Public Comments received by November 14, 2008, in response to the posting of the 2009 PSP *Draft* – Priority Research Topics. Comments were provided to the 2009 Topic Selection Panel for their consideration.

Comments in response to specific topics:

Topic 1: Ecosystem Responses to Climate Change

Comment: The topics look fine; just provide more specific direction so you get research that can help answer key management/restoration issues. Under the climate change category, some ideas that occurred to me were:

1. Identifying climate-sensitive species and ecol functions, with recommendations for increasing their resiliency and adaptability

2. Identifying key agricultural and species dependencies, with conservation recommendations. The example I'm thinking about is Swainson's hawk attraction to alfalfa fields, which is a high-water-demand crop that might decrease due to increasing drought conditions.

3. Long-term vs short-term tradeoffs of different habitat restoration/creation strategies - for example, what are the rationale/justification/pros & cons of investing in upland agric land now for tidal wetlands yet to come with sea level rise?

Marc Hoshovsky
Delta Suisun-Marsh Office
California Department of Water Resources

Comment: I am excited about the new CALFED Science Program PSP and am glad to see Topic 1: Ecosystem Responses to Climate Change. In the description of "need", it is stated that "Areas of interest include responses of primary production, habitat quality and connectivity, ecosystem function, and ecosystem services". These are all very important subjects indeed. Therefore, it is surprising that, in the following section listing possible research questions little is mentioned about how particular ecosystem services may change in light of global climate change.

In addition, in the description of need, I was surprised that there was no mention of how climate change might affect the overall sustainability of ecosystems. Sea-level rise, which is clearly a key aspect of global climate change, will be an important factor in the sustainability of marshes in the Delta and in the San Francisco Bay Estuary as a whole. Sea-level rise may lead to overall loss of marsh acreage, decreased quality of certain marsh types if salinity increases, and loss of ecosystem services (such as carbon sequestration) provided by these systems. Furthermore, sea-level rise may affect restored marshes differently than "historic marshes". Because CALFED has invested and continues to invest in restoration, it would be very important to look at these issues.

Thank you for engaging the community with respect to the PSP. I appreciate being able to provide comments.

Cheers,
Judy Drexler
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Judy Drexler, Ph.D.
U.S. Geological Survey, WRD

Comment: I have reviewed the draft list of priority research topics for CALFED's next PSP and encourage you to consider the following topics in your final solicitation. All of these topics are important to understanding the ecology and function of the Delta system and its watershed.

Ecosystem responses to Climate Change;I recommend that this topic be broadened to "environmental change" since this system will experience a range of environmental changes. Possible topics include: (1) effects of dam and reservoir construction on sediment supply, (2) influence of dams and reservoirs on the delivery of carbon and nutrients to downstream ecosystems, and (3) ecosytem responses to changes in land-use.

Sincerely yours,
Elizabeth A. Canuel
Professor of Marine Science
Virginia Institute of Marine Science

Topic 2: Invasive Non-native Aquatic Species

Comment: November 14, 2008
Subject: Comments on CalFed- 2009 PSP topics
From: Lars Anderson, USDA –ARS Exotic and Invasive Weed Research

The comments are directed at Topic 2: Invasive Non-native Aquatic Species

1. The bullet pertaining the "key factors" allow establishment is re-inventing the wheel: For those that are already present (mainly aquatic and riparian plants and invertebrates), there is adequate data to project likely trends due to: increased salinity, upstream "migration" of the transition zones. There are some gaps: salinity tolerance of some plants (e.g. Curlyleaf pondweed, South American sponge plant (a new invader).
Unless the levees are secured, the likely increase in salinity isn't manageable; and even then, the inevitable rise in sea level will push the transition zones further upstream for longer durations.

I suggest specific salinity tolerance assessments for (1) native aquatic plants and assessing the relative survivorship of these vs. the half- dozen non-native aquatic plants (only two of which are under management).

2. To my knowledge, the impacts of the proposed "diversion" pipeline on further spread of non-native species has not been adequately addressed. There has been an assumption that decreased downstream flows (due to diversions and reduced pumping) will reduce growth of some non native plants (and animals)- But given that the Bay already has >200 invasive species, there is no reason to believe that any reduced flow (and associated increase in salinity) would simply offer more habitat for some of those species.
I suggest a specific assessment needs to be done of the impacts of any "upstream" withdrawal" on existing native and invasive plants and animals. Similar, the concept of "flooded" islands put forth has completely ignored the obvious resulting expansion of invasive plants already present. This could be a combined research focus (i.e. diversions and "flooded islands"

3. The bullet referring to Dreissenid mussels again is pretty straightforward: Plenty of data from other freshwater ecosystems show the types of changes likely to occur. Instead, the real effort should be made at imposing requirements for boat washing, inspections, public education and intensive monitoring, and development of a real rapid responses team and system as the highest priority. Sea level rise will "compress" the suitable habitat for theses species- but the severity and destruction of Delta benthic habitat is fairly certain should either of the two species get established. Put research effort in the real world of "containment structures" and eradication methods to prepare for the likely invasions of the mussels. California already waited far too long to start this, and there are still no real preventive actions in place to protect the Delta from well-known vectors.

4. Regarding bullet four ("practical. options for preventing…" etc. A multi-agency (e.g. CDFA, Dept. of Boating and Waterways and DWR program for management of <u>all vegetation needs to be established immediately.</u> The current "single target" approach (e.g. *Egeria densa* and *Eichhornia crassipes*) approach will not provide sustainable management We are already seeing a "cascade" of replacement species –both native and non-native- as the only "target" species are reduced. CalFEd needs to sponsor the development of a fully integrated vegetation management and restoration program immediately. The tools are mainly available, but the most responsible agencies have not been given the proper scope or resources to implement this approach.

I suggest CalFEd sponsor the development of comprehensive implementation plant to do this.

5. Regarding bullet 5 (nutrients)- This also is re-inventing the wheel: We already know that nutrients contribute to invasive species success. We already know that the natural hydraulics of the Delta will continue to deposit NPK in the sediments- even if all cropland/ ag production ceased. The existing non-native plants are not dominating because the system is "recently " (past 50 years) loaded with more nutrients- They succeed mainly because their growth, reproduction and dispersal characteristics, coupled with lack of herbivore or pathogen pressure allows it.

We already know what leads to invasive success- Please re-orient the scope of work/research to deal directly with preventing the pathways and vectors and with developing in-the-water methods for reducing existing excessive biomass production. The bulleted list of species is far too short. *Potamogeton crispus, Limnobium laevigatum, Hydrocotyle spp., Ludwigia spp, Hydrilla verticillata, Ledpidium latifolia, Sesbania, Arundo donax , Hygrophila polysperma, and Lagarosiphon major* should be included. This is why a comprehensive aquatic/riparian plant management approach is essential.

Comment: My comment for the PSP is that other (more marine) invasive species should be considered, especially in the face of climate change. The salinity in the Bay-Delta could increase significantly over time with reduced rainfall, allowing more marine organisms to expand their range into the delta region (e.g. green crabs).

Chris Brown
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Biologist/Lab Manager
Marine Invasions Research, Tiburon Lab
Smithsonian Environmental Research Center

Comment: Please consider expanding the scope of invasive species concerns. Invasive plant species have had, and will continue to have huge impacts on the economics and aquatic and terrestrial ecology of the delta. There are established impacts of non-native plant species to aquatic and wetland systems that include fish habitat quality, watershed function, water quality and availability, riparian species diversity, soil characteristics, sediment accumulation, recreation, and boat traffic. Particular species of concern include *Arundo donax (giant reed)*, *Ludwigia* hexapetalaspp. (water primose), *Tamarix* spp. (salt cedar), *Limnobium laevigatum* (sponge plant), and many others.

The charge to understand the mechanisms of spread and control of these species is quite large, and is currently dramatically understudied and underfunded.

Thank you for your consideration.
Kristina Schierenbeck

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Kristina A. Schierenbeck
USDA/ARS, Research Leader
Exotic & Invasive Weeds Unit

Topic 4: Coupled Hydrologic and Ecosystem Models

Comment: California Urban Water Agencies asks that you consider two additional research questions under Topic 4: Coupled Hydrologic and Ecosystem Models of the 2009 PSP Draft Research Topic List.

1. Can the X2 standard be replaced by creating shallow water floodplain habitat to provide an equivalent habitat value for at risk fish species?
2. How would you pattern a variable salinity regime that would favor native species over non-native invasive species?

Thank you for considering these questions.
Elaine Archibald
California Urban Water Agencies

General Comments Received:

Comment: I would encourage the solicitation to consider adding the need for developing adaptation planning and the development of strategies for coping with likely climate change impacts in the delta. Also, I think improving watershed management should be included as an objective under topic 5: Water and Ecosystem Management Decision Support System Development. Let me know if these suggestions need further clarification.

Chris Keithley
Fire and Resource Assessment Program
Department of Forestry and Fire Protection

Comment: I would like to say that the proposed list of research topics is necessary but not sufficient and is little different from previous agendas. When is CALFED science program going to recognize the conjunctive use and movement of water and the importance of ground water in the hydrologic cycle from the Sierra's through the Valley and through the Delta and out to satellite basins such as Santa Clara Valley, Monterey Bay, and Southern California.

Please let us know when you get a list of science topics that includes the complete hydrologic cycle and the broader supply and demand components that drive these health of the natural resources that include the Delta and beyond.

An additional comment from Randy in a later message: Thanks for your consideration of my comments...not trying to be too negative but we submitted proposals a couple of years ago and the review panels didn't get the value of our more holistic view of the water resources. Ultimately it's all about conjunctive use at a scale much larger than the Delta that is affecting the water resources and ecology of the Delta in it's present construct, Thus all the supply and demand components should be considered to have a well posed problem.

Best Regards,
Randy Hanson
Randall T. Hanson
Research Hydrologist

U.S. Geological Survey
California Water Science Center
San Diego Projects Office

Comment: This outline is clearly stated and the topics are important. I have a few comments related to the comprehensive nature of the CALFED program:

1. It might be valuable to expand the ecological zone of relevance for this program, as the draft PSP seems focused only on fully-aquatic organisms or processes, even though riparian systems have clear and often strong effects on in-stream elements. Although this opens up a large area of additional concern, it may be an important component to include, at least where there are clear linkages to be studied (e.g. increased transpiration and water loss owing to invasive plants, altered timing and quality of organic inputs, habitat for near-shore species, etc.).

2. The emphasis on the CALFED region, and specifically the the Bay-Delta ecosystem, is appropriate but seems to ignore that research conducted outside of the region can be extremely relevant to CALFED concerns. For instance, we have initiated preliminary research in southern California on transpiration of Arundo donax as compared with native riparian plants found here as well as in the S. JOaquin/Sacramento region. We will be evaluating water use in relation to seasonal and climatic trends, so results will be directly applicable to the other regions of California. Likewise, we have initiated research on development of biological control of invasive New Zealand mud snails, and both the field and lab-based parts of this program are also highly relevant to NZMS-infested streams within the CALFED region.

But, it does not appear that relevant research that happens to be conducted outside of the specific region will be considered, even though it has been in past CALFED programs. It seems supporting such research should be among the goals of CALFED Science program, despite the increased complexity of doing so.

3. One area that should receive attention is the ecological basis for restoration actions. Restoration projects are being conducted or proposed throughout the region, but the monitoring and scientific evaluations of these actions receive lip sevice but little substantive study. The

question of whether restoration actions lead to enhanced biodiversity and/or ecosystem services needs to be more adequately addressed.

Thanks for considering these comments, and I look forward to this new and improved CALFED Science program!

Tom Dudley
Marine Science Institute
University of California,Santa Barbara &
Natural Resource & Environmental Sciences
University of Nevada, Reno

Comment: The PSP should encourage use of "retrospective" analyses" as a tool for understanding how the Delta and its watershed have responded to past changes in water delivery, land-use and other perturbations. Sediment core records provide a useful tool for extending our view of the past beyond the timeframe of most monitoring efforts.

The PSP should consider studies that investigate the ecosystem services provided by marshes (e.g. carbon sequestration) and whether these are sustainable under changing environmental regimes that may influence sediment and carbon supply.

Sincerely yours,
Elizabeth A. Canuel
Professor of Marine Science
Virginia Institute of Marine Science

Comment: From my perspective, having served on a couple of technical review panels for CALFED Programs, there were two key areas of research need that appear to be under-emphasized in the current PSP:

(1) Effects of landscape structure on ecosystem functions and habitat quality. This would seem to be a very important element of the research program given the highly-engineered watersheds in the system.
(2) Basic information on the habitats required during different stages of the life histories of species of key interest. I am thinking specifically here of Delta smelt because it would appear that there is very little information available on the required spawning/nursery habitat for this species, which could very well be the

bottleneck feature controlling the decline/recovery of this threatened organism.

While it is possible to fold these areas into the broader Climate Change topic, it may be more effective for researchers to address these basic issues directly without having to tailor a proposal around anticipated climate effects at this time. Once the basic information is available, projections about how climate might alter the relationships would be appropriate.

Just a couple of thoughts. Thanks for the opportunity to voice them.

Regards,
Ron Kneib
R.T. Kneib, PhD
UGA Marine Institute

Comment: We are very interested in working on Delta problems. Key questions of importance and of interest to us include

. Under current agricultural practices, what is the net greenhouse trace gas (methane, CO2, water vapor) flux to and from Delta peatlands?
. How do fluxes of methane, carbon dioxide and water vapor vary and co-vary seasonally, annually and inter-annually over peatlands?
. What are the effects of weather, water table, salinity and vegetation function on net greenhouse gas fluxes, on short and long time scales?
. How will changes in land-use alter methane and carbon dioxice production of the Delta peatlands?
. How much methane is produced and how much carbon dioxide is sequestered by the Delta region?
. Can we upscale methane and carbon fluxes by knowing relationships between it, net carbon uptake, temperature, water table depth and remotely sensed vegetation indices?

Where are the methane emission hot spots and can they be managed better during ecosystem restoration projects?

Dennis Baldocchi
Professor of Biometeorology
Department of Environmental Science, Policy and Management
& Berkeley Atmospheric Science Center

University of California, Berkeley

Comment:
We are writing in response to the recent posting of CALFED Science topic areas for the 2009 PSP. As physical scientists, we were very encouraged to see the inclusion of climate change and its influence on ecosystems, but we are concerned about the lack of any mention of the relationship between sediment and ecosystems. We have noticed a predominance of research on water quality within the Bay-Delta system, but very little initiative on how sediment is a primary control on this quality. This is surprising and concerning because fine sediments play the dominant role in the sequestration, transport, and deposition of key contaminants such as mercury and pesticides. Fine sediments loaded with contaminants are continually delivered to and stored within lowland environments, where their constituent contaminants are susceptible to well-documented processes of chemical alteration and release. Furthermore, sediment fluxes and deposition at various spatial scales have important implications for ecosystem functioning, flood risk, and topographic evolutions that can drive hydraulic gradients in floodplains and the Delta.

In light of these factors, we would like to propose an additional topic area for the 2009 PSP:

Topic 6: Sediment Dynamics-Boundary Condition for Naturally Functioning Ecosystems
Need: The relationships between sediments and naturally functioning ecosystems are poorly understood. It has been well documented that 1) basin-scale sediment balances have been disrupted by human activities; 2) sediment balances affect flood risk and delta water balance; 3) contaminants, such as mercury and pesticides, selectively adsorb to and travel on fine sediment; 4) sediment and associated nutrients form the substrates of channels and floodplains upon which aquatic and terrestrial ecosystems develop; 5) the physical and biogeochemical interactions between ecosystems and their sediment substrates affect the health of organisms, food chains, and potentially humans; and 6) future modifications to the Bay-Delta system and the impacts of climate change are likely to affect sediment balances. However, details about these processes remain unclear. Field documentation and theory are needed to explore sediment dynamics at various spatial scales and their relationship to ecosystems. Areas of interest include: sources and contamination levels of sediment arriving in sensitive lowland ecosystems; impacts of climate change on sediment balances; relationships between substrates, disturbance, and ecosystem health; and sediment risk analysis of system modification. Basin-scale analyses connecting watersheds to the Bay-Delta are encouraged, as are studies directly linking sediment dynamics to ecosystems.

Possible questions to be addressed by the research:

• How will proposed modifications to the Bay-Delta and upstream watersheds affect sediment balances at basin and reach scales? How can management actions respond to these challenges and create opportunities to enhance habitats? What are the links between sediment delivery to the delta and management problems in that region? How is sediment/contaminant mobility impacted by environmental change such as sea level rise, rainfall distribution, or urbanization?
• How are sensitive lowland ecosystems impacted by sediments from upland watersheds? What are the implications of sediment source areas on contaminant delivery to these environments? What roles do sediment dynamics play in lowland ecosystems and biogeochemical cycles? What is the relationship between sediment and chemical alterations such as methylation of mercury?

We would be happy to speak to you further about any of this material.

Sincerely,

Michael Singer
University of St Andrews
University of California Santa Barbara

L. Allan James
University of South Carolina

Rolf Aalto
University of Exeter
University of Washington

Comment: I am writing to provide comment on the draft topics list as follows. Much thanks for the opportunity to provide comments.

Some topics of key importance to managers could be added or at least be stated more explicitly within existing topics, including:

1) Estimate likely scenarios and mitigation alternatives of ecological impacts in the estuary resulting from:
a) Changes in water operations (e.g. alternative peripheral canal location and operations under different water year types).
b) Implications of human population growth in the next 2-3 decades (e.g. pollution, habitat loss, rate of species introductions).

2) Evaluate recovery trajectories for listed species under different model scenarios including water operations, habitat quality, and climate change scenarios.

3) Assess the genetic structure and test options to preserve the genetic integrity of delta smelt and longfin smelt.

4) Effect of endocrine disrupters and other pollutants on reproductive capacity of delta smelt and longfin smelt.

5) Evaluate water quality issues associated with waste water treatment plants and how their effluent may be impacting the survival of listed species or species of concern.

6) Investigation of Delta fish species life history, especially those listed or of special concern to provide improved information to support biological opinions, recovery plans and management decisions.

Given the extremely limited funding available, I also suggest that the importance of each question within each topic be ranked and that interdisciplinary proposals covering more than one topic be encouraged.

Best,
Kim
Kim Webb
U.S. Fish and Wildlife Service

Comment: How about: Analysis and communication of public health risks associated with changing water quality conditions and water management decisions in the Delta.

This would include quantifying risks associated with disinfection byproduct formation, pathogens, and other pollutants (like arsenic) as well as exposure to pathogens through body contact recreation and contaminants like methyl mercury through consumption of Delta fish.

Appendix H of the recent PPIC report "Comparing Futures for the Sacramento-San Joaquin Delta" says the following with respect to drinking water risks:

"The residual health risks from different treatment alternatives and DBP precursors, along with other factors including reliability, ease of operation, and disposal of residuals, might significantly affect the selection and best operational strategies of water treatment alternatives. Furthermore, since neither ozone nor UV produces residual disinfectant in the treated water, these processes require the application of additional chlorine or chloramine. This may create another public health concern related to the formation of chlorinated or more potent brominated DBPs when source water has a high bromide concentration. Besides TOC and bromide, as the Delta's watersheds develop, there could be increasing loads of pesticide, herbicide, and PPCP, which represent another potential group of

contaminants/DBP precursors. The Sacramento River site considered in this appendix is immediately downstream of the expanded Sacramento Regional wastewater discharge, resulting in another health concern for water from this location."

The recent Science Program peer review of the CALFED Water Quality Program, Stage 1 Final Assessment also recommended a more direct and literal examination of the "equivalent level of public health protection" target.

This possibly could be folded into the decision support system topic but I think public health implications of decisions would have to be called-out explicitly if we want it to be included in any proposals.

Let me know if there are questions. –Sam Harader

Comment: One area of research focus that is not considered in the draft list is Suisun Marsh habitat and biogeochemistry. It is not entirely clear to me the level of interest that CALFED has in funding Suisun Marsh work but to the extent that Suisun Marsh influences water quality (i.e. nutrients), organic matter flow (with influence on foodweb structure), as well as habitat for the whole Bay / Delta system, it seems that it may be a priority area. I remember seeing a Suisun Marsh organic carbon conceptual model some time ago which would highlight some of the ideas that I am thinking of. For example, I am particularly interested in how restoration efforts in Suisun Marsh (or natural levee breaching) will influence nutrient and organic matter flux to the Bay /Delta.

Sincerely,
Alex
Alexander E. Parker PhD
Romberg Tiburon Center for Environmental Studies
San Francisco State University

Comment: Dear Calfed Science Program staff:
Thank you for providing the opportunity to comment on the Priority Research Topics for the 2009 Proposal Solicitation Package. We have commented upon each of the proposed topic areas.

Topic 1: Ecosystem Responses to Climate Change
We think this topic is well-described and accurately captures the important components of understanding ecosystem responses to climate change. We support this topic as currently written.

Topic 2: Invasive Non-native Aquatic Species
This is clearly an important topic for the delta and the topic is clearly written. We support this topic as currently written.

Topic 3: Food Webs and Water Quality
This is clearly an important topic for the delta and the topic is clearly written. We support this topic as currently written.

Topic 4: Coupled Hydrologic and Ecosystem Models
"Need: Hydrodynamic models need to be linked to and coupled with ecosystem models such as those for at-risk species and Delta food web dynamics to better inform management planning and operations; for example to determine flow requirements for aquatic species and to assess potential outcomes of water management. Progress is needed in linking hydrodynamic models that provide information on discharge, water velocities, and inundation patterns with ecosystem models that simulate key ecosystem attributes such as nutrient uptake, rates of primary production, habitat responses to inundation, and fish behavior, growth, and predation. Ecosystem modeling also could be focused on food webs, predator-prey interactions, and nutrient availability effects on production dynamics."
We would like to see this topic broadened to include the importance of flow regimes and water management not just for aquatic species, but also for terrestrial species. An increasing number of studies are demonstrating the link between terrestrial systems and river flows. These are both geomorphic, i.e. river meander creates new habitat, and nutrient, i.e., flood waters enrich floodplains. We would like to see the importance of these types of terrestrial linkages included and emphasized in this topic.

Topic 5: Water and Ecosystem Management Decision Support System Development
We feel that this topic as presented focuses too much on the delivery of information rather than the scientific information itself, which managers critically need. We still have much to learn about how systems respond to management alternatives in the context of changing natural conditions; a second knowledge gap concerns the influence and importance of scale in addressing this topic. This topic has a focus on extremely technical solutions to decision support and we also have some reservations about whether extremely technical decision support tools are going to solve all of our management issues in the Calfed region. They will help solve some of them, but we think other problems may be benefit from some simpler solutions. Most importantly, we need to think beyond the delivery of information to consider the quality of the information itself. We should be looking to some straightforward, on-the-ground actions that we can recommend that managers take to prepare for climate change (and other changes) in the Calfed region. There is a real lack of this type of information, and the sooner we can get it out there, the better. We favor a more integrated approach be emphasized in this topic area that might include a suite of methods, including decision support systems, but one that will also develop the needed scientific information in the first place.

Thank you for taking our comments into consideration.
Sincerely,

Christine A. Howell, PhD
Nadav Nur, PhD
Nathaniel Seavy, PhD
John Wiens, PhD
PRBO Conservation Science - www.prbo.org