

## Robin S. Waples

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### Education

Yale University	American Studies	B.A. 1969
Scripps Institution of Oceanography	Marine Biology	Ph.D. 1986

### Professional Employment

2001-:	Senior Scientist, Northwest Fisheries Science Center (NWFSC), Seattle
1997-2000:	Director, Conservation Biology Division, NWFSC
1991-1997:	Manager, Conservation Biology Project/Program, NWFSC
1987-1991:	Geneticist, NWFSC
1986-1987:	National Research Council Research Associate, NWFSC
1985-1986:	Biology Instructor, University of San Diego

### Professional Activities and Responsibilities Include:

Chair, NMFS Biological Review Teams for Endangered Species Act (ESA) evaluations, 1990-2003 (these teams provided the scientific basis for all ESA listing determinations for Pacific salmon)

Scientific Lead, ESA recovery planning for West Coast salmon, 1999-2003 (oversight for scientific aspects of ESA recovery planning in Washington, Oregon, Idaho, and California)

NMFS Biological Review Teams for green sea turtles (2012-2014); SE Alaska Herring (2008, 2013); Puget Sound marine fish (2000, 2005, 2008); Puget Sound killer whales (2001-2002; 2004)

Marine Fishes Specialist Committee, Committee on the Status of Endangered Wildlife in Canada (COSEWIC), 2001–2009 (these committees provide the scientific basis for endangered species listing determinations in Canada)

Independent Scientific Panels to review scientific whaling: Western North Pacific (Yokohama, Japan, 2009); Iceland (Reykjavik, 2013); Antarctica (Tokyo, Japan, 2014 & 2015)

IUCN Species Specialist Committee for salmon, 2002 - present

Chair, Technical Committee, Western Alaska Salmon Stock Identification Program, 2008-2013

Steering Committee, Fishery-independent estimate of spawning biomass of southern bluefin tuna through identification of close kin using genetic markers. CSIRO, Australia, 2008-2012

Steering Committee, “Review of the contribution that hatchery/culture facilities can make to the conservation of biodiversity.” Canadian Science Advisory Secretariat, 2006-2007.

### Editorial Activities

*Conservation Biology*, Associate Editor, 1998-present; *Conservation Genetics*, Associate Editor, 1999-2007; Editorial Board 2007-present; *Journal of Heredity*, Associate Editor, 2008-present

Guest Editor for: Special Issue, 9 papers from 2014 AGA Presidential Symposium, *Journal of Heredity*, January 2016; Special Section, Climate Change and the U.S. Endangered Species Act, *Conservation Biology*, December 2013; Virtual Issue, 25 Years of Papers on Conservation Genetics, *Conservation Biology*, March 2012; Special Issue, Advances in Marine Fish and Fisheries Genetics\*, *Fish and Fisheries*, December 2008; Special Issue, Evolutionary Perspectives on Salmonid Conservation and Management\*, *Evolutionary Applications*, May 2008. (\* = co-editor)

### **Synergistic Activities Include:**

Director, NWFSC Internal Grants Program, 2000–2015 (provided over \$2.4M in competitive seed-money grants, esp. for career development of junior scientists)

Chair (with Jeff Hutchings of Dalhousie University), Workgroup on Redflats and Extinction Risk, National Center for Ecological Analysis and Synthesis, Santa Barbara, CA 2010–2013

Chair (with Daniel Schindler of University of Washington), Workgroup on Pacific Salmon and Climate Change, National Center for Ecological Analysis and Synthesis, Santa Barbara, CA 2007–2010

Instructor, Short Courses in Conservation Genetics Data Analysis (Denmark 2003; Italy 2005; France 2006; Portugal 2006, 2008; Montana USA 2007, 2009, 2011, 2013, 2015); these courses target advanced graduate students and postdocs and included lectures and hands-on computer data analysis

Steering Committee, FishPopTrace: A large EU project to develop genetic methods for tracing population of origin for fish products in the marketplace, 2008–2012

Affiliate Professor, School of Aquatic and Fishery Sciences, University of Washington, 1991– present

Visiting scientist: U. Montana (2004); UC Berkeley (2004); Université Joseph Fourier, Grenoble, France (2003–2004)

Conferences/Symposia/Workshops Organized: *American Genetic Association Presidential Symposium*, June 2014, Seattle, WA; *Pacific Salmon: Can They Rely on Plasticity to Cope With a Rapidly Changing World?* American Society of Ichthyologists and Herpetologists, Vancouver, B.C., August 2012; *Six Decades of Fishery Genetics*, Seattle, WA, September 2007; *Evolutionary Responses of Salmon to Anthropogenic Changes to Their Ecosystems*, Seattle, WA, December 2006; *Evolutionarily Significant Units and Artificial Propagation*, Seattle, WA, March 2005; *Evolutionary Ecology of Pacific Salmon: Lessons from an Exercise in Applied Conservation Biology*, Society of Conservation Biology, Missoula MT, June 2000; *Genetic Effects of Straying of Non-Native Hatchery Fish into Natural Populations*, Seattle, WA, June 1997; *Application of DNA Technology to the Management of Pacific Salmon*, Seattle, WA, March 1993.

### **Honors and Awards (\* = shared award):**

2015 Thomson Reuters Highly Cited Researcher

Elected to the American Fisheries Society, Genetics Section Hall of Excellence, 2015

Elected to Washington State Academy of Sciences, 2014

Elected President, American Genetic Association, 2014 term

Society for Conservation Biology, Edward T. LaRoe III Memorial Award, 2013 (For being a leader in translating principles of conservation biology into real-world conservation)

American Fisheries Society, William Ricker Fishery Conservation Award, 2008 (For significantly advancing aquatic resource conservation at the national/international level)

NOAA Distinguished Career Award, 2008 (For groundbreaking applied research in the field of conservation genetics that greatly advanced protection of genetic diversity in marine organisms)

Department of Commerce Silver Medal, 1999 (For innovative scientific leadership in advancing the implementation of the Endangered Species Act by introducing new science-based processes)\*

NOAA Administrator's Award, 1992 (For outstanding contributions toward developing a policy to define species of Pacific salmon under the Endangered Species Act)

NOAA Bronze Medals, 1996 (For resolving a long-term US vs Oregon dispute and providing a framework for the Columbia River Basin co-managers to cooperate on wild stock supplementation)\*; 2003 (For developing an innovative, state-of-the-art technical foundation for effective conservation and recovery of Pacific salmon in four Western states)\*; 2003 (For completing the first comprehensive status review of the southern resident killer whale population under the Endangered Species Act)\*

JW Jones Memorial Lecture, Fisheries Society of the British Isles, Leicester, UK, July 2001

Opponent for Doctoral Dissertations: Sweden (1995), Ireland (2009), Norway (2011–12), Denmark (2012)

### **Invited international presentations (last 5 years)**

Department of Fisheries and Oceans, Moncton, Canada, December 2015  
Symposium on Climate Change and the World's Oceans, Santos, Brazil, March 2015  
Commonwealth Scientific and Industrial Research Organisation, Hobart, Tasmania, April 2013  
University of Tasmania, Hobart, April 2013  
Canadian Science Advisory Secretariat, Ottawa, Canada, March 2013  
Salmon and Freshwater Fisheries Research Institute, Hokkaido, Japan, October 2012  
Tokyo University of Marine Science and Technology, Japan, October 2012  
Technical University of Denmark, Silkeborg, Denmark, August 2012  
Norwegian University of Science and Technology, Trondheim, Norway, May 2012  
University of Oslo, Norway, January 2011  
British Antarctic Survey, Cambridge, UK, April 2011  
Norwegian Institute for Nature Research, Trondheim, Norway, June 2011  
Society for Conservation Biology, Edmonton, Alberta, Canada, July 2010

### **Research interests include:**

Adapting evolutionary theory to account for life histories of real species. I began this work in the late 1980s with a focus on the unusual life history traits of Pacific salmon and have recently returned to this theme, with a broader focus on age-structured species with overlapping generations.

Developing and applying scientifically-based policies for implementation of the federal Endangered Species Act. This work has required integrating biology with legal and policy considerations. Primary focus has been on 1) how to define ESA species and “distinct population segments”; 2) the biological meaning of “threatened” and “endangered” and the term “significant portion of its range”; and 3) the appropriate use of artificial propagation under the ESA.

Evaluating genetic effects of artificial propagation on natural populations. Captive propagation can increase survival in early life stages and (potentially) increase abundance, but this generally causes a reduction in fitness in the wild. This is a huge issue for Pacific salmon, given the many ESA listings and the billions of hatchery juveniles released into the Pacific Ocean each year, but it is also more broadly relevant to global programs in forestry, wildlife, aquaculture, and marine stock enhancement.

Disentangling population genetic structure in high gene-flow species. Many marine species (and some terrestrial species) have high dispersal capabilities and as a consequence relatively small differences at neutral genetic markers. But evidence is accumulating that these modest neutral differences can mask important adaptations. Informed management of these species requires careful integration of both demographic and genetic considerations, as well as close attention to experimental design and statistical methods for analyzing data.

Understanding and estimating effective population size ( $N_e$ ) in natural populations.  $N_e$  is one of the most important parameters in evolutionary biology but also one of the most difficult to estimate in nature. Beginning in the late 1980s, my research encouraged the first conservation applications of genetic methods to estimate  $N_e$ . Recent work has focused on applications to species with overlapping generations.

Evaluating adaptive responses by species to anthropogenic changes to their ecosystems. Humans change natural ecosystems in many ways that can be expected to produce evolutionary and/or plastic responses by native species. Understanding these processes is crucial to making informed decisions about management of biodiversity in a rapidly-changing world.

## Peer-Reviewed Publications

- Audzijonyte, A, Fulton, E, Haddon, M, Helidoniotis F, Hobday AJ, Kuparinen A, Morrongiello J, Smith ADM, Upston J, and Waples, RS. 2016. Trends and management implications of human-induced life-history changes in marine ectotherms. *Fish and Fisheries* (published online: 9 MAR 2016 | DOI: 10.1111/faf.12156).
- Epifanio, J., and R.S. Waples. 2016. Artificial propagation of freshwater fishes: benefits and risks to recipient ecosystems from stocking, translocation, and re-introduction. Pp 399-436 in: *Conservation of Freshwater Fishes*. G. Closs, M. Krkosek, and J. Olden, eds. Cambridge University Press, UK.
- Kuparinen A, Hutchings J, and Waples RS. 2016. Harvest-induced evolution and effective population size. *Evolutionary Applications* (published online: 8 APR 2016 | DOI: doi:10.1111/eva.12373).
- Waples, R.S. 2016. Life history traits and effective population size in species with overlapping generations revisited: the importance of adult mortality. *Heredity* (in press).
- Waples, R.S., and Audzijonyte, A. 2016. Fishery-induced evolution provides insights into adaptive responses of marine species to climate change. *Frontiers in Ecology and the Environment* (in press).
- Fisch, K.M., C.C. Kozfkay, J.A. Ivy, O.A. Ryder, and R.S. Waples. 2015. Fish hatchery genetic management techniques: integrating theory with implementation. *N. Am. J. Aquaculture* 77:343-357 (DOI: 10.1080/15222055.2014.999846).
- Keith, D.M., H.R. Akcakaya, S.H.M. Butchart, B. Collen, N. K. Dulvy, E. E. Holmes, J. A. Hutchings, D. Keinath, M. K. Schwartz, A. O. Shelton, and R. S. Waples. 2015. Temporal correlations in population trends: Conservation implications from time-series analysis of diverse animal taxa. *Biological Conservation* 192:247-257.
- Mantua, N.J., L.G. Crozier, T.E. Reed, D.E. Schindler, and R.S. Waples. 2015. Response of chinook salmon to climate change. *Nature Climate Change* 5:613-615 (commentary).
- Shelton, A. O., J. A. Hutchings, R. S. Waples, D. M. Keith, and H. R. Akçakaya. 2015. Maternal age effects on Atlantic cod recruitment and implications for future population trajectories. *ICES Journal of Marine Science* 72:1769-1778 (doi: 10.1093/icesjms/fsv058).
- Waples, R.S. 2015. Testing for Hardy-Weinberg proportions: Have we lost the plot? *Journal of Heredity* 106:1-19 (doi: 10.1093/jhered/esu062).
- Waples RS, Adams PB, Bohnsack J, Taylor BL. 2015. When is a species threatened or endangered in "all or a significant portion of its range"? *Endangered Species Research* 27:189-192.
- Waters, CD, JJ Hard, MSO Briec, DE Fast, KI Warheitd, RS Waples, CM Knudsen, WJ. Bosch, and KA Naish. 2015. Effectiveness of managed gene flow in reducing genetic divergence associated with captive breeding. *Evolutionary Applications* 8:956-971 (doi:10.1111/eva.12331).
- Do, C., R.S. Waples, D. Peel, G.M. Macbeth, B.J. Tillet, and J.R. Ovenden. 2014. NeEstimator V2: re-implementation of software for the estimation of contemporary effective population size ( $N_e$ ) from genetic data. *Molecular Ecology Resources* 14:209-214 (DOI: 10.1111/1755-0998.12157).
- Landguth, E.L., C.C. Muhlfeld, R.S. Waples, L. Jones, D. Whited, W.H. Lowe, J. Lucotch, H. Neville, and G. Luikart. 2014. Combining demographic and genetic factors to assess population vulnerability in stream species. *Ecological Applications* 24:1505-1524.
- Waples, R.S., T. Antao, and G. Luikart. 2014. Effects of overlapping generations on linkage disequilibrium estimates of effective population size. *Genetics* 197:769-780.
- Waples, R.S., and T. Antao. 2014. Intermittent breeding and constraints on litter size: consequences for effective population size per generation ( $N_e$ ) and per reproductive cycle ( $N_b$ ). *Evolution* 68:1722-1734 (doi:10.1111/evo.12384).
- Baskett, M.L., S.C. Burgess, R.S. Waples. 2013. Assessing strategies to minimize unintended fitness consequences of aquaculture on wild populations. *Evolutionary Applications* 6:1090-1108 (DOI: 10.1111/eva.12089).
- Baskett, M.L., and R.S. Waples. 2013. Minimizing unintended fitness consequences of cultured individuals on wild populations: keep them similar or make them different? *Conservation Biology* 27:83-94 (DOI: 10.1111/j.1523-1739.2012.01949.x).

- Burgess, S.C., R.S. Waples, and M.L. Baskett. 2013. Local adaptation when competition depends on phenotypic similarity. *Evolution* 67:3012-3022 (doi:10.1111/evo.12176).
- Neel, M.C., K.S. McKelvey, N. Ryman, M.W. Lloyd, R. Short Bull, F.W. Allendorf, and M.K. Schwartz, and R.S. Waples. 2013. Estimation of effective population size in continuously distributed populations: There goes the neighborhood. *Heredity* 111:189–199 (doi:10.1038/hdy.2013.37).
- Peel, D., R.S. Waples, G.M. Macbeth, C. Do, and J.R. Ovenden. 2013. Accounting for missing data in genetic effective population size ( $N_e$ ) estimation. *Molecular Ecology Resources* 13:243-253 (doi: 10.1111/1755-0998.12049).
- Petrou, E.L., L. Hauser, R.S. Waples, J.E. Seeb, W.D. Templin, D. Gomez-Uchida, and L.W. Seeb. 2013. Secondary contact and changes in coastal habitat availability influence the nonequilibrium population structure of a salmonid (*Oncorhynchus keta*). *Molecular Ecology* 22:5848-5860 (doi: 10.1111/mec.12543).
- Van Doornik, D.M., D.L. Eddy, R.S. Waples, S.J. Boe, T. Hoffnagle, E.A. Berntson, and P. Moran. 2013. Genetic monitoring of threatened Chinook salmon populations: Estimating introgression of non-native hatchery stocks and temporal genetic changes. *North American Journal of Fisheries Management* 33:693-706. (DOI: 10.1080/02755947.2013.790861).
- Waples, R.S., G. Luikart, J.R. Faulkner, D.A. Tallmon. 2013. Simple life history traits explain key effective population size ratios across diverse taxa. *Proc. Royal Society London, Ser. B.* 280: 20131339 (doi: 10.1098/rspb.2013.1339).
- Waples, R.S., M. Nammack, J.F. Cochrane, and J.A. Hutchings. 2013. A tale of two Acts: Endangered species listing practices in Canada and the United States. *Bioscience* 63(9):723-734.
- Christie, M.R., M.L. Marine, R.A. French, R.S. Waples, and M.S. Blouin. 2012. Effective size of a wild salmonid population is greatly reduced by hatchery supplementation. *Heredity* 109:254-260 (doi:10.1038/hdy.2012.39).
- Hutchings, J.A., S.H.M. Butchart, B. Collen, M.K. Schwartz, and R.S. Waples. 2012. Red Flags: Correlates of impaired species recovery. *Trends in Ecology and Evolution* 27:542-546 (DOI 10.1016/j.tree.2012.06.005).
- Kalinowski, S.T., D.M. Van Doornik, C.C. Kozfkay, and R.S. Waples. 2012. Genetic diversity in the Snake River sockeye salmon captive broodstock program as estimated from broodstock records. *Conservation Genetics* 13:1183-1193 (DOI 10.1007/s10592-012-0363-9).
- Nielsen, E.E., A. Cariani, E. Mac Aoidh, G.E. Maes, I. Milano, R. Ogden, M. Taylor, J. Hemmer-Hansen, M. Babbucci, L. Bargelloni, D. Bekkevold, E. Diopere, L. Grenfell, S. Helyar, M.T. Limborg, J.T. Martinsohn, R. McEwing, F. Panitz, T. Patarnello, F. Tinti, J.K.J. Van Houdt, F.A.M. Volckaert, R.S. Waples, FishPopTrace consortium & G.R. Carvalho. 2012. Gene-associated markers provide tools for tackling illegal fishing and false eco-certification. *Nature Communications* 3: 851doi: 10.1038/ncomms1845 (22 May 2012).
- Tallmon, D.A., R.S. Waples, D. Gregovich, and M.K. Schwartz. 2012. Detecting population recovery using gametic disequilibrium-based effective population size estimates. *Conservation Genetics Resources* 4:987-989 (DOI 10.1007/s12686-012-9689-3).
- Vrijenhoek, R.C., and R.S. Waples. 2012. Popular misconceptions (invited Perspective). *Molecular Ecology* 21:4155-4156.
- Hare, M., L. Nunney, M.K. Schwartz, D.E. Ruzzante, M. Burford, R.S. Waples, K. Ruegg, and F. Palstra. 2011. Understanding and estimating effective population size for practical application in marine conservation and management. *Conservation Biology* 25:438-449.
- Israel, J.A., K.M. Fisch, T.F. Turner, and R.S. Waples. 2011. Conservation of native fishes of the San Francisco Estuary: Considerations for artificial propagation of Chinook salmon, delta smelt, and green sturgeon. *San Francisco Estuary and Watershed Science* 9(1). Retrieved from: <http://escholarship.ucop.edu/uc/item/9r80d47p>.
- Martinsohn, J.T., A.J. Geffen, G.E. Maes, E.E. Nielsen, R. Ogden, R.S. Waples, and G.R. Carvalho. 2011. Tracing fish and fish products from ocean to fork using advanced molecular technologies. Pp. 259-282 In: *Food chain integrity: a holistic approach to food traceability, safety, quality, and authenticity* (edited by J. Hoorfar, K. Jordan, F. Butler, and R. Prugger). Woodhead Publishing Ltd., Cambridge, U.K.

- Reed, T.E., D.E. Schindler, M.J. Hague, D.A. Patterson, E. Meir, R.S. Waples, and S.G. Hinch. 2011. Time to evolve? Potential evolutionary responses of Fraser River sockeye salmon to climate change and effects on persistence. *PLoS ONE* 6(6): e20380. doi:10.1371/journal.pone.0020380.
- Reed, T.E., D.E. Schindler, and R.S. Waples. 2011. Interacting effects of phenotypic plasticity and evolution on population persistence in a changing climate. *Conservation Biology* 25:56-63.
- Van Doornik, D.M., R.S. Waples, M.C. Baird, P. Moran, and E.A. Berntson. 2011. Genetic monitoring reveals genetic stability within and among threatened Chinook salmon populations in the Salmon River, Idaho. *North American Journal of Fishery Management* 31:96-105.
- Waples, R.S., P.B. Aebersold, and G.A. Winans. 2011. Population genetic structure and life history variability in *Oncorhynchus nerka* from the Snake River Basin. *Transactions of the American Fisheries Society* 140:716-733.
- Waples, R.S., C. Do, and J. Chopelet. 2011. Calculating  $N_e$  and  $N_e/N$  in age-structured populations: a hybrid Felsenstein-Hill approach. *Ecology* 92:1513-1522.
- Waples, R.S., and P.R. England. 2011. Estimating contemporary effective population size based on linkage disequilibrium in the face of migration. *Genetics* 189:633-644.
- Waples, R.S., and R.K. Waples. 2011. Inbreeding effective population size and parentage analysis without parents. *Molecular Ecology Resources* 11 (Suppl. 1):162-171.
- England, P.E., G. Luikart, and R.S. Waples. 2010. Early detection of population fragmentation using linkage disequilibrium estimation of effective population size. *Conservation Genetics* 11:2425-2430.
- Laikre, L., F.W. Allendorf, L.C. Aroner, C.S. Baker, D.P. Gregovich, M.M. Hansen, J.A. Jackson, K.C. Kendall, K. McKelvey, M.C. Neel, I. Olivieri, N. Ryman, M.K. Schwartz, R. Short Bull, J.B. Stetz, D.A. Tallmon, B.L. Taylor, C.D. Vojta, D.M. Waller, and R.S. Waples. 2010. Neglect of genetic diversity in implementation of the Convention on Biological Diversity. *Conservation Biology* 24:86-88.
- Laikre, L., M.K. Schwartz, R.S. Waples, N. Ryman, & The GeM Working Group. 2010. Compromising genetic diversity in the wild: unmonitored large-scale release of plants and animals. *Trends in Ecology and Evolution* 25:520-529.
- Reed, T.E., R.S. Waples, D.E. Schindler, J.J. Hard, and M.T. Kinnison. 2010. Phenotypic plasticity and population viability: the importance of environmental predictability. *Proc. Royal Society London, B*. 277:3391-3400.
- Tallmon, D.A., D. Gregovich, R.S. Waples, C.S. Baker, J. Jackson, B. Taylor, E. Archer, K.K. Martien, and M.K. Schwartz. 2010. When are genetic methods useful for estimating contemporary abundance and detecting population trends? *Molecular Ecology Resources* 10:684-692.
- Waples, R.S. 2010. High-grading bias: subtle problems with assessing power of selected subsets of loci for population assignment. *Molecular Ecology* 19:2599-2601.
- Waples, R.S. 2010. Spatial-temporal stratifications in natural populations and how they affect understanding and estimation of effective population size. *Molecular Ecology Resources* 10: 785-796.
- Waples, R.S., and C. Do. 2010. Linkage disequilibrium estimates of contemporary  $N_e$  using highly variable genetic markers: A largely untapped resource for applied conservation and evolution. *Evolutionary Applications* 3:244-262.
- Waples, R.S., D.W. Jensen, and M.M. McClure. 2010. Eco-evolutionary dynamics: Fluctuations in population growth rate reduce effective population size in Chinook salmon. *Ecology* 91:902-914.
- Waples, R.S., M.M. McClure, T.C. Wainwright, P. McElhany, and P. Lawson. 2010. Integrating evolutionary considerations in recovery planning for Pacific salmon. Pp. 239-266 in: J.A. DeWoody, J.W. Bickham, C. Michler, K. Nichols, G. Rhodes, and K. Woeste, eds. *Molecular approaches in natural resource conservation and management*. Cambridge U. Press.
- Andersen, L.W., E.W. Born, D.W. Doidge, I. Gjertz, Ø. Wiig, and R.S. Waples. 2009. Genetic signals of historic and recent migration between sub-populations of Atlantic walrus *Odobenus rosmarus rosmarus* west and east of Greenland. *Endangered Species Research* 9:197-211.
- Chopelet, J., R.S. Waples, and S. Mariani. 2009. Sex change and the genetic structure of marine fish populations. *Fish and Fisheries* 10:329-343.

- Waples, R.S. 2009. Conserving the legacy of Arctic-Yukon-Kuskokwim salmon. *American Fisheries Society Symposium* 70:125–139.
- Waples, R.S., T. Beechie, and G.R. Pess. 2009. Evolutionary history, habitat disturbance regimes, and anthropogenic changes: What do these mean for resilience of Pacific salmon populations? *Ecology and Society* 14(1): 3 [online] URL: <http://www.ecologyandsociety.org/vol14/iss1/art3/>.
- Waples, R.S., and J.R. Faulkner. 2009. Modeling evolutionary processes in small populations: Not as ideal as you think. *Molecular Ecology* 18:1834-1847.
- Waples, R.S. and K.A. Naish. 2009. Genetic and evolutionary considerations in fishery management: Research needs for the future. Pp. 427-451 In: *The future of fisheries science in North America*. R. J. Beamish and B. J. Rothschild, editors. Springer, Dordrecht.
- Anderson, E.C., R.S. Waples, and S.T. Kalinowski. 2008. An improved method for predicting the accuracy of genetic stock identification. *Can. J. Fish. Aquat. Sci.* 65:1475–1486.
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- Waples, R.S., G.R. Pess, and T. Beechie. 2008. Evolutionary history of Pacific salmon in dynamic environments. *Evolutionary Applications* 1:189-206.
- Waples, R.S., A.E. Punt, and J. Cope. 2008. Integrating genetic data into fisheries management: how can we do it better? *Fish and Fisheries* 9:423–449.
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- Williams, J.G., R.W. Zabel, R.S. Waples, J.A. Hutchings, and W.P. Connor. 2008. Potential for anthropogenic disturbances to influence evolutionary change in the life history of a threatened salmonid. *Evolutionary Applications* 1:271-285.
- Araki H.A., R.S. Waples, W.R. Ardren, B. Cooper, and M.S. Blouin. 2007. Effective population size of steelhead trout: influence of variance in reproductive success, hatchery programs, and genetic compensation between life-history forms. *Molecular Ecology* 16:953-966.
- Araki H.A., R.S. Waples, and M.S. Blouin. 2007. A potential bias in the temporal method for estimating  $N_e$  in admixed populations under natural selection. *Molecular Ecology* 16:2261-2271.
- Faubet, F., R.S. Waples, and O.E. Gaggiotti. 2007. Evaluating the performance of a multilocus Bayesian method for the estimation of migration rates. *Molecular Ecology* 16:1149–1166.
- Gustafson, R., R.S. Waples, J.M. Myers, J.J. Hard, G.J. Bryant, O.W. Johnson, and L.A. Weitkamp. 2007. Pacific salmon extinctions: quantifying lost and remaining diversity. *Conservation Biology* 21:1009-1020.
- Schwartz, M.K., G. Luikart, and R.S. Waples. 2007. Genetic monitoring: a promising tool for conservation and management. *Trends in Ecology and Evolution* 22:25-33.
- Waples, R.S., P.B. Adams, J. Bohnsack, and B.L. Taylor. 2007. A biological framework for evaluating whether an ESA species is threatened or endangered in a “significant portion of its range.” *Conservation Biology* 21:964-974.
- Waples, R.S., M.J. Ford, and D. Schmitt. 2007. Empirical results of salmon supplementation in the Northeast Pacific: A preliminary assessment. pp. 383-403 in T. M. Bert, ed. *Ecological and Genetic Implications of Aquaculture Activities*. Springer, Dordrecht, the Netherlands.
- Waples, R.S., M. Masuda, and J. Pella. 2007. *SALMONNb*: A program for computing cohort-specific effective population sizes ( $N_b$ ) in Pacific salmon and other semelparous species using the temporal method. *Mol. Ecol. Notes* 7:21-24.
- Waples, R.S., and M. Yokota. 2007. Temporal estimates of effective population size in species with overlapping generations. *Genetics* 175:219-233.
- Dawson, M., R.S. Waples, and G. Bernardi. 2006. Phylogeography. pp. 26-54 in *The Ecology of Marine Fishes: California and Adjacent Waters*. L.G. Allen, D.J. Pondella II, and M.H. Horn, eds. Univ. Calif. Press, Berkeley.

- Geffen, E., G. Luikart, and R.S. Waples. 2006. Impacts of modern molecular genetic techniques on conservation biology. pp. 46-63 *in* Key Topics in Conservation Biology. D.W. Macdonald and K. Service, eds. Blackwell, London.
- Naeem, S., R.S. Waples, and C. Moritz. 2006. Preserving nature. Pp. 70-79 *In*: J. M. Scott, D. D. Goble, and F. W. Davis, editors. The Endangered Species Act at Thirty: Conserving Biodiversity in Human-Dominated Landscapes. Island Press, Washington, D.C.
- Waples, R.S. 2006. Seed banks, salmon, and sleeping genes: Effective population size in semelparous, age-structured species with fluctuating abundance. *American Naturalist* 167: 118-135.
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