

THE  
*Baylands*  
AND  
*Climate Change*



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WHAT WE CAN DO

BAYLANDS ECOSYSTEM HABITAT GOALS  
SCIENCE UPDATE 2015



PREPARED BY  
THE SAN FRANCISCO BAY AREA  
WETLANDS ECOSYSTEM GOALS PROJECT

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## FOREWORD

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Climate change is altering the natural world at an accelerating pace, particularly in low-lying coastal areas like San Francisco Bay. Today management of the bay's shores must account for a future of rising sea levels and more extreme weather events while continuing to address the challenges posed by the demands of a growing urban population. Climate-change science has advanced greatly since the 1999 Baylands Ecosystem Habitat Goals were developed, spurring the need for a technical synthesis of climate-change projections and updated recommendations. The findings of this Science Update indicate clearly that restoring a vibrant and functioning baylands ecosystem will make our future shorelines more resilient to these stresses. Baylands restoration is not a luxury but an urgent necessity as ecological change accelerates.

This Science Update documents and celebrates the remarkable progress made toward achieving the 1999 Baylands Ecosystem Habitat Goals over the past decade and a half. Restoration managers have begun to reverse over a century of habitat loss in the baylands, recommitting tens of thousands of acres to the natural world through a comprehensive and adaptive restoration approach that enhances wildlife habitat, recreational opportunities, water quality, and flood protection.

The variety of uncertainties affecting the baylands requires transitioning from a static to a dynamic approach to planning, one that values flexibility and innovation. An increased commitment to long-term collaboration among diverse regional and local constituencies is essential, as is a willingness to study and learn from our inevitable missteps. This Science Update identifies strategies that are within the current experience of restoration managers but also calls for novel actions that are well beyond the scope of previous activities. Such a bold vision—along with improved

monitoring, governance, and financial investment—is required for an estuary that will support a thriving economy and quality of life in the more dynamic environment that the region now faces.

Achieving such a bold vision will require great focus and long-term resolve, and the successes in restoring the estuary to date show that local managers can devise solutions, learn their strengths and



Restoration of the baylands will be increasingly important in the coming century.

weaknesses, and expand actions when policy, funding, science, and regulation align effectively. The Science Update, however, highlights many unmet needs in achieving such an effective alignment. The scope and pace of scientific experimentation and monitoring must increase, relevant policies and regulations must support innovative strategies, and efficient and cost-effective paths to implementation are critical. In addition, it is quite possible that the pace of climate change will be faster than currently projected or that efforts to effectively mitigate its impacts will lag.

Consequently, now is the time to prepare to adapt—to experiment with new ideas and learn what novel techniques can be most effectively scaled up. We must also act quickly to implement the strategies known to work, to give the baylands the best chance to take advantage of current conditions while they last. At the same time, long-term opportunities to envision the shoreline will take decades to realize, and planning must begin now.

This Science Update is a nonregulatory, voluntary effort to point the Bay Area toward a more resilient future, with strategies that were developed over several years by several hundred experts and practitioners in the region. It is a first step on a long journey to learning how to live, work, and play with a changing estuary, an estuary where ecological processes and ecosystems are used to best advantage.

This region has the distinct advantage of a populace that recognizes the critical importance of the San Francisco Bay estuary and baylands to its economy and quality of life. We invite you to participate in this, the journey to our future bay.

*The Baylands Ecosystem Habitat Goals Steering Committee  
October 2015*

# Baylands Goals Science Update

SCIENCE REVIEW PANEL

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October 2015

The San Francisco Bay ecosystem represents habitat of national and global significance as well as providing important ecosystem services for the region. The 1999 Baylands Ecosystem Habitat Goals report was a seminal document that provided a comprehensive scientific vision for non-tidal and tidal wetland restoration in the baylands ecosystem. This update incorporates new science available since that report and addresses the challenges resulting from the present-day understanding—of climate change and other key drivers—needed to maintain a resilient bayland ecosystem through 2100. The Science Review Panel (SRP) was convened to review the science included in the updated report, identify gaps in the individual chapters, and provide feedback to the Chapter authors and the Steering Committee. The SRP met twice with the Workgroup Chairs to review initial chapter drafts and to discuss issues, concerns, and feedback about our impressions of the scientific concepts, content, and general organization of the individual chapters. The SRP provided a written report and series of recommendations for the entire draft.

The Baylands Goals Science Update includes the work of over 100 scientists who represent an outstanding cross section of expertise and experience in the San Francisco Bay area. A considerable amount of work has been invested in the Baylands Goals Science Update, which reflects the wealth of new information available since 1999. The SRP was able to engage in robust discussions with the Chapter leads about the scientific information in their chapters. We commend all the authors and contributors for their efforts in completing this report, which represents a critically important long-term vision and consensus scientific basis for guiding the development of a resilient ecosystem that can respond to the environmental challenges of the 21st century. We fully expect that as the scientific understanding of these systems and their physical drivers change through continued research and monitoring, further updates will be produced and used in an adaptive management feedback process.



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*Please forgive any unintentional omissions.*



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- ▶ **New Understanding—The Baylands and Climate Change: Appendices**
  - Appendix A: Process for Updating the Baylands Goals
  - Appendix B: Change in the Extent of Baylands Habitat
  - Appendix C: Changes in the Configuration of Baylands Habitats
  - Appendix D: Future Scenarios Evaluated
  - Appendix E: Habitat Types
  
- ▶ **Science Foundation Chapters**
  - Chapter 1: The Dynamic Workings of the Baylands
  - Chapter 2: Projected Evolution of Baylands Habitats
    - Appendix 2.1: Vertical Accretion Models of Future Marsh Evolution*
  - Chapter 3: Connections to the Bay
    - Appendix 3.1: Case Studies*
  - Chapter 4: Connections to the Watersheds: The Estuarine–Terrestrial Transition Zone
    - Appendix 4.1: Recommended Definition of the Estuarine–Terrestrial Transition Zone Guiding Principles and Criteria*
    - Appendix 4.2: Profiles of the Transition Zone Types*
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  - Chapter 5: Risks from Future Change for Wildlife
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