EPA United States Environmental Protection Agency

US Army Corps of Engineers

ERDC

Streamflow Duration Assessment Methods: Desktop reconnaissance, general site information, and measuring bankfull width

Video Training

2025

Initial data collection procedure

- Conduct desktop reconnaissance
- Prepare sampling gear
- Walk and set the reach
  - Determine assessment reach length and boundaries
- Measure bankfull width indicator

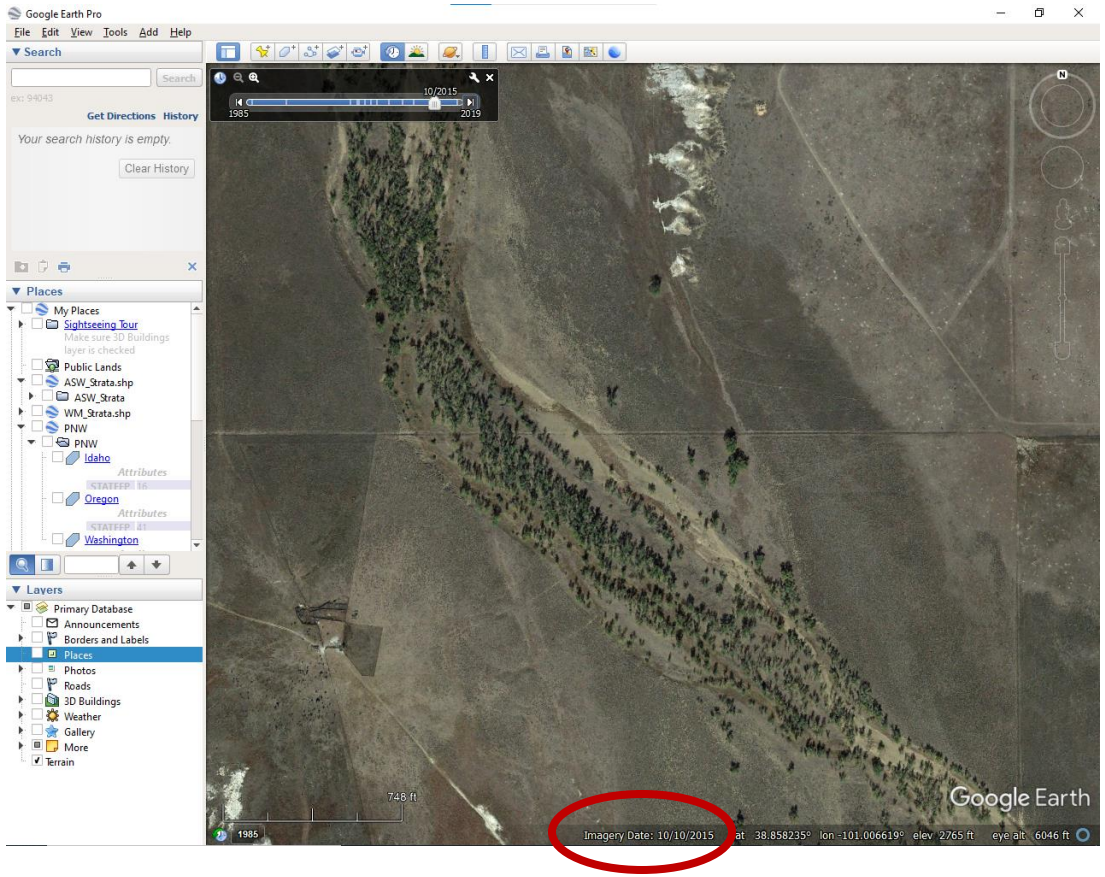
Desktop reconnaissance, general site information & bankfull width

Desktop reconnaissance

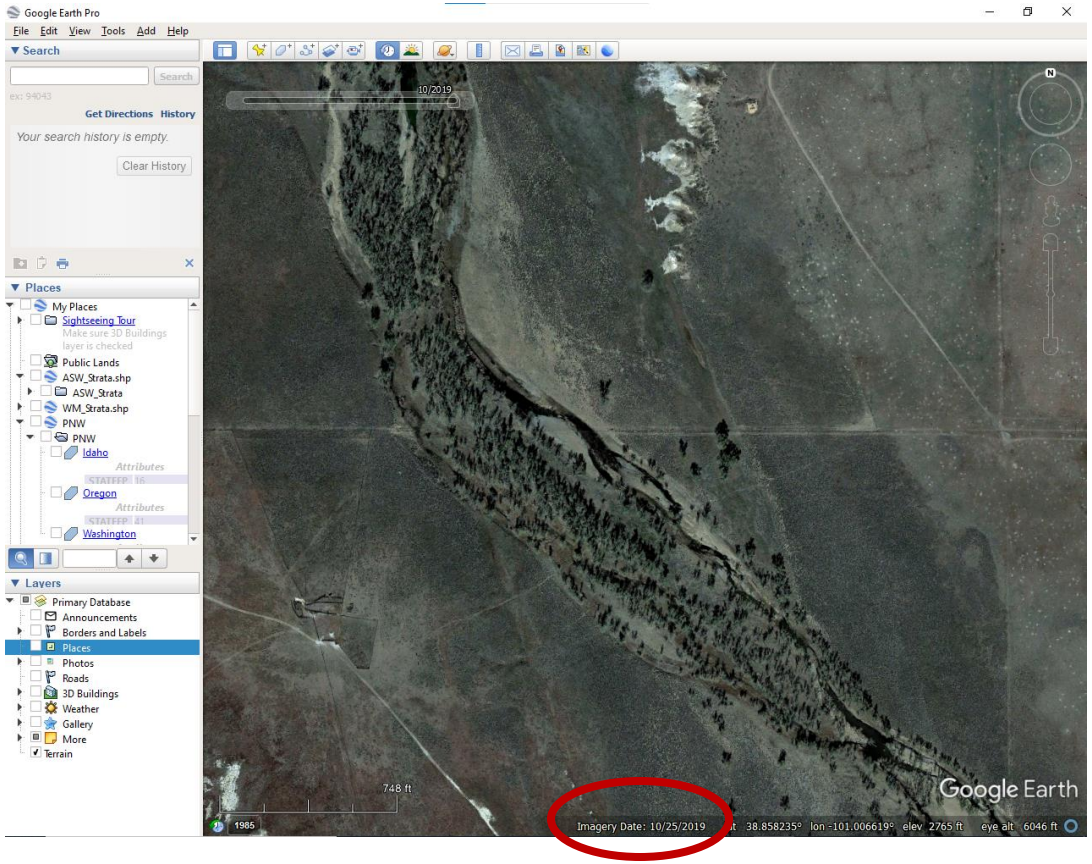
Before you step outside, gather the info you'll need!

- Determine access routes, property ownership, safety concerns
- Gauge field conditions
- Anticipate placement and number of assessment reaches required
- Find related data on flow, indicators
  - Regional plant lists, wildlife observations, bioassessment data, nearby stream gauges, etc.
- Estimate selected indicators from aerial imagery or regional curves, if possible
  - Bankfull channel width
- Identify local experts

Historical imagery can help a lot



October 2015: Dry or Disconnected Pools



October 2019: Wet

Note: Dates reported in Google Earth are not always accurate – can verify imagery dates using USGS Earth Explorer

Sampling gear varies by Regional SDAM

All

- Manual, field forms, clipboard, and notebook
- Site maps, aerial photographs (1:250 recommended)
- GPS & Camera (smartphone ok)
- Flagging tape
- Tape measure(s)
- D-frame kick net (aquarium net ok in small streams)
- Hand lens or magnifying tool for macroinvertebrate observations
- First aid kit
- Personal field gear (boots/waders, hat, etc.)

Some Regions

- Material for voucher collection, if appropriate (vials, ethanol, sample labels, sealable plastic bags)
- Plant and invertebrate ID guides
- Current version of applicable National Wetland Plant List
- Convex spherical densiometer (prepped)
- Clinometer or laser range finder & stadia rod

Gear required for a Regional SDAM may be carried by a single practitioner

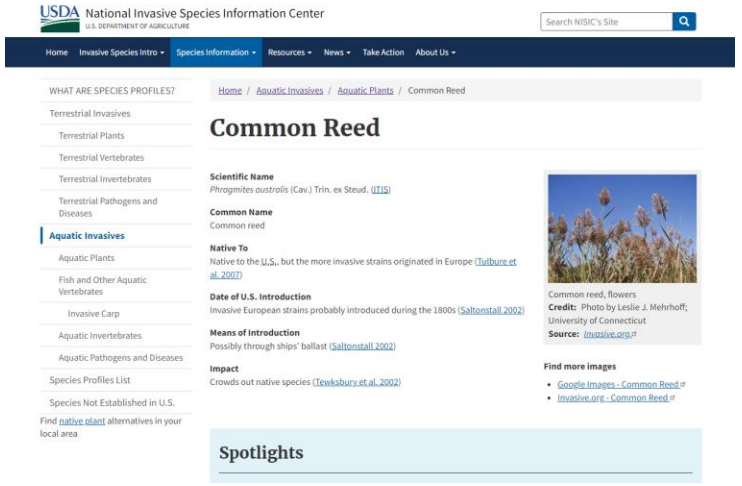
Desktop reconnaissance, general site information & bankfull width

Sampling gear

- Make sure gear is cleaned before and after sampling to avoid spreading invasive species, fish/amphibian disease, etc.

USGS Nonindigenous Aquatic Species website: https://nas.er.usgs.gov/

USDA Invasive Species info: https://www.invasivespeciesinfo.gov/



Phragmites australis

Walk and set the assessment reach

- Determine if multiple assessment reaches are needed
- Start taking bankfull width measurements to estimate assessment reach length:
  - At the downstream end
  - 15 m above the downstream end
  - 30 m above the downstream end, **OR**
  - Three representative locations
- Stay outside the water, if possible. Disturbance could hinder subsequent measurements.
- Determine appropriate reach boundaries
- Start site-sketch
  - Indicate access points, channel features, and location of indicators
  - Revise when assessment is complete

General site information

Project name or number:		
Site code or identifier:	**Assessor(s):**	
Waterway name:		**Visit date:**
Current weather conditions (check one): □ Storm/heavy rain □ Steady rain □ Intermittent rain □ Snowing □ Cloudy (_____ % cover) □ Clear/sunny	Notes on current or recent weather conditions (e.g., precipitation in prior week):	**Coordinates at downstream end (decimal degrees):** Lat (N): Long (E): Datum:
Surrounding land-use within 100 m (check one or two): □ Urban/industrial/residential □ Agricultural (farmland, crops, vineyards, pasture) □ Developed open-space (e.g., golf course) □ Forested □ Other natural □ Other: _____		**Describe reach boundaries:**
Mean bankfull channel width (m): _____ (Indicator 6) _____ _____ _____	**Reach length (m):** 40x width min 40 m max 200 m	**Site photographs**: Enter photo ID or check if completed. Top down: _____ Mid down: _____ Mid up: _____ Bottom up: _____

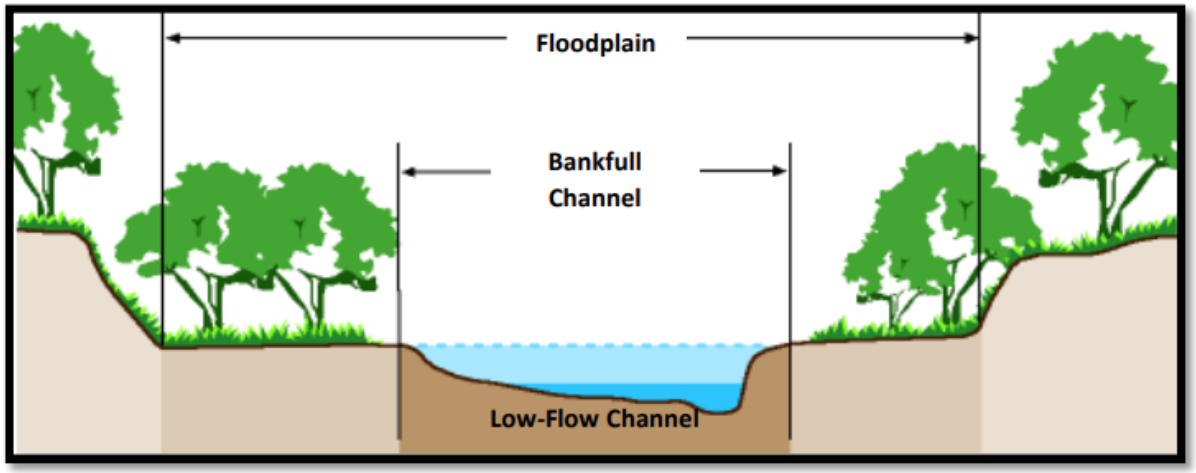
Desktop reconnaissance, general site information & bankfull width

Measure bankfull channel width at 3 locations

Bankfull elevation is the transition between the channel and the floodplain.
Perpendicular to thalweg, bank to bank, and to the nearest 0.1 m.

Identifying bankfull elevation

- Bankfull width contains the bankfull discharge, a flow event that occurs relatively frequently (1.01 to 5 years). Not always top of bank, especially in disturbed systems.
- Identify field indicators of bankfull elevation; may only be present on one bank.
  - Slope break between channel and floodplain
  - Transition from exposed stream sediments or more water- and scour-tolerant vegetation to terrestrial sediments or less hydrophytic and scour-intolerant vegetation.
  - Moss growth on rocks or banks
- If possible, evaluate multiple field indicators of bankfull.



Bankfull Width: The average width of the channel at the bankfull elevation. (image credit USFS)

Identifying bankfull elevation

- In larger systems (e.g., drainage area >0.5 sq. miles), it may be helpful to compare bankfull width measured in field to bankfull width derived from *regional curves* that relate bankfull dimensions to drainage area.
  - Regional curves developed using very small watersheds may not be available; extrapolation outside the range used to develop them is not recommended.
- If field bankfull width is substantially different from estimated bankfull dimensions derived from a regional curve (see next slide), re-evaluation of bankfull indicators may be needed.
- References for identifying bankfull elevation and measuring bankfull width can be found on the SDAM Training Materials website:
  - https://www.epa.gov/streamflow-duration-assessment/

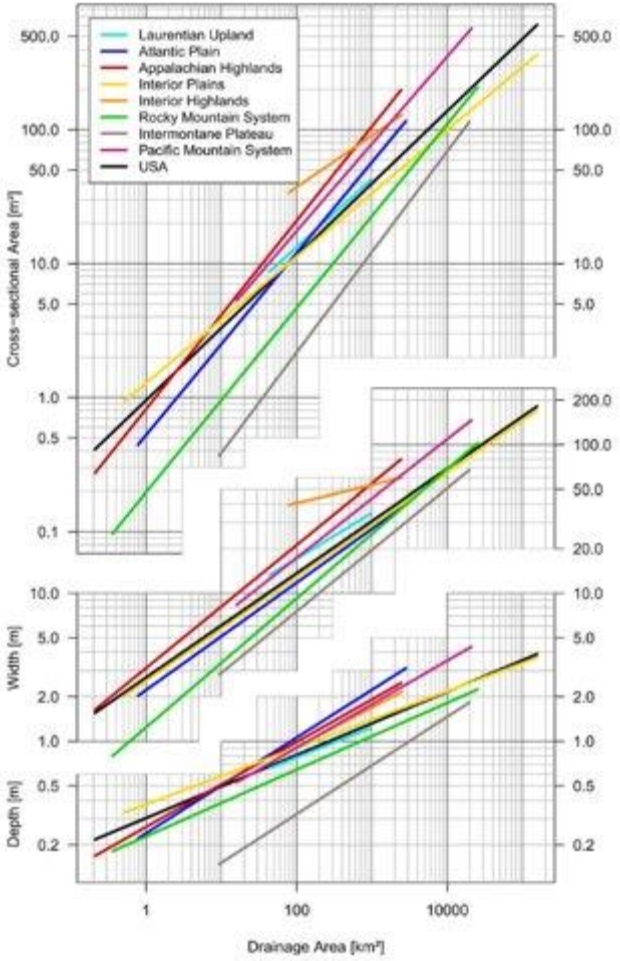
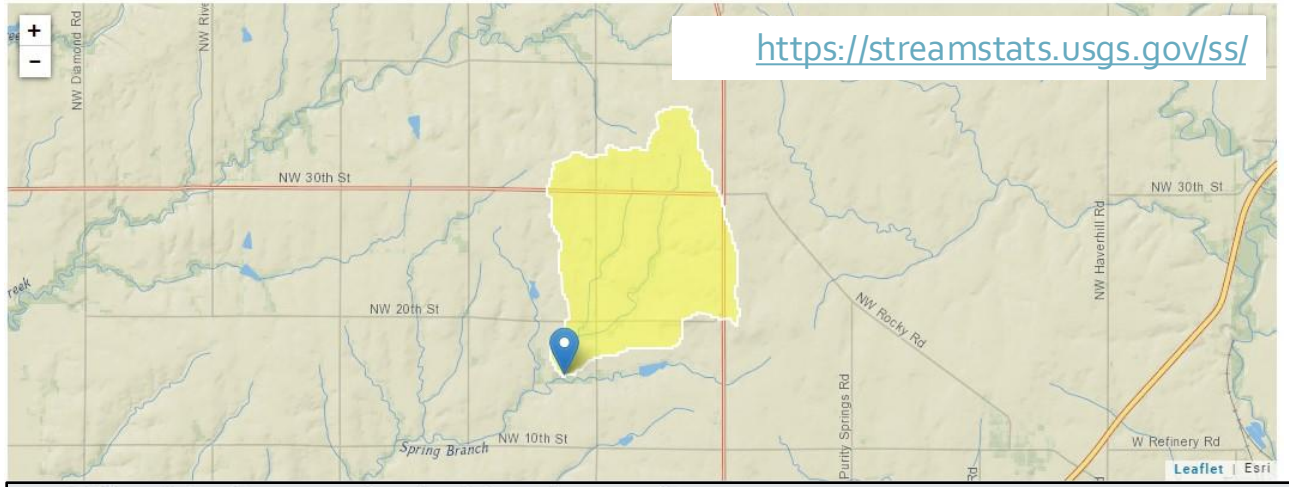


FIGURE 2. Regional and Nationwide Curves Relating Bankfull Width, Depth, and Cross-Sectional Area to Drainage Area.

Regional curves for US by Bieger et al. (2015).

StreamStats provides regional curve estimates

- StreamStats is available for most of the States. https://www.usgs.gov/streamstats
- Delineate watersheds and generate basin and bankfull characteristics (curves from Bieger et al. 2015).
- Example: Spring Branch in Kansas (2.13 sq mile drainage area)
  - Estimated approximate bankfull channel width: 15 to 18 feet
  - If field-based numbers are well outside this range (e.g., width <7.5 feet), re-evaluate indicators.
  - If field indicators justify bankfull dimensions that disagree with regional curves, document rationale with notes and photos.



Bankfull Statistics Flow Report [Interior Plains D Bieger 2015]

Statistic	Value	Unit
Bieger_D_channel_width	15.3	ft
Bieger_D_channel_depth	1.73	ft
Bieger_D_channel_cross_sectional_area	30.8	ft^2

Bankfull Statistics Flow Report [Central Lowland P Bieger 2015]

Statistic	Value	Unit
Bieger_P_channel_width	17.5	ft
Bieger_P_channel_depth	2.11	ft
Bieger_P_channel_cross_sectional_area	29.5	ft^2

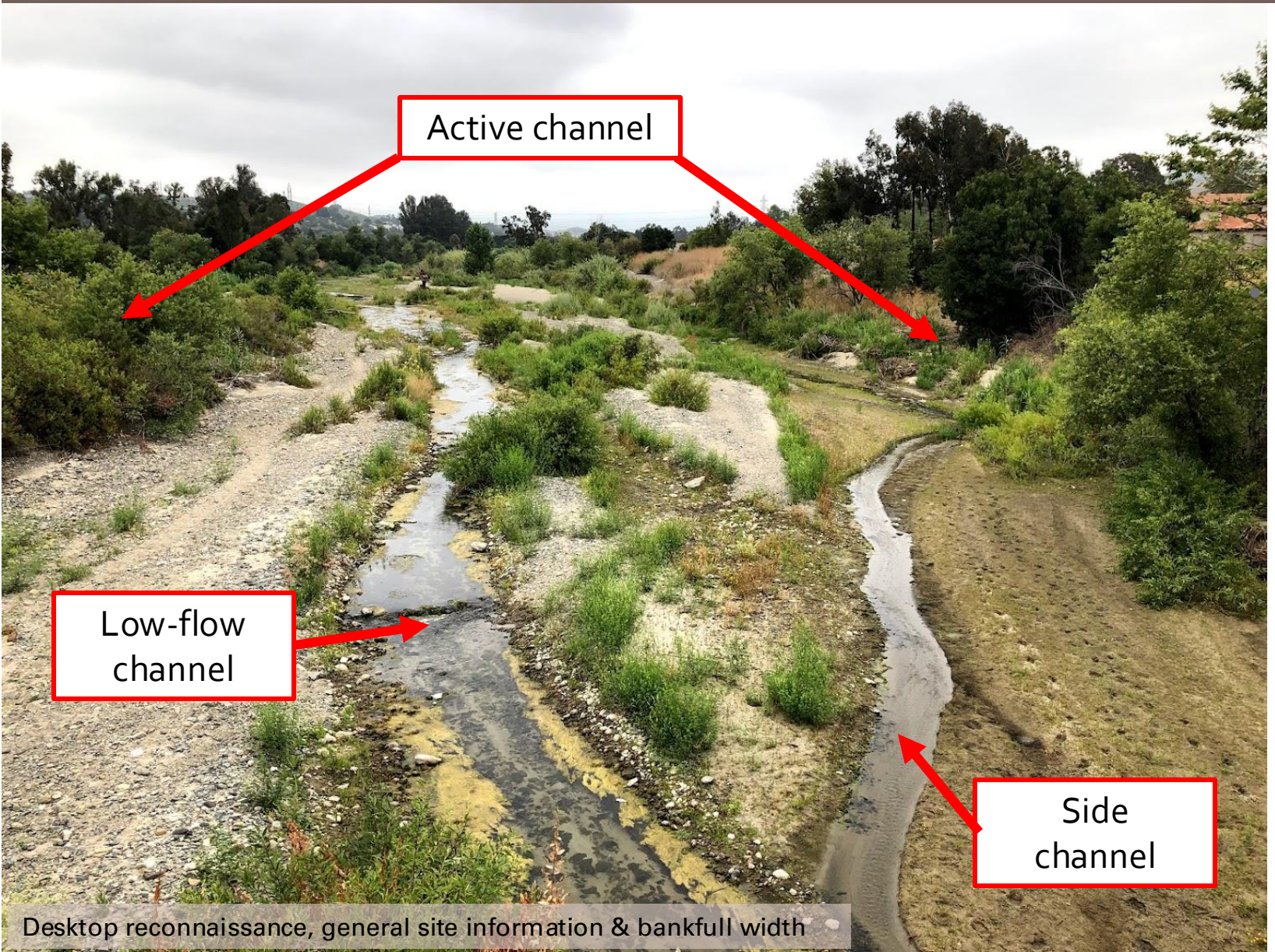
Bankfull Statistics Flow Report [USA Bieger 2015]

Statistic	Value	Unit
Bieger_USA_channel_width	16.2	ft
Bieger_USA_channel_depth	1.42	ft
Bieger_USA_channel_cross_sectional_area	25.7	ft^2

Desktop reconnaissance, general site information & bankfull width

Bankfull channel width

The same measure used to determine the length of the assessment reach



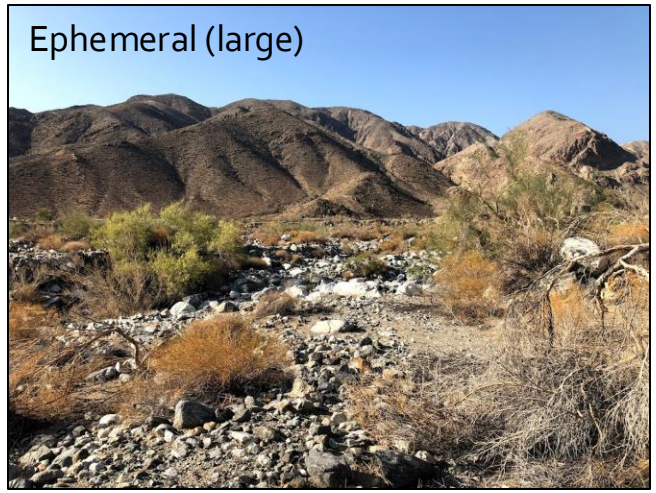
- In multi-thread systems, include entire **active channel** (not just the primary channel)

Bankfull channel width

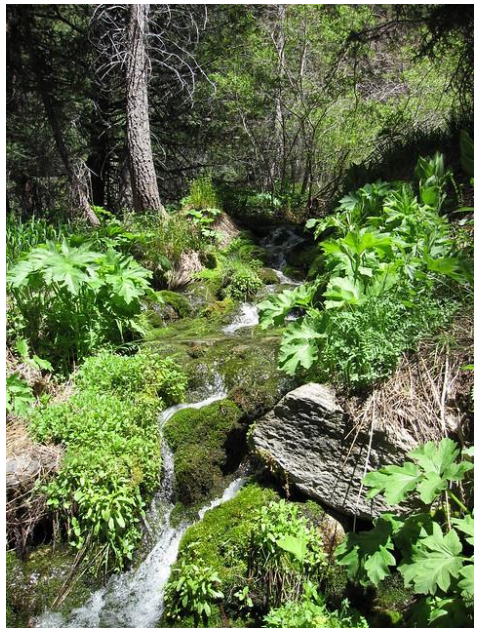
- Bankfull channel width is ***associated*** with longer duration flows.
  - Larger channels usually have longer flow duration.
  - Exceptions are common, especially in the Arid West
- It does not ***respond*** to streamflow duration (like biological indicators do).
- It does not strongly ***control*** streamflow duration (like climate).

Perennial (large)

Ephemeral (large)



Perennial (small)



Ephemeral (small)

Record on the field form

For convenience, record mean bankfull channel width on page 2 of the field form. Mean bankfull width is the first indicator in each of the Regional SDAMs outside of the Pacific Northwest and so also recording it as the first indicator makes it easier to use the web application.

1. Mean bankfull channel width (m) (nearest 0.1 m, copy from first page of field form)

Notes about mean bankfull channel width:

References for identifying bankfull height and measuring bankfull width can be found on the SDAM Training Materials website: https://www.epa.gov/streamflow-duration-assessment/supporting-materials

General site info

- Descriptions of the assessment's location and date:
  - Project name or number
  - Site code/identifier
  - Name of assessor(s)
  - Waterway name
  - Visit date
  - Coordinates
  - Channel width, reach length
  - Reach boundary descriptions
- Surrounding context:
  - Weather conditions
  - Surrounding land use (up to 2 categories)
  - Disturbances

General site information

Project name or number:

Site code or identifier: | **Assessor(s):**

Waterway name: | **Visit date:**

Current weather conditions (check one):
□ Storm/heavy rain
□ Steady rain
□ Intermittent rain
□ Snowing
□ Cloudy (_____ % cover)
□ Clear/sunny

Notes on current or recent weather conditions (e.g., precipitation in prior week):

Coordinates at downstream end (decimal degrees):
Lat (N):
Long (E):
Datum:

Surrounding land-use within 100 m (check one or two):
□ Urban/industrial/residential
□ Agricultural (farmland, crops, vineyards, pasture)
□ Developed open-space (e.g., golf course)
□ Forested
□ Other natural
□ Other: _____

Describe reach boundaries:

Mean bankfull channel width (m): _____
(Indicator 6)

_____ _____ _____

Reach length (m):
40x width
min 40 m
max 200 m

Site photographs:
Enter photo ID or check if completed.
Top down: _____ Mid down: _____
Mid up: _____ Bottom up: _____

Disturbed or difficult conditions (check all that apply):
□ Recent flood or debris flow
□ Stream modifications (e.g., channelization)
□ Diversions
□ Discharges
□ Drought
□ Vegetation removal/limitations
□ Other (explain in notes)
□ None

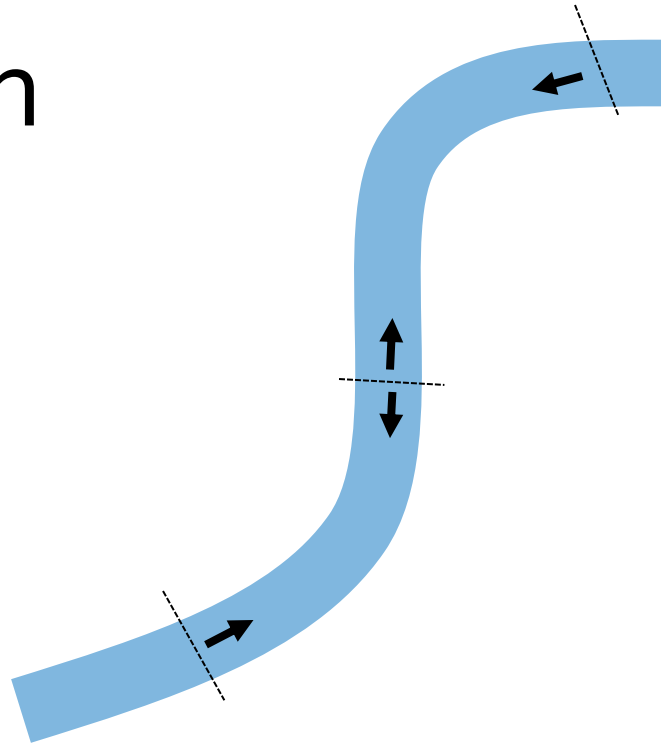
Notes on disturbances or difficult site conditions:

Observed hydrology:
_____ % of reach with surface flow
_____ % of reach with sub-surface or surface flow
_____ # of isolated pools

Comments on observed hydrology:

Desktop reconnaissance, general site information & bankfull width

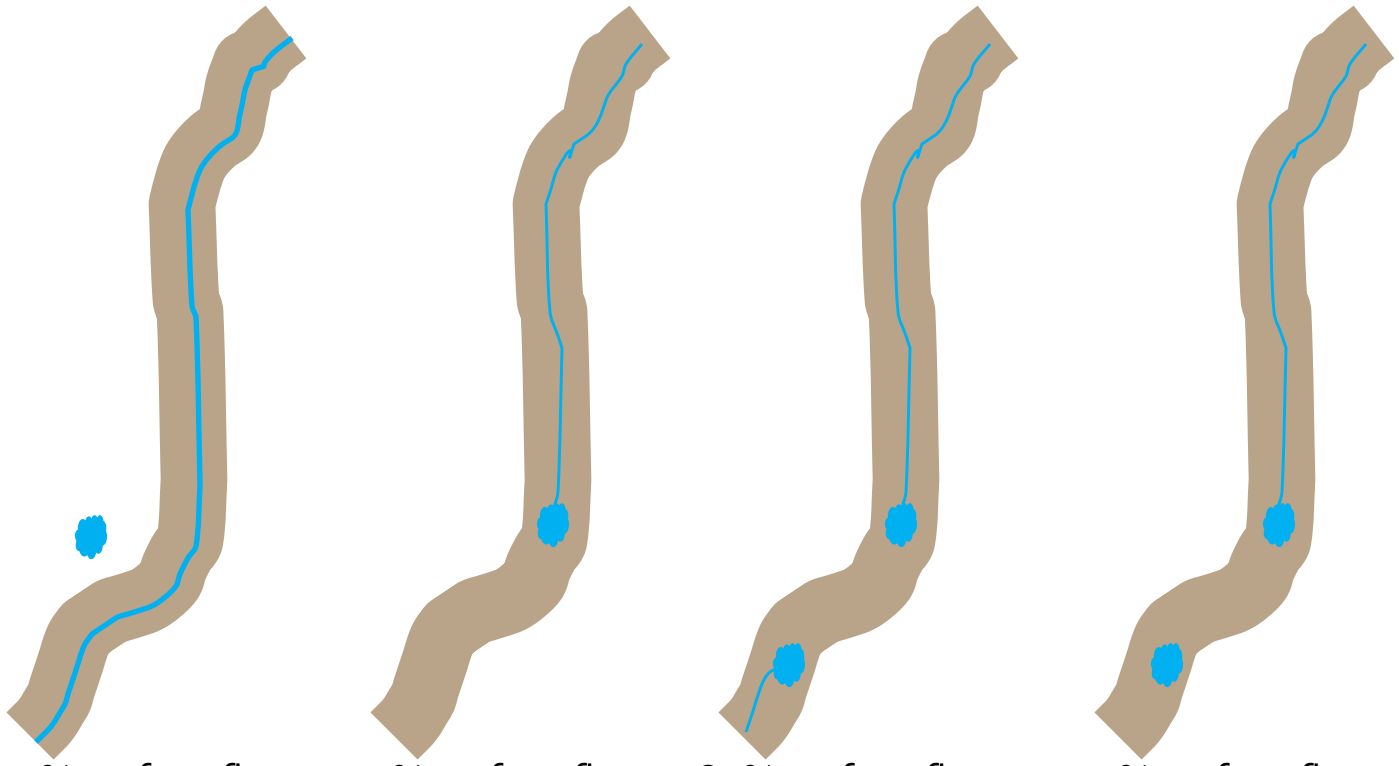
Photo documentation



- More is better!
- Some photos are strongly recommended:
  - Top (upstream) of assessment reach looking downstream
  - Middle of assessment reach, looking up- and downstream
  - Bottom (downstream) of assessment reach, looking upstream
- Other photo recommendations:
  - Top/Plan view, if possible (e.g., from a bridge crossing)
  - Indicators observed on the site (e.g., upland plants in the channel)
  - Any disturbances that affect indicator measurement or interpretation
- Keep a log, or use designated spots on field form

Flow conditions

- Estimate % of reach length
  - With surface flow
  - With surface + subsurface flow
- Estimate # of isolated pools
  - In the channel (i.e., not floodplain)
  - Holding water at time of assessment
  - No connection to flowing surface water



100% surface flow
100% surface + subsurface flow
No isolated pools

70% surface flow
70% surface + subsurface flow
No isolated pools

80% surface flow
100% surface + subsurface flow
No isolated pools

70% surface flow
70% surface + subsurface flow
1 isolated pool

Knowledge check!

Which of the following features should be recorded as an isolated pool?

A. A depression in a channel that retains water at the time of the assessment, but has no surface flow at the inlet or outlet

B. A depression in a dry channel that could retain water, but has no surface water at the time of assessment

C. A depression in a channel with an outlet where surface water flows for several meters, but is dry at the inlet

D. A depression outside of the channel (e.g., on the floodplain) that retains water at the time of the assessment

Isolated pools occur within the channel, retain water at the time of visit, and are discontinuous with areas of surface flow within the assessment reach.

Knowledge check!

What should you determine during desktop reconnaissance?

A. Access routes to the site

B. Property boundaries and other features that may affect assessment reach placement

C. Likely field conditions and safety concerns at the site

D. All of the above

Knowledge check!

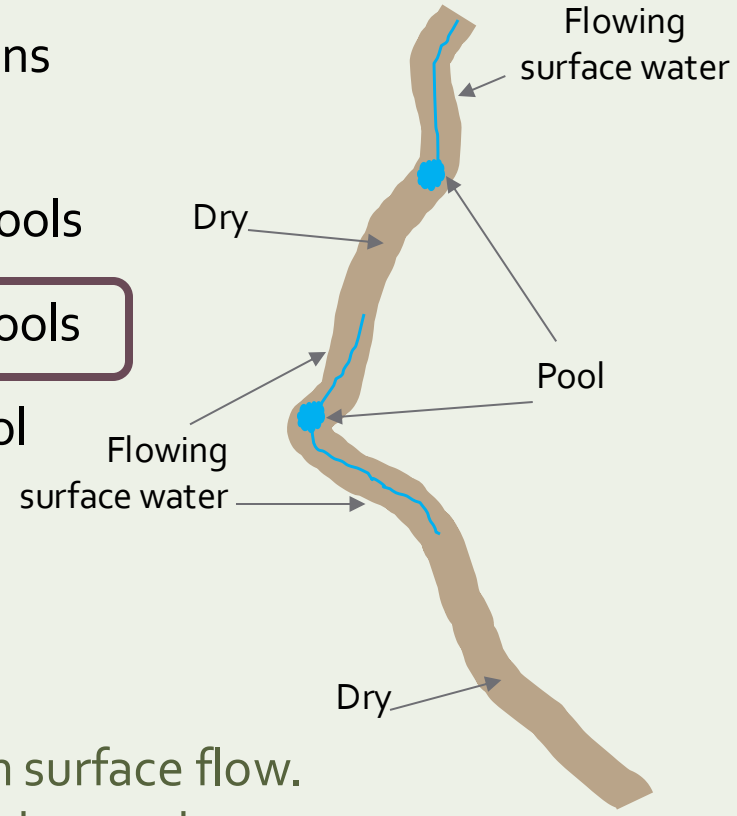
Which of the following correctly describes the hydrologic conditions of this site?

A. 50% surface flow, 50% surface + subsurface flow, no isolated pools

B. 50% surface flow, 70% surface + subsurface flow, no isolated pools

C. 50% surface flow, 70% surface + subsurface flow, 1 isolated pool

D. 50% surface flow, 100% surface + subsurface flow, no isolated pools



There is evidence of subsurface flow between the two areas with surface flow.
There's no evidence of subsurface flow in the bottom portion of the reach.
There are no pools isolated from areas with surface flow.

Knowledge check!

True or false: Bankfull width is always measured from the top of bank.

A. TRUE

B. FALSE

False: In some cases, bankfull elevation is the same as top of bank; however, in many streams, especially those that are disturbed, bankfull elevation is often different from top of bank.

For more information about SDAMs:

https://www.epa.gov/streamflow-duration-assessment