

June 16, 2016

John Laird, Secretary for Natural Resources Chair, California Ocean Protection Council California Resources Agency 1416 Ninth Street, Suite 1311 Sacramento, CA 95814

Via Electronic Submission: COPCpublic@resources.ca.gov

RE: Investment in Ocean Acidification and Hypoxia

Dear Secretary Laird and Members of the Ocean Protection Council:

The Center for Ocean Solutions congratulates the Ocean Science Trust and the Ocean Protection Council on their partnership and leadership behind the Ocean Acidification and Hypoxia Panel (Panel) at the state, regional, and federal levels. It is a true demonstration of California's innovative science to decision-making model and leadership nationwide. We laud the Ocean Science Trust and the Ocean Protection Council in their work to understand priority science needs and engage the Panel in developing actionable ideas and products to address them.

As you know, the Panel has delivered an urgent call to action, and we have a narrow window within which to harness the momentum and respond across the government, NGO, industry, and research communities. Not only must we work diligently to implement the Panel's Recommendations and Actions, the state must challenge itself to develop a vision for our ocean and coast under changing conditions. In California we have the opportunity to utilize our network of MPAs to understand how changing ocean chemistry impacts species and ecosystems, and assess their ability to confer ecological resilience in the face of change. We are also poised to demonstrate leadership as a state to protect critical coastal habitats (e.g., seagrass beds and marshes) that may ameliorate ocean acidification, remove carbon, and provide protection or nursery grounds for vulnerable species; protect water quality; develop climate-ready fisheries; and build consideration of ocean acidification and hypoxia into land-use management and mitigation.

The partnership between the Ocean Science Trust and the Ocean Protection Council is well-positioned to coordinate state agencies to more effectively protect ocean and coastal health. We congratulate the Ocean Protection Council on the actions they are already taking, and urge

continued innovative policy vision and leadership going forward. We look forward to seeing the partnership between the Ocean Protection Council and the Ocean Science Trust continue to thrive in their stewardship of the Panel's Recommendations and Actions to ensure they are implemented in full. We urge you to be bold, and emphasize that the Center for Ocean Solutions and the greater community is here to help inform the process and collaborate with the state on addressing the critical challenge of changing ocean conditions.

Sincerely,

Ashley Erickson, JD

Assistant Director for Law & Policy

Center for Ocean Solutions

Larry B. Crowder, PhD

Science Director

Center for Ocean Solutions

Lany B. Crowden

California Ocean Protection Council



June 27, 2016 Item 5

The Honorable John Laird, Chair California Ocean Protection Council California Resources Agency 1416 Ninth Street, Suite 1311 Sacramento, CA 95814

Re: Ocean acidification and hypoxia

Attachment: April 18 SAT workshop summary

Dear Chairman Laird and Members of the Ocean Protection Council,

On April 18, the Ocean Protection Council Science Advisory Team (SAT), convened by Ocean Science Trust, came together with Ocean Protection Council (OPC) staff, agency leaders, and additional experts to discuss how to prepare for climate and global change. As farmers and fishermen have known for centuries, climate fluctuations are both important and normal. But humans are also affecting climate by increasing atmospheric carbon dioxide (CO₂), and the biological consequences for the ocean are not at present predictable and could be potentially catastrophic. Additional threats to the marine environment come from exploitation and pollution. Human-derived atmospheric CO₂ also acts as a pollutant, getting absorbed by the ocean at an alarming rate leading to so-called ocean acidification. Scientists have also reported steady decreases of oxygen at depth in coastal California waters and have linked these to increased degradation of organic matter. Degradation of organic matter leads to further increases in CO₂ compounding the acidification problem. Reducing oxygen to low (hypoxic) levels creates a separate and additive threat to West Coast marine ecosystems.

A major focus of the April 18 SAT workshop was on the "Major Findings, Recommendations, and Actions" of the West Coast Ocean Acidification and Hypoxia Science Panel (the OAH Panel), and on identifying and prioritizing potential next steps. Three years ago when the OPC called upon Ocean Science Trust to convene experts to discuss the state of the science of ocean acidification and hypoxia (OAH), and potential action items – Ocean Science Trust started with the SAT. They called upon us to provide guidance in establishing what then became the OAH Panel, and to scope its work (SAT workshop, November 19, 2012). SAT member, Dr. Alexandria Boehm (Stanford University) served as co-chair of the Panel, and SAT members Drs. Stephen Weisberg (Southern California Coastal Water Research Project) and Gretchen Hofmann (University of California, Santa Barbara) were among the 20 panelists from across the West Coast brought together to carry out this effort.





The main message of the OAH Panel is that we must indeed prepare for change on multiple fronts. OAH are examples of on-going and widespread changing ocean conditions that are expected to grow in intensity, particularly along the West Coast, where regional circulation patterns and processes dramatically heighten potential effects. While our understanding of changing ocean conditions is accelerating at a rapid rate, how these changes might impact the species, ecosystems, and coastal communities is still the subject of ongoing research. Decision-makers must have access to a mobilized and interdisciplinary scientific community to synthesize new knowledge as it emerges, and translate it into strategic, coordinated, management and policy actions at the local, state, and regional levels.

Working with Ocean Science Trust, the SAT is well positioned to continue to move the OAH Panel's work forward and to provide the scientific leadership needed to guide the State as it prepares to deal with OAH and other concerns associated with changing ocean conditions. The interdisciplinary nature of the SAT brings the diversity of perspectives and creative thinking necessary to confront this challenge at short and longer scales. The term "horizon-scanning" – looking further into the future – emerged from the workshop as an activity agency leaders agreed was well suited to the SAT. Further, changing ocean conditions is an all hands on deck challenge with myriad scientific questions. As your conduit to the broader scientific community, the SAT (with support from Ocean Science Trust) is prepared to link decision-makers to our colleagues across many fields of expertise to ensure your access to the best available science. And, we are relying upon the OPC and the Ocean Science Trust to continue to expand the range of agencies and state entities that can benefit from the scientific work of the SAT.

The OAH Panel report indicates that there are actions we can take now, and we urge bold follow up on the OAH Panel's recommendations. The SAT is in the process of creating working groups to address the highest priority recommendations identified at our recent workshop (brief workshop summary also attached to this letter), including:

- exploring potential roles and importance of aquatic vegetative habitats in ameliorating ocean acidification and storing carbon, among other ecological benefits;
- incorporating OAH considerations into marine protected area monitoring statewide to track changing ocean conditions and associated impacts; and
- addressing science needs to revise water quality criteria to incorporate OAH.

In addition to the OAH Panel and its work, the SAT is also engaged on several other management fronts involving issues driven by changing ocean conditions. Currently underway are two active SAT working groups examining:

- how to incorporate climate variability and change into fisheries management; and
- science needs related to managing in the face of harmful algal blooms.

In conclusion, the SAT lauds the OAH Panel for making tangible – and actionable – recommendations to confront OAH up and down the West Coast. We commend the Ocean Protection Council and its staff for your commitment to the OAH Panel, the SAT, and to advancing the role of the best available and independent science in decision-making. We also commend Ocean Science Trust in convening and positioning the OAH Panel to inform high-level decision-makers at the state, regional, and federal levels.

As the current leadership team for the SAT, we look forward to continuing our interaction and to responding to your science needs, as we work together to address the impacts of changing ocean conditions and other marine issues of environmental concern. We also pledge to continue to use the

SAT's scientific expertise in collaboration with Ocean Science Trust to proactively identify and raise emerging issues. Our goal is to provide the science needed to best position the State as it moves forward in addressing current and future impacts of changing ocean conditions and other threats to California's marine species, ecosystems and coastal communities.

Best Regards,

Dr. Francisco Chavez

Co-chair, OPC Science Advisory Team

Senior Scientist, Monterey Bay Aquarium Research Institute

Tom Maloney,

Co-Chair, OPC Science Advisory Team

Thomas Allra Cour

Science Advisor, OPC

Tevan N Mimay

Executive Director, California Ocean Science Trust

Dr. Steven Murray,

Co-chair, OPC Science Advisory Team

Interim Provost and Vice President for Academic Affairs, Professor of Biology Emeritus, California State University, Fullerton

Dr. Karina Nielsen

Co-chair, OPC Science Advisory Team

Director and Professor, Romberg Tiburon Center for Environmental Studies, San Francisco State University

Ocean Protection Council Science Advisory Team

Workshop: Bracing for a changing world

April 18, 2016 10:00AM - 5:00PM

Hosted by California Ocean Science Trust Elihu M. Harris State Building, Room 1, Oakland, CA

Workshop Participants

SAT Executive Committee: F. Chavez (Co-chair), K. Nielsen (Co-chair), M. Carr (Co-chair Emeritus)

Other SAT Members: R. Ambrose, A. Boehm, D. Cayan, H. Doremus, J. Field, B. Fraley, G. Griggs, M. Hall-Arber, G. Hofmann, S. Johnson, B.W. McCovey, S. Murray, J. Paduan, J. Schubel, J. Stachowicz, C. Striplen, W. Sydeman, S. Weisberg

State Participants: D. Aseltine-Neilson (California Department of Fish and Wildlife), L. Bedsworth (Office of Planning and Research), J. Bishop (State Water Resources Control Board), J. DeLeon (State Lands Commission), D. Halberstadt (Ocean Protection Council, California Natural Resources Agency), B. Ota (California Department of Fish and Wildlife), M. Small (State Coastal Conservancy)

Ocean Science Trust Staff: H. Carter, M. DeLapa, B. Duncan, S. Finstad, E. Knight, D. Liebowitz, E. Meyer, R. Meyer, E. Ramanujam, L. Sievanen, M. Villarreal, S. Wheeler, E. Whiteman

SAT workshops are open to the public.

Workshop Summary

The impact and relevance of the Ocean Protection Council Science Advisory Team (SAT) has grown substantially over the last five years. From ocean acidification and hypoxia (OAH), to sea-level rise and sustainable fisheries, the SAT has advanced science-informed actions on a wide array of state priorities. However, as the threat of climate change looms ever larger over our ocean and coast, the State increasingly recognizes the need to work even more closely with the scientific community. At this workshop, Ocean Science Trust brought the SAT together with decision-makers to:

- reflect upon the SAT's progress as the State's conduit to the scientific community, refine its vision and discuss its working procedures; and
- conduct a deep dive into the final Recommendations and Actions of the West Coast Ocean Acidification and Hypoxia Science Panel (the Panel) to identify next steps that the SAT can carry forward.







Part I: Reflecting on the SAT's Progress and Improving Its Value to the State

The partnership among the Ocean Protection Council (OPC), Ocean Science Trust and the SAT is a unique and innovative model for science advice and integration into ocean management and policy. The impact of the SAT has grown significantly over the last five years, with an increasing demand for working groups over a broader range of topics.

Next Steps: SAT Working Procedures

Ocean Science Trust, the OPC and the SAT will work together to develop a Working Procedures document that will articulate and formalize:

- the role and value of the SAT, including it's role in identifying emerging issues on the horizon to help the State recognize and potentially get ahead of issues;
- processes for convening working groups, providing review of products, and identifying what constitutes a SAT product; and
- the pathways for external partners to engage with the SAT, solicit guidance and use it as a resource for independent scientific expertise.

This document will be widely disseminated among ocean and coastal management agencies, and the public.

Part II: Carrying Forward the Work of the West Coast Ocean Acidification and Hypoxia Science Panel

On April 4, <u>the Panel</u> released its <u>Major Findings, Recommendations</u>, <u>and Actions</u> following three years of scientific synthesis and discussion. At this workshop, the SAT established itself as the successor of the Panel, ready to work with the State and West Coast region to take comprehensive action in the face of changing ocean chemistry.

Next Steps: Taking Action on Multiple Fronts

The Panel urged action on multiple fronts. A strategic approach should balance political opportunity, leverage existing projects, and support new collaborations and research to address knowledge needs. The SAT is already engaged on issues related to changing ocean conditions through the climate change and fisheries working group and the harmful algal blooms working group. At this workshop, the SAT and decision-makers examined the Panel's Recommendations for follow-up work and identified three additional priority areas around which to focus work in the coming year:

- Establish a working group to explore the ability of aquatic vegetated habitats to remove carbon from seawater and ameliorate ocean acidification (Panel Recommendation 2: Advance approaches to remove CO₂ from seawater)
- Address science needs to revise water quality criteria (Panel Recommendation 3: Revise water quality criteria)
- Establish a working group to build OAH considerations into statewide marine protected area (MPA) monitoring and research (Panel Recommendation 5: Advance adaptive capacity of marine species and ecosystems).



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Item 5

June 28, 2016

John Laird, Secretary for Natural Resources Chair, California Ocean Protection Council California Natural Resources Agency 1416 Ninth Street, Suite 1311 Sacramento, CA 95814

RE: West Coast Ocean Acidification and Hypoxia Science Panel

Dear Secretary Laird and members of the Ocean Protection Council,

I am writing to offer the Conservancy's strong support for the Ocean Protection Council (OPC) and Ocean Science Trust (OST) partnership to take action to address ocean acidification and hypoxia.

We congratulate the partnership on executing the West Coast Ocean Acidification and Hypoxia Science Panel (Panel), which recently released a report, distilling three years of scientific study and concluding that ocean acidification and hypoxia (OAH) intensity will increase over time. The report presented a suite of recommended actions based on the best available science to address this significant challenge, and is a demonstration of California's innovative science to decision-making model.

This Panel has initiated momentum on addressing this issue and has redefined the conversation from ocean acidification as a discrete threat to the broader challenge we face regarding changing ocean chemistry and the many resources and species at risk. The Conservancy, in partnership with lead author Brent Hughes at the University of California, Santa Cruz, recently published a comprehensive study of a major California estuary, Elkhorn Slough, that documents the links between nutrient runoff from coastal land use, the health of the estuary as a nursery for young fish, and the abundance of fish in an offshore commercial fishery (PNAS, 2015). These findings suggest that improvements in land management and reductions in nutrient runoff could directly benefit estuaries and indirectly benefit offshore fisheries due to the important role of estuaries as nurseries for some species.

In order to confront the growing issue of OAH and the associated impacts to coastal and marine ecosystems, the Conservancy urges bold action following the release of the Panel's report. OPC, in partnership with OST, must lead the implementation of the Panel's Recommendations and Actions. In addition, the State must develop a comprehensive vision for our ocean ecosystems under rapidly changing conditions and develop a strategic action plan that includes:

• the development of climate-ready fisheries that include more responsive decision-making tied to a diverse set of indicators;

- the utilization of our network of MPAs to understand how changing ocean chemistry impacts species and ecosystems, and an evaluation of their ability to provide ecological resilience in the face of change;
- the protection of water quality by including consideration of OAH into land-use management and mitigation and improving the dialog between land managers and ocean managers; and
- the protection of critical coastal habitats that may remove carbon, ameliorate ocean acidification, and provide protection grounds for at-risk species.

The issue of OAH is of significant importance for California's marine ecosystems and for the fisheries that rely on them, therefore we fully support the Panel's recommendations to take action to address the impacts of changing ocean conditions on coastal and marine ecosystems. We applaud OPC and OST on the actions already taken, and urge continued implementation of innovative policy visions, coordination of the scientific community, and leadership going forward.

Sincerely,

Michael Bell

Michael Bell Oceans Program Director The Nature Conservancy California Coastal & Marine Program



725 Front Street Suite 201 Santa Cruz, CA 95060 831.854.4630 Telephone 831.425.5604 Facsimile www.oceanconservancy.org

June 28, 2016

To: Ocean Protection Council

Re: Item 5. Informational Item: Update on OPC's investment in ocean acidification

and hypoxia

Dear Secretary Laird and Councilmembers:

We write to recognize the ongoing fruitful partnership between the Ocean Science Trust (OST) and the Ocean Protection Council (OPC) and express our strong support for their continued efforts to take action to address ocean acidification and hypoxia. Ocean Conservancy is committed to raising awareness about the impacts of ocean acidification on healthy oceans and promoting action to help coastal communities respond to these challenges.

Stewarded by OST, the West Coast Ocean Acidification and Hypoxia Science Panel (Panel) recently released a report concluding that ocean acidification and hypoxia (OAH) will grow in intensity over time, particularly along the West Coast. This report produced a suite of concrete steps that the state can take to confront this growing challenge.

The partnership between the Ocean Science Trust and the Ocean Protection Council to work with the Panel to advance OAH science and policy recommendations is a true demonstration of California's innovative "science to decision-making" model and leadership. In particular, OST's work across multiple agencies and policy entities uncovered priority science needs and paved the way for the Panel to develop actionable ideas to address them.

The Panel's findings represent an urgent call to action. We now have a narrow window to harness that momentum and take bold steps to implement those recommendations. Ocean Protection Council, in ongoing collaboration with OST, must play a leadership role in implementing the Panel's Recommendations and Actions. Furthermore, the state must challenge itself to develop a broad and forward-looking vision for our ocean and coast under changing ocean conditions and put forward a plan to advance action on multiple fronts. These efforts should:

• use California's network of MPAs to understand how changing ocean chemistry affects species and ecosystems, and assess the ability of protected areas to enhance resilience in the face of ocean change;

- protect critical coastal habitats (e.g., seagrass beds and marshes) that may ameliorate OA, remove carbon, and protect nursery grounds for vulnerable species;
- protect water quality by incorporating OAH into land-use management and mitigation, and;
- evolve fishery management so the state's fisheries are "climate ready".

Most importantly, by guiding and coordinating state agencies, the Ocean Protection Council can help ensure the cross-disciplinary, cross-agency action that is vitally needed to confront the totality of changing ocean conditions. OST can be a critical partner with the state in moving these efforts forward by providing access to credible independent science, coordinating input from the scientific community, and stewarding the Panel's recommendations.

We strongly support the actions the OPC and OST are already taking. We stand ready to help build support for addressing the critical challenge of our changing ocean going forward.

Sincerely,

George H. Leonard, PhD

Chief Scientist

Ocean Conservancy





State Water Resources Control Board

Item 5

June 28, 2016

The Honorable John Laird, Chair California Ocean Protection Council California Resources Agency 1416 Ninth Street, Suite 1311 Sacramento, CA 95814

Dear Chairman Laird,

On behalf of the State Water Resources Control Board (State Water Board), I congratulate the West Coast Ocean Acidification & Hypoxia Science Panel under the leadership of the California Ocean Science Trust in releasing its groundbreaking "Major Findings, Recommendations, and Actions." Recommendation 3; 'Revise Water Quality Criteria' falls within the State Water Board's jurisdiction.

I am writing today to express my support for this important Recommendation. The State Water Board is already putting the pieces in place to assess and where appropriate take action based on the best available science. Specifically, I have asked the Ocean Protection Council Science Advisory Team (SAT), as coordinated by Ocean Science Trust, to:

- identify the appropriate water quality parameters; and
- define thresholds for those parameters.

There is also a need to identify relevant thresholds for specific organisms of management concern. Another critical component is the need to monitor ocean acidification. Key questions the State Water Board needs resolved are:

- What are the environmentally relevant parameters that should be monitored to measure changes to water quality caused by ocean acidification and hypoxia?
- What are the local inputs that exacerbate ocean acidification and hypoxia? And do these local inputs have a measurable impact on coastal water quality?
- Does controlling or reducing local inputs have a measurable benefit on coastal water quality?

The answers to these questions would allow the State Water Board to understand the potential viability of and efficacy of local, water quality-based controls to address ocean acidification impacts.

I look forward to working with Ocean Science Trust and the SAT to tackle this work. I am also pleased that the SAT is forming a work group to build ocean acidification and hypoxia considerations into statewide Marine Protected Areas monitoring. I encourage that group to identify overlaps and link to monitoring of water quality protected areas in service of our priority questions.



In conclusion, I thank the Council, and Ocean Protection Council staff for your continued support and policy leadership.

Best regards,

Jonathan Bishop

Chief Deputy Director

State Water Resources Control Board

Division of Water Quality Division of Financial Assistance

















Item 5 June 28, 2016

John Laird, Secretary for Natural Resources Chair, California Ocean Protection Council California Natural Resources Agency 1416 Ninth Street, Suite 1311 Sacramento, CA 95814

VIA ELECTRONIC MAIL: COPCpublic@resources.ca.gov

Re: Item 5: OPC Investments in Ocean Acidification and Hypoxia

Dear Chair Laird and Ocean Protection Council Members:

California Coastkeeper Alliance (CCKA) strongly supports the Ocean Protection Council's (OPC) partnership with the Ocean Science Trust (OST) to develop key recommendations to address ocean acidification and hypoxia through the West Coast Ocean Acidification and Hypoxia (OAH) Panel. CCKA and California Waterkeepers work closely with OPC to support the development and implementation of critical ocean and coastal policies for California, including forthcoming work to implement the West Coast OAH Panel Report recommendations. Our organizations are deeply involved in local efforts to protect and restore coastal habitats, including seagrass restoration, and in efforts to monitor and protect water quality. We also look forward to the next phase of marine protected area (MPA) network utility as we study how changing ocean chemistry impacts marine life, and consider how MPAs may make our ocean more resilient to change.

The OST was instrumental in stewarding the OAH Panel to success, engaging key federal and regional entities while redefining the conversation from ocean acidification as a singular threat to the true challenge before us: changing ocean chemistry and the many resources and species at risk. The OST Panel Report distilled three years of scientific study to articulate priority science needs, lay out a roadmap for the Panel to put ideas and strategies into action to address those needs, and serve as an effective call to action based on the best available science. We now have a narrow political window to harness that momentum and heed this call to action to implement Panel Recommendations and Actions and develop a vision for our ocean and coast under changing conditions.

We strongly support OPC investment in actions on multiple fronts, including:

- Protect critical coastal habitats (e.g., seagrass beds and marshes) that may ameliorate OA, remove carbon, and provide protection or nursery grounds for vulnerable species;
- Protect water quality;
- Develop climate-ready fisheries; and
- Build consideration of OAH into land-use management and mitigation.

It will also be important for OPC to help state agencies understand and prepare for OAH and to work in a more integrated fashion to do so. As the convener of the Panel, OST efforts to steward Panel Recommendations to develop ocean acidification policies and management strategies based on credible, independent, rigorous science will also be essential. We support the partnership between the OPC and the OST to address OAH on the multiple levels—regional, state, and national—we will experience the change.

Sincerely,

Sara Aminzadeh, Executive Director

Because life is good.

Item 5

June 28, 2016

John Laird, Secretary for Natural Resources Chair, Ocean Protection Council California Resources Agency 1416 Ninth Street, Suite 1311 Sacramento, CA 95814 COPCpublic@resources.ca.gov

Re: Item 5. Informational Item: Update on OPC's investment in ocean acidification and hypoxia and community-wide strategies to adapt and respond to the impacts

Dear Secretary Laird and Councilmembers,

I write to express the Center for Biological Diversity's support for the work of the California Ocean Protection Council on ocean acidification, and to urge the Council to take strong action on the items recommended by the West Coast Ocean Acidification and Hypoxia Panel. In particular, we urge the Council to advocate for the adoption of new water quality criteria specific to ocean acidification.

Ocean acidification is one of the most pressing environmental issues of our time. The ocean's chemistry is changing faster than it has in the past 300 million years, imperiling species from corals and pteropods to shellfish and crabs. These changes threaten the health of our coastal ecosystems and industries that depend upon the marine environment. While we must ultimately reduce global carbon dioxide emissions to address the ocean acidification crisis, the Panel recognized the imperative to take action now at a state and local level.

In particular, the Panel highlighted the inadequacy of existing water quality criteria, calling the existing water quality criteria for pH "not scientifically valid for application to ocean acidification." Water quality criteria are the management foundation of the Clean Water Act, and provide water quality managers with a basis for assessing water body condition, determining the level of discharge that will maintain a water body in an ecologically acceptable condition, and objectively determining when a water body is impaired. Water quality criteria can also serve as targets for water body planning and mitigation projects. We urge the Ocean Protection Council to continue its partnership with the Ocean Science Trust to develop new water quality criteria based upon the best available science.

The Ocean Protection Council and the Ocean Science Trust have successfully stewarded the Panel towards the production of report that captures the urgency of the ocean acidification crisis, and distills the best available science into a call to action. Now, we urge the Ocean Protection Council to harness the momentum of the Panel's findings and implement the Panel's recommendations. The State and the Ocean Protection Council must continue to develop a vision for our ocean that protects coastal

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habitat and water quality, and guides and coordinates agencies in addressing the threats of ocean acidification.

Through its support of the Ocean Science Trust, the State has demonstrated that it cares about rigorous, independence science. We urge the Ocean Protection Council to continue its support of the Ocean Science Trust, and ensure that the recommendations of the Panel, including the development of new water quality criteria, are implemented in full.

Sincerely,

Emily Jeffers Staff Attorney

Center for Biological Diversity ejeffers@biologicaldiversity.org

(510) 844-7109