Data Management and the GWFNet Catalogue for INARCH/COPE

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Canada

Today’s Presentation

Endurance of Data

GWFNet

COPE information currently in GWFNet

Additional information and detail requested

Endurance of Data

Four Desirable Concepts Towards Endurance of Data

1. Iterative Improvement – We prefer a flexible data system that can accommodate to-be-perfected and partial data so baseline information can be obtained without delay and enhanced later as time and improved knowledge become available.
2. Legacy – This refinement process results in future (meta)data which will improve with time and become tomorrow's important legacy. Thus we establish a desirable recurring "today's legacy is tomorrow's future" pattern.
3. Continuity – Our collection of Water Research data is a "critical mass" constant which spans and survives intact across often overlapping funding events:
   - MAGS, DRI, IP3, CCRN, INARCH-1 (past)
   - GWF, INARCH-2/COPE (present), GIWS
   - GWFO (future),

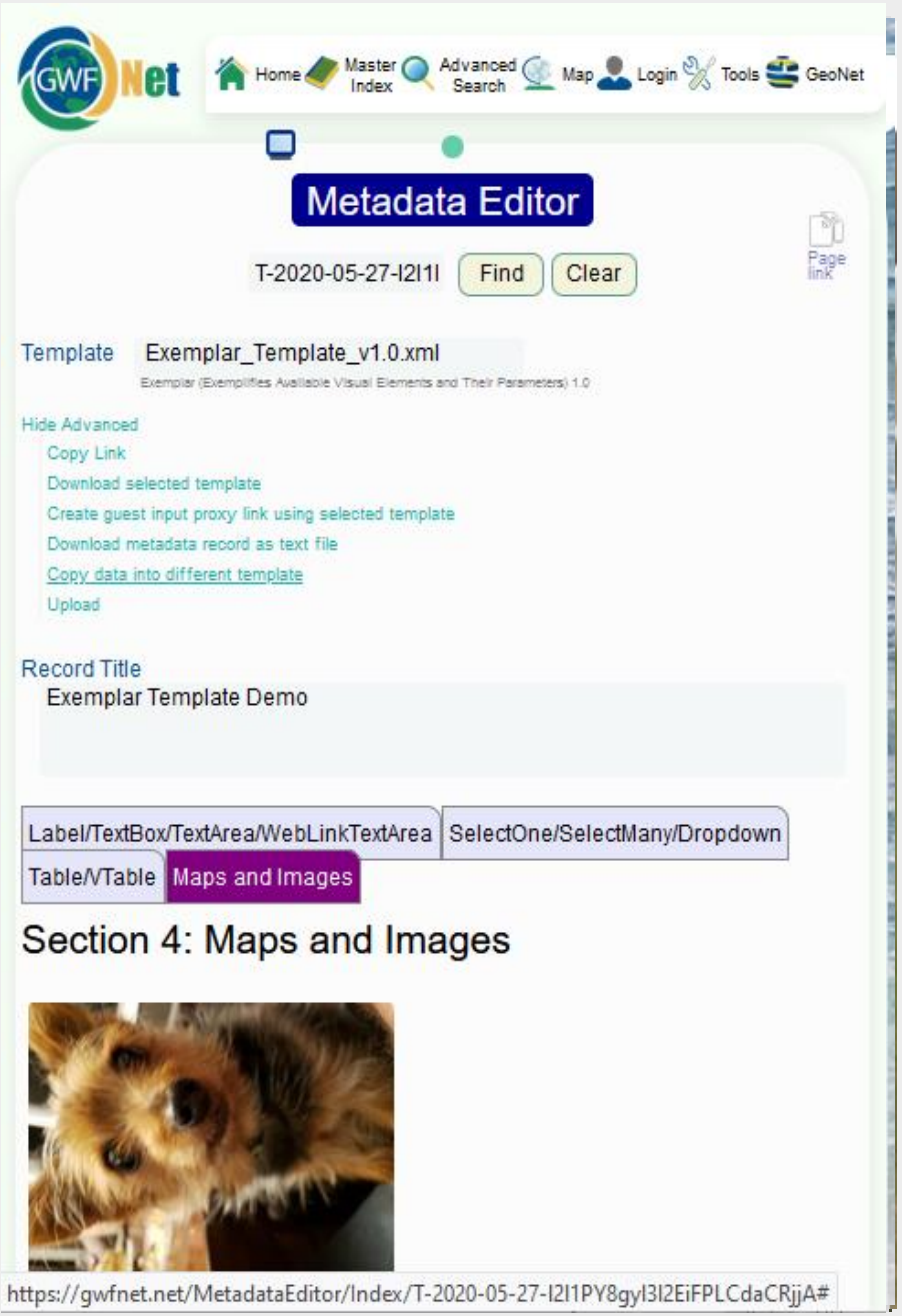
   and decades--continuing to be relevant, referenced, and improved. "We are our data."
4. Decentralized Data – For practical reasons it is best to keep our data decentralized into databases and repositories best suited for the research in question, and track this information through a central catalogue of data.

Information Tracked in Central Data Catalogue

- What is out there:
  - Observatories, Sites per observatory, Stations per site
  - Detailed inventories on instrumentation and equipment per site
  - Projects (of large programs)
  - Publications – Datasets and Papers
- Where it is:
  - Maps (location(s), contours, and bounding boxes)
  - Repositories (Relational Databases, WISKI, FRDR, GitHub, Zenodo, DataStream, Compute Canada, Web Services)
  - Under Embargo or Private (Instructions, “Go talk to Sam and arrange to obtain a copy”)
- Who is responsible for it/Who has it:
  - Authorship, Technicians, Principal Investigators, Model users and creators
- Other information:
  - Videos, interactive charts,
  - Context through cross-referencing and indexing

GWFNet

GWFNet Catalogue



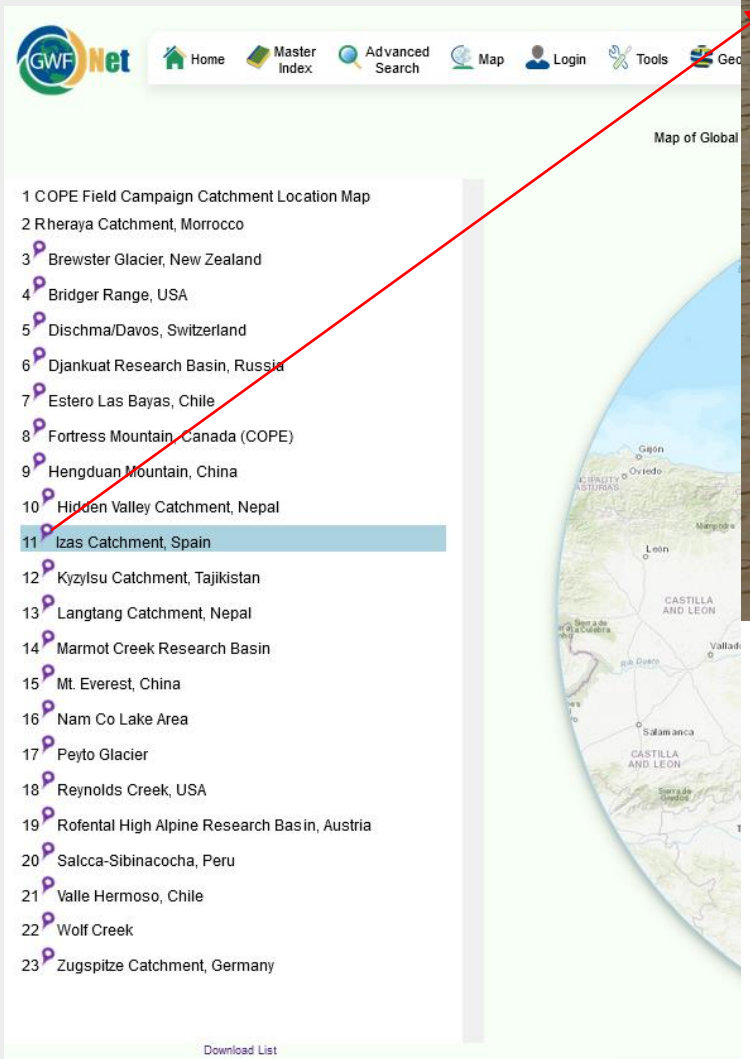
GWFNet is a data catalogue originally created for Global Water Futures (GWF) but will prevail well into the future to include and interrelate information from:

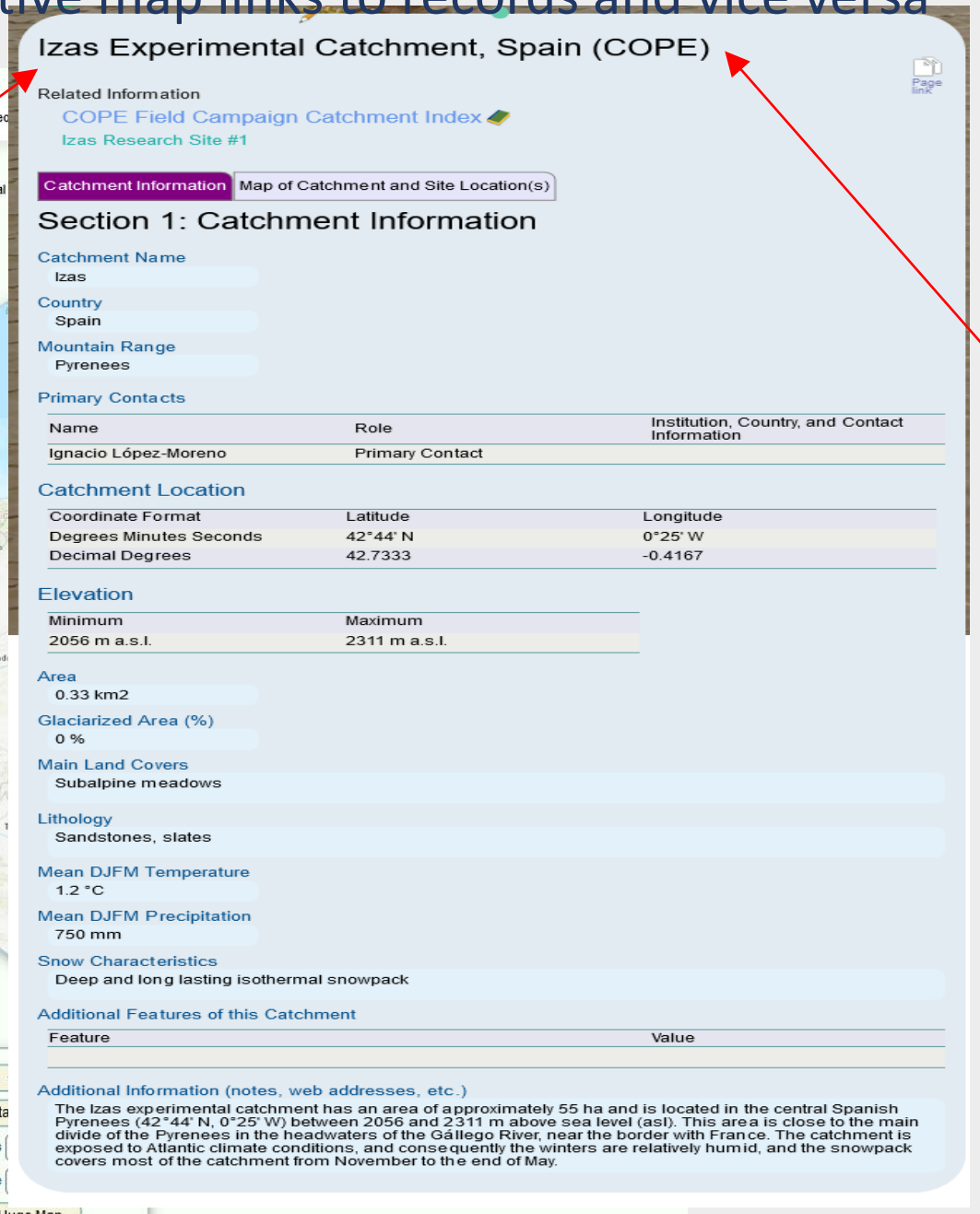
- programs prior to GWF (e.g., MAGS, DRI, IP3, CCRN, INARCH ph1),
- current programs (e.g., GWF, INARCH ph2, INARCH/COPE), and
- future programs (e.g., INARCH ph2, GWFO, Other contributors),

GWFNet contains cross-linked, well-**indexed** records (based on easily defined XML templates controlling visual appearance and database variable content) on:

- **observatories**, **research sites**, **stations**
- **models** -- descriptions, workflows, inputs, outputs, database requirements, links to source code, and extra information related to setup and operation
- **datasets, paper publications** -- including DOIs, authorship, abstracts, and download locations,
- **persons** associated with projects, data, datasets, models,
- **projects** within programs, (e.g., Mountain Water Futures within GWF),
- other record types, e.g., **videos** (e.g., locations, model usage, etc.), interactive **graphs** (soon to incorporate real-time data from live data sources), and
- any other types of records needed in future (simply add new record templates).
- To facilitate futureproofing (iterative improvement, legacy, and continuity), records based on earlier templates can be transformed into records based on new templates at any time, and all information matching the new template is copied to the new (or in-situ-reformed) record

GWFNet Catalogue – Interactive map links to records and vice versa





Izas Experimental Catchment, Spain (COPE)

Related Information
COPE Field Campaign Catchment Index
Izas Research Site #1

Catchment Information | Map of Catchment and Site Location(s)

Section 1: Catchment Information

Catchment Name
Izas

Country
Spain

Mountain Range
Pyrenees

Primary Contacts

Name	Role	Institution, Country, and Contact Information
Ignacio López-Moreno	Primary Contact	

Catchment Location

Coordinate Format	Latitude	Longitude
Degrees Minutes Seconds	42°44' N	0°25' W
Decimal Degrees	42.7333	-0.4167

Elevation

Minimum	Maximum
2056 m a.s.l.	2311 m a.s.l.

Area
0.33 km2

Glaciarized Area (%)
0 %

Main Land Covers
Subalpine meadows

Lithology
Sandstones, slates

Mean DJFM Temperature
1.2 °C

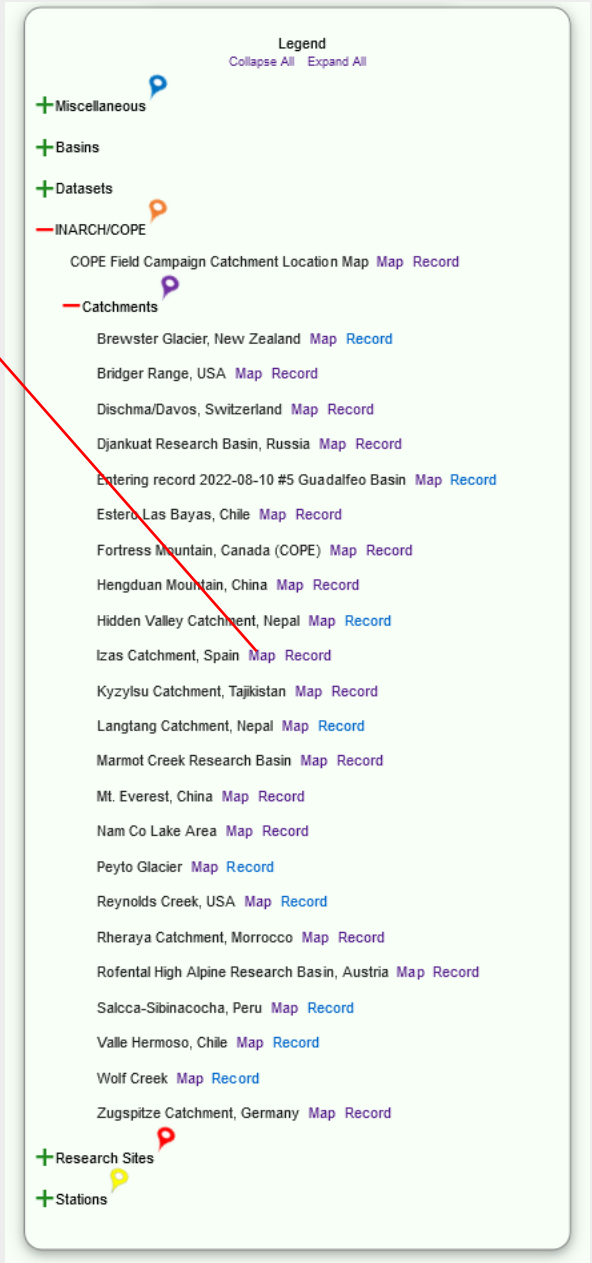
Mean DJFM Precipitation
750 mm

Snow Characteristics
Deep and long lasting isothermal snowpack

Additional Features of this Catchment

Feature	Value

Additional Information (notes, web addresses, etc.)
The Izas experimental catchment has an area of approximately 55 ha and is located in the central Spanish Pyrenees (42°44' N, 0°25' W) between 2056 and 2311 m above sea level (asl). This area is close to the main divide of the Pyrenees in the headwaters of the Gállego River, near the border with France. The catchment is exposed to Atlantic climate conditions, and consequently the winters are relatively humid, and the snowpack covers most of the catchment from November to the end of May.



COPE information in GWFNet

COPE Data in GWFNet

- COPE Catchments [COPE_Catchment_v1.0.xml]
  catchment information and map locating catchment and precise site locations
- COPE Research Sites (within Catchments) [COPE_Research_Site_v1.0.xml]
  minimally, there is currently a temporary reference to “Research Site #1”
  overview information, map, forcing data, hydrological instrumentation, hydrometric/cryospheric measurements, hydrological modelling data
- Stations (within Sites) [Station_v1.0.xml]
  lists of instruments, maintenance records, quality control, measurements, maps, etc.
- Models [Model_v1.0.xml]
  snow, hydrological, mass balance, etc. used at each catchment
- Asset records for equipment(especially UAVs [Asset_v1.0.xml]
- Indexes of the above catchment, site, station, model, asset, person, dataset, publication records related to COPE) [Index_v1.0.xml]
- Very easy to add new record templates (XML) for COPE if and when needed

COPE Landing Page: gwfnet.net/cope

GWF Net

Home | Master Index | Advanced Search | Map | Login | Tools | GeoNet

COPE (Common Observation Period Experiment) Project

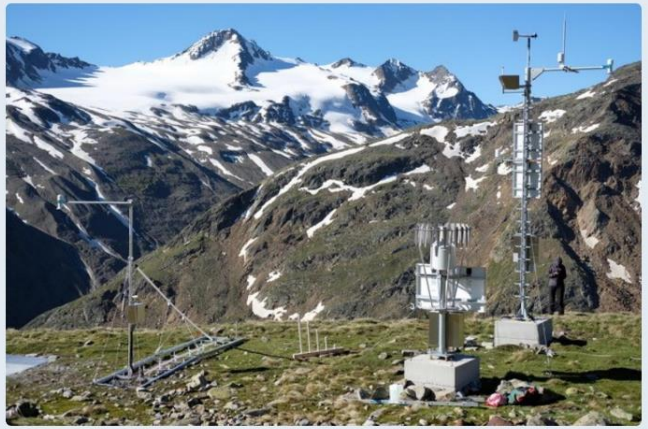
Page link

Related Information

- All Projects
- COPE Field Campaign Catchment Index
- COPE Models
- INARCH: The International Network for Alpine Research Catchment Hydrology Project

Project Information

Section 1: Project Information



Project Name

COPE: Common Observation Period Experiment

Classification (e.g., "GWF Pillar 3", "CCRN", etc.)

Project Websites

Please reference this page as:
https://gwfnet.net/cope

COPE:
https://inarch.usask.ca/science-basins/cope.php

Project Description

INARCH is conducting a Common Observing Period Experiment (COPE) across a network of research basins which started in 2022 to coincide with the start of the snow season in the southern hemisphere, and continuing on until 2024.

During this "COPE", there will be an international, coordinated effort to
- obtain high-quality measurements
- ensure that all sensors remain in working order,
- enhance observations at all participating mountain research basins,
- fly supplementary UAV acquisitions, and to
- run high resolution models and work together to compare processes, share data, and test the robustness of these models in challenging environments around the world.

Why have a COPE? This initiative provides an opportunity for inter-comparisons across the global network of INARCH research sites and basins.
While different climates prevail across the network of sites and each are subject to temporally and spatially varying conditions and extreme events, we need to coordinate our own efforts and response to some of the observations and data and also coordinate the modelling. We need to engage the modelling community to ensure we have comparable observations for model testing and evaluation. In some instances there are teleconnections that may occur and can be of interest to examine. Further, by getting these instruments into place and the campaign underway, this would be a start for longer-term observations of higher quality that can be comparable. Tremendous value can accrue from activities such as this and the approach has been used in the past with various GEWEX initiatives (e.g., in western Canada some basins have stayed instrumented over time since the late-1990s). The other aspects are in providing testbeds for instrumentation that some of us may be developing and allowing us to share information about the density of instrumentation and other things that may be useful as people work on basins.

Project Participants

Name	Role	Position Informa
John Pomeroy	Steering Committee	Univers Canada Dept. o Canada Resour Director Prograr Director Director Canmor John.pc
Ignacio López-Moreno	Steering Committee	Pyrenea Spain nlopez@
Ekaterina Rets	Steering Committee	Institute Academ river ba Russia retska@
Eric Sproles	Steering Committee	Montan United S Spatial resourc eric.spr
		Univers

		eric.spr
Ulrich Strasser	Steering Committee	Univers Austria ulrich.st
Lindsey Nicholson	Steering Committee	Univers Austria lindsey.
Rainer Prinz	Steering Committee	Univers Austria rainer.p
James McPhee	Steering Committee	Univers Chile jmcphee
Franziska Koch	Steering Committee	Univers Life Sci Austria franzisk
Vincent Vionnet	Steering Committee	Environ Canada Canada vincent.
Wouter Buytaert	Steering Committee	Imperial United K w.buyta
Ethan Gutmann	Steering Committee	Nationa Researc United S gutman
Dhiraj Pradhananga	Steering Committee	Univers Canada dhp355
Stephen O'Hearn	Coordination and support (Data)	Global I Canada stepher
Chris DeBeer	Coordination and support	Univers Canada chris.de

Current Status of this Project

- ○ Planned
- ◉ In Progress
- ○ Abandoned
- ○ Complete

Catalogued INARCH/COPE Data

gwfnet.net/cope

GWF Net

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COPE (Common Observation Period Experiment) Project

Page link

Related Information

All Projects

COPE Field Campaign Catchment Index

COPE Models

INARCH: The International Network for Alpine Research Catchment Hydrology Project

Project Information

Section 1: Project Information

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COPE Field Campaign Catchment Index

COPE (Common Observation Period Experiment) Project

COPE Catchment Map

Brewster Glacier, New Zealand (COPE)

Bridger Range, USA (Cope)

Dischma/Davos, Switzerland (COPE)

Djankuat Research Basin, Russia (COPE)

Estero Las Bayas, Chile (COPE)

Fortress Mountain, Canada (COPE)

Guadalfeo Basin, Spain (COPE)

Hengduan Mountain, China (COPE)

Hidden Valley Catchment, Nepal (COPE)

Izas Experimental Catchment, Spain (COPE)

⋮

Rheraya Catchment, Morrocco (COPE)

Rofental High Alpine Research Basin, Austria (COPE)

Salcca-Sibinacocha, Peru (COPE)

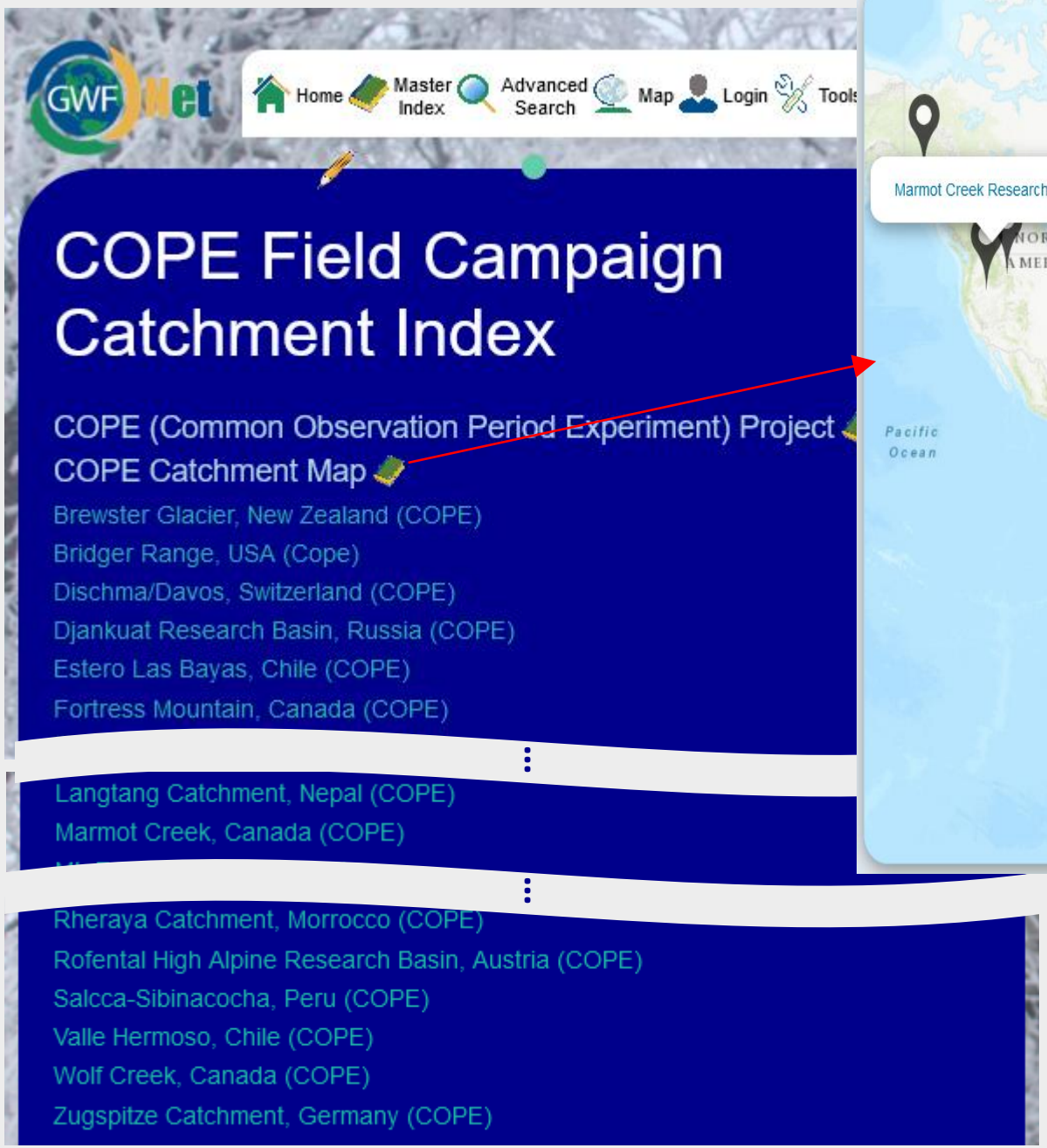
Valle Hermoso, Chile (COPE)

Wolf Creek, Canada (COPE)

Zugspitze Catchment, Germany (COPE)

Catalogued INARCH/COPE Data

Catalogued INARCH/COPE Data



Catalogued INARCH/COPE Data

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Marmot Creek, Canada (COPE)

Related Information

- COPE Field Campaign Catchment Index
- CRHM (Cold Regions Hydrological Model)
- Marmot Creek
- Marmot Research (COPE) Site #1

Catchment Information | Map of Catchment and Site Location(s)

Section 1: Catchment Information

Catchment Name
Marmot Creek

Country
Canada

Mountain Range
Canadian Rockies

Primary Contacts

Name	Role	Institution, Country, and Contact Information
John Pomeroy	Primary Contact	

Catchment Location

Coordinate Format	Latitude	Longitude
Degrees Minutes Seconds	50° 57' 40.536" N	115° 11' 22.632" W
Decimal Degrees	50.96126	-115.18962

Elevation

Minimum	Maximum
1590 m a.s.l.	2829 m a.s.l.

Area
9.4 km²

Glaciarized Area (%)
0

Main Land Covers
Montane, subalpine, alpine

Lithology
Conglomerate, sandstones, shales, siltstones

Mean DJFM Temperature
-8.3°C (2325 m.a.s.l.), -7.3 °C (1845 m.a.s.l.), -5.6°C (1436 m.a.s.l.)

Mean DJFM Precipitation
279 mm (2325 m.a.s.l.), 147 mm (1845 m.a.s.l.), 107 mm (1436 m.a.s.l.)

Snow Characteristics
cold continental, deep

Additional Features of this Catchment

Feature	Value

Additional Information (notes, web addresses, etc.)
Marmot Creek Stations (links to real-time data):
Centennial Ridge: http://giws.usask.ca/cfh/Marmot/Nakiskachart.html
Fisera Ridge: http://giws.usask.ca/cfh/Marmot/Fiserachart.html
Hay Meadow: http://giws.usask.ca/cfh/Marmot/HayMeadowchart.html
Upper Clearing: http://giws.usask.ca/cfh/Marmot/UpperClearingchart.html
Vista View: http://giws.usask.ca/cfh/Marmot/VistaViewchart.html

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- Marmot Creek, Vista View Station (THIS RECORD BEING EDITED)

Site Overview | Map | Forcing Data | Hydrological Instrumentation | Hydrometric/Cryospheric Measurements | Hydrological Modelling Data

Section 3: Forcing Data

Standard Forcing Variables

Forcing Variable	Instrumentation Description	Temporal Resolution
T	Vaisala	
RH	Vaisala	
K in	Kipp&Zonen, Apogee CS300-L, Li-cor LI200s	
K out	Kipp&Zonen, Apogee CS300-L, Li-cor LI200s	
L in	Kipp&Zonen	
L out	Kipp&Zonen	
Net Radiometer	Kipp&Zonen	
Wind Speed	RM Young 05305-10, RM Young 05105-10, Met One 50.5, 3-cup anemometer	
Wind Direction	RM Young 05305-10, RM Young 05105-10, Met One 50.5	
Precipitation	Geonor T200B gauge with alter shield, Texas TE525M rain gauge, Hydrological Services TB4 tippring bucket rain gauge	

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Site Overview | Map | Forcing Data | Hydrological Instrumentation | Hydrometric/Cryospheric Measurements | Hydrological Modelling Data

Section 4: Hydrological Instrumentation

Standard Hydrological Instrumentation (including sensor name and model)

Hydrological Variable	Instrumentation Description	Temporal Resolution
Water Level	Solinst Levelogger	
Discharge Method	Basin discharge -1962 to 19 June 2013 measured by Water Survey of Canada at V-notch gauge (05BF016); -from 26 June 2013 to current, basin discharge	
Water Temperature	Solinst Levelogger	
Isotope Types (e.g., O18, D, T)		
Water Conductivity		
Turbidity		
Sediment Load (Gravels)		
Water Sampling Hydrogeochemistry (Elements)		
Groundwater Level	Yes, Groundwater Observation Well Network from Alberta Environment and Parks	
Soil Moisture	Yes, CS615 and CS616 soil moisture probes	

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Site Overview | Map | Forcing Data | Hydrological Instrumentation | Hydrometric/Cryospheric Measurements | Hydrological Modelling Data

Section 5: Hydrometric/Cryospheric Measurements

Standard Hydrometric/Cryospheric Measurements

Hydrometric/Cryospheric Variable	Measurement Description	Temporal Resolution
Terrestrial Laser Scanner	Yes, at a forest clearing for 2013-2014 field season	N/A
UAV Sensors	2019 operations in past near Upper Clearing (additional permitting challenges limits flexibility)	N/A
Snow Surveys	Yes, several manual snow survey transects located in and above alpine treeline, in subalpine forest, forest clearings, and valley bottom	N/A
Time-lapse Photographs	Yes	
SWE Instruments, Pillows	Sommer Snow Pack Analyzer (SPA)	every 15 minutes
Snow Depth	CS SR50	every 15 minutes
Soil Temperature	CS 107 thermistor, Type K Thermocouple, Stevens HydraProbe	
Surface Temperature	IRTC homemade sensor	
Eddy Covariance	No	
Ice Elevation	N/A	N/A
Debris-Covered Ice Elevation	N/A	N/A

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Section 6: Hydrological Modelling Data

Vegetation Map
Forest cover type map from Alberta Forest Service (1963), SPOT5 (July 2007)

Soil Map
No

Soil Depth Information
Yes

Digital Elevation Map (and Spatial Resolution)
Yes, 1 m Lidar and 8 m resampled Lidar

Additional Modelling Information

Catalogued INARCH/COPE Data

Marmot Research (COPE) Site #1

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Soil Map

No

Soil Depth Information

Yes

Digital Elevation Map (and Spatial Resolution)

Yes, 1 m Lidar and 8 m resampled Lidar

Additional Modelling Information

Marmot Creek, Centennial Ridge Station

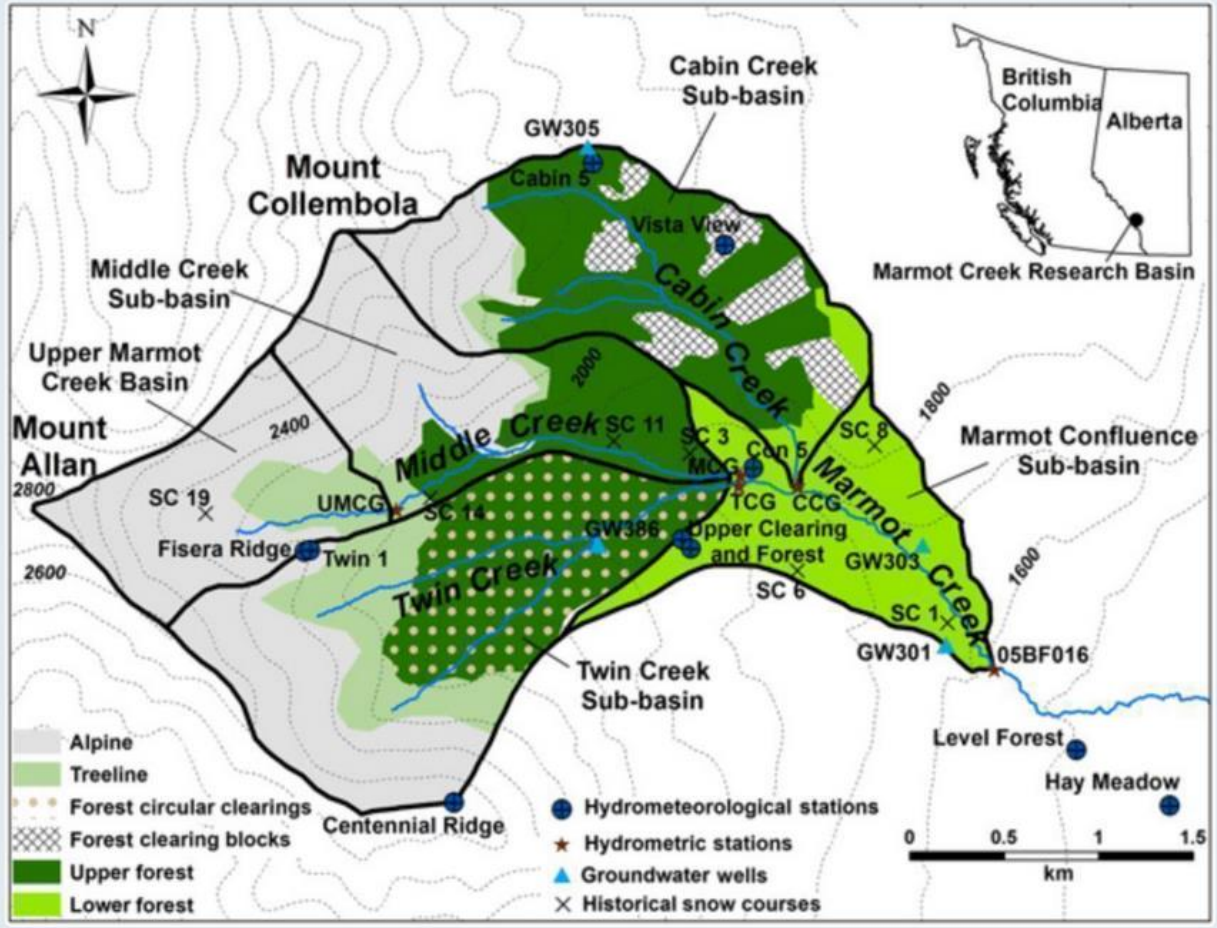
Page link

Related Information

- Stations
- Marmot Creek
- Marmot Research (COPE) Site #1

Station Metadata | Quality Control | Instrument Measurements | Station Maintenance | Map | Additional Information

Section 1: Station Metadata



Observatory Station Summary

Catalogued INARCH/COPE Data

Marmot Research (COPE) Site #1

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Forest cover type map from Alberta Forest Service (1963), SPOT5 (July 2007)

Soil Map

No

Soil Depth Information

Yes

Digital Elevation Map (and Spatial Resolution)

Yes, 1 m Lidar and 8 m resampled Lidar

Additional Modelling Information

Marmot Creek, Centennial Ridge Station

Page link

Related Information

Stations

Marmot Creek

Marmot Research (COPE) Site #1

Station Metadata | Quality Control | Instrument Measurements | Station Maintenance | Map | Additional Information

Observatory Station Summary

Station Name	Centennial Ridge
Location	Marmot Creek, Kananaskis, Alberta
GPS Coordinates	UTM 11 626894E; 5645229N long: -115.1937° lat: 50.9447°
Elevation	2470 m
Data Logger	CR1000 (SN:63333)
Program Name	Centennial115G01
Installation Date	July 23rd, 2005
Power	120Ah battery with 30W solar panel
Telemetry	RF401
Miscellany	

Detailed Metadata

Instrument	Manufacturer	Variable	Variable Name
HMP45C212	Vaisala	Air Temperature	HMP45C212T
		RH	HMP45C212RH
		RH	RHcorrected
05105-10 Wind Monitor	RM Young	Wind Speed	WindSpeed
		Wind Direction	WindDir
TE525M	Texas Instruments	Rainfall	Rainfall
SR50A Sonic Ranger	Campbell Scientific	Snow Depth	SnowDepth
		Signal Quality	SignalQuality
107B	Campbell Scientific	Soil Temperature	SoilT5
			SoilT15

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Soil Map
No

Soil Depth Information
Yes

Digital Elevation Map (and Spatial Resolution)
Yes, 1 m Lidar and 8 m resampled Lidar

Additional Modelling Information

Marmot Creek, Centennial Ridge Station

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Station Metadata | Quality Control | Instrument Measurements | Station Maintenance | Map | Additional Information

Section 2: Quality Control

Date Updated
2020-04-20

Is QC in Effect?
- (•) Yes
- ( ) Yes (but see Notes for exceptions)
- ( ) No

Quality Control Parameter Table

Parameter	Data Logger Actions	MatLab QC Actions	Further Actions R
Air Temp			
RH Corrected	corrected for air temp < 0. if RH > 100 then RH=0		
Incoming SW			
Outgoing SW			
Snow Depth	corrected for air temp		
Windspeed			
Wind Direction			
Rainfall			
Soil temp 15			
Soil Temp 5			
Pressure	adjusted to sea level		

Notes

Catalogued INARCH/COPE Data

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- Marmot Creek, Hay Meadow Station (THIS RECORD BEING EDITED)
- Marmot Creek, Upper Clearing Station (THIS RECORD BEING EDITED)
- Marmot Creek, Vista View Station (THIS RECORD BEING EDITED)

Site Overview | Map | Forcing Data | Hydrological Instrumentation | Hydrometric/Cryospheric Measurements | Hydrological Modelling Data

Section 6: Hydrological Modelling Data

Vegetation Map

Forest cover type map from Alberta Forest Service (1963), SPOT5 (July 2007)

Soil Map

No

Soil Depth Information

Yes

Digital Elevation Map (and Spatial Resolution)

Yes, 1 m Lidar and 8 m resampled Lidar

Additional Modelling Information

Marmot Creek, Centennial Ridge Station

Page link

Related Information

- Stations
- Marmot Creek
- Marmot Research (COPE) Site #1

Station Metadata | Quality Control | Instrument Measurements | Station Maintenance | Map | Additional Information

Section 3: Instrument Measurements

Measurement Table

Instrument	Variable	Measurement Type	Frequency
HC2-S3	HMP45C212T	Average	15 min
	HMP45C212RH	Average	15 min
	RHcorrected	Average	15 min
05305-10	WindSpeed	WindVector	15 min
	WindDir	WindVector	15 min
	WindDir_StDev	WindVector	15 min
SR50A	SnowDepth	Average	15 min
	SignalQuality	Average	15 min
LI200S	Swin	Average	15 min
	Swout	Average	15 min
TE525M	Rainfall	Totalize	15 min
107B	SoilT5	Average	15 min
	SoilT15		15 min
CS106	Pressure	Sample	15 min
Battery	BattVolt	Maximum	Daily
		Minimum	Daily
Logger	Ptemp	Maximum	Daily
		Minimum	Daily
HC2-S3	HMP45C212T	Average	Daily
	HMP45C212T	Maximum	Daily

Catalogued INARCH/COPE Data

Marmot Research (COPE) Site #1

Related Information

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Section 6: Hydrological Modelling Data

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Soil Map

No

Soil Depth Information

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Digital Elevation Map (and Spatial Resolution)

Yes, 1 m Lidar and 8 m resampled Lidar

Additional Modelling Information

Marmot Creek, Centennial Ridge Station

Page link

Related Information

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- Marmot Creek
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Station Metadata | Quality Control | Instrument Measurements | Station Maintenance | Map | Additional Information

Section 4: Station Maintenance

Install Date

July 23rd, 2005

Installer

Mike Solohub

Original Installation

Instrument	Height	Notes
107 B Soil Temperature	5 cm and 15 cm below surface	
NRG wind direction	223 cm	
NRG wind speed	223 cm	
SR50	127.4 cm	
LI200S (Incoming)	155.7 cm	
LI200S (Outgoing)	144 cm	
TB4	65 cm	
HMP35C	224 cm	
Particle Detector	82.5 cm	

Station Maintenance and Changes

Date	Maintenance Performed	Old Serial Number	New Serial Numbe
2019-11-18	Coordinates - Updated according to Xing Fang's corrections		
08-Aug-18	Update CR1000 OS and Cell Modem TBD date of completion		
08-Aug-18	Replaced TE525M tipping bucket that was lost by wind with new TB4	13273-394	118-257
01-Feb-17	Replaced broken RM Young with new unit		
04 2014	CR10X out - CR1000 In		
Jul 3rd, 2013	SR45 Out - SR50A In		
Aug 19th, 2010	HMP35C out - HMP45C212 In		
2008/2009	CR21 out - CR10X In		
2008/2009	CR21 out - CR10X In		

Catalogued INARCH/COPE Data

Marmot Research (COPE) Site #1

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Section 6: Hydrological Modelling Data

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Soil Map

No

Soil Depth Information

Yes

Digital Elevation Map (and Spatial Resolution)

Yes, 1 m Lidar and 8 m resampled Lidar

Additional Modelling Information

Marmot Creek, Centennial Ridge Station

Page link

Related Information

- Stations
- Marmot Creek
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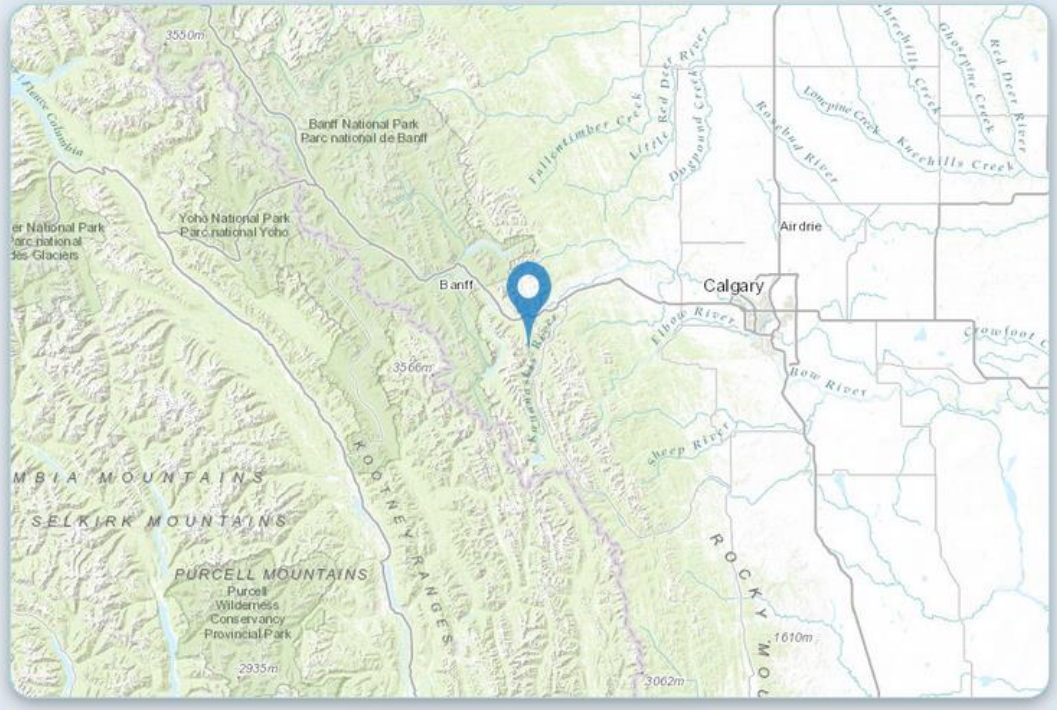
Station Metadata | Quality Control | Instrument Measurements | Station Maintenance | Map | Additional Information

Section 5: Map

Station Location



Toggle Interactive

- | +

Center | Reset

Display | Topo (ArcGIS

View on Global Map

Catalogued INARCH/COPE Data

Marmot Research (COPE) Site #1

Related Information

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Section 6: Hydrological Modelling Data

Vegetation Map

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Soil Map

No

Soil Depth Information

Yes

Digital Elevation Map (and Spatial Resolution)

Yes, 1 m Lidar and 8 m resampled Lidar

Additional Modelling Information

Marmot Creek, Centennial Ridge Station

Page link

Related Information

- Stations
- Marmot Creek
- Marmot Research (COPE) Site #1

Station Metadata | Quality Control | Instrument Measurements | Station Maintenance | Map | Additional Information

Section 6: Additional Information

Additional Information (notes, web addresses, etc.)

Real-time data:
http://giws.usask.ca/cfh/Marmot/Nakiskachart.html

Catalogued INARCH/COPE Data

Marmot Research (COPE) Site #1

Page link

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Soil Map

No

Soil Depth Information

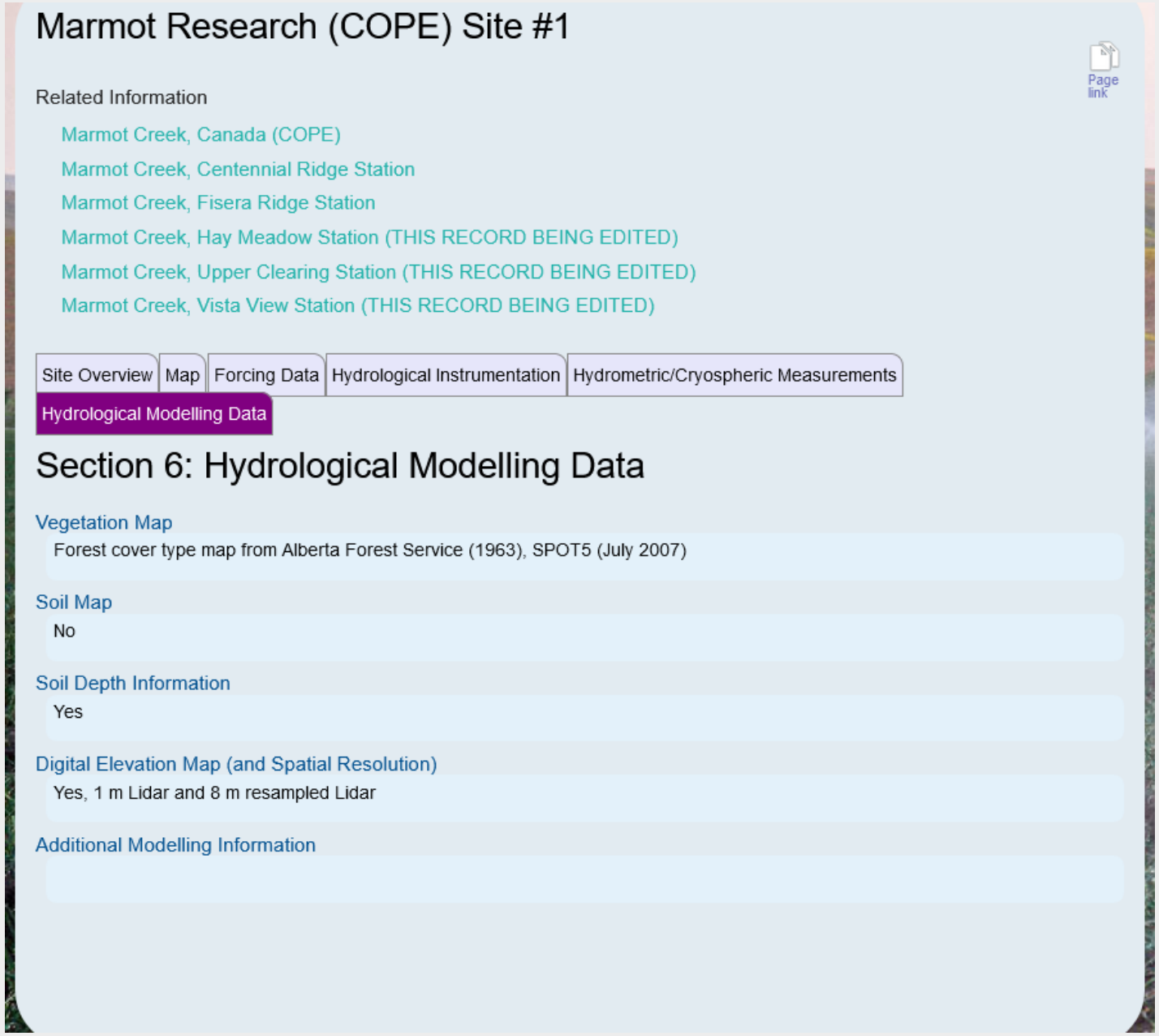
Yes

Digital Elevation Map (and Spatial Resolution)

Yes, 1 m Lidar and 8 m resampled Lidar

Additional Modelling Information

Catalogued INARCH/COPE Data



Marmot Research (COPE) Site #1

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Section 6: Hydrological Modelling Data

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Soil Map

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Soil Depth Information

Yes

Digital Elevation Map (and Spatial Resolution)

Yes, 1 m Lidar and 8 m resampled Lidar

Additional Modelling Information

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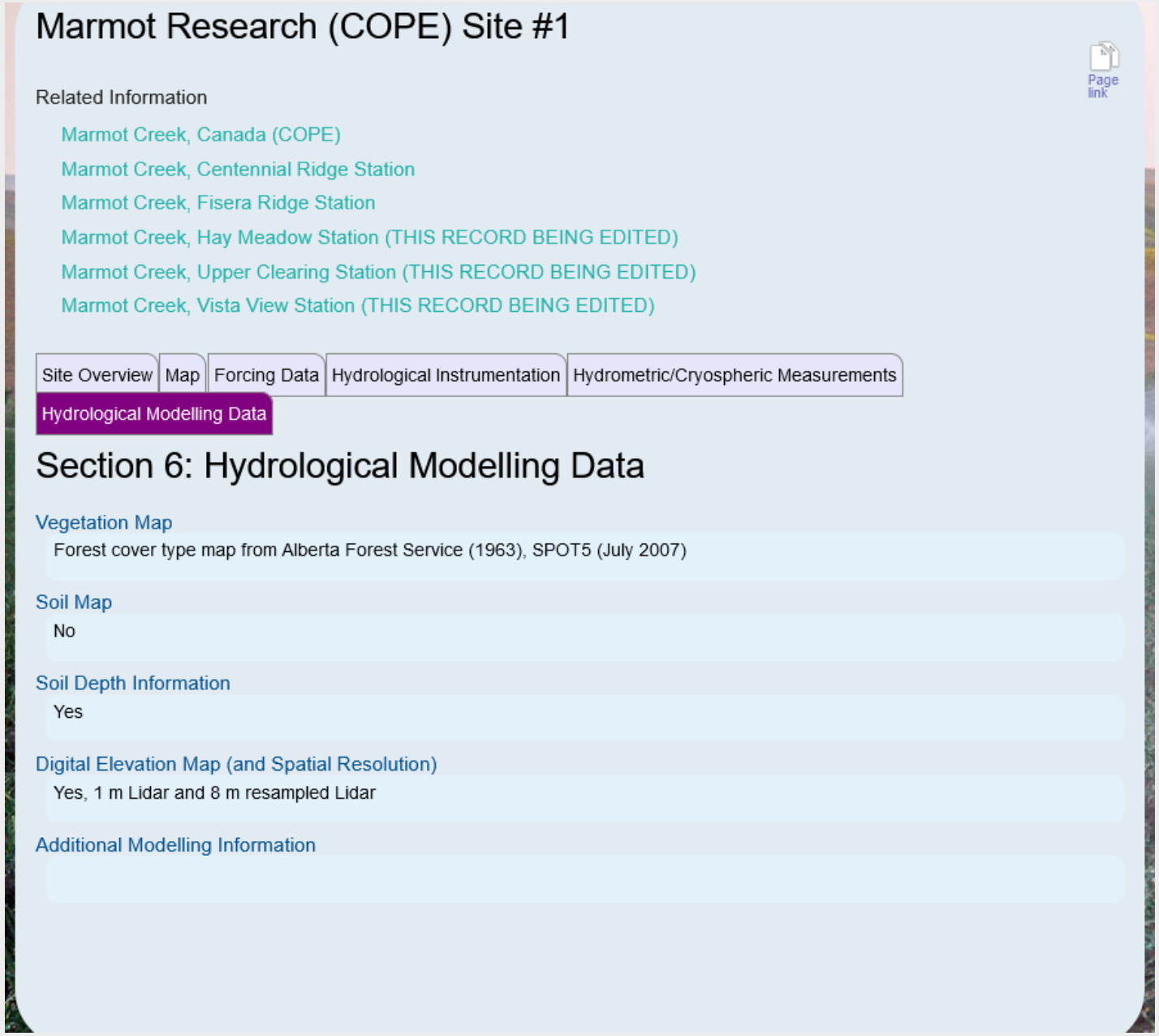

Marmot Research (COPE) Site #1

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Site Overview | Map | Forcing Data | Hydrological Instrumentation | Hydrometric/Cryospheric Measurements | Hydrological Modelling Data

Section 6: Hydrological Modelling Data

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Forest cover type map from Alberta Forest Service (1963), SPOT5 (July 2007)

Soil Map

No

Soil Depth Information

Yes

Digital Elevation Map (and Spatial Resolution)

Yes, 1 m Lidar and 8 m resampled Lidar

Additional Modelling Information

Catalogued INARCH/COPE Data

GWF Net | Home | Master Index | Advanced Search | Map | Login | Tools | GeoNet

Marmot Creek, Canada (COPE)

Page link

Related Information

- COPE Field Campaign Catchment Index
- CRHM (Cold Regions Hydrological Model)
- Marmot Creek
- Marmot Research (COPE) Site #1

Catchment Information | Map of Catchment and Site Location(s)

Section 1: Catchment Information

Catchment Name
Marmot Creek

Country
Canada

Mountain Range
Canadian Rockies

Marmot Research (COPE) Site #1

Page link

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Section 6: Hydrological Modelling Data

Vegetation Map
Forest cover type map from Alberta Forest Service (1963), SPOT5 (July 2007)

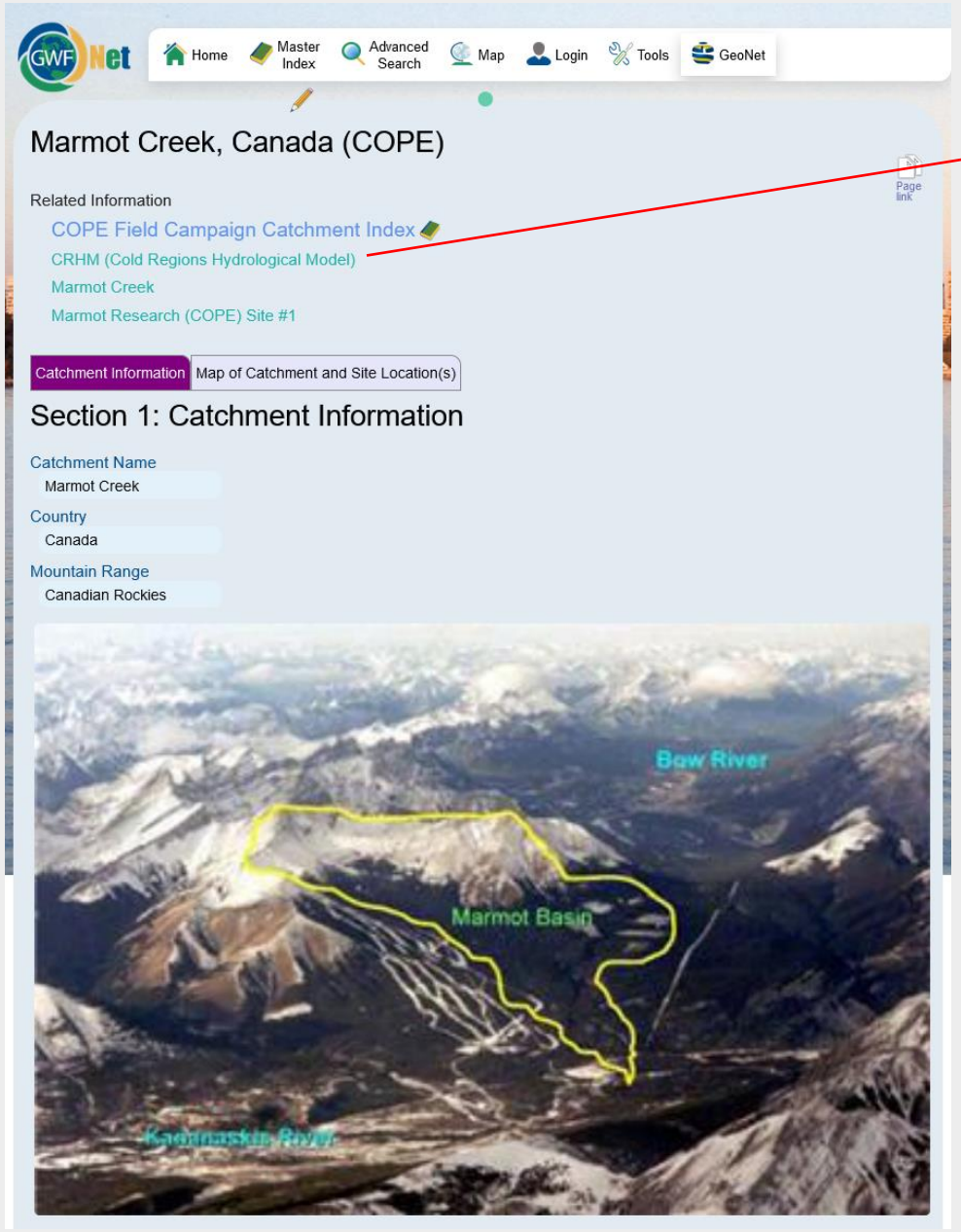
Soil Map
No

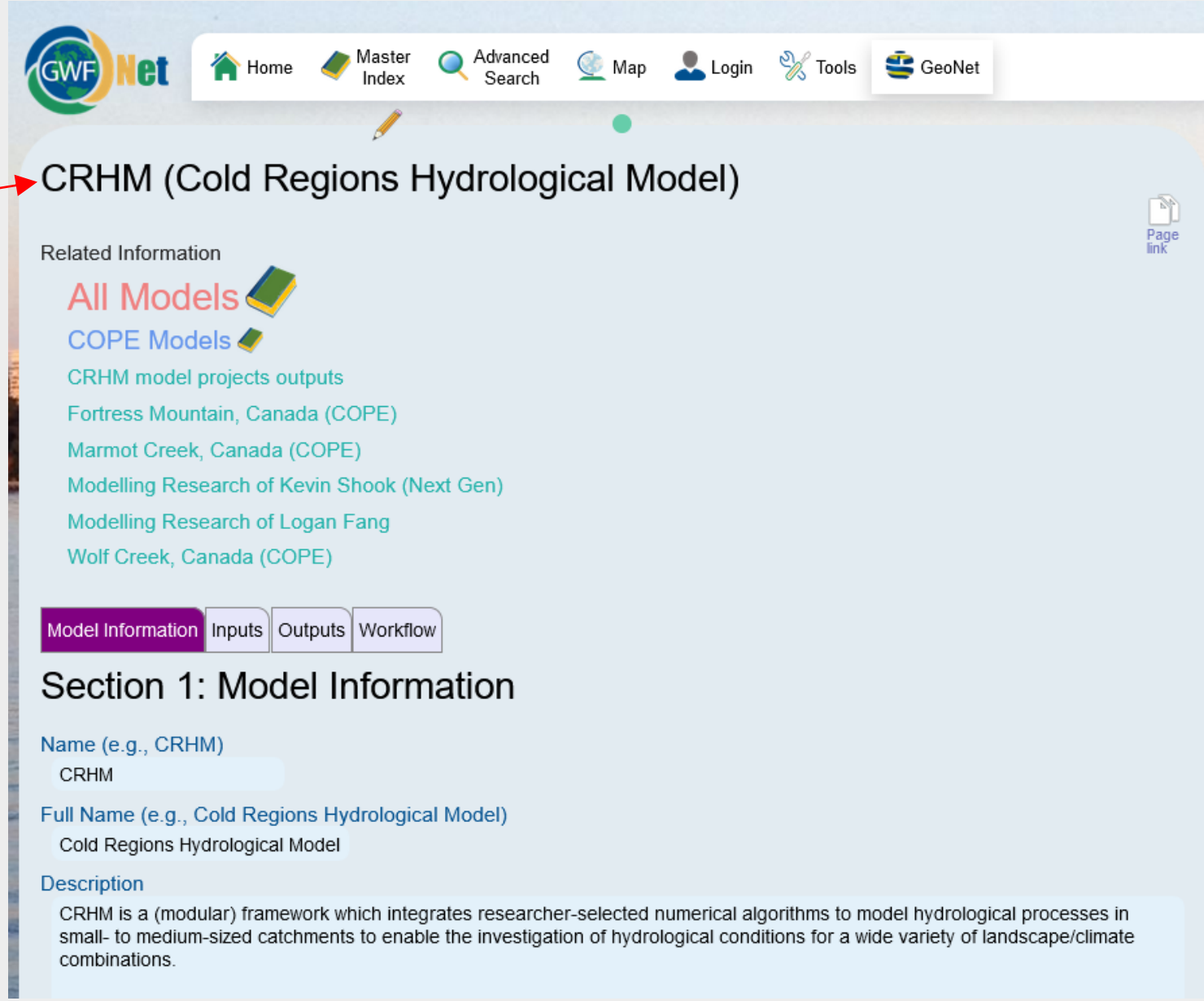
Soil Depth Information
Yes

Digital Elevation Map (and Spatial Resolution)
Yes, 1 m Lidar and 8 m resampled Lidar

Additional Modelling Information

Catalogued INARCH/COPE Data





Catalogued INARCH/COPE Data

Model Information | Inputs | Outputs | Workflow

Section 1: Model Information

Name (e.g., CRHM)

CRHM

Full Name (e.g., Cold Regions Hydrological Model)

Cold Regions Hydrological Model

Description

CRHM is a (modular) framework which integrates researcher-selected numerical algorithms to model hydrological processes in small- to medium-sized catchments to enable the investigation of hydrological conditions for a wide variety of landscape/climate combinations.

Processes modelled may include:
- blowing snow redistribution
- snow and rain interception by forest canopies
- sublimation
- snowmelt in open and forested environments
- infiltration into frozen and unfrozen soils
- soil moisture storage and movement
- water movement along hillslopes (with and without permafrost)
- actual evaporation and evapotranspiration
- radiation exchange on complex surfaces and through vegetation
- wetland dynamics
- variable contributing area
- groundwater flow
- streamflow hydraulics
- gravitational snow transport
- glacier melt

CRHM incorporates information about distinct landscape elements called Hydrological Response Units (HRUs). HRUs can be linked in process-specific sequences such as blowing snow, overland flow, organic layer subsurface flow, mineral interflow, groundwater flow, and streamflow.

More information about the system is included in C.R. Ellis, J.W. Pomeroy, T. Brown, and J. MacDonald 2010: Simulation of snow accumulation and melt in needleleaf forest environments Hydrology and Earth System Sciences 14: pp. 925–940.
https://research-groups.usask.ca/hydrology/documents/downloads/Ellis_etal_2010_HESS.pdf

Technical Details:
https://research-groups.usask.ca/hydrology/modelling/crhm.php#TechnicalDetails

Other links:
https://www.doi.org/10.1002/hyp.6787
https://research-groups.usask.ca/hydrology/modelling/crhm_manual_march_15_2013.pdf (CRHM Manual PDF)

Institution

University of Saskatchewan

Purpose

Models an investigator-selected variety of hydrological processes (see list in Description) in small- to medium-sized catchments.

Contact Persons

Name	Role	Contact Information
John Pomeroy	Main Investigator	john.pomeroy@usask.ca
Logan (Xing) Fang	Model Development	xing.fang@usask.ca

Catalogued INARCH/COPE Data

Model Information | Inputs | Outputs | Workflow

Section 2: Inputs

Minimum Input Data

Input Data	Units (if specific or preferred)	Additional Information
Temperature		
Relative Humidity		
Shortwave Radiation In		When unavailable, model can estimate it
Wind Speed		
Precipitation		

Optimal Input Data (additional to above minimal input data)

Additional Input Data	Units (if specific or preferred)	Additional Information

Calibration Data

No formal calibration

Validation Data

SWE, snow depth, albedo, glacier ablation stakes, soil moisture, and streamflow

Catalogued INARCH/COPE Data

Model Information | Inputs | Outputs | Workflow

Section 3: Outputs

Model Outputs

Outputs	Additional Information
Mass and energy fluxes for snowpack and glacier, water balance	

Processes Modelled

Processes	Additional Information
blowing snow redistribution	
snow and rain interception by forest canopies	
sublimation	
snowmelt in open and forested environments	
infiltration into frozen and unfrozen soils	
soil moisture storage and movement	
water movement along hillslopes (with and without permafrost)	
actual evaporation and evapotranspiration	
radiation exchange on complex surfaces and through vegetation	
wetland dynamics	
variable contributing area	
groundwater flow	
streamflow hydraulics	
gravitational snow transport	
glacier melt	

Spatial Resolution

HRU scale

Temporal Resolution

Sub-daily (ideally hourly)

Strengths and Limitations

-Station data are not readily available for all catchments
-Data may contain long gaps

External and Internal Tools

-R package (CRHMr) for filling data through interpolation
-R package (Reanalysis) for creating CRHM .obs files from gridded data

Source Code Availability

Module code and tools are publicly available (with examples)

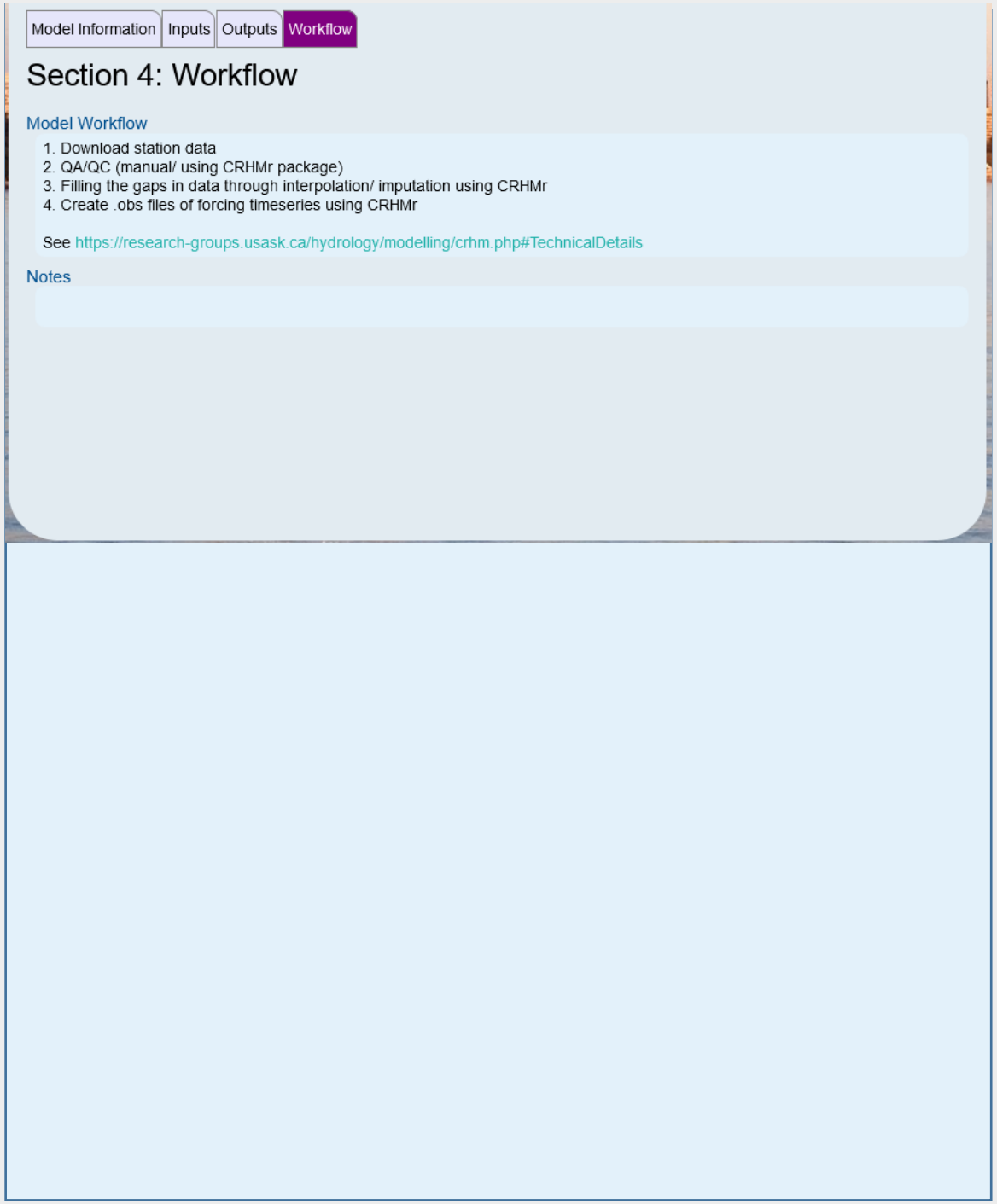
Data Sources

Station (ECCC, provincial, research site) and Reanalysis data

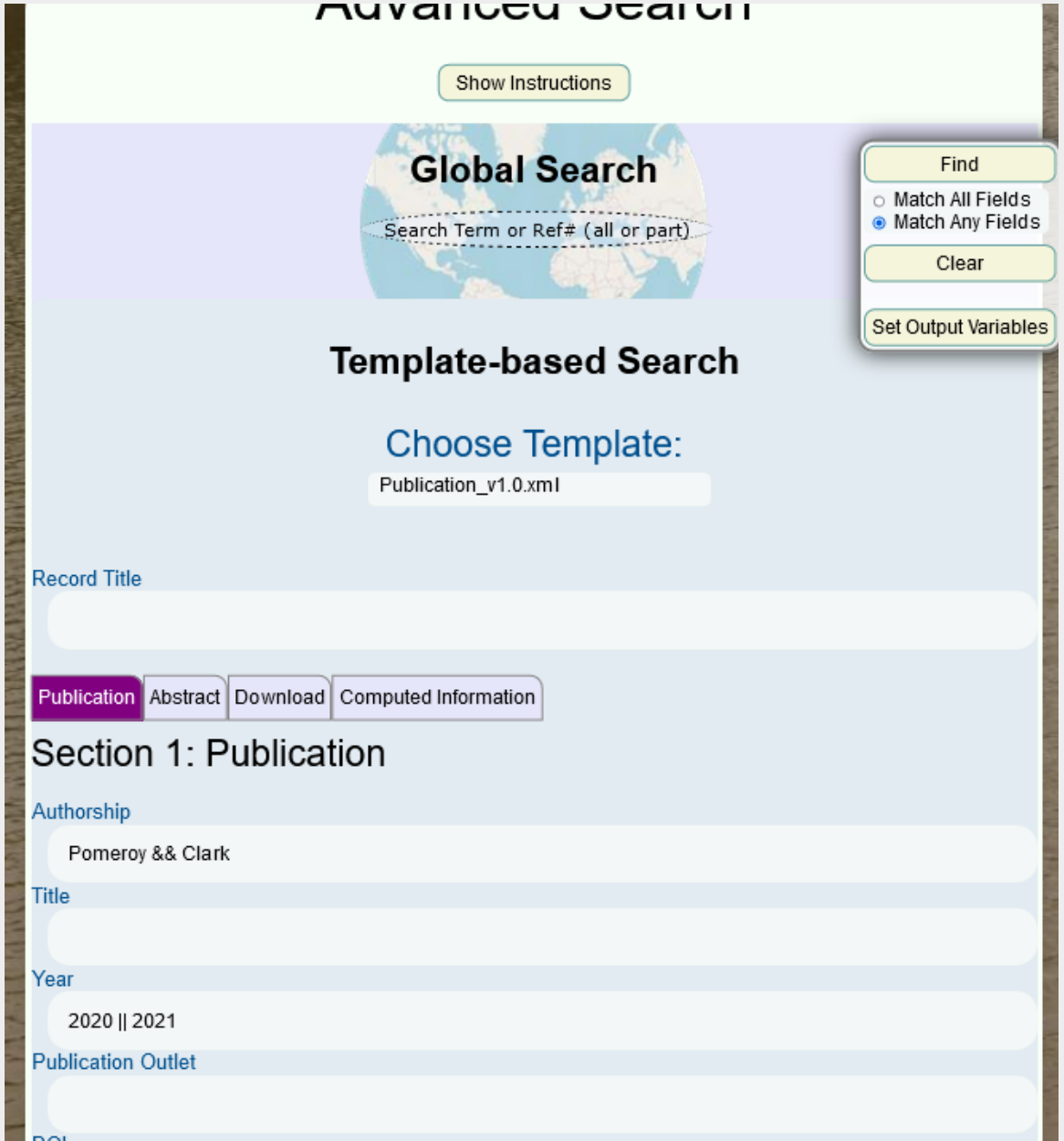
File Formats

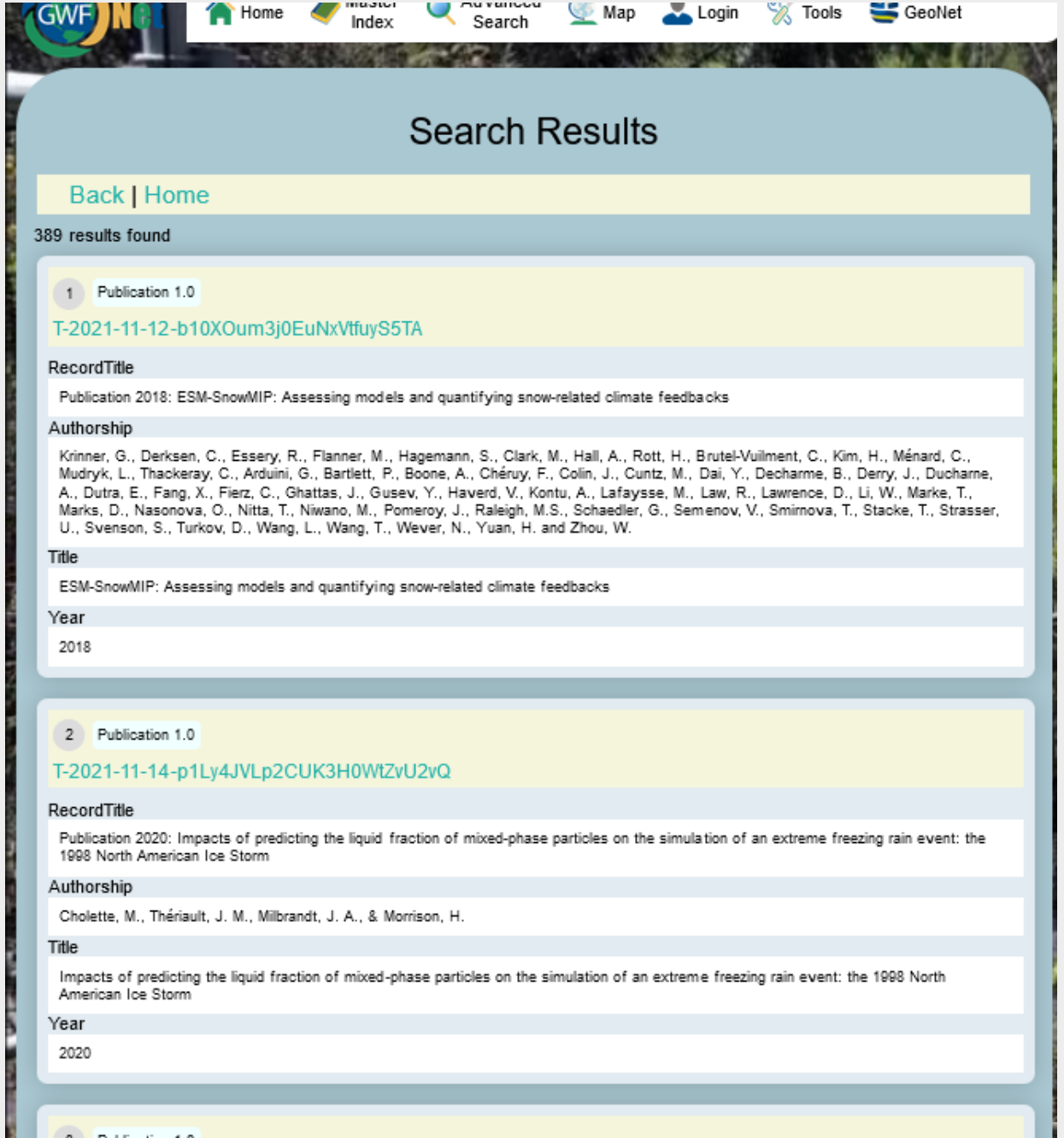
Timeseries stored in flat ASCII (.obs)

Catalogued INARCH/COPE Data



Advanced Search





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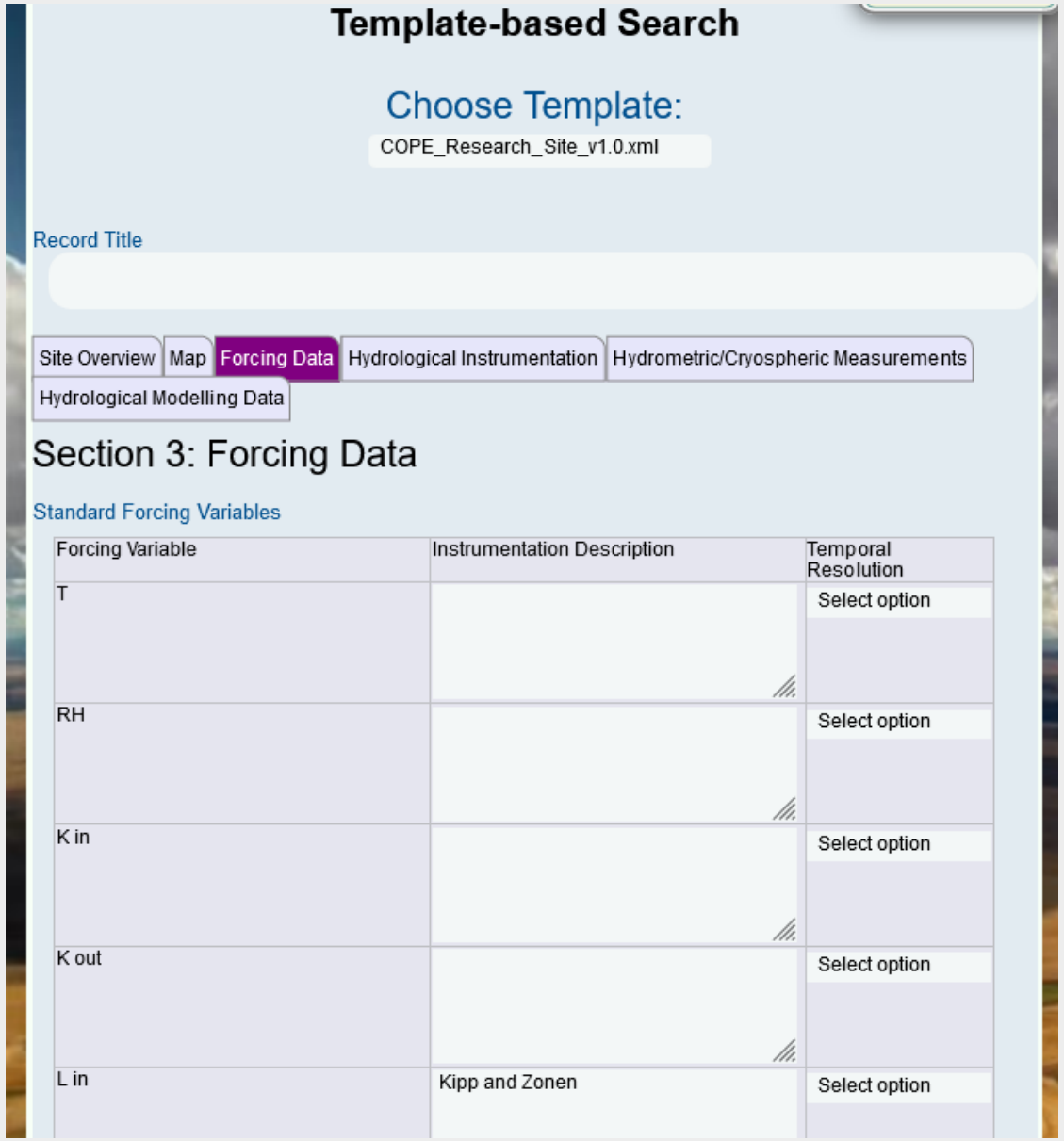
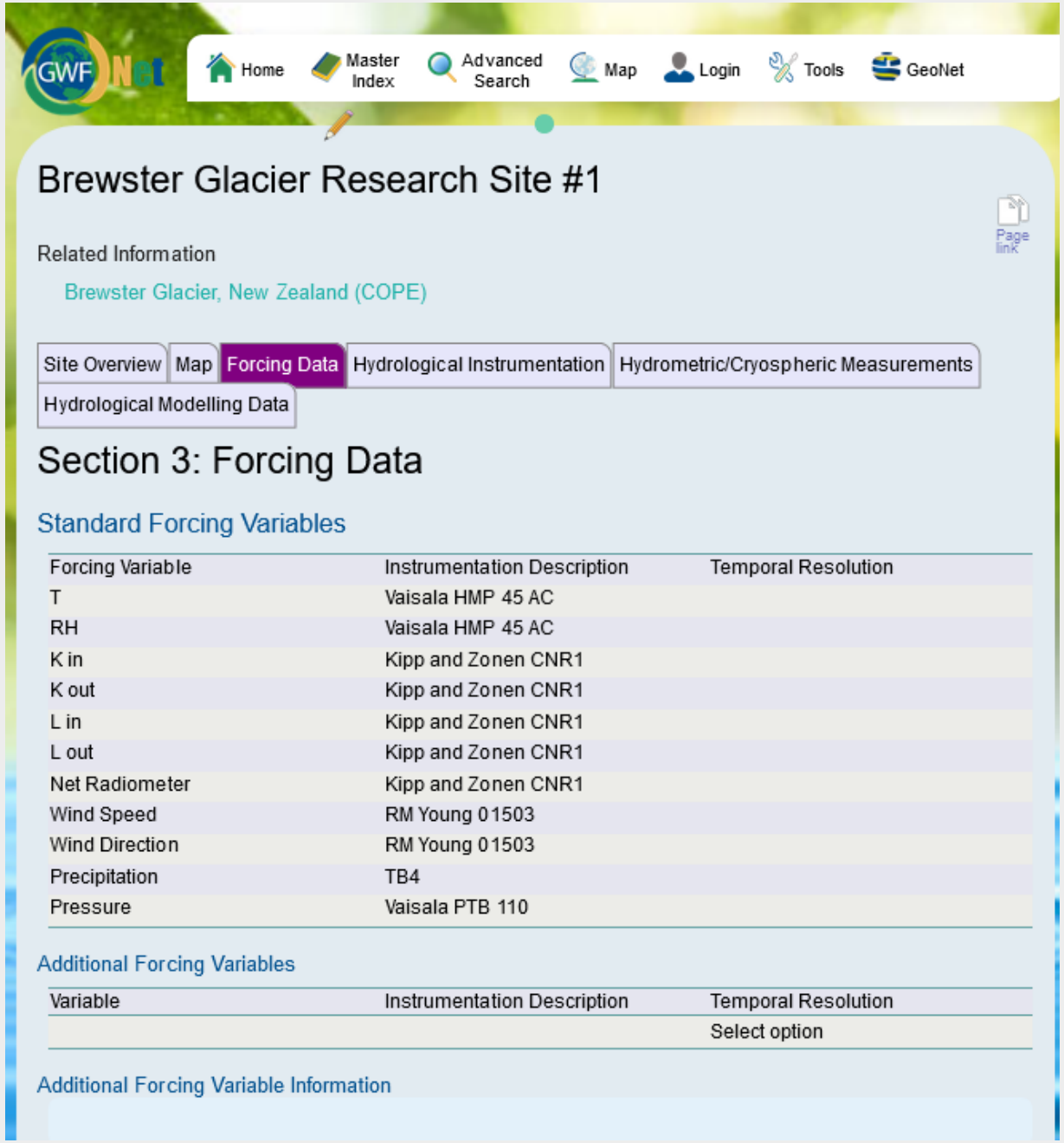
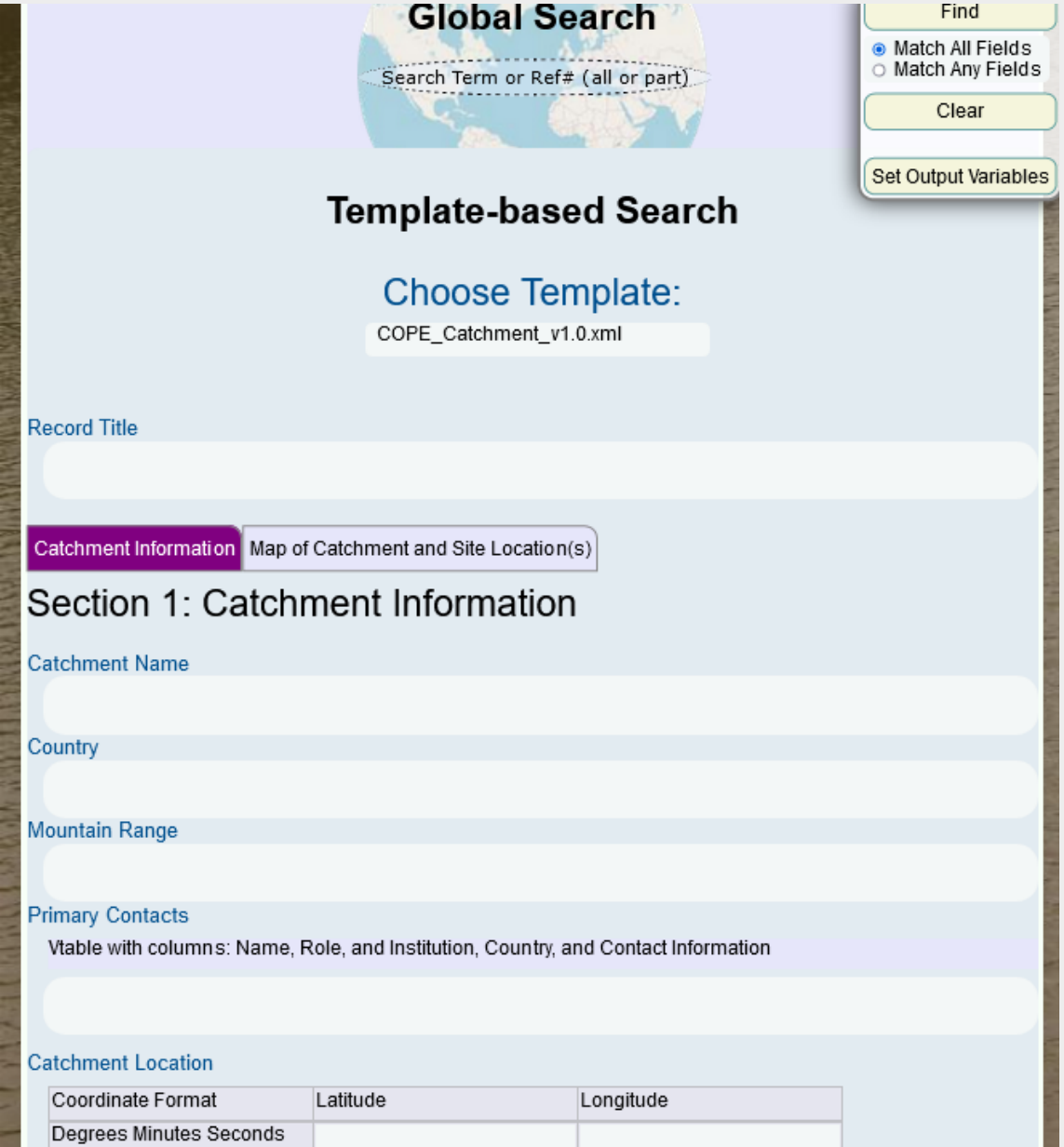




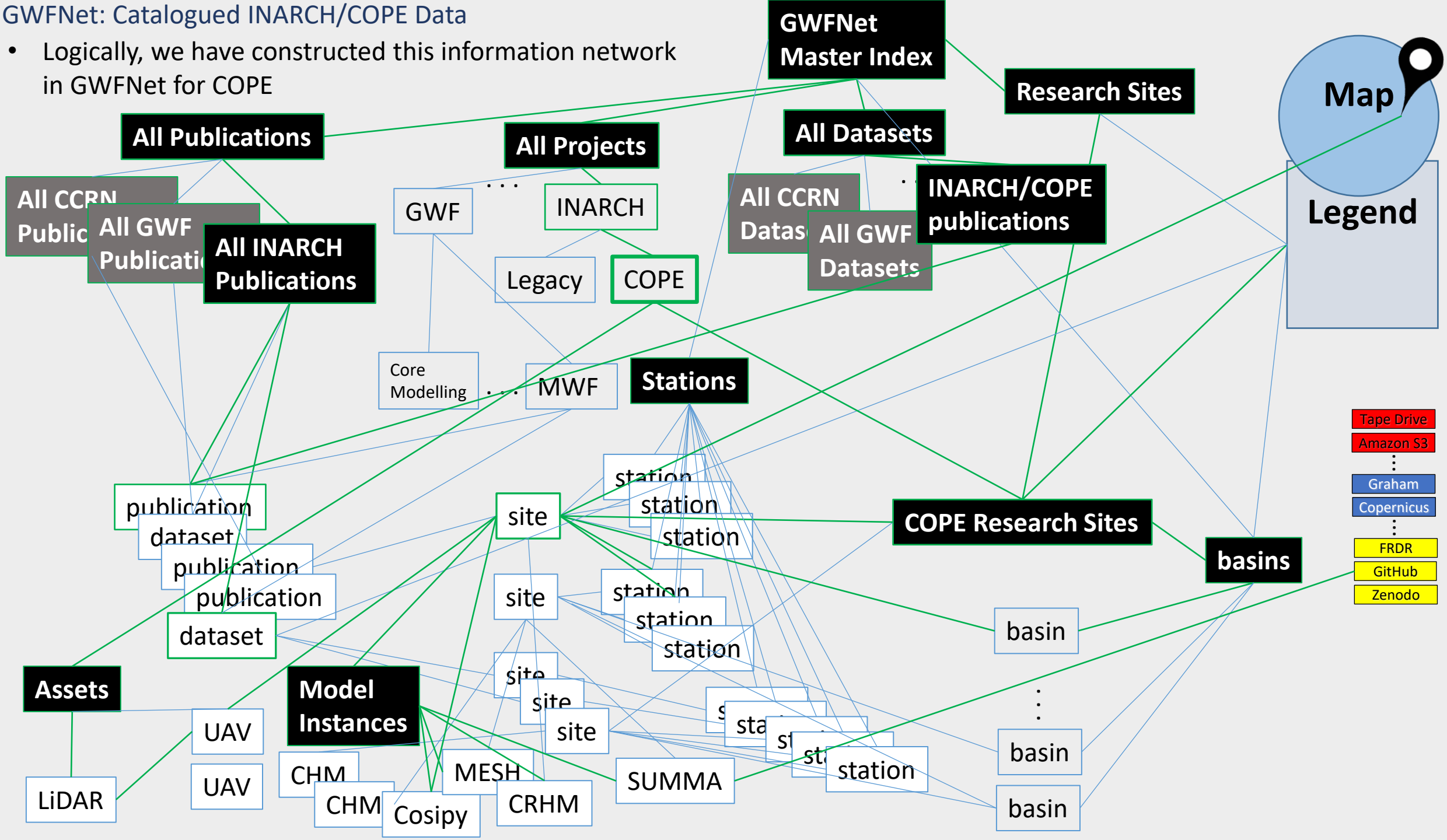
Advanced Search

- Select Template (e.g., Catchment) and immediately press Find -- gives list of all Catchment records!



GWFNet: Catalogued INARCH/COPE Data

- Logically, we have constructed this information network in GWFNet for COPE



Additional Information and Detail Requested

Additional Information and Detail Requested

- site names (even for just one site rather than site #1) and exact latitude and longitude locations
- station names and exact latitude and longitude locations
- detailed lists of instrumentation at each site and station
- measurement frequencies at stations
- download locations for:
  - vegetation maps
  - digital elevation maps
  - soil depth
  - snow survey data
  - anything else you find relevant

The End

Thank you!