[Texas]

Considerations for Quantifying Environmental Parameters for Trout in the Red River

Assuming that Molycorp people will make a determined effort to attack minimum flow recommendations designed for maintaining trout abundance at optimum levels, it will be necessary to obtain a sound basis of evidence for flow recommendations that is least vulnerable to criticism.

Our evidence should be able to correlate environmental parameters with trout biomass and to predict how a change in flow regime will affect these parameters, and, in turn, the trout population. To accomplish this objective, I believe we will need data on other parameters that are affected by flow besides depth and velocity measurements, and we should establish new depth and velocity preference curves specifically on brown and rainbow (wild, not hatchery) trout in the Red River.

If I put myself in the position of Pennak and tried to attack the validity of any recommendations based on present data, my questioning would be along the following lines. In current ecological theory, the concepts

of niche and habitat are considered separately. Niche is defined as the role of a species in its community -- its interactions with biotic and abiotic ~~facto~~ elements of its environment. Habitat is defined as the physical, abiotic components of the environment. The distributional response of a species to its habitat can be measured and quantified. ~~This is~~ Thus, Instream Flow methods can quantify habitat, but does not consider niche. Habitat is only part of the niche and ~~therefore~~ ~~data~~ quantification of only habitat of rainbow trout and of brown trout does not give the whole picture of rainbow trout and brown trout niches. This omission can explain why the Instream Flow curves of weighted useable area predicts ~~that~~ rainbow trout should be dominant over brown trout in the Red River, when, in reality, the brown trout is probably the dominant species. (Pennak ~~migh~~ could probably get quite eloquent -- or at least verbose -- arguing on this point).

In looking for flaws in Instream Flow preference curves, I examined some of the published reports on which they are based. My conclusions are that the upper and lower limit end points are essentially correct, but the shape of the curves ~~the~~ are open to question -- they have

much non-genetic (not species specific) noise. In most situations, the fish under study, could not express true preference because their options were limited -- they had to make do with what was available. Also, ~~they~~ preferences are dependent on the size of the fish. A rainbow trout of 32 inches ~~prefers~~ prefers deeper water with higher velocity and much larger substrate for spawning than does a 7 inch rainbow trout (the giant Kamloops rainbow of Kootenay Lake is a source of data for ~~developing~~ developing Instream Flow preference curves). Taking velocity and depth measurements on the same fish spawning at the same site in high flow and low flow years would yield different sets of data.

If spawning preference curves for depth, velocity, and substrate (and all other habitat characteristics) were plotted for data on Gila trout and apache trout (from publications of Ken Harper and John Rinne), curves quite distinct from the Instream Flow rainbow trout curves would be apparent. However, such curves are not species specific preferences of Gila and apache trout. They are only a reflection on the very limited habitat available in the tiny streams where the data were collected. That is,

there would not be a species specific basis for Gila and Apache trout curves. ~~but~~ If the Gila and Apache trout were removed from the tiny streams where they were studied and rainbow trout stocked, I am confident that the rainbow trout would duplicate the "preferences" of the Gila and Apache trout.

A small difference in the shape of the preference curves between species generates larger differences in the computer model. Thus, the "shakiness" of the curves ~~allow~~ causes predictive errors. Barry Nehring found the Instream Flow model to have very low ~~predictive~~ success in predicting what trout species would be dominant in any particular habitat ~~he studied in~~ several Colorado streams, (INSERT →) The obvious accusation that could be made is that if the habitat species specific preference curves can not accurately predict the species success than the data on which they are based contains errors ~~and how then~~ how then can erroneous information be validly used as a basis for flow recommendations? We ~~could~~ might get around this problem by making ~~a~~ generalized "trout" preference curves. However, I believe to obtain defensible evidence for recommendations for Red River flows, habitat

I also note that the spawning and incubation curves (probability of use criteria for Salmonidae) do not coincide. If, in nature, they ~~actually~~ did not coincide, then a basic tenet of natural selection would be violated. Because natural selection favors those individuals who produce ~~leave~~ the most offspring, deposition of eggs in sites most favorable to hatching would be strongly selected for and there could be no difference between optimum spawning sites and optimum incubation sites -- two different preference curves ~~are~~ a contradiction of evolution.

preference curves should be developed on brown and wild rainbow trout in the Red River. Also we should borrow from Allen Binns' Wyoming model for predicting trout biomass from environmental parameters to more fully quantify rainbow trout and brown trout niches.

Other significant facets of the environment that are ~~might be~~ amenable to quantification ~~after field~~ may become apparant after field studies are underway. For example, two pools equal in depth and volume, but differing in structure ~~and~~ would be expected to have different densities of trout due to different amounts of "microhabitats" present.

I would also expect that when adequate data have been gathered on the Red River trout and their environment it will become apparant that all habitat criteria are not equal as determinants of trout biomass and any model developed ~~should not~~ should take this into account and not give equal weight to all ~~of~~ criteria (unless all are affected identically by flow).