Deirdre Des Jardins

Independent, insightful, and transformative research and policy analysis on issues with California's developed water supply. Deep background in modeling, physics, and applied mathematics.

EDUCATION

BA, University of California, Santa Cruz, Applied Mathematics, 1992.
PhD Candidate, University of California, Santa Cruz, Machine Learning, Bioinformatics, and Complex Systems Theory, 1992-1997.

EXPERIENCE

Principal, California Water Research, 2011-present

Extensive research on climate change impacts on developed water in California. Thorough, original, and independent analysis addressing key policy questions relating to California's water supply through synthesis of scientific literature, agency reports, relevant computer modeling, and analysis of relevant data. Produced synthesis reports and fact sheets, as well as doing research for comment letters by many different environmental and fishing groups.

Senior Policy Analyst, Friends of Trinity River, 2010

Evaluated potential impacts of legislation sponsored by Senator Dianne Feinstein's Water Transfer legislation, to eliminate requirements that transfers of water under the CVPIA be limited to amounts which would have been consumptively used during the year or years of the transfer. Extensive research on South of Delta CVP and SWP water contracts, the Bureau's M&I shortage policy, and prior CVP contractors, including the Kern Water Bank and Semitropic.

SCIENTIFIC RESEARCH AND MODELING

Research Associate, Santa Fe Institute for Complex Systems and Computational Mechanics Research Group, 1994-1997

Theoretical physics research on a measure of complexity in dynamical systems. Involved both computational simulation of complex dynamical systems and synthesizing theory from statistical physics on phase transitions and critical phenomena with measures of memory from information theory and the theory of computation.

Graduate Student Researcher, NASA Ames Research Center, Summer Internship, 1992 and 1993

Application of a NASA developed simulation of airflow over the wing of an airplane to investigate nonlinear vortex shedding and its effect on lift dynamics. The investigation was related to laboratory experiments on dragonfly flight. Internship as part of National Physical Science Consortium fellowship.

Graduate Student Researcher, Bioinformatics Research Group, University of California, Santa Cruz, 1992-1994

Worked on code representing protein sequences, as well as research on machine learning methods for finding structure in protein sequences. The group produced a Hidden Markov Model of protein

structures that was used by several biomolecular engineering companies.

Research Programmer, Center for Nonlinear Studies, Los Alamos National Laboratory, 1990-1991

Worked on large and complex code for nonlinear modeling of time series. The model used a local linear k nearest neighbors method to do short term forecasts. The model was useful in predicting currency market trends, and was later used to start the Prediction Company.

Undergraduate Researcher, Chaos Theory and Nonlinear Dynamics Research Group, University of California, Santa Cruz, 1989-1990

Implemented a model of growth of Nautilus seashell patterns using reaction-diffusion equations on a three dimensional spiral surface representing the shell.

AWARDS

National Physical Science Consortium Fellow 1992-1996
Armstrong Scholarship for Computer and Information Science, 1991

SELECTED WORK

Bay Delta Conservation Plan

***Bay Delta Conservation Plan comments on climate change assumptions,* October 30, 2015.** Reviewed current research on climate change for comments on the 2015 Revised Draft EIR/EIS. Research reviewed included recent studies mass loss in Greenland and West Antarctica from satellite observations, and resulting changes to predictions of sea level rise. Also reviewed recent studies on global climate models and climate sensitivity.

***Environmental Water Caucus comments on Draft Bay Delta Conservation Plan and Draft EIR/EIS, Section 4, Climate Change Analysis and Modeling Results,* June 11, 2014.** I contributed to the analysis in this section, which commented on the Bay Delta Conservation Plan's method of using perturbations of the historic hydrology to model future climate change.

***Dead pool and reservoir operations modelling,* August 2013.**
Evaluation of dead pool conditions in the 2013 Draft Bay Delta Conservation Plan modeling, and investigation of CalSim representation of reservoir operations. Analysis for Friends of the River. Produced fact sheet on BDCP and Droughts.

***Impacts on migrating Chinook and fish survival modeling,* April, 2012.**
Analysis of changes in modeled impacts on migrating Chinook. Analysis for PCFFA/IFR.

Climate Change impacts on the State Water Project and Central Valley Project

***Incorporating Drought Risk from Climate Change into California Water Planning,* August 2, 2012.**
The report compared modeled projections of areas of increased drought under climate change with the unprecedented droughts in Australia, Texas, New Mexico, and around the world. It noted that in California, many climate change models predicted increased frequency and severity of droughts, as well as markedly reduced stream flow and reduced reservoir inflows. The report made specific recommendations for incorporating drought risk into climate modelling and planning by the Department of Water Resources. The report was submitted to the California Department of Water Resources as part

of comments on the draft Climate Adaptation Strategy, and incorporated by reference in the Environmental Water Caucus Response Letter To The Final Delta Plan, Recirculated Draft Peir, And Rulemaking Package, January 14, 2013. The drought came to California the following year.

Ecosystem Impacts of Climate Change

Turning Point for the Delta: Critical changes leading up to the 2002 crash of pelagic fish populations, **June 2010.** A large reduction in Delta outflow in the Spring and Fall was associated with decreases in phytoplankton production in Suisan Bay. The emergence of harmful algal blooms in the Delta was associated with low flows and high nutrient inputs during an exceptionally warm and dry fall. Presentation to the National Academy of Science panel on Sustainable Water and Environmental Management in the California Bay-Delta for Friends of Trinity River and Revive the San Joaquin.

Hydrology

Waivers and Estimated Area of Origin Requirements, May-November 2014, **February, 2015.**
A critical question for consideration of the Temporary Urgency Change Petition in 2015 was how much stored water from Shasta was needed for in-basin uses with curtailment. Developed a spreadsheet which used gage data from USGS stations to calculate depletions on the Sacramento River from Keswick to Freeport. Compared depletions with Shasta inflow and Keswick releases to estimate needed releases of stored water. Presented to the State Water Resources Control Board as part of a panel with California Sport Fishing Protection Alliance and California Water Impact Network.

Analysis of controlling factors for Delta Exports**, Dec 2014.**
Analysis of the 2013-2014 report of the Delta Operations for Salmonids and Sturgeon technical advisory team showed that Delta water exports were governed by the biological opinions for Delta smelt and salmon just 36% of the time that they were in effect in the first half of 2014. Analysis for Restore the Delta press release, Dec 10, 2014.

History of the State Water Project and Central Valley Project

Water Supply for Diversions in the Delta by the Central Valley Project and the State Water Project, **October 26, 2012.** The report considered the water supply analyses for the original Central Valley Project and State Water Project permits, as well as State Water Project reports on augmentation of water supply, and looked at the reverse flows in the Delta, and how the San Joaquin River was being made to flow backwards, effectively acting as a point of diversion for the main stem of the lower Sacramento River. Involved extensive research into the history of the Bureau of Reclamation. Presented to the State Water Resources Control Board for the Workshop on the Bay-Delta Plan.

State Water Project Water Supply, **August 2012.** The report examined the initial planning for the Feather River and Sacramento-San Joaquin Delta Diversion Project, that became the State Water Project, and how and why the California Department of Water Resources was unable to obtain the supplemental supplies needed to fulfill the Table A entitlements in the State Water Project contracts. Involved extensive research into the history of the State Water Project. Produced for the Environmental Water Caucus.

Drought Impacts in the San Joaquin Valley

***Analysis of impact of drought and curtailments on crop production and the dairy industry in the San Joaquin River Exchange Contractors Water Authority service area*, July 6, 2015.** Synthesized information from the National Agricultural Statistics Service Cropscape data layer, USDA statistics, commodity prices, hay and pasture reports. Report submitted to the State Water Resources Control Board. Cited by California Sportfishing Protection Alliance.

***Myths and Facts about a Drought Year in the San Joaquin Valley*, January 2014.** Fact sheet on the complex causes of land fallowing on the west side of the San Joaquin Valley. The fact sheet synthesized information from agency reports, Dayflow data, and models of groundwater salinization to show that the agricultural industry in the San Joaquin Valley is being impacted by several long-term trends, including salinization of soil, depletion and contamination of groundwater, and increasing population growth and demand for water in Southern California cities. Published on the website of Save the California Delta Alliance.

***Myths and Facts about Land Fallowing in Westlands Water District*, August 2013.** Comparison of satellite maps showing that land fallowed in 2009 was retired land. Fact sheet for Congressional lobbying by Pacific Coast Federation of Fishermen, California Sportfishing Protection Alliance, Restore the Delta, and Salmon Water Now.

***Analysis of history of contracted water deliveries and cropping patterns of Westlands Water District*, May 2012.**
Analysis showed that due to the growth in permanent crops such as almonds, the permanent crops now take the entire allocation for the district in dry or below-normal years. Analysis for Restore the Delta.

***Mendota: Evidence that soil and groundwater salinization is the predominant cause of land fallowing*, June 2, 2011.** Compiled information from maps, satellite photos, USDA and other salinity investigations, which showed that the greatest concentration of fallowed land in Westlands Water District in 2009 was near Mendota, and that the fallowing in that area was associated with severe soil and groundwater impairment, and with land retirement. Released to the press by Restore the Delta.

***Myths and Facts About the 2010 Water Supply on the West Side of the San Joaquin Valley, Myths and Facts About Land Fallowing on the West Side of the San Joaquin Valley*, 2010.** Fact sheets for Congressional lobbying by a coalition of environmental organizations.

Independent analysis and reports on Climate Change and Drought

***Climate Change in the San Joaquin River Basin*, March 29, 2013.** The report cited evidence from recent climate change modelling and the historical record which indicated that precipitation and runoff patterns in the basin may have begun to shift to a more arid state. The report noted that dry periods in the San Joaquin River basin have been significantly drier in the past few decades, and there had been a corresponding increase in critically dry years. Almost immediately following this report, the basin entered a severe drought. The report was presented to the State Water Resources Control Board in comments on the Southern Delta Water Quality SED.

***Defining Water Supply Reliability Under Climate Change*, June 13, 2012.** The report examined recent climate change modeling of the Sacramento River basin and looked at the policy implications of the drier climate change scenarios in the context of evaluating water supply reliability. It was submitted for comments on the Sixth Staff Draft Delta Plan.

***Drought Impacts Briefing, Tulare Lake Region: Tule River Subbasin including East Porterville and Porterville*, March 5, 2015.** A synthesis of maps, satellite photos, and agency groundwater basin modelling information which showed that reduced flow from the Tule River and high groundwater use was likely the predominant cause of well failures in the Tule River subbasin. Report submitted to the State Water Resources Control Board.

INVITED ARTICLES

"Will the 'Cadillac Desert' become the 'Cadillac Oven'?" ***Sierra Club Yodeler,* July 23, 2013.**

The article noted that modeling for the 2009 California Climate Adaptation Strategy shoed that current peak temperatures seen in Death Valley–over 110°–could expand to most of the Inland Empire by 2070, and questioned the assumption in the Bay Delta Conservation Plan economic study that the Inland Empire would see the same rate of growth as in the boom years of 2000 – 2007, and that the new housing would have the same large lawns.

"Preparing for climate change in the Delta and its watersheds," ***Sierra Club Yodeler,* March 24, 2013.**

The article noted that some climate models project that drying has started in the central Sierra and will extend to the northern Sierra by the end of the century, and that more frequent and severe droughts in the Sierra Nevada would greatly impact not only the Sierran forests but also California's major rivers and the Delta, already under severe stress from water diversions.

PEER-REVIEWED JOURNAL ARTICLES

Martin Casdagli, Deirdre Des Jardins, Stephen Eubank, J. Doyne Farmer, John Gibson, Norman Hunter & James Theiler, Nonlinear Modeling of Chaotic Time Series: Theory and Applications, Los Alamos National Laboratory and Santa Fe Institute. USA. In Jong Hyun Kim and John Stringer, editors, Applied Chaos, pages 335¬380. John Wiley & Sons, Inc., 1992.