

# GEOLOGIC-GEOMORPHIC MAP OF PLUMMERS ISLAND

BY TONY FLEMING, 2015

## GEOMORPHOLOGY OF PLUMMERS ISLAND

Plummers Island consists of a series of terrace straths and intervening slopes that record the abandonment of the Bear Island terrace and stepwise incision of the Potomac River to its present channel. Dozens of cosmogenic ages along the gorge between Great Falls and Plummers Island (Bierman, 2015) indicate that the segment of the Bear Island strath between Carderock and Plummers Island was last occupied by the river approximately 75,000 - 100,000 ybp. The presence of a series of prominent rock buttresses (map unit Rb) with near-vertical downstream faces, along with the abrupt termination of the wide Carderock segment of the Bear Island strath at the island, are strongly suggestive of a former falls, or knickpoint, at this location - similar in form to the former knickpoint postulated by Bierman (2015) to have existed at Black Pond prior to the inception of the modern Great Falls. If this inference is correct, Plummers Island and the confined section of the gorge it occupies would represent an even older knickpoint.

Remnant terrace straths and channel meanders at Plummers Island (map units Qt1 - Qt3) indicate that subsequent incision of the river to its present level probably proceeded by uniform downcutting rather than steady upstream knickpoint retreat. In this process, higher terraces were progressively cannibalized, leaving a fragmentary record of intermediate river levels.

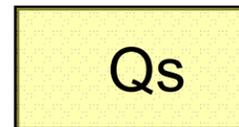
Based on the present distribution of vegetation communities, together with soil structure and colors observed in sparse exposures, terrace soils become progressively more weathered and base-depleted higher in the landscape, reflecting progressively longer weathering. However, soil pH and nutrient availability are also strongly affected by flood frequency at any given place in the landscape: major floods deposit significant amounts of nutrient-rich, calcareous alluvium in protected places throughout the landscape, producing lateral variations in soil quality and resulting vegetation on any given strath or landform.

### References

Bierman, Paul, 2015, The incision history of the Great Falls of the Potomac River: Geological Society of America Field Guide 40, p. 1-10.



C Intermittent river channel with long-lived pools. Alluvium interspersed with many rock outcrops. Inundated annually or more often



Qs Sand bar. Coarse, micaceous sand, gravel, and silt; calcareous. Frequently scoured



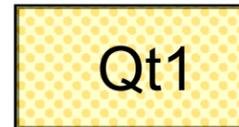
Qm Mud flat. Silt and clay. Frequently inundated. Waterlogged most of year



Qa Modern alluvium. Undifferentiated sand, gravel, silt, and clay, mixed with shells. Typically calcareous with a high base saturation. Corresponds to modern floodplain; also includes extensive areas of low, frequently scoured riverbanks composed of bedrock blanketed by alluvium. Inundated annually



Qc Colluvium. Heterogeneous mix of boulders, cobbles, and residual soil derived from bedrock, locally mixed with sand and silt from eroded terrace straths. Circumneutral, moderately base saturated. Present on most slopes; many small bodies not shown on map



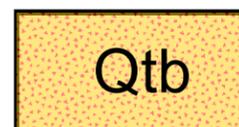
Qt1 Low terraces flanking the modern river channels, surface elevation typically 60-70 ft. Minimally eroded. Commonly covered with calcareous sandy or silty alluvium, with scattered, fluviially streamlined outcrops. Periodically inundated at approximately 5-10 yr intervals



Qt2 Terrace remnants at 70-75 ft elevation, moderately to highly dissected. Commonly veneered with weathered sand, silt, and gravel over shallow bedrock, with many fluviially streamlined rock outcrops and protuberances. Infrequently inundated. Circumneutral, with moderate base saturation



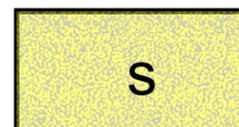
Qt3 High terrace remnants at 80-90 feet, highly fragmental and dissected. Scattered patches of moderately weathered sand, silt, and gravel with common to many protuberances and fluviially streamlined bedrock outcrops. Circumneutral to moderately acidic. Seldom inundated



Qtb Bear Island terrace. The highest and most extensive river terrace in the area. Pervasively capped by 5-10 feet or more of weathered sand, silt, and minor gravel with scattered protuberances of bedrock. Acidic, with low base saturation. About 75,000-100,000 years old. The questionable occurrence of this terrace on the island is severely eroded and appears to be almost entirely bedrock defended. Inundated only in largest floods (100+ yrs).



Qtb-c: broad, shallow channel cut into the terrace



S Undifferentiated slopes, mostly underlain by bedrock, with scattered patches of colluvium, alluvium, and residual soil. Infrequently (elev. >70 ft) to periodically (<70 ft) inundated. Circumneutral to acidic; base saturation variable, but mostly low to moderate, greatest where periodically inundated



Rb Rock buttresses. Erosional remnants of former falls and gorge walls. Areas of bouldery colluvium and residual soil locally present. Composed of foliated to intensely sheared metadiamicite of the Sykesville Formation (early Ordovician). Acidic, typically with low base saturation. Highest areas rarely inundated (100+ year recurrence interval)