SALMON RECOVERY SCIENCE REVIEW PANEL
Report for the meeting held
August 27-29, 2001
Northwest Fisheries Science Center
National Marine Fisheries Service
Seattle, Washington

Robert T. Paine	**University of Washington, chair**
Ted Case	**University of California – San Diego**
Fran James	**Florida State University**
Si Levin	**Princeton University**
Russ Lande	**University of California – San Diego**
Bill Murdoch	**University of California – Santa Barbara**
Beth Sanderson	**National Marine Fisheries Service liaison** **RSRP report coordinator**

EXHIBIT 1
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Recovery Science Review Panel

The Recovery Science Review Panel (RSRP) was convened by the National Marine Fisheries Service (NMFS) to help guide the scientific and technical aspects of recovery planning for listed salmon and steelhead species throughout the West Coast. The panel consists of six highly qualified and independent scientists who performs the following functions:

1. Review core principles and elements of the recovery planning process being developed by the NMFS.
2. Ensure that well accepted and consistent ecological and evolutionary principles form the basis for all recovery efforts.
3. Review processes and products of all Technical Recovery Teams for scientific credibility and to ensure consistent application of core principles across ESUs and recovery domains.
4. Oversee peer review for all recovery plans and appropriate substantial intermediate products.

The panel meets 3-4 times annually, submitting a written review of issues and documents discussed following each meeting.

Expertise of Panel Members

Common to many/all panel members:

- Involvement in local, national and international activities
- Participation in National Research Council activities
- Service on multiple editorial boards
- Numerous publications in prestigious scientific journals

Dr. Ted Case

- University of California- San Diego
- *Field of expertise*: evolutionary ecology, biogeography and conservation biology
- *Awards*: Board member for National Center for Ecological Analysis and Synthesis; Research featured in prominent scientific journals (Science, Nature) popular science journals (American Scientist, Discover), on public television and public radio
- *Scientific leadership*: Chair of department of Biology at UCSD and author of leading textbook on theoretical ecology;
- *Research*: More than 116 scientific articles published

Dr. Frances C. James

- Florida State University
- *Field of expertise*: conservation biology, population ecology, systematics, ornithology
- *Awards*: Eminent Ecologist Award (Ecological Society of America); Leadership and dedicated service awards from the American Institute of Biological Sciences
- *Scientific leadership*: Participant on National Research Council Panels; service on many editorial boards; Board of Governors for The Nature Conservancy; scientific advisor for national, state and local activities;
- *Research*: More than 105 scientific articles published

Dr. Russell Lande

- University of California-San Diego

- *Field of expertise*: evolution and population genetics, management and preservation of endangered species, conservation and theoretical ecology
- *Awards*: Sewell Wright Award (American Society of Naturalists); Fellow - John Simon Guggenheim Memorial Foundation, MacArthur Foundation, American Academy of Arts and Sciences
- *Scientific Leadership*: President of the Society for the study of Evolution; International Recognition; developed scientific criteria for classifying endangered species adopted by the International Union for Conservation of Nature and Natural Resources (IUCN)
- *Research*: More than 116 scientific publications

Dr. Simon Levin

- Princeton University
- *Field of expertise*: theoretical/mathematical ecologist
- *Awards*: National Academy of Sciences member; Robert H. MacArthur award recipient from the Ecological Society of America; Statistical Ecologist Award from the International Association for Ecology; Distinguished Service Award from the Ecological Society of America
- *Scientific leadership*: Member of many National Research Council panels; Board of Director member for Santa Fe Institute, Beijer International Institute of Ecological Economics, The Committee of Concerned Scientists
- *Research*: More than 275 technical publications

Dr. William Murdoch

- University of California Santa Barbara
- *Field of expertise*: theoretical and experimental ecologist, population ecology
- *Awards*: Robert H. MacArthur award recipient from the Ecological Society of America; President's Award from the American Society of Naturalists; Guggenheim Fellowship
- *Scientific leadership*: Founder of National Center for Ecological Analysis and Synthesis; Director of Coastal California Commission 10-year study; scientific advisory panel member for the Habitat Conservation Plan for the California marbeled murrelet
- *Research*: More than 118 scientific publications

Dr. Robert Paine (chair)

- University of Washington
- *Field of expertise*: marine community ecology, complex ecological interactions, natural historian,
- *Awards*: National Academy Sciences member; Robert H. MacArthur award recipient from the Ecological Society of America; Tansley Award (British Ecological Society); Sewell Wright Award from the American Society of Naturalists; Eminent Ecologist (Ecological Society of America)
- *Scientific leadership*: Member of multiple National Research Council panels, editorial boards, past president of Ecological Society of America
- *Research*: About 100 scientific publications

Dr. Beth Sanderson

- National Marine Fisheries Service liaison to the Recovery Science Review Panel
- Recovery Science Review Panel report coordinator

RECOVERY SCIENCE REVIEW PANEL (RSRP)
Northwest Fisheries Science Center
Seattle, 27 - 29 August 2001

I. OVERVIEW

A partial committee of the Recovery Science Review Panel (RSRP) [Case, Lande, Levin, Murdoch and Paine] met at the Montlake Northwest Fisheries Science Center. The meeting, like its predecessors, had two primary goals: 1) to explore the intersection of the scientific basis informing harvest decisions and salmon ESU restoration and 2) to discuss Population Viability Analysis [PVA] and habitat delisting criteria with the Puget Sound, Willamette/Lower Columbia, and Oregon/California Technical Recovery Teams (TRTs). The agenda is appended.

To achieve the first objective a panel of experts was invited to an "information garnering" workshop on the science underlying harvest decisions and salmonid management. Representation included federal, the State of Washington and Tribal harvest and policy managers. Participants were asked beforehand to identify, and justify the scientific basis, of whether or not a pre-determined harvest regime could be impeding salmon ESU recovery [one of the RSRP committees primary mandates].

Consultation with the TRTs embraced a broader though related range of topics, including ESU habitat delisting criteria, analyses of stock viability, and some of the underlying analytical models [Population Viability Analysis (PVA), Risk Assessment Procedure (RAP) and Viability Risk Assessment Procedure (VRAP)].

II. THE STRUCTURE OF PVA MODELS, AND ESU LISTING - DELISTING CRITERIA

Population Viability Analysis (PVA) is the estimation of the probability of population extinction or collapse to a specified level within a given time. PVA is generally conducted using the framework of stochastic population models that incorporate both intrinsic and extrinsic stochastic factors as well as deterministic factors affecting individual birth and death rates.

Demographic stochasticity is an intrinsic stochastic factor arising from chance independent differences in birth and death rates among individuals in finite populations; it produces random fluctuations in population growth rate that are inversely proportional to population size (in large populations these among-individual differences in vital rates tend to average out). Environmental stochasticity affects the fitness of all individuals in a population in the same or similar fashion, and causes random fluctuations in population growth rate of a magnitude that does not necessarily decline with increasing population size (Leigh 1981, Goodman 1987, Lande 1993). The importance of stochastic factors is not only that they can cause chance declines in population growth rate and hence population size, but also that stochasticity per se decreases the long-run growth rate of a population (the asymptotic rate of increase of lnN) when it is well below carrying capacity; sufficient stochasticity can cause a population to decline with high probability even when it is expected to increase in a constant average environment (Tuljapurkar 1982, Lande 1998).

Failure to empirically separate demographic stochasticity, environmental stochasticity, and measurement error in estimated population sizes in population time series used to estimate population parameters can strongly bias PVAs (Engen et al. 2001, Sæther et al. 2002). Deterministic factors, including the intrinsic rate of population increase at low population size, the form of density dependence at intermediate or large population sizes, and the possible existence of depensation (an Allee effect) at small population size or density, also may have major impacts on population viability (Mills et al. 1996, Middleton and Nisbet 1997). For a given realistic value of the intrinsic rate of increase, using a model of density-independent growth up to a an upper limit of population size (ceiling), as in the NMFS presentation to the RSRP Committee, is not conservative because density dependence below carrying capacity, as well as an Allee effect, would decrease population viability. Because sufficient data are not usually available to accurately estimate Allee effects on population dynamics at very small population size, and because methods for empirical estimation of demographic stochasticity have only recently been developed (Engen et al. 1998, 2001, Sæther et al. 1998a,b, 2000, 2002), it is increasingly recommended that PVA be conducted by evaluating the risk of population decline to a threshold size, N*, above which demographic stochasticity, Allee effects, and even the genetic effects of inbreeding depression, can be largely ignored. This leaves environmental stochasticity, the intrinsic rate of increase, and the form of density dependence as the primary factors in PVA. For a given intrinsic rate of increase, different forms of density dependence (without an Allee effect) can be analyzed using the thetalogistic model (Gilpin and Ayala 1973), which includes the hockey stick model when theta approaches infinity.

The choice of N* is guided by several considerations. It is often stated that demographic stochasticity can be neglected when N* is on the order of 100 (mature) individuals or more. More precise guidance for choosing N* to avoid demographic stochasticity can be obtained from models of small populations (well below carrying capacity) subject to demographic and environmental stochasticity. The total stochasticity in population growth rate, (r or ln lambda), at a given population size N takes the form $Var[r|N] = V_e + V_d/N$ where V_e and V_d are respectively the environmental variance and demographic variance in r (Leigh 1981, Goodman 1987, Lande 1993, 1998). This shows that the condition for neglecting demographic stochasticity is N >> Vd/Ve which suggests choosing the PVA threshold at N* = 10Vd/Ve. Estimates of Vd are on the order of 0.1 to1.0 for several species and estimates of Ve for many species are often on the order of 0.01 to 0.1 (Dennis et al. 1991, Engen et al. 1998, 2001, Sæther et al. 1998a,b, 2000, 2002, Lande et al. unpubl.). Estimation of these parameters for salmonids could be used by NMFS to help justify a choice of N* in PVAs, assuming that the values suggested are also sufficient to minimize possible Allee effects and inbreeding depression.

The statistical method that most fully accounts for the impact of uncertainty in estimated population parameters on PVA is application of a Population Prediction Interval (PPI). In contrast to a confidence interval on an observable parameter such as current population size, a prediction interval is used by statisticians to place likely bounds on an unobserved variable that must be extrapolated, such as population size at a specified time in the future. PPIs are more appropriate and more readily interpretable than the alternative approach of constructing a confidence interval on the probability of population collapse or extinction at a future time. A PPI can be constructed in practice by repeated simulations of a stochastic population model by choosing population parameters among simulations according to the joint sampling distribution of the parameters. The methodology of PPIs has been developed and applied in the context of PVA by Engen et al. (1998, 2001) and Sæther et al. (1998a,b, 2000, 2002).

Because the amount and quality of population data are not likely to be sufficient for very accurate estimation of population parameters, we expect high levels of uncertainty in PVAs for most salmonid ESUs. We recommend that quantitative PVA modeling be used primarily to guide the development of relatively simple objective, population-based listing and delisting criteria for salmonid ESUs, similar to the IUCN Red List Criteria (IUCN 2001), which can and have been widely applied to a variety of taxa including those with relatively limited data (Hilton-Taylor 2000).

III. HARVESTING THEORY AND PRACTICE

Government agencies have historically done a rather poor job of preventing overexploitation of marine fish, as nearly half of the commercial fisheries in the U.S. were recently classified as overexploited (Ludwig et al. 1993, Rosenberg et al. 1993, Myers et al. 1997). The same conclusion applies to the management of anadromous fish, as most wild stocks of Pacific salmonids in the continental U.S. are either severely depleted or already extinct due to a variety of factors including overexploitation (Nehlson et al. 1991, Lichatowich 1999).

Models used to set allowable harvests for fisheries are notoriously inaccessible and impenetrable for ecologists. Presentations to the RSRP panel did little to dispel this impression, and we felt that the presenters were unnecessarily defensive, and at times even obfuscatory. Despite hours of presentations and numerous probing questions from the RSRP panel, we remain somewhat mystified concerning the scientific justification for current allowable harvests, especially the continuation of substantial or high allowable harvests rates on listed salmonid ESUs. Most of the listed ESUs have experienced continued declines in spawner abundance over the past two decades, with estimated lambda less than 1 (McClure et al. in review). In every case in this manuscript, the estimated lambda in the absence of harvest exceeded lambda with harvest. Thus, it is clear that exploitation contributed, in several cases quite significantly, to the population declines, decreasing estimated lambda by as much as 20% or 30%. In four cases harvest rates in effect before ESA listing tipped the balance between estimated lambda greater than 1 without harvest to less than 1 with harvest (Lower Columbia Chinook, Snake River Fall Chinook, Lower Columbia Winter Steelhead, and Upper Columbia Steelhead) (McClure et al. in review). Allowable harvest rates have been reduced on some, but not all, ESUs since ESA listing. For example, allowable in-river harvest of Snake River Spring/Summer Chinook actually increased in recent years from less than 5% in 1995-1999 to nearly 6% in 2000 and more than 12% in 2001 (McClure et al. in review). Apparently substantial harvest of listed ESUs continues to be permitted by NMFS, e.g. up to about 50% per year for components of the Lower Columbia Chinook and Snake River Fall Chinook. The difficulty of obtaining historical information on harvest rates for each stock in each year, even for NMFS personnel not directly involved in setting allowable harvests, is also disturbing. A means of addressing this problem would be the development of a public internet accessible database that reports annual total harvest rates by stock along with indices or estimates of population size (from dam counts, spawner counts, redd counts, or coded-wire tag recovery rates).

We were informed that allowable harvests are suggested by a consortium of harvesters, and then approved by NMFS. Presenters explained that allowable harvests usually are based on a leading indicator for a given year, such as jack returns from the previous year, employing simple deterministic formulas that allocate adult fish within a given year to harvest, mortality and escapement to spawn. Errors in estimated escapement can be large: for example, we were told that because of recent changes in ocean conditions steelhead returns were about three times greater than predicted in some reaches in 2001. Presumably in other years or sites errors of similar magnitude also occur in the opposite direction. For instance, the total Frasier River 2001 sockeye run (catch + escapement) amounted to about 6 million fish compared to a pre-season forecast of 13 million (C.C. Wood, pers. comm. Department of Fisheries and Oceans, Nanaimo, BC, September 9, 2001).

In response to our questions it became apparent that NMFS, state and tribal personnel involved in setting allowable harvests were not making use of basic theories of harvesting fluctuating populations, in which stochasticity and uncertainty in population dynamics strongly support the precautionary principle for setting conservative allowable harvests (Hilborn and Walters 1992), nor were they familiar with the advantages of threshold harvesting to reduce risk of population collapse or extinction and to increase average sustainable harvests (reviewed by Lande et al. 1997). They offered the following justifications for current substantial harvest levels on listed salmonid ESUs that are experiencing continued declines. 1) Existing laws (Indian treaty rights, the Magnuson-Stevens Act, and the Endangered Species Act) have been interpreted by NMFS as dictating the maximum harvest that does not "substantially restrict recovery". 2) Connected with this is the common practice of open ocean, mixed stock fisheries, in which depleted, threatened and endangered stocks are harvested along with abundant stocks. 3) Forgoing harvests on such mixed stock fisheries would waste a valuable resource.

Our suggestion that a transition toward terminal fisheries (in estuaries and rivers where the stocks are better separated) would help solve the problem of mixed stock fisheries was dismissed as being either politically impossible due to social inertia of fisherman accustomed to ocean fishing, or because for some stocks carcass quality is lower in terminal fisheries. It was later admitted however that some moves toward terminal fisheries have been made, which implies to us that our suggestion may have been too quickly dismissed. NMFS should carefully investigate the extent to which it can promote further transition to terminal fisheries in cases where depleted and endangered stocks are mixed in the ocean with abundant stocks.

NMFS personnel involved in setting allowable harvests revealed that validation of the allowable harvests through the use of stochastic population models is done only sporadically every several years. They indicated that allowable harvests are set so as not to substantially impede recovery. Substantial was never defined quantitatively in this context. It appears to us that NMFS personnel involved in setting allowable harvest rates use subjectivity and legalism, and their inability to promote a transition to terminal fisheries to justify biologically unsustainable harvest rates on several listed ESUs.

There is a glaring disconnect between the deterministic yearly allocation models used to set allowable harvests, and their validation with stochastic population dynamic models. Stochastic population models that have or can be employed to validate the yearly allocation models for setting allowable harvests include Ratner et al. (1997) Nickelson and Lawson (1998) and RAP (2000), among others. Earlier versions of RAP lacked realistic patterns of temporal autocorrelation in environmental stochasticity and simulated population trajectories only over a 25-year time frame. We are encouraged by recent efforts to improve this model (i.e. the VRAP model, which includes different forms of density dependence, depensation, more general patterns of environmental stochasticity, and a longer simulation time frame). However, we did not see any indication of close interaction between the groups setting yearly allowable harvests and those exploring the consequences of these choices on a longer time frame. It was not clear to us how, when, and even whether, these stochastic population dynamic models will be applied in the future to validate the deterministic yearly allocation models used to set allowable harvests. Furthermore, it appears that harvest decisions are never connected with other factors in an overall restoration and recovery plan (see section V).

We recommend that NMFS carefully reexamine the procedures by which allowable harvests are suggested and approved. The deterministic allocation models used to set allowable harvests each year need to be much more thoroughly tested and validated with long-term stochastic population modeling based on objective PVA criteria. Moreover, we see a need to incorporate the yearly cycle of harvest decisions into a long-term simulation model like VRAP. This was once attempted by NMFS personnel, including a stochastic population dynamic model and the yearly allocation model for setting allowable harvests in a comprehensive simulation of the overall management process spanning both short and long time scales (Kope 1993, 1994), but such efforts have not been pursued. Legal and policy constraints under which NMFS operates (Indian treaty rights and the Magnuson-Stevens Act) in its management of listed ESUs should also be carefully reexamined to determine whether they are superceded by the Endangered Species Act; it may be that, by more seriously considering measures to promote a transition toward terminal fisheries, a potential conflict between these laws can be reduced to the benefit not only of the harvesters but also the endangered stocks; this might also make threshold harvesting of depleted and listed ESUs more acceptable politically. NMFS should reexamine their policies and procedures for setting allowable yearly harvests and evaluating their long-term consequences. Finally, the procedures for setting allowable harvests should be integrated with other aspects of restoration and recovery so that harvest impacts can be compared to other factors affecting population viability.

IV. HABITAT CRITERIA FOR DELISTING

A species or ESU may be delisted when its survival, as characterized by biological measures such as its population size, population growth rate, diversity of subpopulations, and ecotypes, is no longer in jeopardy. For example, delisting conditions for the IUCN (International Union for Conservation of Nature and Natural Resources) categories are simply the opposite of the listing conditions, implemented after a lag time of 5 years. In practice, recovery will only occur when the factors responsible for salmon declines have been sufficiently reversed, raising the possibility that specific recommendations for improvement in these factors could serve as a surrogate or amendment to the biological conditions for delisting discussed above.

The RSRP discussed the pros and cons of supplementing the biological delisting criteria adopted in the VSP criteria (Viable Salmonid Populations) with additional explicit preconditions for habitat improvements and/or specific administrative procedures. Based on the presentation by Dan Shively (USFS, Mt. Hood, Oregon), there seems to be some precedent in other recovery plans dealing with aquatic species for such habitat specifications in recovery plans. It will be valuable to have this database and criteria underlining the derived conclusions publicly available on-line much like the Boersma et al. (2001) evaluation of 1000 recovery plans is available on the NCEAS website (www.nceas.ucsb.edu). Such publicly accessible information permits independent assessment of the criteria and the generality of the derived conclusions.

Because salmon are anadromous, their life history integrates very different habitats over different life stages. The exact conditions required to achieve optimal survival and fecundity cannot be specified with quantitative accuracy. In addition, our knowledge of these factors and the relative trade-offs between them will no doubt improve with further research and monitoring. Also, many possible combinations of actions involving improved habitat, reduced harvesting, less interference from dams, and better hatchery management, could accomplish recovery. Which combination of strategies will be most fruitful and cost effective for each ESU needs to be evaluated before one can determine what exact habitat improvements are necessary or sufficient for delisting.

Improved habitat conditions should lead to increased cohort replacement rates and growth rates. Botsford (1994) for example, writes "Habitat quality can be incorporated in delisting criteria by specifying population growth rate in addition to population abundance". A possible advantage to utilizing measures of habitat improvement is that when specific habitat measures can reliably be associated with improvements in intrinsic growth rate, they can serve as leading indicators for population recovery, giving a potential for more timely management intervention. However, we are convinced that the specific models connecting habitat conditions to population growth rates and viability (e.g. EDT) are not sufficiently reliable to accomplish this task at the present time. While we do not favor including specific habitat prescriptions as delisting criterion, improvements to habitat and procedures for effecting them should be integrated, along with the other impacts to salmon (see section V), into the Recovery Plans. We also think that better monitoring of temporal trends in various life-cycle components of intrinsic growth rates might prove useful as leading indicators.

Salmon survival rates in the ocean phase of their life cycle are particularly unpredictable and seem to fluctuate with long-term, decadal, changes in ocean conditions. The exact mechanism of these survival rate fluctuations is incompletely known. Temporary but unsustained improvements in ocean conditions could lead to the temporary fulfillment of VSP conditions, even though the longer-trend for these ESUs is still downward because of inadequate habitat conditions in the terrestrial phase. The panel felt that this possibility should be dealt with by building into the delisting conditions a sufficient time period (e.g. 30 years) for demonstration of VSP conditions so as to avoid being misled by erratic short-term fluctuations in ocean conditions. Furthermore, it is important to explicitly include variation in ocean conditions into analyses aimed at establishing requirements for viability of salmon populations, so that transient interludes of "good times" do not induce a false comfort that salmon are recovered.

V. INTEGRATION OF FACTORS IMPACTING SALMON

The committee has been impressed with the complexity of the salmon management problem, the need to disentangle the effects of the 4 H's -hydropower, harvesting, habitat loss and hatcheries- upon salmon decline, and the potential for effecting recovery by modification of these. There is no simple answer, since there are likely to be multiple feasible paths leading to the same goal. Improvements in stock abundances can be achieved through a variety of actions, and the choices among these will involve not only science, but also sociopolitical decisions. Science can inform these decisions, but cannot dictate the choices among them.

Given these facts, it seems obvious to us that it makes little sense to consider factors one at a time. The effectiveness of a harvesting strategy, for example, will depend upon assumptions about hydropower, hatcheries, and habitats. Similarly, decisions about hatcheries must be based upon assumptions concerning the other three H's (habitat, hydropower, and harvest). We were frustrated, therefore, to hear discussion of optimal harvesting strategies, as if no other factors were involved, just as we were previously frustrated to hear discussion of hatcheries in a vacuum. Indeed, it was our view that it was this isolation that led to some counterintuitive recommendations, such as to continue the harvesting of declining populations. We were told that sociopolitical factors mandated that certain fisheries could not be shut down entirely, but clearly those extrinsic factors were not being considered systematically. The problem was not in the presentation, and only partially in the execution; the researchers are clearly hamstrung by constraints imposed upon them. The real problem appears to be an organizational one, with apparently insufficient contact among the individual H groups, and insufficient integration.

We recommend that ways be found to integrate the activities of the various H groups, and to charge them with developing tradeoff curves that can guide management by evaluating the tradeoffs among diverse strategies. Solution to the problem of salmon decline surely will involve every H, and a coordinated strategy is needed for interfacing the work of the individual groups. That strategy is currently lacking. We were told that the integration would occur at the level of the TRTs, after the individual H groups will have done their work. But this is backwards; it is impossible to develop, for example, a harvesting strategy consistent with recovery without reference to assumptions about other factors. Such steps are essential to the success of the entire recovery effort. Indeed, the organizational structure of the NMFS Northwest Regional Office seems to inhibit the very integration that is needed, and we urge that alternative ways to organize activities be considered.

VI. SUMMARY OBSERVATIONS

A. Research

- Selina Heppel presented an argument for expanded research on smolt [= outmigrant] production. Her basic rationale: delisting criteria are now primarily confined to either a sole life-history stage [returning adults] or habitat suitability. The panel agrees that studies of outmigrant numbers as a function of spawner numbers could reveal vital information on the extent to which negative density dependence is a factor, and help to develop delisting criteria that are independent of the oceanic "black box".

- The RSRP committee has repeatedly urged that hatchery closure be considered as an experimentally desirable management option. Given prior genetic studies at selected river systems/watersheds, results could include the genetic consequences of straying, novel data on the rates of local adaptation, and even whether stock enhancement via hatchery augmentation is an appropriate activity. The recent federal decision in Oregon regarding coastal Coho stocks emphasizes the urgency of such science-based studies.

- The RSRP committee remains convinced that some evaluation of stock or site specific genetic identity can be recovered from retrospective analyses, especially of museum specimens and recently rediscovered archival salmon scale collections. The results could support or challenge the robustness of genetically based ESU concepts. These historically relevant data should not be ignored; rather they could provide genetic standards against which current population structure could be compared.

- Carrying capacity [or K in ecological models] remains an important metric in salmonid recovery studies. It affects hatchery activities at sites where urbanization or forestry practices have influenced habitat quality. If dam removal allows salmon to return to long-denied but acceptable spawning grounds, what will be the population consequences? Experimental studies on carcass addition or a variety of studies quantifying what factors determine breeding habitat quality will remain essential. Progress towards ESU recovery requires such information; salmonid habitat, possible including estuarine conditions, is a likely focus of up-coming RSRP meetings.

- The committee is concerned that the effects of hydropower, harvesting, habitat loss and hatcheries are being considered independently, and urges that integration of the effects of these be built in early in the process, so that the interplay between these can be considered adequately.

B. Policy relevant science issues

- Can data rich models be used to manage or even evaluate the status of data poor populations elsewhere? That is, for instance, will quantitative analyses of Skagit River or Columbia River salmonid stocks [once the "multiple dam influences" is accounted for] be applicable to comparable but less studied river systems? This is more than a simple modeling dilemma; it touches all salmonid management decisions because of the implied geographic scale and substantially varied regional information bases and research priorities.

- The RSRP committee continues to urge NMFS and other regulatory entities involved in setting harvest quotas to consider stock size, demography, and other dynamic aspects of populations, especially the longer-term population trajectory [lambda or its equivalent]. Simply put, it is difficult to argue that a continually declining stock is a "healthy" stock. An inability to detect a difference between harvest and no harvest regimes should not suffice as a justification for harvesting such stocks. NMFS should develop a rational policy that does not demean scientific common sense.

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Recovery Science Review Panel Meeting
Northwest Fisheries Scence Center
Seattle, Washington
August 27-29, 2001

Monday, August 27th
Room 370W NWFSC

RSRP "information garnering" workshop regarding the science of harvest management: how would we determine if a particular harvest regime were impeding recovery?

8:30 - 8:50 AM	*Peter Kareiva* briefs the RSRP on the upcoming day.
8:50 - 9:40 AM	*Peter Dygert*
9:40 - 10: 30 AM	*Gary Morishima*
	COFFEE BREAK
10:50 - 11:40 AM	*Teresa Scott*
11:40 - 1:20	LUNCH with TRT chairs (McClure, Cooney, Ruckelshaus, and McElhany)
1:20 - 2:10 PM	*Robert Kope*
	COFFEE BREAK
2:30 - 4:30 PM	OPEN DISCUSSION SESSION with Susan Bishop, cast of supporting experts and resource people, and as many of the presenters who have the patience to join in. Susan will be the "master of ceremonies" on this, and introduce folks as required.
4:30 PM	Adjourn

Tuesday, August 28th NWFSC Auditorium

Meeting with TRTs

10:00 AM – 12:00 PM	Population Identification
12:00 – 1:00 PM	Pizza Lunch
1:00 – 5:00 PM	Population Viability

Wednesday, August 29th
Room 370W, NWFSC

8:30 – 10:00 AM	Habitat Delisting Criteria (Willamette/Lower Columbia Habitat Workgroup)
10:00 – 3:00 PM	RSRP meeting time (discussion, report writing, analysis, etc.)