

Appendix XXX. Families of freshwater ecological system types and their attributes.

Each family type is determined by elevation, size and geologic setting. For some of the families, where regional experts were familiar with actual examples of a given family type, we have included lists of attributes. This document is intended to provide a starting point for conservation project planning.

A. Alpine to Montane

1. Headwaters and creeks

a. impermeable - granitic/silicic (examples: SR 115, SR 116)

- very steep, narrow, v- and u-shaped channel cross-sections
- some young alluvium
- step-pool, pool-riffle and cascade bedforms; moderate to high channel confinement
- sediment balance/transport: erosional, mixed and suspended loads
- channel planforms: straight and meandering
- fish community composition: Bonneville cutthroat, mottled sculpin, leatherside chub, speckled dace, mountain sucker
- dominated by EPT taxa: mayflies, stoneflies
- amphibian community may include boreal toads, chorus frogs, leopard frogs
- riparian community consists of sedges, forbs, willows, cottonwoods and birch in lower elevations; aspen and fir in higher elevations
- channel shading varies from little or none to full canopy

Critical attributes¹: thermal regime (cold water); suspended sediment load (low); substrate composition (coarse); phosphorus regime; temporal and spatial longitudinal flow continuity

2. Small and medium river systems

a. old alluvium (SR 2215)

B. Montane

1. Headwaters and creeks

a. impermeable - granitic/silicic

- in CSJ, fish community may include bluehead sucker, leatherside chub, flannel mouth sucker, Colorado river cutthroat, mottled sculpin, speckled dace
- in CSJ, headwater macroinvertebrate taxa dominated by EPT taxa, including mayfly, stonefly, caddisflies; lower sections have crane fly, dragonfly, dobsonfly
- in CSJ, other taxa may include chorus toads, tiger salamanders, chorus frogs, fishlake physa and naiad

¹ vulnerable/threatened/tenuous/susceptible ecological attribute

- in CSJ, headwaters embedded in large wetland and lake complex
- in CSJ, system is highly alkaline
- in CSJ, system runs from 9,000 to 4,000 feet; thermal regimes from low elevation warm-water systems, to high elevation cold-water systems
- in CSJ, sediment regime ranges from high-elevation erosional streams to low-elevation depositional
- in CSJ, channel form ranges from high gradient v- and u-shaped cascade, step-pool systems, to broad, low-gradient braided streams and rivers.
- in CSJ, riparian composition ranges from alders, aspen and fir (high elevation), to sedges, wet grasses and willows (mid-elevation) and river birch, maple, cottonwood, cattails and sedges (low elevation)

Critical attributes: (in upper and middle CSJ) thermal regime (cold), substrate composition (coarse), suspended sediment regime (low), riparian zone integrity; (in lower CSJ) sediment regime; temporal and spatial longitudinal flow continuity

b. sedimentary and young alluvium (3, 4, 16, SR131)

- steep headwaters
- fish community composition dominated by cold-water, visual-feeding, gravel-spawning specialists: Colorado cutthroat trout, native cyprinids, mottled sculpin in YW/UC/CS/GR; Bonneville cutthroat, mottled sculpin, leatherside chub, speckled dace and mountain sucker in SR; desert sucker, flannel-mouth sucker, speckled dace, virgin spine dace in VR
- substrate – flat rocks
- macroinvertebrate taxa dominated by EPT; in lower reaches, odonata, diptera and megaloptera
- in VR, other taxa of interest may include the *Oxyloma* snail and Zion wetrock physa species
- in CSJ, headwaters are connected to numerous high plateau lakes
- in SR and VR, naturally high levels of alkaline compounds
- channel form is usually straight, v- and u-shaped, step-pool, pool-riffle and cascade; mostly in tight canyons
- riparian vegetation may include pinyon, juniper, spruce, fir, aspen, willow, cottonwood, grasses and forbs
- channel cover varies from open to closed
- in SR, mostly intermittent and ephemeral flow; seasonally clear; some turbidity

Critical attributes: riparian zone integrity; spatial and temporal natural flow regime; thermal regime; phosphorus regime

2. Small rivers
 - a. granitic/silicic (2204, 2205)
 - b. sedimentary (2206, 2216, 2207, 2208)
3. Large/extra-large rivers
 - b. sedimentary and alluvial (3205, 3207)

C. Montane to foothill transition

1. Headwaters and creeks
 - b. sedimentary and young alluvium (17, SR33, YW56)
 - steep, highly confined headwaters, moderate gradient creeks
 - sandstone
 - in YW/UC/CSJ/GR fish community composition: Colorado cutthroat trout, sculpin, dace, maybe mountain sucker; in SR, leatherside chub, mottled sculpin, mountain sucker and
 - in SR, other taxa of note may include beaver, tiger salamanders and chorus frogs
 - perennial flows in mainstems; ephemeral flow throughout headwaters
 - no large fish (Strawberry watershed)
 - sandstone just under surface, cobble in lower reaches with loose sand
 - mostly pool/riffle, v- and u-shaped channels
 - relatively high gradient – but not enough flow to be erosive
 - riparian area has willow and conifers in lower elevations; in higher elevations fir and spruce mixed with grasses and forbs
- Critical attributes:** spatial and temporal longitudinal flow continuity; temperature regime; sediment load regime; substrate composition

D. Foothills

1. Headwaters and creeks
 - b. sedimentary (UC4, 6, 7)
 - low to moderate gradient
 - combinations of sedimentary geologies
 - in VR, fish community may include desert sucker, flannel mouth sucker, speckled dace, Virgin spine dace, Virgin river chub, woundfin minnow
 - in VR, macroinvertebrate fauna usually include EPT, odonata, diptera, megaloptera
 - in VR, naturally high alkalinity do to soft rock weathering
 - in VR, channel form is usually straight, cascade, v- and u-shaped; confined in canyons
 - in VR, canopy is usually >50% open

Critical attributes: spatial and temporal longitudinal flow continuity;
temperature regime; sediment load regime

2. Small to medium rivers
 - a. impermeable – granitic/carbonates (2102, 2104)
 - b. sedimentary and alluvial (2105, 2107, 2108, 21010)
3. Large – extra-large rivers
 - a. impermeable – basaltic (3101)
 - b. sedimentary and alluvial (3105, 3115, 3107, 3108)