APPENDIX E

Mathematical Transformations for Intrinsic Productivity Values

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The Interior Columbia TRT (ICTRT) has proposed an approach to assign salmon populations to risk categories based on viability curves. The viability curves define boundaries of risk categories in terms of threshold abundance and productivity. The "risk status" of a population would be determined by estimating productivity (recruitment per spawner) and abundance from a time series of spawner abundance estimates. The question that arises for the subbasin planner is: "How can I predict what the risk status of a population is likely to be after habitat measures have been implemented?"

The ICTRT viability curves assume a constant productivity below a maximum abundance level. A relatively conservative method for predicting the productivity and abundance coordinates for a future population is to estimate abundance from the EDT-predicted equilibrium abundance (Neq) and productivity as a weighted mean from the EDT-predicted survivals at low abundance. Specifically, the productivity estimates would be weighted by abundance over the interval from zero to Neq. Survival values closest to Neq, where survival is close to 1 would be weighted highest and survival close to zero would be weighted lowest.

Expressed as a formula, the concept is represented as follows:

>> Abundance coordinate = (EDTCapacity)*(1-1/(EDTProductivity)) = EDTNeq

and

>>Productivity coordinate = $r = \dfrac{\int_0^1 \dfrac{pS}{(1+(P-1)S)}\,dS}{\int_0^1 SdS} = \dfrac{2p}{(p-1)}\left(1-\dfrac{\ln(p)}{(p-1)}\right)$

where S is spawning escapement measured in units of Neq, and p is EDT Productivity.

EDT results are most robust when used to compare outcomes of different scenarios. The projected change in the coordinate values is a reasonable estimate of the expected proportional change in population viability. Thus the EDT-based estimates of productivity and abundance can be used to estimate the expected change in "risk status" from current to a future condition with habitat changes.