

Meeting Summary
for the
California Bay Delta Authority Independent Science Board Meeting
Convened May 10-12, 2005
CBDA's Delta Room, Sacramento, California

Action Items

ISB Calendar

1. The ISB's previously scheduled September and November 2005 meeting dates are to be re-scheduled at a later date. Board members were released from holding these dates on their calendars.

South Delta Barriers Monitoring and Data Assimilation

2. The South Delta Barriers Fact-Finding Team of Freyberg and Mount will assimilate all the comments received during this ISB meeting and write a memorandum on behalf of the ISB. The Fact-Finding Team will solicit input on the document from Glaze, who was not able to participate in the ISB's discussion.

Science Agenda - Research Component

3. All ISB members, but in particular the Science Agenda Research Team (Glaze and Meyer), were asked to review the following three documents and provide written comments to the Lead Scientist by May 31, 2005:
 - o Science Program Multi-Year Program Plan (MYPP).
 - o Moore's document entitled "A New Vision for CALFED Science, May 2005".
 - o Response to the legislative directive regarding water availability for fish.

Science Agenda - Information Transfer

4. All members of the ISB, in particular the Information Transfer Team (Twiss and Adams), were invited to review the following document and provide written comments to the Lead Scientist prior to June 15:
 - o Final Draft CALFED Science Program Communication Strategy, April 29, 2005 prepared by Julie Lamont.

Assessing Science Needs

5. The Assessing Science Needs Fact-Finding Team (Reed and Adams) will continue their efforts and provide a final report to the ISB at its next meeting.

Levee

6. ISB members Reed and North will refine the Subcommittee's Report to reflect the ISB's discussion and to properly format it to a formal report to the Authority by Monday, May 16th.
7. Dunne will present the ISB's findings regarding Levees at the Authority's June 8, 2005 meeting.

Performance Measures

8. Members of the Performance Measures Subcommittee will refine the guidance framework, intended to guide development and implementation of performance measures, by applying it to existing performance measures (supplied by Science Program staff) addressing:
 - (a) Water supply/reliability (Keller)
 - (b) Water quality (Meyer)
 - (c) Habitat (Patten)
 - (d) Species populations (Rose)

Subcommittee members will report initial results to Judy Meyer (jlmeyer@uga.edu) before early June, and the subcommittee will revise the guidance framework prior to the next ISB meeting, and send the results to the Lead Scientist.

ISB Recommendations to Others

Performance Measure

9. Science Program staff will collaborate with the agencies to assemble a package of performance measures currently being used in CALFED programs
10. Science Program staff will collaborate with agency personnel in an iterative process to refine the package of performance measures using the revised guidance framework. Recommendations resulting from this process will address the following kinds of questions:
 - Is the set of performance measures adequate?
 - Are new performance measures needed? (Is there a better set of indicators to assess performance? Or would the performance measure be more clearly linked to CALFED actions if a different life history stage were targeted?)
 - Are any performance measures misleading? (Would they be more meaningful if evaluated at a different time scale?)
 - Is the current methodology for data collection adequate? Are there new methods that would significantly improve the performance measure (e.g. reduce uncertainty in interpretation)?
 - Is the rigor of monitoring, analyzing, and evaluating the performance measures adequate for adaptively managing the package of implemented actions?
11. Science Program staff will report their progress on development of a package of performance measures to the ISB Performance Measures Subcommittee at the next ISB meeting.

Water Management Research Questions

12. The ISB requested that Tom Gohring, Deputy Director of Water Management and Regional Coordination, follow up on the water management research questions previously presented to the WMSB as outlined in Dunne's Power Point presentation made to the WMSB at their April meeting. The ISB would like to know the thoughts of

the WMSB on the value of the various questions, and which of the questions (if any) the WMSB has the resources to investigate.

Modeling

13. Building on experience of CWEMF, the ISB emphasized that objective third party peer review of models is a very important part of the model development process and asked the Science Program to continue providing assistance to peer review efforts. The ISB recommended an independent rigorous peer review of the reformulated CalSim II module for the San Joaquin Basin to be conducted jointly by the Science Program and CWEMF.
14. The ISB encourages the development and use of community models that can be shared among agencies and other interested parties. In the context of this long-term goal, the ISB encourages an approach that builds upon the existing CWEMF recommendations to provide open access to the models and to facilitate rigorous, independent peer review of the models.
15. The Science Program is requested to proceed with planning for a workshop to be held jointly with CWEMF in late Fall 2005 or early winter 2006 to focus on the integration of hydrodynamic models with biological and water quality models. This workshop is intended to facilitate a comparative and critical discussion of the ability of the models to address a specific management question: “will increased pumping capacity from the Delta leads to increased management flexibility in meeting goals for water quality and ecosystem function?” It is hoped that this workshop will encourage innovative approaches to increase understanding of the system through the use of simulation modeling.

EWA/ERP Integration

16. The ISB recommends that a Task Force be constituted to evaluate the ecological benefits, operational costs, and other costs associated with additional integration among the four environmental water programs (EWA, ERP, (b)(2), and Water Acquisition Program ¹). The evaluation by the Task Force could include analyses of past actions that quantify synergistic effects of various levels of integration. The Task Force should involve agency and CBDA staff.

Handouts

- *Delta Risk Management Strategy for the Levees in the Sacramento-San Joaquin Delta, Project Scope, Final Draft.* Prepared by Calif. DWR, USACOE, Calif. DFG in conjunction with CBDA and the Delta Risk Management Strategy Steering Committee, May 6, 2005.
- *CALFED Science Program Communication Strategy*, prepared by Dr. Juliet Lamont, Berkeley, California, Final Draft, April 29, 2005.
- *Monitoring Team Progress Report*, Bill Glaze and Judy Meyer, February 2005 ISB Meeting.

¹ For more information on the U.S. Department of the Interior Water Acquisition Program see: <http://www.usbr.gov/mp/cvpia/wap/docs/FAQ.pdf>

- *CALFED Bay-Delta Program, Levee System Integrity Program, Multi-Year Program Plan (Years 6-9)*, Prepared by CBDA with implementing DWR, DFG, and USACOE, Draft as of 4-6-06.
- *Report from Subcommittee on ERP/EWA Integration to CBDA ISB*, by Subcommittee members Ken Cummins, David Freyberg, Helen Ingram, Duncan Patten, and Kenneth Rose (Chair), 2-pages, May 11, 2005.
- *Annual Report 2004, CBDA* (See website at: <http://calwater.ca.gov/AboutCalfed/AnnualReport2004.shtml>)
- *Excerpt from Science Symposium on Environmental and Ecological Effects of Proposed Long-term Water Project Operations*, pages B-13 to B-18 (see website at: http://www.science.calwater.ca.gov/pdf/SymposiumSummary_11-24-03.pdf)
- *Letter from Anson Moran, General Manager, Delta Wetlands Project to BDPAC Levees and Habitat Subcommittee*, (4 pages), May 2, 2005.
- *Letter from Anson Moran, General Manager, Delta Wetlands Project to ISB Levees Integrity Subcommittee*, Regarding In-Delta Science and Engineering Reports, (1 page), May 10, 2005.
- Print-out of Robert Duvall's presentation entitled "*Real-Time Data and Forecasting Project (RTDF)*", given to the ISB on May 11, 2005.
- *Real-Time Data and Forecasting Project Water Quality Weekly Report*, Office of Water Quality, DWR, Volume: 2, Issue: 17, Tuesday, May 3, 2005.
- *Real-Time Data and Forecasting Project Water Quality Weekly Report*, Office of Water Quality, DWR, Volume: 1, Issue: 45, Tuesday, November 16, 2004.

Presentations

- *South Delta Permanent Barriers Program: Monitoring and Data Assimilation Working Session* (Mount).
- *Monitoring and Data Assimilation for Delta Water Resource Management* (Losee, MWD).
- *Working Session on Monitoring and Data Assimilation* (Freyberg).
- *Opportunities for Integrating Science, Research with Multi-Objective Management* (Goodwin).
- *EWA/ERP Subcommittee Report to ISB* (Rose).
- *Lead Scientist Report to ISB* (Moore).
- *The Real-Time Data and Forecasting Project (RTDF)* (Duvall, DWR's Municipal Water Quality Investigations Unit).
- *Assessing Science Needs Fact-Finding Team's Preliminary Observations* (Reed, Adams).

Meeting Summary, Tuesday, May 10, 2005

ISB Members in attendance

Rich Adams, Ph.D.	John Melack, Ph.D.	Kenny Rose, Ph.D.
Tom Dunne, Ph.D.	Judy Meyer, Ph.D.	Duncan Patton, Ph.D.
David Freyberg, Ph.D.	Jeff Mount, Ph.D.	Bob Twiss, Ph.D.
Peter Goodwin, Ph.D.	Warner North, Ph.D.	
Helen Ingram, Ph.D.	Denise Reed, Ph.D.	

ISB Members not in attendance

Ken Cummins, Ph.D.	Bill Glaze, Ph.D.	Jack Keller, Ph.D.
Sam Luoma, Ph.D.		

CBDA Staff

Zach Hymanson	Johnnie Moore, Ph.D.	Tim Ramirez
Heather Johnston		

Support Staff

Kateri Harrison	Elizabeth Soderstrom, Ph.D.
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Other

Les Harder, DWR	Andy Moran	Ramona Swenson, TNC
Chrissy Howell, PRBO	Curt Schmutte, DWR	David White

Welcome (Dunne)

Meeting convened 8:35 a.m.

Dr. Peter Goodwin was introduced as a new member of the ISB. Goodwin is DeVlieg Professor of the Department of Civil Engineering at the University of Idaho and serves as the Director of the Center for Ecohydraulics Research.

Due to CBDA's budget situation, there is great uncertainty about summer and fall ISB activities. The products resulting from this ISB meeting will provide an opportunity to explain and document the value of science. Additionally, Dunne will utilize the results of this 3-day ISB meeting to prepare for a presentation at the June Authority meeting. The goal for today's meeting was to bring to closure to most of the activities and recommendations the ISB subcommittees and teams have been working during the past year.

ISB reviewed the notes from the January 2005 meeting.

Soderstrom discussed meeting logistics, including the procedure for public comment.²

² Public comments for topics that are listed on today's agenda may be heard during the presentation/discussion, upon completion of a blue card. Public comment for items not on the agenda will be heard towards the end of the meeting as shown on the agenda.

Subcommittee Meetings (Concurrent)

Levees Subcommittee

Subcommittee Members in attendance:

Ingram - Chair, Adams, North, Keller, Mount, Reed, Freyberg, Twiss, Goodwin.

Agency and consultant staff in attendance:

Les Harder, Curt Schmutte, Kateri Harrison

Ingram indicated that the goal of this subcommittee meeting was to discuss and finalize recommendations to ISB regarding levees. In the following days, the ISB will consider the recommendations from the Subcommittee, revise as appropriate, and then forward them to the Authority.

DWR's Delta Risk Management Strategy (DRMS)

Les Harder noted DWR is working with the Army Corps of Engineers and the Department of Fish and Game to produce a "Delta Risk Management Strategy" (hereafter cited as DRMS). A skeleton Scope of Work for DRMS was presented to the ISB (see handout). DWR's next step will be to produce a project management task description.

Future levee failure could result in a potential risk to water quality, water conveyance, and many other Delta services. DWR's intent is to improve quantification of risk and to develop risk reduction strategies. Documenting the benefits and services that the Delta provides and to whom, will assist in determining the package of risk management strategies for various levels of effort. Discussion of funding mechanisms will not be included in the DRMS report but could be part of a later, optional, analysis.

Although DWR staff has had many discussions about the importance of Suisun Marsh to water quality, the focus of DRMS will be on the Delta. DRMS will consider diverse risk reduction strategies. Projects at Suisun Marsh may be incorporated in the DRMS as a potential risk reduction strategy.

DWR's preliminary research indicates that steep thresholds are reached when emergency and back-up water supplies run out. Problems and costs increase substantially when those thresholds are crossed. Schmutte noted that the Jones Tract failure had a small impact on water supply. If Jones Tract failure had lasted 2.5 years, the impact and cost would be very high.

Advisory Panels for DRMS

A Technical Advisory Committee for DRMS is being assembled. DWR is in the process of issuing contracts for the Advisors. Two members of the ERPSB (Kimmerer and Moyle) participate on the DRMS Technical Advisory Committee. The Subcommittee noted that experts from outside California with levee related experience in other regions could offer new perspectives and insights into the local issues.

Timeline

The proposed 2-year timeline for completion of the DRMS document is ambitious. Given the anticipated level of funding, the Subcommittee suggested that DWR prioritize items or tasks that might take longer than 2 years. Harder noted that DRMS will utilize existing information. The development of new data or models is not proposed.

Economics

The financing of DRMS and its implementation was discussed. The identification of beneficiaries and the corresponding geographic area that derives benefits is an important part of the economic and financing analysis. Adams noted that more information is needed to determine who benefits, where the benefits accrue, and who pays.

DWR's analysis of economic impacts associated with levees was based on a normal water year starting July 1. Adams noted that this analysis assumes fortuitous circumstances. For example, it assumes water supplies will not be affected until a 2-year threshold has been crossed. It provides a lower bound estimate for a catastrophic event. The analysis could have been more variable depending on the range of conditions. Adams noted that operating in a "business as usual" manner may lead to \$50 billion in costs.

Editing Subcommittee's Draft Report and Associated Recommendations

The Levee Subcommittee previously met on May 6, 2005 and the draft recommendations developed at that time are posted at the following website:

http://science.calwater.ca.gov/pdf/isb/ISB_subcom_levee_rec_050605.pdf

At today's meeting, the subcommittee continued wordsmithing their draft report and associated recommendations. Audience members were encouraged to offer comments at any time during the discussion. The Subcommittee's report to the ISB utilized for editing during this meeting and subsequently corrected is shown as Attachment B to this Meeting Summary.

The recommendations of the ISB Levee Integrity Subcommittee are based upon their reading of the ROD, review of past publications, and other fact-finding by ISB members. When considering their draft report, the Subcommittee generally discussed many levee and report related issues.

A federal resolution (H.R. 2828 Calvert-Napolitano: PL 108-361³) outlines work that the Corps of Engineers will perform in the Delta (provided funding is allocated). HR2828 also describes development of a delta management plan.

Workshops

Two workshops, one conducted mid-course and the second conducted at the end of the DRMS study, would facilitate peer review by providing an evaluation of the DRMS methodology, findings, and conclusion. It is anticipated that by the time of the mid-course workshop, agency staff will make the analysis of risk estimates, risk management strategies, and a broad range of alternative solutions available for review by workshop participants.

³ Text of HR 2828 may be viewed on the following website: <http://www.govtrack.us/congress/bill.xpd?bill=h108-2828>

Scenarios

The Subcommittee would like to encourage agency staff to continue with the analysis of a broad range of scenarios and to think boldly about the questions that are difficult to deal with. Possible scenarios include sea level rise, climate change, controlled flooding, ecological restoration of the Delta, varying volumes of water export to southern California, and retreat strategies. Economic and other analysis of selected scenarios could be considered at the beginning of the DRMS effort.

Public Comment

Anson Moran from the Delta Wetlands Project provided public comment to the Subcommittee as described in his letter dated May 10, 2005.

The Subcommittee agreed that research and analysis by CALFED agencies regarding levee integrity should be made broadly accessible, available for peer review, and published in scholarly literature.

Performance Measures Subcommittee

Subcommittee Members in attendance:
Meyer, Patten, Rose, Melack, Dunne

Agency and Consultant Staff in attendance:

Kristi Howe

Jana Machula

Elizabeth Soderstrom

Zach Hymanson

Donna Podger

Dave Wright

Subcommittee member Judy Meyer led the discussion by noting that the purpose of today's subcommittee meeting was to develop recommendations to forward to the ISB.

The Record of Decision (ROD) states that the Science Program needs to develop performance measures. To assist the other CALFED programs with their development of their own performance measures, the Science Program sponsored the development of prototype measures⁴ and conducted a workshop. Although CALFED's Science Program and other programs have developed performance measures, a systematic evaluation of these measures has not yet been conducted. Also, there was no consensus regarding the usefulness of these performance measures. It was also noted that the ERP Science Board was asked to review performance measures several years ago. Although at that particular time, the ERP Science Board did not reach consensus on this topic, it has continued to make incremental progress.

Some CALFED programs have set targets or milestones along the way. Examples of previously developed or potential performance measures come from the Watershed Program and from the Ecosystem Restoration Program. The role of this Subcommittee is not to directly develop

⁴ See website at: <http://science.calwater.ca.gov/library.shtml>

performance measures; but rather to provide conceptual thinking and a road map for their development.

Ideally, performance measures would:

- Clearly reference the CALFED goals and objective that are being addressed.
- Provide a linkage from a CALFED action to the referenced change in the performance measure.
- Illuminate cause and effect.
- Measure progress (trends in a positive direction).
- Be based upon a dataset that provides useable information for decision –makers.
- Describe the relationship between various Program elements such as Water Use Efficiency and specific ecological trends such as biodiversity of native species.
- Be based on conceptual models to describe “how the system works” and to identify uncertainties in performance measures.

Any performance measure(s) will require continuous interpretation. An analogy can be drawn for the way national economies are managed. The public and policy makers understand that the economy goes up and down and is measured by many performance measures. Society responds to economic indicators by fine-tuning taxes or incentives, but the appropriateness and effectiveness of these strategies continue to be matters of judgment. The economic system is data rich and with good information disbursement. A similar data collection and management system is needed for CALFED.

Fish

If smelt abundance is important, the various methodologies used to measure population abundance could be analyzed and the results used to improve methodologies. Rose noted that state agency and IEP staff need assistance with (1) the underlying science that the low data points represent and (2) how statistical information relates to functioning of the system. Rose noted that he will provide individual advice to agency fish biologists on statistical approaches, fish population viability, and fish life cycles. He will also help staff present their analysis more effectively. This advice will help IEP staff move forward with their study plan to assign probabilities to potential causes of population declines. IEP has established work teams and Meyer suggested that recruiting a number of analysts from academia might be useful to IEP' efforts.

Tracking salmon populations may necessitate concurrent consideration of multiple factors, such as juvenile production or recruitment success. It is important to measure the correct variables.

The Delta smelt assessment effort evolved from an existing striped bass survey as staff also caught Delta smelt during field surveys. However, staff continues to use methods appropriate for collecting striped bass. Ideally, an indicator for Delta smelt would look deeper into the system as a whole, by considering the lower trophic levels that support smelt such as chlorophyll A or nutrients. Habitat for Delta smelt may be a good indicator. Studying smelts' preferred type of substrate and water temperatures may illuminate how the fish respond to environmental conditions.

Data

The following aspects of data use should be recognized when developing performance measures:

- Performance measures are dependent on data collection and monitoring to provide indicator trends.
- Lack of data or the choice of the wrong dataset could impede progress.
- If methodologies are to be changed, there should always be a period of inter-calibration.
- Many measures may be needed to get an accurate picture of conditions, and existing data may be used in new ways.
- Existing milestones range widely in their usefulness: some need work, some are adequate, some are outdated, and others need to be changed.
- Technically based vetting processes may be useful in evaluating particular performance measures.

New and improved methods for data analysis are continuously developed by statisticians and other researchers. Agency staff should be aware of and potentially make use of these new ideas. Peer review is a necessary part of the process and provides useful critiques. Peer review should be carefully planned to provide constructive ideas for improvement and provide a framework for moving forward.

Framework

The Framework (shown as Attachment C to this Meeting Summary) will help define the questions to use as a guideline for assessing performance measures. The intent is to make continuous progress towards improving performance measures - not to discard those measures that may not fully adhere to the framework. Later, the Science Program will have an opportunity to conduct workshops or reviews along with agency staff to consider the framework in more detail with agency staff.

A test run of the framework could provide background on what worked or what did not work. It could also provide an example on how to use the framework. This process recognizes that all performance measures need evaluation and continual interpretation will be necessary.

Regular ISB Meeting Continued

ISB Member Disclosure Updates

ISB member disclosures are posted on the ISB website at:

http://science.calwater.ca.gov/pdf/isb/ISB_members_affiliations_disclosures_021705_v3.pdf

Additionally, Kenny Rose noted that he participated in a CALFED PSP grant application. Peter Goodwin indicated that he is a co-PI with the National River Restoration Synthesis through the National Center for Ecological Analysis and Synthesis at UC Santa Barbara. He has also worked with Philip Williams and Associates, Ltd since 1997.

Director's Update (Ramirez)

Tim Ramirez reported that Patrick Wright is beginning his recovery from his cardiovascular ailment. The ISB expressed good wishes for Wright.

State budget hearings in both the Senate and Assembly occur this week. Additionally, the Governor's proposed May budget revision will soon be released. The Authority's overall budget is very small and CBDA's primary responsibility will be coordination of the Science Program and oversight of restoration work. More details about the budget will be presented at the next Authority meeting on June 8, 2005. All the "Resource Departments" including Dept. of Water Resources (DWR), Dept. of Fish and Game, Bay Conservation and Development Commission, and Calif. Dept. of Forestry have a CALFED aspect to their budgets. CBDA's role is to provide oversight and coordination and ensure that the portion of their Departmental budgets related to CALFED are aligned with Program goals.

Lead Scientist Report (Moore)

Finances

The Science Program PSP is currently within a 30 day public comment window. The Selection Panel will meet June 28 to work on funding allocations. Initially, the Panel selected \$19 million in proposals but only \$18 million of funding is available. The remaining worthy but unfunded proposals will be shopped around to other Program Elements and CALFED partners seek other sources of funding. This PSP process is working smoothly thanks to Ladd Lougee and Danielle Wilson.

The ABAG contract ends May 30, 2005 and this means that funding for the ISB and funding for several Science Program staff positions also end. The Science Program has worked diligently with financing staff at CBDA to consider various funding alternatives. By September 2005, it is anticipated that the Science Program will have made progress on re-organizing and staffing the program and with contracting issues. Only three existing Science Program employees are state funded. The Program Manager position was upgraded to Deputy Director of Science Program.

The Deputy Director of Science Program (Hymanson) provided a PowerPoint presentation that summarized the past thinking and conditions about the Science Program. Briefly, the presentation covered the following topics:

- Funding has been allocated but not yet spent on PSP and post-doc fellows. Work has started on directed actions, workshops, whitepapers, communication, peer review, and program administration.
- Initially, science funds were directed to ecosystem related research.
- Workshops sponsored by the Science Program have greatly contributed to the state of knowledge.
- The Science Program never received the amount of funding that was originally contemplated under the ROD and the older Finance Plan. Additionally, Science Program funding has been very unstable and thus has created operational difficulties.

Moore described the work the Science Program can accomplish with existing level of funds (i.e. not asking the legislature for any more money). Moore provided a handout entitled “A New Vision for CALFED Science, May 2005”. Recommendations in the Science Program Vision include replacing the long-term PSP process with a more focused annual peer-reviewed directed action program. Directed actions allow staff to respond more quickly to information needs of decision-makers. Peer reviewed/directed actions would still be competitive, but would be much more focused. Workshops would serve to both delineate priorities and provide information transfer to researchers and potential grantees. The Science Program Vision contemplates six million dollars (\$6 million) per year in combined PSP/directed action funding for each year over the next three years.

Ideally, a stable source of funding providing \$10 million per year to run the Science Program would be available. However, since circumstances are less than ideal, Moore proposes operating over the next 3 years by utilizing only existing funds and by moving funds around.

The primary lesson learned is that science needs to be communicated to agency directors and decision-makers in a more effective manner. Scientific work products that are useful to agency management are needed. EWA Review Panel was a model of success in that they produced a precise product and the process included presentation to the Authority. The legacy documents describe a process for the Authority to respond to the ISB in writing. This is a powerful, but underutilized tool for ISB to inform the broader community about scientific issues. Another, lesson learned is that the lead scientist could provide constant and on-going communication with the upper level agency managers.

Streamlining Existing Science Boards

Consolidation of the three Science Boards would decrease overlap and streamline efforts. Moore recommends that one Science Board be developed to focus on review and program assessment. In order to make science more responsive to Agency and Authority’s needs, substantial changes in operational structure of the science boards are needed. Technical review panels such as the EWA panel may be an effective approach and may be able to produce written products on a faster timeline. Ingram noted that the agencies supporting the EWA review panel felt that producing background material for the panel was a burden requiring significant funding and staff time. In the end, panel members agreed that it was a successful process.

It will be difficult for a reconfigured Science Board to consider the strategic and the cross-program aspects of science, given the overall reductions in funding. Additionally, the ISB is charged to bi-annually review the science conducted by all the programs. Each program element produces a Multi-Year Program Plan (MYPP) with data presentation including charts and figures. It may be possible for the programs to include scientifically relevant information into their MYPP. This information could be reviewed by ISB. Hymanson recommended that partnerships be established to more closely link the programs to the Science Board. This type of partnership could facilitate investment and relationship building in the beginning and could result in improved science practices.

The ROD indicates that the science program/board should implement a large scale monitoring program like CMARP. However, the Science Program did not receive projected levels of funding and was not able build up an organizational structure to accomplish this large task. A more targeted approach building off IEP is being considered.

Team Reports

Water Management Research Questions (Luoma and Freyberg)

At the February 2005 meeting, the ISB considered possible effects of water management on biological resources and ecosystem restoration options in the DIP context and the need for a scientific approach to address uncertainties. On May 4-5, 2005, Dunne provided a presentation to the WMSB outlining the ISB's suggested questions. The WMSB is processing these suggestions.

Freyberg noted the ISB had previously recommended that the list of questions identified in the memorandum to the WMSB be developed into an article for the on-line journal. The Team considered this suggestion and found little value added in publication in the on-line journal at this time.

See Action Item #12

Modeling Team (Melack and Rose)

Melack reported on his participation at the March 2005 joint conference of the Inter-agency Ecological Program (IEP) and the California Water and Environmental Modeling Forum (CWEMF)⁵. A highlight was J. Nestler's presentation of a Columbia River model that incorporates fish response to fluid dynamics (flows). This model combines sophisticated biological and hydrological approaches. It is important for CALFED to investigate similar approaches for use in the Delta.

During the conference, Melack provided a plenary presentation on the ISB's interest in exploring the use of modeling in determining the role of increasing pumping rates to provide more flexible approaches to water quality management and ecosystem restoration. Melack found that the professional agency modelers are interested in interacting with the ISB.

⁵ For more information, see the following website: <http://cwemf.org/>

Melack found that locally implemented models do not yet exist for answering the ISB's question about whether the Delta Improvement Package (DIP) proposal to increase in pumping capacity can provide increased flexibility in meeting management goals. The hypothesis about increased flexibility remains untested and additional work remains to be done. A workshop in the fall of 2005 or the winter of 2006 to pose the DIP increased pumping question could stimulate new thinking and raise the level of discussion.

ISB discussion noted that increasing the pumping capacity presents an opportunity for hypotheses to be posed, data to be collected over a number of years, and for data to be incorporated into models. This basic scientific inquiry would form a foundation of knowledge to respond to new management questions, especially if future increases in pumping capacity are needed.

A workshop hosted jointly by the Science Program and CWEMF in September 2005 would help bridge the cultural gap between hydrological and biological modelers. Moore noted that the Science Program's ability to fund such a workshop in fall 2005 may be limited. However, he understood the benefits such a workshop could provide. Goodwin suggested the workshop be open to all interested parties (including university and non-profit associations).

Melack also briefly analyzed those PSP proposals that related to modeling. Of particular interest is a model called "CASCADE" that includes climate, biology, and fluid dynamics. Proposals of this type start to build capability into the community and Science Program staff should aim for incremental progress in modeling efforts.

The details regarding the formal findings made by the ISB during this meeting can be found in the Memorandum from John Melack, Attachment D to this Meeting Summary.

See ISB Recommendations # 13- 15

Selenium and Salinity (North)

North reminded the ISB that this Fact-finding Team (North and Luoma) was originally established on a parallel track with the ISB's temporary barrier effort to determine whether an observation and forecasting system would be helpful in addressing this issue. North reported that selenium is an essential nutrient but in high magnitudes it becomes toxic. For example, Kesterson Reservoir selenium conditions resulted in bird deaths. Under certain conditions the San Joaquin River flows backwards and salt, in conjunction with selenium, creates problems.

Teresa Pressor at USGS has developed a complex model with a 400-page report that describes the pathway of selenium moving through a food chain, incorporating water flow and ecosystem factors. A significant amount of study time would be needed to understand the model and how it works.

A separate technical panel/task force/workshop was suggested to bring diverse experts together to consider selenium and salinity issues such as:

- Relationships between selenium and salinity to larger community food webs.
- Feasibility of a program to monitor selenium levels in bivalves.

- Use of models to clarify cause and effect relationships related to selenium.

The ISB will think about this suggestion in more detail at its next meeting when Luoma can participate and advise.

Public comment

David Wright, a former USFWS employee who has visited sites in San Joaquin and talked with Luoma, indicated that Westlands Irrigation District will retire 100,000 acres from irrigated agriculture. The Irrigation District will keep the water. Retirement of additional acreage is also under consideration. These areas are the worst selenium producing land. These actions will not improve the problem to safe levels. The Grasslands area also has both selenium and salinity problems. The whole process is complex and difficult.

Science Agenda - Research Component (Glaze and Meyer)

Meyer reported that this Team has not yet been provided materials from the Science Program to review. However, three important documents will soon be available for the Team to consider, including:

- 1) Science Program Multi-Year Program Plan (MYPP)
- 2) Moore's document entitled "A New Vision for CALFED Science, May 2005"
- 3) Response to the legislative directive regarding water availability for fish.

These three reports represent the evolution of thinking since February 2005. The March MYPP was predicated on availability of a large budget, \$25 million per year. However, today our approach is to operate within existing funding constraints as described in the New Vision for CALFED Science, May 2005.

See Action Item # 3.

Science Agenda - Information Transfer Team (Twiss and Adams)

Today, the ISB and this Team were provided with a copy of the "Final Draft CALFED Science Program Communication Strategy, April 29, 2005 prepared by Julie Lamont". This document represents the strategy that the Science Program proposes to use to facilitate information transfer.

See Action Item # 4

EWA/ERP Integration Subcommittee Report (Rose, Patten, Ingram, Freyberg, Cummins)

Rose provided a PowerPoint slide presentation outlining the findings of the EWA/ERP Integration Subcommittee. The Subcommittee found that there is a lot of coordination and communication. However, integration is opportunistic. Potential benefits of a more integrated approach could include: using opportunities to maximize ecological benefits, and by acting together agencies can minimize overlap. Some potential difficulties to integration of the programs could include:

- loss of individual agency flexibility in their operations.
- as programs work together their responsibilities can be distorted and shifted around.
- reduced transparency of the decision-making process
- integration may really require more effort and additional funding.

The ISB discussed the potential linkages between EWA and WRP water and whether or not it was desirable to integrate them. Key concepts from the ISB's discussion are summarized below:

- Differences in funding levels between the two programs.
- The two programs have different objectives.
- Unlikely that EWA water will be used for "restoration". Potential exists to use EWA water to solve a downstream restoration problem, such as moving sediment, lowering water temperatures, or raising the hydrograph to flood the riparian areas.
- Perhaps the marginal benefits associated with integration may not be worth the cost of integration.
- An ideal design hydrograph for every important tributary is needed to manage in a manner that maximizes benefits.
- Feasibility to "recycle" EWP water for use again downstream.
- Quantification of benefits from individual programs is needed before synergistic effects can be determined.
- EWA is a flexible tool to address specific fish.
- EWA water is "project water" released from reservoirs.
- EWP is non-project water on non-project streams.
- Think about reconstituting the EWA technical panel to further consider integration of environmental water.

The Subcommittee made two preliminary recommendations to the ISB:

- 1) The EWA/ERP Subcommittee be disbanded because it has completed its initial charge.
- 2) Develop a broader charge for a new technical panel to evaluate the science that underlies the use of environmental water for biological benefits, to assess possible interaction among the major four water programs, and to encourage the exchange of knowledge among the four environmental water programs.

ISB members generally agreed on the need to approach this idea of coordination and integration very cautiously. Questions about the optimal use of EWA water remain. Research regarding the use and distribution of ERP water is limited.

The ISB continued this discussion to May 12. See page 31 of this Meeting Summary and see also Attachment E.

Meeting Summary, Wednesday May 11, 2005

ISB Members in attendance

Rich Adams, Ph.D.	John Melack, Ph.D.	Kenny Rose, Ph.D.
Tom Dunne, Ph.D.	Judy Meyer, Ph.D.	Duncan Patton, Ph.D.
David Freyberg, Ph.D.	Jeff Mount, Ph.D.	Bob Twiss, Ph.D.
Peter Goodwin, Ph.D.	Warner North, Ph.D.	
Helen Ingram, Ph.D.	Denise Reed, Ph.D.	

ISB Members not in attendance

Ken Cummins, Ph.D.	Bill Glaze, Ph.D.	Jack Keller, Ph.D.
Sam Luoma, Ph.D.		

CBDA Staff

Zach Hymanson	Johnnie Moore, Ph.D.	Heather Johnston
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Support Staff

Kateri Harrison	Elizabeth Soderstrom, Ph.D.	
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Other

Marina Brand	Mark Holderman DWR	R. Lossee, MWD
Rob Duvall, DWR	Paul Hutton	Ramona Swenson, TNC

The ISB meeting convened at 9:15 a.m.

Report from Levees Subcommittee to ISB (Ingram)

Ingram provided an overview of the Subcommittee's findings and recommendations. Concurrently, this information was shown on the projector screen so that audience members could participate. (See draft report, included as Attachment B to this Meeting Summary). The Subcommittee has worked on their report over the course of several months and the Subcommittee met in-person on Tuesday May 10, 2005. The Subcommittee's recommendations fall into three categories:

1. Enhanced understanding.
2. Development of long-term economically feasible solutions.
3. Quality and transparency of science.

Discussion among the ISB focused on the following topics:

- Any management strategies proposed or developed by DWR's Delta Risk Management Strategy (DRMS) should be evaluated in the context of long-term consequences.
- Many aspects of the Delta levee issue are fundamentally socio-economic.

- Key uncertainties about geotechnical information for the 1,100 miles of levees remain. However, knowledge of levee foundation and soils could improve and problem areas could be more clearly identified by using new technology and financial investments.
- Economists can quantify the full range of opportunity costs for a range of scenarios. At a more detailed level, potential solutions could be objectively ranked based upon their cost effectiveness. The type of economic analysis that could be provided to support DRMS, including traditional and non-traditional (non-market) methods, was debated by ISB members. Advantages and disadvantages of both types include dollar reductionism, linking costs to benefits, and quantifying ecosystem restoration values.
- A broad range of strategies to address levee integrity is needed.

The ISB accepted the Subcommittee's Report, with the understanding that the Subcommittee members Reed and North would refine the document to reflect the ISB's comments from today's discussion and properly format it into a formal report to the Authority⁶.

Public Comment

Marina Brand from the Department of Fish and Game asked if the ISB's levee report could be sent to Sergio Guillen, CBDA Levee Program Manager and to BDPAC Levee Subcommittee. Some BDPAC members feel strongly about DRMS. Making documents public really means distributing it to all interested parties.

Action Items:

Please see Action Items # 6-7.

Work Session on Monitoring and Data Assimilation

Overview (Dunne)

The ISB's thinking on the value of monitoring and data assimilation has evolved over the course of several meetings. In the Delta, improved monitoring and better availability of data could be useful. State agencies should be encouraged to take advantage of modern developments in data assimilation system, new sensor technology, and data management techniques. A data assimilation system is a set of structures and activities that takes measurements from a broad array of sensors. Data are then quality controlled and entered into a well-structured data base for distribution and analysis. The standard adaptive management cycle includes obtaining data, checking data, interpolation between sparse sensors, and testing hypotheses. Additionally, the sensor data and associated analysis/findings should be presented to decision-makers in a timely manner to promote an interactive decision making process. During the February 2005 meeting,

⁶ Please see the ISB's report to the Authority on the following website:
<http://calwater.ca.gov/CBDA/CBDAMeetingMaterials.shtml> (click on meeting materials for the June 8 meeting.)

the Glaze and Meyer Fact-finding Team presented a short report recommending that a task force to be established to design and cost a monitoring and data assimilation system.

Prior to adopting the recommendations of the fact-finding team, ISB's next step was to consider whether there are specific CALFED activities that could be enhanced by such a monitoring and forecasting system. The ISB used the Temporary and Permanent Barriers Program in the South Delta as a case study:

Temporary Barrier Fact-Finding Team (Mount and Freyberg)

Freyberg provided a PowerPoint presentation (see website at: http://science.calwater.ca.gov/sci_tools/isb.shtml) that set the context of the South Delta barriers issue and its wider relationship to observation and forecasting systems. Freyberg noted that new developments in sensor technology, cyber infrastructure, and analytical tools allow scientists to measure more variables and to measure them more densely, rapidly, and efficiently for the same cost. This provides an opportunity to rationally integrate the data with modeling tools to enhance value.

Data Assimilation is an area of expertise defined as "Optimally combining information from imperfect models and imperfect measurements." CALFED agencies grapple with the complex objective functions that exist in the Delta. An analytical structure to help the agencies with the complexity of the system would have three components:

- Observations.
- Dynamical models.
- Data assimilation (melding) schemes allow things to be brought together systematically.

A systematic feed back of observations to improve the model over time and space explicitly improves the use of models to make decisions.

Purpose and benefits:

- Power in integrating data with biological forecasting models, considering the errors in both.
- Improves prediction /forecasting.
- Characterize uncertainty, parameter estimation.

All these terms add up to improved adaptive management.

The concept of feedback systems that promote improvements to models based on real world observations is not a new notion. In the past it was applied, by agencies such as NASA, to engineering feedback and control, meteorology, and oceanography. Weather forecasting models have improved both because our methods of observation have improved and because our weather models have improved. Many of the current highly visible applications occur in a non-regulated environment. The weather service doesn't pay a fine if their prediction is wrong.

Mount provided a PowerPoint presentation entitled *South Delta Permanent Barriers Program: Monitoring and Data Assimilation Working Session* (see website at: http://science.calwater.ca.gov/sci_tools/isb.shtml). Temporary barrier program was initiated in

1991 as a five-year program. Adaptive management was incorporated to develop information for future anticipated decisions regarding the installation of permanent barriers. As a result of the adaptive management learning process, the barrier on the Grant Line Canal will be moved closer to the pump. The program was extended in 1996.

Primary purpose of a barrier is to maintain water elevations at sufficient levels so that a water agency can remove water for irrigation purposes. Additionally, the barriers reduce salinity in the water (by improving water circulation) and this protects the quality of the water used to irrigate crops and feed into the water export pumps. Water moves to the east on a rising tide. The barriers maintain a higher level on the eastern side of the barrier.

The construction of permanent barriers is an integral part of the South Delta Improvements Program (see website at: <http://sdelta.water.ca.gov>). The permanent barriers will include a “bladder” that can be raised or lowered to allow fish to move. Bladders are a variable that can be operated to respond to management needs. The Draft EIR/EIS will be released to the public in June 2005 with public hearings progressing later this summer. Construction of the barriers will be phased and expected to start in 2007 and completed in 2008.

The California Department of Fish and Game has collected substantial information about the temporary barriers and their impacts on fish species including the Delta smelt. Additionally, two refereed journal articles/papers were published. The timing of installation, removal, and operations of the temporary barriers are subject to numerous permit requirements and precautions to protect fish. However, fishery monitoring was not conducted for a few years due to a lack of staff. Fishery data includes tagged salmon and smolt survival investigations. In one study 25,000 fish were released and only 3 survive to the end. Additionally, the fish salvage program conducts weekly monitoring.

Water quality sampling (separate from that done for fish) includes weekly and bi-weekly grab samples. Some stations have water quality monitoring probe instruments with data loggers. So, perhaps collecting real-time data is feasible.

Multiple variables and the many different types of data needed make it difficult to quantify even simple factors like agricultural pumping and drainage. DSM²⁷ is used to forecast water elevations and analysis of model results compared to observations is distributed via a weekly bulletin.

Multiple monitoring programs conducted by diverse agencies under multiple mandates are complex. Staff integrate their findings by meeting annually in small technical teams to discuss issues ranging from fish salvage operation to operation of culvert flaps. Cooperating with IEP, staff tries to improve their operational methods; although some staff feel their efforts are not effective.

⁷ See April 2005 Report on DSM2 Standardization at website:
http://baydeltaoffice.water.ca.gov/modeling/deltamodeling/DSM2UsersGroup/DSM2StudyStandards_042705.pdf

The installation of permanent barrier is a suitable prototype for an observation and forecasting system because of the character of the issue and because the State will be investing a significant amount of funding (\$15 - \$20 million) to install permanent barriers.

Guest Speaker Presentation: Municipal Water Quality Investigations Program

Robert Duvall⁸, an Environmental Scientist from DWR provided a PowerPoint entitled *The Real-Time Data and Forecasting Project (RTDF)* (see website: http://science.calwater.ca.gov/sci_tools/isb.shtml) about the Municipal Water Quality Investigations Program (MWQIP)⁹. This is an inter-agency effort to use real time data and forecasting. Overall it is hoped this program (or a similar program) will improve coordination between federal Central Valley Project and the State Water Project. Planned improvements to the RTDF include expansion of monitoring stations and development of new stations (anion analyzers for chloride and bromide).

Public comment

Hutton noted that from the start it felt like the program had a good understanding. It started as science/experimental based endeavor and has now evolved to an applied monitoring process.

Reporting Information

Duvall noted that data dissemination must meet user needs and provide quality assurance and control of the data. Visual presentation of the data is important for users with different technical and non-technical backgrounds. USGS accomplishes this by posting raw gauge data immediately on the website and later posts a QA/QC version of the dataset.

Currently, a weekly report and data set for the Delta, SWP and CVO (see handouts) is e-mailed to about 200 people. Data are organized according to watershed or water quality constituent and provide “boundary conditions” for the models. Forecasts come from DSM2 model as a volumetric forecast. Using precipitation data, new fingerprinting of DOC sources can be run within one week. It is a boundary condition model and does not get re-initialized but over time, DSM2 may evolve to utilize observed data to improve the model. Although state agencies try to use the same baseline information and a similar platform, a variety of models are used for planning studies. Particle Tracking Animation shows the fate of particles at any modeled location including the export intakes. This modeling tool could be used to explore implications of all sorts of barriers.

ISB Discussion on CDEC

California Data Exchange Center (CDEC) includes 50 sensors over 300 miles of the State Water Project (SWP). CDEC started as a flood management tool and is currently funded by DWR for this purpose. However it has evolved over time. CDEC is an excellent tool for getting real-time data from the sensors to the users. However:

- Many different groups operating sensors.

⁸ ISB members are invited to contact Duvall if they have follow-up questions at: Phone: (916) 651-9272 or email: rduvall@water.ca.gov

⁹ See the Municipal Water Quality Investigation’s data and maps at the following website: <http://www.wq.water.ca.gov/mwq/>

- Similar data reported on different time steps.
- QA/QC is always in question with real time data.
- Difficult to remove or qualify bad data (lots of complexity – it is not easy to remove the data).
- Contributions of metadata are not allowed.
- CDEC is not intended to be a database because old information is discarded over a period of time.

CDEC is popular, has evolved over time, and is dispersed. However, data archiving and retrieval could be accomplished much more efficiently using a new, relational database. It is possible that this new relational database concept could be applied to other broader CALFED related programs. In the near term, improved databases that connect different types of data would provide positive benefits. ISB members can advise about database development.

Public comment noted that CDEC doesn't qualify as a relational database but it is heavily used and provides ready access to data.

Guest Speaker Presentation: Monitoring and Data Assimilation for Delta Water Resource Management

Richard Losee¹⁰ from Metropolitan Water District provided a PowerPoint presentation entitled "Monitoring and Data Assimilation for Delta Water Resource Management" as shown on the ISB website at http://science.calwater.ca.gov/sci_tools/isb.shtml. MWD has learned that real-time monitoring and modeling could help solve problems important to water operators like benthic and planktonic algae that can affect taste of water. MWD's water quality staff worked with hydrologist to inject nutrient-laden water deep into the dark portion of the reservoir to avoid stimulating growth of algae. Reservoir operations are now very well-designed.

In some instances, forecasts need to be provided to MWD very quickly so it can alter operations of its system. For example, a filter clogging algae or an algae bloom with a taste-causing compound is a serious issue. The travel time for particles of water to move between Banks pumping plant to MWD intake can vary depending on the season and other factors. Ideally MWD's operation at the intake valve could be modified to respond to water quality conditions upstream in the Delta. Near term needs are related to a prediction of arrival time – when a change in algae or bromide will arrive at the water treatment plants.

An increase in the number of monitoring stations and sophistication of sensors could be useful in developing forecasts. Accurate and timely forecasts could provide economic benefits to water contractors like MWD. However, it would take a long time commitment for an individual contractor or organization to build a monitoring and modeling system in the Delta. Ideally, State water contractors would work together to pay a third party to put this in place.

¹⁰ ISB members may contact Losee at MWD, 700 Moreno Ave, La Verne, CA 91750, Phone: (909) 392-5124, E-mail: rlosee@mwdh20.com

Discussion

ISB noted that Lossee has demonstrated utility of a monitoring and modeling approach on a small scale of time and geography. MWD has done work on data assimilation on specific questions that concern them. A remaining question relates to the spatial and temporal scale of this approach to CALFED's concerns including: long-term simulations, and modeling complexity. It will be challenging to develop the capacity within CALFED to deal with big complex issues over a long-time scale such as water supply, water conveyance, and long-term drought conditions.

It was noted that models exist that could potentially accommodate this effort. For example the Calvin¹¹ model (economic based) can be driven by CDEC. However, the most complex part of any modeling effort is the biological components; specifically, the fish, because conceptual models are not yet well defined and monitoring is difficult.

Presentation: Opportunities for Integrating Science, Research with Multi-Objective Management (Goodwin)

ISB member, Peter Goodwin, provided the above PowerPoint slide show as posted on the ISB's website at: http://science.calwater.ca.gov/sci_tools/isb.shtml.

Social Aspects

Idaho's long drought has resulted in many lawsuits and difficulties for local farmers. Using objective factual information within the local community was facilitated by the use of laptops and voting software to simultaneously display the results of a group's vote and editing of documents. These participatory technologies assist in making decisions with diverse groups of stake-holders. Ingram noted that the laptop and community voting exercise is useful when data comes from a trusted, credible source. Transparency and accessibility is important. The technology and models help groups converge on their understanding of reality. People look at objects from their different perspective. CALFED has many voices.

Emerging technologies

New technologies exist now but are not part of standard agency operations. Examples of emerging technologies include advances in temperature measurement, wireless sensors, plane-mounted ground penetration radar, and acoustic camera for detecting fish. Costs for sensors and other equipment have decreased substantially. NSF sponsored a recent workshop to bring sensor technology experts together with the users of these technologies to help define future technology development and application. CALFED agencies could collaborate with universities to seek joint funding opportunities in order to take advantage of these new technologies.

Ecological Restoration Monitoring Challenges

Performance assessment of restoration projects and appropriate monitoring level poses many challenges including the following:

- How are cumulative effects of different restoration actions toward a watershed wide objective detected?

¹¹ time steps forecast model

- After restoring physical aspects of a stream, how can one prove that the project made a difference and improved fish populations at the specific site and at larger scale?
- Biological parameters have large variability, so monitoring for periods up to 20-years may be needed.
- Significant advances in statistical methodologies have been made in the past few years.
- Pre-implementation monitoring data, consistent with post-implementation performance monitoring is needed.
- There is never enough money to do what we want. So how does one allocate funds to do the most good?
- How does one take multiple models and run them on a common platform so that the various expert disciplines can communicate with each other and share data?

Goodwin advised that monitoring and data assimilation is the right approach. This is a community problem and careful consideration about how to develop the system is needed. It is important to collaborate with experts from local universities, consulting community, and experienced DWR staff to start a dialogue and to begin thinking about the next generation of sensors, models, and decisions.

Discussion of Monitoring and Data Assimilation Applications

Fish

Attention to the spatial scale of fish is needed. For example, when developing habitat suitability models in Louisiana, both large and small scales were considered. Spatial scale depends on the fish species. Grain size, edge, and migration patterns are just a few of the factors that need to be considered and this type of data is not readily available.

Rose noted that under ideal circumstances, data assimilation used for Delta fish would focus on fish as they approach the pumps. Technology could be used in small time windows (3-9 hours) to determine where fish are currently located. Pumps could be switched on or off depending on the near-term location of sensitive fish species. Models could analyze various scenarios of operating the inflatable bladders to reduce fish mortality.

Improved methods and tools (cameras, tagging, fish tracking, and computational cyber infrastructure) will eventually expand data collection efforts such that data can be incorporated into models. These models could describe fish behavior, response to conditions, or changes in micro-habitat. Predicting fish distribution or response to predators is a more difficult modeling task. Data assimilation may not be immediately useful for the purpose of extracting population sustainability. However, improved data collection and modeling will provide incremental steps towards that goal and this would be valuable.

Other Applications for Monitoring and Data Assimilation

Potential applications for Monitoring and Data assimilation include:

- Improve communication among groups by enhancing opportunities to visualize commonalities or assess different management strategies and to help reach agreement.
- Operation of hydro-power facilities and management of the rivers.
- Organic carbon and trihalomethanes in water.
- Evaluate potential for integrating EWA/ERP.

ISB members agreed that there are a wide range of applications for a monitoring and data assimilation approach over a range of timescales. Advances in technology make these applications more feasible.

Examples of Success

Successful programs in other regions commonly have a consortium of universities and agencies as champions for the process. It is difficult to sustain the energy needed to develop a program over the long run. Monitoring and data assimilation have been popular in:

- Chesapeake Bay
- Napa: agencies like RWQCB, DFG, and County were cheerleaders who articulated a vision for a world-class system and shopped for funding.
- Columbia River: Baptista started small with salinity and temperature and later expanded the effort to include hydrology and biology data.

The ISB agreed there is potential to develop this idea in the realm of physics and chemistry. Considerable opportunity to increase transparency in:

- Delta cross channel
- Franks tract
- South Delta barriers

If all three groups used a similar approach to data collection and analysis, a critical mass of scientific community and agency support would be established.

Demonstration and quantification of the benefits associated with a monitoring and data assimilation could consider values such as public health, water supply reliability, and healthy ecosystems. A specific benefit includes fewer red light and yellow light days. Ancillary benefits like the survival of the species may be difficult to quantify. A technical panel could consider more detailed information related to cost and benefits.

Database

A report by an unidentified UC Davis expert noted problems with BDAT's metadata and quality control. Identifying uncertainty and conducting statistical analysis with BDAT is problematic. In general, existing databases are not easy to combine with other datasets for statistical or spatial analysis. Existing databases are difficult to transmit and share with other parties. Assembly of data is also problematic. The first step for CALFED should be to obtain a relational database that is fully operational and accessible to agencies that need the data. The ISB continued this discussion to May 12. Please see page 28 of this Meeting Summary.

Improvements in CALFED's Technical Knowledge Base

Board members reviewed a handout entitled *Excerpt from Science Symposium on Environmental and Ecological Effects of Proposed Long-term Water Project Operations*, pages B-13 to B-18 (see website at: http://www.science.calwater.ca.gov/pdf/SymposiumSummary_11-24-03.pdf). ISB members contemplated advances in scientific issues that the CALFED community has made in the past several years and noted the following:

- Reliance on continually increasing water storage has been reduced by conservation programs, conjunctive use, and EWA.
- Risk-taking and adaptive management has been demonstrated by the EWA Program. Policy makers recognize strategies must be undertaken.
- The development of models to raise critical questions and show new opportunities has been demonstrated by Rose's fish population model, CALSIM II upgrades, allocation of PSP funds to appropriate models, John Burau's work, and the Delta Cross Channel model.
- Understanding of the tidally driven hydrodynamic Delta Conceptual Model has been increased by (1) improved visualization tools and communication, (2) installation of dopler technology, (3) knowledge of shorter term scales (jets at Franks Tract), (4) new details regarding tidal mixing, and (5) State of Estuary conference presentation relating Delta as "pipe" vs. "habitat".

Improvements to the technical understanding of Delta pelagic fish has had mixed success. On one hand, incremental progress has been made by (1) completion of the Cowan/Rose striped bass model showing multi-causal factors, (2) completion of Bennett's Delta smelt model, (3) describing three stressors: diversions, exotics and contaminants, and (4) highlighting the correlation between temperature and smelt vulnerability to water operations. On the other hand, new information about the processes and mechanisms related to Delta fish is needed as demonstrated by recent population declines in smelt. An approach that considers the fish in context of their wider ecological community, such as food webs, may be needed. It may not be possible to elucidate direct cause and effect relationships or to easily manage a large complex system like the Delta. The complexity of the system is exemplified by control of tidal flows by large processes like the gravitational pull of the sun and the moon. These types of processes are not well defined in the Delta and our ability to control these large processes may be limited.

This exercise was positive in that it offered an opportunity to look back and reflect on past progress and incomplete knowledge. However, further inquires into recent pelagic fish population declines is needed. In the long-run, attention to scientific fundamentals like monitoring and data assimilation will improve data transparency, availability, and analysis. Connections and integration among the realms of physics, chemistry, and biology should be sought.

Meeting Summary, Thursday, May 12, 2005

ISB Members in attendance

Rich Adams, Ph.D.	John Melack, Ph.D.	Kenny Rose, Ph.D.
Tom Dunne, Ph.D.	Judy Meyer, Ph.D.	Duncan Patton, Ph.D.
David Freyberg, Ph.D.	Jeff Mount, Ph.D.	
Peter Goodwin, Ph.D.	Warner North, Ph.D.	
Helen Ingram, Ph.D.	Denise Reed, Ph.D.	

ISB Members not in attendance

Ken Cummins, Ph.D.	Bill Glaze, Ph.D.	Jack Keller, Ph.D.
Sam Luoma, Ph.D.	Bob Twiss, Ph.D.	

CBDA Staff

Zach Hymanson	Johnnie Moore, Ph.D.	Heather Johnston
Donna Podger		

Support Staff

Kateri Harrison	Elizabeth Soderstrom, Ph.D.
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Other

Marina Brand	Bernci Sullivan	Ramona Swenson, TNC
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Performance Measures

Judy Meyer presented the results of the May 10 meeting of the Performance Measure Subcommittee. This Subcommittee was originally established because the Authority's Charge to the ISB states the ISB is to review performance measures throughout the CALFED Program.

The Subcommittee produced a draft framework for guiding and appraising performance measures and offered continuing assistance to Donna Podger, who has been hired by the Science Program to work on advancing performance measures. A structure and direction about how one would assess the effectiveness of performance measures have not been provided in the Science Program's Charge or the ROD. Hence, additional work and interaction with the ISB are needed. It is anticipated that over the next several months, Podger will utilize the framework and develop a packet of performance measure material that the ISB can consider during its next meeting.

The draft framework is a set of questions that can be used to guide the development of new performance measures and for agency staff to appraise the effectiveness of existing performance measures. ISB members reviewed the framework and the embedded series of questions. The

result of the ISB's review is shown in the May 19 Memorandum from Meyer to Moore shown as Attachment C to this Meeting Summary. ISB discussion noted:

- Link CALFED objectives to performance measures.
- Use performance measures to detect patterns of change.
- Appropriate tools for agency staff to utilize in measurements are needed.

Although the Science Program has developed six proto-type performance measures (see website at: <http://science.calwater.ca.gov/library.shtml>) there is a general perception that participating agencies were not adequately involved. These prototype measures were developed by a consultant and focused on ecosystem restoration. The ERP Science Board did not validate the proto-types nor recommend specific ways to improve them. The remaining ten CALFED Programs attempted to develop their own performance measures. Additionally, performance measures were used in the CALFED Annual Report and the Program Multi-Year Program Plans. Hymanson noted that CALFED has all the "parts, but we don't have the whole machine."

The Science Program has not had the staff resources needed to engage the CALFED programs in discussions or workshops on performance measures. Ingram noted that performance measures are a process not an end result. If done correctly, the development of performance measures would directly involve key agency personnel who can describe the various mandates and tasks of each agency. Agencies have staff and funding constraints that may limit their ability to achieve the goals outlined in the Record of Decision.

Under ideal circumstances, staff would begin a process for a dialogue on performance measures with the programs and related agencies. Performance measures, based on conceptual models, and used in an adaptive management context would improve the big picture understanding of how the ecosystem currently functions and improve the ability to predict the effects of particular changes to that system. A roadmap or framework that provides a list of items to consider and an overall approach is useful.

Subcommittee members would like to test the framework by using existing prototype performance measures. Based on this test-run, the list of questions/framework can be refined.

See Action Item # 8 and ISB Recommendations # 9-11.

Monitoring and Data Assimilation

Over the past few days, the ISB has received presentations from Mount and Freyberg about the Delta Barriers program and the benefits this program could receive from a comprehensive monitoring, data assimilation, and modeling approach. The ISB agreed that monitoring and data assimilation is important especially as it relates management, decision-making, and development of new policy. Developing a monitoring and data assimilation program on a CALFED-wide basis has some issues including:

- New challenges facing IEP
- Help IEP utilize the adaptive management "clock".
- Emerging technology and related new tools.

- Disconnectedness among the various agencies.
- Diversity in the type of management decisions.
- Data are currently collected for regulatory purposes and are not designed to consider the big picture.

ISB discussion about the South Delta Barriers Program as a pilot study for monitoring and data assimilation raised the following points:

- New technological advances provide great opportunities to use monitoring and data assimilation to improve the operations of the barriers.
- Barriers program is related to DIP pumping issues and to fish protection.
- Many agencies currently coordinate regarding Barriers Program including MWD, DWR, and the Bureau.
- Need to start small and proceed in well conceived incremental steps.
- Use pilot project as benchmark and a tool for broader applications (later) to other CALFED related programs.
- Concept for pilot project can be brought to Authority's attention quickly.
- As an example, Delta Barriers are a hydraulic variable or "knob", which can be managed in a more informed way, taking advantage of new technology to help the state manage water better and more efficiently (i.e. cheaper).

The role of IEP in this proposed pilot project was discussed and ISB members noted the following points:

- IEP is a group of agency scientists and managers collecting data across the system to address important water issues.
- IEP has a lot of other responsibilities.
- ISB's recommendation relates to improving data assimilation and monitoring (the structure needed to support decision-making) for this particular project.
- IEP is intimately involved in important monitoring work. Other monitoring groups also offer significant contributions. Data that can be shared by all would be useful.
- A proposed technical panel can ask IEP to identify all on-going monitoring efforts and to help integrate/focus/streamline these on-going efforts.
- IEP is a data provider. CWEMF does modeling. Modeling is needed for data assimilation.

Time-scale for a monitoring and data assimilation system.

“Real-time” can mean: 1) now, on-demand instantaneously, 2) in near-time or 3) “early warning” sensors alert staff several hours in advance of potential concerns. Other timescales include: long-term, geologic, tidal, sub-tidal, weekly or bi-weekly, and hourly. The time-scale should be such that it responds to the management needs and the dynamics of the system.

Summary

ISB members agreed that Monitoring and Data assimilating is an important fundamental scientific effort that will provide many long-term benefits to CALFED as described in the Monitoring Team Progress Report, Glaze/Meyer, dated February 2005. The South Delta Barrier Program is near-term and tractable. As such it is an excellent pilot project to demonstrate the value of monitoring and data assimilation. ISB recommends that the Science Program establish a task force or panel to further explore methods to help CALFED modernize its monitoring and data assimilation system. The task force should include experts from other regions and experts in eco-information.

See Action Item # 2

Assessing Science Needs (Reed, Adams)

Reed presented the Fact-Finding Team's preliminary observations (not a final recommendation) via a PowerPoint Slide show. The presentation focused on the PSP process used in CALFED. The Team considered the 2001 Water Quality PSP and the recent combined PSPs. However, this is not an equivalent level of review for each program. Generally, the strengths of the PSP process include: widely advertised and open to any applicant, open to innovative ideas, strong review process, and transparent process.

Weaknesses of PSP

- Lengthy process from proposal release to funding decision (even prior to contracting delays).
- Complex proposal requirements and administrative tasks.
- Major effort by proposers with low chance of success.
- 159 projects were not provided funding in any form.
- Lack of timely response to Authority's needs.

Other mechanisms to fund science include directed actions. Directed actions can involve collaboration with water agencies, Science Program, and ERP. Many proposals received from 2002 PSP were sent to the directed action pile. Since 1999 ERP has funded \$14 m in research/studies.

Local Integration Science Transparency (LIST) ensures there is local engagement, peer review, and makes proposals and reviews available during public comment periods (transparency).

Workshops:

- Can be used to develop consensus on state of knowledge.
- Must be focused and product orientated to generate something new.
- Can be used to identify/refine focus areas for solicitation.

Science Advisors can broaden the level of expertise available to program for fast response with the caveat that the advice may not reflect range of scientific opinion.

Discussion

ISB discussion noted that funding 25 percent of the PSP applications are consistent with grant programs from other regions. The local culture seems to expect that a higher percentage of applications would be funded. Expectations should be managed so that organizations do not feel either entitled or rejected if their application is approved or denied. The purpose of the PSP is to develop mechanisms to address the needs of the Programs.

Board members offered the following advice:

- Expedited solicitations can focus topic and streamline the review process.
- Tools from other federal agencies, like NASA or EPA Star program, should be studied.
- Pre-proposals, like those for the Proposition 50 Drinking Water Grant Program, may be useful.
- Universities and agencies should be encouraged to work together to submit joint proposals.

Moore suggested the Team's report in assessing science needs will be a powerful tool that documents the past approach and helps staff define a future PSP or directed action process.

The ISB found the discussion useful and suggested that these preliminary findings should be noted by the Science Program and possibly presented to the Authority in late 2005.

See Action Item # 5

Report from the EWA/ERP Integration Subcommittee

Based on comments received during the May 10 ISB discussion, the subcommittee revised its recommendations as shown in the handout dated May 11 (see Attachment E of this Meeting Summary)

See ISB Recommendation # 16.

ISB Meeting Schedule for Remaining Part of 2005

The ISB's ABAG contracts expire May 31, 2005. Next fiscal year, a different type of contractual mechanism will be used and staff is currently investigating alternative mechanisms. Contractual details may be resolved by October of 2005. Moore anticipates major changes to the methods used to finance Science Boards, the number of Science Boards, and the make-up of the Boards. At this point the future is uncertain.

Moore and Hymanson expressed thanks to all the ISB members for their contributions to the CALFED program. The larger CALFED community continues to appreciate the objective approach and new knowledge that science provides.

See Action Item # 1.

Update ISB 2005 Workplan

The ISB decided to move forward with updating the workplan, even in light of the fiscal uncertainty surrounding the Science Board and Science Program. The workplan represents the significant efforts of the ISB and the projected dates were reasonable goals at the time they were established. The Workplan assumes there may be some minor changes to the deliverable dates. The updated Workplan is shown as Attachment A to this Meeting Summary.

Public Comment for Items not on the Agenda

Ramona Swenson from The Nature Conservancy (TNC) noted that science will continue to have a role in the CALFED process. TNC is currently assessing water flow needs of the Sacramento River and opportunities to use environmental water, no matter from what account it comes. She invited Board members to help develop a product that will suggest operational changes and be useful in the policy arena. TNC is a stakeholder that wants to ensure science continues to be part of the process. ISB member North suggested that Swenson forward a short summary of the Sacramento River study along with relevant website links. Swenson also noted that she appreciates having access to ISB work products on the website and asked that this continue.

Elizabeth Soderstrom noted that Tom Dunne will be taking a sabbatical next year and she joined ISB members in thanking him for all of his efforts chairing the ISB this past year.

Meeting adjourned 12:00 p.m.

Attachments:

- A) Workplan as updated May 12, 2005
- B) Levee Subcommittee Report to ISB
- C) Memorandum from Meyer to Moore re: Observations on Performance Measures
- D) Memorandum from John Melack regarding Modeling
- E) ERP/EWA Integration Subcommittee May 11, 2005 report to ISB
- F) February 22, 2005 Memorandum from Luoma and Freyberg regarding Water Management Research questions.

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