Name: Richard A. Hinrichsen

Title: Population modeler/statistician

Education: B.S., Mathematics, Central Washington University (1985); M.S., Mathematical Sciences, Clemson University (1987); Ph.D., Quantitative Ecology and Resource Management, University of Washington (1994).

Technical Experience:

Bonneville Power Administration projects:

- Evaluated models for estimating latent mortality using spawner-recruit data and published results in Transactions of the American Fisheries Society.
- Developed population viability models for endangered ESUs in the Columbia Basin for use in 2008 Biological Opinion.
- Reviewed guidelines presented by technical recovery teams for delisting endangered salmonids in the Columbia Basin. Reviewed critically the data and statistical techniques used to set delisting criteria based on population abundance, population trend, and habitat attributes. Recommended ways to make criteria measurable, objective, and unambiguous.
- Developed a research and monitoring plan for Columbia Basin salmonids, identifying important design criteria (how many measurements and where) to reduce bias and increase resolution.
- Reviewed and developed population models used in the National Marine Fisheries Service Biological Opinion for endangered Columbia River salmon populations (Bonneville Power Administration). Recommended alternative population models for increases precision of estimates of population trend.
- Participated in PATH (Plan for Analyzing and Testing Hypotheses) Columbia River modeling group to form alternative population models for calculating the probability of meeting jeopardy and recovery standards set for Snake River spring/summer chinook salmon. Introduced alternative hypotheses on the effects of climate regime shifts on productivity of salmon populations.
- Developed, implemented, tested, calibrated, and documented a salmonid juvenile survival model (CRiSP). This model was used by Bonneville Power Administration and National Marine Fisheries Service in their biological assessments.
- Evaluated the BPA and Army Corps of Engineers versions of the juvenile salmon passage model FISHPASS by conducting sensitivity analyses to determine what model parameters tended to have the largest influence on passage survival estimates.

Anchor Environmental:

- Estimated extinction risks of Lake Washington chinook salmon populations using viability models that accounted for measurement error.

Corp of Engineers project:

- Conducted extensive statistical analysis of the survival of fish PIT-tagged and transported in the Snake River Basin.
- Analyzed the effects of proposed John Day drawdown on survival and recovery probabilities of endangered Snake River spring/summer chinook. This analysis incorporated several alternative hypotheses on passage survival, effectiveness of transportation, and effects of ocean/climate regime shifts.

Seattle City Light project:

- Developed statistical tests for detecting increases in abundance of kokanee in Lake Pend Orielle, Idaho, due to changes in reservoir management. The statistical tests incorporated age-structured population data and autocorrelation in time abundance time series.

Publications

Hinrichsen, R.A. and T.R. Fisher. 2009. Inferences on the Latent Mortality of Snake River Spring–Summer-Run Chinook Salmon Using Spawner–Recruit Models. Transactions of the American Fisheries Society 138:1232–1239.

Hinrichsen, R.A. 2009. Population viability analysis for several populations using multivariate state-space models. Ecological Modelling 200: 1197-1202.

Hinrichsen, R. A. and E. E. Holmes. 2009. Using multivariate state-space models to study spatial structure and dynamics. In *Spatial Ecology* (editors Robert Stephen Cantrell, Chris Cosner, Shigui Ruan). CRC/Chapman Hall.

Paulsen, C.M., Hinrichsen, R.A., and Fisher, T.R. 2007. Measure twice, estimate once: Pacific salmon population viability analysis for highly variable populations. Transactions of the American Fisheries Society. **136**:346-364.

Hinrichsen, R.A. and Van Holmes, C. 2006. Snake River Fall chinook salmon life history diversity. Independent Technical Analysis Process, Bonneville Power Administration Report. 26 pages.

Hinrichsen, R.A. 2003. The power of experiments for estimating relative reproductive success of hatchery-born spawners. Can. J. Fish. Aquat. Sci. **60**:864-872.

Petersen, J.H, Hinrichsen, R.A., Gadomski, D.M., Feil, D.H., and Rondorf, D.W. 2003. American shad in the Columbia River. *In* Biodiversity, Status, and Conservation of the World's Shads. Edited by K.E. Limburg and J.R. Waldman. American Fisheries Society, Bethesda, Maryland.

Hinrichsen, R.A. 2002. The accuracy of alternative stochastic growth estimates for salmon populations. Can. J. Fish. Aquat. Sci. **59**: 1014-1023.

Paulsen, C.M., and Hinrichsen, R.A. 2002. Experimental management for Snake River spring–summer chinook *(Oncorhynchus tshawytsch*a): trade-offs between conservation and learning for a threatened species. Can. J. Fish. Aquat. Sci. **59**: 717–725.

Hinrichsen, R.A. 2001. The importance of influence diagnostics: examples from the Snake River chinook salmon spawner-recruit models. Can. J. Fish. Aquat. Sci. **58**: 551-559.

Hinrichsen, R.A. 2001. High variability in spawner-recruit data hampers learning. Can. J. Fish. Aquat. Sci. **58**: 769-776.

Ingraham, W.J., C.C. Ebbesmeyer, and R.A. Hinrichsen. 1998. Imminent climate and circulation shift in Northeast Pacific Ocean could have major impact on marine resources. EOS **79**: 197.

Hinrichsen, R.A. 1994. Optimization models for understanding migration behavior of juvenile chinook salmon. Ph.D. dissertation. University of Washington. Seattle, Washington. USA.

Hinrichsen, R.A. 1987. The Leslie model with harvesting. Master's thesis. Clemson University. Clemson, South Carolina, USA. 29p.