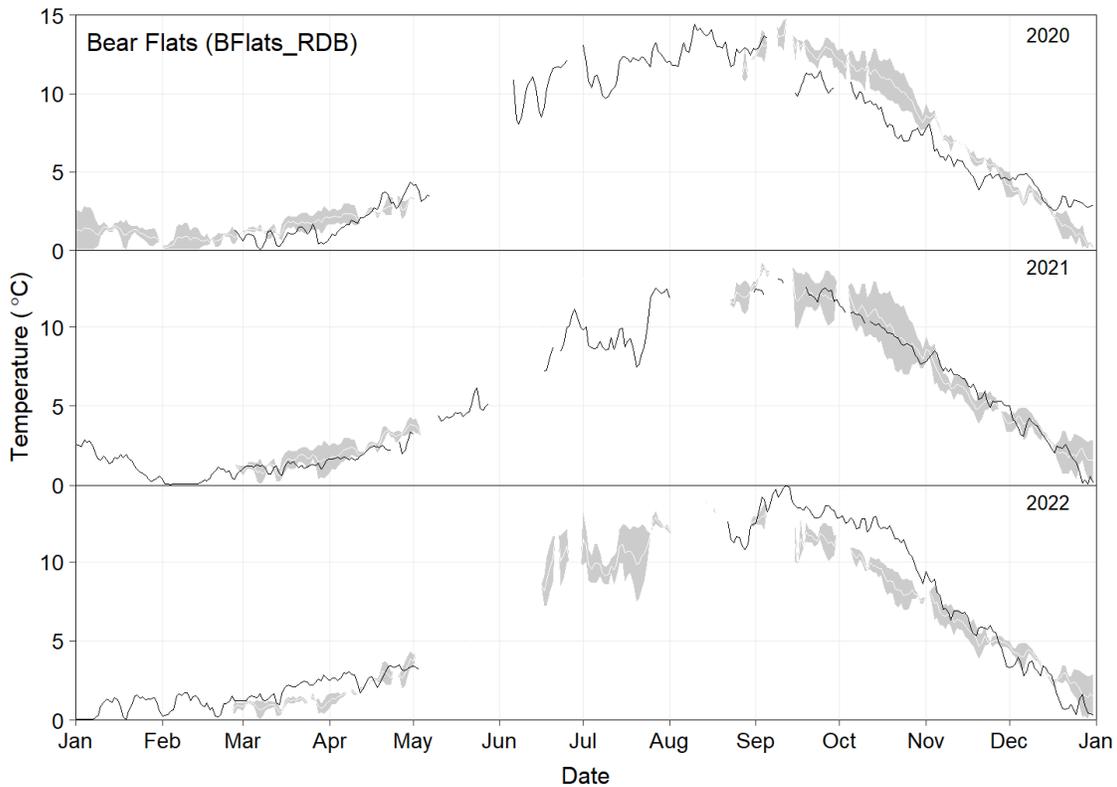


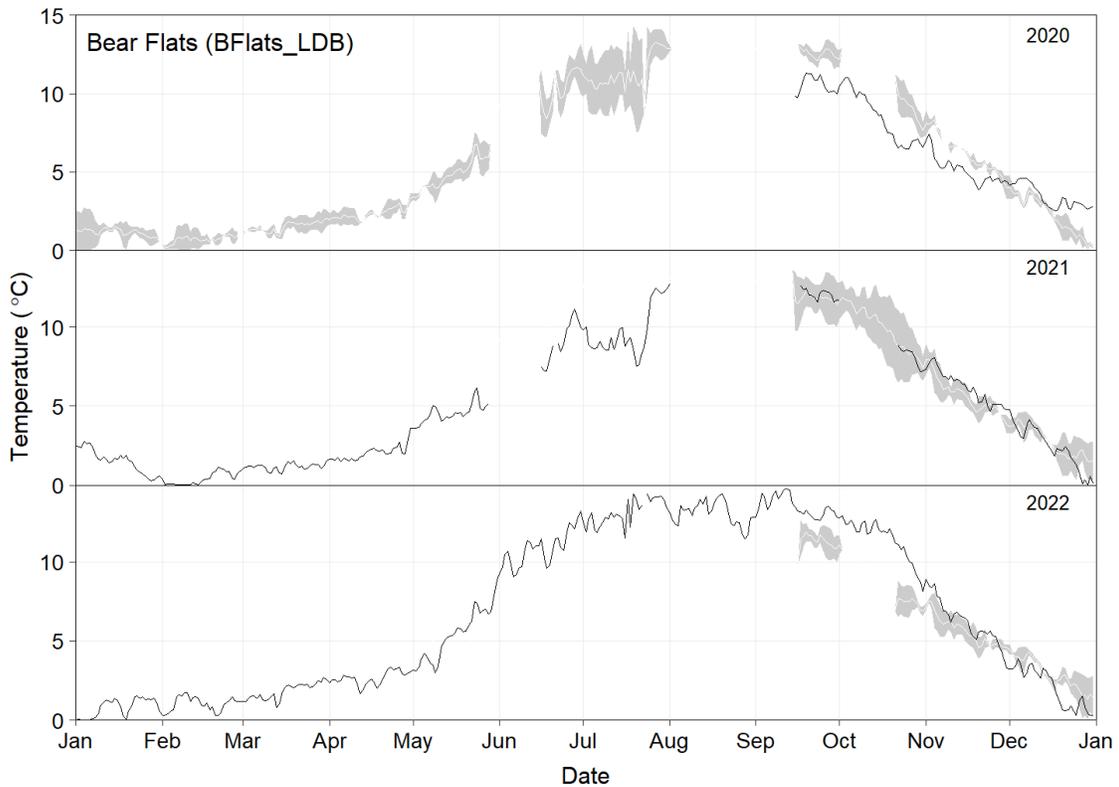
Figure 56. Continued.



**Figure 57.** Mean daily water temperature (°C) for the right bank of the Peace River at Bear Flats between the Halfway River and the Moberly River confluences with the Peace River (BFlats\_RDB; black line), 2020 to 2022. The shaded area represents minimum and maximum water temperature recorded at the station during other study years between 2020 and 2022. The white line represents average mean daily water temperature over the same period.



**Figure 58.** Mean daily water temperature (°C) for the left bank of the Peace River at Bear Flats between the Halfway River and the Moberly River confluences with the Peace River (BFlats\_LDB; black line), 2020 to 2022. The shaded area represents minimum and maximum water temperature recorded at the station during other study years between 2020 and 2022. The white line represents average mean daily water temperature over the same period.



**Figure 59.** Mean daily water temperature (°C) for the right bank of the Peace River upstream of the Moberly River’s confluence with the Peace River (mobUP1; black line), 2008 to 2020. The shaded area represents minimum and maximum water temperature recorded at the station during other study years between 2008 and 2020. The white line represents average mean daily water temperature over the same period.

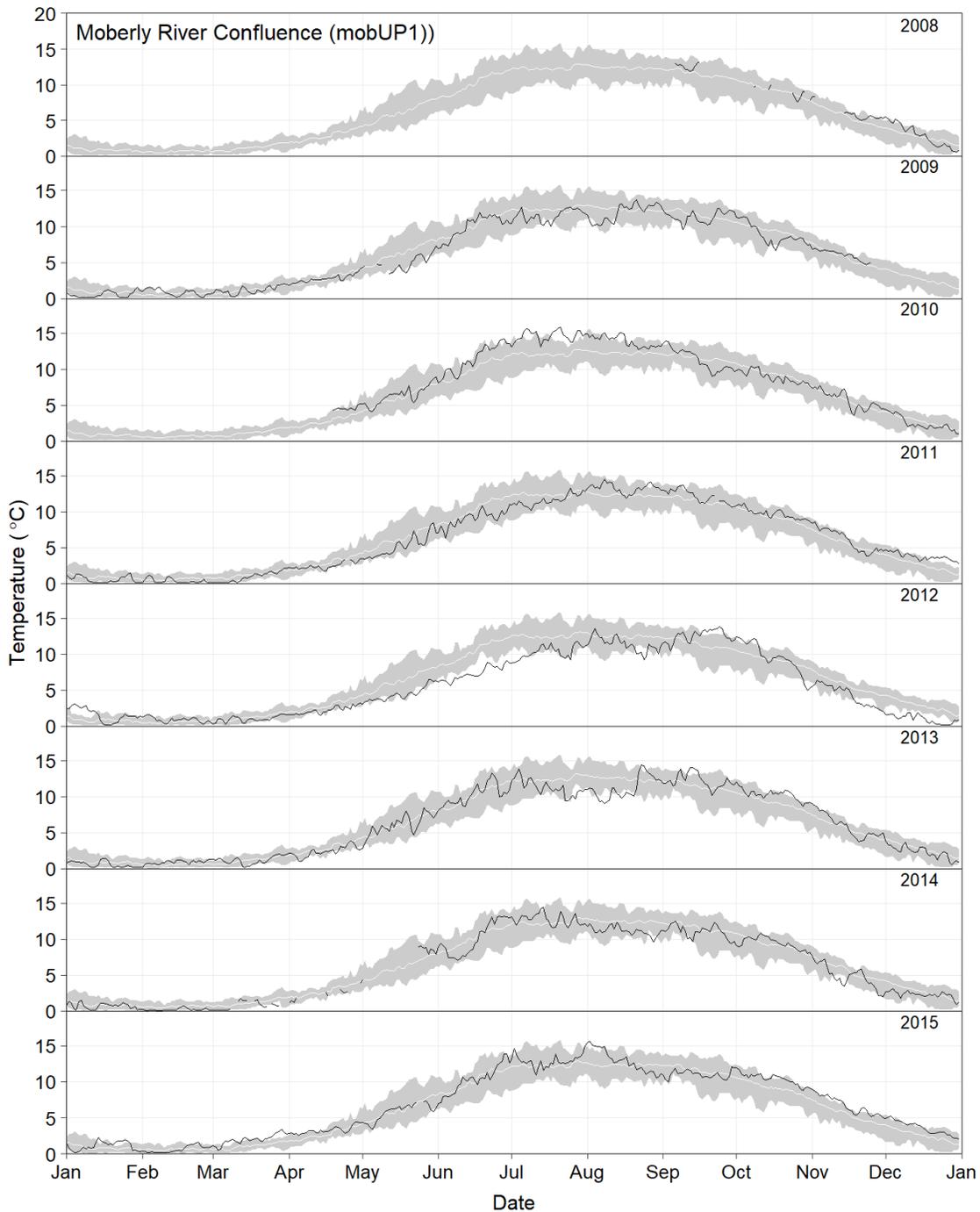
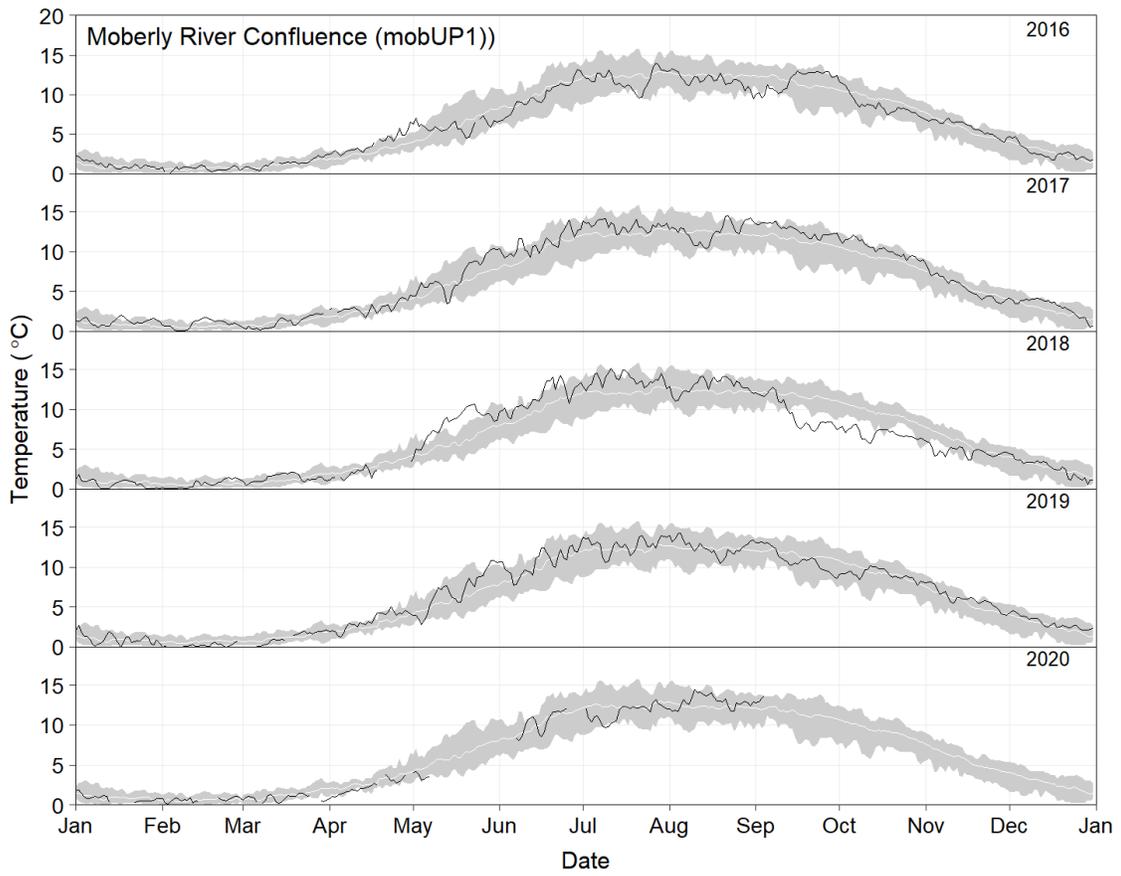


Figure 59. Continued.



**Figure 60.** Mean daily water temperature (°C) for the left bank of the Peace River upstream of the Moberly River’s confluence with the Peace River (mobUP2; black line), 2008 to 2020. The shaded area represents minimum and maximum water temperature recorded at the station during other study years between 2008 and 2020. The white line represents average mean daily water temperature over the same period.

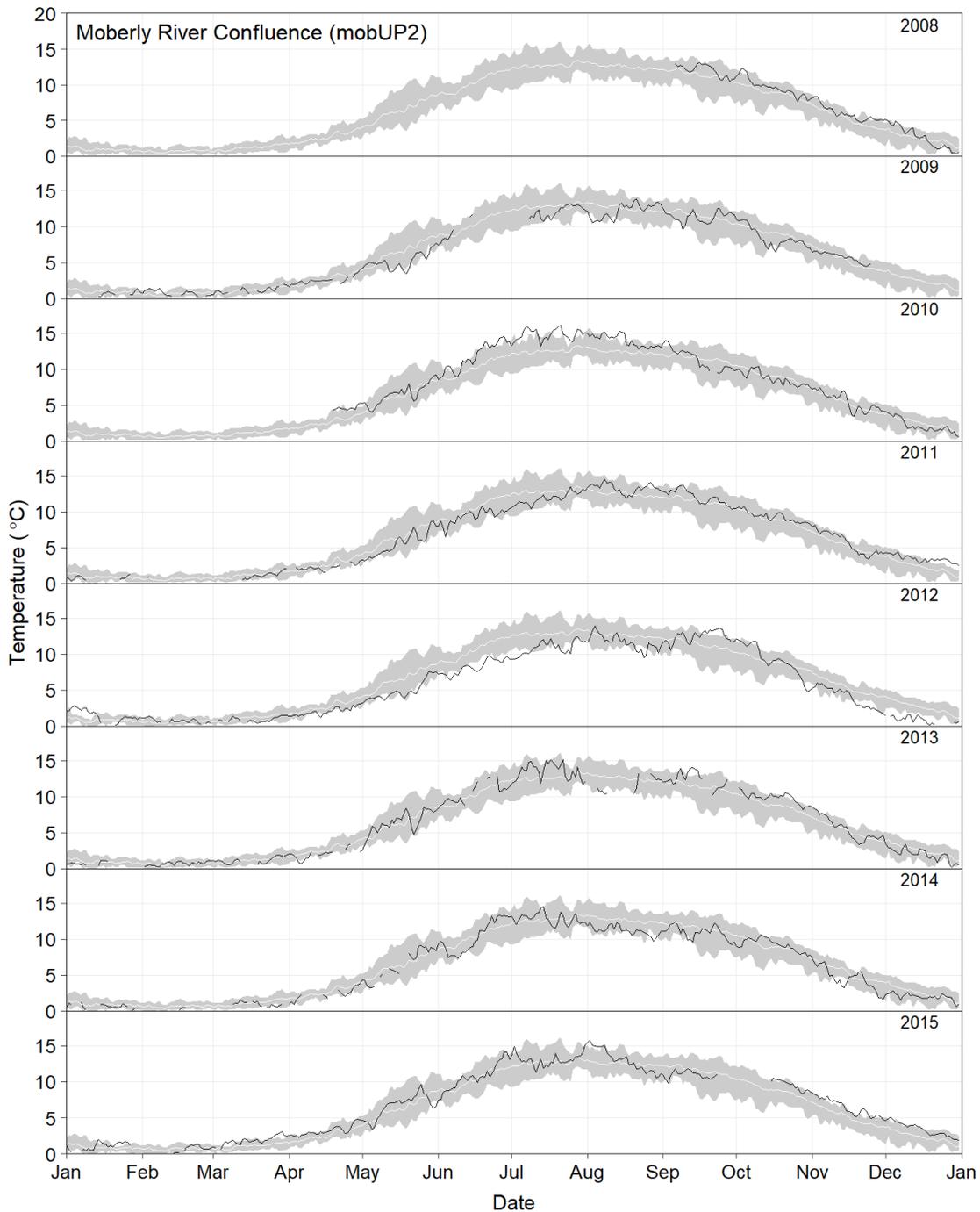


Figure 60. Continued.

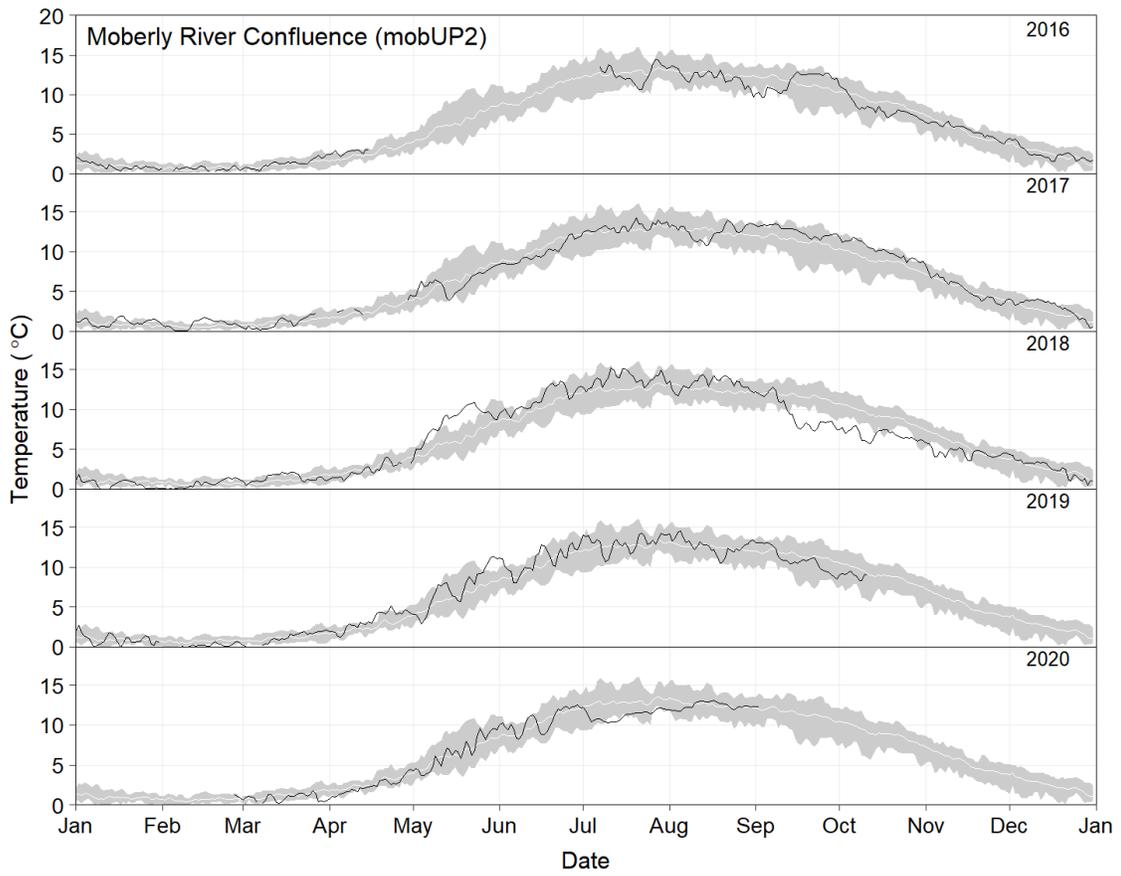


Figure 61. Mean daily water temperature (°C) for the right bank of the Peace River downstream of the Moberly River’s confluence with the Peace River (mobDN1; black line), 2008 to 2020. The shaded area represents minimum and maximum water temperature recorded at the station during other study years between 2008 and 2020. The white line represents average mean daily water temperature over the same period.

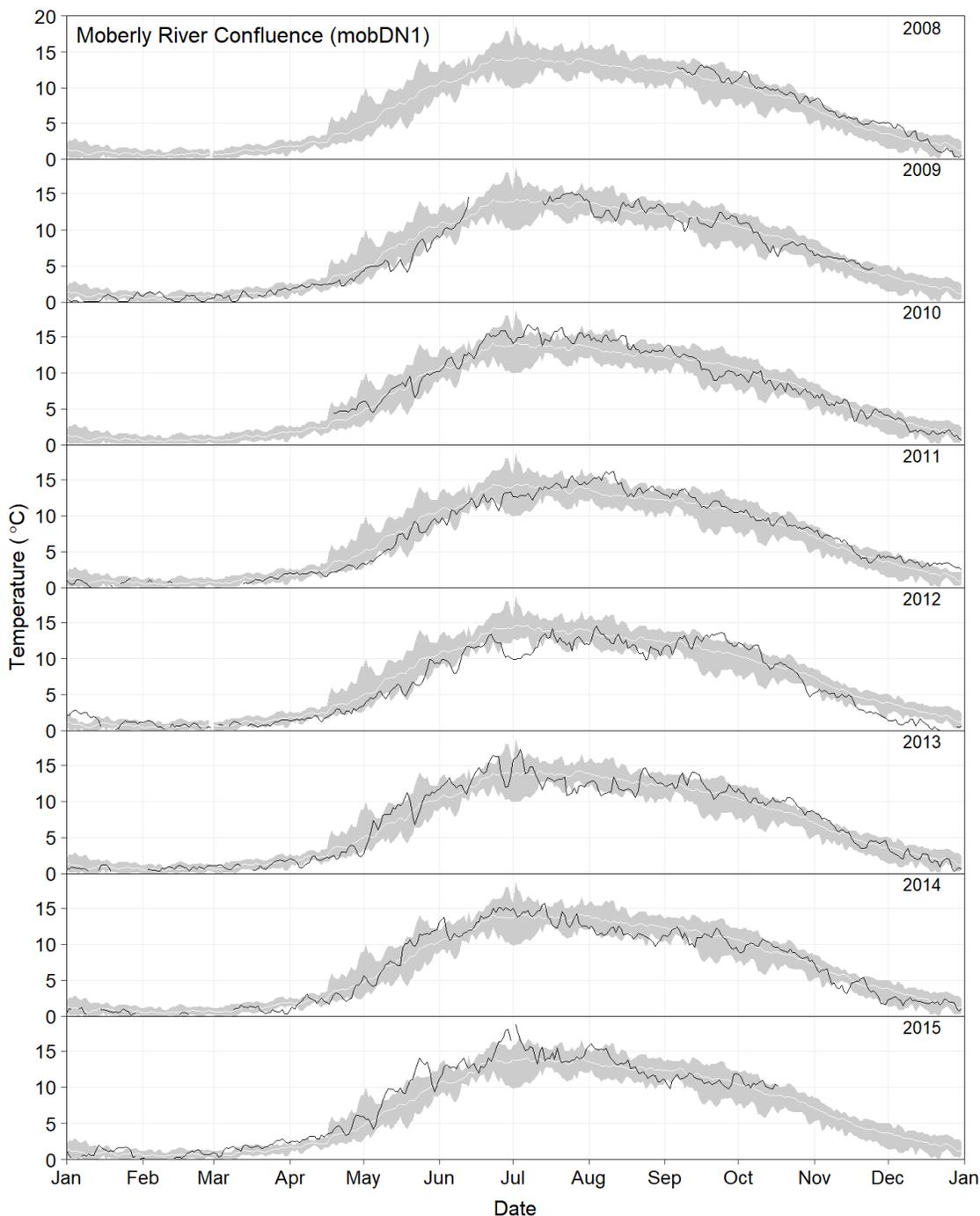
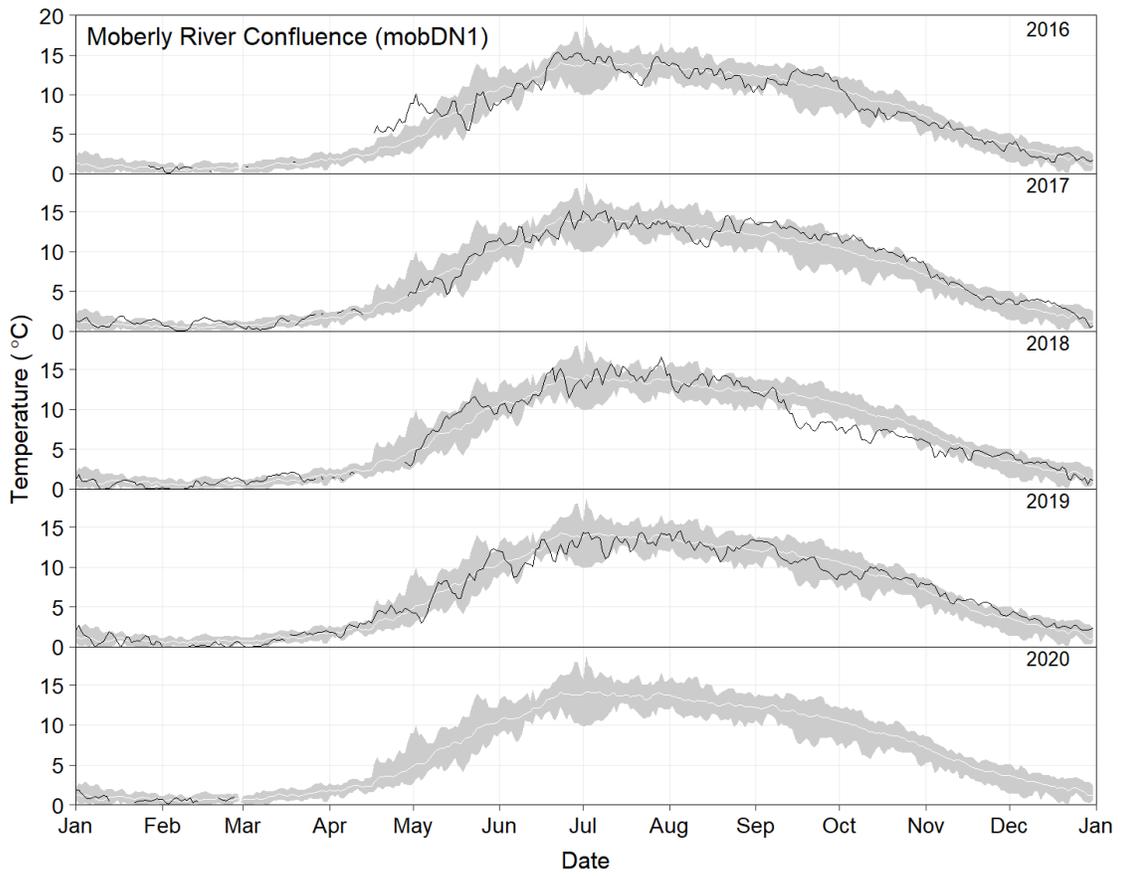


Figure 61. Continued.



**Figure 62.** Mean daily water temperature (°C) for the right bank of the Peace River upstream of the Pine River’s confluence with the Peace River (pineUP1; black line), 2008 to 2022. The shaded area represents minimum and maximum water temperature recorded at the station during other study years between 2008 and 2022. The white line represents average mean daily water temperature over the same period.

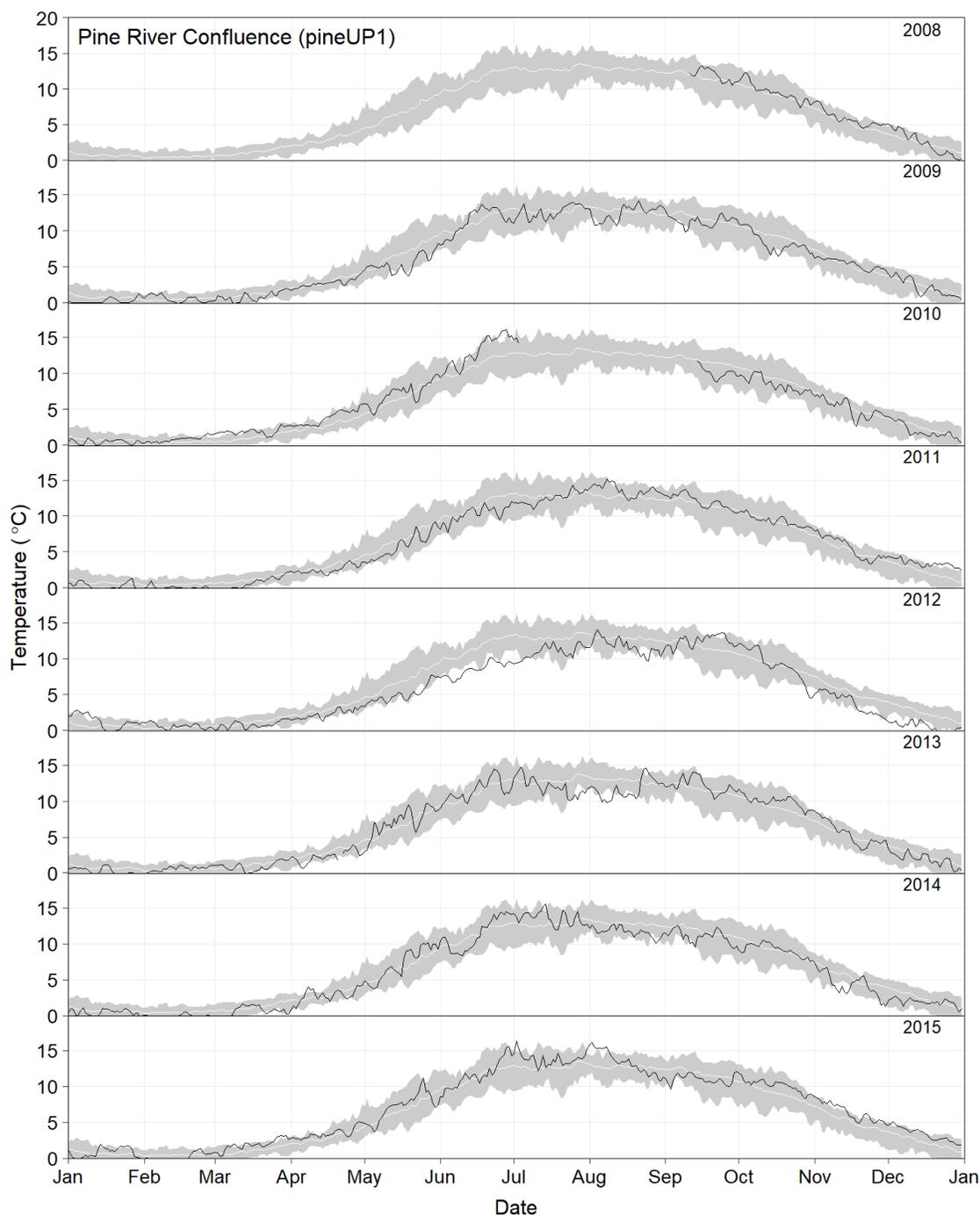
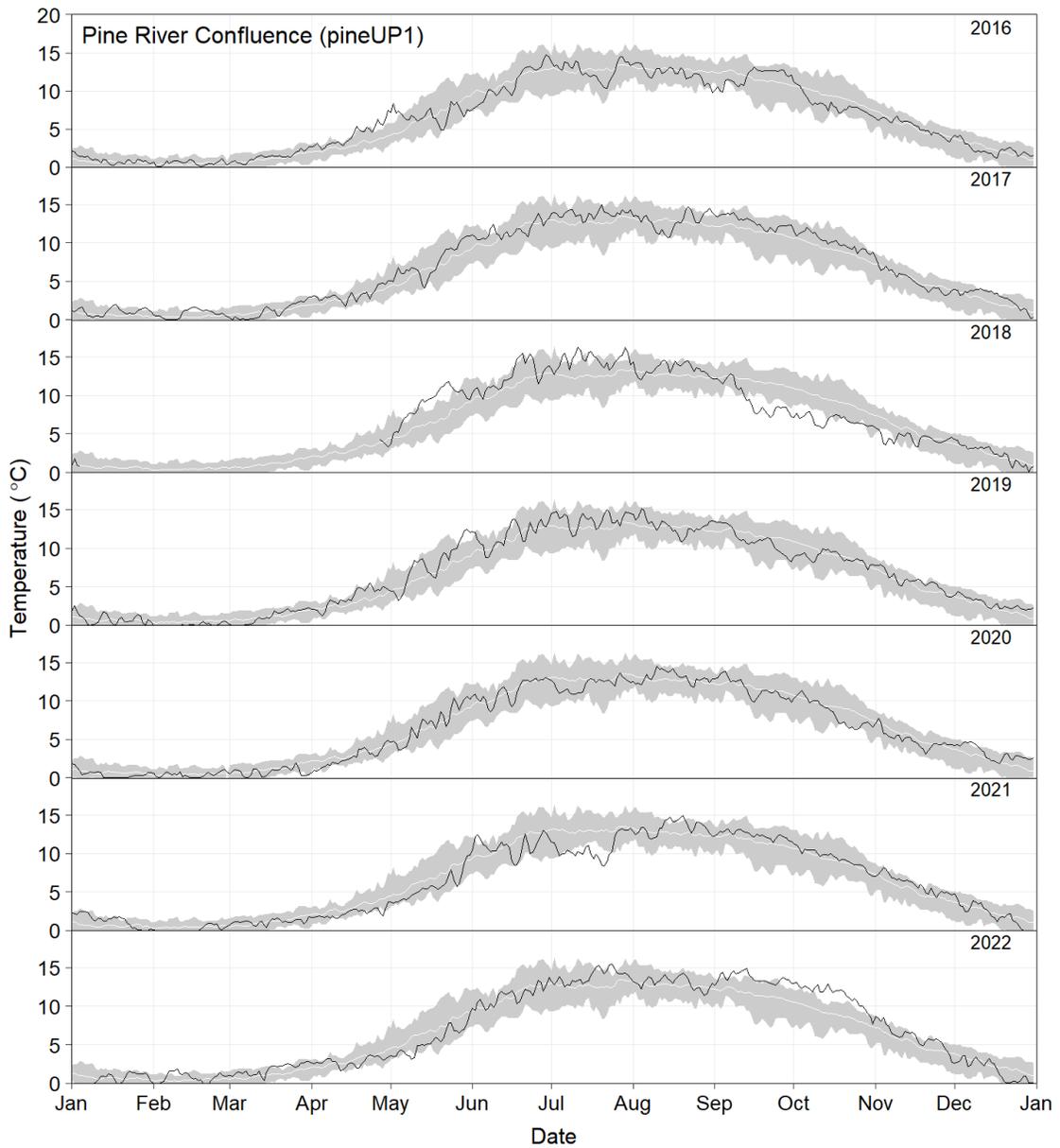


Figure 62. Continued.



**Figure 63.** Mean daily water temperature (°C) for the left bank of the Peace River upstream of the Pine River’s confluence with the Peace River (pineUP2; black line), 2008 to 2022. The shaded area represents minimum and maximum water temperature recorded at the station during other study years between 2008 and 2022. The white line represents average mean daily water temperature over the same period.

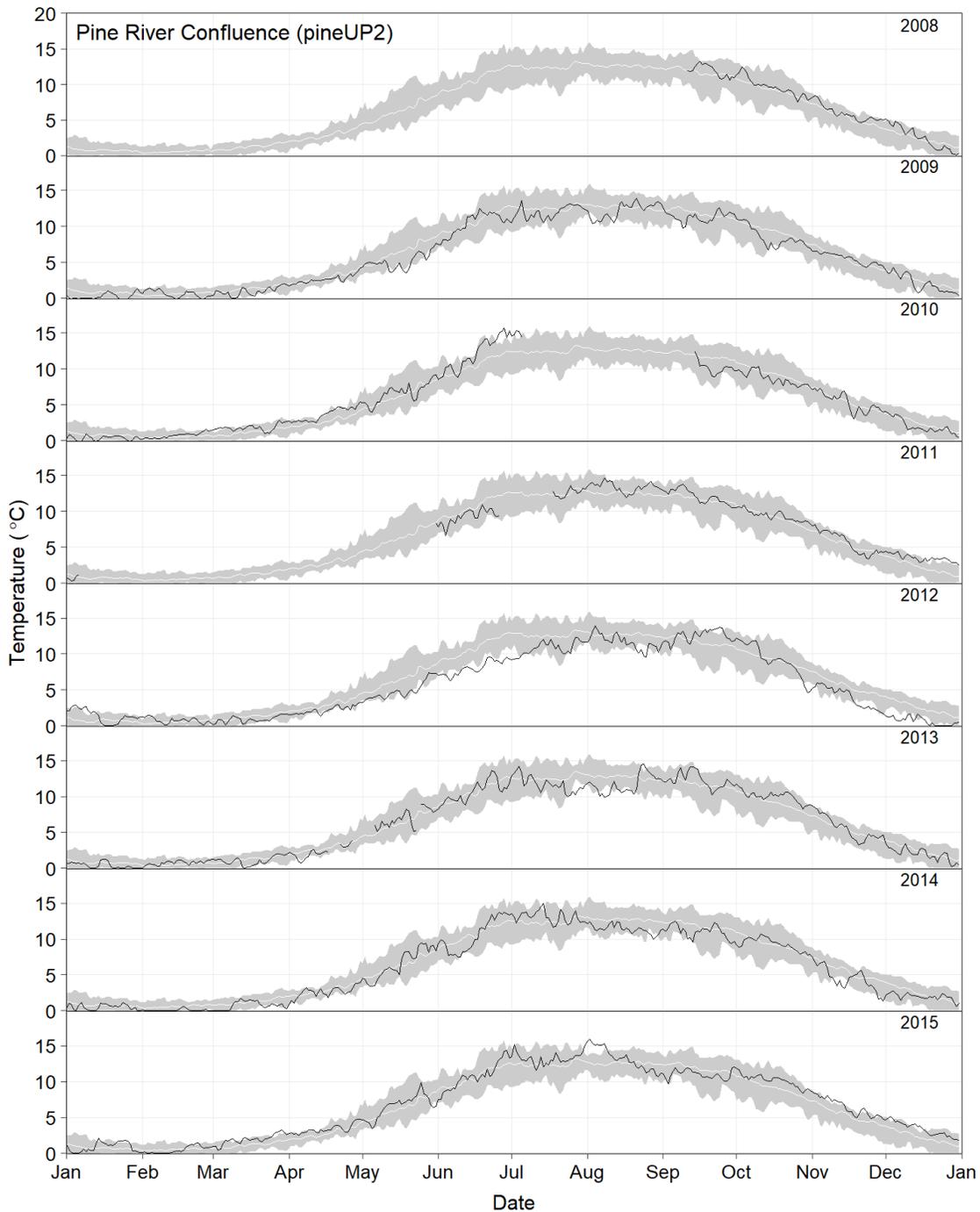
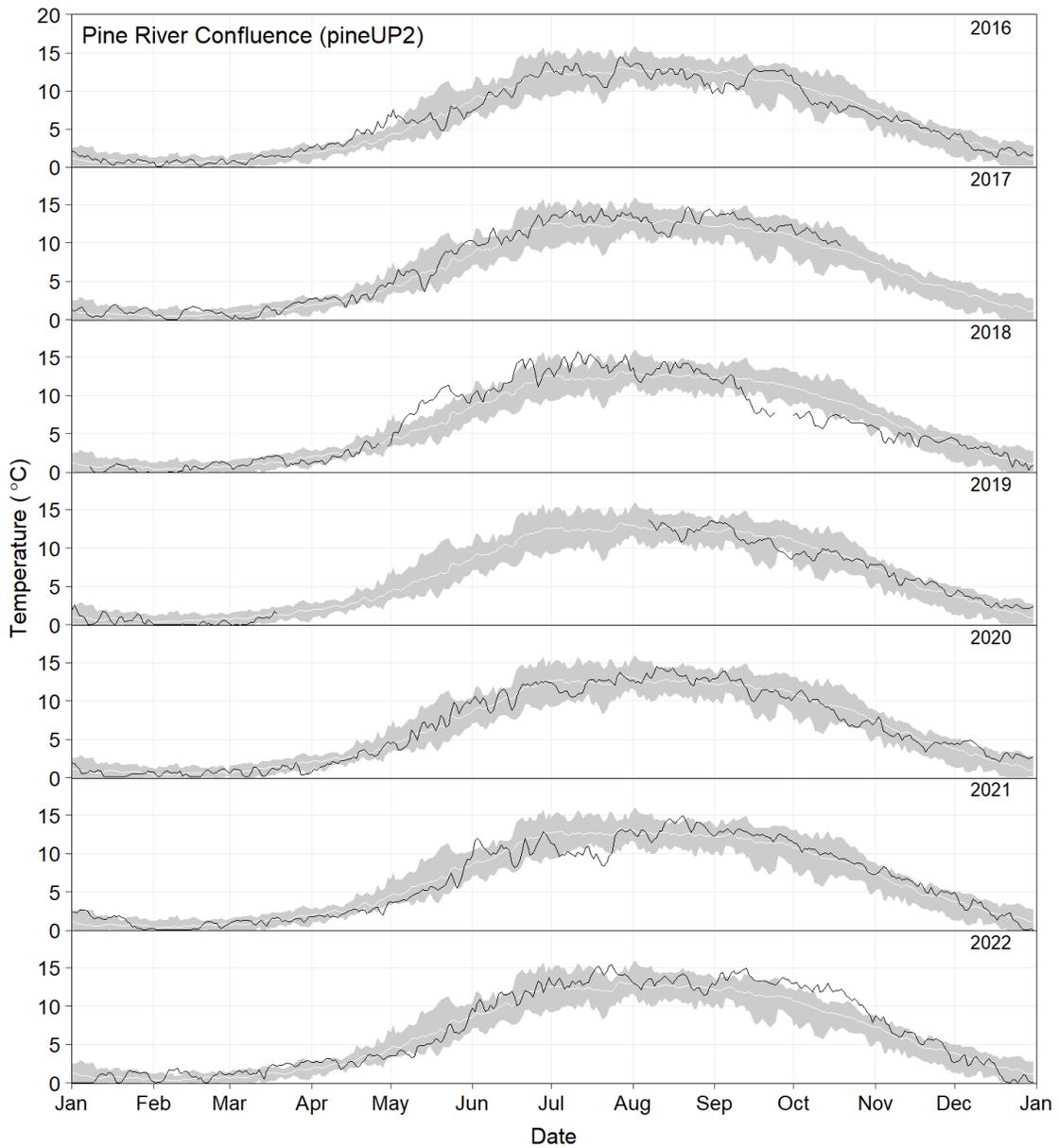


Figure 63. Continued.



**Figure 64.** Mean daily water temperature (°C) for the right bank of the Peace River downstream of the Pine River’s confluence with the Peace River (pineDN1; black line), 2008 to 2022. The shaded area represents minimum and maximum water temperature recorded at the station during other study years between 2008 and 2022. The white line represents average mean daily water temperature over the same period.

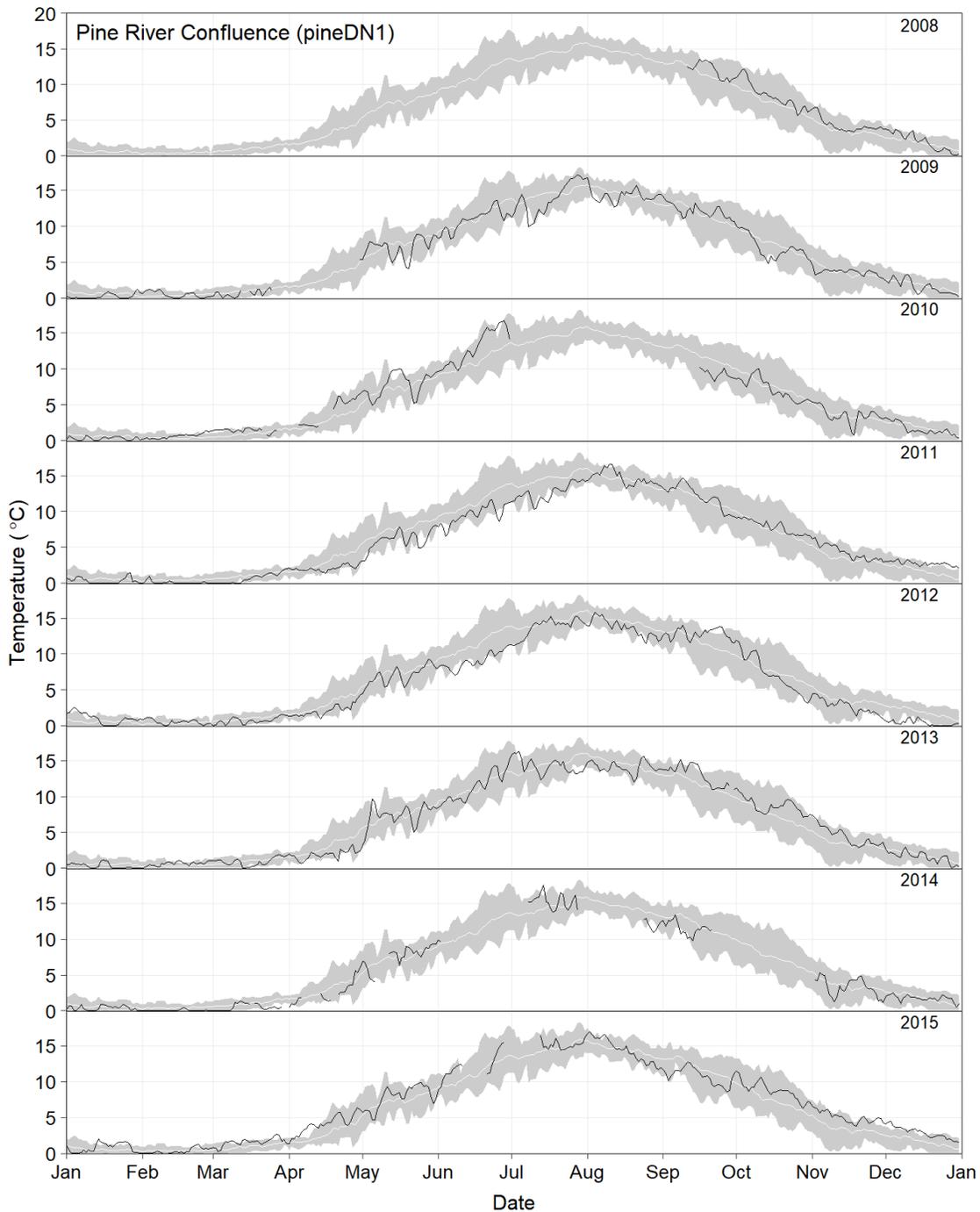
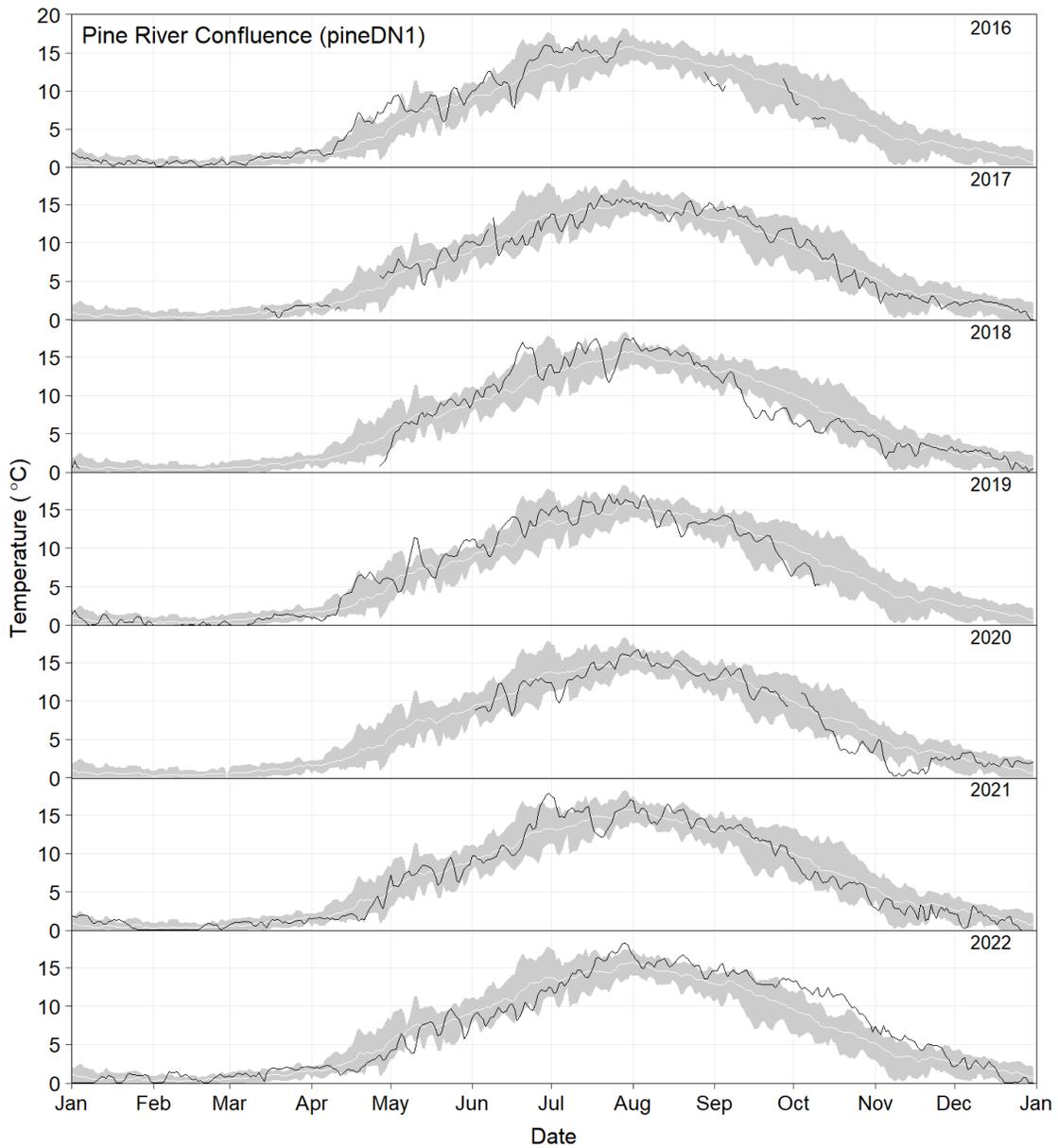
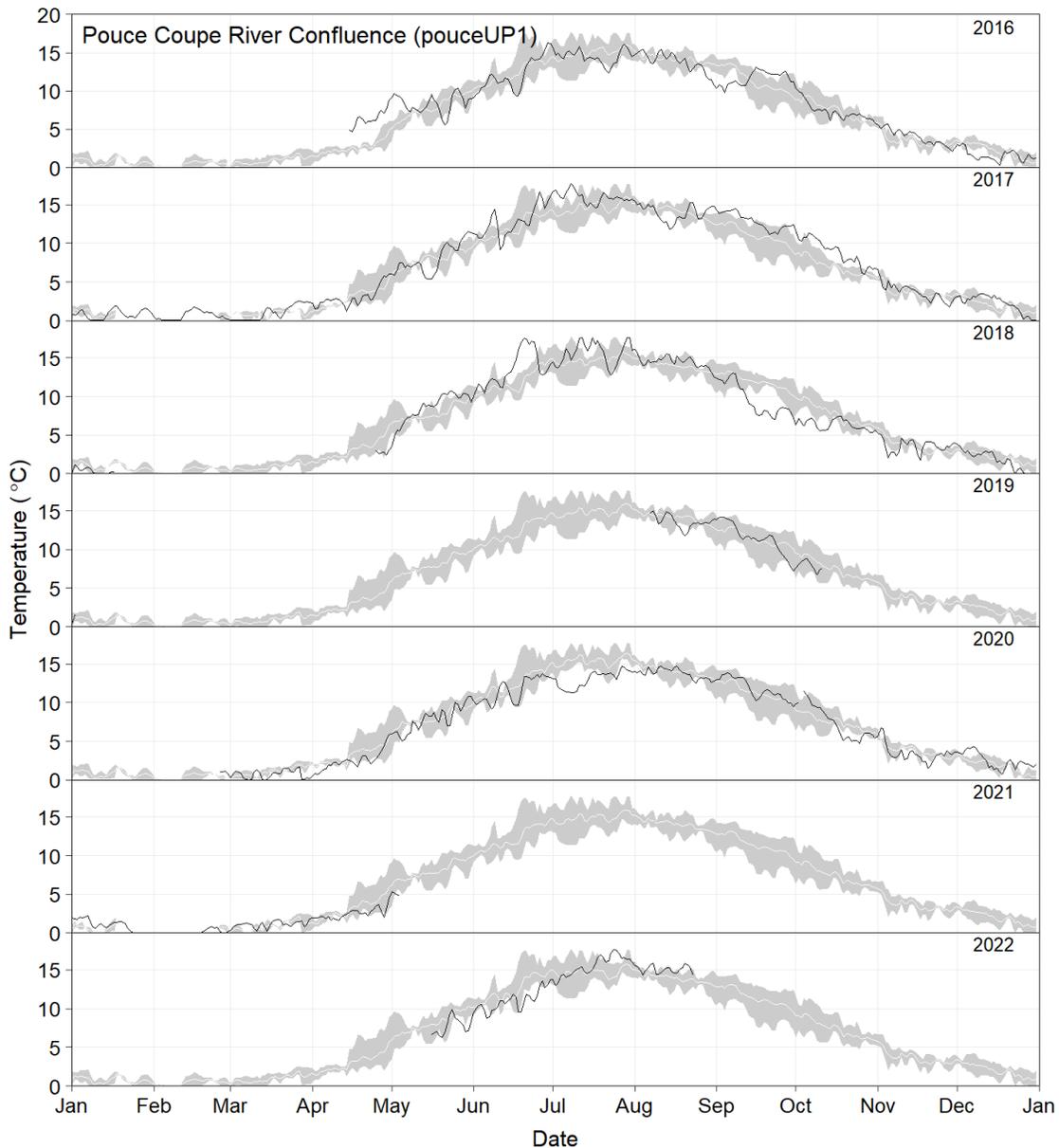


Figure 64. Continued.



**Figure 65.** Mean daily water temperature (°C) for the right bank of the Peace River upstream of the Pouce Coupe River’s confluence with the Peace River (pouceUP1; black line), 2016 to 2022. The shaded area represents minimum and maximum water temperature recorded at the station during other study years between 2016 and 2022. The white line represents average mean daily water temperature over the same period.



**Figure 66.** Mean daily water temperature (°C) for the left bank of the Peace River upstream of the Pouce Coupe River’s confluence with the Peace River (pouceUP2; black line), 2016 to 2022. The shaded area represents minimum and maximum water temperature recorded at the station during other study years between 2016 and 2022. The white line represents average mean daily water temperature over the same period.

