Supplemental AIM-NAMF Field Protocol for Wadeable Lotic Systems

Supp. TR-1735-2 Field Methods Protocol
Version 1, April 2019

Table of Contents

Introduction

This supplement to TR 1735-2 provides replacement protocols for select field methods and additions and clarifications for others. The objective is to facilitate consistent and accurate implementation of TR-1735-2.

Replacement protocols are provided for:

- Total phosphorus and nitrogen
- Sampling streams and rivers with side channels
- Photos
- Pool tail fines

For these indicators, the existing protocol in TR 1735-2 should be omitted and these new protocols implemented.

Protocol additions and clarifications are provided for:

- Core versus contingent indicators
- Timing of data collection
- Bank cover
- Flood-prone width
- Large woody debris
- Vegetation plots (10 x 10 m plots)
- Non-native or noxious species presence/absence surveys
- Human influence

For these indicators, the provided guidance is intended to supplement and not replace existing sections.

Replacement Protocols

5.2 Total Nitrogen and Phosphorus (contingent methods)

Reason: To better understand the variability and potential sampling error of TN/TP grab samples by collecting blank and duplicate samples in a standardized fashion.

Overview: Take a single “grab sample” that will be analyzed for total nitrogen and phosphorus, and preserve the samples by freezing. For 10% of sites where TN/TP samples are collected, duplicate and blank samples should also be collected. Blank samples are created by placing DI water in the sample jar and are used to assess sample contamination. Duplicate samples assess the repeatability of the original sample of stream water.

Methods:

1. Obtain a new pair of surgical gloves, and place them on both hands, being careful not to contaminate the outside of the gloves with substances such as sunscreen. Dispose of gloves after use.
2. If collecting a “Blank” sample, process the blank first to avoid stream water contamination of your gloves.
    a. When collecting the Blank sample, rinse a sterile container five times with DI water and then fill the jar with 30-35 ml of water to allow enough head space for freezing.
    b. Proceed to step 4.
3. Collect and process original and duplicate samples identically.
    a. Obtain and rinse a sterile 50 ml TN/TP container for each sample.
    b. Rinse the container five times with stream water. Be careful not to overly disturb the stream bottom.
    c. Fill the vial with 30-35 ml of stream water directly from the stream allowing enough head space for freezing.
4. Fill out a water quality label with the full site code, stream name, date, your initials, and the type of sample (Original, Duplicate, or Blank). Record the day, month, and year, making sure to spell out the month rather than using numerals (e.g., 27Aug2015). Lastly, check the appropriate box as to whether the sample is the Original, Duplicate, or Blank.
5. Tape the label on the outside of the vial with clear packing tape.
6. Immediately after collecting and labeling, place all samples on ice and freeze them within 24 hours. If in the field for longer than 24 hours, the sample will need to be frozen using dry ice. If the sample was not frozen within 24 hours of collection, please make clear notes of this.

C2. Side Channels

Reason: Improve habitat measures and reduce dependence on stage-dependent field measurements.

Overview: Use the following guidance when sampling a reach with one or more side channels. Data should be collected on side channels regardless of size or presence of water. However, data should only be collected on a single side channel at each transect. If multiple side channels are present, select the one with the widest bankfull width.

A side channel is defined by

- A channel separated from the main channel by an island (not a mid channel bar)
- A continuous channel that diverges from and reconnects to the main stream channel. This does not need to occur within the sample reach.
- A channel that has geomorphic features of a perennial or intermittent stream. For example, a clear definable channel, identifiable bankfull features, point bars and other depositional/erosional features may exist. Perennial vegetation should not be growing within the bed of the channel.
- Types of side channels
    - Major side channel: Meets all side channel criteria and the side channel contains 16-49% of the total flow.
    - Minor side channel: Meets all side channel criteria and the side channel contains less than or equal to 15% of the total flow.
    - Dry side channel: Meets all side channel criteria and the side channel does not have any flowing water. It may be completely dry or contain isolated non-flowing pools.

Setting up transects on side channels:

1. Visualize the main channel transect continuing over the island to the bank of the side channel where you will collect side channel data (Figure C1).
2. From the point where the transect would intersect the bank of the side channel, reorient the transect so that it is perpendicular to the thalweg of the side channel (Figure C1).
3. Record which side of the main channel the side channel is on as you are facing downstream. In Figure C1 the side channel is on the right side of the main channel.

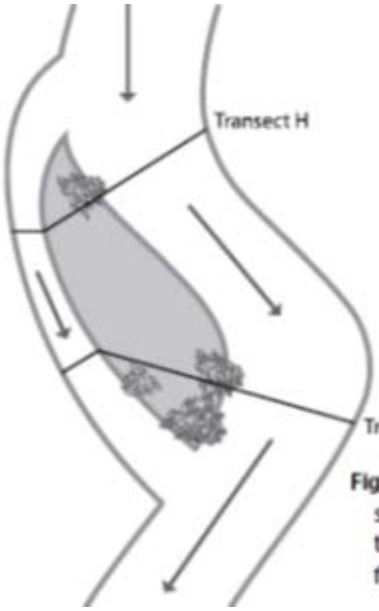

Figure C1. Transects are set up on side channels such that they are projected linearly across the island and turned perpendicular to the flow of the side channel.

What to measure on side channel transects:

1. Bankfull width
2. Streambed particle sizes
3. Large woody debris
4. Bank stability and cover
5. Bank angle (contingent)
6. Canopy cover
7. Instream habitat complexity (fish cover) estimates (contingent)
8. Human influence (covariate)
    a. If the human influence plot extends beyond the island and contains water from the main channel, do not exclude this section of the plot as you would for vegetation plots. Rather mark appropriately as “contained within the plot” or “present beyond the plot”.
9. Riparian vegetation
    a. If the vegetation plot contains water from the main or a side channel, ignore the water and only consider the portion of the plot overlaying the land. For example, if a 2x2 m section of the 10x10 m plot is overlaying water, only consider the 8x8 m section of the plot that overlays the land as 100% of the plot.
    b. Riparian plots from the main transect and the side channel may overlap. In this case, treat each plot as an individual measurement.

Do not measure the following on side channels:

- Macroinvertebrates
- Pool dimensions
- Thalweg depth profile
- Slope
- Bankfull height and floodplain height

9. Photos (covariate)

Reason: To better capture the variability at each site and to improve QA/QC of critical concepts.

Overview: Take a minimum of ten representative photos of each sampled reach, and a minimum of 4 for all failed sites. Failed site photos should include the first four photos listed below, where possible. Photos should include:

1. Bottom of the reach
2. F transect
3. Top of the reach
4. Overview containing as much of the reach as possible
5. Monumenting photo to assist subsequent crews with relocating the sample reach.
6. Two photos identifying scour, bankfull, and floodplain features: One close up photo of the bank and one far out with both banks visible.
7. Two additional photos that do at least one of the following:
    a. Represent the reach in ways that the previous photos do not portray;
    b. Display special situations such as side channels, interrupted flow, or beaver impacts (see Appendix C for more specific guidance);
    c. Display impacts or signs of degradation to the stream or riparian area (e.g., head cuts, excessive grazing, recreation);
    d. Are characteristic of problematic features that created challenges for protocol implementation.
8. Photos of any non-native or noxious riparian plants found throughout the reach

Purpose of taking photos: Photo documentation of sample reaches can provide valuable insight regarding the overall character of each reach. An understanding of reach character can be invaluable when interpreting data. Data interpretation can sometimes take place years or even decades after the sampling event, when the character of the reach could have changed drastically. Therefore, it is important to accurately capture the reach character at the time of sampling. A few high-quality photos are much more valuable than many poor quality photos.

- Adhere to the following guidelines to capture high-quality photos:
    - A depth rod should be present in all photos
    - Photos should be taken at about the height of the depth rod
    - Do not use the zoom feature in any photos
    - Avoid taking photos looking into the sun; try to take photos with the sun at your back.
    - Try to avoid taking photos where part of the frame is in the shadows and part in the sun.
    - Do not take photos of unprofessional behavior.

General Photo Methods:

1. Considering stream size, vegetation, and sunlight, decide if it will be best to take the photograph looking upstream, downstream, or at a cross section.
2. Place or hold a depth rod within the frame of the photo for scale. Make note of the location of the depth rod (or other item for scale) in the photo (e.g., right bank).
3. Stand approximately 5 meters from the depth rod and in a location where the photo will capture both banks. Do not zoom in for any photos.
4. Hold a depth rod vertically, set the camera on top of the depth rod, and take a photo.

5. Any photos pertinent to data collection should be taken within or uploaded to the SARAH application. These photos will be automatically named and uploaded to the National AIM Team with the rest of the field data.
    a. If photos are taken outside of SARAH with the photos app, they should be added into the app so that they are automatically named with the site code and sent to the National AIM Team. Photos can be added to the app by clicking “Tap to take photo” and then clicking “Photos” instead of “Camera“.
    b. It can also be helpful to take screenshots of the iPad and upload these into the app. This can be useful especially for navigation or recording app errors. Screenshots can be taken by holding down the power button and the home button and then releasing.
6. Preview the photo on the screen to ensure you captured the key elements. If the photo did not turn out well, delete it and try again.
7. For all photos, record the following information:
    a. Photo location or type (e.g., bottom of the reach, F transect, top of the reach, monument, overview, other)
    b. Direction facing (upstream, cross section, downstream)
    c. Letter of the closest transect
8. Repeat steps 1-7 for all necessary photos.

Reach Overview Photo Methods:

The purpose of taking reach overview photos is to try to capture the ecological and geomorphic context of the site. Take reach overview photos from a location where as much of the reach is visible in the photo as possible. Ideally, reach overview photos should be taken from a hillside that overlooks the reach, but this will not always be practical.

Monument Photo Methods:

The purpose of taking monumenting photos is to help future crews relocate the sample reach and to capture visible changes in the reach over time. Therefore, monumenting photos should be taken in locations where obvious features can be identified.

1. Strive to combine photos that show a prominent feature(s) of the area (e.g., large tree, boulder, or human structure) with a narrative of the reach description.
2. Describe the monument feature and the approximate distance and direction to the feature from the location that the photo was taken.
3. In addition to taking field-based photos, it is recommended to use Google Earth or similar aerial photography to mark the top and bottom of the reach and any other distinguishing features. Archiving such aerial photos can greatly assist with relocating the reach for future sampling.
4. If the reach was targeted for monitoring condition and trend, then photos on repeat visits should be taken of the same exact photo frame that was photographed in previous visits. The exception to this rule is when the previous photos were poor quality. Photos from previous visits should be taken into the field so that the repeat photos can be properly aligned.

Critical Concept Photos Methods:

The purpose of critical concept photos is to ensure that geomorphic features are properly identified in the field and to assist with data QC. Crews should go over these photos with their project lead or crew supervisor after each trip for at least the first month of data collection.

1. Find a location within the reach with clear scour, bankfull, and floodplain features. Note multiple locations and photos may be needed if one location does not have clear indicators of all three features.
2. For scale, place the depth rod vertical next to the bank so that measurements can be read. Additionally, it may be useful to have another depth rod pointing to features in photos.
3. Take at least 2 photos, one that is close up and focused on the bank and one in which both banks can be seen so that geomorphic features can be traced up and down the reach. Take additional photos as needed so that you adequately characterize the diversity of the reach.
4. Using the iPad, draw lines on photos indicating the location of scour, bankfull, and floodplain features throughout the reach (Figure 31).
    a. Users can only draw on a photo if it is taken with the camera app and not with SARAH.
    b. To draw on a photo, click the camera app. Take the photo and then find the photo in the photos app.
    c. Select the photo and then select upload button in the upper right corner. Then select “duplicate”.
    d. Draw lines on the duplicated photo that correspond to geomorphic surfaces.
        i. Click the photo and then the “edit” button at the top. Then click the three dots on the side of the screen and click markup.
        ii. Proceed to draw on the photo with a:
            1. blue line for scour;
            2. yellow for bankfull height; and
            3. red for floodplain height.
        iii. Click done and done.
    e. Upload both the original photo and the edited photo into SARAH.

Figure 31. Example critical concepts photo with lines drawn on the photo to indicate scour (blue), bankfull (yellow), and floodplain (red) features. Note the markup tool in the iPad photos application can be used to draw these lines and then the photo should be uploaded into the SARAH application.

New Appendix G: Pool Tail Fines (Supplemental method- adapted from PIBO)

Reason: To more clearly outline and explain the PIBO methods for sampling pool tail fines.

Overview: Quantify the percentage of fine sediments on the pool tail surface of scour and plunge pools.

Sampling method:

1. Measure ten scour and plunge pools, beginning at transect A and working upstream. Exclude dam and beaver pools. If there are not ten pools, measure all existing pools.
2. Use a square grid with 49 evenly distributed intersections. Include the top right corner of the grid for a total of 50 intersections. In some locations with very narrow streams, a smaller grid may be necessary. This smaller grid should still include 49 evenly distributed intersections.
3. Take 3 measurements per pool.
    a. Sample within the wetted channel.
    b. Place the bottom edge of the grid upstream from the pool tail crest a distance equal to 10% of the pool's length or one meter, whichever is less (Figure G1-adapted from PIBO).
    c. Visually estimate and place the center of the grid at 25, 50, and 75% of the distance across the wetted channel, making sure the grid is parallel to and following the shape of the pool tail crest.
    d. In narrow streams, it is OK if grid placements overlap
    e. If you cannot collect two of the three grids at a pool, do not collect data for this pool and move to the next pool to collect data. Data collection may be impeded by:
        - Water that is too deep to see the grid. Attempt to use an underwater viewer. If you still cannot see the grid, you should not collect data at this pool and should move to the next pool.
        - Turbidity being too high to see the grid. Attempt to poke and pinch each intersection with your fingers and estimate the measurements (flag as estimated). If this is not possible, do not collect data at this pool and move to the next pool.
4. Record the number of intersections that are underlain with fine sediment <2 mm in diameter at the b-axis. Use the 2 mm wide piece of electrical tape on the grid as a reference.
5. Record the number of intersections that are underlain with fine sediment <6 mm in diameter at the b-axis. Use the 6 mm wide piece of electrical tape on the grid as a reference.
6. If the fines grid lands on a boulder (≥ 512 mm b-axis diameter), record the number intersections on the boulder in the "OM (organic matter) or boulder" column (Figure G2-adapted from PIBO). Aquatic vegetation, organic debris, roots, or LWD may be covering the substrate. First attempt to identify the particle size under each intersection. If this is not possible due to debris, then record the number of intersections in the "OM or boulder" column. Do not attempt to move the obstructing debris.

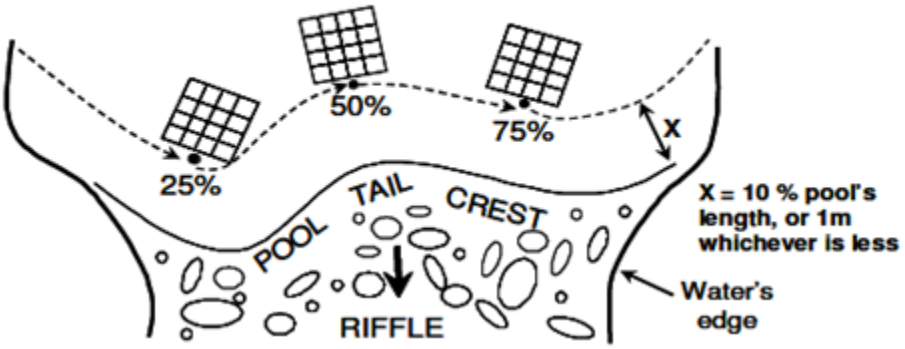

Figure G1. Adapted from PIBO. Location and orientation of the pool tail fines grids relative to the pool tail crest

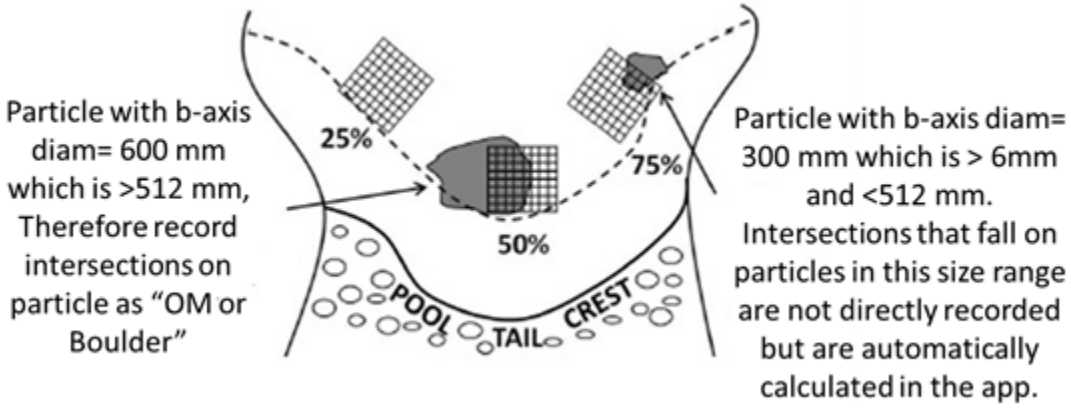

Figure G2. Adapted from PIBO. Record intersections of the fines grid that land on particles 512 mm (b-axis diam. as "OM or boulder". Do not record the number of intersections that fall on particles > 6mm and <512 mm.

Reminders

- Only record particles that are <2 mm, <6mm, > 512 mm, or organic. All grid locations NOT marked as < 2mm, <6mm, or "OM or boulder," are assumed to be mineral substrate between 7 mm and 511 mm, and the app will calculate this value in the column labeled > 6mm <512 mm (Figure G2).
- The number of fines <2 mm cannot exceed the number of fines <6 mm.
- The number of fines <6 mm + intersections marked as "OM or boulder" must be ≤50.
- If a substrate particle is covered with enough fine sediment to "pinch" between your fingers, record the particle as either <2 mm or < 6 mm. If a substrate particle is covered with fine sediment but not enough to be "pinched", measure the particle below the fines and record accordingly.

Protocol Additions & Clarifications

1. Introduction

Ocular estimates of vegetative type, cover, and structure was changed from a core to a contingent indicator as a result of studies suggesting high measurement error among crews and/or sample visits. Consult your monitoring objectives and the AIM team to determine relevance of this indicator going forward The presence / absence of native and nonnative vegetation types is retained as a core and should be assessed at all sites.

Table 1. Core and contingent aquatic indicators and covariates for use in perennial, wadeable streams. The indicators are grouped by the BLM's four fundamentals (43 CFR 4180.1).

Fundamentals	Indicator	Core	Contingent	Covariate
Water quality	pH	X		
	Specific conductance	X		
	Temperature (instantaneous and seasonal)	X		
	Total nitrogen and phosphorous		X	
	Turbidity		X	
Watershed function and instream habitat quality[1] (i.e., physical habitat)	Residual pool depth, length, and frequency	X		
	Streambed particle sizes	X		
	Bank stability and cover	X		
	Floodplain connectivity	X		
	Large woody debris	X		
	Bank angle[1]		X	
	Ocular estimate of instream habitat complexity[1]		X	
	Thalweg depth profile		X	
	Bankfull width			X
	Wetted width			X
	Slope			X
	Flood-prone width			X
Biodiversity and riparian habitat quality	Macroinvertebrate biological integrity	X		
	Presence / absence of native and nonnative vegetation types	X		
	Ocular estimate of riparian vegetative type, cover, and structure		X	
	Canopy cover	X		
	Quantitative estimates of riparian vegetative cover and composition[2]		X	
Ecological processes	See indicators from other fundamentals[3]	NA	NA	
Other	Photos			X
	Human influence			X

[1]Bank angle and ocular estimates of instream habitat complexity were included as contingent indicators to be collected in all regional and national surveys on a research basis; consult your monitoring objectives and the AIM team to determine potential relevance for local applications.

[2]Methods for the quantification of riparian vegetative cover and composition are pending. In the interim, use the multiple indicator monitoring (MIM) methods.

[3]Indicators used to assess ecological processes are redundant with other indicators, such as temperature; total nitrogen and phosphorous; streambed particles sizes; and macroinvertebrate biological integrity.

1.2 Timing of field data collection- Sampling after rain or other elevated discharge events

Implementation of the AIM-NAMF protocol is to occur when stream discharge is at base flow (i.e., when discharge achieves a temporally stable height below scourline). However, base flow sampling is not always practical between June and September and thus we limit sampling to discharge levels below bankfull.

On the occasions when rain or snow events, irrigation return flows, dam release patterns etc. cause discharge to be elevated for short durations during the index period (June 1 - September 30), we recommend that field crews consult with local weather stations and local field offices to try to determine how recently such an event occurred and if evidence of dramatic flooding exists. Following high flow events, consideration should be given as to whether data should be collected or the site re-visited at a later date. For example:

- Sampling should be delayed for approximately one month after bed mobilizing flows. Of concern are atypical physical habitat, macroinvertebrate, and water quality samples.
- Sampling should be delayed until discharge recedes to base flow after significant rain events. Of concern are atypical water quality samples.
- If sites are particularly difficult to access and crews have made the effort to travel to a site, we suggest the collection of all data IF discharge is below bankfull. Crews should take notes as to the observed condition. Lastly, if anomalous conditions are observed, efforts should be made to resample such indicators at a later date.

5.1 pH, Specific Conductance, and Temperature

Record the serial number of the YSI used so that any issues with the device can be tracked.

7.3.1 Bank Cover

Dead perennial vegetation counts as cover.

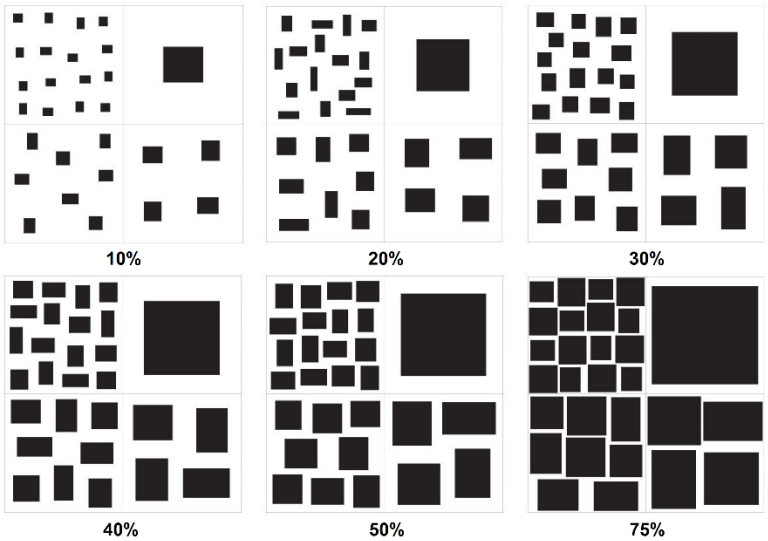

Figure 6A. Visual representation of aerial cover percentages to assist with ocular estimates of bank cover and riparian vegetation plots. NOTE: Within each larger box, a quadrant contains the same total area covered but contains different object sizes and numbers. (Adapted from NRCS - Schoeneberger et al. 2012).

7.8 Flood-Prone Width

In addition to other specifications outlined in main protocol, flood prone width must be collected at a riffle that is parallel to the valley. Also, be sure to select a location in the riffle that has typical bankfull and thalweg depths. For example, do not choose the deepest or shallowest part of the riffle and do not choose an area with strange bankfull indicators.

7.6 Large Woody Debris (LWD)

- The qualifying section of the LWD must be at least partially within or bridging the main bankfull channel, but record the entire length that qualifies.
- Dead limbs spanning bankfull that are connected to live trees are counted as LWD if they meet the size criteria. Dead limbs should be clearly dead for example they might be devoid of leaves, they might be free of bark or shedding bark, and often times many of the small branches are broken off.

8.1 Vegetation Plots:

- Dead vegetation counts as cover, even annual grasses.
- If the vegetation plot contains water from the main or a side channel, ignore the water and only consider the portion of the plot overlaying the land. For example, if a 2x2 m section of the 10x10 m plot is overlaying water, only consider the 8x8 m section of the plot that overlays the land as 100% of the plot.
- See Figure 30 to better understand how to implement methods on meander bends.

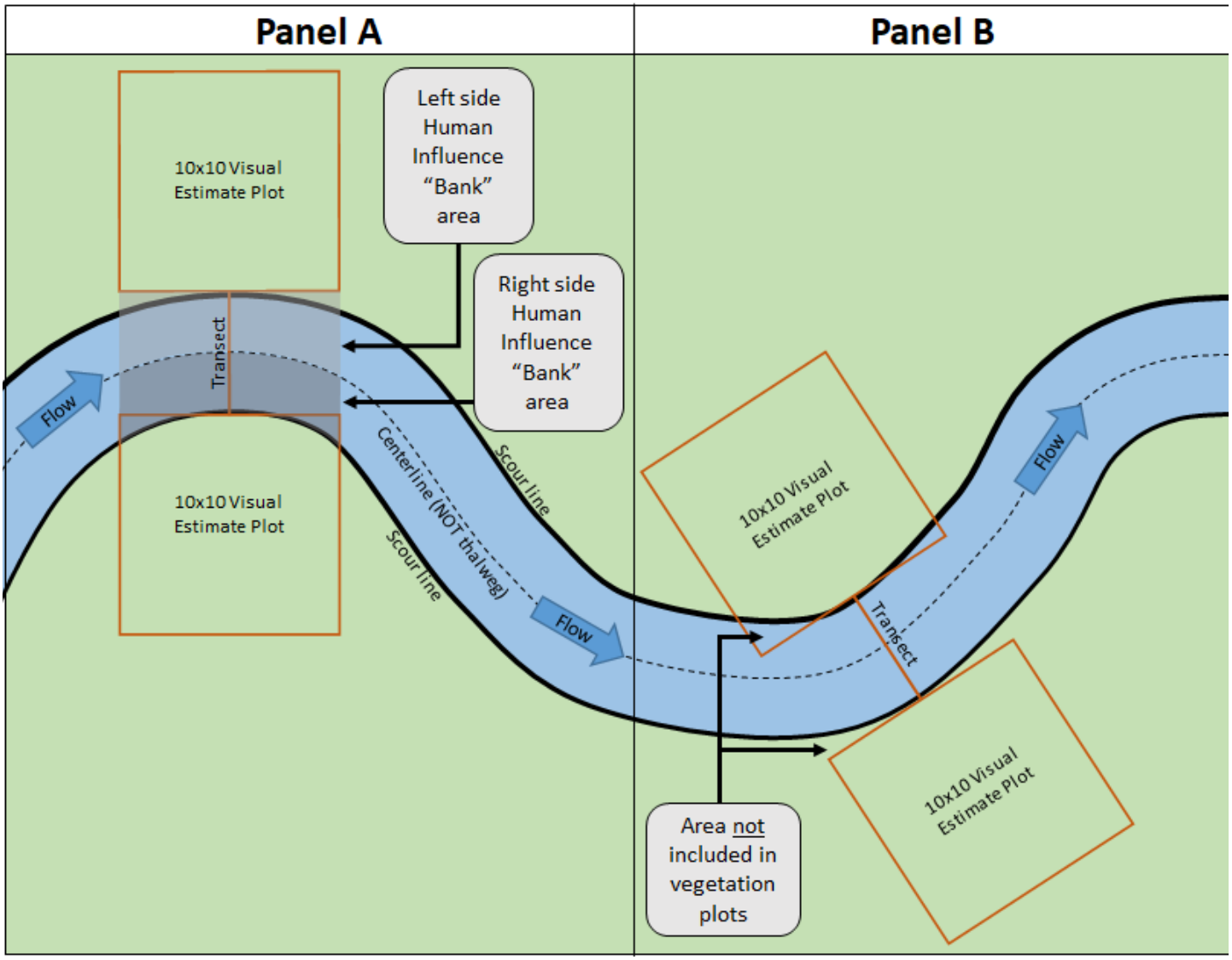

Figure 30. Example layouts for human influence (Panel A) and vegetation (Panel B) plots. The location of human influences are recorded as: (B) on the bank or instream, (C) contained within the plot, or (P) present outside of the plot. For assessments of whether the human influence occurs on the bank or in the stream, the plot area starts at the centerline of the stream and extends to the plot edge or scour line (Panel A). In contrast, vegetation cover is only estimated within the part of the plot that overlays land. Areas along the bank that are not in the plot or areas of that plot that overlay water should be excluded (Panel B).

8.1 Non-native or noxious riparian vegetation

- Each state has worked to standardize a list of non-native or noxious riparian species and these lists are included in the app for your sample area(s). These lists are provided to standardize presence/absence estimates for:
    - Nonnative woody
    - Nonnative herbaceous
    - Nonnative aquatic (i.e., obligate) species

- In addition to the basic identification materials provided by the AIM Team, individual Project Leads and Contractors should provide supplemental trainings to field crews in the identification of these species.
- For all identified nonnative species, we recommend the collection of voucher specimens and/or photos for verification by local BLM field staff.
- When estimating the presence/absence (P/A) of nonnative riparian species, follow these guidelines:
    - Nonnative woody and herbaceous species: assess P/A in the 10x10 riparian plot.
    - Nonnative aquatic (riparian obligates): assess P/A in the 10x10 riparian plot, BUT also extend the plot to the center of the stream.
    - P/A of both nonnative woody and herbaceous and nonnative aquatic species are assessed for both right and left banks at each transect.

8.2 Human Influence

- The presence/absence of human impacts is assessed based on the proximity of the impact to the stream - is the impact present on the ‘bank’, contained within the 10x10 riparian plot, or present.
- For the ‘bank’ designation, all land and water is considered that exists from the centerline of the stream channel to the edge of riparian plot or scour line, whichever is farthest from the stream centerline (Figure 30). This includes the triangles that are caused by not conforming the plots to bend along the edge of the channel.
- If the human influence plot extends over a meander bend and contains water from the main channel, do not exclude this section of the plot as you would for vegetation plots. Rather mark appropriately as “contained” within the plot or “present” outside the riparian plot.