A. Lind email to Terry Brennan on snowmelt recession…. Dec. 2010

- In Mediterranean climates, like that of the Sierra Nevada of California, the snowmelt recession typically begins in mid-spring. When viewing a typical annual hydrograph plot, the snowmelt recession is recognized as the period immediately following the last flow peak in the spring. From that peak, flows gradually drop off to a "baseflow" by mid-late summer.

- U.C. Davis hydrologists (Gerhard Epke, Sarah Yarnell) have recently developed a daily percent change approach to modeling natural (unregulated) river flow patterns during the snowmelt recession. In the two rivers they have studied thus far (North Fork American and North Fork Yuba) they found that mid-late May is typically when the snowmelt recession begins, with minimal variation among water year types.

- Once the recession begins, it is possible to very accurately model natural recession patterns using a decreasing percent change in flow from day to day. The percent change per day is somewhat higher at the beginning of the recession period than at the end. In the NF American and NF Yuba it ranged from ~ 9% per day coming off the last peak, down to ~3% per day by mid-late summer.

- The FS Sensitive species, foothill yellow-legged frog (FYLF) lay eggs, and tadpoles develop during the spring and summer of each year in a variety of stream environments from small creeks to large rivers. In the Sierra Nevada, FYLF have evolved with and are adapted to the snowmelt recession period and typically lay eggs during the middle to the tail end of that period. Because of this adaptation, FYLF can be considered an indicator species for other native riverine species, that are less well-studied (e.g., non-game fishes and macroinvertebrates).

- The primary risks to FYLF during the snowmelt recession period are scouring and stranding. Scouring can occur if water flows increase substantially after eggs have been laid. Stranding can occur if recession rates are too fast relative to the water depth at which the eggs are laid at and the time it takes for eggs to develop. Egg development time is dependent on water temperature, but typically ranges from 2-3 weeks in mid-elevation Sierran rivers.

- When the gradual percent flow change per day method (9% to 3%) is translated to river stage (depth) at actual river cross-sections where FYLF breed, water depth changes are maintained within appropriate levels to protect FYLF eggs from stranding.

- In regulated rivers, spring down-ramping rates often do not follow natural snowmelt recession patterns. Implementing a gradual percent change per day approach in a regulated river offers a method that can be readily understood by project operators and would be protective of FYLF and other riverine species.