



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

Data Management and Quality Assurance and Control Protocol – 2022 Field Season



VERSION 5.0

**Produced by BLM National Operations Center (NOC) and the BLM/USU National Aquatic
Monitoring Center (NAMC) – March 2022**

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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.

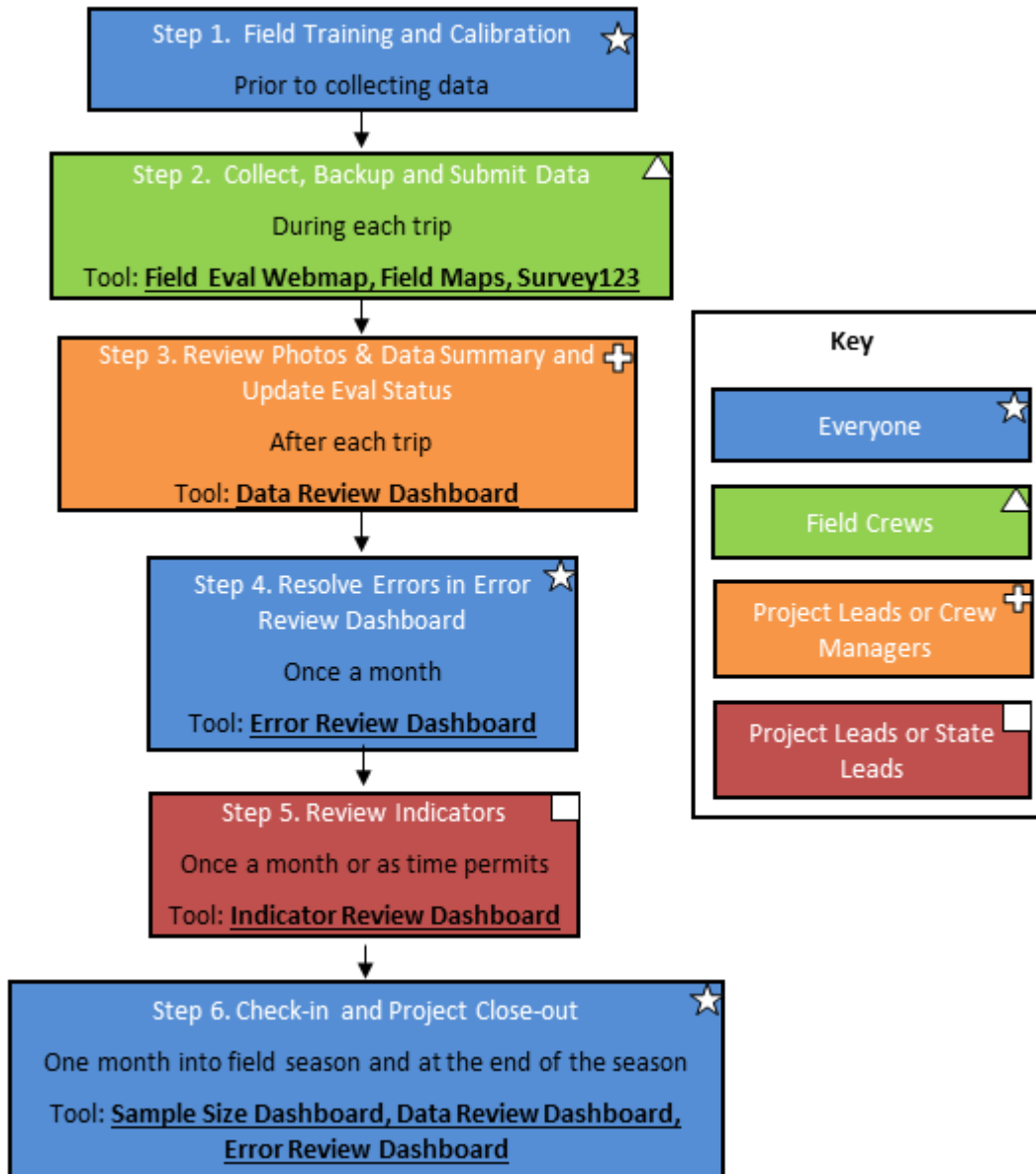


Figure 1. Six steps during the field season for managing data and assuring data quality. Steps are color coded by responsible parties and the timeframe for completing.

more quickly resolve issues with crews and use local knowledge about the reach to review data integrity. The National AIM Team will still check some aspects of data integrity such as basic data structure but will not be reviewing raw data with as much scrutiny as before.

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, the Lotic Technology Manual, or the Evaluation and Design Management Protocol, please reach out to your contract lead, BLM Project Lead, or State Lead. If you need additional support, please contact the appropriate National AIM Team member:

- Design related questions: Janet Miller (jlmiller@blm.gov; 303-236-1019)
- General project coordination and implementation support: State Lead and Kate Lunz (klunz@blm.gov; 303-236-0473)
- Field data collection questions (e.g., Survey123 and protocol): Logan Shank (lshank@blm.gov; 303-236-1161)
- Technology and applications questions (e.g., iPads, Field Maps, Companion): Julia Sobczak (jsobczak@blm.gov; 303-236-1031)
- 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 Orientation

Overview

The National AIM Team and local BLM resource specialists lead annual lotic AIM field methods trainings following TR 1735-2 Version 2, which include 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 requirements vary among participants and include:

- All lotic AIM training attendees must complete the lotic AIM online training materials before attending the field methods training.
- Seasonal BLM data collectors or contractor/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.
- Permanent BLM staff collecting lotic AIM data must have successfully completed 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.
- Contractor/agreement staff not collecting lotic AIM data directly, but responsible for lotic AIM crew 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).
- Project leads overseeing lotic AIM data collection should attend the first 3.5 days of field methods training at least one out of three years and should review protocol updates every year.
- State leads are encouraged to attend a few days of the training at least every other year, but 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 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 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).

Responsible Parties

Field training: The National 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 management staff (if applicable), field crews, and other BLM and contractor staff are required to attend as specified in the overview above.

Field orientation and calibration: BLM project leads, contractor management staff (if applicable), field crews, a BLM Botanist (or plant specialist), and other BLM and contractor 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 National AIM Team when all calibration data from their state have been submitted using the Survey123 Lotic Calibration form.

When and Estimated Time

Field training: Attend a weeklong field training conducted annually in late spring and early summer.

Field orientation and calibration: Occurs after field training on TR 1735-2 Version 2 and prior to the start of data collection. It is recommended that field calibration be repeated any time crews 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](#)
- Local riparian vegetation identification guides ([See state specific Teams channel](#))
- Survey123 Lotic Calibration Form
- [Paper calibration data sheets](#). Note that if you choose to use paper calibration sheets, you will need to transcribe the information into the Survey123 Lotic Calibration Form in order to submit the data to the National AIM Team.

Instructions

Field training

- A. Watch pre-training videos and complete video-based quizzes and activities
- B. Attend 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 crews 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 crew members 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 crew 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 crew 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 present would have knowledge of local riparian vegetation and the MIM greenline vegetation protocol. If this experience is present, work with the crew field botanist to review vegetation and greenline application while other individuals are working on steps IV c and d above.
- VI. If the crew is measuring other contingent indicators (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 National 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 the crew 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 crew 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 the crew.
 - 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.
- B. Review photos with crews 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.

Calibration

- A. Identify a stream reach having representative hydrologic, geomorphic, and vegetative conditions similar to those the crew will be working with this summer. If the crew is working among multiple field offices or districts, more than one field calibration might be required.
 - I. 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 Form. 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 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. Crews collect data independently, but do not need to take photos.
- G. BLM and contractor staff review the crew's values compared to Trainer values and discuss results with crews 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. Crew 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 crew, BLM, and contractor staff results MUST be synced through Survey123 within one week of calibration. State leads should notify the National AIM Team when all calibration data from their state have been submitted. The National 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 crew 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. Survey123 is used to collect field data, and Field Maps is used for navigating to points and to record 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, following along with an iPad if possible. 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.

The crew will need to backup both Survey123 and Field Maps data during each trip using a USB flash drive device. Backups will allow data recovery if, for example, the iPad is lost or stolen. Crews should sync Field Maps and Survey123 data to the Office and Field Eval Webmaps 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 Crew

When and 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 sample 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 the crew has 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 crew syncs data and when the data summary PDF is posted on the Data Review Dashboard, but photos will appear instantaneously. If crews have tight windows to discuss the data summaries with crew managers (see Step 3 below), crews should try to sync all forms except Photos and Reach Coordinates in the field ASAP before returning from their trip.

Tools and Files

- [Lotic Master Gear List](#)
- [Lotic Field Protocol for Wadeable Systems TR 1735-2 Version 2](#)
- Local riparian vegetation identification guides
- [Paper copies of field data collection forms](#)
- [Macroinvertebrate](#) and [water quality](#) labels
- 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.
 - 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 of the 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 made 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 3.b. above to locate and resolve the missing data.
2. If one or more 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. If 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. All data must be entered into Field Maps and Survey123 for the National AIM Team to ingest it into the National Lotic AIM database. Additionally, photos or scans should 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 say 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 of 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 that the National 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 crew managers should review photos and data summaries for all sampled reaches using the Data Review Dashboard. The National 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 crews 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 crew managers use the QC Comments form linked in the Data Review Dashboard to record whether they agreed with crew placement of critical concepts and any errors found. They should then contact the crew to discuss any issues and move on to Step 4 below to record resolutions to those issues.

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 a crew field visits 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 the crew is sampling the correct reaches and that the design is being implemented and tracked properly and consistently.

Responsible Parties

Project leads and crew managers

When and Estimated Time

Review should 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 the crew submits data. If crews have tight windows to discuss the data summaries with crew managers, crews 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 the crew 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 crew’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 and Trip
2. Selector panel for select one specific PointID or EvaluationID

3. Webmap displaying design, field visit, and bottom and top of reach coordinates
4. Photos and photo comments
5. Webmap with Points layer for updating 'Eval Status'
6. Link to the data summary PDF and QC Comments form

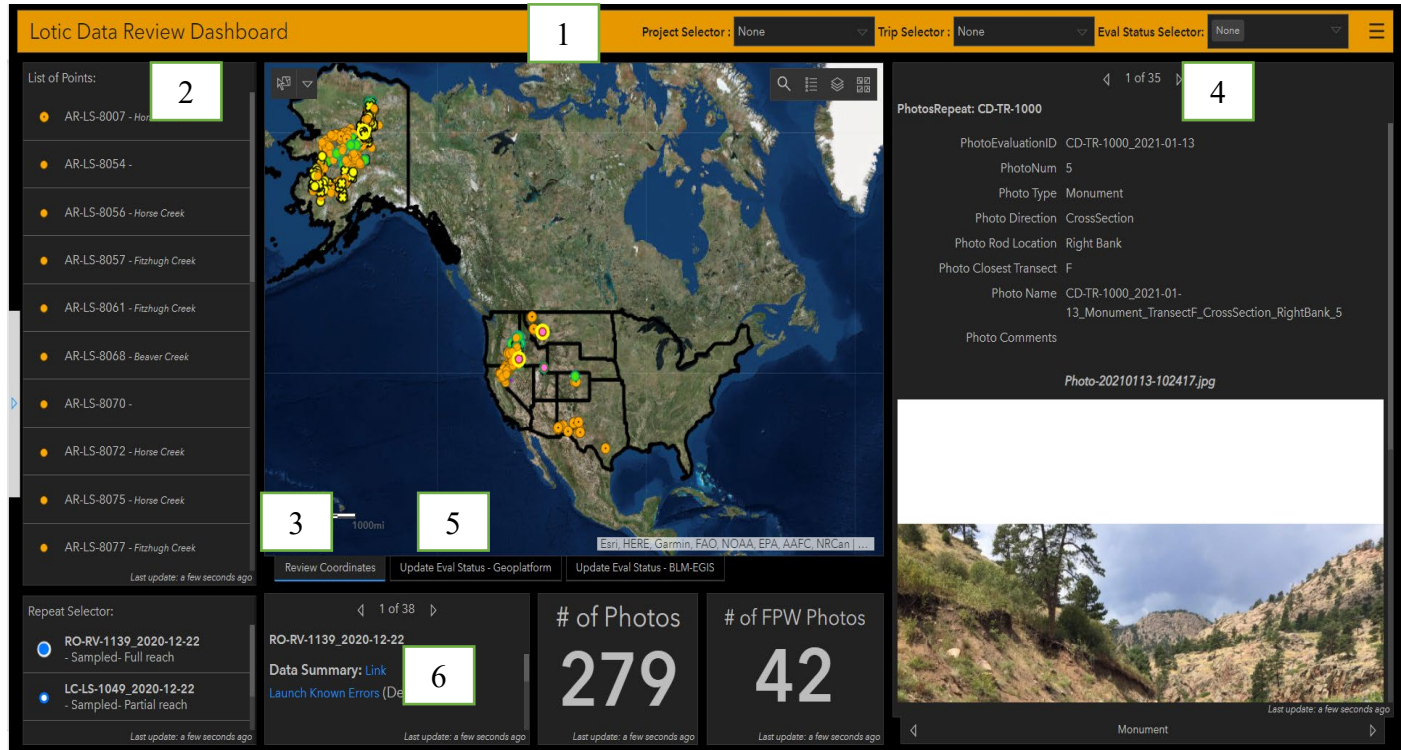


Figure 2. Screenshot of Data Review Dashboard. Numbers correspond to dashboard key components listed above.

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.
- **Symbology**
 - 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 EvaluationID section 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. If editing on an iPad, open it using the Companion app. (see Technology Manual for more information on using

Companion). 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 “Review Coordinates” tab (Figure 2, Label #3) Select either a PointID on the left panel (Figure 2, Label #2) or an EvaluationID in the lower left panel (if there are multiple visits to a point). Then complete the following steps and repeat this process for each point on the trip:

Coordinates

- A. Using the map tab labeled “Review Coordinates” (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 the crew 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 the crew 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.
- B. 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.

Photos

- C. 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.
- D. 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 crew’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) and chose the one that matches your account type.
 - 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.
- E. 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 the crew 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 crew 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 crew’s placement of these features. Use the photo comments field to note any things that you want to discuss with the crew regarding their critical concepts. You should 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 the crew, 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 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 the crew 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 especial 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 the crew.

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 crew 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.

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 the crew (e.g., talked to crew and confirmed slope was collected incorrectly and should be removed), these should usually be directed to the National AIM Team so they can go ahead and make the identified data edit. Things that might not have immediate solutions are issues that require talking to the crew, project lead, or state lead to determine what to tell the National 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 crew such as “we noticed there was heavy beaver activity at your reach let's discuss and ensure your confident in your protocol application”. Then once these comments are discussed, they can be marked as resolved.

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

General Comments:
 Comment

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/No
Greenline Veg Comp: No/No
Veg Complexity: No/No
Core Subset1: No/No
Core Subset2: No/No
Core Subset3: No/No
Supplementals:

**Currently not fully integrated with Lotic AIM Survey forms*

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): 8.90° **pH:** 6.89 **Spec. Cond. (uS):** 598 **Avg Turbidity:** 3

Bugs & WQ Comments:
 Coffee still cold

DISCLAIMER: These are NOT indicators.
 Data provided below should be used for discussions and to ID systematic protocol application issues

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

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

Pools

Pool Status: Partially Collected Due to Accessibility or Interrupted Flow

# of Pools	Pool Reach Surveyed (m)	% Pools	Total Pool Length (m)
5	120.00	23.77%	28.52

Pools with PTF Grids: 0

Tail Depth (cm)	Max Depth (cm)	Pool Length (m)
Min 5	15	2.33
Avg 8.8	42.6	5.70
Max 15	63	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

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:
 [jdntfj]

Veg and Human

Native Veg: Canada thistle, curly pondweed, Eurasian watermilfoil, flowering rush, Himalayan blackberry, hoary cress, whitetop, roundstomach, hyssop, Japanese knotweed, leafy spurge, poison hemlock, purple loosestrife, Russian olive, saltcedar, yellow flag, iris

Non-Native Veg: Alder, ash, aspen, birch, black oak, bunchberry, chokecherry, cottonwood, dogwood, Douglas fir, fir, gambel oak, hemlock, rose, serviceberry, snowberry, spruce, thimbleberry, western redcedar, willow

Buildings/ Fire/ Hydrologic Alterations/ Instream Restoration/ Landfill Trash/ Livestock Horse Barro/ 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 crew data in relation to photos and local knowledge following each trip.

- F. Read all comments (gray boxes) to determine if the crew 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.
- G. 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 crew correct it in the Field Visits layer and then resync their offline area. Then they will need to reopen and submit their Verification Form. Additionally, determine if the crew 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 crew 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 crew deletes a transect repeat or ends a reach early, does not properly mark transects as “Not Collected”. Unless the crew has 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”.
- 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 crew.
 - IV. Lastly, discuss special situations with the crew. Ask the crew if they have questions on how to implement the protocol. These protocols are nuanced, it is extremely rare a crew will not have at least one question the first time each 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 the crew 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 reach?
 - e. Braided Channels: Was it difficult to set up the reach?
 - H. 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 the crew collects these data at future sites.
 - I. 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.
- J. Transects – Bank Stability and Cover
 - I. Use the bank stability and cover specific photos to answer the following:
 - a. Did the crew place the plot in the right location (e.g., correct identification of scour and bankfull features)?
 - b. Did the crew correctly identify the depositional vs. erosional banks in the photo?
 - c. Did the crew 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 crew correctly estimate foliar cover?
 - d. Did the crew 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 crew 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.
- K. 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.
- L. Pools
 - I. Review photos, number of pools, and percent pools to determine if the crew 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 crew.
- M. 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 4 – Resolve Errors

Overview

The Error Review Dashboard is used to review and resolve data errors after crew data submission. Errors on the dashboard come from three places: 1) This dashboard displays all errors or comments recorded in Step 3 by project leads or crew managers in the QC Comments form; 2) Crews may also use this QC Comments form on their iPad to record errors after submitting forms; 3) The National AIM Team will run basic structure checks on raw data and post any errors to this dashboard on a weekly basis. 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 crew managers should review and resolve errors in the Error Review Dashboard with the help of the crew 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 National AIM Team will review the dashboard every two weeks to resolve errors that require additional expertise. The National 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

When and Estimated Time

Errors should be resolved monthly, but preferably after each trip; The more time that lapses between when errors are recorded and resolved, the greater the likelihood the crew will not be able to remember the reach and adequately answer any questions that have arisen. The first few reaches there may be a large number of comments or errors that may take an hour or so per trip to investigate, but these should decrease significantly as the field season goes on. If there is continuing evidence of protocol confusion, we recommend having a crew manager meet up with the crew and possibly conduct another calibration exercise.

Tools and Files

- Error Review Dashboard

Instructions

General Error Review Dashboard Use

- Prior to reviewing data from the crew'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. Selector panel for selecting a specific PointID or EvaluationID
 3. Webmap displaying which points have resolved (yellow points) vs. unresolved errors (pink points)

4. Descriptions of error and comments separated by unresolved, resolved, and photo review comment tabs
5. Transactional dialog detailing any back-and-forth discussions had prior to resolving an error
6. The QC Comments form used to respond to and resolve errors
7. Data Summary link

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 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.
- The dashboard can be accessed on a computer or iPad. If editing on an iPad, open it using the Companion app. (see Technology Manual for more information on using Companion). Responding to edits must be done online. This dashboard cannot be taken offline.

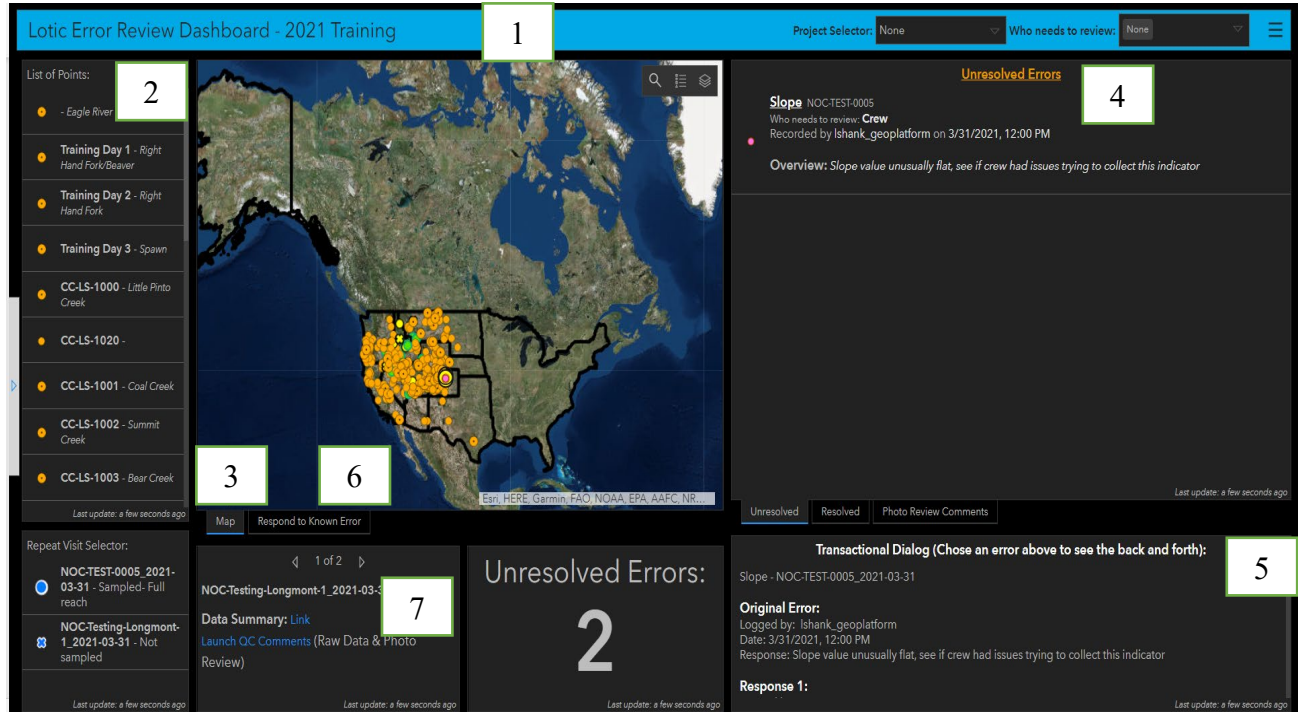


Figure 4. Screenshot of Error Review Dashboard. Numbers correspond to dashboard key components listed above.

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 Crew Managers, Project Leads or State Leads/Monitoring Coordinators should update this field when they are satisfied with the provided responses. Crews cannot resolve errors; the crew responses need to be reviewed by someone in the above list and then “Resolved”. The National 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 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 QC 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. Crew managers may also review calculated indicators as desired, but this will not take the place of the Project Lead's review. 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 National AIM Team should be consulted.

Responsible Parties

State Leads, Project leads, crew managers (optional), and the National AIM Team

When and Estimated Time

Once a month or at least 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
- [Lotic Historic Photo Viewer](#)

Instructions

General Indicator Review Dashboard Use

- Prior to reviewing data from the crew's first trip watch the QC webinars 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. Link to download an excel file with the latest version of preliminary indicators.
 2. Selector bar for filtering points by Project and PointID.
 3. Webmap displaying which points have had indicators reviewed.
 4. Photos from current field season.
 5. Descriptions of any found errors and comments separated by unresolved, resolved, and photo review comment tabs.
 6. Transactional dialog detailing any back-and-forth discussions had prior to resolving an error.
 7. Data summary link & link to QC Comments form used to record indicator review and resolve errors.

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.
- Symbology
 - 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 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.

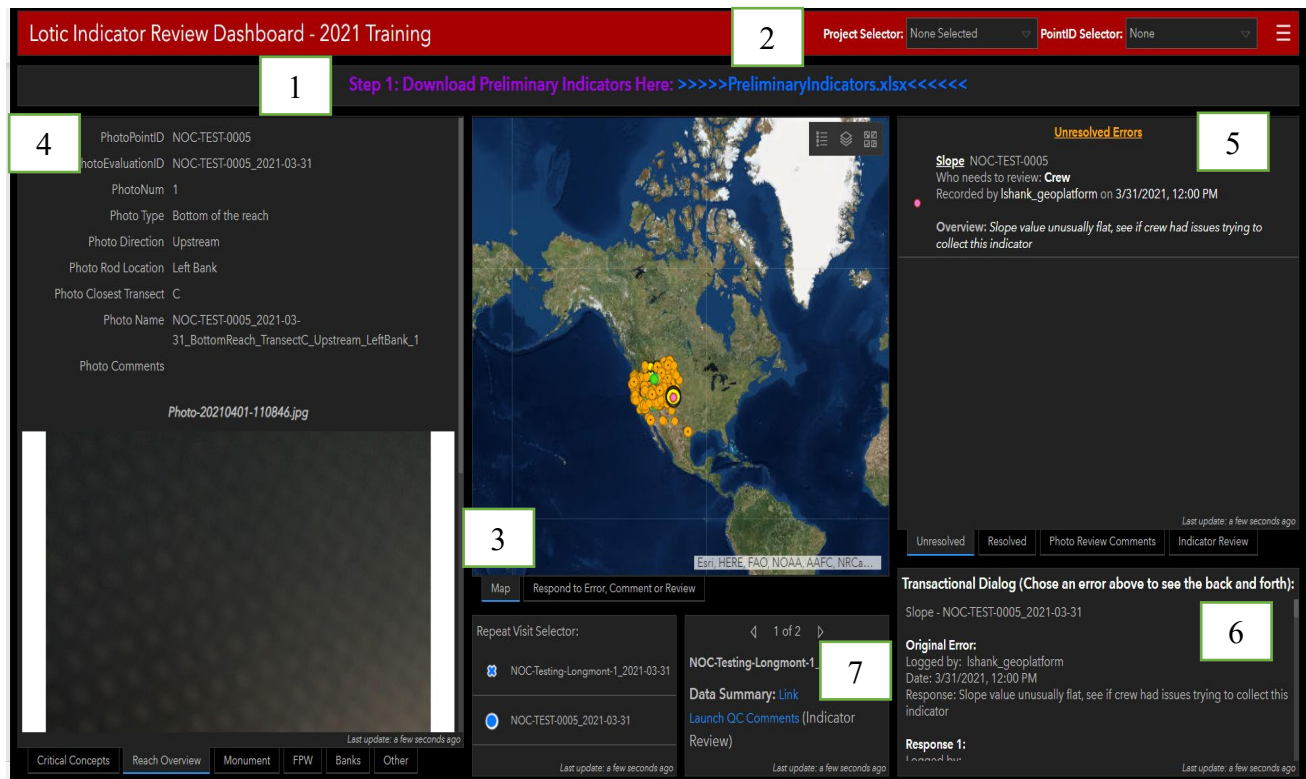


Figure 5. Screenshot of the Indicator Review Dashboard. Numbers correspond to dashboard key components listed above.

Indicator QC

- Open the Lotic Indicator 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 or Error Review Dashboards.
- Locate and click the “Download Indicators” link (Figure 5, Label #1). In the downloaded preliminary indicators excel file, filter the data by Project and then sort by EvaluationID.
- Determine if you have any points that have been sampled in previous field seasons. If a reach has been sampled in the past, previous data will be included in the file as a unique row for each visit. If the point has not been sampled previously, follow directions in Step D. If the point has been sampled previously, follow directions in Step E. If time is

limited, data issues may be easier to catch when reviewing indicators for reaches with multiple visits (Step E) so you may want to prioritize reviewing data for these reaches.

- D. Use the following guidance to evaluate data in the computed indicator file for reaches with only one visit. 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 National AIM Team.
- I. Go through the computed indicator file one reach at a time.
 - II. Filter the Indicator Review Dashboard by selecting your project and your first PointID in the selector, this will display the data and photos associated with only that PointID.
 - III. Quickly review field comments from the crew and the “Transactional Dialog” for any field errors. Crew comments and data statistics can be located in the data summary PDF. This document is linked on the Indicator Review Dashboard (Figure 5, Label #7) once a PointID has been specified (Figure 5, Label #2). Be sure to select the correct visit using the ‘Repeat Selector Panel’ if the point has been visited more than once. Additionally, all prior QC comments can be found in the errors panel on the dashboard (Figure 5, Label #5 & #6). While reviewing comments and field resolved errors consider if any comments or errors warrant omitting or flagging an indicator value as suspect?
 - a. Flagging data as suspect allows data users to consider data use on a case-by-case basis for a given analysis.
 - b. Omitting data should be done if there are no situations in which data use is appropriate.
 - IV. 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?
 - V. 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).
 - VI. Do groups of indicators tell a consistent and/or logical story at each reach? If not, review pictures, crew comments, and consider the reasons this could be the case. For example:
 - a. 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.
 - b. 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.
 - c. 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.

- d. Do floodplain connectivity and entrenchment ratio indicator values tell a consistent story? For example, stream channels with well-connected floodplains 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.

VII. To record the outcomes of the above review, open the QC Comments form using the Dashboard (Figure 5, Label #7) after selecting your point. Both positive and negative outcomes need to 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 – percent pools was 100%, which is an unrealistic value. The crew 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 follow up with other project leads or the state lead before making a decision on whether to omit or keep as a flag.

E. 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 National AIM Team.

- I. Review photos (Figure 5, Label #4) and reach coordinates displayed on the dashboard map (Figure 5, Label #3) to determine if sampling conditions and reach placement were similar or if major changes occurred at a reach.
 - a. Only photos from the 2022 season are displayed on the Indicator Review Dashboard. All historic photos can found using the [Lotic Historic Photo Viewer](#).
- II. Quickly review field comments from the crew and the “Transactional Dialog” for any field errors. Follow details in step D III above.
- III. 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.
- IV. 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.
- V. 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.
- VI. To record the outcomes of the above review, open the QC Comments form using the Dashboard (Figure 5, Label #7) after selecting your point. Both positive and negative outcomes need to 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 should be held one month into the field season with the crew, project lead, state lead and/or monitoring coordinator, crew manager, and the National 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 leads or monitoring coordinators should schedule and lead this meeting and 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 should be scheduled by the state lead and/or monitoring coordinator before the end of contracts such that crews and crew 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 crew managers should submit all macroinvertebrate samples and water quality samples to NAMC following the [Lotic Macroinvertebrate and Water Quality Submission Protocol](#).

Responsible Parties

Everyone

When and Estimated Time

One month into data collection and at the end of the season while the crew is still working. The End of season check-in MUST occur no sooner than one week after the crew's last field day and no later than 4 weeks after. Crews will then need one week minimum to finalize and submit data to the NOC prior to the end of their employment period. Crews 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
- Data Review Dashboard
- Sample Size 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:

- ☐ The project lead has prepared a quick assessment of number of points sampled and crew productivity. All attendees should reference the Sample Size Dashboard for official numbers.
- ☐ The crew has submitted ~1 months' worth of data 1 week prior to this meeting.
- ☐ The crew has selected bankfull, scour, and bench photos from at least 3 reaches and sent their PointIDs to all meeting attendees prior to the call for discussion. Photos should include: 1) a normal reach, 2) the quirkiest reach visited to date, and 3) something in between or that warrants discussion. All attendees should reference photos in the Data Review Dashboard
- ☐ All parties involved have prepared a list of protocol questions and clarifications and potentially some photos to facilitate discussion.
- ☐ All parties involved have prepared a list of design management and data questions to discuss during the meeting. Ensure that all parties are staying up to date on Data Review and are actively resolving issues in the Error Review Dashboard. If indicator review has been completed review those errors as well. Design Management related questions can be tracked using the Advice Requested gages in the Sample Size Dashboard.
- ☐ The National AIM Team has a list of questions in regard to any submitted data to discuss during the meeting.

Discussion topics and questions:

If crews are taking more than 4-8 hours per site, or not sampling 1-1.5 sampled sites per day, what can we do to help improve efficiency? Consider:	Action Items and Notes
Does the crew 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, etc.?	
Is it clear to the crew who they are supposed to call for protocol questions, access issues, trip schedule issues, etc.?	
Design management	Action Items and Notes
Is the crew 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 ?	
Table continued on next page	

Is the crew 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 has the crew collected duplicates and blanks for so far?	
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 is the crew 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 this local training? How many and what types of reaches were visited?	
Did this enhance everyone's understanding (especially the crew) 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 saved electronically on Teams?	
Photo review (Use Data Review Dashboard):	Action Items and Notes
The crew presents bankfull photos and discusses their experience at 3 sampled reaches: 1) a typical reach, 2) a challenging reach, and 3) 1 other reach that you would like to share. Does everyone agree on the critical concept locations? Is the crew confident identifying the three critical concepts across a diversity of reaches? Other discussion about these reaches?	
Does anyone else have photos or specific indicators they want to discuss?	
Has the crew encountered any of the below special situations (TR 1735-2 Appendix C) yet this field season, and how did they go? What indicators were difficult in these systems?	Action Items and Notes
Interrupted flow	
Beaver impacts	
Partial data	
Side Channels	
Braided systems	
Survey123 and QAQC	Action Items and Notes
Has the crew found any Survey123 glitches preventing efficient data collection, QAQC, backup, and submission that the National AIM Team can fix?	
Is the crew backing up data after at least every two reaches? If not, why?	
Are there reoccurring themes or issues being discussed at the weekly QAQC meetings? Who is attending? If these meetings are not occurring, why not? How can we improve?	
How often is the project lead able to review indicator values? What issues have arisen?	
Does the National AIM Team have questions for the team about data?	
Are there any other unresolved data issues?	

Table 2. Discussion Topics and Questions to be used during Lotic Mid or Early Season Check-In meetings.

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 crew's last field day and no later than 4 weeks after. Crews 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:

- ☐ Crews have submitted all final data.
- ☐ Project Lead has reviewed all indicator data and will come to the meeting with any questions. All attendees should reference the Indicator Review Dashboard
- ☐ National AIM team has reviewed submitted data and will come to the meeting with any questions.
- ☐ All questions in the Error Review Dashboard have been resolved or will be resolved during the meeting.
- ☐ The National AIM Team has reviewed the finalized Evaluation Statuses in the Office Webmap and will come to the meeting with any questions. All attendees should reference the Sample Size Dashboard for their official numbers.
- ☐ Crews 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).
- ☐ Contractors have coordinated with NAMC to submit macroinvertebrate and water quality samples following the [Lotic Macroinvertebrate and Water Quality Submission Protocol](#).
- ☐ State Lead/Coordinator organizes meeting with National AIM Team, project leads, contractors, and crews. Keeps notes in the Teams Mid and End of season check folder.

Pre-meeting table to be completed by Project Lead:

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 crew members	
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 AIM Team will follow up during the planning stages.	

Table 3. Pre-meeting 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 AIM Team. If not, resolve issues at meeting.

APPENDIX A. COMMENT PROTOCOL

Crews should be judicious when recording comments in Survey123. Any general comments related to difficulty implementing the protocol are very helpful. To assist crews with understanding what other kinds of comment are helpful, comment types are listed below with example comments. General and access comments are required. Photo and water quality and macroinvertebrates comments are not required in all cases but are frequently used. The rest of 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 all locations. 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 followed a 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 1) and in specific circumstances. See each method section in TR 1735-2 Version 2 for more information on these specific circumstances.

Table 1. 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.

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

Biodiversity and riparian habitat quality	Frequency of occurrence of priority noxious vegetation	No
Biodiversity and riparian habitat quality	Frequency of occurrence of priority native woody riparian vegetation	No
Biodiversity and riparian habitat quality	Canopy cover	Yes
Biodiversity and riparian habitat quality	Greenline vegetation composition	No
Other	Photos	No
Other	Human influence	No