**Juvenile Chinook Use of Seasonally Disconnected Habitats – Year 1**

Choosing Sites

*Making a Geodatabase*

* When receiving data (shapefiles, rasters, etc.) from collaborators or online resources put them in a folder called “Incoming Data” that is a subfolder of your project folder on File Explorer
  + Project (i.e., “Seasonally Disconnected Habitats”) > “GIS” > “Incoming Data”
* Open ArcGIS Pro and add data to your map for the project (.mxd project file)
  + You may need to create a folder connection to the “Incoming Data” folder
* They will show up in your contents panel on the left side of ArcGIS Pro
* Open the Catalog by going to the View tab and clicking “Catalog Pane”
* Go to your “GIS” subfolder within your project folder and right click then select New > New File Geodatabase
* Name the geodatabase something like “Seasonal\_Habitats\_Sites.gdb” or “REM\_Sites.gdb”
  + Think of the geodatabase as a filing cabinet and feature datasets as drawers
* If you want to organize the data in your dataset even more you can right click on your geodatabase > New > Feature Dataset
* Name your feature dataset something appropriate for the type of data that you will put in it (e.g., Seasonal\_Habitat\_Water for hydroline data or watershed boundaries)
  + You don’t need to make feature datasets but it may be helpful if you can organize data by categories
* Right click on each item in your catalog (other than basemaps) and select Data > Export Features
* Name the feature class something appropriate and select the geodatabase or feature dataset within that geodatabase as the Output Feature Class location and click “Run”
* It will me added to your map so you can delete the old duplicate which is sourced to the “Incoming Data” folder
  + This way everything in your map is sourced from the same geodatabase
  + Data is converted from a shapefile to a feature class within a geodatabase
    - Better for storage space and organization
* If someone wants a specific feature class from your map you can export it as a shapefile, zip the folder, and send it to them

*Classifying REM*

* Use the raster file “Middle\_Skagit\_REM\_2016.tif” created by Kate Ramsden who is the GIS Analyst at SRSC
  + Any GIS files that are being used for a specific project should go in a database made just for the project (i.e., “REM\_Sites.gdb”)
    - See “*Making a Geodatabase*”
  + The ArcGIS Pro file (i.e., “REM\_Site\_Personal.mxd”) cannot go in the geodatabase but should go in a subfolder with the geodatabase so if you want to send it to someone else you can zip the whole subfolder containing the geodatabase and .mxd
    - The .mxd contains symbology so if you want the symbology to stay the way that it is in your map you have to include the .mxd in the zipped folder
* Import into ArcGIS Pro

Text

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* It will look like a gradient of gray when you import it
* Right click on the file and click on “Symbology” > “Classify” (drop down menu)
* Click on the drop down menu “Method” and click “Manual Interval” then go into the table and manually change the values for the color breaks
  + You can also change the “Color Scheme” to whatever you want
    - If you wanted to change the actual values of the raster (i.e., 1, 2, 3 instead of -5.215011 – 0, 0.000001 – 0.5, 0.500001 – 1 then you would use the “Reclassify” tool in the Spatial Analyst Toolbox
* The resulting change in symbology will allow you to see potential pinch points at site outlets
  + Use this raster file in conjunction with aerial imagery and hydroline shapefile

A picture containing bar chart

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*Selecting Outlets*

* Using the REM, aerial imagery, and hydroline shapefile find potential outlets of seasonally disconnected sites
* Create a new point feature class in your .mxd by opening the Catalog > Right click on the geodatabase that you made for the project (i.e., “REM\_Site.gdb”) > Create Feature Class
* Name the new feature class (i.e., “Placemarks\_Final\_WGS”) and then go through the six pages making sure that you select the feature type (point) and appropriate projection (WGS 1984)
  + If you want to calculate the latitude and longitude in decimal degrees the projection must be in WGS 1984
* Click on Edit > the feature class that you created (i.e., “Placemarks\_Final\_WGS”)
* Place points at site outlets and select the box with the green check mark when you’re done so that it is saved

A picture containing diagram

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*Calculating Latitude and Longitude of a New Point Feature*

* Once points have been placed in the new feature class you can name and calculate the latitude and longitude in decimal degrees of each point
* After making any edits make sure to press the “Save” button in the Edits tab
  + You will not be able to add a field (i.e., “Name”) unless all edits have been saved

A picture containing graphical user interface

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* Add two new fields called Latitude and Longitude with a Data Type of “Text” and a Length of 50
  + Make sure to save once the new field has been created
* Right click on the field Latitude and click “Calculate Field” then enter Python code into the “Latitude =” box
  + !shape.extent.YMax!
* Right click on the field Longitude and click “Calculate Field” then enter Python code into the “Latitude =” box
  + !shape.extent.XMax!
    - There is an easier way to do this in ArcMap but this is the most straightforward way to do it in ArcGIS Pro

Graphical user interface, application

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Fieldwork – Reconnaissance

*Uploading Coordinates Onto GPS*

* Choose the feature class that you want to upload to the GPS in ArcGIS Pro and right click > Data > Export Features
* Choose the folder location for your shapefile to be created
  + Make sure that it is in a normal folder (i.e., “Seasonally Disconnected Habitats” > “GIS” > “Exported Shapefiles”)
    - It won’t be saved as a shapefile if it’s in a geodatabase
* Click Run and the new copy which is now sourced to the “Exported Shapefiles” folder will show up on the map
  + Go ahead and delete it because you want to keep the feature class that is sourced to the geodatabase
* Open DNRGPS and click File > Load From > File
  + Make sure ESRI Shapefile (2D) is the file type and select the shapefile that you just exported form ArcGIS Pro
* Choose the column that you want to be IDENT
  + This will be what shows up on the GPS in the field so choose that “Site Name” column
  + You can also edit columns in DNRGPS
* Upload to the GPS using GPS > Upload All

*Equipment*

* Dry suits with neoprene footies and boots
* Charged dive light, snorkel, hood
* Pontoon
* Pontoon oars and cross-bar
* Pontoon pump
* GPS with sites pre-loaded
  + Make sure it is the right GPS and there is enough battery life – if not replace batteries from battery/SD card box
* Survey temperature logger (white)
* Field laptop
* Shuttle for HOBO loggers
* Rangefinder
* Stadia rod
* YSI
* Distilled water (to calibrate YSI)
  + Put a small amount of distilled water in the YSI boot (but not so much that the probe is wet) and press “Calibrate” for DO%
  + The calibration should be somewhere near 100.00%
  + Accept calibration
* Swoffer (rod with propeller and box reader)
* Red clipboard with datasheets and Rite-in-Rain with logger metadata
  + Use a datasheet with site name “Boat Recon” with the date and just use WPT column to put the outlet identifier (e.g. J1, J2, C1, etc.)
  + Start a new data sheet if you end up doing an actual snorkel survey
* HOBO temperature pendants with PVC housing, wire, wire cutters
* Solinst water level logger with PVC gages with screw-on lids, string, metal clamp with screwdriver to tighten
* DO logger with PVC shield, boot, and cord
* Time-lapse camera with 6 lithium batteries (there’s an EJECT button on the inside that you push to open the battery compartment) and an SD card (under the screen) installed
* Time-lapse camera t-post mount
* Post pounder
* T-posts
* Phone/camera (have the coordinates settings on if your phone has that feature – makes it easier for me to find out where the pictures were taken)

*Protocols*

* Time-lapse camera installation
  + Set-up the camera
    - Switch to ON
    - Press the M button (this opens the setup window)
    - Enter date and time
    - Mode: Timelapse+
    - CaptureDelay: 60Min
    - PicSize: Low[4MP]
    - MultiShot: Off
    - CapStart: 12:00 AM
    - CapEnd: 12:00 AM
    - SmartIR: On
    - NightExp: PwrSave
    - TLFrequency: 60Min
    - TLPeriod: 1Hr
    - TempUnit: F
    - InfoStrip: On
    - SDManagement: Off
    - MotionDetect: Long
    - MotionTest: OK
    - Language: English
    - Name: SITE[e.g.AA]
      * Say you check out outlet C2 and place a time-lapse camera somewhere in that site you would name it SITEC
    - The rest of the settings just leave as is
    - If the screen falls asleep just push the M button to wake it up
  + Position time-lapse camera
    - Attach to the t-post mount
    - Find a spot so that facing the pinch point but tucked away if possible so tweakers won’t be enticed to steal it and pound in t-post
    - Get it positioned right using the screen to make sure the pinch point is in the frame (someone can stand in the pinch point to make sure it is framed well)
  + Document
    - Take a GPS point and note in the Rite-in-Rain (write down site and date) along with brief description
    - Take a picture or two
* Water level logger installation
  + Launch the Solinst logger with the logger shuttle in HOBOware on the field laptop
    - Make sure that it is recording in 15 minute intervals
    - Make sure that the delayed start time is for midnight on the day of installation
  + Pound in a t-post that is in a deep spot at the downstream end of the pond/pool holding water (ideally where we have seen fish nearby)
    - The idea is to put it in a spot that will still hold water when the site is disconnected in the summer
  + Write down the Solinst logger ID, the length of the string, the height of the water on the gauge once you have it clamped to the t-post, the date, time, waypoint, and description of location in Rite-in-Rain
    - Make sure to record the Solinst logger number, date, and time in the Rite-in-the-Rain when removing the level logger
  + Take a picture or two
* Temperature logger installation
  + Launch the temperature pendant with the logger shuttle in HOBOware on the field laptop
    - Make sure that it is recording in 15 minute intervals
    - Make sure that the delayed start time is for midnight on the day of installation
  + Put the temp logger in the PVC housing and feed wire through it, cut with wire cutters
  + Attach either to branch, stump, etc. or to the outside of the level logger
  + Write down pendant ID, the date, time, waypoint, and description of location in Rite-in-Rain
    - Make sure to record the pendant number, date, and time in the Rite-in-the-Rain when removing the temperature logger
  + Take a picture or two
* DO logger installation
  + Launch the DO logger with the logger shuttle in HOBOware on the field laptop
    - Make sure that it is recording in 15 minute intervals
    - Make sure that the delayed start time is for shortly before it will be put in the water
  + Take off the DO boot!
  + Make sure that the cord is fed through the PVC shield and the loop in the top of the logger and tie to a branch, stump, etc.
  + Write down logger ID (if there is more than one DO logger in rotation), the date, time, waypoint, and description of location in Rite-in-Rain
    - Make sure to record the date and time in the Rite-in-the-Rain when removing the DO logger to move to another site
  + Take a picture or two
  + When moving the DO logger readout with the logger shuttle in HOBOware on the field laptop and save the HOBO file as “Logger#\_Date\_DO” (e.g., “21060313\_07122021\_DO”) on a thumbdrive or on OSU laptop in the field then relaunch before putting back in water
    - Make sure to put the boot back on any time that it isn’t in water
* Snorkel survey
  + Launch the white survey temperature logger with the logger shuttle in HOBOware on the field laptop
    - Make sure that it is recording in 5 second intervals
    - Make sure that the delayed start time is before you will be starting the survey (preferably not too soon before because wastes storage on the GPS)
  + When ready to start the survey turn on tracking on the GPS
    - Main Menu > Setup > Tracks
      * Track Log: Record, Show On Map
      * Record Method: Time
      * Recording Interval: 00:00:05
        + Make sure that it is the same interval that the survey temperature logger is recording in (in this case 5 seconds)
  + When the tracklog is running and the temperature logger is in the water record survey start time on datasheet
  + At each location where you see fish record:
    - Waypoint
    - Fish quantity, species, and size class
    - Depth (m) using a stadia rod
    - Substrate (mm) by randomly grabbing whatever is at the tip of your boot
    - Distance to cover (yd) using a rangefinder
    - Temperature (°C) and DO (mg/L) with the YSI
    - Velocity (mps) using the swoffer
      * Will likely be 0 mps in seasonally disconnected habitats
  + Randomly take supplemental habitat condition points
    - Same measurements as above but just put a line through fish quantity, species, and size class columns
  + Take pictures when you can
  + Take any extra notes about site conditions, visibility, etc.
  + Record survey end time when the temperature pendant is out of the water and turn off GPS
  + Readout the white survey temperature logger with the logger shuttle in HOBOware on the field laptop and save the HOBO file as “Logger#\_Date\_SiteCode\_SiteName” (e.g., “21099530\_09212021\_AA\_James\_Brown\_Slough”) on a thumbdrive or on OSU laptop in the field
* At the end of each day take a picture of any datasheets or notes taken in Rite-in-the-Rain

Organizing Fieldwork Data

* After each week of fieldwork you will have some combination of the following:
  + Datasheets
  + HOBO files from survey temperature loggers
  + A GPS with tracklog and waypoint data
  + A Rite-in-the-Rain with timelapse camera and logger metadata
  + Pictures
  + Notes of site features and conditions
  + Logger and timelapse data (DO logger data periodically and timelapse, level logger, and temperature logger data at the end of the field season)
* Make a folder for each site as “SiteCode SiteName” (e.g., “AB McCleod Slough”)
  + Make a subfolder called “Notes”

*Datasheets*

Scanning and Entering Data into an Excel File

* Make a subfolder within “SiteCode SiteName” (e.g., “AB McCleod Slough”) for each snorkel survey as “MM-DD-YYYY (SurveyType)” (e.g., “4-14-2021 (Snorkel Survey)”) for sites that were surveyed
* Make a subfolder within “MM-DD-YYYY (SurveyType)” called “Datasheets”
* Scan datasheet(s) for the appropriate site and put in the “Datasheets” folder named as “SiteCode\_SiteName\_Date” (e.g., “AB\_McCleod\_Slough\_04142021”)
  + If a datasheet was used to take boat reconnaissance notes then scan datasheet(s) and put in a “Boat Recon” folder in the main “Data” folder named “Date\_Boat\_Recon” (e.g., “05122021\_Boat\_Recon”)
    - Boat recon has information for multiple sites so should not be in a specific site folder
    - This information can be put in the “Notes” word document for respective sites
* Make a folder called “Survey Data” in the main “Data” folder
* Make an Excel spreadsheet called “Seasonal\_Habitat\_Survey\_Data”
* Enter all survey data from the datasheets

Assigning Coordinates to Survey Waypoints

* Copy all of the waypoints from the project with their latitude and longitude from DNRGPS and paste them into an Excel spreadsheet called “Seasonal\_Habitat\_Survey\_Data\_Waypoints”
* If using more than one GPS unit (e.g., “Estuary” and “Floodplain”) that have overlapping WPT numbers, create a new column with the GPS Unit and WPT combined in Excel so that each is a unique identifier (“GPSUnitWPT”) for both the snorkel dataset (“Seasonal\_Habitat\_Survey\_Data”) and the waypoint with coordinates dataset (“Seasonal\_Habitat\_Survey\_Data\_Waypoints”)
  + =[GPS Unit cell]&[WPT cell]
  + =A2&B2
    - “Estuary” and “184” 🡪 “Estuary184”
* Open both the snorkel dataset (“Seasonal\_Habitat\_Survey\_Data”) and the waypoint with coordinates dataset (“Seasonal\_Habitat\_Survey\_Data\_Waypoints”)
* In the empty “Latitude” cell that you want to fill with a coordinate in the snorkel dataset use VLOOKUP()
  + =VLOOKUP([GPSUnitWPT cell in snorkel dataset],[range of cells including GPSUnitWPT, Latitude, and Longitude in the waypoint with coordinates dataset], column number within that range that corresponds to Latitude (i.e., 2)], FALSE)
  + Repeat this step with Longitude changing the second to last variable to 3
* Once you have finished, copy and paste the Latitude and Longitude columns as plain text and delete the GPSUnitWPT column to clean up the data

*Survey Temp Logger HOBO Files*

* HOBO files from survey temperature loggers will be saved as “Logger#\_Date\_SiteCode\_SiteName” (e.g., “21099530\_09212021\_AA\_James\_Brown\_Slough”) either on a thumb drive or on my OSU laptop in the field
* Copy and paste the HOBO file for each site into a subfolder of “MM-DD-YYYY (SurveyType)” (e.g., “4-14-2021 (Snorkel Survey)”) called “Survey Temp Logger”
* Open the HOBO file in HOBOware
* Click File > Export Table Data
* Click on the settings button A picture containing icon

  Description automatically generated and make sure that the “Include plot title in header” box is unchecked
* Also make sure that only the second “Temp” column is checked (the first one is the air temperature)

Table

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* Name the exported .csv file the same as the HOBO file
  + “Logger#\_Date\_SiteCode\_SiteName” (e.g., “21099530\_09212021\_AA\_James\_Brown\_Slough”)
* NOTE: It is crucial that these original .csv files are not manually manipulated and saved over in Excel. Any time that it is opened in Excel, even just to view the data, make sure not to save! It is always best practice to manipulate .csv data in R instead of manually in Excel. This data has to be specifically trimmed in R because the time stamps include seconds and manually trimming them (like we did for the other logger data) and saving over the original file messes with the formatting and zeros out all the seconds
* Copy the .csv file into the GitHub folder under “Raw Data” and add “\_READONLY” at the end of the file name so that people know not to edit or save over the .csv file
* Read the .csv file into R and use the slice() function to trim the data using notes from the datasheet to see when the survey temp probe was in and out of the water
* Export the trimmed data as “Logger#\_Date\_SiteCode\_SiteName\_Trimmed” (e.g., “21099530\_09212021\_AA\_James\_Brown\_Slough\_Trimmed”) and save in the “Derived” folder in GitHub

*GPS Data*

* Plug in the GPS and open DNRGPS
* Click GPS > Download All

Table Data

* Make a new subfolder of “MM-DD-YYYY (SurveyType)” (e.g., “4-14-2021 (Snorkel Survey)”) called “Tracklogs and Waypoints”
  + Each survey folder within a site folder should have three subfolders
    - “Datasheets”
    - “Survey Temp Logger”
    - “Tracklogs and Waypoints”
* Highlight the waypoints for a specific site visit and click File > Save To > File
* Save as a text file (either comma-delimited or tab-delimited) named as “SiteCode\_Site\_Name\_Waypoints\_Date” (e.g., “AA\_James\_Brown\_Slough\_Waypoints\_06092021”)
* Save this as a .csv with the same name
* Repeat this process for tracklogs
* Change the headers of the .csv so that they are simplified and no spaces between words
* Copy the .txt or .csv file into the GitHub folder under “Raw Data” and add “\_READONLY” at the end of the file name so that people know not to edit it
* Sync the tracklog and survey temp logger data to get spatiotemporal temperature data at sites
  + If the tracklog intervals and the survey temp logger intervals don’t line up (which they didn’t in most cases because used “Most Often” as interval on GPS instead of “00:00:05”) then do a rolling join using the data.table package in tidyverse
  + Export the merged dataset in the “Derived” folder in GitHub
* NOTE: Table data should only be saved in cases where a survey took place
  + Waypoints taken at sites not part of a survey (e.g., during a boat reconnaissance or opportunistically) can be saved as GIS data only

GIS Data

* You should have a “GIS” folder which should be within your project folder but separate from your “Data” folder
  + GIS files are too large to be held in places like GitHub so save GIS files just one folder hierarchy outside of the local repository but within your project folder
* In your “GIS” folder make a “Tracklogs and Waypoints” subfolder and organize like this:
  + “GIS” > “Tracklogs and Waypoints” > “Tracklogs” > “MM-DD-YYYY” (e.g., “4-12-2021”)
  + “GIS” > “Tracklogs and Waypoints” > “Waypoints” > “MM-DD-YYYY” (e.g., “4-12-2021”)
* Highlight the waypoints for a specific site visit and click File > Save To > File
* Save as an ESRI Shapefile (2D) in the “GIS” folder under the appropriate data type (tracklogs or waypoints) and date named as “Date\_SiteName” (e.g., “04122021\_Powerline\_Pond”
* Repeat for tracklogs

*Logger and Timelapse Metadata*

* Make a subfolder in “Data” called “Equipment Locations” and create an Excel spreadsheet called “Equipment\_Locations”
  + Once all equipment location data (i.e., timelapse camera, level logger, barometer temperature pendant) has been entered into the “Equipment\_Locations” Excel file it can be imported into ArcGIS Pro and then exported as a shapefile
    - This shapefile can then be loaded into DNRGPS to upload the waypoints onto a GPS unit

Timelapse Camera Metadata

* Notes (including pictures) about timelapse camera installation in the Rite-in-Rain can be typed into a Word document in the “Notes” folder named “SiteCode\_SiteName\_Notes” (e.g., “AA\_James\_Brown\_Notes”)
* Coordinates of timelapse camera locations can be added to the “Equipment\_Locations” Excel file and also to the “Site\_Breakdown\_Selection” Excel file which keeps track of activity at all sites

Level Logger Metadata

* Notes (including pictures) about level logger installation in the Rite-in-Rain can be typed into a Word document in the “Notes” folder named “SiteCode\_SiteName\_Notes” (e.g., “AA\_James\_Brown\_Notes”)
* Coordinates and other installation information (i.e., serial number, installation date/time, string length) should be saved in an Excel file called “Level\_Logger\_Metadata” saved in a subfolder of the “Data” folder called “Water\_Quality\_Metadata”
* Information from the “Level\_Logger\_Metadata” Excel file can be copy and pasted into the “Equipment\_Locations” Excel file and also to the “Site\_Breakdown\_Selection” Excel file

Temperature Logger Metadata

* Notes (including pictures) about temperature logger installation in the Rite-in-Rain can be typed into a Word document in the “Notes” folder named “SiteCode\_SiteName\_Notes” (e.g., “AA\_James\_Brown\_Notes”)
* Coordinates and other installation information (i.e., serial number, installation date/time, etc.) should be saved in an Excel file called “Temperature\_Logger\_Metadata” saved in a subfolder of the “Data” folder called “Water\_Quality\_Metadata”
* Information from the “Temperature\_Logger\_Metadata” Excel file can be copy and pasted into the “Equipment\_Locations” Excel file and also to the “Site\_Breakdown\_Selection” Excel file

DO Logger Metadata

* Notes (including pictures) about DO logger installation and movement in the Rite-in-Rain can be typed into a Word document in the “Notes” folder named “SiteCode\_SiteName\_Notes” (e.g., “AA\_James\_Brown\_Notes”)
* Coordinates and other installation information (i.e., serial number, installation date/time, removal date/time, etc.) should be saved in an Excel file called “DO\_Logger\_Metadata” saved in a subfolder of the “Data” folder called “Water\_Quality\_Metadata”
* Since the DO logger gets rotated regularly, the metadata should not be included in the “Equipment\_Locations” Excel file but should be included in the “Site\_Breakdown\_Selection” Excel file to keep track of which sites had a DO logger rotation

*Pictures and Notes*

* Notes in the notes box of the datasheet, descriptions of waypoints marking features on the datasheet, descriptions of waypoints marking features from boat reconnaissance, and any additional notes should be put in a Word document in the “Notes” folder named “SiteCode\_SiteName\_Notes” (e.g., “AA\_James\_Brown\_Notes”)
* Waypoints taken at sites not part of a survey (e.g., during a boat reconnaissance or opportunistically) can be saved as GIS data
  + See “GIS Data”
* Pictures should be opened in Google Photos and (for pictures taken with phones with GPS turned on) pictures can be sorted into the “Notes” folder for each site
  + No need to rename the image file just keep whatever name Google Photos assigns it

*Logger and Timelapse Data*

Timelapse Camera Data

* Create a new subfolder called “Connectivity Data” in the Data folder
* Create a .xlsx file called “Connectivity\_Data” and create two tabs called “Connectivity Notes” and “Connectivity Thresholds”
  + In the “Connectivity Notes” tab use site notes, timelapse camera footage, level logger data, and temperature data to note dates and corresponding Skagit or Sauk mainstem discharge (cfs) of varying degrees of connectivity
  + In the “Connectivity Thresholds” tab use the notes from the “Connectivity Notes” tab to figure out the range of discharge that a particular site is estimated to become disconnected
    - Each site will have two discharge measurements (upper and lower connectivity threshold estimate)
* Save the “Connectivity Thresholds” tab is the .xlsx document as a .csv file and save in the “Raw Data” folder in GitHub with \_READONLY at the end of the file name

Level Logger Data

* Create a new folder called “Level Logger Data” in Data > Water\_Quality\_Metadata
* Use the Solinst software (<https://www.solinst.com/downloads/>) to download the data off of the loggers and export as a .csv file in the “Level Logger Data” folder named “SiteName\_MM\_DD\_YY” (e.g., “Cumberland\_10\_12\_21”)
* Use the “Level\_Logger\_Metadata” Excel file to select the rows when the level logger was installed at the site
* Copy and paste these rows into a .csv file called “Level\_Logger\_Data\_SiteCode\_SiteName” (e.g., “Level\_Logger\_Data\_R\_Hurn\_Field” that should be saved in a new folder called “Logger Data” in Data > SiteCode SiteName (e.g., “AB McCleod Slough”)
* Change the headers of the .csv so that they are simplified and no spaces between words
* Copy the .csv file into the GitHub folder under “Raw Data” and add “\_READONLY” at the end of the file name so that people know not to edit or save over the .csv file
* NOTE: It is always best practice to manipulate .csv data in R instead of manually in Excel. In this case, the formatting of the data was not corrupted so it was okay, but for future reference it is best to keep data as-is in a “READONLY” .csv file and then manipulate in R

Temperature Logger Data

* Temperature logger data can remain as HOBO files in a “Temperature Logger Data” folder under Data > Water\_Quality\_Metadata named as “Logger#\_SiteName\_MM\_DD\_YY” (e.g., “20772086\_Cumberland\_10\_12\_21”)
* We didn’t realize that there is a temperature logger built into the level logger so no need for redundancy
* For any temperature logger data that going to use for analysis, change the headers of the .csv so that they are simplified and no spaces between words
* Copy the .csv file into the GitHub folder under “Raw Data” and add “\_READONLY” at the end of the file name so that people know not to edit or save over the .csv file
* NOTE: It is always best practice to manipulate .csv data in R instead of manually in Excel. In this case, the formatting of the data was not corrupted so it was okay, but for future reference it is best to keep data as-is in a “READONLY” .csv file and then manipulate in R

DO Logger Data

* DO logger data will be collected continuously throughout the season because it is being rotated between sites and data is periodically downloaded
* HOBO files from DO loggers will be saved as “Logger#\_Date\_DO” (e.g., “21060313\_07122021\_DO”) either on a thumb drive or on my OSU laptop in the field
* Copy and paste the HOBO files into a folder called “DO Data” in Data > Water\_Quality\_Metadata
* Open the HOBO file in HOBOware
* Click File > Export Table Data
* Name the exported .csv file the same as the HOBO file
  + “Logger#\_Date\_DO” (e.g., “21060313\_07122021\_DO”)
* Make an Excel file in the same “DO Data” folder called “DO\_Logger\_Data” and copy data from each .csv file into this file chronologically so all DO data is in one file
* Use the “DO\_Logger\_Metadata” Excel file to highlight the rows when the DO logger was in the water at a particular site and color these rows pale green
  + All rows that are pale green should have a column that indicates the site name and site code
* For each site copy and paste the appropriate rows into a .csv file called “DO\_Logger\_Data\_SiteCode\_SiteName” (e.g., “DO\_Logger\_Data\_R\_Hurn\_Field”) that should be saved in the “Logger Data” folder in Data > SiteCode SiteName (e.g., “AB McCleod Slough”)
* Change the headers of the .csv so that they are simplified and no spaces between words
* Copy the .csv file into the GitHub folder under “Raw Data” and add “\_READONLY” at the end of the file name so that people know not to edit or save over the .csv file
* NOTE: It is always best practice to manipulate .csv data in R instead of manually in Excel. In this case, the formatting of the data was not corrupted so it was okay, but for future reference it is best to keep data as-is in a “READONLY” .csv file and then manipulate in R

Creating Spatial Temperature Maps

* Click on A picture containing icon

  Description automatically generated in ArcGIS pro and then select “XY Point Data”
* A panel will show up on the right side of the screen called “XY Table to Point”
* Under “Input” table select the merged and trimmed csv file that was produced using the “Survey\_Temp\_Logger\_Merge\_and\_Trim” R code in the Code > Cleanup folder in GitHub
* Under “Output Feature Class” have it exported to the Exported Data > From ArcGIS Pro folder as a shapefile (.shp)
* The “X Field” should autofill with Longitude and the “Y” field should autofill with Latitude
* Click “Run”
* Right click on the produced feature class and click “Symbology”

A picture containing chart

Description automatically generated

* Click “Color” and enter Temp\_C for “Field”
* If you click on Color scheme > Format Color Scheme you can personalize the colors and gradient
* I created this temperature gradient and then clicked “Save to Style” at the bottom then named it “Temperature”
  + This color scheme will then be saved so the same symbology can be applied to other feature classes
* The minimum and maximum Temp\_C values can be assigned
  + In this case it autofilled as 12.316 for the minimum and 15.031 for the maximum
* Unclick the boxes next to all the feature classes on your left panel so just the basemap, hydroline, outlet waypoint, and spatial temperature waypoints are showing then save a PNG of the map to be put into site reports

Folder Organization

*Dropbox “Disconnected Sites”*

* Data (folder) >
  + Water\_Quality\_Metadata (folder)
  + Boat Recon (folder)
  + Survey Data (folder)
  + Connectivity Data (folder)
  + SiteCode SiteName (e.g., “AB McCleod Slough”) (folders)
  + Water\_Quality\_Metadata (folder) >
    - DO Data (folder)
    - Level Logger Data (folder)
    - Temperature Data (folder)
    - “DO\_Logger\_Metadata” (.xlsx file)
    - “Level\_Logger\_Metadata” (.xlsx file)
    - “Temperature\_Logger\_Metadata” (.xlsx file)
    - DO Data (folder) >
      * “Logger#\_Date\_DO” (e.g., “21060313\_07122021\_DO”) (HOBO files)
      * “DO\_Logger\_Data” (.xlsx file)
    - Level Logger Data (folder) >
      * “SiteName\_MM\_DD\_YY” (e.g., “Cumberland\_10\_12\_21”) (.csv files)
    - Temperature Data (folder) >
      * “Logger#\_SiteName\_MM\_DD\_YY” (e.g., “20772086\_Cumberland\_10\_12\_21”) (.csv files)
  + Boat Recon (folder) >
    - “Date\_Boat\_Recon” (e.g., “05122021\_Boat\_Recon”) (.pdf files)
  + Survey Data (folder) >
    - “Seasonal\_Habitat\_Survey\_Data” (.xlsx file)
    - “Seasonal\_Habitat\_Survey\_Data\_Waypoints” (.xlsx file)
  + Connectivity Data (folder)
    - “Connectivity\_Data” (.xlsx file)
  + SiteCode SiteName (e.g., “AB McCleod Slough”) (folders) >
    - “MM-DD-YYYY (SurveyType)” (e.g., “4-14-2021 (Snorkel Survey)”) (folders)
      * Some sites might not have this folder because never surveyed
    - Logger Data (folder)
      * Some sites might not have this folder because loggers not installed
    - Notes (folder)
    - “MM-DD-YYYY (SurveyType)” (e.g., “4-14-2021 (Snorkel Survey)”) (folders) >
      * Datasheets (folder)
      * Survey Temp Logger (folder)
      * Tracklogs and Waypoints (folder)
      * Datasheets (folder) >
        + “SiteCode\_SiteName\_Date” (e.g., “AB\_McCleod\_Slough\_04142021”) (.pdf file)
      * Survey Temp Logger (folder) >
        + “Logger#\_Date\_SiteCode\_SiteName” (e.g., “21099530\_09212021\_AA\_James\_Brown\_Slough”) (HOBO file)
        + “Logger#\_Date\_SiteCode\_SiteName” (e.g., “21099530\_09212021\_AA\_James\_Brown\_Slough”) (.xlsx file)
      * Tracklogs and Waypoints (folder) >
        + “SiteCode\_Site\_Name\_Waypoints\_Date” (e.g., “AA\_James\_Brown\_Slough\_Waypoints\_06092021”) (.txt file that can later be converted to .csv or .xlsx if needed)
        + “SiteCode\_Site\_Name\_Tracklog\_Date” (e.g., “AA\_James\_Brown\_Slough\_Tracklog\_06092021”) (.txt file that can later be converted to .csv or .xlsx if needed)
    - Logger Data (folder) >
      * “DO\_Logger\_Data\_SiteCode\_SiteName” (e.g., “DO\_Logger\_Data\_R\_Hurn\_Field”) (.csv file)
      * “Level\_Logger\_Data\_SiteCode\_SiteName” (e.g., “Level\_Logger\_Data\_R\_Hurn\_Field”) (.csv file)
    - Notes (folder) >
      * “SiteCode\_SiteName\_Notes” (e.g., “AA\_James\_Brown\_Notes”) (.docx file)
      * Image files

*Box “GIS”*

* Incoming Data (folder)
* Exported Data (folder)
* Seasonal\_Floodplain\_Habitat (.gdb file)
* REM\_Sites\_Personal (.mxd file)
* Incoming Data (folder)
  + Any shapefiles (.shp) or raster files (.tif) that receive from collaborators (e.g., Kate Ramsden) or online
    - E.g. REM, hydroline shapefile, Skagit property boundary shapefile, Mike Olis historical surveys shapefile, USFS Salish Sucker waypoints
* Exported Data (folder)
  + From DNRGPS (folder)
  + From ArcGIS Pro (folder)
  + From DNRGPS (folder)
    - Tracklogs and Waypoints
      * Tracklogs and waypoint shapefiles (.shp) exported from DNRGPS
  + From ArcGIS Pro (folder)
    - Feature classes that were created or altered in ArcGIS Pro and then exported as shapefiles (.shp)
      * E.g. equipment locations, spatial temperature waypoints, site outlet waypoints
* Seasonal\_Floodplain\_Habitat (.gdb)
  + Geodatabase containing all the more permanent features of the map as feature classes
* REM\_Sites\_Personal (.mxd)
  + Map for project

*GitHub (seasonal-floodplains) Repository*

* Save a “READ\_ONLY” version of your data after doing any manual cleanup and before starting any analysis