Vanishing weekly cycles in American and Canadian hydropoaking rivers

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Sub-daily and weekly streamflow cycles termed hydropoaking are common features in regulated rivers across the globe. Weekly periodicity in flows arises from fluctuating hydropower demand and production tied to socioeconomic activity, typically with higher consumption during weekdays followed by reductions on weekends. In this presentation, we will introduce a novel weekly hydropoaking index to quantify the intensity and prevalence of weekly hydropoaking cycles at 368 sites across the United States of America (USA) and Canada over 1920-2019. Our results reveal a robust weekly hydropoaking signal exists at 1.3% of available sites starting in 1920 with a fraction that peaks at 16.7% of sites in 1963. Highly hydropoaking signals then diminish to only 3.3% of available sites in 2019, marking a 21st century declining pattern in hydropoaking intensity across parts of North America. Application of the Mann-Kendall Test reveals 95 locally significant declines in weekly hydropoaking intensity between 1980-2019. Our results can be attributed to diminishing differences between streamflow on weekends versus weekdays in regulated rivers across Canada and the USA. We will conclude the presentation with a discussion on how these findings may be tied to shifts in socioeconomic activity, alternative modes of electricity production, and legislative and policy changes impacting water management in regulated systems.