Supervisor's Manual
for the
Columbia Habitat Monitoring Program

2014 Version

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Bonneville Power Administration's
Columbia Habitat Monitoring Program

For

Bonneville Power Administration's Columbia Habitat Monitoring Program

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TABLE OF CONTENTS

SECTION 1: INTRODUCTION

This manual is a reference to support watershed supervisors implementing the Columbia Habitat Monitoring Program (CHaMP). It describes 1) 'scouting', the procedure of visiting a site prior to sampling and 2) the steps needed to prepare files and documents necessary for crews to sample a site. These two steps are performed to ensure that each CHaMP survey meets acceptable quality and repeatability standards and to improve a crew's sampling efficiency. Scouting should be performed by an experienced CHaMP surveyor.

In a typical CHaMP core watershed, 45 sites are sampled throughout the duration of each 3-year sampling cycle within the nine-year study design (three rotations through each three-year cycle). The total number of 45 sites is split into four panels, one annual panel composed of 15 sites and three rotating panels each composed of 10 sites (Table 1). Each year, sites from the annual panel and one rotating panel are sampled for a total of 25 sites per year. Supervisors are responsible for preparing documents and scouting all sites within a given year.

Table 1. Example of a split panel sample design in a typical CHaMP core watershed.

Site Type	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Annual Panel	15	15	15	15	15	15
Rotating Panel 1	10			10		
Rotating Panel 2		10			10	
Rotating Panel 3			10			10

SECTION 2: SCOUTING

2.1 Pre-Scouting

Before heading out in the field scouts should formulate a plan for what needs to be done at each site during their scouting mission. To prepare, scouts needs to compile and carefully review information about each site. Site information is available on the CHaMP website (www.champmonitoring.org), and includes:

- Site Notes: Site notes contain site directions, landowner contact information, sampling notes, and information and locations for benchmarks, site markers, and stream and air temperature loggers. This document is titled "**SiteNotesPrintouts.pdf**". For new sites this form can be used to fill in directions and infrastructure coordinates.
- Site Survey Map: For Revisit Sites, a map that includes all benchmark locations, monument locations, bottom and top of site marker locations, stream and air temperature locations, and the survey extent (See Section 2.3, Preparing the Scout/Site Survey Map). For New Sites, a map that includes the X-Site location. All maps should contain aerial imagery and a UTM grid to aid navigation.
- Photos: For Revisit Sites, previous site visit photos include site markers, monuments, stream and air temperature loggers, and four photos taken at five transects; transect 1 (bottom of site), 6, 11, and 21 (top of site)). This document is titled "**RevisitPhotos.pdf**".
- Site Map: For Revisit Sites, this map is a sketch of the site drawn by the survey crew during a previous site visit. The site map is helpful during scouting when relocating benchmarks, monuments, and temperature loggers. This document is titled "**SiteMap.jpg**".
- Suggested Topographic Workflow Form (Section 1.6): This form outlines a strategy used by the crew to efficiently survey a site.
- GPX file: The GPX file contains coordinates downloaded from champmonitoring.org in a file that can be loaded directly to a Garmin GPS unit. For new sites, these coordinates represent the X-Site For revisit sites, the coordinates are the bottom of site marker.
- Additional Information/Gear: Regional map, GPS unit, metal detector, flagging, compass, thermometer, and sharpie. You will need additional equipment if you are installing or downloading temperature loggers (Section 1.8).

2.2 Scouting New Sites

The scout should refer to Sections 4.1 and 4.2 of the CHaMP Habitat Survey Protocol for direction on establishing new sites. Before visiting a new site, the scout/supervisor should gain landowner permission and review aerial photographs and other pertinent information in order to help identify a suitable bottom of site location.

Prior to the crew survey of a new site, the scout will:

- Locate the X-Site, establish the bottom of site and bottom of site marker (the survey crew will establish the top of site marker after laying site out) (Habitat Survey Protocol Section 4.1).
- Install the survey control network including benchmarks, monuments, and control points. Flag these features so the crew can relocate them (Habitat Survey Protocol Section 4.2).
- Install stream temperature logger and record relevant information (time/date deployed, GPS coordinates, instantaneous temperature, and location description). Flag the logger location (Section 1.8).
- Define the topographic survey extent on an aerial photograph/scout map (Section 1.6).
- Complete a Suggested Topographic Workflow form (Section 1.6)
- Record driving directions, notes about site access including hiking directions and parking, landowner information, and any other pertinent site information (Section 1.7).

2.3 Scouting Revisit Sites

The scout should refer to Section 4.3 of the CHaMP Habitat Survey Protocol for direction on Revisit Sites. Before going to a Revisit Site, the scout/supervisor should reestablish landowner permission.

Prior to the reoccupation of a Revisit Site, the scout will:

- Relocate and flag the bottom and top of site, site markers, monuments, and benchmarks. If markers or benchmarks are missing, establish new ones.
- Assess the integrity of previously completed topographic surveys by evaluating the location of benchmarks and control points, the survey extent, and point distributions and densities (Sections 1.4 and 1.5).
- Provide recommendations regarding crew workflow using the Suggested Topographic Workflow form. For example, recommendations can be made as to which benchmark to first set up total station, where to backsight, and where to traverse. Also include suggestions for the establishment of new benchmarks or control points (Section 1.6).
- Delineate a survey plan on a scout map identifying areas of the site where crews should prioritize their topographic surveying efforts and how far out the survey extent should extend.
- Relocate and flag stream and air temperature loggers. Take an instantaneous temperature. Evaluate logger placement and relocate if necessary. You may also want to download data; read Section 1.8 for guidance about the timing of date downloads.
- Update driving directions, hiking directions, landowner information, and other pertinent site details (Section 1.7).

2.4 Assessing the Control Network and Benchmarks

2.4.1 Control Network

Consider the criteria listed below when assessing the control network. These criteria are also described in Section 5.1 of the CHaMP Habitat Survey Protocol.

1) The control network should contain sufficient spatial distribution along the length of the site. A control network that spans the length of the site is considered a 'strong' network and will reduce the propagation of survey error when combined with backsight checks.
2) The benchmarks should be spaced in an equilateral triangle when possible.
3) All benchmarks should be intervisible from each other.
4) The benchmarks should be stably installed in locations where they are unlikely to get disturbed from natural (erosion) or anthropogenic sources.

A minimum of three benchmarks is needed at a site, however, installation of additional benchmarks is recommended. Additional benchmarks increases data quality, and provide redundancy and insurance. Benchmarks are the preferred target during required backsight checks because they are permanent and thus can be used to identify survey errors. The installation of more than three benchmarks provides more opportunities to shoot in benchmarks during backsight checks and additional benchmarks provide insurance should any benchmark or control point be destroyed or compromised. Additional benchmarks also provide flexibility to the crew by giving them more than the standard number of station set-up options as well as troubleshooting options. However, as more benchmarks are added, there is a greater potential for mislabeling and misidentification of these features. Therefore the scout must follow consistent naming conventions and monumenting practices in order to avoid any confusion during the survey.

When establishing a control network or improving an existing control network, we recommend using the following strategies:

- Add benchmarks to extend the control network as far along the length of the site as possible. When possible, add benchmarks both near the bottom and top of the site.
- Improve benchmark geometry. If necessary, add benchmarks in order to achieve an equilateral triangle with benchmarks extending as far apart as possible.
- When possible, set benchmarks far outside of the survey extent on adjacent hillsides or low ridges adjacent to the stream. Look for holes in vegetation that will allow line of sight to the stream from these adjacent higher elevation areas.
- If a stream has open space on one side, utilize it to the fullest extent. A benchmark triangle that extends the entire site length on one side of the stream is better than a ¼ site length triangle on both sides of the stream.

2.4.2 Benchmarks

At each site, assess each benchmark for the following criteria: stability, intervisibility, and geometry. Locate existing benchmarks using a metal detector if needed. Benchmarks should only be "retired" when their spatial integrity has been compromised (kicked, bent, missing). If a benchmark is not intervisible, keep the benchmark as is, instruct the crews to survey it and establish a new benchmark in a more appropriate location.

- New Benchmarks - New benchmarks will be established at revisit sites if it is determined that the pre-existing benchmark is:

  - Spatially compromised
  - Improperly placed or not well spaced in an equilateral triangle, or
  - Missing – i.e., the scout could not find the benchmark.

- Retiring Benchmarks- Follow the procedures below for "retiring" spatially compromised benchmarks.
  - Missing Benchmarks –
    - If a benchmark is missing, indicate which benchmark is lost on the scouting form. Include the benchmark number and year established. In the data logger, change benchmark from "Active" to "Retired".
    - Establish a new benchmark. Find a location for the new benchmark. Record relevant information on the scouting form and enter new information in the data logger.
  - Spatially Compromised Benchmarks – If benchmark is located, assess whether the benchmark is spatially compromised. This may only be done by the crews and with a Total Station in most cases.
    - If the benchmark is spatially compromised, retire it. Indicate which benchmark was compromised on the scouting form. Include the benchmark number and year established. In the data logger, change benchmark from "Active" to "Retired".
    - Remove benchmark or establish a new benchmark at the same location with a new benchmark number (i.e., bm403).
    - Establish a new benchmark. Find a location for the new benchmark. Record relevant information on the scouting form and enter new information in the data logger.

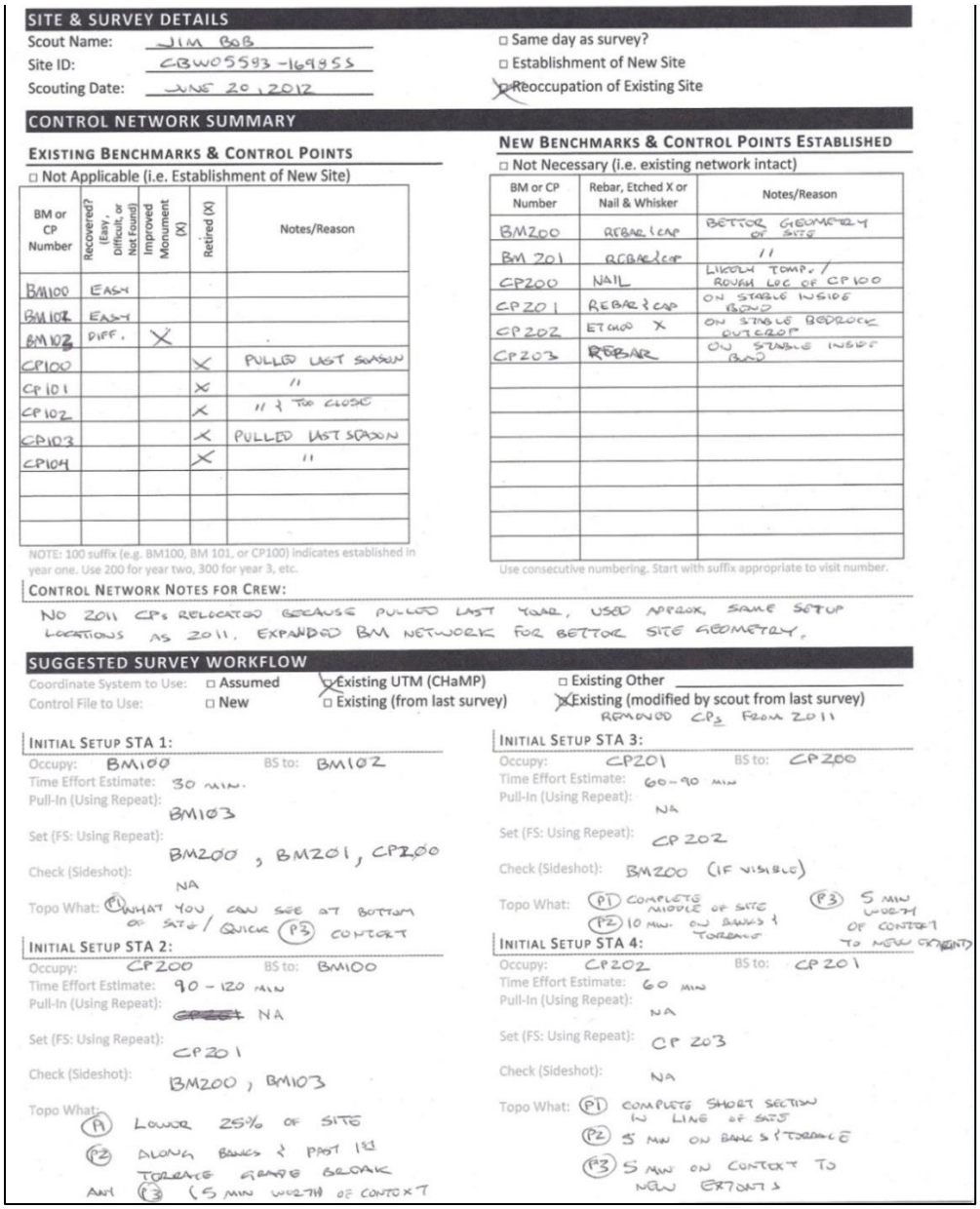
2.5 Defining/Confirming Site Extents & Point Densities

When scouting previously surveyed sites, the scout should review the adequacy of the previous survey(s) keeping in mind that this data will be used in a geomorphic change detection analysis. When assessing previous surveys:

- Identify the upstream/downstream extents of the site and spatial extent of the floodplain captured in previous survey(s). If the spatial extend of previous surveys is inadequate to capture potential geomorphic changes, indicate the boundary of the site extent that should be surveyed on the Site Survey Map and hang flagging to indicate boundary in the field. Record details in the Scout's Suggested Topographic Survey Workflow' form (Section 1.6; Figure 4).
- Determine whether there are adequate point densities and distributions both within the channel and across the adjacent floodplain. This evaluation may require opening the Survey GDB in GIS and reviewing the topo points feature class overlaid on an aerial photograph. Record details in the Scout's Suggested Topographic Survey Workflow' form (Section 1.6).

2.6 Developing a Survey Workflow for Crew

A survey workflow is simply a plan that the scout suggests to the crew for how they should complete the survey. This survey workflow is based on what the scout feels is realistic and will be the most efficient. To encourage consistency in how scouts communicate information to the crews, we recommend completing the 'Scout's Suggested Topographic Survey Workflow' form. Figures 1 and 2 are examples of a completed workflow form.



SITE & SURVEY DETAILS

Scout Name: JIM BOB
Site ID: CBW05593-169955
Scouting Date: JUNE 20, 2012

□ Same day as survey?
□ Establishment of New Site
☒ Reoccupation of Existing Site

CONTROL NETWORK SUMMARY

EXISTING BENCHMARKS & CONTROL POINTS

□ Not Applicable (i.e. Establishment of New Site)

BM or CP Number	Recovered? (Easy, Difficult, or Not Found)	Improved Monument (X)	Retired (X)	Notes/Reason
BM100	EASY			
BM101	EASY			
BM102	DIFF.	X		
CP100			X	PULLED LAST SEASON
CP101			X	"
CP102			X	" & TOO CLOSE
CP103			X	PULLED LAST SEASON
CP104			X	"

NOTE: 100 suffix (e.g. BM100, BM 101, or CP100) indicates established in year one. Use 200 for year two, 300 for year 3, etc.

NEW BENCHMARKS & CONTROL POINTS ESTABLISHED

□ Not Necessary (i.e. existing network intact)

BM or CP Number	Rebar, Etched X or Nail & Whisker	Notes/Reason
BM200	REBAR/CAP	BETTOR GEOMETRY OF SITE
BM 201	REBAR/CAP	"
CP200	NAIL	LIKELY TEMP. / ROUGH LOC OF CP100
CP201	REBAR & CAP	ON STABLE INSIDE BEND
CP202	ETCHED X	ON STABLE BEDROCK OUTCROP
CP203	REBAR	ON STABLE INSIDE BEND

Use consecutive numbering. Start with suffix appropriate to visit number.

CONTROL NETWORK NOTES FOR CREW:

NO 2011 CPs RELOCATED BECAUSE PULLED LAST YEAR, USED APPROX. SAME SETUP LOCATIONS AS 2011. EXPANDED BM NETWORK FOR BETTOR SITE GEOMETRY.

SUGGESTED SURVEY WORKFLOW

Coordinate System to Use: □ Assumed ☒ Existing UTM (CHaMP) □ Existing Other
Control File to Use: □ New □ Existing (from last survey) ☒ Existing (modified by scout from last survey) REMOVED CPs FROM 2011

INITIAL SETUP STA 1:

Occupy: BM100 BS to: BM102
Time Effort Estimate: 30 MIN.
Pull-In (Using Repeat): BM103
Set (FS: Using Repeat): BM200, BM201, CP200
Check (Sideshot): NA
Topo What: (P1) WHAT YOU CAN SEE AT BOTTOM OF SITE / QUICK (P3) CONTEXT

INITIAL SETUP STA 2:

Occupy: CP200 BS to: BM100
Time Effort Estimate: 90 - 120 MIN
Pull-In (Using Repeat): ~~CP201~~ NA
Set (FS: Using Repeat): CP201
Check (Sideshot): BM200, BM103
Topo What: (P1) LOWER 25% OF SITE (P2) ALONG BANKS & PAST 1ST TERRACE GRADE BREAK ANY (P3) (5 MIN WORTH OF CONTEXT

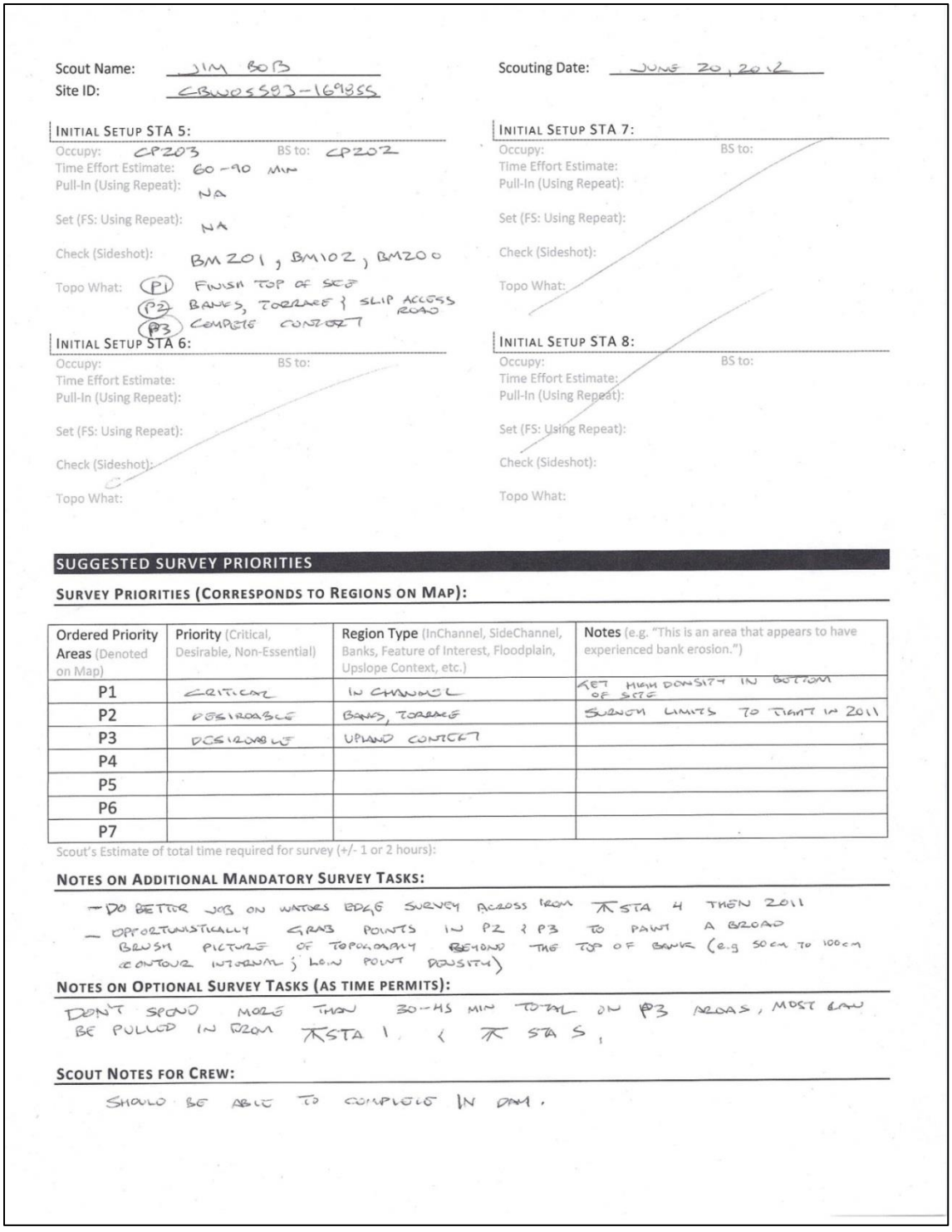
INITIAL SETUP STA 3:

Occupy: CP201 BS to: CP200
Time Effort Estimate: 60-90 MIN
Pull-In (Using Repeat): NA
Set (FS: Using Repeat): CP202
Check (Sideshot): BM200 (IF VISIBLE)
Topo What: (P1) COMPLETE MIDDLE OF SITE (P2) 10 MIN. ON BANKS & TERRACE (P3) 5 MIN WORTH OF CONTEXT TO NEW EXTENT

INITIAL SETUP STA 4:

Occupy: CP202 BS to: CP201
Time Effort Estimate: 60 MIN
Pull-In (Using Repeat): NA
Set (FS: Using Repeat): CP 203
Check (Sideshot): NA
Topo What: (P1) COMPLETE SHORT SECTION IN LINE OF SITE (P2) 5 MIN ON BANKS & TERRACE (P3) 5 MIN ON CONTEXT TO NEW EXTENTS

Figure 1. Example of Page 1 of a Scout's 'Suggested Topographic Survey Workflow' form at a revisit site showing previously established control points and benchmarks that were relocated, new control points and benchmarks established by the scout, and the suggested workflow for the field crew.



Scout Name: JIM BOB
Site ID: CBW05593-169855
Scouting Date: JUNE 20, 2012

INITIAL SETUP STA 5:
Occupy: CP203 BS to: CP202
Time Effort Estimate: 60-90 MIN
Pull-In (Using Repeat): NA
Set (FS: Using Repeat): NA
Check (Sideshot): BM201, BM102, BM200
Topo What: (P1) FINISH TOP OF SITE
(P2) BANKS, TORRAEE & SLIP ACCESS ROAD
(P3) COMPLETE CONTEXT

INITIAL SETUP STA 6:
Occupy: BS to:
Time Effort Estimate:
Pull-In (Using Repeat):
Set (FS: Using Repeat):
Check (Sideshot):
Topo What:

INITIAL SETUP STA 7:
Occupy: BS to:
Time Effort Estimate:
Pull-In (Using Repeat):
Set (FS: Using Repeat):
Check (Sideshot):
Topo What:

INITIAL SETUP STA 8:
Occupy: BS to:
Time Effort Estimate:
Pull-In (Using Repeat):
Set (FS: Using Repeat):
Check (Sideshot):
Topo What:

SUGGESTED SURVEY PRIORITIES

SURVEY PRIORITIES (CORRESPONDS TO REGIONS ON MAP):

Ordered Priority Areas (Denoted on Map)	Priority (Critical, Desirable, Non-Essential)	Region Type (InChannel, SideChannel, Banks, Feature of Interest, Floodplain, Upslope Context, etc.)	Notes (e.g. "This is an area that appears to have experienced bank erosion.")
P1	CRITICAL	IN CHANNEL	GET HIGH DENSITY IN BOTTOM OF SITE
P2	DESIRABLE	BANKS, TORRAEE	SUNSH LIMITS TO TIGHT IN 2011
P3	DESIRABLE	UPLAND CONTEXT	
P4			
P5			
P6			
P7			

Scout's Estimate of total time required for survey (+/- 1 or 2 hours):

NOTES ON ADDITIONAL MANDATORY SURVEY TASKS:

- DO BETTER JOB ON WATERS EDGE SURVEY ACROSS FROM ⊼STA 4 THEN 2011
- OPPORTUNISTICALLY GRAB POINTS IN P2 & P3 TO PAINT A BROAD BRUSH PICTURE OF TOPOGRAPHY BEYOND THE TOP OF BANK (e.g. 50cm TO 100cm CONTOUR INTERVAL & LOW POINT DENSITY)

NOTES ON OPTIONAL SURVEY TASKS (AS TIME PERMITS):

DON'T SPEND MORE THAN 30-45 MIN TOTAL ON P3 AREAS, MOST CAN BE PULLED IN FROM ⊼STA 1 & ⊼ STA 5.

SCOUT NOTES FOR CREW:

SHOULD BE ABLE TO COMPLETE IN DAY.

Figure 2. Example of Page 2 of a Scout's 'Suggested Topographic Survey Workflow' form showing the rest of the suggested workflow for the field crew and how priorities are outlined.

The Suggested Topographic Survey Workflow form consists of four key elements:

1. Site & Survey Details
2. Control Network Summary
3. Suggested Survey Workflow
4. Suggested Survey Priorities

The suggested site and survey details capture who the scout was, the site ID and whether or not the visit involved establishment of a new site or reoccupation of an existing site. The control network summary lays out survey benchmarks and the suggested survey workflow.

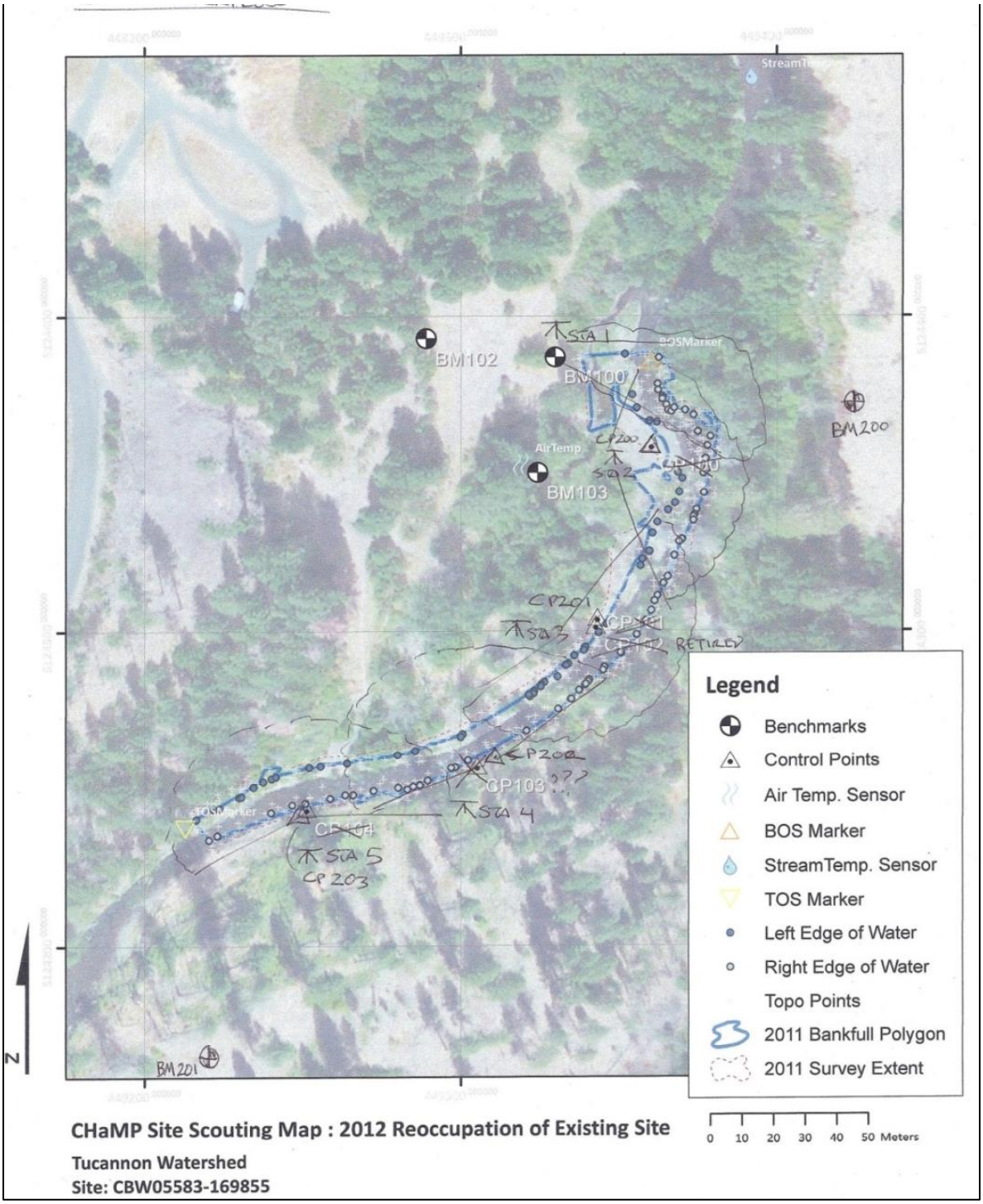


Figure 3. The Site Scouting Map with an example of a Scout's sketch on top depicting the suggested Survey Workflow outlined in the form (Figures 1 & 2). The sketch marks where new control points and benchmarks were placed and outlines suggested total station setup locations and workflow.

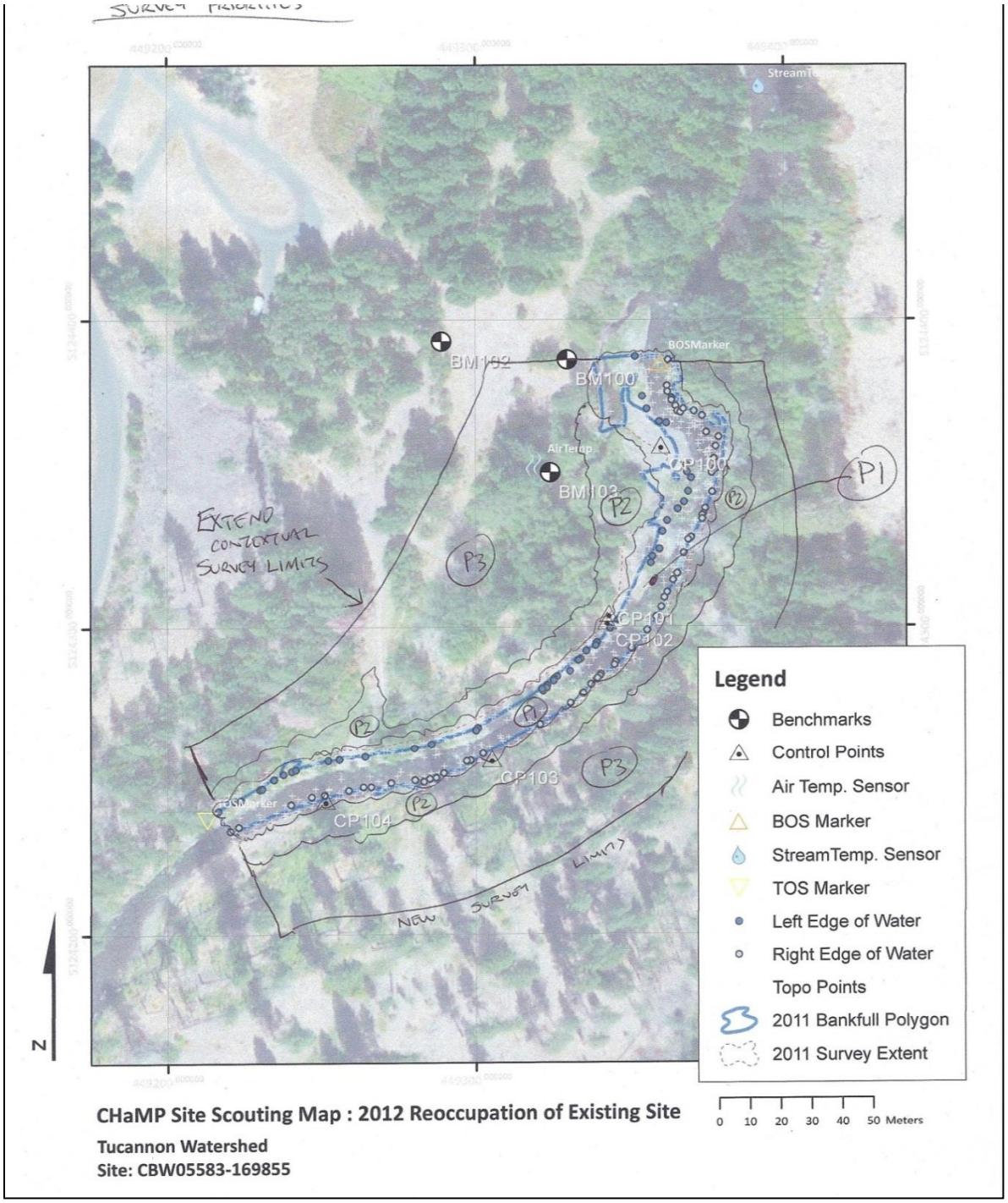


Figure 4. The Site Scouting Map with an example of a Scout's sketch on top depicting the suggested Survey Priorities outlined in the Suggested Survey Workflow form (Figures 1 & 2). The map depicts the survey extent and the priority of different survey areas for capturing points.

2.7 Site Documentation

- Document (new site) or update (existing site) site descriptions, driving directions, hiking directions, landowner information, etc.
- Assesses qualitatively whether any major geomorphic changes have occurred since the previous visit and scope areas upstream of site for potential changes/events that might have or could in the future contribute to site changes (e.g., new beaver dams, abandoned channels, landslides, major land use changes, etc.).

2.8 Installing and Maintaining Temperature Loggers

2.8.1 Pre-field season

- Calibration. Temperature loggers need to be correctly calibrated to ensure data is precise, accurate, and meets quality standards. Calibration requires the use of a NIST-certified thermometer. A detailed description of calibration is available from the Oregon Department of Environmental Quality: (http://www.oregon.gov/odf/privateforests/docs/sttempprofromwqg.pdf)
    - All CHaMP temperature loggers should be calibrated prior to the season by CHaMP staff before you receive them. Tests are conducted at two temperatures, 10 and 20°C. Double check to see if this has been done before programming/initiation.
- Programming/initiating.
    - Use a laptop with Onset software (HOBOware) and shuttle to interface with loggers. For detailed instructions on programming/initiation, see the Scouting - Stream Temperature Logger document (Appendix A or: https://www.champmonitoring.org/Program/Details/1#documents.
    - Program the logger to collect hourly temperature measurements.
    - Make sure the time/date are correct. If your laptop's time/date are incorrect, the logger's will be too.
    - Ensure units are set to °C, not °F.
    - The loggers' battery life will be displayed, ensure it has adequate life for your needs. Battery life is approximately five years; keep track of which loggers might be approaching this deadline.
- Launching. Loggers that have been launched begin collecting hourly temperature measurements at the time of launching. If you are launching a logger that will not be installed within a short time period, program the logger to begin collecting data at an anticipated future launch date/time. This will ensure that the logger collects as few air temperature measurements as possible and saves battery life.

2.8.3 Field Season

- Logger installation – It is important that the supervisor makes a concerted effort to install all loggers before high summer temperatures (approx. July 15). Some of the most valuable temperature data spans from Mid-July through August when maximum temperatures occur. Attempt to have a continuous temperature record throughout this time period; probes should be placed prior to this period and downloaded afterwards. If a site is going to be sampled within this timeframe, it is ideal to instruct the crew not to download the logger if it can be downloaded at a later date.

- Logger data downloads – Loggers should be checked and downloaded at least twice a year. Loggers need to be downloaded once in the fall to ensure summer temperatures are captured. It is also recommended that loggers are downloaded before high spring flows and checked early in the summer if a crew will not sample a site until later.
- Training - Ensure technicians are adequately trained to place loggers and download data using the data shuttle. It is a good idea to review correct installation techniques with technicians (Section 9.5 in the CHaMP Habitat Survey Protocol). Incorporate information relevant to streams they'll be placed in. For example, in larger streams techs need to place loggers so they won't get washed away in high flows. If a stream's flows are really low in late summer, make sure the logger is placed close to the streambed so it won't go dry.
- Logger documentation - In order to correctly summarize data, installation and removal dates must be correctly entered into the logger on into CM.org. It is a good idea to examine temperature loggers whenever a site is visited for any reason. At each visit, make sure the red light is still blinking and note the status of the logger (in flowing water, dry, or missing) and any action taken (left in place, moved, removed). Documentation of these events will allow temperature data to be 'trimmed', and help investigate suspicious readings during the QA process.
- Instantaneous temperature - At each visit to a site, collect an instantaneous temperature reading and enter that value in the logger or directly into CM.org. Instantaneous temperature readings may be done with any thermometer and should be done closest to the top of the hour when the logger will be recording temperature (even just after installation). In the notes section, describe what device you used to collect instantaneous temperature.
- Review temperature data and conduct QA –Note: It is highly recommended that temperature data is downloaded from shuttles as soon as possible after the site visit. Create an archive of all temperature data from the field season.
- Review water temperature data on laptop to quickly assess if new temperature logger should be installed at the site, or if the probe should be moved. Consult the CHaMP Stream Temperature Quality Assurance Protocol document located on champmonitoring.org. Familiarize yourself with probe placements that impact data quality (logger goes dry or is buried in sediment).
    - Review water temperature data on laptop to quickly assess if new temperature logger should be installed at the site, or if the probe should be moved. Consult the CHaMP Stream Temperature Quality Assurance Protocol document located on champmonitoring.org. Familiarize yourself with probe placements that impact data quality (logger goes dry or is buried in sediment).
        - Does the logger appear to be submerged continuously at the placement location throughout the year?
        - Review water temperatures and identify daily fluctuations of more than 15°C for more than 3 consecutive days. This likely indicates the logger was out of the water. If so, how often does this occur? If this occurs for a combined period of over 10 days during a season, consider moving the sensor.
        - Does the sensor appear to ice over during winter months? Review water temperatures during winter months and identify if temperatures become erratic or stabilize at temperatures < 0° C. This may be inevitable at some sites, but it is worthwhile to review the frequency and duration of the icing events, as loggers may become damaged during ice events.

- Upload data files and conduct quality assurance checks - Instructions for uploading data files and conducting quality assurance on temperature data are located in the CHaMP Stream Temperature Quality Assurance Protocol document located on champmonitoring.org.
    - Upload temperature files to the Data Broker or champmonitoring.org. This includes both the .hobo file and an exported .csv file from HOBOware. Both files should have the same name and contain the Site ID, logger serial number, and date downloaded (i.e., CBW05583-000851_10148966_20131009).
    - Complete quality assurance steps in champmonitoring.org.
    - If you believe that a probe's location results in the probe going dry, getting buried, etc., move the probe ASAP.

2.9 Post-Scouting

After a scout finishes their visit to a site they must upload and enter the following data.

- Site Directions and Notes
    - Enter/edit driving and hiking directions to the site, landowner information, and any other site or sampling details on the "SiteNotesPrintouts.pdf" form and then transcribe the information into champmonitoring.org.
- Stream Temperature Data (read Section 1.8 for more details)
    - Stream temperature data will be on the shuttles. The data will need to be transferred to the laptop and then exported from Hoboware as a csv file. Both the .hobo and .csv files need to be uploaded to the Data Broker or champmonitoring.org. You should also maintain an archive of all temperature data from the field season.
    - Enter temperature logger information data such as logger serial number, date/time of download, logger condition, etc. into champmonitoring.org or the data logger.
- Benchmark Information
    - Enter all information regarding newly established or retired benchmarks into the data logger.
- Suggested Topographic Survey Workflow
    - Fill out the Suggested Topographic Workflow form and communicate the suggested survey strategy and any changes (benchmarks, temperature logger) to the survey crew.

SECTION 3: FILE AND DOCUMENT PREPARATION

This section outlines the process for obtaining and preparing site information for both scouts and crews. Field crews need to be provided with the following site information before they head into the field.

- Site Notes: Site notes contain site directions, landowner contact information, sampling notes, and information and locations for benchmarks, site markers, and stream and air temperature loggers. This document is titled "**SiteNotesPrintouts.pdf**". For new sites this form can be used to fill in directions and infrastructure coordinates.
- Site Survey Map: For Revisit Sites, a map that includes all benchmark locations, monument locations, bottom and top of site marker locations, stream and air temperature locations, and the survey extent. For New Sites, a map that includes the X-Site location. All maps should contain aerial imagery and a UTM grid for aid in navigation.
- Control File: For Revisit Sites, a file (.txt) containing benchmarks and control point coordinates from previous surveys that are used to re-occupy the established coordinate system. This file should be uploaded and stored to the Total Station prior to surveying.
- Photos: For Revisit Sites, previous site visit photos include site markers, monuments, stream and air temperature loggers, and four photos taken at five transects; transect 1 (bottom of site), 6, 11, and 21 (top of site)). This document is titled "**RevisitPhotos.pdf**".
- Site Map: For Revisit Sites, this map is a sketch of the site drawn by the survey crew during a previous site visit. The site map is helpful during scouting when relocating benchmarks, monuments, and temperature loggers. The document is titled "**SiteMap.jpg**".
- Suggested Topographic Workflow Form: This form outlines a strategy used by the crew to efficiently survey a site.
- GPX Waypoint file: The GPX file contains coordinates downloaded from champmonitoring.org in a file that can be loaded directly to a Garmin GPS unit. For new sites, these coordinates represent the X-Site For revisit sites, the coordinates are the bottom of site marker.
- Additional Information/Gear: Regional map, GPS unit, metal detector, flagging, compass, sharpie.
- Macro Invert Labels: Print out bug labels for each site crews will be sampling.

3.1 Site Directions and Photos

The GPX Waypoint File and Macro Invert labels can be downloaded from champmonitoring.org. Navigate to your watershed in champmonitoring.org. Select the "Field Support" tab and then the "Hitch" tab. Scroll over to column labeled "GPX Waypoint File" and download for your hitch. Do the same for the column "MacroInvert Labels".

Site directions and photos can be downloaded from champmonitoring.org.

- Navigate to your watershed in champmonitoring.org. Select the "Field Support" tab and then the "Hitch Planning" tab. Scroll over to column labeled "Scouting Info Packet" and download for your particular site. Open downloaded folder and print the following files:
    - **SiteNotesPrintouts.pdf** – Driving directions, landowner contacts and site notes.
    - **RevisitPhotos.pdf** – Repeat photographs for Revisit Sites.
    - **SiteMap.jpg** – Hand drawn site map from previous visit.

3.2 Site Geodatabase

A Site Geodatabase (GDB) contains GIS data from all previous surveys/visits to a site as well as important metadata. Since all of a site's survey data are contained in a GDB, GIS can be easily used to aid in data processing, planning, and making quality comparisons among previous surveys. The Site GDB is used to produce Site Survey Maps and Total Station Control files for Revisit Sites. The CHaMP Toolbar in ArcGIS utilizes the Site GDB to produce all Total Station Control Files and Survey Extents as well as Site Survey Maps for crews that are revisiting/surveying previously established sites. The Site GDB contains the following files:

- Channel Units (from the last survey)
- Control_Points (merged from all visits)
- OrthogInfo and SiteInfo tables
- SurveyExtentIntersect (Minimum area of all visits)
- SurveyExtentUnion (Maximum area of all visits)
- SurveyExtent (from previous surveys)
- TopoPoints (from previous surveys)
- Instrumentation_Points (GPS Coordinates of Temp/Air Loggers, Monuments , etc.)

For new sites, the Site Geodatabase is generated by the RBT on CHaMPMonitoring.org only after all surveys pass data validation.

Site GDBs can be downloaded from champmonitoring.org. Navigate to your watershed in champmonitoring.org. Select the "Field Support" tab and then the "Hitch Planning" tab. Scroll over to column labeled "Site GDB" and download for your particular site. Open downloaded folder and save file. Open GDB in ArcGIS.

3.3 Preparing the Scout/Site-Survey Map

A scout map is used to help a scout or survey crew navigate within a previously visited site. The CHaMP Toolbar provides a tool to generate a basic scout map that can be modified to meet each crew's specific needs. To create a scout/site map:

1. Obtain the Site or Survey GDB for the site. Use of the Site Geodatabase is strongly recommended if one is available.
    a. If a Site GDB is unavailable, you can use a Survey GDB. The Survey GDB is the GIS geodatabase that was created by a crew during the previous visit to the site. It contains all the Feature Classes created from the initial visit.
2. Run the Export Scout Map tool
    a. Provide the Site ID or Map Name
    b. Select a Site or Survey Geodatabase
3. The new map will open with ArcGIS. The base imagery is turned off by default to save time. You can turn it on (if you are connected to the internet) from the table of contents, or provide your own imagery.
4. Adjust the map symbology as needed. Save and print your map(s).

3.4 Preparing and Exporting Control Points

Crews returning to a previously visited site will need to export a cleaned and updated set of control points to load on the Total Station. Optionally, they may include base layers to overlay on the Total Station display while surveying.

1. Obtain the Site or Survey GDB for the site. Ideally, you want to use the Site GDB if available. You can also use the Survey GDB from the most recent visit if a Site GDB is unavailable.
2. If using a Site GDB, run the Control Network Check Tool (If using Survey GDB, proceed to Step 4 – Export Control File Tool).
    a. This tool will analyze the control points/benchmarks to find duplicate points, names, and invalid codes and select points to be included in the control file.
3. Open the control points attribute table and check the following:

Table 2. Control Point Status Field:

Message	Cause	Action*
Valid	Unique point with a valid code.	None - The point should be included in the control file.
Invalid Code	Description code is invalid (2012 standards).	Enter a "0" in the Control File Field.
Duplicate Point	Point has the same description code and spatial location as a previous point.	Enter a "0" in the Control File Field.
Duplicate Name	Point has the same description code as another point, but they are in ***different*** spatial locations. This often indicates that surveys are using two different transformations.	**1.** Use the Transformation Repair Tools to adjust a visit (or visits) to match the primary transformation of the site. **2.** Retired points should not be included in the control file. **3.** Check for possible naming, surveying, or duplication errors.

*Note: Permanent repairs should be made to the corresponding Survey GDB and re-uploaded to champmonitoring.org. A new Site GDB will be generated that reflects these updates.

Control File field:

This field indicates which points will be exported in the control file.

- Points that contain a "1" are included in the control file.
- Points that contain a "0" are not included in the control file.

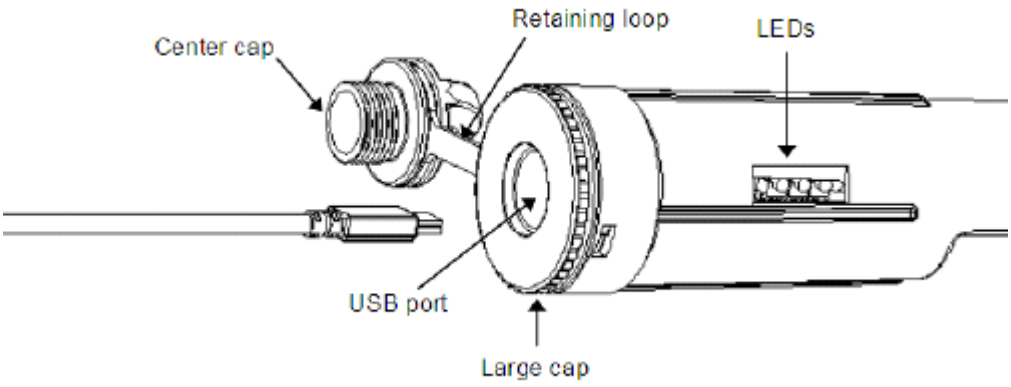
You can adjust the values in this field to include or remove points in the control file as needed.

4. Run the Export Control File Tool.
    a. Provide a Site Name.
    b. Select the "Control_Points" feature class from a Site or Survey Geodatabase.
    c. Choose to export only "benchmarks", or "all" of the features in the Control_Points Feature Class (Note: only features with a '1' in the Control_File Field will be exported).
    d. Optional: Select Feature layer(s) to include as baselayers on the Total Station.
    e. Optional: Select Raster Dataset(s) to include as basemaps on the Total Station.
5. Load the file(s) on your Total Station to the survey job folder:
    a. Control_File.txt
    b. Baselayers.DXF (one file that contains multiple layers)
    c. Basemaps.jpeg (one jpeg per basemap image)

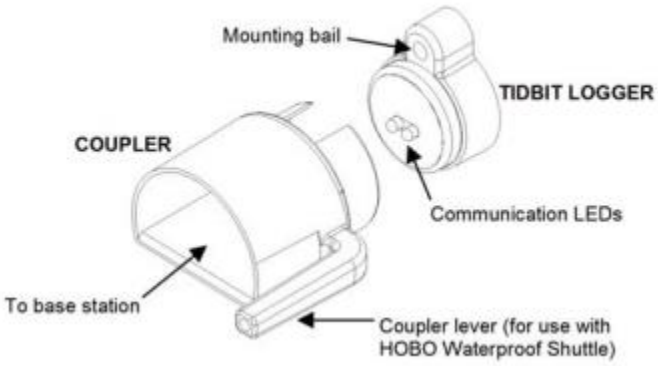
Appendix A: Onset HOBO TidbiT: Logger Initiation and Download

Initiating TidbiTs with Data Shuttle

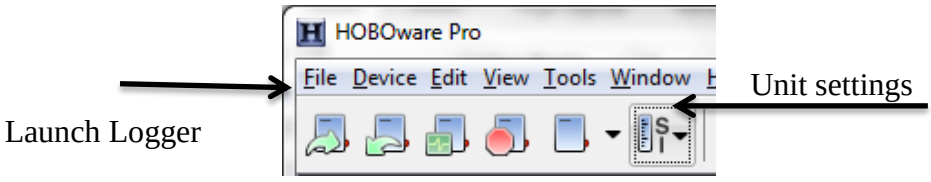
1. Plug Onset Data Shuttle into USB port and open HOBOware Pro software from desktop of CHaMP laptop.



2. Insert TidbiT into data shuttle and press lever. The Data Shuttle's green light will turn on if TidbiT is working. The following image does not show the full waterproof shuttle, only the coupler that should be already connected to the waterproof shuttle.

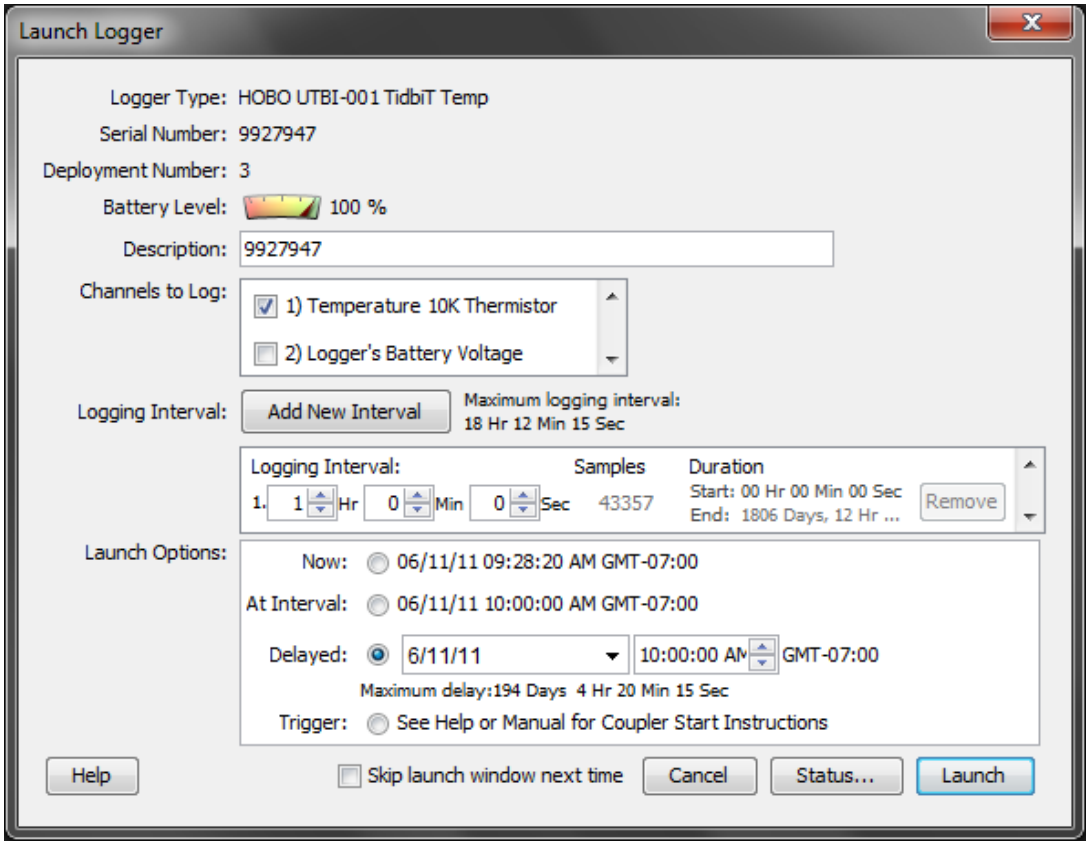


3. Make sure that the settings are in SI units. In HOBOware, select Launch Device. The Launch Logger dialogue will open (see below).



In the Launch Logger dialogue

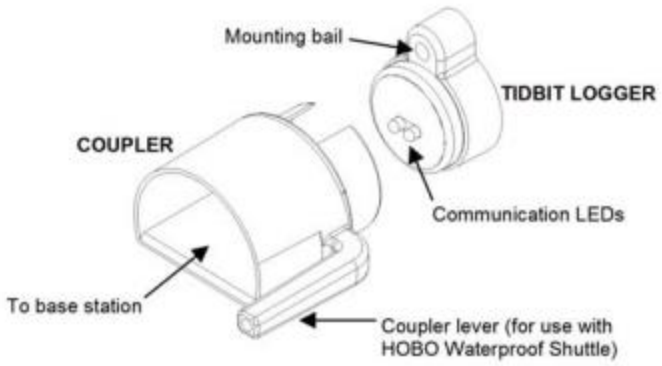
1. Check battery. It should read near 100% before initiation.
2. Set Logging Interval to every hour.
3. Under Launch Options, select At Interval or Delayed and enter the date and time you want the logger to start recording.
4. Select Launch.
5. Remove TidbiT from Data Shuttle. Make sure that red light is blinking.



Downloading

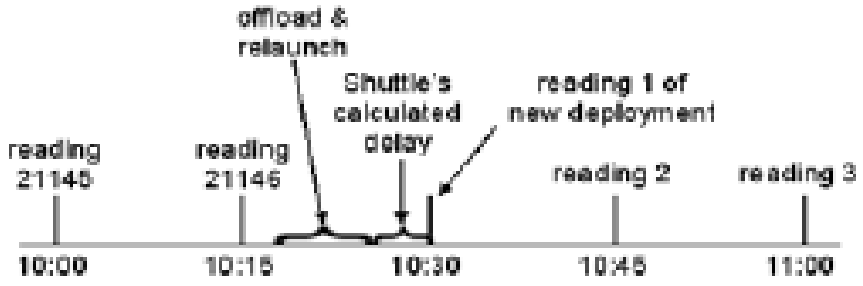
A. Downloading data from the HOBO TidbiTs to the Data Shuttle:

1. Make sure the shuttle's large cap and center cap are closed securely. Tighten the center cap until it is just flush with the large cap, or until the O-ring is no longer visible.
2. Make sure the communication end of the shuttle is clean. Attach the correct coupler for the logger, and ensure that it is seated properly (This should have already been done.)
3. Insert the logger into the coupler, following the instructions that came with the coupler (See below).



Momentarily press the coupler lever. Readout should begin immediately. The amber LED blinks continuously while readout and relaunch are in progress. Do not remove the logger when the amber LED is blinking.

4. After reading out the logger, the shuttle synchronizes the logger's clock to the shuttle's internal clock and relaunches the logger, using the description, channels to log, logging interval, and other settings that are already in the logger. (If the logger was launched with multiple logging intervals, the final defined logging interval will be used.) The logger is launched with a slight delay that causes its readings to be synchronized with those of the previous deployment, as shown in the following diagram.



5. When the relaunch has completed, the green LED blinks for 15 minutes or until you momentarily press the coupler lever to stop it. If the red LED blinks instead, there was an error and the logger may have stopped. Refer to "Troubleshooting" in the Onset Data Shuttle manual for details.
6. Remove the logger from the coupler.

B. Downloading data from the Data Shuttle to the CHaMP laptop:

You can download the data stored in the shuttle even when the batteries are depleted. Take the following steps:

1. Connect the Data Shuttle to a CHaMP laptop running HOBOware as described above in step 1 of initiating the Hobo tidbit.

NOTE: HOBO Shuttles require HOBOware Pro.

2. Choose **Manage Shuttle** from the Device menu.

Alternate Method: To quickly offload all of the new datafiles that are on the shuttle, choose **Readout** from the **Device** menu.

3. Choose files to offload:

U-Shuttle
All files are selected by default if the shuttle has not been offloaded before. To uncheck all files, click the **Uncheck All** button. To uncheck individual files, click the checkbox next to each file.

Waterproof Shuttle
Only the files that have not previously been offloaded *and saved* are selected by default. To check or uncheck individual files, click the checkbox next to each file. Use the **Check All** and **Uncheck All** buttons next to **Previously Offloaded Files** and **New Files (Not Offloaded)** to control the selection of these groups of files.

To automatically delete files from a Waterproof Shuttle after you offload and save them, enable the **Delete Contents Upon Offload** option. Files will be automatically deleted only after you successfully save them to the CHaMP host computer.

4. Offload Files

Click the **Offload Checked** button to begin offloading the data files.

Once offloading begins, the **Offload Checked** button will change to **Cancel Offload**. When offloading is complete, the **Files on Shuttle** panel on the Shuttle Management window will change to a **Files Offloaded From Shuttle** panel.

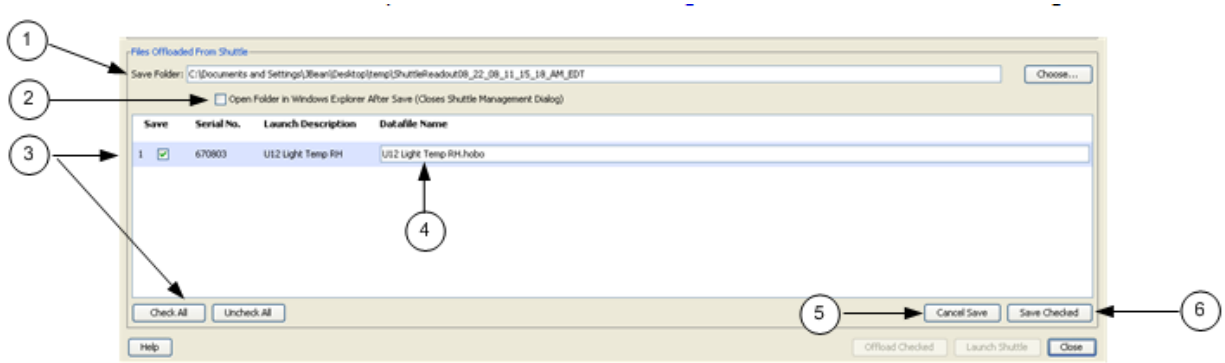
You can now save the files to your computer (See the following section, **Saving Files**).

5. Review the list of banks and delete any that are no longer needed. Make sure the battery level is good, and change the batteries now if they are weak. (If you change the batteries in the field, the shuttle's clock will stop, and the shuttle will not read out loggers.) Update the shuttle's clock, if necessary.
6. When finished, disconnect the shuttle from the computer and close the center cap securely.

C. Saving Files:

Before you can save files, you must offload them from the Data Shuttle, see prior section (**Downloading data from the Data Shuttle to the CHaMP laptop).**

Saving Files
The illustration below shows the parts of the Shuttle Management window related to saving files.



1. Save Folder

   The default location for the save is indicated in the **Save Folder** box. To change to another location, click **Choose** and browse to the location

2. Automatically Open Files

   To have the folder automatically open on the desktop after the files are saved, check:

   Windows: *Open Folder in Windows Explorer after Save*.

   Mac: *Open Folder in Finder after Save*.

3. Choose files to save.

   By default, all of the files you offloaded will be selected for saving.

   To uncheck individual files, click the checkbox next to each file.

   To uncheck all files, click the **Uncheck All** button.

   To save all files (if you have already unchecked a few), click the **Check All** button.

4. Data file Name

   Enter a new name if desired.

5. Cancel Save

   To exit without saving any files, click **Cancel Save**.

6. Save Checked

   Click this button to save all checked files.

   The files are saved to the specified folder.

Exporting Hobo tidbit data as a .csv file:

Before You Begin

To change preferences for exporting, Preferences > General > Export Settings (This is where you can specify to export the data as a .csv file type.

1. Open the .hobo or .dtf file(s) in HOBOware pro by navigating to the file: File > Open Datafile(s) that have been saved on the CHaMP laptop.

2. HOBO tidbit data will be displayed as a table or plot.

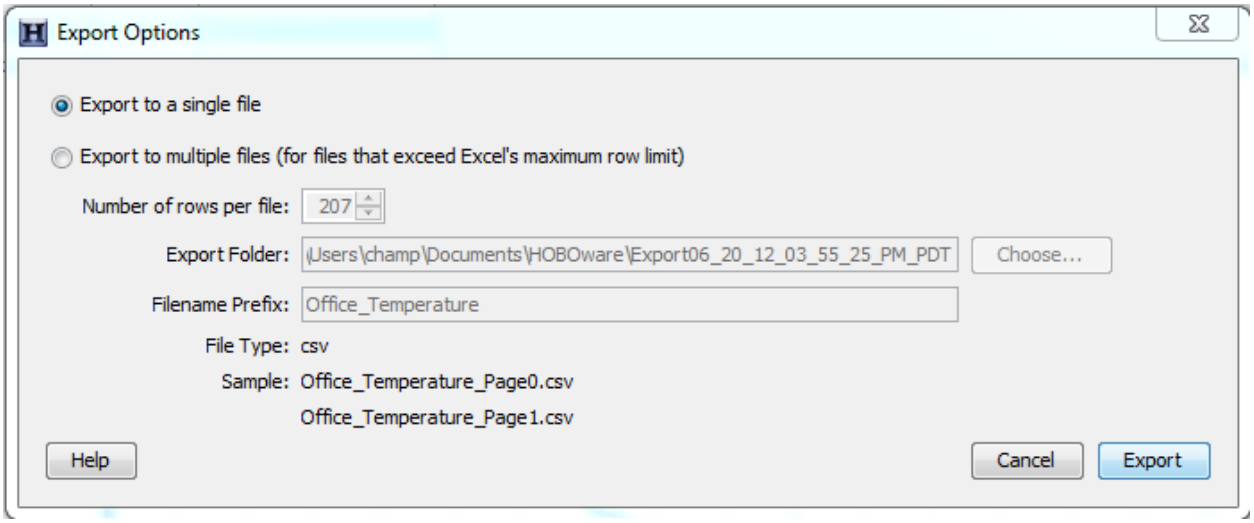
Steps

To export points:

1. Make sure the Points table includes the series you want to export. This might include series pasted from other datafiles, or series derived through filters or Data Assistants.

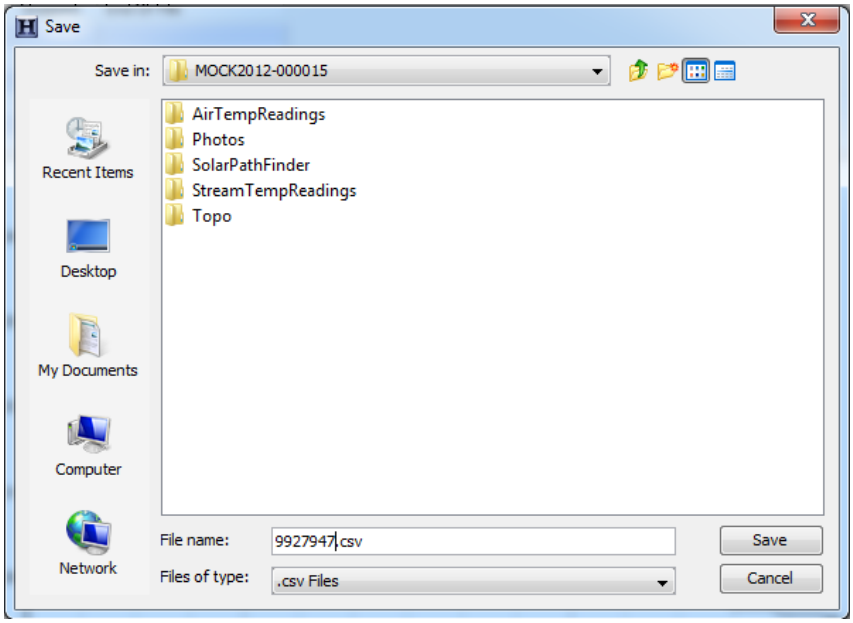
2. Click the Export icon  on the toolbar, or choose **Export Table Data** from the File menu.

The Export Options window appears.



4. Choose **Export to a single file** and click **Export**.
5. In the Save window, navigate to the folder

   "C:\ChampBroker\Organization\Crew\Hitch\SiteID\StreamTempReadings"



6. Name the file using the serial number from the logger plus the date when the data were downloaded (use "YYYYMMDD" format)
7. Click **Save**.

Copy Hobo Data File:

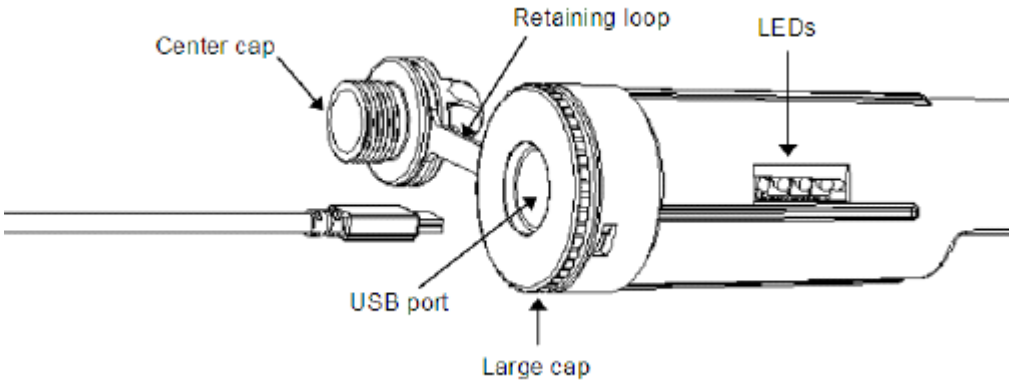
Move a copy of the Hobo data file into the survey folder. This will provide a redundant copy of the data to the CHaMP Broker in the hobo data file format.

1. Open the folder "C:\Users\champ\Documents\HOBOware\" or go to "Documents\HOBOware\"
2. This folder contains multiple files with the .hobo extension.
3. Select and copy the file for the given survey and then paste it into the folder

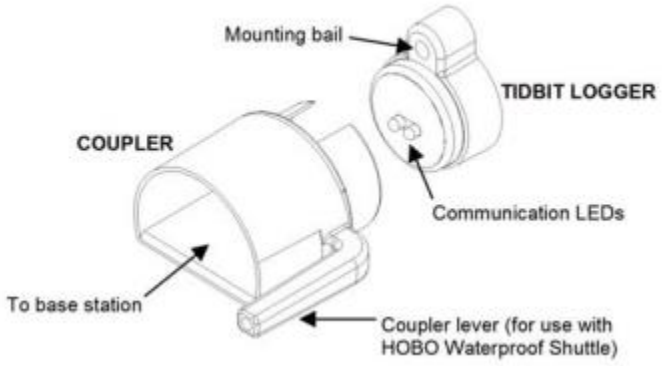
   "C:\ChampBroker\Organization\Crew\Hitch\SiteID\StreamTempReadings"

Deactivation of the Hobo tidbit:

1. If HOBO tidbit is on it will be flashing red.
2. Open HOBOware Pro software from the desktop.
3. Connect the Data Shuttle to the laptop via the USB port underneath the screw cap lid.

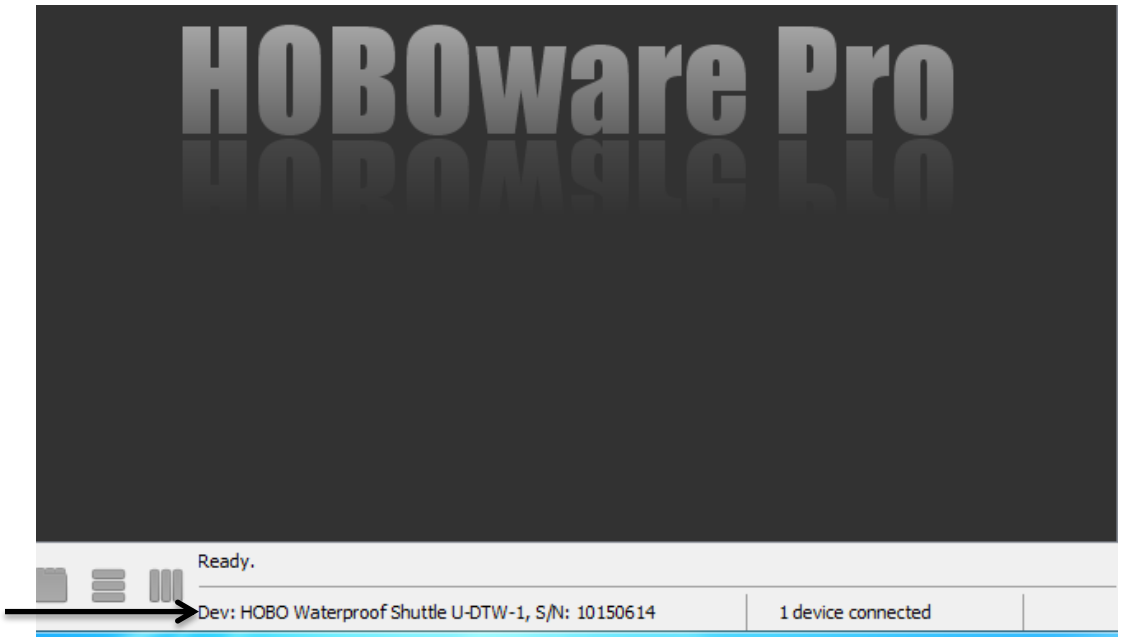


4. Connect the HOBO tidbit to the Data Shuttle. The following image does not show the full Data Shuttle only the coupler which is already connected to the Data Shuttle.

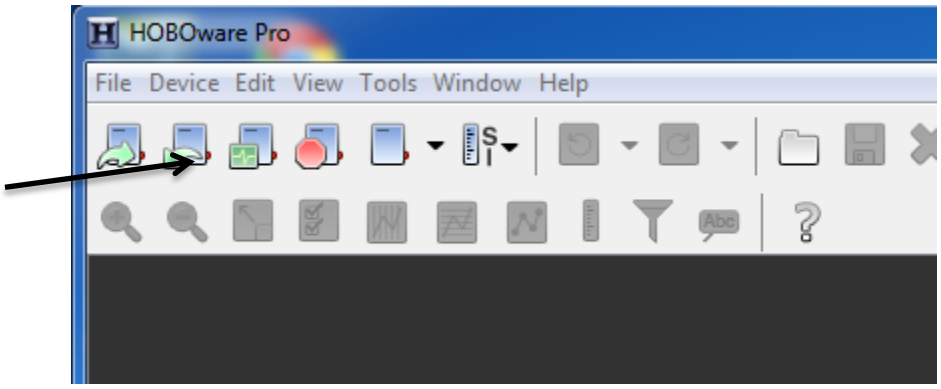


5. Once the tidbit is connected to the waterproof shuttle via the coupler press the coupler lever firmly. The amber TRANSFER LED light should turn on. Release the coupler lever and the green OK LED light should turn on.

6. After a few moments the HOBOware Pro software should recognize the HOBO tidbit and register the unique identification serial number at the bottom of the screen (see below).



7. You are now ready to turn off the HOBO tidbit. Navigate to the STOP icon located on the upper left icon with a red stop sign symbol.



8. Press the stop icon button and turn off the HOBO tidbit.

Appendix B: Onset HOBO Shuttle: Field Downloading Instructions

The Onset HOBO waterproof shuttle is used to download water temperature data from stream temperature loggers (TidbiTs) in the field. More detailed instructions on shuttle use can be found at: http://www.onsetcomp.com/files/manual_pdfs/10264-F-MAN-U-DTW-1.pdf

Step 1. Make sure the shuttle's large cap and center cap are closed securely. Tighten the center cap until it is just flush with the large cap, or until the O-ring is no longer visible.

Step 2. Make sure the communication end of the shuttle is clean. Attach the correct coupler for the logger, and ensure that it is seated properly.

Step 3. Insert the logger (TidbiT) into the coupler.

Step 4. Momentarily hold down the coupler lever and release. Readout should begin immediately. The amber LED blinks continuously while readout and relaunch are in progress. Do not remove the logger when the amber LED is blinking.

Step 5. After reading out the logger, the shuttle synchronizes the logger's clock to the shuttle's internal clock and relaunches the logger to start recording data.

Step 6. When the relaunch has completed, the green LED blinks for 15 minutes, or until you momentarily press the coupler lever to stop it. If the red LED blinks instead, there was an error, and the logger may have stopped. If this occurs, make sure that the logger is secure in the coupler (as close to shuttle as possible) and clean off any residue on the glass nodes of the logger. Retry. If repeated attempts fail, remove logger and replace it with new logger. Notify watershed lead about downloading error.

Step 7. Remove the logger from the coupler and return it to the stream.

Checking Shuttle Status in the Field

The shuttle's memory has 63 "banks." One logger's readout can be stored in each bank. To check the shuttle's memory and batteries in the field, remove the logger and press the coupler's lever for at least three seconds. When you release the lever, the green LED blinks once for each unoccupied bank in the shuttle's memory. (Press the lever momentarily to stop the blinking).

If the shuttle's batteries are running low, all of the shuttle banks are full, or the clock has not been set, the red LED blinks (press the lever momentarily to stop the blinking). Use HOBOware software to check the shuttle's battery level, available memory, and clock. You may need to change the batteries, or offload the data files to the host computer and delete them from the shuttle to free up memory before you can continue reading out loggers.