

South Bay Salt Pond Restoration Project: Science Team Two-Year Summary

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Reviewed by the Project Science Team

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Summary

This update provides a record and analysis of the activities of the South Bay Salt Pond Restoration Project Science Team, which was constituted in March 2004, and describes how the Team's work has shaped the outcomes of the planning process.

In October 2003, the Project convened a 6-member Science Strategy Team, which expanded to a 12 member Science Team in March 2004. The Science Team is composed of local experts on physical, biological and social processes and is directed by the Lead Scientist. During the past two years, the Science Team has been carrying out the Project's Science Program, which is designed to provide direction for designing, collecting, synthesizing and disseminating the best science during the planning process and beyond.

Very few large-scale ecosystem restoration projects have ever been undertaken and, those that do exist are all quite different from each other. Since there was no blueprint to follow in developing the science program for the Restoration Project, the work of the Science Team has evolved throughout the planning phase, in an adaptive way, to meet the needs of the Project and science development.

The original Science Strategy Team viewed the role of the Science Team as primarily advisory, focusing on reviewing and commenting on key documents produced during the planning phase. However, the Project's National Science Panel strongly recommended that the Science Team be active in bringing the best information to the Project and clearly setting direction for what scientific information should be collected to achieve the Project Objectives. Consequently, the Science Team embarked on a science program that has significantly changed the direction of the Project and the outcomes of the planning process. For the first critical steps in the science program, the Science Team identified the key uncertainties relevant to achieving the Project Objectives and wrote science syntheses, i.e., focused literature reviews, to determine the state of our knowledge on those key uncertainties. The syntheses recommended restoration targets, monitoring needed to assess progress, and applied studies needed to reduce uncertainties. Technical workshops, held in 2004-2006, have brought in more information on uncertainties and have helped educate the Project managers and the public on key issues.

In September 2004, the Science Team wrote a Draft Science Plan to provide a blueprint for how the science program would be implemented; much of the Plan was based on the key uncertainties and science syntheses. At that time, the Project Managers envisioned the Science Team as having a substantial role in reviewing Consultant Team products. However, the planning process and most Consultant Team products have moved far too quickly to allow for adequate scientific review. This product review role was not realistic nor the best use of the Science Team's talents. The Science Team has since directed its efforts to developing the Project's adaptive management plan and applied studies for reducing the key uncertainties. During 2005, the Science Team and Consultant Team were relatively separate from each other

and pursued different missions; the Science Team developed the long-term adaptive management program and the Consultant Team worked on the short-term planning process centered on the NEPA/CEQA process. However, the products of both Teams are complementary and in 2006 and 2007, the Science Team is focused on integrating its work with that of the Consultant Team for the benefit of the NEPA/CEQA process.

In 2007, as the Project's planning process ends, the Science Team role will evolve again. Science Team roles may be to coordinate the peer review of Project-sponsored monitoring and applied studies and to organize the results of these studies to provide information to the public and recommendations to the Project managers as required by the adaptive management process.

Mission and Roles of the Science Team

In January 2005, the Science Team stated its mission as providing guidance on short-term planning activities and developing a Science Program for the collection, synthesis and dissemination of best possible science to support long-term restoration activities and adaptive management such that the objectives of the South Bay Salt Pond Restoration Project can be achieved.

The Science Team developed and adopted a charter (Appendix 1) that clarifies the role of the Science Team in document review during the short-term planning process and emphasizes the role of the Science Team in long-term adaptive management and science implementation. The primary roles of the Science Team are:

1. Science Development and Implementation Role. The Science Team is best suited to developing and implementing a long-term Science Program that will provide adaptive management and scientific information needed to address uncertainties in achieving the project objectives. This primary role of the Science Team is described thoroughly in the *Draft Science Plan* (dated September 30, 2004) for the Restoration Project. Key components of science development and implementation are:

- Develop the Adaptive Management Plan and Scientific Information Collection Program.
- Prioritize those questions that require more scientific investigation to reduce project uncertainties for PMT review. Ultimately, the PMT will determine the questions that will be addressed through further study.
- Oversee the competitive proposal process that has been developed for research activities related to data collection and analysis, information synthesis, and modeling strategies, and undertake science outreach which will include workshops, conferences and other activities that advance South San Francisco Bay ecosystem restoration science.
- Provide and review scientific information developed for public outreach.

2. Review Role with respect to Selected Consultant Team Documents. Science Team members will review Consultant Team documents or segments of those documents as appropriate. Formal document review by the Science Team consists of a Science Team-Consultant Team Loop, which constitutes peer review. Science Team members may also provide comments on Consultant Team documents during the public comment period. The Consultant Team will

address these comments just as they would any other public comment. This type of interaction does not equate to peer review by Science Team members.

3. Advisory Role of Individual Science Team Members. Science Team members may provide *ad hoc* advice to the Consultant Team through informal interactions or formal collaboration. In either case, the final Consultant Team documents must identify clearly the specific members of the Science Team who provided advice on the document. Individual members do not speak for the Science Team and this type of interaction does not equate to peer review by the Science Team.

Science Team Activities and Products

During the last two years, the Science Team has produced work in all three roles, but primarily in the realm of Science Development and Implementation. Table 1 shows a list of the Science Team accomplishments and where the work appears. Most of the work was in science development (defined as developing the scientific basis for the Project), especially summarizing existing information, providing direction on key uncertainties, and identifying what studies should be done to reduce uncertainties. This work ultimately resulted in: 1) the adaptive management “staircase” which is guiding programmatic planning for the EIR/S, and 2) the Adaptive Management Plan, which is a central component of both the Phase 1 restoration actions and the long-term, programmatic restoration.

There was some science implementation, defined as initiating research (a.k.a. “applied studies”) based on key project uncertainties. Implementing applied studies during planning has proven difficult because there were no funds identified for scientific study when the planning process was developed. At the time the planning process was funded, there was neither a Science Team nor a Lead Scientist to guide the Project managers on planning and budgeting for science. Thus, the applied studies element of the Science Program has been added to the planning process by the Science Team. Despite the fact that applied studies were not included in the planning budget, the Project and Science Team have successfully initiated a range of studies during planning using Project monies and funding from other sources (see Table 2).

The Project managers did wisely fund extensive baseline monitoring of Project area conditions during planning. This work, conducted primarily by USGS, has produced a tremendous amount of data, especially on bathymetry, water quality, and fish and bird use in the ponds and sloughs in the Project area. However, the Project managers did not incorporate in their planning and budgeting the need to analyze and interpret the monitoring data to convert them into information that can be used by the Project. In 2006, the Lead Scientist began to fill this process gap by assisting the Project managers in identifying the most important questions for interpretation. However, over the next year, the Project managers and Science Team must develop a long-term, sustainable process for data/information collection, analysis and dissemination to the Project managers.

A lesson learned from this Project is the need for scientific input, even at the earliest inception of planning. Early scientific input would have helped Project managers anticipate problems such as the water quality issues related to the discharge of effluent from managed ponds. In addition, the Science Team has had to work hard to catch up with the Project. Participation of the Lead

Scientist in early project planning would have resulted in better coordination of the science with the planning process and, perhaps, resulted in fewer major role changes for the Science Team. However, it is important to realize that large interdisciplinary projects, such as the South Bay Salt Pond Restoration Project, are evolving processes and adaptive changes will be required by all Project participants throughout the life of the Project.

TABLE 1. Science Team Activities from March 2004 to June 2006

Science Team Activity	Where Products Appear
<i>Role: Science Development and Implementation</i>	
Identified Key Uncertainties	Draft Science Plan (2004) and Draft Adaptive Management Plan (2005)
Wrote Science Syntheses containing: Summary of knowledge and unknowns, restoration targets, monitoring parameters, key applied studies to reduce uncertainties	Peer-reviewed papers posted on Project Website
Wrote Draft Scientific Basis for the Project Objectives	Draft Adaptive Management Plan
Developed Adaptive Management “Staircase”	Draft Adaptive Management Plan (2005) and Draft EIR/S
Wrote Adaptive Management Plan, including Applied Studies list, Monitoring & Restoration Targets table, and Institutional Structure	EIR/S and Record of Decision; Future monitoring and research undertaken for the Project
Held technical workshops	Summaries posted on Project Website
Implemented Applied Studies through a competitive proposal process and other funding approaches	Future syntheses of monitoring and studies to be used by Project managers to manage Phase 1 and design Phase 2
Held a South Bay Science Symposium	EIR/S; Presentation and poster summaries posted on the website; Future syntheses of monitoring/studies
Assist the PMT peer reviewing monitoring and applied study results	EIR/S; Future syntheses of monitoring/studies
<i>Role: Review Role for Project Documents</i>	
Science Team modelers memos on modeling and the LSGA	Modeling results in EIR/S
Science Team recommendations memo on the Phase 1 Actions	EIR/S and Adaptive Management Plan
Review and revision of integrated Applied Studies document	Adaptive Management Plan
Review and revision of Monitoring and Restoration Targets Plan	Adaptive Management Plan
<i>Role: Advisory/Collaboration of Individual Science Team Members with the Consultant Team</i>	
Dave Schoellhamer, USGS, worked as advisor to Consultant Team on model development	EIR/S
Nils Warnock and PRBO, worked on bird habitat modeling as part of the Consultant Team modeling	EIR/S
Many Science Team members provided advice to the Consultant Team on their work and products	EIR/S

TABLE 2. Monitoring and Applied Studies undertaken during Project Planning

	Monitoring Project or Study*	Funded By*	Funding Amount
	Monitoring Project		
1	Pond and Project Area Monitoring—USGS, Takekawa, Schoellhamer, Jaffe (2003-05)	SCC and WCB	~\$600K/year
2	Pond and Project Area Monitoring—USGS, Takekawa, Schoellhamer, Jaffe (2005-06)	SCC and WCB	~\$350K
3	LIDAR Survey of South Bay--TerraPoint	SCC and WCB	\$178K
4	Bathymetry of the South Bay--Sea Surveyor, Inc.	SCC and WCB	\$380K
5	Urban Levee Flood Management Requirements, Hydrologic Data Collection, Inventory of Discharge Facilities, Hydrodynamic Modeling Tools and Techniques Report--Moffat and Nichol	SCC and WCB	\$300K
6	ISP Water Quality Monitoring--USGS, Takekawa	RLF	~\$200K/year
7	ISP Mercury Monitoring—USGS, Keith Miles (2005-06)	RLF and FWS	~\$50K
	Applied Study or Modeling Project		
1	Bird and Habitat Change Modeling--PRBO	SCC	\$215K
2	Water Quality Data QC and Compilation—USGS, Cloern	USGS	In-kind
3	Pond A8/South Bay Mercury Study--SFEI, USGS, SCVWD	SCVWD, FWS, SFF, SCC	~\$440K (~\$300K in-kind)
4	Bird Diversity and Abundance on Newark Ponds--SFBBO	SFF and FWS	\$80K for 2 years
5	Bird Use of Mature and Restored Marshes--PRBO	SFF	\$60K for 2 years
6	Snowy Plover use of Managed Ponds; Harbor Seal Response to Watercraft; CA Gull Impacts to Nesting Birds—SJSU, Trulio	SJSU	In-kind
7	Hg in SF Bay-Delta Birds: Trophic pathways, bioaccumulations, and ecotoxicological risk to avian reproduction—USGS, Josh Ackerman	CALFED	unknown
8	Invasive <i>Spartina</i> Project (mapping and control)	SCC, FWS	unknown
9	Initiate development of 3-D, integrative and predictive model	Proposal to NOAA (10/27/05)	Funding being sought
10	Island Ponds Adaptive Management Studies: Initial physical and vegetation change	SCC	~\$100,000
11	Eden Landing Adaptive Management Studies: Long-term change and ecosystem response	??	Funding being sought

* Acronyms: FWS=US Fish and Wildlife Service; DFG=California Department of Fish and Game; RLF=Resources Legacy Fund; SCVWD=Santa Clara Valley Water District; SFF=San Francisco

Foundation; SCC=State Coastal Conservancy; COPC=California Ocean Protection Council; SJSU=San Jose State University; WCB = Wildlife Conservation Board

Analysis

The 2004 Draft Science Plan described the *content basis* and *process* for the collection, synthesis and dissemination of the best available scientific information for the Project and to support the adaptive management necessary to achieve Project Objectives. This Plan listed three pillars of the science program, the Key Uncertainties and Science Syntheses, the content basis, and the Science Structure, the process that implements an on-going process of evaluating key questions, collecting and synthesizing information, disseminating the information to decision-makers, and evaluating restoration progress.

Science Program successes are primarily related to the Project managers' use of content generated by the Science Team. Science Program successes include:

- Providing clear understanding of uncertainties and the resulting need for monitoring and applied studies;
- Convincing the Project managers and public of the need for adaptive management;
- Developing an Adaptive Management Plan that clearly articulates the structure and processes for successful adaptive management of the Project over time;
- Having the adaptive management "staircase" incorporated in the EIR/S as an essential element of each programmatic alternative;
- Initiating applied studies during the planning phase of the Project, without any funds originally dedicated to this activity;
- Having applied studies included in each Phase 1 Action, and having any applied study experiments recognized as restoration activities in Phase 1.

Process issues have posed challenges for the Science Program including the following:

- *Planning began in advance of science input.* This challenge remained largely unresolved. Over time, the role of the Science Team adapted to catch up to the planning process. The next three challenges resulted, at least in part, from this problem.
- *There was no Project funding for implementing a significant research program of applied studies during planning.* As noted earlier, funds for research during planning were not budgeted. The Project managers and Science Team members have been working to meet this challenge by freeing up some Project monies and seeking other funding sources outside the Project. Identifying key uncertainties and critical applied studies to address those uncertainties has been instrumental in garnering funds from other sources. The South Bay Salt Pond Restoration Project, at least for the foreseeable future, will not have a dedicated pot of money for research. To implement applied studies, the Project will need to first identify research needs and then seek the funding.
- *Role of the Science Team with respect to Consultant Team work was unclear.* The fast-paced planning process and uniqueness of this Project resulted in unclear interaction rules for these two Teams. Some level of this problem was inevitable, given the organic nature of large interdisciplinary projects. Recent focus on the EIR/S process has clarified how the work of the two Teams should be integrated.
- *There was no clear mechanism/process to interpret monitoring and applied studies data for use by managers during the ISP, for NEPA/CEQA or adaptive management.* The Project managers are working in 2006 to develop these processes, which are essential for

adaptive management decision-making. In the near future, the Science Team is likely to take on the role of data synthesizer and interpreter for the Project managers.

Future Science Team Activities and Roles

In 2006 and early 2007, most of the Project's work will focus on completing the EIR/S process. A number of complementary Science Team and Consultant Team products are being integrated for incorporation into the EIR/S documents and Adaptive Management plan. Appendix 2 gives the schedule of Science Team tasks and products, as known in June 2006. The EIR/S process has provided clear direction on how the roles of the Science and Consultant Team dovetail at this point in the planning phase.

As the planning process winds down, the best future use of the Science Team's abilities is expected to be:

- 1) Coordinating peer reviews of the reports produced from Project-sponsored monitoring and applied studies, and
- 2) Synthesizing existing information, including Project-sponsored monitoring and applied studies reports. Based on these syntheses, the Science Team would provide the Project managers with recommendations on how findings can be incorporated into Project planning and implementation, suggestions for further analyses of existing information, and recommendations for future monitoring and applied studies.

In short, the Science Team should begin evolving from a planning-focused group to an adaptive management Science Team. The role of the Science Team in the future has not been clearly defined nor have the mechanisms by which scientific information will be incorporated into Project decision-making. As a step toward defining future roles, the Project managers held an Institutional Retreat in May 2006 to begin refining the adaptive management structure. The Science Team will assist in developing the final institutional structure for effectively implementing peer review and Science Team recommendations. The final Adaptive Management Plan will clearly describe the roles and processes required to successfully incorporate science and other information into adaptive management decision-making.

Because applied studies are critical to the Project and because the Project is not endowed with a research fund, Science Team members may be involved in locating funding sources and/or researchers interested in applied studies relevant to the South Bay. By mid-2006, the Science Team, Consultant Team and Project managers will have completed a refined list of applied studies. With these research needs clearly identified, the Project is now in position to link potential funding sources with expertise to address key uncertainties. The Science Team should consider what approaches may be most efficient for achieving these connections over the short and long-term.

SOUTH BAY SALT POND RESTORATION PROJECT SCIENCE TEAM MEMBERS

Lynne Trulio, Lead Scientist	San Jose State University
John Callaway	University of San Francisco
Joshua Collins	San Francisco Estuary Institute
Edward Gross	Environmental Consultant
Bruce Herbold	US Environmental Protection Agency
Michael Josselyn	WRA, Inc.
Frederic Nichols	US Geological Survey (ret.)
Mark Marvin-DiPasquale	US Geological Survey
David Schoellhamer	US Geological Survey
Cheryl Strong	San Francisco Bay Bird Observatory
John Takekawa	US Geological Service
Dilip Trivedi	Moffat and Nichol
Nils Warnock	PRBO Conservation Science

APPENDIX 1: Charter for the Science Team (01/27/05)

Mission of the Science Team:

Provide guidance on ongoing short-term planning activities and develop a Science Program for the collection, synthesis and dissemination of best possible scientific information to support long-term restoration activities and adaptive management such that the objectives of the South Bay Salt Pond Restoration Project can be achieved.

Purpose of the Charter:

The mission of the South Bay Salt Pond Restoration Project is to provide a publicly supported and scientifically sound planning process. While long-term science implementation can be planned and executed through an appropriate scientific review process, the pace of the short-term planning process does not allow for a thorough scientific review of planning documents.

This charter clarifies the role of the Science Team in the review of documents in the short-term planning process and emphasizes the role of the Science Team in long-term adaptive management and science implementation. The roles described here mirror the recommendation of the NSP, in their November 2004 report, that "review of the consultant's products should not be a priority for the Science Team given their need to focus on the science syntheses and other tasks."

Roles of the Science Team:

1. Science Development and Implementation Role. The Science Team is best suited to developing and implementing a long-term Science Program that will provide adaptive management and scientific information needed to address uncertainties in achieving the project objectives. This primary role of the Science Team is described thoroughly in the *Draft Science Plan* (dated September 30, 2004) for the Restoration Project. Key components of science development and implementation are:

- Develop the Adaptive Management Plan and Scientific Information Collection Program.
- Prioritize those questions that require more scientific investigation to reduce project uncertainties for PMT review. Ultimately, the PMT will determine the questions that will be addressed through further study.
- Oversee a competitive proposal process for research activities related to data collection and analysis, information synthesis, and modeling strategies, and undertake science outreach which will include workshops, conferences and other activities that advance South San Francisco Bay ecosystem restoration science.
- Provide and review scientific information developed for public outreach.

2. Review Role with respect to Selected Consultant Team Documents. Science Team members will review Consultant Team documents or segments of those documents as appropriate. Such review can be time consuming and will not occur for all documents nor will all Science Team members be involved in the review of any particular document. Consultant Team presentations to the Science Team and subsequent discussion do not equate to peer review by the Science Team. Formal document review by the Science Team will follow one of two procedures:

A. *Science Team-Consultant Team Loop--*

- The Science Team or subset of the Team reviews a specific Consultant Team document.
- Science Team comments are provided in a letter or memo to the PMT.
- The PMT gives the Science Team comments, along with its own comments, to the Consultant Team. The Consultant Team will prepare a response to Science Team and PMT comments and provide them to the PMT.
- The Science Team reviews the Consultant Team's response to Science Team comments, to determine if comments were accurately understood and whether they will be addressed appropriately, and provides a letter or memo to the PMT.
- The Consultant Team finalizes its document(s).
- The Science Team provides a synopsis of its review of the final document and the extent to which the Consultant Team addressed Science Team comments on the draft document. This synopsis should be appended to the final public review document. While the Consultant Team may not have the time to address all the Science Team comments, there may be risk to the Project when comments are not addressed. Thus, where possible, the Science Team synopsis will discuss the risks associated with comments not addressed by the Consultant Team.
- *This type of interaction equates to peer review by involved Science Team members.*

B. *Public Comment Procedure*—Science Team members may also provide comments on Consultant Team documents during the public comment period. The Consultant Team will address these comments just as they would any other public comment. *This type of interaction does not equate to peer review by the Science Team.*

3. Advisory Role of Individual Science Team Members. Science Team members may provide *ad hoc* advice to the Consultant Team through informal interactions or formal collaboration. In either case, the final Consultant Team documents must state clearly the specific members of the Science Team who provided advice on the document. Individual members do not speak for the Science Team and *this type of interaction does not equate to peer review by the Science Team.*

Responsibilities of the Science Team:

Members will:

- Assist in developing Science Team products that support science development and implementation. This is a primary and mandatory responsibility.
- Participate in advising the Consultant Team, to the extent that they are able.
- Participate in reviewing Consultant Team documents and provide comments, to the extent that they are able.
- Attend Science Team meetings.
- Interact in a constructive and collegial manner with all contributors to the South Bay Salt Pond Restoration Project. This will include occasional involvement in clarifying scientific issues during public involvement.

APPENDIX 2: Schedule of Science Team and Related Activities in 2006 (06/22/06)

In 2006, the Project is focused on developing the EIR/S and AMP for the overall restoration project and Phase 1, and the associated Record of Decision. The overall goal for the Science Team in 2006 is to support that effort by ensuring that existing data are made available to the Project and by providing comment and direction on work going into the EIR/S process.

Lynne Trulio and/or the Consultant Team, as appropriate, will produce the draft work products. The primary role of the Science Team will be to provide direction on and review the products. A subteam of the Science Team may accomplish the initial review of a product, but the revised product will then go to the full Science Team for comment and revision.

Objectives of 2006 Science Team Activities:

- Ensure existing data are made available to the PMT and Consultant Team for use in the EIR/S and AMP.
- Integrate work of the Science Team and Consultant Team for the EIR/S and AMP.
- Provide advice to the PMT on specific products and tasks, as required.

Science Team Activities and General Timeframes for work:

- Review and provide comments on Phase 1 actions (Dec 2005-June 2006)
- Review and provide comments on modeling associated with landscape-scale predictions and with Phase 1 actions (Feb-Nov)
- Work with PMT and USGS to ensure that monitoring data collected for the Project (Dec 2005-Sept 2006) are synthesized, interpreted and publicly disseminated in useful formats.
- Host a South Bay Science Symposium to highlight data and analyses useful in the EIR/S process
- Integrate the key uncertainties and hypotheses for Applied Studies developed by the Science Team and Consultant Team (Jan-May)
- Develop plan for monitoring based on restoration targets and management triggers (Feb-Aug)
- Provide comments on revised institutional structure for AMP (April-Aug)
- Finalize AMP (Aug-Nov)

Science Team Meetings in 2006 with Primary Focus and Meeting Product:

January 17:	Phase 1 comments; report produced
March 13:	Review Applied Studies List document
May 22:	Finalize Applied Studies List; Begin Draft Monitoring and Restoration Targets Plan
June 13:	Review and comment on Phase 1 Applied Studies and Restoration Techniques
July 17:	Review Revised Monitoring and Restoration Targets Plan
Aug:	Finalize Monitoring and Restoration Targets Plan
September:	Review Revised Draft AMP; provide written comments
October:	Draft AMP provided for Admin. Draft EIR/S
November:	Review Draft AMP; finalize document for EIR/S and ROD

Other Relevant Meetings:

March 14:	Meeting with John Takekawa's USGS group to discuss monitoring results and analysis
April 18:	Social Science Workshop
May 2:	PMT's Institutional Retreat to discuss long-term institutional structure
June 6:	South Bay Salt Pond Science Symposium
Aug:	Peer Review of Landscape Scale Geomorphic Assessment
Sept-Oct:	NSP Meeting