EPA United States Environmental Protection Agency

US Army Corps of Engineers

ERDC

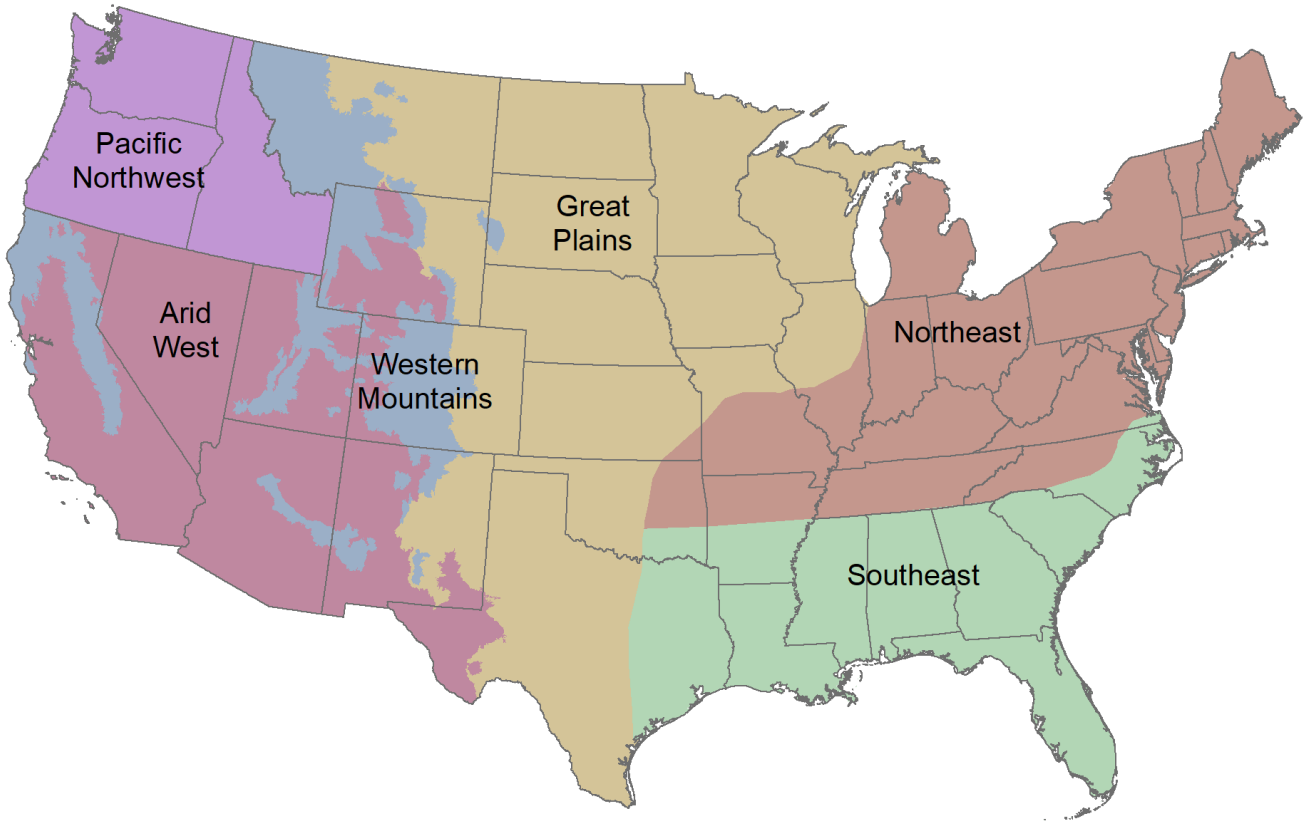
Streamflow Duration Assessment Methods: Method Development for the Northeast and Southeast

Video Training

2025

SDAM Regions

- These methods cover the Northeast and Southeast, as defined by Wohl et al. 2016 (*Synthesizing the Scientific Foundation for Ordinary High-Water Mark Delineation in Fluvial Systems*).
  - Regions identified based on, regional differences in climate, dominant native vegetation type, hydrology, geology, and topography.



- The NE and SE are generally dominated by forest-type vegetation; in the NE, snowmelt contributes some flow to streams and rivers during the year while the SE is dominated by rainfall runoff other than snowmelt, including tropical storms and hurricanes.

Method development

- Form Regional Steering Committees of EPA and Corps staff
- Identify candidate indicators through review of technical literature (Mazor et al. 2021a, b) and existing SDAMs (e.g., NMED 2011, Nadeau 2015)
  - Geomorphological (e.g., slope, sinuosity)
  - Hydrological, both direct and indirect (e.g., presence of baseflow [direct], organic debris lines or piles [indirect])
  - Biological (e.g., fish presence, presence of perennial macroinvertebrate indicator taxa)
  - Geospatial indicators and additional field indicators with available data identified during analysis stage.
- Identify candidate study reaches through literature review, reviewing hydrologic databases, and consulting local experts.

Beta methods

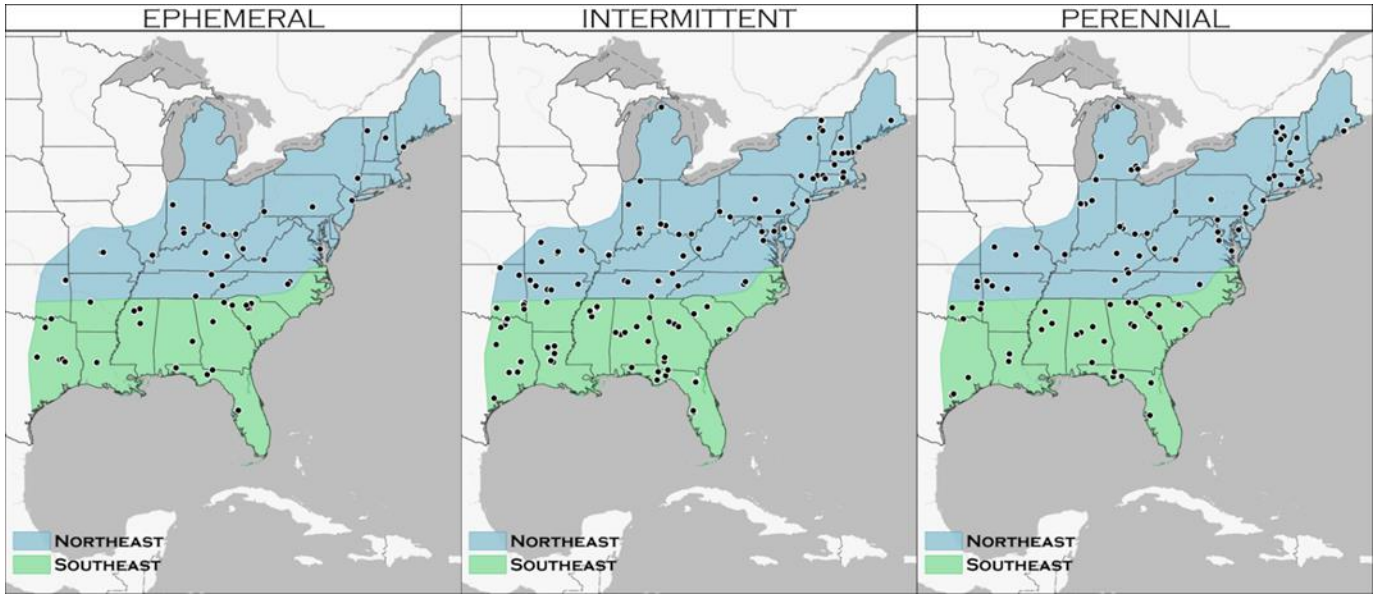
- Collect indicator data at 389 study reaches; 336 reaches ultimately used to calibrate the beta models (NE: 190; SE: 146).
  - NE: 38 ephemeral, 86 intermittent, 66 perennial.
  - SE: 33 ephemeral, 64 intermittent, 49 perennial.
  - Flow class determined using loggers at 60% of these (200)—instrumented reaches re-visited up to 4 times.
  - Data collected at 23 U.S. Caribbean sites (Puerto Rico and USVI) not used to develop beta methods.
- Create machine learning statistical model(s) to predict streamflow-duration class from 97 candidate indicators.
- Refine and simplify final beta methods.
- One year plus trial period to garner feedback from user community.

Final methods

- Additional data collected from additional visits of established sites, and some not initially used for development of the beta methods, for 358 total sites used in calibration of final models (NE: 205; SE: 153).

Region	Eph	Int	Per
NE	41	95	69
SE	34	72	47

NE and SE SDAM calibration sites



- Create machine learning statistical model(s) to predict class from 112 candidate indicators.
- Refine and simplify the final method based on agency experience with beta method and public comment.
- Publish final method, web app, and trainings.

The NE & SE SDAMs are based on 12 indicators:

Nine (9) indicators are measured in the **field,** three (3) are **desktop-based**

NE SDAM: 7 indicators
SE SDAM: 10 indicators

Five (5) are shared by both SDAMs, plus:

- Two only used in NE SDAM
- Five only used in SE SDAM

Biological indicators

1. Aquatic macroinvertebrate indicators (2)
   - Benthic Macroinvertebrate Index (BMI) score
   - Total aquatic macroinvertebrate abundance (SE only)
3. Shading
4. Prevalence of rooted upland plants in the streambed (SE only)
5. Prevalence of fibrous roots in the streambed (SE only)

Geomorphological indicators

6. Bankfull channel width
7. Entrenchment ratio (NE only)
8. Slope (NE only)
9. Particle size of stream substrate (SE only)

Geospatial/climactic indicators

10. Drainage area
11. Elevation
12. Average precipitation (May-July) (SE only)

Classifications are based on outputs from a statistical model

- A web application is required to obtain classifications for both SDAMs.
- The web application automatically determines which SDAM is appropriate for a set of coordinates.
- The web application runs a statistical model to interpret field data provided by the user to obtain one of six possible classifications:
  - Ephemeral
  - Intermittent
  - Perennial
  - At least intermittent
  - Less than perennial
  - Needs more information

SDAMs classify stream reaches into 3 main categories

Less Than Perennial

Perennial

Intermittent

Ephemeral

?

At Least Intermittent

Need More Information

Random forest

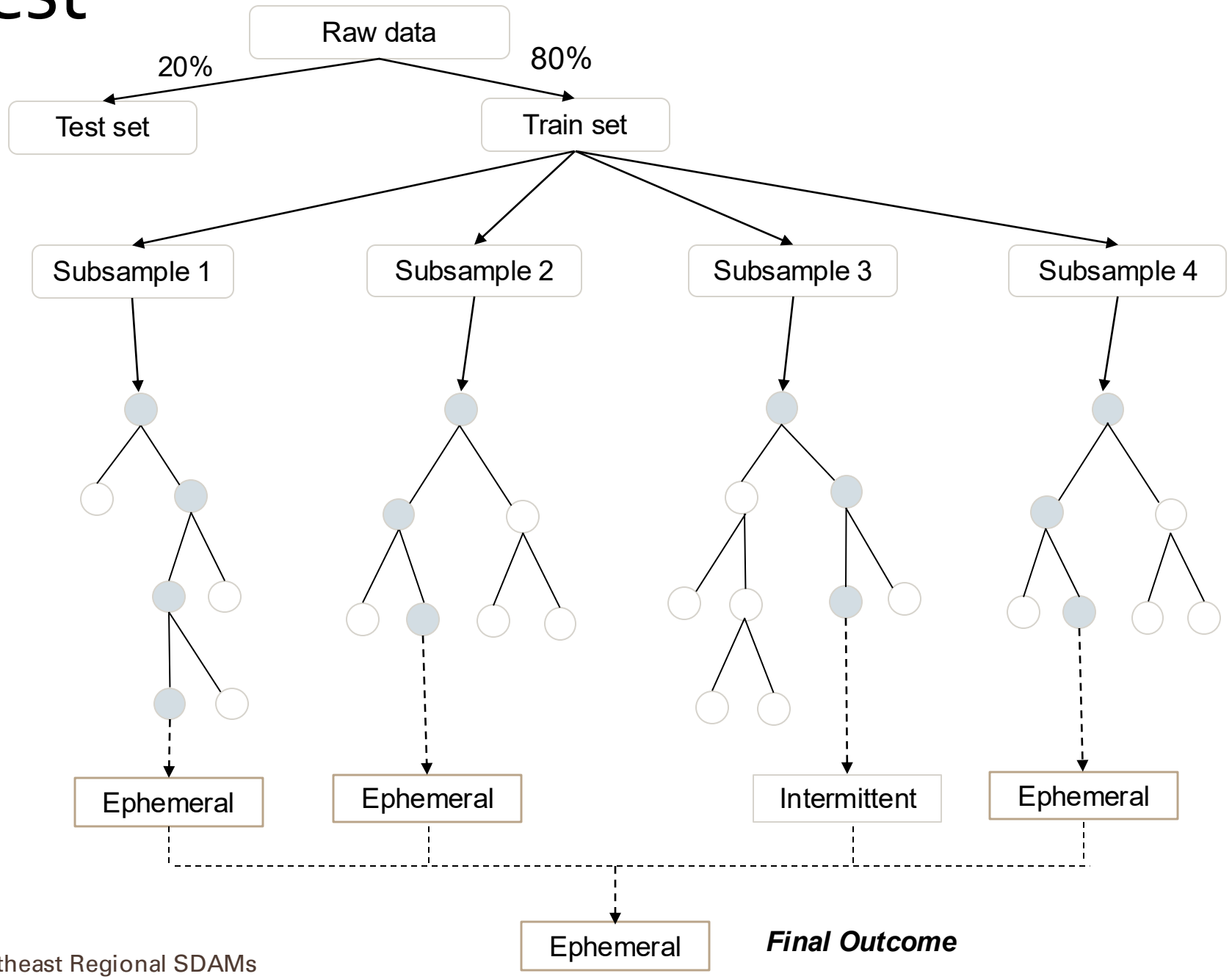
Set aside 20% for testing

Sample from the original training set with replacement to create independent subsamples

Build the trees on a random subset of indicators

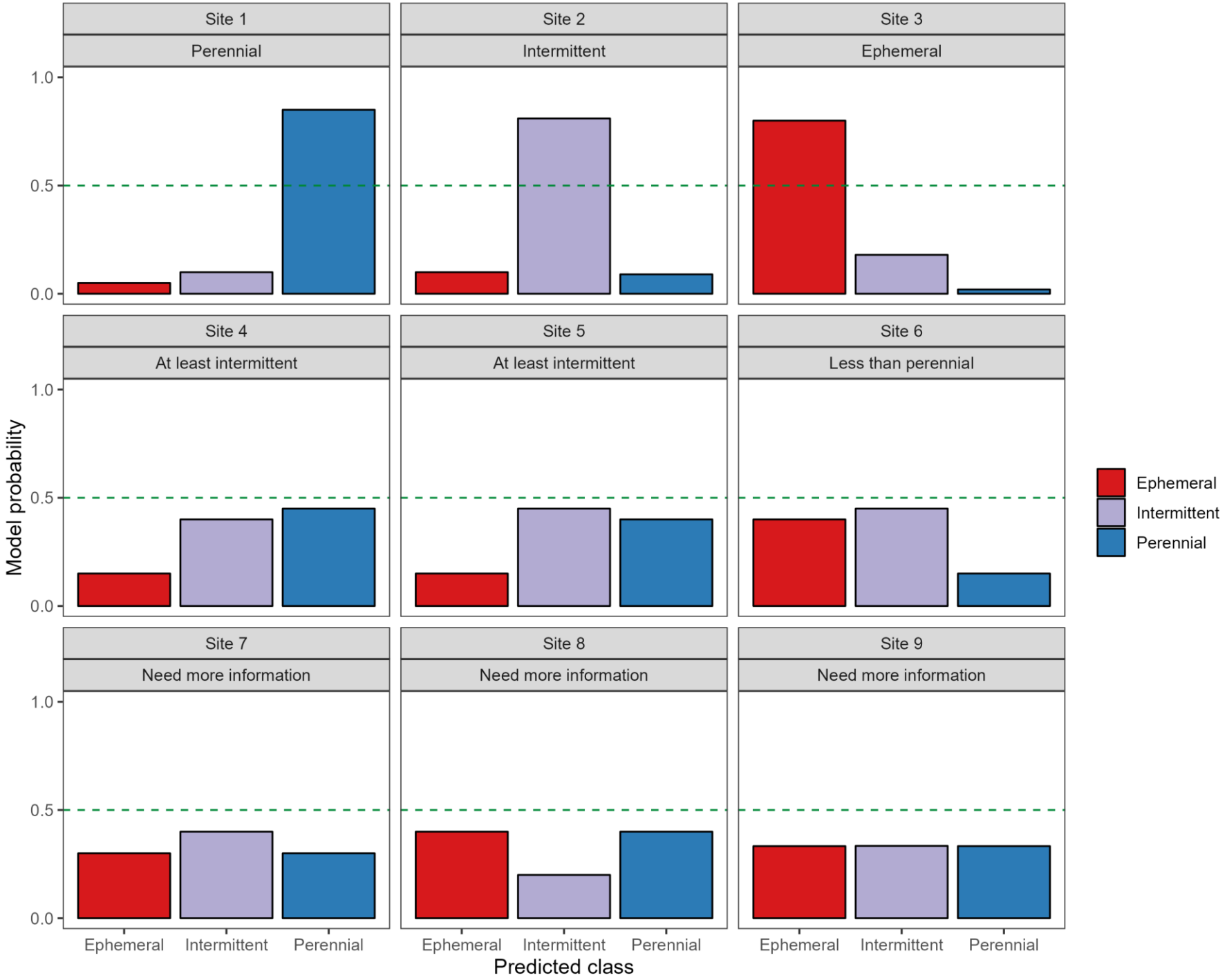
Aggregate classifications

50% voting



Six outcomes

- Perennial (P)
- Intermittent (I)
- Ephemeral (E)
- At least intermittent (ALI)
- Less than perennial (LTP)
- Needs more info (NMI)



Knowledge check!

Which of the following indicators are part of the SE SDAM? Select all that apply.

A. Prevalence of rooted upland plants in the streambed

B. Bankfull channel width

C. Benthic Macroinvertebrate Index

D. Riffle-pool sequence

E. Drainage area

F. Fish presence

G. Entrenchment ratio

H. Particle size of stream substrate

The SE SDAM is based on 10 indicators, including the 5 circled answers, plus:

- Prevalence of fibrous roots in the streambed
- Total abundance of aquatic macroinvertebrates
- Shading
- Elevation
- Average precipitation (May-July)

Knowledge check!

Which of the following indicators are part of the NE SDAM? Select all that apply.

A. Prevalence of rooted upland plants in the streambed

B. Bankfull channel width

C. Benthic Macroinvertebrate Index

D. Riffle-pool sequence

E. Drainage area

F. Fish presence

G. Entrenchment ratio

H. Particle size of stream substrate

The NE SDAM is based on 7 indicators, including the 4 circled answers (minus rooted upland plants and particle size), plus:

- Shading
- Slope
- Elevation

For more information about SDAMs visit

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