



BLM's Lotic Assessment, Inventory, and Monitoring (AIM)

Data Management and Quality Assurance and Control Protocol

2025 Field Season



**Produced by BLM National Operations Center (NOC) – 3/2025
VERSION 8.0**

National AIM Data Submission Disclaimer

The National AIM team reserves the right to reject data if data management and quality assurance and quality control requirements are not met. Rejected data will be deleted from the system and will not be stored in the AIM database or made available elsewhere. The following items must be complete in order for data to be accepted:

- All data collectors and data collector managers must attend a Lotic AIM Field Methods training or an approved (by the National AIM team) alternate training method prior to data collection every year.
- Data collectors must complete post-training calibration (more details outlined in Step 1).
- A photo review must be completed for every site sampled. Photo reviews must occur on a weekly basis following each trip.
- A data summary review must be completed for every site sampled. Data reviews must occur on a weekly basis following each trip.
- Data collector managers and/or Project Leads must meet with data collectors after every hitch to review issues and errors, answer questions and discuss critical concepts.
- Errors must be identified, reviewed, and resolved in a timely manner.
- A project check-in meeting must occur approximately one month into the field season. Data collectors, data collector managers, Project Leads, and National AIM Team members are required to attend this meeting.
- A project close out meeting must occur before the end of the contract/agreement such that data collectors and data collector managers/supervisors are still available.

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PROTOCOL OVERVIEW

The purpose of this protocol is to detail steps for managing data and assuring data quality (i.e., data quality control and assurance procedures) during the field season (Figure 1). The protocol describes six steps and includes responsible parties and required files and tools for each step.

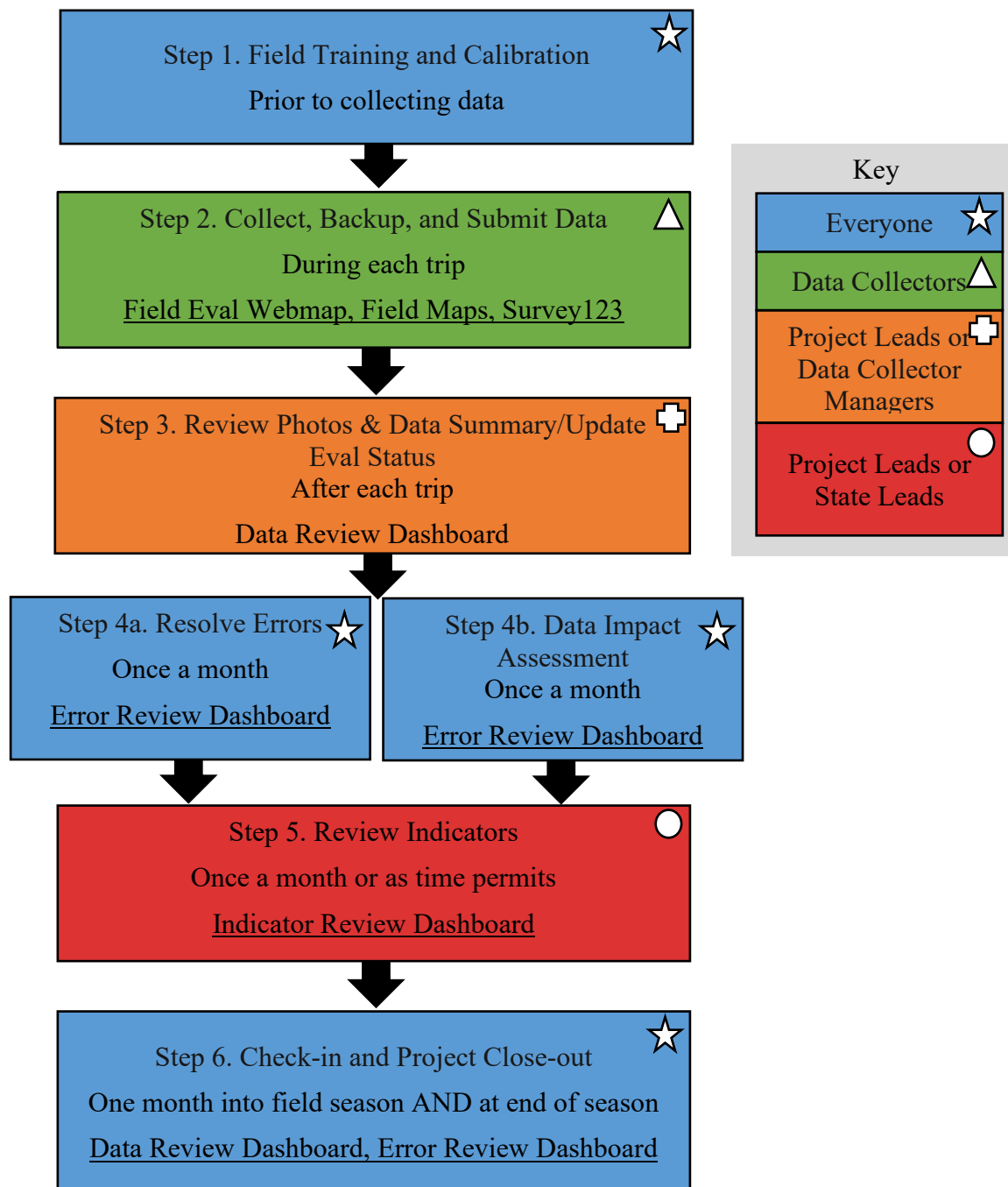


Figure 1. Six steps during the field season for managing data and assuring data quality.

The Lotic AIM Team has developed a series of ArcGIS Dashboards to better facilitate project lead and data collector manager review of raw and computed indicators. With Survey123 and ArcGIS tools, data is immediately available to project and data collector managers who are able to resolve issues quickly with data collectors and use local knowledge about the reach to review data integrity. The Lotic AIM Team checks some aspects of data integrity, such as basic data structure, but will not be reviewing raw data.

Users should consult this protocol for data collection, management, and ensuring data quality. Refer to the Technology Manual for details on how to use data collection tools such as Survey123 and Field Maps. If questions remain after reading this protocol, or other protocols found in the [BLM Library](#), please reach out to your contract or agreement holder lead, BLM Project Lead, or State Lead. If you need additional support, please contact the appropriate Lotic AIM Team member:

- Data Management questions: Logan Shank (lshank@blm.gov; 303-236-1161)
- Design related questions: Janet Miller (jlmiller@blm.gov; 303-236-1019)
- General project coordination and implementation support: State Lead and Meghan Krott (mkrott@blm.gov)
- Field data collection questions and QC questions (e.g., Survey123 and protocol): Kevin Poole (kpoole@blm.gov; 208-993-0463)
- Technology, applications, and QC questions (e.g., iPads, Field Maps): Ryn Cox (kcox@blm.gov)
- If someone from the list above is not available and there is an immediate issue, please contact Nicole Cappuccio (ncappuccio@blm.gov; 303-236-6112)

STEP BY STEP DIRECTIONS

Step 1 – Field Training and Calibration

Overview

Field methods training and calibration exercises increase data collectors' confidence and knowledge of the protocol, thus improving data quality. The Lotic AIM Team and local BLM resource specialists lead annual lotic AIM field methods trainings following TR 1735-2 Version 2, which includes pre-training online coursework. The main objective of this field-based training is for participants to be proficient in the application of AIM lotic core and contingent field methods. Training includes two calibration exercises, the first directly after teaching the methods to provide a practice-test approach, the second occurs on the last day of training to ensure data collectors are able to implement methods appropriately. The third and final mandatory calibration occurs in the region the data collector(s) will collect data after training and is combined with a mandatory field orientation exercise. This final calibration is essential to ensure that the skills and methods the data collectors learned at training are properly translated to the local systems in the region they will be working in.

Field training is a 6-day training run by the National AIM Team and States. More information about training dates, locations, and registration are found on blm.gov/AIM/training. Training requirements vary depending on type of participant:

- All lotic AIM training attendees must complete the lotic AIM online training materials before attending the field methods training. Returning data collectors must complete the online training material every year.
- Seasonal BLM data collectors, contract staff, or agreement staff responsible for lotic AIM data collection must have successfully completed lotic AIM field methods training during the year in which data will be collected.
 - In rare circumstances, staff responsible for lotic AIM data collection will be hired after all of the trainings have been concluded. All data collectors must be trained before collecting and submitting lotic AIM data. Contract/agreement managers, or BLM supervisors for BLM seasonals, must convey all staff changes throughout the field season with the National Lotic AIM team so that contingent training options can be identified. Failure to report staff changes may result in the National Lotic AIM Team rejecting all of the data collector's data.
- Permanent BLM staff collecting lotic AIM data must have successfully completed the entire 6-day lotic AIM field methods training within the last three years and must review protocol updates and training materials every year as a refresher. They should also have actively collected AIM data in the years since training attendance.
- Contractor/agreement staff not collecting lotic AIM data directly, but responsible for lotic AIM data collector management and lotic AIM data QAQC should attend training at minimum every other year.
- Contractor/agreement staff responsible for Multiple Indicator Monitoring (MIM) data collection must have successfully completed MIM training within the last three years and collected MIM data in the years since. Furthermore, the field botanist must be proficient in species level identification of riparian plants including difficult taxa (e.g., *Salix* and graminoids such as Cyperaceae, Juncaceae, and Poaceae).
- State Data Analysts/Specialists are required to attend training the first 3.5 days every 3

years, although it is recommended if they have not been to training previously to attend the full 6 days at minimum the first year. We highly recommend Data Analysts/Specialists become AIM trainers for their state-based trainings, this level of involvement improves data quality, interpretation, and analysis, and provides networking opportunities with the local BLM and NOC BLM.

- Project leads overseeing lotic AIM data collection but not collecting data should attend the first 3.5 days of field methods training every three years and review protocol updates every year.
- State leads are encouraged to attend the first 3.5 days of the training every 3 years but are not required.

Field training cannot fully introduce individuals to the diversity of stream types present on BLM lands, so a local orientation to critical geomorphic concepts and riparian vegetation is required. Two field orientation activities are recommended depending on BLM project leads and contractor/agreement staff availability and expertise. **At a minimum, Field Orientation Activity #1 (Field Tour of Critical Concepts and Protocol Review) is required.**

Similarly, field calibration is an important and required quality assurance step. The purpose of field calibration is to: 1) ensure the precision of collected data among field technicians; 2) assess the accuracy of collected data to the ‘known truth’ established by BLM and/or contractor/agreement staff; and 3) provide supplemental training opportunities for field technicians. Calibration occurs twice during field methods training, but similar calibration in local streams where data will be collected is critical for ensuring protocols are mastered and properly applied to local systems. **This local field calibration must occur before data collection begins**, but after the Local Orientation exercise(s). Field calibration should occur every time data collectors change geographic regions/ecoregions or are sampling in areas with different geomorphology. Calibration should be done multiple times during a sampling season for data collectors that work in large areas (e.g. statewide or national project data collectors) or move to different states to sample.

Responsible Parties

Field training: The Lotic AIM Team develops and leads content delivery for field methods training and State and Project Leads are recruited to host and/or serve as trainers. BLM project leads, contractor/agreement management staff (if applicable), field data collectors, and other BLM and contractor/agreement staff are required to attend as specified in the overview above.

Field orientation and calibration: BLM project leads, contractor/agreement management staff (if applicable), field data collectors, a BLM Botanist (or plant specialist), and other BLM and contractor/agreement partner staff as appropriate or available facilitate local field orientation and calibration. Ideally, subject matter experts in hydrology, geomorphology, and riparian vegetation would be present. State leads should notify the Lotic AIM Team when all calibration data from their state have been submitted using the Survey123 Lotic Calibration form.

Estimated Time

Week-long field trainings are conducted annually throughout spring and early summer. Field orientation and calibration occur after field training and prior to the start of data collection. It is recommended that field calibration be repeated any time data collectors switch to new areas that possess unique hydrologic, geomorphic, or vegetative conditions from that which they have been oriented and working. Field orientation takes 1 – 2 days and calibration 0.5 – 1 day.

Tools and Files

- [Lotic Field Protocol for Wadeable Systems TR 1735-2 Version 2](#)
- [Lotic Field Protocol for Wadeable Systems TR 1735-2– Changes](#)
- Videos and quizzes through DOI Talent
- [Lotic Master Gear List \(See Gear, Technology, and Forms Zipped Folder\)](#)
- Local riparian vegetation identification guides (See state specific channels on Lotic AIM Fieldwork Team)
- Survey123 Lotic Calibration Forms
- [Paper calibration data sheets](#) (See Gear, Technology, and Forms Zipped Folder).
 - Note that if you choose to use paper calibration sheets, you will need to transcribe the information into the Survey123 Lotic Calibration Forms in order to submit the data to the Lotic AIM Team.

Instructions

Field training

- A. Watch pre-training videos and complete video-based quizzes and activities
- B. Attend field methods training
- C. Complete two calibration exercises while at training

Field Orientation Activity #1 - Field Tour of Critical Concepts and Protocol Review

- A. Tour a variety of stream systems that represent the hydrologic, geomorphic, and riparian vegetation diversity data collectors will encounter throughout the field season. At a minimum, visit three different systems, but the more the better!
- B. At each of the visited systems, conduct the following exercises:
 - I. Work as a group to walk the reach and identify:
 - a. Scour line height
 - b. Bankfull height
 - c. Bench height

Review protocol section 2.2 and discuss what features were helpful indicators of scour, bankfull, and bench height versus unhelpful. Encourage data collectors responsible for data collection to lead these discussions.

- II. Review priority noxious and native woody vegetation at each system.
- III. Walk the reach to review the protocol related to bank stability and cover. Specifically, have the data collectors identify:
 - a. Erosional and depositional banks
 - b. Covered and uncovered plots

- c. Erosional features (fracture, slumps, sloughs, vertical banks)
- IV. Walk the reach to identify 3 – 4 pools. For each pool, have the data collectors identify or measure:
 - a. Pool tail
 - b. Pool head
 - c. Max pool depth
 - d. Pool length
- V. If measuring greenline vegetation composition, review greenline location and riparian plant species at each of the visited systems with the field botanist.
 - a. Ideally at least one BLM staff or contractor/agreement staff present would have knowledge of local riparian vegetation and the MIM greenline vegetation protocol. If this experience is present, work with the field botanist to review vegetation and greenline application while other individuals are working on step IV above.
- VI. If data collectors are measuring other contingent methods (e.g., nutrients, turbidity, bank angle, pool tail fines), ensure they are confident in the application of protocols to local systems.
- C. At the conclusion of the Field Orientation Activity #1, review major discussion points and reiterate any protocol application clarifications or corrections. If questions or clarifications exist for the Lotic AIM Team, capture those and identify who is reaching out to continue the conversations.

Field Orientation Activity #2 – Photo Review

- A. Review photos in state geomorphic guides or from past sampling efforts in your area to expose data collectors to as much geomorphic complexity as possible. State geomorphic guides currently have only been developed for some states.
 - I. If you have a state geomorphic guide, go over this guide with data collectors to further discuss the diversity of stream and river systems that they will encounter.
 - II. If you do not have a state geomorphic guide, please work with your state lead to develop one for the future, but in the meantime, locate past stream and river system photos taken during AIM, MIM, PFC or other field inventory, assessment, and monitoring activities to discuss with data collectors.
 - a. If you are a BLMer, AIM photos can be found using the [Lotic Historic Photo Viewer](#). This tool requires VPN/network access.
 - b. If you need to download photos in bulk, all photos can be located on the network at ...\\EGIS\\ReferenceNational\\environment\\BLM_AIM\\Lotic. Within this directory, photos are organized by Admin State and EvaluationID. If you need to download photos from the BLM drive, right click on a folder, file, or group of highlighted files, select “Copy”, and then navigate to your desired local folder, right click and select "Paste" into your personal location. Don't worry, you do not have IT permission to

delete or move files so you can't mess anything up. Logan Shank can also assist BLMers with getting bulk photos.

- B. Review photos with data collectors to identify and discuss critical geomorphic concepts – scour line height, bankfull height, and bench height.
- C. Have field technicians annotate 3 – 5 photos with critical concept heights (Section 10.4) and bank stability and cover plot locations (Section 10.5), as they would for sampled lotic AIM reaches. Review annotated photos and discuss results with data collectors.

Calibration

- A. Identify a stream reach having representative hydrologic, geomorphic, and vegetative conditions similar to those the data collectors will be working with this season. If the data collectors are working among multiple field offices or districts, more than one field calibration might be required. Do not calibrate on the same system used for field orientation activities.
- B. Do not discuss critical concepts or other aspects of the sample reach with field technicians prior to conducting calibration exercises.
- C. Set up 5 transects for field technicians to perform calibration.
 - I. Guidance from Section 4.0 of TR 1735-2 Version 2 – For this exercise do not follow Setting Up the Reach rather, optimize transect locations for:
 - a. Diversity of bank types
 - b. Presence of pools and large wood in the reach (Not all reaches will have large wood but try to select reaches with pools. If wood is not present, consider staging logs in the stream or measuring on uplands)
 - c. Riparian plots containing priority noxious and/or native woody species
- D. Have field technicians work in groups of two or three to perform the following measurements:
 - I. Bankfull and wetted width (Section 7.1)
 - II. Bankfull and bench height (Section 7.2)
 - III. Thalweg depth – at main transects only (Section 7.2.1)
 - IV. Bank stability and cover (Section 7.3)
 - V. Large wood (Section 7.6)
 - VI. Pools dimensions (Section 7.7)
 - VII. Pool tail fines (contingent) (Section 7.8)
 - VIII. Flood-prone width for a single representative riffle (Section 7.9)
 - IX. Priority noxious and priority native woody vegetation (Section 8.0)
 - X. Bank angle (contingent) (Section 7.11)
- E. Collect all calibration data electronically using the provided Lotic Calibration Survey123 Forms. If electronic data capture is not possible, print the spreadsheets, record data on paper, and then transfer the data into the Lotic Calibration Survey123 Form for submission.

- F. BLM and contractor/agreement staff (i.e., trainers) work together to take their own measurements for each of the above methods and take photos of all transects and plots. Data collectors collect data independently, but do not need to take photos.
- G. BLM and contractor/agreement staff review the data collector's values compared to Trainer values and discuss results with data collectors to provide course corrections.
 - I. Table 1 provides a guide for the desired level of precision among repeat measurements. Use these values as a starting point for when transects and/or plots should be revisited, and differences discussed.
 - II. Data collector values should be compared to "trainer" values, but keep in mind that we do not know the truth and any differences should be discussed and consensus achieved.
- H. All data collectors, BLM, and contractor/agreement staff results **MUST** be synced through Survey123 within one week of calibration. State leads should notify the Lotic AIM Team when all calibration data from their state have been submitted. **The Lotic AIM Team reserves the right to refuse data entry in the Lotic AIM database if calibration is not completed, unless previously approved.**

Table 1. Desired level of precision among repeat measurements taken as a part of calibration exercises. Use these values as a guide to determine when transects and/or plots should be revisited and differences in results discussed. Percent differences are to be assessed individually for each measurement per transect unless otherwise noted in relation to trainer values.

Measurement	Precision among repeat measurements
Wetted width	$\leq 10\%$
Bankfull width	$\leq 10\%$
Bankfull height	$\leq 15\%$
Bench height	$\leq 15\%$
Thalweg depth	$\leq 15\%$
Bank type ¹	90% of assessed plots in correct category
Bank cover ¹	90% of assessed plots in correct category
Bank erosional feature ¹	90% of assessed plots in correct category
Bank cover categories	$\leq 10\%$
# of pools ²	0 – 5 pools +/- 1; 6 – 10 pools +/- 2; > 10 pools +/- 3
Max pool depth	$\leq 15\%$
Pool tail depth	$\leq 15\%$
Pool length	$\leq 10\%$
Large wood (# of pieces) ³	± 1 or 15%, whichever is greatest
Flood-prone height	$\leq 15\%$
Flood-prone width	$\leq 10\%$
Bank angle	$\leq 10^\circ$
Pool tail fines	± 2 or 15% of intersections, whichever is greatest
Priority noxious	All priority noxious species identified in all plots
Priority native woody	All priority noxious species identified in all plots

¹Assess bank type, cover, erosional features, individually for each plot, but then compute the percent correct among the 10 assessed banks.

²Total number of pools observed throughout the reach

³Percent difference is assessed across all measurements taken throughout a calibration reach. For example, if 5 pieces of qualifying large wood were observed throughout the reach, acceptable data collector values for large wood would be between 4 and 6 qualifying pieces.

Step 2 – Collect, Backup, and Submit Data

Overview

Electronic data collection and submission is centrally managed by the National AIM Team. An iPad is required for electronic data collection and submission. Survey123 is used to collect field data, and Field Maps is used for navigating to points and recording which points were field visited. Use of Survey123 and Field Maps are part of field training, but proficiency is only gained through consistent use. To prevent information overload when learning the field protocol, we recommend that first-time users watch the Survey123 and Field Maps pre-training videos and follow along with the iPad. Detailed instructions on using Survey123 and Field Maps can be found in the [Lotic Technology Manual](#). Best data entry practices and requirements are detailed below.

Data collectors will need to backup Survey123 data during each trip using a USB flash drive device. Backups will allow data recovery if, for example, the iPad is lost or stolen. Field Maps data does not need to be backed up and can be recreated in the event it is lost. Data collectors should sync Field Maps data and submit completed Survey123 forms once they are back from their trip or are at a location where strong reliable internet access (4G or Wi-Fi) is available.

Responsible Parties

Field data collectors

Estimated Time

Data collection should occur when water levels are at baseflow between June 1 and September 30, with exceptions for climatic conditions that preclude data collection during this time. Data collection takes 4-8 hours per reach.

Data backup preferably occurs daily after every sampled reach, but it MUST occur after every two reaches. Backup to USB drives should only take 1-2 minutes. Final data submission should occur once data collectors have reliable Wi-Fi immediately during or after each trip. The Photos and Reach Coordinates form is much larger than the other forms and may require stronger Wi-Fi. Note there is a day delay between when the data collector syncs data and when the data summary PDF is posted on the Data Review Dashboard, but photos will appear instantaneously. If data collectors have tight windows to discuss the data summaries with data collector managers (see Step 3 below), data collectors should try to sync all forms except Photos and Reach Coordinates in the field ASAP before returning from their trip.

Tools and Files

- [Gear, Technology, and Forms Zipped Folder on BLM Library](#)
 - Lotic Master Gear List
 - Paper copies of field data collection forms
 - Macroinvertebrate and water quality labels
- [Lotic Field Protocol for Wadeable Systems TR 1735-2 Version 2](#)
- Local riparian vegetation identification guides
- iPad
- External USB drive

- Field Maps
- Survey123

Instructions

- A. Record field evaluation and reach statuses using Field Maps.
- B. Record all field data in Survey123 including photos and GPS coordinates.
 - I. Pay attention to app warnings and checks. Some warnings will not let you move on, while others will. If values are left after being warned, comments should be made (see Appendix A for more information).
 - II. Follow the Comment and Estimation protocols in Appendices A and B to make comments and estimate values where appropriate. Do NOT make extraneous comments. Only estimate values when allowed and flag any estimated or suspect values. Review all comments, paying attention to spelling and typos.
 - III. Appropriately mark what data was not collected vs. zeros
 - a. Zeros are data too!
 - b. Make sure all fields that were “Not Collected” are properly noted as such.
 - IV. Summary pages are provided as a quality assurance step at the end of all forms except Verification, Water Quality and Macroinvertebrates, and Slope which are simple enough not to need summary pages. As data is entered into a Survey123 form, the Summary Page is updated dynamically to display a summarized view of the data. Due to the complexity of nested repeats, we highly recommend that users review the summary page frequently while collecting Transect data to identify errors early so they can be fixed or recollected without spending a lot of time trying to scroll through everything and locate the error. Summary page content varies depending on the form but in general it has the following kinds of information/checks:
 - a. Min, Max, Avg
 1. The Transects and Pools forms summary pages compare minimum, average and maximum values recorded for channel and pool dimensions to try to highlight obvious data errors such as missed decimals or typos. At a minimum, be sure to review all fields in detail before you are finished with the form.
 - b. Outlier checks
 1. Bankfull width and height are especially important measurements and should be determined using a relatively continuous surface throughout the reach. Therefore, there should be minimal variation in these measurements unless geomorphology also changes.
 2. For any outliers that appear, think back to the channel dimensions across the reach. Was there a constraining feature such as a hillslope that caused the channel to change shape partway throughout the reach? Verify that you did not use a local feature that was not continuous throughout multiple transects to determine channel dimensions.
 3. If the outlier values are plausible but just due to features such as changes in valley geomorphology, make a comment to this affect. If a value was clearly wrong or seems questionable, very carefully

scroll through the form to find the location of the error. Paging through transects in Survey123 is tedious and you risk accidentally changing or deleting data unintentionally, this process should be done with great care and ideally prevented by checking the data summary intermittently. Once identified, recollect the data correctly and replace the incorrect value.

c. Missing data checks

1. Checks have been built into Survey123 to count the number of times a user said that a particular indicator was collected. This is particularly useful with repeats since it is easy to move onto the next transect without adding a right bank repeat. Ensure that each count makes sense. If you collected 3 transects with bank cover and stability data, your count of Bank Stability Collected should be 6 (2 banks collected per transect). If this number is odd or does not match what you collected, follow the steps in Outlier checks b.3. above to locate and resolve the missing data.
2. If one or more full transects in the Transects form were marked as not collected, classify the reach as “partial”. Make comments about how many PHAB transects were not collected and why they were not collected. If you already completed your verification form, you may need to reopen this form and update your Field Eval Status.

- C. In the rare circumstance that electronic data collection is impossible (e.g., iPad breaks), record all data on paper datasheets and then enter into Survey123 and Field Maps at a later date. Paper datasheets are only allowed in the uncommon event of an iPad breaking and becoming completely unusable or getting lost. If paper data sheets are used for more than one site, data collectors MUST contact the National AIM Team immediately to problem solve iPad issues. All data must be entered into Field Maps and Survey123 for the Lotic AIM Team to ingest it into the Lotic AIM database. Additionally, photos or scans must be taken of paper datasheets and uploaded to Teams.
- D. When you are finished with each form, use the check mark on the last page of every form to save it in your Outbox. When you return from your trip, you will need to return to your Outbox to send your forms and sync your offline area from Field Maps.
- a. Forms will need to be manually sent from each forms outbox. There is no way to send all forms at once.
 - b. Once the forms have been sent and you have synced your offline area, click on your Field Visits. Scroll down past the hyperlinks to launch your Survey123 forms to the Form Count section. Here you will see the names of all the forms and a count of the associated records. If a form was not submitted, you will notice that it says “No forms found” rather than a 1. If it says, “More than one form found” and you do not remember having to launch a second form to finish data collection, then you probably launched the form from the wrong Field Visit point. If this is the case, be sure to log an issue using the QC Comments form so that the Lotic AIM Team can fix this. This functionality is only available once your forms have been submitted and you have synced your offline area in Field Maps.

Step 3 – Review Photos & Data Summary and Update Evaluation Status

Overview

Within a week after a trip, project leads and/or data collector managers **must** review photos and data summaries for all sampled reaches using the Data Review Dashboard. The Lotic AIM Team has identified concepts that are most error prone and highlighted them in gray, gold, or blue on the data summary PDF. Additional data are provided to foster general discussions of the reach or protocol with data collectors as needed. We encourage, but do not require, review of this non-highlighted data. After reviewing the photos and highlighted data at a minimum, project leads and/or data collector managers use the QC Comments form linked in the Data Review Dashboard to record whether they agreed with data collector placement of critical concepts and any errors found. They must then contact the data collectors to discuss any issues and move on to Step 4 below to record resolutions to those issues. Data collector managers and/or Project Leads **must** meet with data collectors after every hitch to review issues and errors, answer questions, and discuss critical concepts.

The photos and data summaries should also be used to verify the ‘Eval Status’ for all field visited reaches. The ‘Eval Status’ in the Points layer tracks which reaches have been sampled or not. This status and the ‘Reason Not Sampled’ (if applicable) will need to be updated after data collectors field visit a point. This step overlaps with the Evaluation and Design Management Protocol Step 6. This is an iterative step in design management throughout the field season but is also relevant for data management. Updating evaluation statuses in the Data Review Dashboard or Office Eval Webmap ensures that data collectors are sampling the correct reaches and that the design is being implemented and tracked properly and consistently.

Responsible Parties

Project leads and data collector managers

Estimated Time

Review must occur within a week after each trip and takes 1-3 hours depending on the number of reaches and errors. Data summaries are generated nightly and available the day after data collectors submit data. If data collectors have tight windows to discuss the data summaries with data collector managers, data collectors should try to sync data in the field ASAP before returning from their trip. Photos on the other hand are uploaded to the dashboard instantaneously and can therefore be synced at the end of the trip with better Wi-Fi. Also consider scheduling the post-trip check-in with data collectors for the day before their next trip.

Tools and Files

- Data Review Dashboard

Instructions

General Data Review Dashboard Use

Prior to reviewing data from the data collector’s first trip, watch the [QC webinar](#) which covers detailed instructions on how to use the Data Review Dashboard. Only general instructions are provided below. The data review dashboard has the following key components (Figure 2):

1. Selector bar for filtering points by Project, Trip, and Evaluation Status
2. Selector panel for selecting one specific PointID or EvaluationID
3. The Map tab contains a webmap displaying design, field visit, and bottom and top of reach coordinates in addition to a pane that displays form counts
4. Photos and photo comments
5. Webmap with Points layer for updating 'Eval Status'. Also referred to as the Data Review Webmap
6. Link to the data summary PDF, QC Comments form and the Error Review Dashboard
7. The Project Status tab displays high level information on the status of QC workflows. This tab also stores assistance request information.
8. The Design Status tab displays sample size and design progress information. This tab was previously referred to as the Sample Size Dashboard.
9. Historic photos are available for users using the respective tab. EGIS – Historic Photo Viewer is designed for internal users and requires VPN/BLM network access.



Figure 2. Screenshot of Data Review Dashboard.

Quick Tips

- Instructions on how to use the dashboard can be found by clicking on the gray arrow on the left side of the screen to expand the panel. This panel also contains additional QC step filters.
- Symbolology
 - The symbol next to each point in the List of Points represents its status in the Points Layer. Similarly, the symbol next to each field visit in the Sampled and Not Sampled Field Visits sections represents its status in the Field Visits layer.
 - Pink points are unresolved errors.
 - Points with yellow donuts have had a photo review completed.

- Yellow points have had Eval Status reviewed and fully updated in the Points layer.
- A full list of symbology can be toggled on using the legend icon in the map.
- To enlarge any of the boxes on the dashboard, click the arrows in the upper right-hand corner of the box.
- The dashboard can be accessed on a computer or iPad. iPad users should access this dashboard using the hyperlinks in the Trip Details dashboard. Responding to edits must be done online. This dashboard cannot be taken offline.

Open the Data Review Dashboard from the BLM Natl Lotic AIM AGOL group page. Select the desired project and trip from the top orange bar (Figure 2, Label #1). This will filter the points displayed on the main map in the “Map” tab (Figure 2, Label #3) Select either a PointID or an EvaluationID using the left panel (Figure 2, Label #2). If a reach was visited more than once, use the Sampled or Not Sampled Field Visits tabs to select an individual visit. Then complete the following steps and repeat this process for each point on the trip:

Form Counts

- A. In the tab labeled “Map” (Figure 2, Label #3), locate the panel to the left of the map. Review the form count information and any warning messages. Ensure that all forms have been submitted and that any merged forms are properly documented using the QC Comments form (Figure 2, Label #6) before proceeding with Data Review.

Coordinates

- B. Using the map in the tab labeled “Map” (Figure 2, Label #3), compare the design coordinates (green symbol from the Points layer) with the sampled coordinates (blue symbol from the Field Visits layer). Ensure data collectors visited the correct location and did not incorrectly move the point coordinates in the field. If you have concerns, review the ‘PointMoved’ text in the data summary PDF (Figure 2, Label #6) which indicates if data collectors noted that the point was moved in the field. See section 3.2.2 in TR 1735-2 for guidance on moving the point coordinates.
- C. Review bottom (BR) and top (TR) of reach coordinates (Figure 2, Label #3). Ensure they fall on the stream and are approximately equally spaced from the F transect. If not, check the ‘Field Eval Status’ or other fields in the data summary to see if the point may have been partially sampled. If top, bottom or F transect coordinates appear incorrect properly document the issue using the QC Comments form (Figure 2, Label #6) before proceeding with Data Review.

Photos

- D. Page through the photos and photo comments (Figure 2, Label #4) to get a feel for the site. There should be photos for all visits to a reach even if it wasn’t sampled. If the reach was sampled, ensure that critical concept, flood-prone width, and bank cover and stability photos were taken and that unannotated copies were uploaded as well.
- E. If the reach was not sampled, use the photos and photo comments from the Not Sampled tab to determine if the ‘Reason Not Sampled’ is correct and update the ‘Eval Status’ and

‘Reason Not Sampled’ in the Points layer. Click the Field Visit point on the Webmap panel (Figure 2, Label #5) to see the “Not Sampled Comments”.

- I. If you agree with ‘Reason Not Sampled’, update the Points layer to match the Field Visits layer. If you disagreed with the data collector’s status, mark as a ‘Reattempt’ or update Points layer appropriately.
- II. Follow the instructions below to update an ‘Eval Status’ using the Data Review Dashboard:
 - a. With a PointID selected and highlighted blue on the left side of your screen (Figure 2, Label #2), in the center of the map, locate the tabs that say “Update Eval Status” (Figure 2, Label #5).
 - b. This will switch the default map to a fully functional webmap. Click the expand button in the upper right corner to make this full screen. Wait a moment. As soon as this webmap loads, it will automatically zoom you to the PointID you have selected in the dashboard and will open the popup for the Points layer.
 - c. At the bottom of the popup, hit “Edit”. The popup will change to the edit view.
 - d. Update your ‘EvalStatus’, ‘ReasonNotSampled’, ‘NotSampledEvidence1&2’, and any final comments. Note “field visit” may be recorded for one line of Not Sampled Evidence but the other should be descriptive based on your review.
 - e. When done, click the “Edit” button in the upper left corner of your page to stop editing. Then minimize this tab using the box in the upper right corner and switch back to the “Review Coordinates” tab in the center of your page.
- F. If the reach was sampled, review the critical concept photos in depth. Determine if scour line, bankfull, and bench heights are correct on the annotated critical concepts photos. Do the heights correctly correspond to local knowledge or gage data?
 - I. If there are questions about any of the lines or critical concepts data, reference the field protocol and ask data collectors the following questions:
 - a. What features from section 2.2.3 (Identifying Scour Line) were used to identify scour line?
 - b. What features from section 2.2.1 (Identifying Bankfull) did the data collectors use to identify bankfull?
 - c. Was the guidance in section 2.2.2 properly used to identify bench height?
 - II. Using the link in the lower-center-left box of the dashboard (Figure 2, Label #6), open the QC Comments form to “Log a Photo Review” and record the extent to which you agreed with the data collector’s placement of these features. Use the photo comments field to note anything that you want to discuss with the data collectors regarding their critical concepts. You must do this even if you agreed with all placements. This will let everyone know that the photos and the initial data has been reviewed. Points that have had photos reviewed are symbolized on the main map with a yellow ring around them.
 - III. After discussing the photos and critical concepts with data collectors, record notes from your discussion and any disagreements or data changes by opening the QC Comments form again and selecting “Log an Issue”. Then record your notes

and/or one of the following examples of possible errors. If an immediate resolution is still not possible the point will be pink until the errors have been resolved.

- a. Critical concepts were slightly off, but no major changes are needed. Protocol is clarified for data collectors for future reaches.
- b. Scour line placement was incorrect:
 1. Bank stability and cover data at a minimum may need to be omitted but see bank stability and cover section below.
 2. Streambed Particles and Canopy Cover data are also impacted by the location of scour, and these data for the reach may be suspect; Consult the Project Lead or State Lead for next steps.
- c. Bankfull placement was incorrect:
 1. Bankfull height was too low but can be inferred from bench height (i.e., bankfull heights should be replaced with the data recorded for bench height). If this is the case, consider how wrong bankfull widths are. If bankfull widths would be drastically different, some physical habitat data for the reach may be suspect; Consult the Project Lead or State Lead for next steps.
 2. Bankfull is incorrect and can't be inferred from other data. Some physical habitat data for the reach may be suspect; Consult the Project Lead or State Lead for next steps.
- d. Bench placement was incorrect:
 1. Bench height was placed too high and should be changed to equal bankfull height.
 2. Bench height was incorrect and should be omitted.

Data Summary

If the reach was sampled, open the data summary PDF using the link at the bottom-center-left of the page (Figure 2, Label #6). Review the data along with photos paying special attention to the gray, gold, and blue highlighted boxes on the data summary (Figure 3). Data not highlighted in gray, gold, or blue is not a priority but is provided to assist with discussions with data collectors.

Any issues found during this process should be recorded using the “Log an Issue” option in the QC Comments form. This form can be launched from either the dashboard (Figure 2, Label #6) or from the upper right corner green box of every data summary PDF. If something looks unusual, it is best to document it and then have the data collectors respond to the issue. Some things may look like issues but could very well be acceptable and explainable. We especially want these sorts of things recorded as these can be extremely helpful when reviewing data and indicators in future years.

Data collectors should never return to a sent form to fix identified issues. Always use the QC Comments form to document issues so that the Lotic AIM Team can implement any necessary changes.

To log an issue, walk through the form and answer the questions as best possible starting with if it was a technology (e.g., Survey submission issue) or data (e.g., remove slope data) issue and

ending with if there is an immediate resolution or not and who should address the issue. Immediate resolutions are usually either obvious mistakes or issues that you've confirmed with data collectors (e.g., talked to data collectors and confirmed slope was collected incorrectly and should be removed), these should usually be directed to the Lotic AIM Team so they can make the identified data edit. Things that might not have immediate solutions are issues that require talking to the data collectors, project lead, or state lead to determine what to tell the Lotic AIM team to do. Additionally, items that don't have immediate solutions might just be talking points that need to be discussed and confirmed with the data collectors such as "we noticed there was heavy beaver activity at your reach let's discuss and ensure you are confident in your protocol application". Then once these comments are discussed, they can be marked as resolved. Once an issue has been marked as resolved, it will automatically be added to a list for the Lotic AIM Team to review and implement.

Created: 3/26/2021 3:49 PM

AB-TR-1001

Sampled- Interrupted flow

Stream Name: Test Creek
Field Eval Date: 1/19/2021 11:02:56 PM
Protocol Reach Length (m): 150
Plot Moved?: No
(Crew Lead), Crew members - Field Visitors
 (Andrew Britton), Kelsey DeRose, Matt Sauer - Bob

Beaver **Beaver** **Water** **Weather**
Mods? **Signs?** **Withdrawals?** **Conditions?**
 Minor Rare Absent Clear

General Comments:
 Comment

Transects

*Side channels excluded from all channel dimensions and cover/stability statistics

	Min:	Avg:	Max:	n:	Est:	Not Collected:
Bankfull Height (cm):	23	28	36	11	0	0
Bench Height (cm):	23	30	39	11	0	0
Bankfull Width (m):	3.66	7.55	10.36	11	0	0
Wetted Width (m):	0.00	2.84	6.98	21	0	0

Thalweg Collected to Blank: 161 : 0
Min<(Avg)<Max Thalweg (cm): 3<(15) <98

Canopy, Substrate & Thalweg Comments:
 I don't like iced coffee

Channel Dim., Bank Angle, Cover & Stab Comments:
 My coffee is cold

Bank Cover, Stability & Angle

Launch Known Errors Form: <https://survey123.arcgis.com/s>

Bank Plots Collected to Not: 40 : 0
Count Erosional to Depositional: 35 : 5
Count Stable to Unstable: 27 : 13
Count Covered to Uncovered: 27 : 13
Avg % Cover (All Banks): 67.0%
Count Obtuse to Acute: 10 : 10

Transect Is... Missing: Wet: Dry: Not Collected:
Main and Mid: 0 16 5 0
Side channel: 0 10 1 0

Contingent Indicators:

What should have been collected / What was really collected

TNTP: No/Yes
Turbidity: No/Yes
Thalweg Profile: No/Yes
Bank Angle: No/Yes
Extra Bank Plots: No/No
Pool Tail Fines: No/No
Native Woody: No/Yes
Greenline Veg Comp: No/No
Veg Complexity: No/No
Core Subset1: No/No
Core Subset2: No/No
Core Subset3: No/No
Supplementals: No/No

*Currently not fully integrated with Lotic AIM Survey forms

Pools

Pool Status: Partially Collected Due to Accessibility or Interrupted Flow

# of Pools	Pool Reach Surveyed (m)	Total Pool Length (m)
5	120.00	28.52

% Pools: 23.77%

Pools with PTF Grids: 0

Tail Depth (cm)	Max Depth (cm)	Pool Length (m)
5	15	2.33
Min	8.8	42.6
Avg	15	63
Max	15	10.66

Pool Comments: Pooly

Estimated Pools: 0

Slope

Avg Elevation Δ ≈ % Slope: 480cm 3.2%

Slope Comments: Slopey

Collection Status: Fully Collected
Start & End Transects: A-K

Large Wood

Above Bankfull: 50
In Bankfull: 41
Total pieces: 50 41
Transect Collected to Not Collected: 20 : 0

Large Wood Comments: Pooly

Bugs & WQ

Collection Method and Net Type: Targeted Riffle - Surber net
Of Bug Jars: 5
WQ Samples: Blank and Duplicate and Original
WQ Date/Time: 1/19/2021 11:22:00 PM
Last Calibration Date: 1/19/2021 7:00:00 PM

Temp (C)	pH	Spec. Cond. (uS)	Avg Turbidity:
8.90	6.89	598	3

Bugs & WQ Comments: Coffee still cold *Flagged value

FPW

Location	Bankfull Width (m)	Bankfull Height (cm)	Thalweg Depth (cm)	Floodprone Height (cm)	Floodprone Width (m)	Rosgen Entrenchment Class	Lat / Long:
Location 1:	6.36	25	12	74	12.96	Moderate	(46.587935, -112.032035)
Location 2:	6.99	26	12	76	20.97	Minor	(46.587950, -112.032069)

FPW Comments: [Empty]

Veg and Human

Buildings/ Fire/ Hydrologic Alterations/ Instream Restoration/ Landfill Trash/ Livestock/ Horse Burns/ Logging Operations/ Mining/ Oil Gas/ Parks Lawns/ Pasture Hay Fence/ Pavement Cleared Lot/ Pipes/ Powerline Pipeline/ Recreation/ Road Railroad Culvert/ Row Crops/ Wall Dike Rip Rap

Veg and Human Influence Comments: Veggie and human-y

Figure 3. Data summary PDF that can be used to review data in relation to photos and local knowledge following each trip.

- G. Read all comments (gray boxes) to determine if the data collectors had any issues implementing the protocol or had any application errors. If there are any data in the comments that need to get added to the database, record this in the QC Comments form. Remember that "General Comments" and "Access Comments" are required for every

site. If these are missing, log an error and have the data collectors respond with comments to be added.

- H. Review all the data in the gold boxes to determine if the 'Field Eval Status' at the top of the page is correct, specifically the subcategories of sampled (i.e., Partial, Interrupted, Partial and Interrupted). If it is not correct, have the data collectors correct it in the Field Visits layer and then resync their offline area. Then submit a QC Comments form requesting that the Field Eval Status in the Verification form be updated, and mark as resolved. Additionally, determine if the data collectors properly implemented the protocol for any special situations (side channels, interrupted flow, partial data, beaver impacts, or braided channels).

- I. Partial Reach Check

- a. If there are any 'Not Collected' or 'Missing' transects in the large gold "Transects Is" box, ensure 'Field Eval Status' is "Sampled – Partial Reach".
- b. For partially sampled reaches, ensure that the data collectors did their best to collect as much data as possible. Targeted points should rarely, if ever, have a 'Field Eval Status' of "Sampled – Partial Reach". Partially sampled reaches should not make up more than 10-15% of sampled random points.
- c. Missing transects are identified by subtracting all transects with a status of wet, dry or not collected from 21 for Main and Mid transects or 11 for Side Channels. These are completely missing transects and can occur if the data collectors deletes a transect repeat, ends a reach early, or does not properly mark transects as "Not Collected". Unless data collectors have data recorded somewhere else, like on paper data sheets that can be submitted to make the reach complete, ensure that the 'Field Eval Status' is "Sampled – Partial Reach".
 - 1. Data collectors often forget to add their XK repeat in the Transects form when there clearly isn't a side channel present. This will result in 1 missing side channel. Remind data collectors to mark XK as absent at future reaches if it does not exist.

- II. Interrupted Flow Check

- a. If there are any dry transects, or 0s for min wetted width or min thalweg, ensure 'Field Eval Status' is "Sampled – Interrupted Flow".

- III. Compare 'Field Eval Status' to pools and slope statuses to ensure pools and slope were collected properly.

- a. Pools must have a 'Pool Status' of "Partially Collected Due to Accessibility or interrupted Flow" if the 'Field Eval Status' is "Interrupted Flow", "Partial Reach", or Interrupted Flow and Partial Reach". Additionally, in the above situation, 'Pool Reach Surveyed' must be less than the 'Protocol Reach Length'.
- b. Slope is less clear cut than pools, it is possible for 'Field Eval Status' to be "Sampled – Partial Reach" and have slope fully collected depending on which transects were inaccessible (e.g., H and I). If this occurs, use this as a discussion point with the data collectors.

- IV. Lastly, discuss special situations with data collectors. Ask data collectors if they have questions on how to implement the protocol. These protocols are nuanced, it

is extremely rare a data collector will not have at least one question the first time each special situation protocol is implemented. The following questions could be used to start conversations:

- a. Side channels: Were multiple side channels present and if so, which did you sample and why? What made you determine that the channels were separate by islands rather than mid-channel bars?
- b. Interrupted flow: What was the most difficult or confusing part of collecting macroinvertebrates and water quality? Were any concerns about the quality of these samples noted in the comments?
- c. Partially Sampled: What caused the partial sample? Did data collectors do everything in their ability (within safety limits) to collect all possible data?
- d. Beaver impacts: How did you decide or determine if this was a lotic vs. lentic or wetland reach?
- e. Braided Channels: Was it difficult to set up the reach?
- I. Review data in the blue highlighted boxes starting with the Core and Contingent Indicators.
 - I. Ensure the correct core and contingent methods and resulting data were collected. If the proper methods were not collected, discuss why not and ensure data collectors collect these data at future sites.
- J. Transects – Channel Dimensions
 - I. Most Channel Dimension issues should have been caught in the photo review but review the data here to ensure that the heights match those in the photos.
 - II. Additionally, check for any typos, unit issues, or a large number of estimated values.
- K. Transects – Bank Stability and Cover
 - I. Use the bank stability and cover specific photos to answer the following:
 - a. Did the data collectors place the plot in the right location (e.g., correct identification of scour and bankfull features)?
 - b. Did the data collectors correctly identify the depositional vs. erosional banks in the photo?
 - c. Did the data collectors properly identify erosional features (i.e., fracture, slump, slough, eroding)?
 - II. Use the rest of the reach photos and data in data summary to answer the following:
 - a. Does the proportion of depositional to erosional banks make sense?
 - b. Does the proportion of covered to uncovered banks make sense?
 - c. Did the data collectors correctly estimate foliar cover?
 - d. Did the data collectors correctly include perennial vegetation (including senesced vegetation) and exclude annual vegetation as cover?
 - e. Keep the following in mind
 1. It is rare to have more depositional than erosional banks.
 2. It is rare to have a high proportion of depositional and high proportion of covered banks.
 - III. If the answer to any of the above questions is no, ensure that the protocol is clarified for the data collectors for the future and record one of the following options in the QC Comments form for this specific reach:

- a. Bank cover data should be omitted.
 - b. Bank stability data should be omitted.
 - c. Bank cover and stability data should be omitted.
- L. Transects – Thalweg
 - I. Most methods have missing data and value checks on the summary pages of Survey123. However, thalweg does not. Check this box for missing data and the depths for typos.
- M. Pools
 - I. Review photos, number of pools, and percent pools to determine if the data collectors implemented the protocol correctly.
 - a. The most common issue is classifying runs as pools.
 - b. Note that just because it might not look like a pool doesn't mean it doesn't qualify using the protocol. Stress both lateral and longitudinal concavity and referencing the protocol often.
 - II. If pool tail fines is a desired contingent indicator, check that Pools with PTF Grids matches the # of pools. If it does not, discuss this missing data with the data collectors.
- N. After all data has been reviewed and errors recorded in the QC Comments form, use the instructions in Step D II above to update the 'Eval Status' in the Points Layer to "Sampled- Data Summary Reviewed".

Step 4a – Resolve Errors

Overview

The Error Review Dashboard is used to review and resolve data errors after data submission. Errors tracked in the dashboard come from three places: 1) Errors or comments recorded in the QC Comments form during Step 3 by project leads or data collector managers; 2) Data collectors that use the QC Comments form on their iPad to record errors after submitting forms; 3) Errors found during the Lotic AIM Team's weekly structure checks on raw data. In contrast, any errors identified during indicator QC (Step 5 below) will be reviewed and resolved in the Indicator QC Dashboard. At least once a month, project leads and data collector managers must review and resolve errors in the Error Review Dashboard with the help of the data collectors and state lead. At least once a month, state leads should review the number of unresolved errors and the date errors were recorded and resolved in the dashboard to ensure errors are being resolved in a timely manner. The Lotic AIM Team will review the dashboard every two weeks to resolve errors that require additional expertise. The Lotic AIM Team will make data edits once a month prior to calculating indicators for Indicator Review (Step 5). Indicators will only be calculated if all errors for a given reach were resolved.

Responsible Parties

Everyone

Estimated Time

Errors must be resolved monthly, but preferably after each trip. The longer errors go without being addressed, the greater the likelihood that the data collectors will not be able to remember the reach and will inadequately answer any questions that have arisen. The first few reaches may

generate a large number of comments or errors that may take an hour or so per site to investigate, but these should decrease significantly as the field season goes on. If there is continuing evidence of protocol confusion, we strongly recommend having a data collector manager or project lead meet up with the data collectors to sample a site, discuss critical concepts and protocol implementation and possibly conduct another calibration exercise.

Tools and Files

- Error Review Dashboard

Instructions

General Error Review Dashboard Use

- Prior to reviewing data from the data collector's first trip, watch the [QC webinar](#) which covers detailed instructions on how to use the Error Review Dashboard. Only general instructions are provided below. The error review dashboard has the following key components (Figure 4):
 1. Selector bar for filtering points by project and role
 2. Webmap displaying which points have resolved (yellow points) vs. unresolved errors (pink points)
 3. Descriptions of error and comments separated by unresolved, resolved, and photo review comment tabs. There are also tabs for complete and incomplete critical concepts data impact assessments.
 4. Transactional dialog detailing any back-and-forth discussions had prior to resolving an error
 5. The QC Comments form used to respond to and resolve errors
 6. Data Summary link
 7. QC Status Indicators

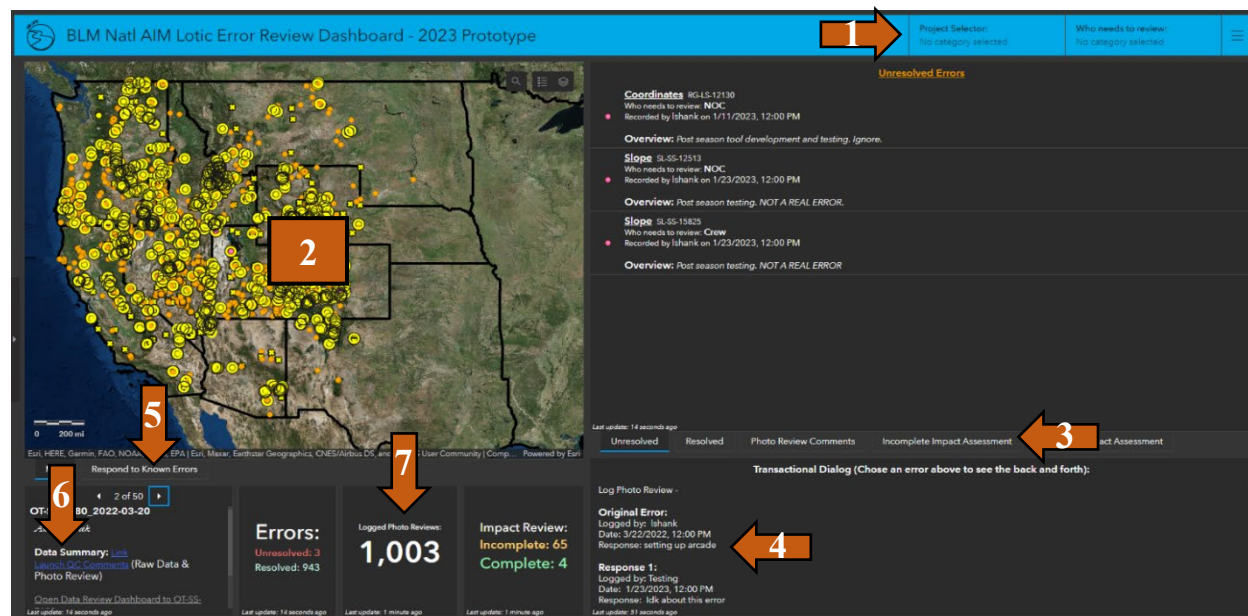


Figure 4. Screenshot of Error Review Dashboard

Quick Tips

- Instructions on how to use the dashboard can be found by clicking on the gray arrow on the left side of the screen to expanding panel.
- Symbolology
 - Pink points are unresolved errors.
 - Points with yellow donuts have had a photo review completed.
 - Yellow points have had their 'Eval Status' reviewed and fully updated in the Points layer.
 - A full list of symbology can be toggled on using the legend icon in the map.
- To enlarge any of the boxes on the dashboard, click the arrows in the upper right-hand corner of the box.
- The dashboard can be accessed on a computer or iPad. iPad users should access this dashboard using the hyperlinks in the Trip Details dashboard. Responding to edits must be done online. This dashboard cannot be taken offline.

Responding to Unresolved Errors

- A. Open the Lotic Error Review Dashboard from the BLM Natl Lotic AIM AGOL group page or the stack icon in the upper right corner of the Lotic Data Review Dashboard.
- B. Use the blue bar at the top (Figure 4, Label #1) to filter points for a given project and your specific role (e.g., crew or project lead). Note for the role filters you can select multiple options from the dropdown. Selected options have a blue tab to the left.
- C. Review the “Unresolved Errors” and “Transactional Dialog” section on the right side of your screen (Figure 4, Label 4 & 5). This list will be filtered based off your choices in B above and will be sorted so that the oldest recorded errors are on the top of the list.
 - a. Each error shows the type of error, its PointID, who recorded the error and when, and the initial error that was logged. Select an error from the list. Notice that it highlights your selection blue.
 - b. The “Transactional Dialog” box (Figure 4, Label #5) displays what has already been looked into and what information is still needed to resolve the error. This should be reviewed before responding to errors in case there are additional details, questions, or resolutions logged.
- D. To respond to the error, while it is selected and blue in the Unresolved Errors section, click the “Respond to Known Error” tab in the center of the page (Figure 4, Label #6). This will open an embedded Survey form and will prepopulate it based off the prior individual’s responses.
 - a. Scroll down to “Who needs to review this error” and update it based off who needs to review your response.
 - b. Next scroll down to the bottom of the page. Locate the question asking, “Log another response?” above the Submit button. Select “Yes”.
 - c. In the Date Reviewed box that appears, hit the “Recalculate” to pull in the current date. Next provide your comments or resolutions in the text box.
 - d. When you are finished hit Submit.
 - e. If you feel that the issue has been properly resolved, at the bottom of the form, select “Yes” for the resolved question. This will push it over into the “Resolved” errors tab on the right side of your screen. This may be switched back to unresolved if the provided response is deemed inadequate or inappropriate. Do not mark as resolved if the issue is not thoroughly resolved. Only data collector

managers, Project Leads or State Leads/Monitoring Coordinators should update this field when they are satisfied with the provided responses. Data collectors cannot resolve errors; the data collectors responses need to be reviewed by someone in the above list and then “Resolved”. The Lotic AIM team cannot resolve issues either, however they will review the “Resolved” issues and implement data changes as needed or “Unresolve” issues without adequate responses.

- E. From the list in the “Unresolved Errors” section (Figure 4, Label #4), select the next error on the list and repeat through steps C-D until everything has been responded to.

Step 4b– Critical Concepts Data Impact Assessment

Overview

A Critical Concepts Data Impact Assessment is required whenever there are significant concerns (disagree or strongly disagree) with the data collector’s placement of critical concept features to determine the impact these potential errors have on the data. If the data collectors misidentified critical concept features, the data from other methods will also be impacted (Table 2). The Impact Assessment is triggered during the ‘Log a Photo Review’ process and the Error Review Dashboard is used to review and record feedback. Once triggered the Lotic AIM Team recommends a group effort with the project lead, data collector manager, and data collectors to review the information. However, it is ultimately the project lead’s responsibility to review and submit the completed assessment. Preliminary indicators will not be computed or posted if there is an incomplete assessment associated with a particular reach.

This step ensures that project lead focuses on reaches with potential data concerns and if concerns exist that they are properly flagged in or omitted from the Lotic AIM database. Finally, this step should be used to provide feedback to the data collectors about the concerns and how to make sure issues do not persist across other reaches. For that reason, it is important that these assessments be completed in a timely manner, ideally after each trip.

Table 2. Field methods potentially impacted by incorrect geomorphic feature identification and critical concepts placement.

	Scour	Bankfull	Bench
Bankfull Width		X	
Bankfull Height		X	
Bench Height			X
Bank Stability	X	X	X
Bank Cover	X	X	X
Bank Angle*	X	X	X
Streambed Particles	X		
Canopy Cover	X		
Vegetation Presence/Absence	X		
Floodprone Width		X	
Large Wood		X	

* = Contingent method

Responsible Parties

Lead and final decision maker: Project Lead or State Lead

Additional participants: Data collectors, Data collector Manager, other specialists

Estimated Time

Critical Concepts Data Impact Assessments are only required if the initial data reviewer disagrees with the data collector's placement of a critical concept feature. If necessary, these assessments should be completed monthly, but preferably after each trip. The more time that lapses before an assessment can be completed, the greater the likelihood the data collectors will continue to make mistakes in the field and risk impacting more data before they can be corrected. Depending on the severity of the data collector's critical concepts determinations, one Critical Concepts Data Impact Assessment can take between 20mins-1hr to complete.

Tools and Files

- Error Review Dashboard

Instructions

Conducting a Critical Concepts Data Impact Assessment:

- A. Open the Error Review Dashboard and set the Project Selector at the top of the page.
- B. On the right side of the page open the "Incomplete Impact Assessment" tab
- C. Select the first record displayed in the list so that it is highlighted
- D. In the lower left-hand corner of the page, click the link to open the Data Review Dashboard to the selected reach. This will be important later so that you can review the data collectors photos and Data Summary PDF.
- E. On the right side of the page, open the "Photo Review Comments" tab. Review the initial photo reviewers comments and feedback, then return to the "Incomplete Impact Assessment" tab.
- F. Click Begin Critical Concepts Assessment to open the Critical Concepts Data Impact Assessment form. This is the only location that this form should ever be launched from.
- G. The Critical Concepts Data Impact Assessment Form will open in a new tab in your browser.
- H. Record the names of everyone present during the assessment. Only one form needs to be submitted. Every person participating in the assessment should not fill out their own form.
- I. Next indicate if there is revisit data available that you are using to influence these decisions.
 - a. To view revisit data, go to the Data Review Dashboard that you opened in step D.
 - b. This dashboard should be zoomed to the reach you have selected in the Error Review Dashboard.
 - c. At the bottom of the page, locate the "EGIS – Historic Photo Viewer" tab and open it. Within this pane, there will be a list of EvaluationID and StreamNames on the left. Select the visit you want.
 - d. Historic photos and comments will be available in the panel to the right.
 - e. In the lower left corner of this tab, locate the Lotic Data Portal URL and click it.

- f. This will open the AIM Lotic Data Portal and zoom you to your selected visit. For more information on using the Lotic AIM Data Portal, reference the Data Portal Quick Start Guide linked in the upper left side panel of the Data Portal.
- J. Bank Angle is a contingent method that not everyone collects. If your project is collecting Bank Angle, ensure that you check Yes.
- K. The impacted critical concepts should be passed over and defaulted in the form for you. The critical concepts that were impacted will determine what field methods need their data reviewed.
 - a. Minimize the Critical Concepts Section of the form after ensuring these were passed over.
 - b. **Changing these choices after completing the following sections of the form will wipe your information!**
- L. The rest of the form will display the field methods that are directly impacted based on the questionable identification of critical concept features displayed in step K.
- M. Expand the first group.
 - a. Each field method contains a link to a web version of the TR 1735-2 Field Protocol for Wadeable Lotic Systems. Each link will open this PDF document to the exact page that method is introduced allowing everyone participating in the assessment to quickly become familiar with how incorrect critical concepts impact the data.
 - b. Return to the Data Review Dashboard and review the data collectors photos from the reach and their comments.
 - c. Open the Data Summary PDF using the link in the lower left hand corner of the dashboard. Review the relevant information in the PDF.
 - d. If necessary, go to the “Update Eval Status” tab in the Data Review Dashboard to look at the raw field data.
 - e. As a group, discuss the method and how it was collected, if critical concepts are indeed incorrect and to what degree, and to what extent that those incorrect critical concept features are impacting the methods data.
 - f. Determine if you think there is No, Minor, or Major impact to the methods data. Record your notes and feedback in the appropriate box below.
 - g. Next the project lead needs to make a final decision on if data is Not Impacted, Impacted but should be retained with flags and comments, or should be Omitted.
- N. After completing the first method, minimize it, expand the next one on the list, and return to step M.
- O. Once every method has been reviewed, hit the “Submit” button at the bottom of the page.
- P. Once submitted, the Lotic AIM Team will review your assessment and begin implementing the project leads prescribed action.

Reviewing Completed Critical Concepts Data Impact Assessment's

- A. Open the Error Review Dashboard and set the Project Selector at the top of the page.
- B. On the right side of the page open the “Complete Impact Assessment” tab.
- C. Locate the reach you are interested in and click the “Open Impact Assessment Summary” link to open the PDF summary in a new page.
- D. PDF Summaries are generated each night after a new assessment is submitted and are updated automatically.

Step 5 – Review Indicators

Overview

The objective of indicator review is to ensure the accuracy of collected field data and resulting indicators. Indicators will be calculated and posted once a month for review on the Indicator Review Dashboard. Indicators will only be calculated once Step 4 is fully complete. Project Leads are responsible for reviewing indicators for their project. Indicator review would ideally occur once a month and must be complete by the end of the field season. Data collector managers may also review calculated indicators as desired, but this will not take the place of the Project Lead's review. State analysts may assist Project Leads with indicator review however Project Leads must remain involved in this process, and they retain all final decision-making authority for their data. If concerns are found during indicator review, Project Leads should record and discuss concerns with state leads/coordinators or other project leads in the state to resolve as many issues as possible. If additional expertise is needed to come up with a resolution, the Lotic AIM Team should be consulted.

Responsible Parties

State Leads, Project Leads, state analysts and the Lotic AIM Team

Estimated Time

This occurs once a month and must be completed by the end of the field season; 3-5 hours if done monthly. We strongly encourage doing this task one site at a time over a month or set aside a ½ day per month to make review more manageable and to catch any errors ASAP, so they do not persist through the summer.

Tools and Files

- Indicator Review Dashboard

Instructions

General Indicator Review Dashboard Use

- Prior to reviewing data from the data collector's first trip watch the QC webinar which covers detailed instructions on how to use the Indicator Review Dashboard. Only general instructions are provided below. The Indicator Review Dashboard has the following key components (Figure 5):
 1. Selector bar for filtering points by Project and whether indicators have been reviewed.
 2. Map Tab – Select filtered points, review spatial information and access to Data Summary PDF and Indicator Review - QC Comments.
 3. Review Indicators Tabs – Computed Indicators are grouped into panes of similar items to review. Revisit information is included where available. Data is flagged based off the EcoregionStreamSize field in I_Indicators.
 4. Photos from the current field season in categorized tabs.
 5. Historic Photo Viewer Tab – Displays all available previously evaluated Lotic AIM photos and provides a linkage to raw data in the Lotic AIM Data Portal.
 6. Error History Tab - Descriptions of any found errors and comments separated by unresolved, resolved, and photo review comment tabs. Information about

completed Critical Concepts Data Impact Assessments is also displayed. This section also include a web enabled Survey123 form to respond to logged errors.

7. Data Review Webmap Tab – This tab includes access to all raw Survey123 field data for power users that want to dig into their data and see why things are being computed the way they are.
8. Optional: StreamCat Tab – This tab integrates StreamCat into the Indicator Review process to provide a more in depth look at what is occurring within the reaches watershed.

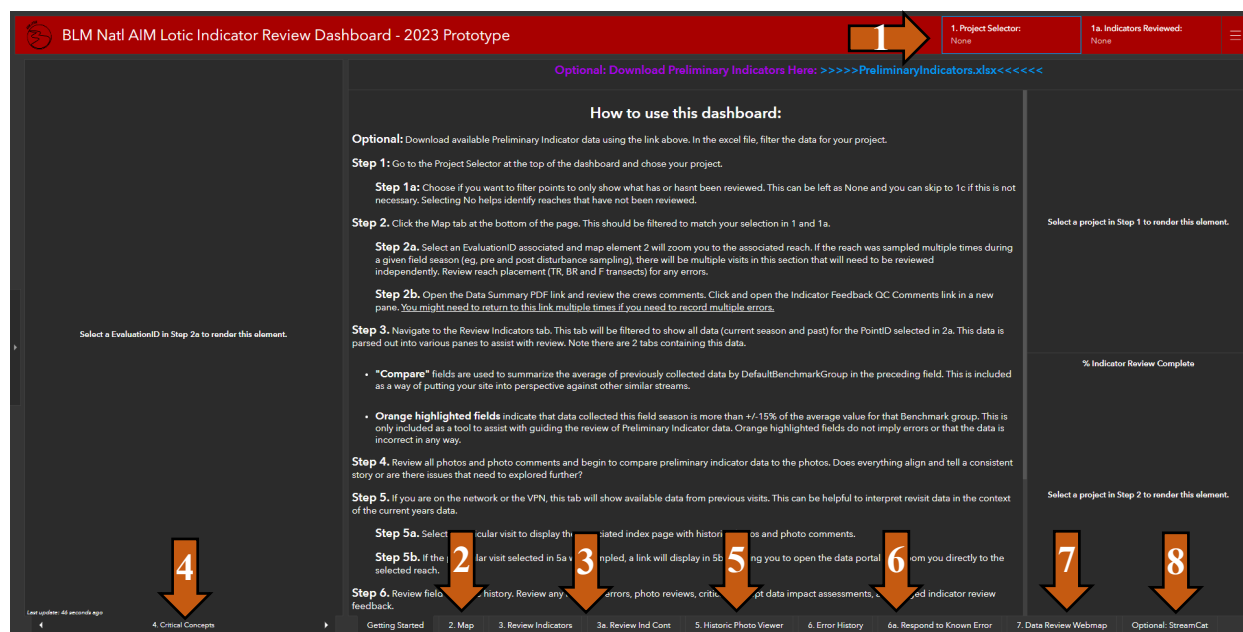


Figure 5. Screenshot of the Indicator Review Dashboard

Quick Tips

- Instructions on how to use the dashboard can be found by clicking on the gray arrow on the left side of the screen to expanding panel.
- Symbolology
 - Once indicator review is recorded as completed for a given point using the QC Comment form, points will have a thin black line around the yellow donut.
 - A list of full symbolology can be toggled on using the legend icon in the map.
- To enlarge any of the boxes on the dashboard, click the arrows in the upper right-hand corner of the box.

Indicator QC

- A. Open the Lotic Indicator Review Dashboard from the BLM Natl Lotic AIM AGOL group page
- B. Review the Getting Started splash page. This page provides step by step instructions, so if you are ever lost return to this tab to get your bearings. The process of how indicators are served out has been drastically updated. You may still download your indicators as an excel sheet, however this is no longer a required step.

- C. Select your project from the Project Selector (1) at the top of the page. Next, using the Indicators Reviewed Selector (1a) select “No”. This will filter out any reaches that you have already reviewed Indicators for.
- D. Open the Map tab (Figure 5, Label #2). Select the first reach from the list on the left (2a).
- E. Review the reach’s placement on the map (2) against satellite imagery and orient yourself to the area. If the reach has been previously evaluated, compare both reaches top of reach, bottom of reach and F transect placement.
- F. In the lower left hand corner (2b), open the Data Summary PDF and review the data collectors comments.
- G. In the same pane (2b), launch a QC Comments (Indicator Review) form in a new tab. You will fill this out during your review. After completing an Indicator Review form, either refresh your webpage to submit another for the same reach or return to this link (2b) and launch another. This is the only location where Indicator Review feedback can be recorded. All other QC Comments links are configured for recording and tracking Field Data QC issues.
- H. Open the first Review Indicators tab (Figure 5, Label #3). Indicators are organized and arranged into panels allowing the user to see and compare multiple indicators at the same time.
 - I. If the reach has been previously evaluated, revisit data will be included in each panel as a reference. Guidance for reviewing reaches with revisit data can be found below in step S.
 - II. To the right of each indicator, there is a “Compare” field. All available lotic data was aggregated by EcoregionStreamSize in I_Indicators and a mean value was determined for each Indicator. Current season data points are compared to this mean Indicator value based on its EcoregionStreamSize. If the current data point is more than +/- 15% from the mean EcoregionStreamSize value, it is highlighted orange. THIS DOES NOT MEAN THE VALUE IS INCORRECT. This was added to spur conversations and guide you through reviewing your data.
 - a. How might this reach be different than others in the same EcoregionStreamSize?
 - b. Is this reach on the fringe of an EcoregionStreamSize area?
 - c. Are there any management activities in the area that might be associated with this difference?
 - III. The panels in the upper right hand corner display the AIM equivalent of a Rosgen Channel Classification system. AIM Width to Depth differs slightly from Rosgen’s calculation since AIM uses the one thalweg measurement plus bankfull height to determine depth at each transect and Rosgen averages depths across the width of the channel to create an average channel depth.
 - IV. After reviewing the information on the first Review Indicators tab, proceed to the Review Ind Cont tab (3a) for additional information that would not fit on the first tab.
- I. Review the photos (Figure 5, Label #4) to get a feel for the nature of each reach. For example, is the reach high versus low gradient, confined versus unconfined, or highly impacted by management or unaltered? All photos are categorized into tabs. Click the tabs name to select your next tab from a list or use the arrows to navigate.

- J. Given what you observed in the photos, do the covariate values such as slope, sinuosity, and bankfull width make sense? For example, do entrenchment, sinuosity, and slope values follow patterns expected by stream typologies like the Rosgen Classification (e.g., It is rare to observe reaches with both high slope and high sinuosity or high slope and low entrenchment).
- K. Do groups of indicators tell a consistent and/or logical story at each reach? If not, review pictures, data collector comments, and consider the reasons this could be the case. For example:
 - I. Are there consistent patterns between bank overhead cover and bank cover? For example, both low bank overhead cover (PctBankOverheadCover) and low bank cover (PctBankCoveredMIM). It is rare to have high bank overhead cover and low bank cover unless the overhead cover is all greater the 0.5 m in height .
 - II. If bank stability is low (PctBankStable), is the percent of covered banks (PctBankCoveredMIM) also low? It is rare to have a large percent of banks covered and yet have low bank stability .
 - III. Does the number of pools (PoolCount) and percent pools (PctPools) seem practical for the observed slope, sinuosity, and general reach characteristics? The number of pools generally increases as sinuosity increases and slope decreases, for example. Exceptions include high slope reaches with step-pool geomorphic features.
 - IV. Do floodplain connectivity and entrenchment ratio indicator values tell a consistent story? For example, stream channels with well-connected floodplain connectivity are generally associated with little to no entrenchment. However, exceptions exist where minor channel incision is present. Similarly, in V-shaped valleys with no potential to support benches, floodplain connectivity values should be 1, as bankfull and bench heights are measured as equal.
- L. If the reach has been previously evaluated, open the Historic Photo Viewer tab (Figure 5, Label #5), and select the visit from the list on the left (5a). Once selected, all photos and photo comments will be displayed in the window on the right.
 - I. If you receive a 404 error, that means we do not have any photos for this visit.
 - II. Once a visit is selected, you can instantly jump to that visit in the Lotic AIM Data Portal using the link in the lower left corner (5b) to explore the raw data further.
- M. Next open the Error History tab (Figure 5, Label #6) and review all “Transactional Dialog” of the QC information related to the selected reach. Select an element in this pane and then review the information displayed in the “Transactional Dialog” box.
 - I. Review all Resolved Errors to see what data changes were made. If nothing is returned in this section, review the indicators carefully.
 - II. Review the feedback from the individual who conducted the initial Photo Review.
 - III. Review any Indicator feedback that has already been recorded.
 - IV. If the reach required a Critical Concepts Data Impact Assessment, review the information available in the linked summary PDF.
- N. If at any point you wish to respond to a logged QC item to provide more details, information, or feedback, select the QC item in the Error History tab, navigate to the

Respond to Known Error tab (6a) and use the QC Comments form to provide more information in the next available response box.

- O. OPTIONAL: If you wish to dive deeper into the current field seasons data to determine why a particular indicator is being computed a certain way, navigate to the Data Review Webmap tab (Figure 5, Label #7). This tab will automatically be zoomed to the reach you have selected. Click on the Points layer and select “Show Related Records” to look at available raw data.
- P. OPTIONAL: Curious about other factors in your reaches watershed that could be impacting its data? Open the Optional: StreamCat tab (Figure 5, Label #8) to see what information EPA StreamCat has for your reach’s catchment and watershed.
 - I. Locate the map in the upper left corner and chose the selector box from within its upper left corner.
 - II. Next select the NHD segment associated with your reach.
 - III. Once selected, a histogram will display in the lower left corner displaying annual mean discharge by month.
 - IV. On the right, a Watershed Report will be rendered on the EPAs website for the selected stream segment.
- Q. To record the outcomes of the above review, open the QC Comments form using the Dashboard (Figure 5, Label #2) – 2b. Both positive and negative outcomes must be recorded. If no errors were found, mark that everything looks good and submit. Identified errors should be recorded individually to ensure that all data decisions are properly tracked and implemented. For each error choose the method the issue is most associated to, mark whether to flag, omit or edit the data, and provide a comment and reasoning. If follow up is needed to resolve the error still record it as an error, use the “Flag” category, and make clear comments. This is the only location where Indicator Review feedback can be recorded. All other QC Comments links are configured for recording and tracking Field Data QC issues. Examples:
 - a. Omit data – percent pools was 100%, which is an unrealistic value. The data collectors clearly misapplied the protocol and classified runs as pools.
 - b. Flag data – percent pools seemed high at 40% based on local knowledge of the system and the photos taken, but it is unclear what the true value is.
 - c. Flag data – Bankfull height seems off, but not by very much, I’d like to follow up with other project leads or the state lead before making a decision on whether to omit or keep as a flag.
 - d. As the resource expert, be sure to take good notes during indicator review. This information is saved in the Lotic Database and is provided to end data users through various other tools. The better notes and feedback you provide, the more confidence users will have when it is being used later.
- R. After completing one reach, return to step D, select the next reach on your list and repeat the process.
- S. Use the following guidance to review all indicator data for reaches with multiple visits. Any questions or discussions that cannot be resolved by consulting other project leads within your state or your state lead/ coordinator should be raised with the Lotic AIM Team.

- I. Review photos (Figure 5, Label #4) and reach coordinates displayed on the dashboard map (Figure 5, Label #2) to determine if sampling conditions and reach placement were similar or if major changes occurred at a reach.
 - a. Historic photos can be found using the Historic Photo Viewer tab (Figure 5, Label #5).
- II. Quickly review field comments from the data collectors (Figure 5, Label #2) – 2b.
- III. Review the “Transactional Dialog” for any field errors (Figure 5, Label #6). Follow details in step M above.
- IV. Review Indicators (Figure 5, Label #3) and compare covariate values to the photos and through time. Any large differences in covariates are particularly concerning because things such as stream slope usually do not change appreciably among years.
- V. Compare sample dates among visits to determine if any protocol changes or natural temporal variation were likely. The following are key protocol changes to be aware of:
 - a. Change in 2019 to collecting bank foliar cover rather than bank basal cover. These will appear as separate indicators but could result in higher cover values from 2019 on, and lower values from 2013-2018.
 - b. Changes in location of canopy cover measurements along the bank (i.e., from water’s edge to scour), which could result in higher canopy cover values from 2016 on, than those measured from 2013-2015.
 - c. Changes in the extent of collected streambed particles (e.g., scour to scour vs. wetted edge to wetted edge). Data from 2013 could be biased towards higher median particles sizes and lower percent fines, for example, than data post 2013.
- VI. Compare logical groups of indicators among sample events keeping in mind which indicators should or shouldn’t be expected to change much through time. Absolute value changes through time should be considered in an ecological or geomorphic context.
- VII. To record the outcomes of the above review, open the QC Comments form using the Dashboard (Figure 5, Label #2) – 2b. Both positive and negative outcomes must be recorded. If no errors were found, mark that everything looks good and submit. Identified errors should be recorded individually to ensure that all data decisions are properly tracked and implemented. For each error choose the method the issue is most associated to, mark whether to flag, omit or edit the data, and provide a comment and reasoning. If follow up is needed to resolve the error still record it as an error, use the “Flag” category, and make clear comments. Examples:
 - a. Omit data- if bench height was incorrectly identified during the first visit (measured abandoned terrace above floodplain height accidentally) and only bench height and subsequent floodplain connectivity values are correct for the second visit.
 - b. Flag data- if percent pools from visit one was 5% and 20% for visit two, but there is no reason to expect large geomorphic changes between years and it is unclear from photos which one is correct.

Step 6 – Check-in and Project Close-out

Overview

A check-in meeting must be held one month into the field season with the data collectors, project lead, state lead and/or monitoring coordinator, data collector manager, and the Lotic AIM Team to make sure data management and data quality steps are being completed and that there is good communication among team members. During this meeting, the one-month check list and agenda topics can provide a starting point of questions to address unresolved protocol questions, app and iPad quirks, or logistical and gear issues, such as YSIs malfunctioning. The state lead or monitoring coordinator is responsible for scheduling and leading this meeting. All other parties should come prepared to discuss issues that have arisen thus far throughout the season. If the state lead or monitoring coordinator is not able to schedule and lead these meetings, they should coordinate with the project leads to ensure these meetings occur.

The project close-out meeting must be scheduled by the state lead and/or monitoring coordinator before the end of contracts/agreements such that data collectors and data collector supervisors are still available to clear up any data questions that may arise. The end of season check list below should serve as an exhaustive list of everything that needs to be done to close out the project. In summary, all final data should be submitted and the evaluation statuses in the Point and Field Visits layers should be finalized. Project leads or data collector managers should submit all macroinvertebrate samples to NAMC and water quality samples to the specified lab following the [Lotic Macroinvertebrate and Water Quality Submission Protocol](#).

Responsible Parties

State Lead/Monitoring Coordinator is responsible for scheduling and leading check in and project close out meetings. This includes ensuring preparation items are complete.

Project leads, data collector managers, data collectors, and the Lotic AIM Team are expected to attend both meetings.

Estimated Time

This occurs one month into data collection and at the end of the season while data collectors are still working. The End of Season check-in MUST occur no sooner than one week after the data collector's last field day and no later than 4 weeks after. Data collectors will then need one week minimum to finalize and submit data to the Lotic AIM Team prior to the end of their employment period. Data collectors must have access to internet for the meeting so that they can view dashboards. Meetings last 1-2 hours.

Tools and Files

- Check lists below
- Teams
- Trip Details Dashboard (for data collectors on iPads only)
- Data Review Dashboard
- Error Review Dashboard
- Indicator Review Dashboard
- [Lotic Macroinvertebrate and Water Quality Submission Protocol](#)

One-month check list and agenda topics

The purpose of the one-month check-in meeting is to discuss data quality processes for design management, data collection, and data submission to date with the goal of resolving any questions or issues so they don't propagate throughout the field season.

Pre-meeting preparation checklist:

State lead/state personnel

- ☐ Schedule the meeting and share agenda. Pre-meeting requirements: Data collectors must have submitted ~1 months' worth of data 1 week prior to this meeting.
- ☐ Check that all pre-meeting tasks are complete a couple days before the meeting.
- ☐ Touch base with Project Leads and NOC PRIOR to this meeting to review tasks and meeting topics.
- ☐ Prepare for Design Management questions in table below by checking webmap and Data Review Dashboard "Project Status" and "Design Status" tabs.
- ☐ Run meeting.

Project Lead

- ☐ Ensure that data collectors are staying up to date on Data Review and are actively resolving issues in the Error Review Dashboard.
- ☐ Review and respond to errors, as assigned, in the Error Review Dashboard.
- ☐ Complete Critical Concepts Data Impact Assessment, if required.
- ☐ Prepared a list of data or QC kudos, questions, and concerns to discuss during the meeting.
- ☐ If indicators have been calculated, review indicators.

Data collector Manager (if not applicable this should fall to the Project Lead)

- ☐ Complete all photo review and QC for the data collected to date prior to the meeting.
- ☐ Share a list of concerns or data issues found during photo review and QC to be discussed on the call.

Data collectors

- ☐ Select 3 reaches to discuss including bankfull, scour, and bench photos. Send PointIDs to all meeting attendees prior to the call for discussion. All attendees should reference photos in the Data Review Dashboard. Reaches should include:
 - 1) a normal reach,
 - 2) the quirkiest/most challenging reach visited to date, and
 - 3) something in between or that warrants discussion.
- ☐ Prepare a list of protocol questions and clarifications and potentially some photos to facilitate discussion.

NOC

- ☐ Share a list of concerns or data issues found at the NOC level with the State to be discussed on the call.
- ☐ Support discussion, provides details, clarifications, and troubleshooting during the meeting.

Discussion topics and questions:

Sampling efficiency	Action Items and Notes
How many reaches have been sampled so far? Are data collectors generally sampling 1-1.5 sites per day, or taking approximately 4-8 hours per site? If no, what can we do to help improve efficiency?	
Do the data collectors feel they have been provided with adequate office evaluation information to get to point coordinates? Are trip plans organized in a realistic manner? If not, what do they suggest for improvements?	
Does the project lead feel that it is realistic to meet the project's total sample size by the end of the summer? If not, how do we adjust and prioritize, what's in the contract/agreement, etc.?	
General Implementation	Action Items and Notes
Is it clear to the data collectors who they are supposed to call for protocol questions, access issues, trip schedule issues, etc.?	
Are the data collectors labeling macroinvertebrate samples with an inside and outside label and storing appropriately?	
Is everyone aware of the BMI/WQ Submission requirements highlighted in Lotic Macroinvertebrate and Water Quality Submission Protocol ?	
Are the data collectors clear that they should be collecting duplicate and blank WQ samples for total nitrogen and phosphorus at 10% of sites and labeling these samples appropriately? How many reaches have the data collectors collected duplicates and blanks for so far?	
Have the data collectors encountered any special situations (Appendix C)? Has Appendix C provided enough information to fully implement protocol? Were there any unanswered questions related to special situations?	
What has been the most difficult/confusing method to collect? What questions/clarifications do data collectors have?	
Design management	Action Items and Notes
Are project leads finalizing eval statuses so that designs can be managed iteratively? Are there questions in regard to this?	
Are the trip planners managing the design iteratively according to guidance in the design management protocol? Is the Points layer being properly and completely updated?	
Has the project lead assigned merged PointIDs properly and are data collectors clear on what coordinates and PointIDs should be used?	
Local Field/District Office orientation training and calibration:	Action Items and Notes
Who was able to make it to the local field/district office training and calibration? How many and what types of reaches were visited?	
Did this enhance everyone's understanding (especially data collectors) of how to identify the critical concepts? Which critical concept caused the most discussion?	
Which other indicators caused a lot of discussion and why?	
Was calibration data submitted via Survey123?	
Table continued next page	

Photo review (Use Data Review Dashboard):	Action Items and Notes
Data collectors presents bankfull photos and discusses their experience at 3 sampled reaches: 1) a normal reach, 2) a quirky/challenging reach, and 3) something in between or that warrants discussion. Does everyone agree on the critical concept locations? Are data collectors confident identifying critical concepts across a diversity of reaches? Other discussion about these reaches?	
Does anyone else have photos or specific indicators they want to discuss?	
Survey123	Action Items and Notes
Have data collectors found any Survey123 glitches preventing efficient data collection, QAQC, backup, and submission that the National Lotic AIM Team can fix?	
Are data collectors backing up data after at least every two reaches? If not, why?	
QC	Action Items and Notes
Are there reoccurring themes or issues being discussed at the weekly QC meetings? Who is attending? If these meetings are not occurring, why not? How can we improve?	
Discuss as a group all data concerns from all parties.	
Finalize unresolved data issues in the dashboard.	

Table 3. Discussion Topics and Questions to be used during Lotic One Month Check-In meetings.

Wrap Up Reminders/Next Steps

- ☐ If folks feel like they need another check-in meeting at any point throughout the field season, please request one via the State Lead/state personnel.
- ☐ At the end of the field season, there will be a final project check-in and close out meeting.
- ☐ If they haven't been already, indicators will be calculated shortly. Project Leads are responsible for indicator review, please reach out to State Leads if you need assistance.

End of season check list

The purpose of the end of season meeting is to ensure all that all data questions have been resolved, all design and field data have been finalized, and no more information or tasks are required prior to the end of the field season. The End of season check-in MUST occur no sooner than one week after the data collector's last field day and no later than 4 weeks after. Data collectors will then need one week minimum to finalize and submit data to the NOC prior to the end of their employment period.

Pre-meeting preparation checklist:

State Lead/State personnel

- ☐ Organize meeting with National AIM Team, project leads, contractors/agreement holders, and data collectors. Pre-meeting requirements: data collectors have submitted all final data to NOC. The End of season check-in MUST occur no sooner than one week after the data collector's last field day and no later than 4 weeks after.
- ☐ Provide End of Season Project Details Table in agenda for Project Leads to fill out.
- ☐ Check that all QC has been completed on both field data and indicators.
- ☐ Check that all evaluation statuses in the design have been finalized.
- ☐ Check that all pre-meeting tasks are complete a couple days before the meeting.
- ☐ Touch base with Project Leads and NOC PRIOR to this meeting to review tasks and meeting topics.
- ☐ Run meeting.

Project Lead

- ☐ Fill out End of Season Project Details Table in agenda.
- ☐ Review all indicator data and come to the meeting with any questions.
- ☐ Review and respond to all questions in the Error Review Dashboard that were set to "Project Lead" for review.
- ☐ Complete Critical Concepts Data Impact Assessments for any reaches requiring one.
- ☐ Reviewed and finalize all Evaluation Statuses in the webmap.
- ☐ Prepare list of reaches that need to be reattempted in the future.
- ☐ Start compiling list of priority data request sites.

Data collector Manager (if not applicable this should fall to the Project Lead)

- ☐ Coordinate with NAMC to submit macroinvertebrate and water quality samples following the [Lotic Macroinvertebrate and Water Quality Submission Protocol](#).
- ☐ Resolve all errors in the Error Review Dashboard.
- ☐ Finalize all QC tasks.

Data collectors

- ☐ Submit all final data.
- ☐ Resolve all errors in the Error Review Dashboard.
- ☐ Prepare a list of gear that needs to be replaced, replenished, or fixed and share with whomever is responsible for gear (using the master gear list as a checklist could be helpful).

NOC

- ☐ Share a list of concerns or data issues found in the finalized data with the State to be discussed on the call.
- ☐ Share a list of design management questions, such as Final Evaluation Status to discuss on the call.
- ☐ Support discussion, provides details, clarifications, and troubleshooting during the meeting.

End of Season Project Details Table:

Project Lead Name	
Project Area	
Year of design (e.g., first year of 3)	
Field season start and end dates (e.g., May 1-August 31)	
Contract/agreement company and data collectors	
Number of random sampled reaches	
Number of targeted sampled reaches	
List of reaches that were supposed to be sampled this year but for various reasons will need to be sampled next year (discuss list)	
List of boatable reaches support is needed for sampling	
Preliminary notes about the design (e.g., next year we will need more points in Field Office A, next year we will want an intensification because there are not enough points in X allotment, or the design was great and should continue as is next year) National Lotic AIM Team will follow up during the planning stages.	

Table 4. End of season project details table to be completed by the Project Lead prior to the Lotic End of Season Meeting

Discussion topics/questions, and final checks at minimum:Design management

- ☐ Resolve any disagreements on 'Eval Status' in Points Layer in the Office Webmap.
- ☐ Resolve any other questions in regards to the Points or Field Visits layers in the Office Webmap.
- ☐ Is there any other follow up needed on reaches that should be revisited in future years?
- ☐ Have all PointIDs that were merged been properly noted as such with the merged site code in the Points layer?

Data

- ☐ Discuss any remaining problem reaches, photos, indicators, or field methods.
- ☐ Final data questions follow-up.
- ☐ Have macroinvertebrate and WQ samples been submitted? If not, what is the plan?
- ☐ All electronic data, photos, etc. have been sent to National Lotic AIM Team. If not, resolve issues at meeting.

APPENDIX A. COMMENT PROTOCOL

Data collectors should be judicious when recording comments in Survey123. Any general comments related to difficulty implementing the protocol are very helpful. To assist data collectors with understanding what other kinds of comment are helpful, comment types are listed below with example comments. **General and access comments are required for all sites.**

Photo and water quality and macroinvertebrates comments are not required in all cases but are frequently used. The rest of the comment types listed below are rarely used. See the description of each comment type in Survey 123 for further assistance in determining what kinds of information are useful to provide in comments. The example comments provided below are a holistic example, but likely an unrealistically complicated example.

General Comment

This stream runs through a tight canyon with a very popular hiking trail that crosses the stream several times and in many locations the stream bed is part of the trail. The stream currently has interrupted flow but also flash floods and evidence of the last flood is apparent throughout the reach with debris above bankfull. Reach was moved upstream 50 m to avoid private land.

Transect E was mostly inaccessible due to dense rose bush, bier, and poison ivy but measurements at this transect were estimated where possible.

Access Comment

What appears to be the easiest route is to turn off of HWY 9 onto Pipeline Rd. However, you cannot access Pipeline Rd. directly from HWY 9 because of bison grazing (see photos). Instead, you turn off of HWY 9 onto Olander and drive until it appears to be a dead end. Then you will follow a path that connects with Pipeline Rd. Follow Pipeline Rd until you see a fence and gate and you will park. Then walk down the hill to the stream. Please see photos.

Photos Comment

A large boulder about 7 meters upstream of F transect was chosen as the F monument for this site. The boulder constrains the stream in this section, creating a pool below it. Stain lines on the boulder helped determine bankfull here.

Water Quality and Macroinvertebrates Comment

YSI readings of pH and Specific Conductance are atypical due to heavy agriculture water return upstream and patches of stagnant water with algae mats. Bug samples were taken by scooping water into the net from the stagnant water.

Channel Dimensions Bank Angle and Cover and Stability Comment

Bankfull and scour were difficult to identify throughout the system due to the flashy nature of the system and the prominence of bedrock. See Critical Concept and Bank Stability photos and comments for more specifics. The canyon widens right at transect A and so bankfull width is much larger here. Transect E was inaccessible due to vegetation, we estimated channel dimensions but could not see the banks well enough to estimate angle, cover, or stability.

Canopy Cover and Streambed Particles and Thalweg Comment

Estimated 5 streambed particles and 5 thalweg measurements due to transect E being largely inaccessible due to veg. Very windy during sampling so canopy cover was difficult to measure and estimated at 4 transects. We also estimated canopy cover at transect E as 17 for all locations due to dense veg.

Pools Comment

Reach not assessed for pools from C-K due to interrupted flow and stagnant water. A-C had a trickle so pools were assessed.

Large Wood Comment

One log jam present at transect K and estimated the number of pieces of large wood present.

Vegetation and Human Influence Comment

Sampled early in the season to avoid monsoonal rains and difficult to identify veg species. Trail that crossed the stream was recorded as recreation, but trail used to be an old road.

Flood-Prone Width Comment

Only one flood-prone width collected due to lack of time with long hike in and coming thunderstorm.

Slope Comment

Only one pass of slope done due to lack of time with long hike in and coming thunderstorm.

APPENDIX B. ESTIMATION PROTOCOL

Estimating values is only allowed for specific methods (Table 5) and in specific circumstances. See each method section in TR 1735-2 Version 2 for more information on these specific circumstances.

Table 5. Summary of lotic AIM methods for which field measurements and resulting values can be estimated. Field methods are organized by the BLM's Fundamentals of Land health applicable to lotic systems and matches the order of Table 1 in TR 1735-2 Version 2.

Fundamentals	Method	Estimates allowed
Water quality	pH	No
	Specific conductance	No
	Temperature (instantaneous and seasonal)	No
	Total nitrogen and phosphorous	No
	Turbidity	No
Watershed function and instream habitat quality (i.e., physical habitat)	Pool dimensions	Yes
	Streambed particle sizes	Yes
	Bank stability and cover	No
	Floodplain connectivity: Bankfull and Bench Heights	Yes
	Large wood	Yes
	Bank angle	Yes
	Thalweg depth profile	Yes
	Pool tail fines	No
	Bankfull width	Yes
	Wetted width	Yes
	Slope	No
	Flood-prone width	No
Biodiversity and riparian habitat quality	Macroinvertebrate biological integrity	No
	Frequency of occurrence of priority noxious vegetation	No
	Frequency of occurrence of priority native woody riparian vegetation	No
	Canopy cover	Yes
	Greenline vegetation composition	No
Other	Photos	No
	Human influence	No