

Whether it's the bleakness of Death Valley National Park's Devil's Racetrack, left, or the tranquility of a mountain stream, right, California's array of habitats face enormous challenges as the world prepares for climate change. Environmental experts say the shift in weather will bring the possibility of rising tides, blistering summers and parched winters.

# Tracks, Splashes and

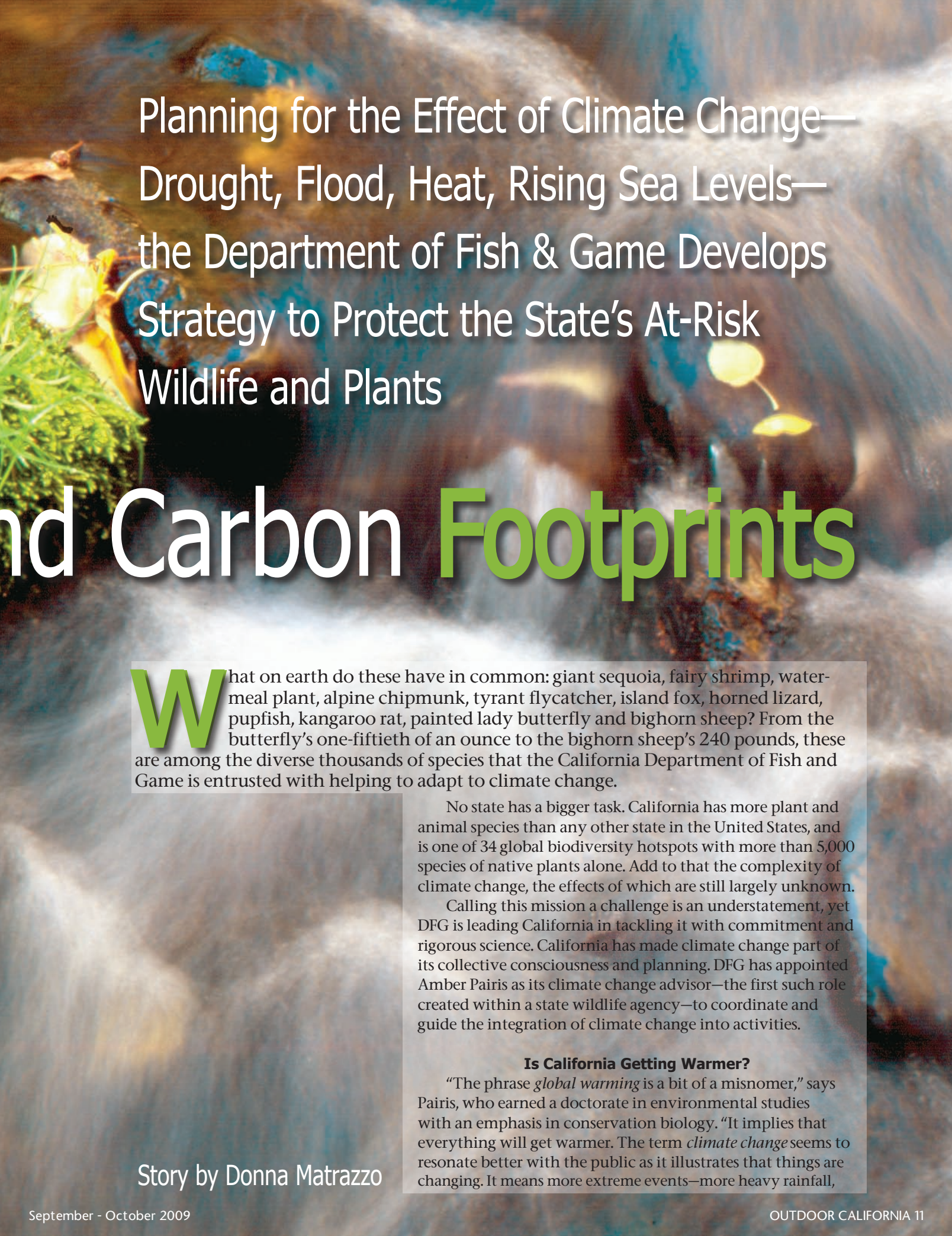
Photograph © Anna Bell Poynter

10 OUTDOOR CALIFORNIA

Photograph © Don Jackson

September - October 2009





Planning for the Effect of Climate Change—  
Drought, Flood, Heat, Rising Sea Levels—  
the Department of Fish & Game Develops  
Strategy to Protect the State's At-Risk  
Wildlife and Plants

# and Carbon Footprints

**W**hat on earth do these have in common: giant sequoia, fairy shrimp, water-meal plant, alpine chipmunk, tyrant flycatcher, island fox, horned lizard, pupfish, kangaroo rat, painted lady butterfly and bighorn sheep? From the butterfly's one-fiftieth of an ounce to the bighorn sheep's 240 pounds, these are among the diverse thousands of species that the California Department of Fish and Game is entrusted with helping to adapt to climate change.

No state has a bigger task. California has more plant and animal species than any other state in the United States, and is one of 34 global biodiversity hotspots with more than 5,000 species of native plants alone. Add to that the complexity of climate change, the effects of which are still largely unknown.

Calling this mission a challenge is an understatement, yet DFG is leading California in tackling it with commitment and rigorous science. California has made climate change part of its collective consciousness and planning. DFG has appointed Amber Pairis as its climate change advisor—the first such role created within a state wildlife agency—to coordinate and guide the integration of climate change into activities.

#### Is California Getting Warmer?

"The phrase *global warming* is a bit of a misnomer," says Pairis, who earned a doctorate in environmental studies with an emphasis in conservation biology. "It implies that everything will get warmer. The term *climate change* seems to resonate better with the public as it illustrates that things are changing. It means more extreme events—more heavy rainfall,

Story by Donna Matrazzo





Photograph © Alice Cahill



Photograph © Willy Onarheim

more flash floods, more really hot days, more drought, more hurricanes. I think that while it's easy to get overwhelmed with information, people can see from their personal experiences that things are changing."

Climate change will likely alter water sources, sea levels, weather patterns, vegetation and critical food resources, Pairis says. Many wildlife species are already at risk, and climate change will have major consequences for their habitats and ecosystems throughout the state.

For example, direct the spotlight to Elkhorn Slough, located in the center of the Monterey Bay coastline. As the largest tract of tidal salt marsh in California outside of San Francisco Bay, it's a national estuarine research reserve with habitat for more than 340 species of birds. But if sea level rises as projected, naturally accumulating sediment deposits could lift the elevation enough to annihilate the slough's salt marshes.

Critical thinking such as this is important for protecting California's rivers and mountains, beaches and deserts, lakes and grasslands. The state's rich natural diversity guarantees that wildlife and habitat management in the face of climate change won't be a one-size-fits-all solution.

### California on the cutting edge

"We're known for being an environmentally minded state, and a leader on a variety of fronts," Pairis says. "We have the tools,

the thinking and the vision. We have a huge advantage in our governor, who has made a commitment to aggressively put the state on the path to addressing the challenges associated with climate change."

Governor Arnold Schwarzenegger initiated the California Climate Adaptation Strategy, a first-of-its kind, multi-sector plan that directs efforts that respond to climate changes. Led by the Natural Resources Agency, the strategy utilizes the best known science to protect natural habitats from coastlines to mountain peaks and beyond. Additionally, the strategy addresses public health concerns and the state's infrastructure through its roads and bridges.

The transformation anticipated with a change of typical weather patterns can leave California vulnerable. Extended dry seasons cause more frequent and intense wildfires. Less snow weakens already low water supplies. Change in the agricultural growing season affects crops. Rising sea levels along the coast and in the bays could cover billions of dollars of real estate. Entire ecosystems, including the native plants and animals that make California such a unique place, will face the challenge.

The strategy calls for the state to work together and adapt policies intended to complement each other. The overall plan will work best in partnership with proposed mitigation measures, such as reducing greenhouse gases and minimizing the government's carbon footprint—greenhouse gas emissions



Scientists believe the effects of climate change will occur systemwide and cause habitat loss, fragmentation and movement of species. Every portion of California could be affected, from Death Valley National Park and its stylistic pattern of alkali rings, left, Yreka and its electrical storms, center, and the icy shores of Lake Tahoe, below.



generated by an individual or through their work. With adaptation, agencies will make adjustments in human and natural systems to minimize harm or take advantage of opportunities.

Having an adaptation strategy in place puts California on track for potential federal funding. A significant amount of funding is earmarked for fish and wildlife, to help states protect natural resources impacted by climate change. In order to be eligible, states must have an adaptation strategy in place for addressing climate change.

### **Pieces of a Big Puzzle**

DFG and the California Department of Parks and Recreation are leading the way to develop a plan for the biodiversity and habitat sector of the Climate Change Adaptation Strategy. That wide-ranging preparation, which includes goals and measures for protecting and restoring the state's ecosystems, falls under Kevin Hunting, deputy director of DFG's Ecosystem Conservation Division.

"The work of our Department is directed at helping species adapt to these challenges in the face of climate change impacts," Hunting says. "DFG is a key part of the climate change solution and is uniquely positioned to implement the kind of conservation strategies that will safeguard California's natural resources from a changing climate. We have the vision and leadership to tackle

these challenges but still need the resources to do things better and faster to address climate change."

In some ways, adaptation and mitigation for climate change across the state are like putting together the pieces of a big puzzle. Precisely how many plants and animal species will respond is unknown yet. What scientists do recognize is this: the change will be systemwide and require an encompassing point of view. Habitat loss, fragmentation and movement of species will act synergically. Plant and animal communities will break apart, shift in different patterns and reassemble in ways that are new.

DFG's *California Wildlife Action Plan*—a comprehensive plan that takes an ecosystem approach to the interdependence of multiple species and their habitats—is a keystone of the new adaptation strategy. Climate change has been identified as one of the major stressors on natural communities and wildlife. Biologists are rethinking their questions and research through the climate change lens, with a goal of keeping common species common and avoiding the listing of species.

The wildlife action plan also looks at the species that are in decline, or, in some cases, at risk of extinction. Cited are 807 species of special concern—plants and animals designated as rare or at risk—and 134 species listed as threatened or endangered. California is second behind Hawaii for having the most endangered species.

"Climate change will push some ecosystems over the edge,"

“Climate change isn’t business as usual. We don’t have the luxury to wait. We have to act now.”  
Donald Koch, Director, Department of Fish and Game

Pairis says. “We are going to have to decide where we put our limited resources, where we can have the most impact, and how we fulfill our responsibility to conserve fish and wildlife and the places they live for future generations to enjoy.”

In 1991, DFG created an unprecedented program called Natural Community Conservation Planning (NCCP), a unique concept that became a tool to help plan for climate change. The NCCP program involves public and private partners collaborating to protect and perpetuate biological diversity at the ecosystem scale.

The NCCP tackled protection of more than 6,000 square miles of coastal sage scrub habitat under 59 local government jurisdictions and strung across five counties. The resulting plan focused on the long-term stability of wildlife and plant communities in the ecosystem and became a role model for the current 32 active NCCPs that cover more than 7 million acres.

As Pairis notes, “This is a key tool for dealing with climate change on the ground—working with communities and local governments to protect landscapes in perpetuity in balance with development. These are large-scale projects and that’s really the way we have to come at this, across the map, to conserve these ecosystems. Every region of the state is unique and will need its own blueprint for balancing the needs of habitat, fish and wildlife.”

### Mapping the way

Maps are always good for guidance—suggesting what road to take, whether literal or metaphoric. To help plan for climate change, maps present at a glance how the landscape may be altered, or what areas are critical to preserve.

Inundation maps are visible portrayals of projected sea level rise and shows how shorelines might change by certain dates. They clearly depict how climate change will impact the human and wildlife communities along the coast. Early consideration can be given to where the species that live there might move, and how DFG can help.

Another significant planning technique underway is the Areas of Conservation Emphasis (ACE) mapping and modeling effort. The maps and models can help identify zones with high biodiversity or that have a recreational value. They can also be used to support other conservation efforts. In light of climate change, the technology to map priority areas can, for example, identify inland areas that might be used as wetlands. Such tools could help pinpoint which high altitude swath of mountainside should be protected in order for displaced species to have a cooler elevation where they can move.

ACE maps can help the decision makers determine acquisitions, conservation easements and areas that should be protected to avoid fragmentation or degradation. They show how the state can create a landscape that will work as the climate changes. The bottom line is that critical space for wildlife will remain within a checkerboard of agricultural lands, forest lands and open space. The maps also give a picture of priorities, so DFG can decide where best to leverage resources.

### Now, not later

The United Nations Environment Programme has recently sounded an alarm over the speed and scale of climate change, outpacing earlier predictions from the Intergovernmental Panel on Climate Change. In its Climate Change Science Compendium 2009, a publication based on some 400 major scientific contributions over the last three years, the Programme warns about greater losses from glaciers, dramatic changes in monsoons, the increase of dry lands and greater-than-anticipated rising sea levels.


DFG Director Donald Koch says no one can ignore the reality of climate change.

“Climate change isn’t business as usual,” Koch stresses. “We don’t have the luxury to wait. We have to act now. We have to constantly ask, ‘Is this working?’ If not, we have to change what we’re doing. Research and monitoring are critical. We need the data to be able to respond and not be paralyzed. Responding to climate change is really about putting good conservation actions on the ground. The Department is fortunate enough to have an incredible number of gifted and committed employees who have the knowledge to help the state face the challenges that climate change can pose. This is truly one of our greatest assets.”

DFG employees in the state’s northern region have formed a regional climate change committee and are tackling a variety of issues in addition to their regular responsibilities.

In Elkhorn Slough, environmental scientists are examining marsh elevations, tidal dynamics and sediment deposits to investigate salt marsh sustainability. Water quality is monitored at two dozen estuarine stations to be able to verify changes in rainfall, salinity, water nutrients and more. Other research related to climate change includes monitoring of breeding birds, and the detection of non-native species that may be moving into the estuary. Scientists are using federal stimulus funding to reexamine 20 years of data through a climate change lens.

Because California is recognized as a national leader on the topic, Pairis, the DFG advisor, has worked with regional, national and global organizations. The role allows her to ensure that fish, wildlife and plants have an advocate at the national table. DFG has initiated a Climate Change Committee for the Western Association of Fish and Wildlife Agencies to increase collaboration among states and provinces west of the Mississippi River.

“I’m a very positive person. I believe that if everyone focuses on their little piece of the puzzle it will come out all right,” Pairis says. “People care about what the future will be in 50 years, or even a hundred years from now. They worry about the legacy they’re leaving for their children and grandchildren. We have a common goal: protect as much of California’s diversity as we can, protect as much of the amazing ecosystems and lands as we can. And it’s going to take all of us to do that.” 

*Donna Matrazzo is a science and environmental writer who hikes, kayaks, bicycles and gardens. Her book, Wild Things: Adventures of a Grassroots Environmentalist, is a finalist for the 2009 Oregon Book Awards.*