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**IWI COMPARE: CALAPOOIA METRIC METHODS**

**FISH MMI METHODS**

Fish sampling data used to derive multimetric indices (MMIs) in the Calapooia basin were collected by CSS-Dynamac on behalf of USEPA between 2010 and 2014 using methodologies consistent with those used by EPA’s Environmental Monitoring and Assessment Program (EMAP). In total 50 sites were visited over four years (no sampling occurred in 2012) and ranged from forested headwater streams in the Cascade mountains to lowland reaches in high density agricultural areas of the Willamette Valley. Study reaches were 40 times the active channel width and were sampled using a single pass with backpack electrofishers (Hughes and McCormick 2006). Sampling occurred throughout the year but for consistency only NRSA index period data were used for this analysis (summer low-flow conditions).

MMIs were calculated following methods set by Whittier et al. (2007a). Seven metrics for the Western Mountains Ecoregion were selected and consisted of an assemblage tolerance index estimating overall resilience to disturbance (Whittier et al. 2007b), along with proportional measures of sensitive rheophilic species (habitat), sensitive invertivores-piscivores (trophic), lithophilic spawners (reproductive), salmonid abundance (composition), native sensitive long-lived species (life history), and alien vertebrate presence (aliens). Scores were generated for each unique sampling event and a mean inter-annual score was attributed to sites receiving multiple visits over the course of the study. Final scores were rescaled to values between 0 and 100 for comparison with the IWI, with increasing scores indicating higher overall ecological condition.

**TEMPERATURE METHODS**

Water temperature was measured using temperature loggers (Optic TidBits model TBI32; Onset Computer Corp., Pocasset, Massachusetts) placed in a well-mixed portion of the stream channel following methods of (Dunham et al. 2005).

Max Temp

The maximum summer temperature metric was derived from a database containing seven years (2009 – 2015) of 30-minute time series temperature logger data from 87 established sites the Calapooia basin. Maximum summer temperature was defined as the absolute maximum observation during the warmest period of the year in western Oregon, July – August. Raw data were processed using R statistical software (R Core Team) to screen for completeness and remove observations where loggers were exposed to air. Any sites containing less than 90% continuous summer time coverage in a given year were excluded from further analysis. The maximum temperature value across all years considered was assigned to each site as a final representative maximum summer temperature metric. 45 of the 87 sites sampled met the minimum observation threshold for at least one year of data, 36 of which corresponded to NHD PlusV2 stream lines and were used for further comparison with the IWI.

Amplitude/Phase

Amplitude and phase metrics for stream temperatures were calculated following the methods of Maheu et al. (2015) in order to fit a sine curve to continuous time series data for each sample site and examine the magnitude and timing of temperature change throughout the year. This method provides a generalizable index of thermal regime magnitude (amplitude) and timing (phase).

**PHYSICAL HABITAT (PHAB) METHODS**

The physical habitat of stream segments was characterized using the methods of {Kaufmann, 2006 #3243}. Data were collected 2013 – 2015 during the summer low-flow season. The following metrics were extracted for comparison and analysis to capture functional processes of interest and that had been previously identified by Kaufmann (2006) as among those most reliable and commonly used (Table 13 in Kaufmann 2006, page 89-90). Codes in parentheses correspond to metric codes from Kaufmann 2006:

* Large wood volumetic density (m3/m2), a measure of channel complexity and roughness
* Sediment embeddedness (%), a measure of the degree to which substrate cobbles and gravels are encompassed by finer sediments (xembed)
* Morphology, using an index of variation in longitudinal variation in channel depth; a measure of pool/riffle ratio (sddepth)
* In-channel cover (%), an index of channel complexity relevant to fish (xfc\_nat)
* Riparian vegetation cover (%), an index of riparian vegetation density and complexity (xcmgw)

**CITATIONS**

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