SWAMP Surface Water Ambient Monitoring Program

SWAMP Newsletter

Sound science for informed water quality management

2017 | Fall Issue

Statewide Hydrologic Classification Map Now Available

By Eric Stein (erics@sccwrp.org)

A team from the Southern California Coastal Water Research Project (SCCWRP) and UC Davis recently completed a hydrologic classification of all streams in the state (Figure 1). The classification divided the state's streams into nine hydrologic classes based on the dominant processes that control flow. Catchment characteristics were used in combination with long-term flow data from over 200 reference stream gauges to develop the hydrologic classes, which have been attributed to the National Hydrography Dataset Plus (NHDPlus) stream layer for the state (Table 1). These stream classes represent distinct hydrologic landscapes, with unique flow patterns, flow sources, hydrologic characteristics, and catchment controls over rainfall-runoff response.

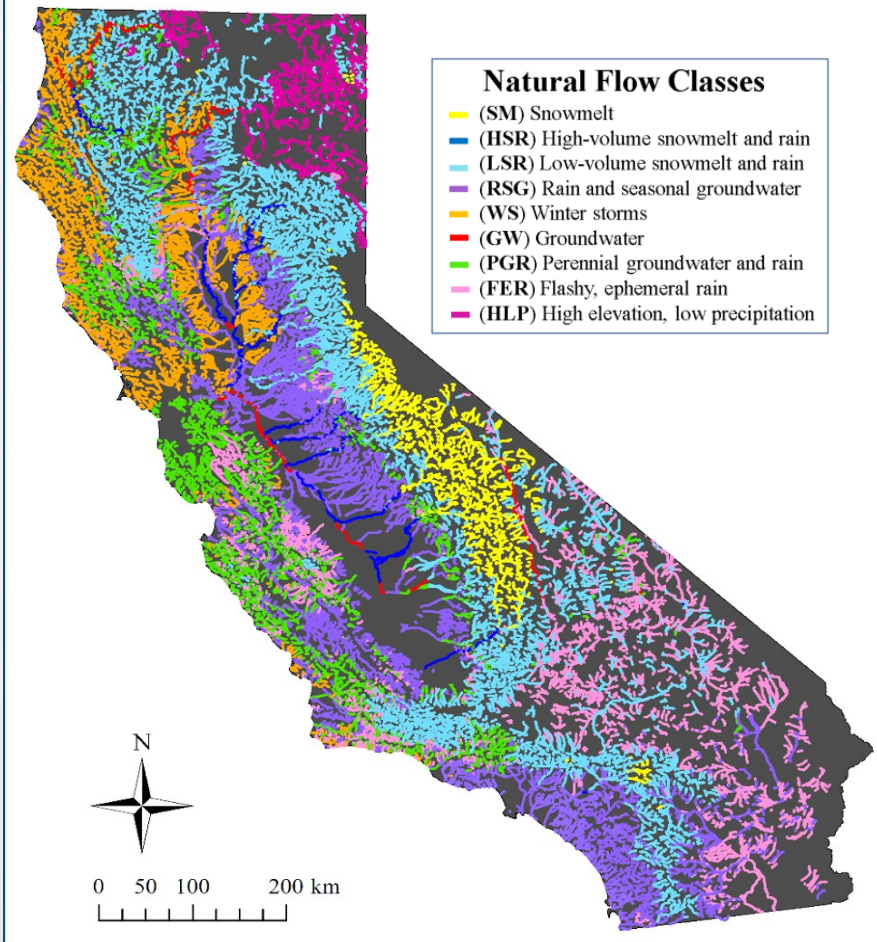

***Figure 1**: Hydrologic classification of California streams.*

The classification system was developed to support a statewide effort to define environmental flow targets associated with maintaining healthy instream biological communities. Hydrologic classification is an important precursor to identifying the degree of hydrologic alteration and developing management targets for stream networks. State and regional Water Board staff has begun using the classification system to explore patterns in bioassessment scores based on the California Stream Condition Index (CSCI), and to support causal assessments investigating the correlation between altered hydrology and lower CSCI scores. The SCCWRP/UC Davis team is currently building on this effort to define reference hydrographs for each of the nine stream classes that can be used to support these analyses.

(Continued on next page)

SWAMP Surface Water Ambient Monitoring Program

SWAMP Newsletter

Sound science for informed water quality management

2017 | Fall Issue

Class	Name	Hydrologic Characteristics	Physical and Climatic Catchment Controls
SM	**Snowmelt**	• Large spring snowmelt pulse (~May 24) • Very high seasonality index • Extreme low flows (<10th percentile) Sep-Feb	• High elevation catchments (>2,293 m), major snow influence
LSR	**Low-volume snowmelt and rain**	• Transition between SM and HSR • Bimodal snow - rain hydrograph driven by spring snowmelt pulse and winter rain	• Mid-elevation catchments with limited area (<2,144 km²) [low winter temperatures (Jan temp <-5C°), high stream density (>0.65 km/km²)]
HSR	**High-volume snowmelt and rain**	• Spring snowmelt pulse (~May 4) • High seasonality but larger winter storm contributions • Retain high baseflow throughout summer Bimodal snow - rain hydrograph	• Mid-elevation catchments (1,126 - 2,293 m), large contributing area (>2,144 km²) *not* underlain by volcanic geology [high stream density (>0.65 km/km²), mild winter temperatures (Jan temp >-5C°)] **OR** • Low elevation (<1,125 m) with very large contributing area (>15,420 km²) and high clay content soils (>17% clay)
WS	**Winter storms**	• Predictable large fall and winter storms • Earliest peak flows (in January)	• Low elevation catchments with substantial winter precipitation **OR** • Low elevation, mid-slope (31 - 24%) catchments with low winter precipitation but high riparian soils clay content (>23%) **AND** • Underlain by unconsolidated aquifers covered by thick alluvium
GW	**Groundwater**	• Highest mean annual flows and highest minimum flows • Low seasonality and high predictability	• Mid-elevation catchments with large area (>2,144 km²) underlain by volcanic (basaltic and andesitic) geology [low stream density (<0.65)] **OR** • Low elevation, limited winter precipitation, very large contributing area (>15,420 km²) with low riparian soils clay content (<17%) **AND** • Underlain by igneous and metamorphic rock aquifers
PGR	**Perennial groundwater and rain**	• Low seasonality and mean annual streamflow • Transition between WS and GW, with winter rain contributions but generally stable flows	• Low elevation catchments with low clay content riparian soils (<23%) [low stream density (<1.1 km/km²)] **AND** • Underlain by sedimentary rock materials in Central Coast region
RGW	**Rain and seasonal groundwater**	• Bimodal hydrograph driven by winter rain pulse and percolating winter rain appearing as baseflow pulse later in year; can be ephemeral	• Low elevation with limited winter precipitation and low slopes (<24%) **AND** • Coastal catchments with small aquifers driving short residence times
FER	**Ephemeral, flashy rain**	• Lowest mean annual flows, often ephemeral • Highest CV, lowest predictability • Longest extreme low flow duration • Highest flows in winter	• Low elevation catchments with high clay content soils (>23%) and high slopes (>31%) [high stream density (>1.15 km/km²)]
HLP	**High elevation, low precipitation**	• Low mean annual flows • Highest flows in winter	• High elevation but low slope • Low precipitation and limited snow influence

***Table 1**: Description of the nine hydrologic classes identified for California streams.*

The statewide shapefile and geodatabase (along with a Google Earth KML layer) of the stream classification is available on the California Open Data Portal (https://data.ca.gov/dataset/flow-targets-southern-california-streams) and the Bioassessment Site Map Server (http://www.waterboards.ca.gov/water_issues/programs/swamp/bioassessment/csci_scores_map.shtml).