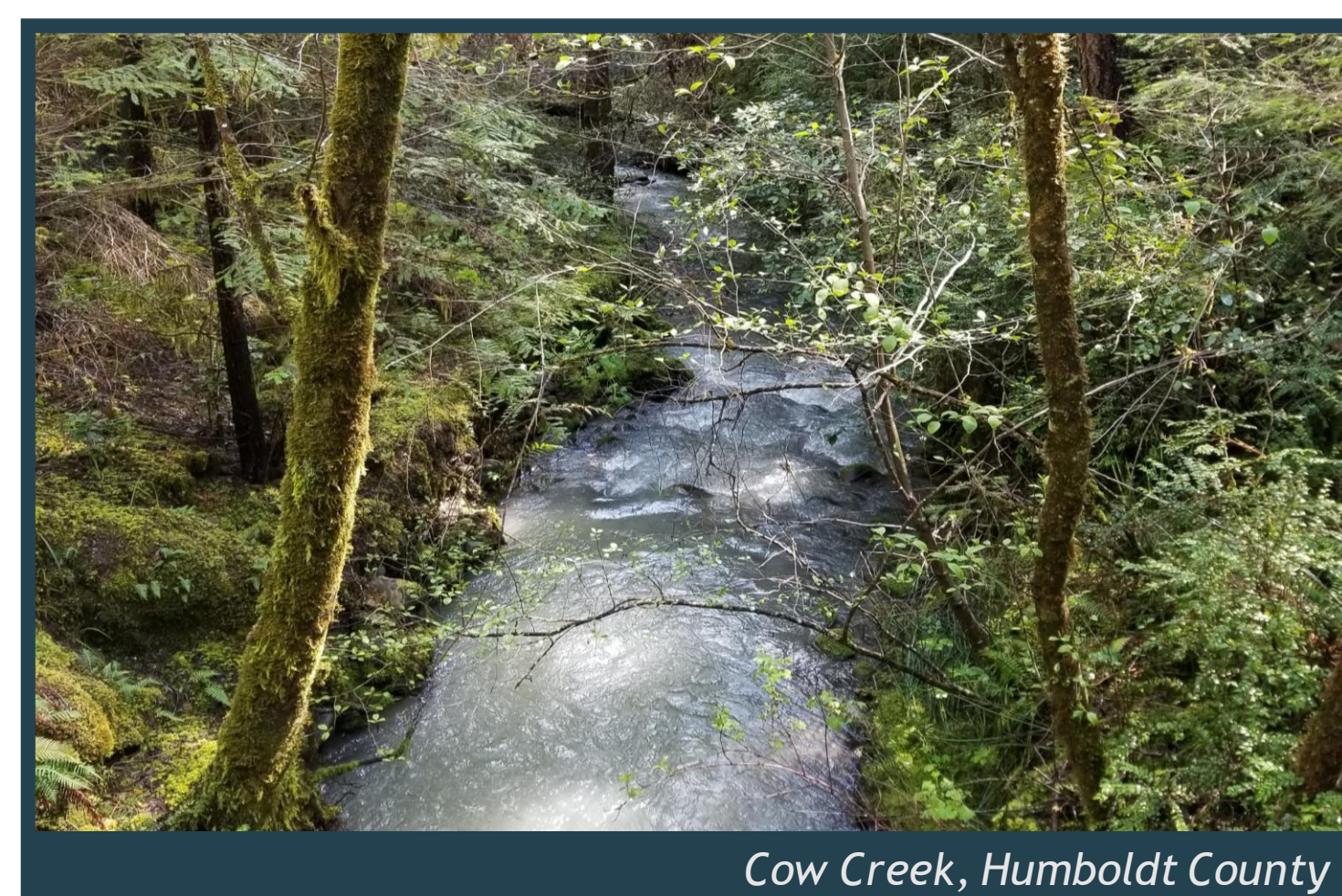


# A Rapid Approach for Developing Instream Flow Criteria on a Watershed Scale

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The mission of the California Department of Fish and Wildlife is to manage California's diverse fish, wildlife, and plant resources, and the habitats upon which they depend, for their ecological values and for their use and enjoyment by the public.

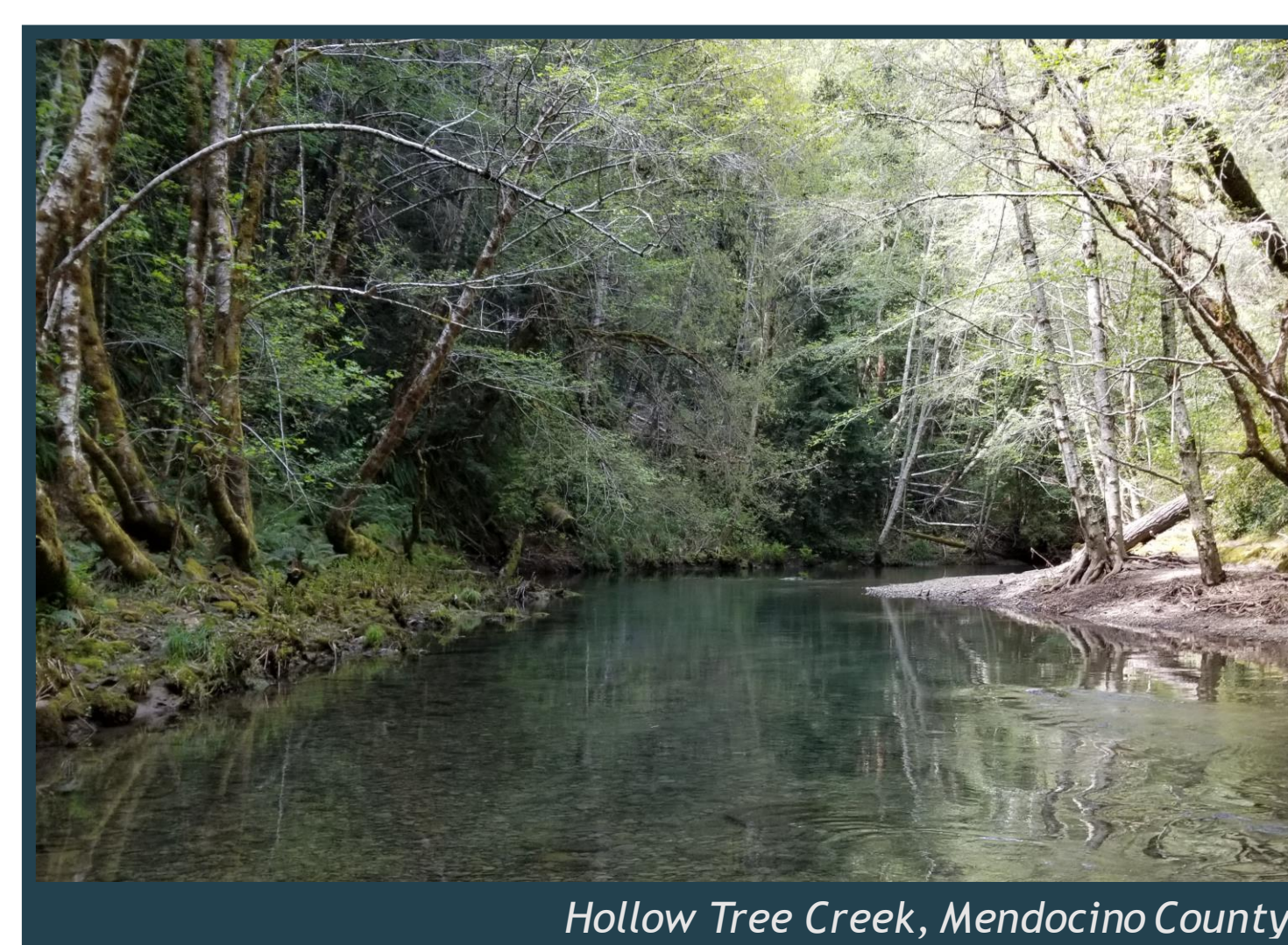
## BACKGROUND



Cow Creek, Humboldt County

In California, variable hydrology, climate change, and water demand have created complex challenges for freshwater ecosystem management. The California Department of Fish and Wildlife (CDFW) is tasked with identifying instream flow criteria that are protective of fish, wildlife, and the habitats that support them.

Existing approaches for the development of flow criteria are frequently time- and resource-intensive. CDFW has developed a rapid and standardized approach to identify ecological flow criteria on a watershed scale. The approach uses a combination of desktop and field analyses to produce results that are reported in the Department's *Instream Flow Criteria on a Watershed Scale* reports.



Hollow Tree Creek, Mendocino County

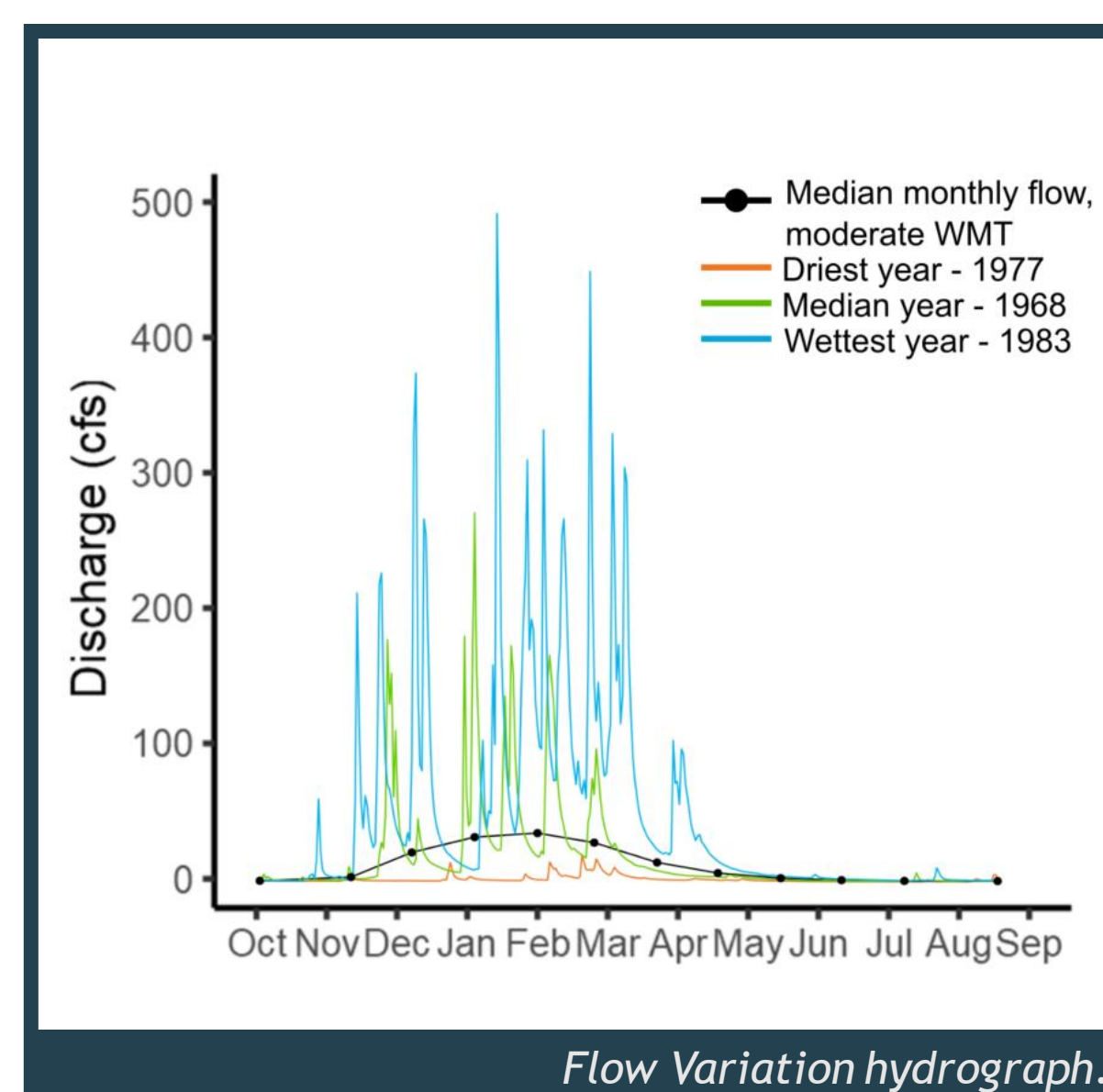
## METHODS

### 1. Base Hydrology

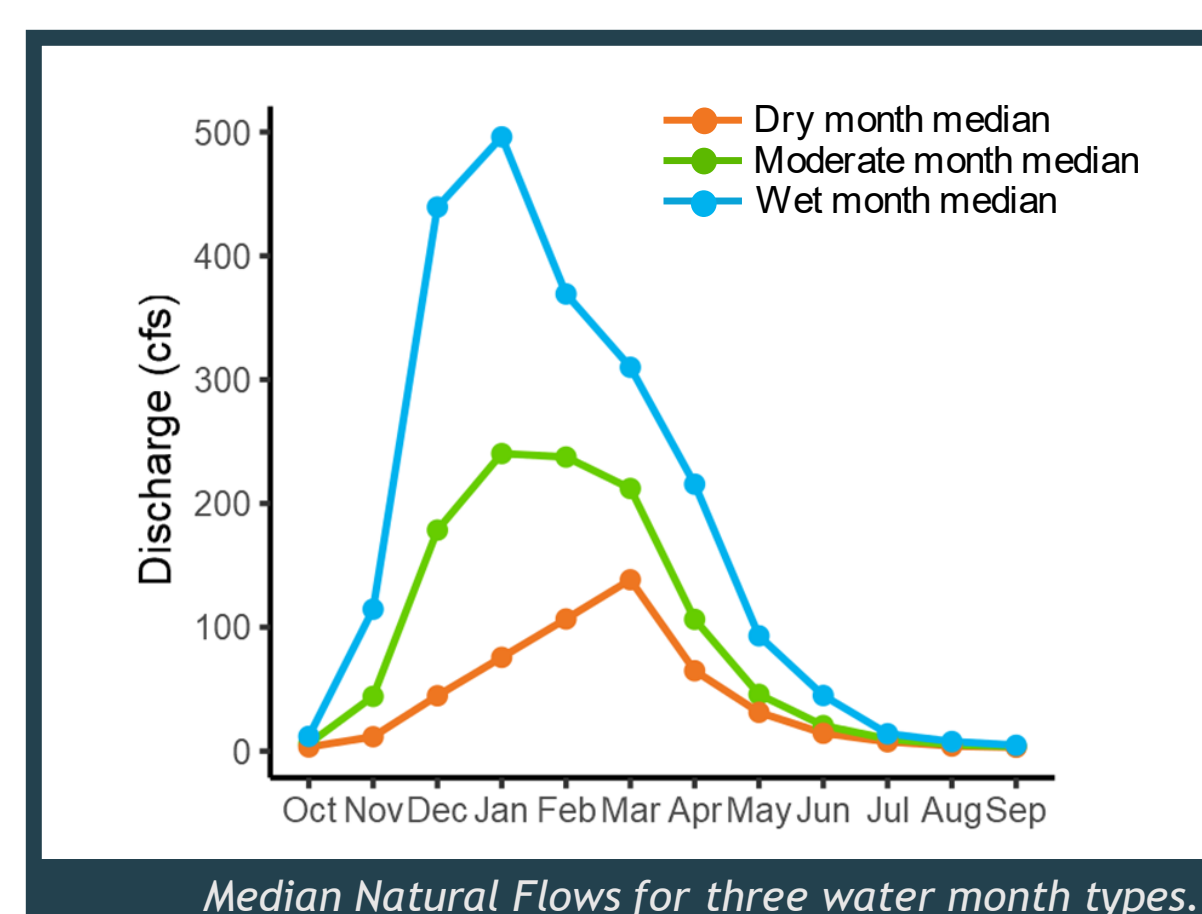
An understanding of hydrologic patterns and variability under natural conditions provides valuable context when developing ecological flow criteria.

Using gage data, **Flow Variation** presents hydrographs for the wettest, driest, and median years on record within a watershed. These data present information about annual and interannual variation in flows that are critical to long-term ecological functioning<sup>1</sup>.

**Median Natural Flows** provide estimates of monthly natural flows by water month type for each reach, based on the Natural Flows Database<sup>2,3</sup>



Flow Variation hydrograph.

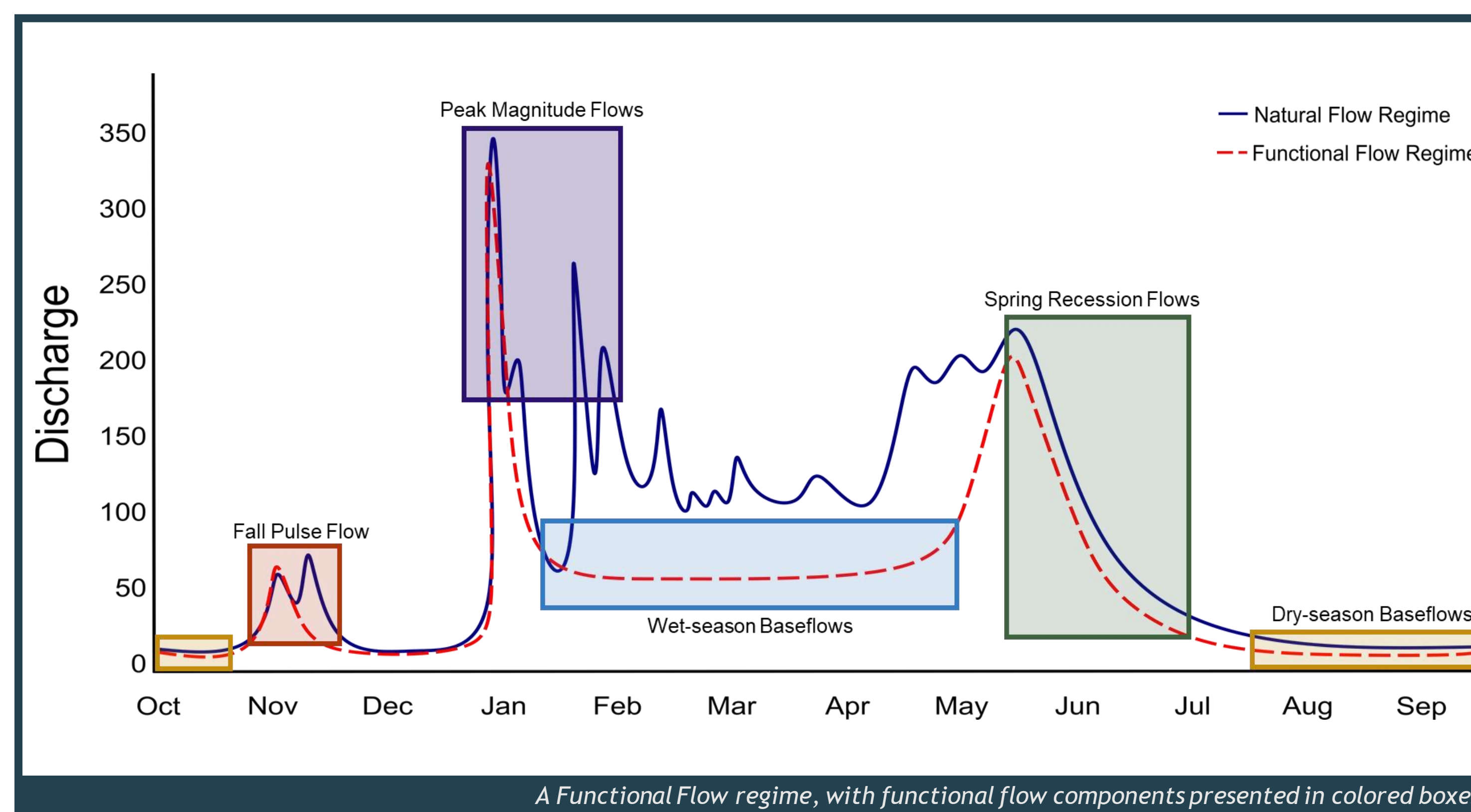


Median Natural Flows for three water month types.

### 2. Baseline Flow Criteria

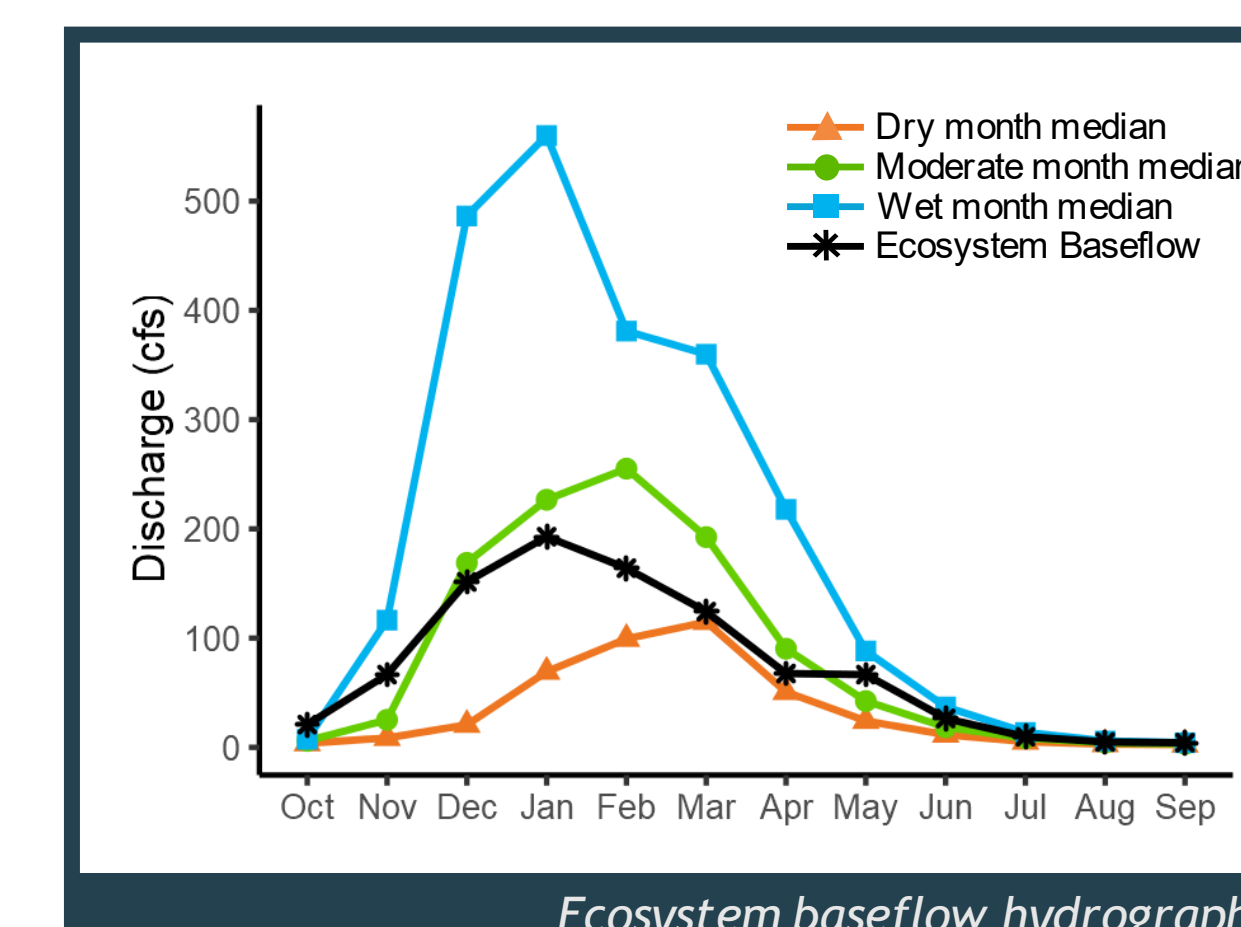
**Functional Flows** and **Ecosystem Baseflows** can be used to develop baseline ecological flow criteria.

**Functional Flows** perform key ecological and geomorphic functions<sup>4</sup>. These are described by five components that define seasonal aspects of the flow regime related to timing, magnitude, and duration of flows.



A Functional Flow regime, with functional flow components presented in colored boxes.

**Ecosystem Baseflows** are monthly baseflows that preserve a health stream ecosystem<sup>5</sup>. They are calculated as a percentage of monthly and annual mean natural flows and vary throughout the year.



Ecosystem baseflow hydrograph.

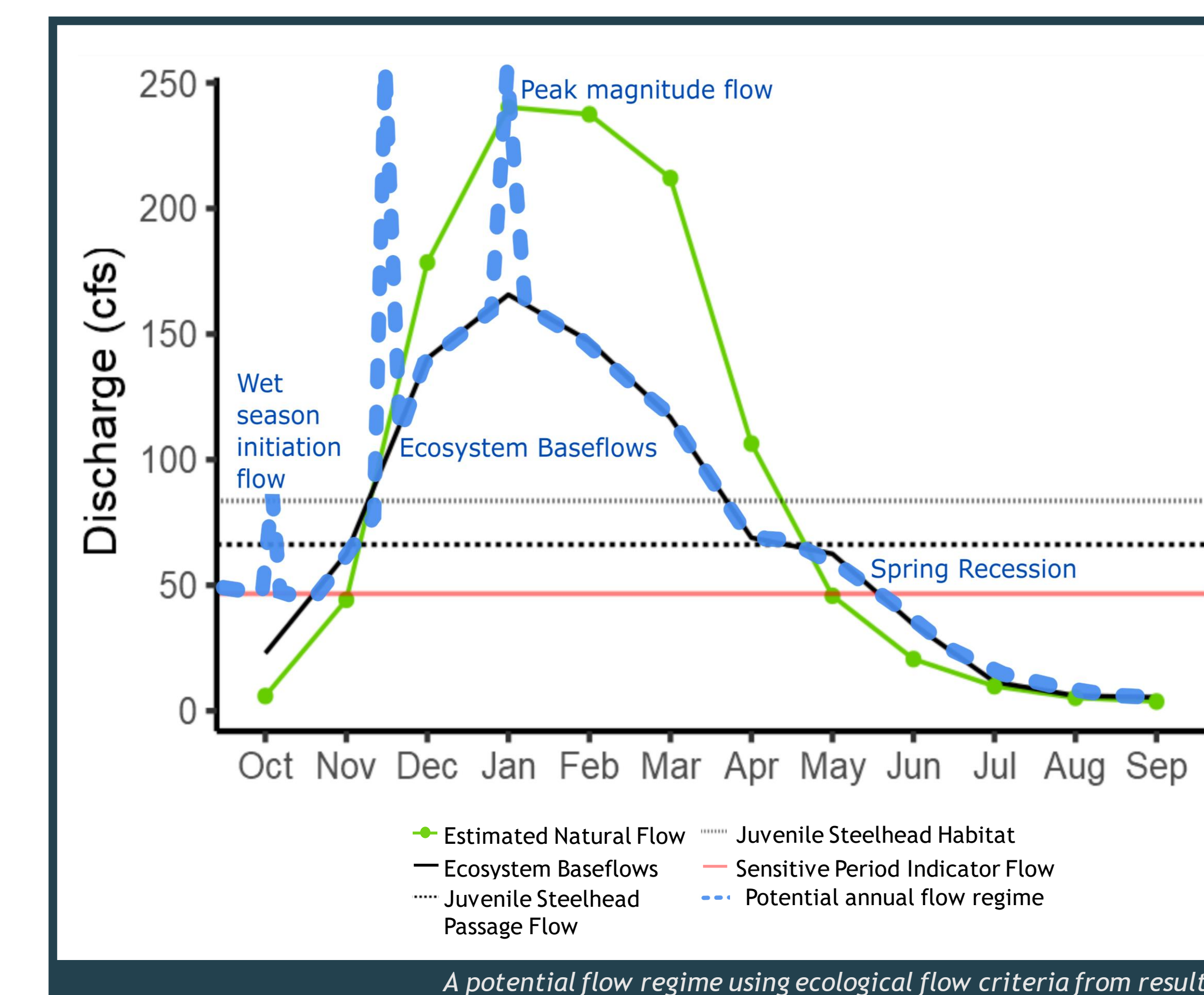
### 3. Site and Species-Specific Results

Site and species-specific results are also presented within the reports, which can be used to supplement baseline ecological flow criteria.

- **Salmonid Habitat Optimum Flows** provide optimal access to preferred salmonid habitat. These flows are specific to particular salmonid species and life stages<sup>6</sup>.
- **Sensitive Period Indicator Flows** identify the sensitive-low flow period, below which fish and wildlife are particularly sensitive to flow reductions<sup>7</sup>. These are determined using a field-based, site-specific analysis.
- **Salmonid Passage Flows** provide enough water for salmonids to cross riffles, which are typically the shallowest part of the channel<sup>8</sup>. These are determined using a field-based, site-specific analysis.

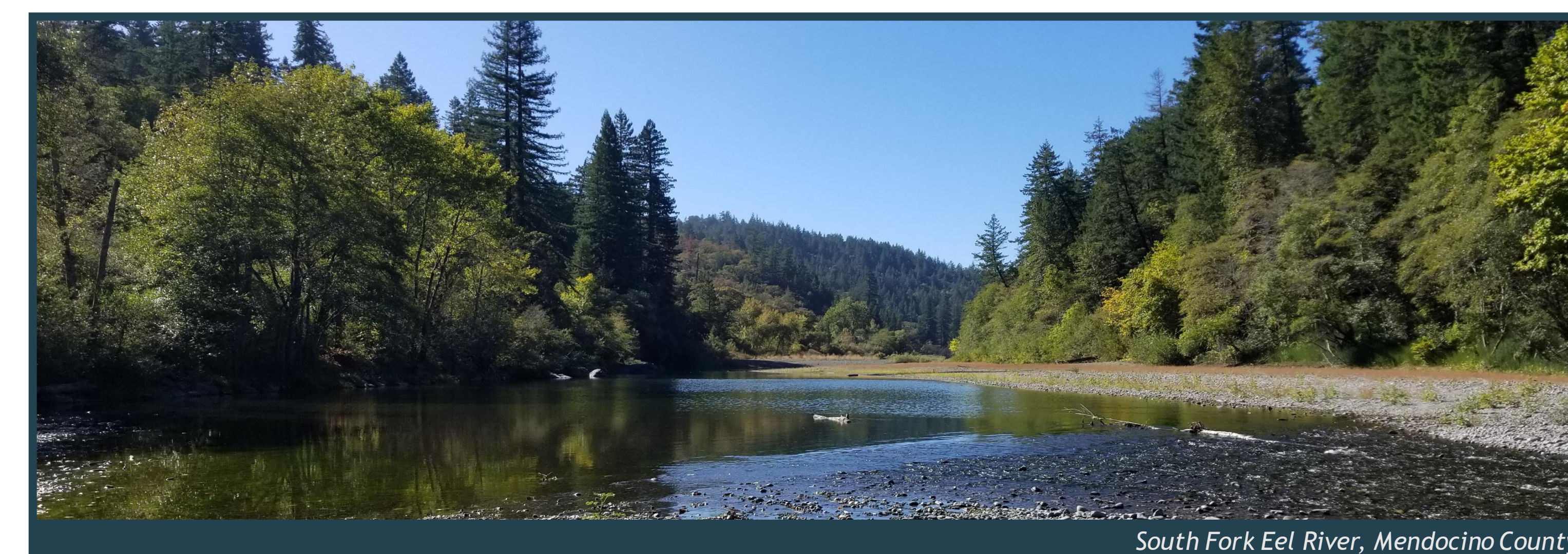
## DEVELOPMENT OF FLOW CRITERIA

The results provided by each analysis section can be tailored to specific ecological management goals for a stream or watershed. Functional Flows and Ecosystem Baseflows can be used to develop baseline ecological flow criteria and may be combined with site- or species-specific data to address specific flow needs throughout the year. Additional information (e.g., water quality data) may also be considered during the development of flow criteria. CDFW is currently developing additional guidance on translating results of the *Flow Criteria on a Watershed Scale* reports into flow criteria.



A potential flow regime using ecological flow criteria from results.

Flow criteria developed using this rapid approach can be used to address a variety of objectives, including permitting, water rights, bypass flows, stream condition assessments, and restoration.



South Fork Eel River, Mendocino County

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