Regional curves for bankfull stream characteristics in the Appalachian Plateaus, West Virginia

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Main points

- Limited stream-gaging network required collecting additional information
- Variation in BF characteristics is substantial within reaches, but averages out regionally
- Curves for Appalachian Plateaus are different from adjacent areas
Regional curves/ NSCD defined

- Regression equations describing regional relations in flow-calibrated bankfull channel characteristics
- NSCD, Leopold, Rosgen
- Wadable streams, riffle cross sections
“Bankfull” key concept

- BF not necessarily top of bank
- Challenging or impossible to identify in some (generally unstable) channels
Extensive previous studies

- Stream-gaging network

- West Virginia: Flood frequency, BF dimensions from Q measurements

- Adjacent Regional Curves:
  - Valley and Ridge in VA, WV, MD
  - Pennsylvania
  - Ohio
Stream-gaging network

- Network designed in 1950s: water management and regional hydrology
  - Primary (long-term) and secondary stations, mostly on larger rivers and their headwaters
- 1960s: CSGs added to improve flood frequency estimates for bridge design
  - Generally short-term, sites [sensibly] selected partly for convenience and economy
- Geomorphology not even an afterthought
BF estimates from discharge measurements

- Valley and Ridge, Appalachian Plateaus distinct regions with clear differences
  - AP streams: wider, smaller XS

- Within AP: elevation, mean annual precipitation appeared significant
Ideal network:

- Abundant gaged sites with recent, long-term record
- At a range of sizes
- Throughout the area of interest
- In stable, natural channels with easily identifiable BF features
Marsh Fork at Maben
Filling data gaps

- Biggest gaps:
  - Size: small stream
  - Geographic: near Ohio River

- Prefer public lands
Filling data gaps - Methods

- Routine stream-gaging methods:
  - Develop partial ratings at ungaged sites to extend network; this required extra X.Ss, allowed us to measure variation w/in reaches
  - Add near-bankfull HWM profile at all sites to give a known discharge, roughness at all X.Ss
  - Use known discharge/verified roughness to move reaches away from bridges, failing banks
Regional curve sites and modified planning regions

Findings from recon:
(1) Lots of unstable channels
(2) Especially in coal fields, Northern Panhandle
(3) Especially ~20-50 mi²
Variation within reaches

![Graph showing variation within reaches.](image)
Regional pattern

BF discharge
$R^2 = 0.9546$
1.5-yr flows from gages; BF similar in size & scatter

1.5-yr Q
$R^2 = 0.9326$
XS area from flow measurements

With same, known discharge through reach

Cross-sectional area

Drainage area
Regional pattern, XS area

\[ 20.4865 \times x^{0.7133} \]

\[ R^2 = 0.9768 \]
$20.4865 \times x^{0.7133}$

$R^2 = 0.9477$
$1.067 \times x^{0.3128}$

$R^2 = 0.8785$
BF flow ~1.5-yr RI

1.2-year through 1.7-year regression lines plot within BF 95% confidence interval
Appalachian Plateaus
West Virginia, with
99% confidence
interval
Valley and Ridge, VA, WV, and MD
BF area: similar relations to adjacent regions

Appalachian Plateaus, West Virginia, with 99% confidence interval
Appalachian Plateaus, 1.5-year flow, estimated from USGS discharge measurements (9-207)
Project status:

- Analysis mostly done, first draft in progress
- Scheduled & on track for late fall publication
Questions?