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**Hot chicks and Cool dudes**  
**Why climate matters and what we can do about it**

**Joint Hearing**  
**Senate Committee on Natural Resources and Water**  
**Senate Select Committee on the Environment, the Economy and Climate Change**  
**20 October 2011**

Presented by Rosi Dagit,  
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Good morning. Thank you for the opportunity to speak about a most important subject:  
How do our native plants and animals respond to changes in climate? Do these changes matter?

Unlike many of the preceding speakers, I am not usually involved in policy level decision making. Rather, I am an on-the-ground front line field biologist observing how these decisions affect the world around us. Thus my perspective is perhaps a bit more parochial, but hopefully by closely looking at the local consequences of our policies, we can find a way to improve on what we are currently doing.

Change is a constant and necessary part of ecosystems – an ongoing process with indirect, direct, and sometimes unintended impacts that vary by scale (regional, watershed, property). But not only is the spatial component critical, the temporal element is also critical: How fast are the changes occurring? Do species have time to respond? Southern California is characterized by long periods of stasis, followed by catastrophic upheavals resulting from fires, floods and earthquakes, so many local species already have strategies for recovery.

Our current policies focus on two responses to environmental threats:

1) We create Reserves and Refuges.  
“Umbrella” or “keystone “ species are often used to provide a big picture context. For example, mountain lion home ranges are over 100 square miles. Our efforts to protect large contiguous blocks of habitat to support this species is thought to promote ecosystem integration, reduce fragmentation, and build in some resiliency.

But what about smaller species with more limited movement opportunities?  
Our consideration of climate change impacts should reflect the complexity of the whole plant-animal community structure.

2) We attempt to Restore areas where conditions have deteriorated.

While both of these are valuable and have made some progress, they do not seem to be enough in the face of exponential human population explosions concentrated in biologically sensitive areas. I

would like to suggest that we need to take the next step and develop policies driven by the concept of Reconciliation or Reconnection.

Southern California is a biodiversity “hot spot” with an interwoven web of ecosystems that literally extends from the ocean, to the mountains, to the deserts. Approximately 20% of all federally listed endangered species live alongside 13 million people.

This diversity did not just “happen.” It is the result of thousands of years of integrated management by the Native American tribes who lived in a close association with the natural processes, but who also selected for a diversity of species that met their needs for food, water, and shelter. If we can incorporate ecological functions into our developed landscapes (or better yet, develop in harmony with these landscapes), we increase the opportunities for species to gain back lost ground.

Our challenge is to reconcile and balance the ecosystem functions provided by this complex mass of life with the values and needs of the human community today. Reconnection is KEY! This does not mean relaxing our efforts in Reserve design or environmental protection regulations, but rather recognizes that existing developed areas have potential to help provide more space, if we are clever enough to use them.

Climate change is idiosyncratic and not totally predictable. The rate of change is also unprecedented in geologic history. While it formerly took hundreds, thousands or even millions of years to increase global temperatures, we have accomplished over 3°C change in less than 3 human lifetimes.

Southwestern Pond Turtles (SWPT) are a great example of how species respond to changes in climate and highlight specific ways we can try to reconcile these changes so that there is sufficient flexibility and opportunity for species to survive.

So, what biological responses to climate change we might expect to see? How might a reconciliation policy help address these changes?

**BIOLOGICAL RESPONSE TO CLIMATE CHANGE:** Shift species range

**Reconciliation Opportunity: Expand suitable habitats in built areas, create habitat “stepping stones”, and refugia that connect like a string of pearls.**

Pond turtles only live in ponds when they are available, the rest of the year they spend hunkered down in the shade of chaparral shrubs. Ponds are not abundant in southern California, but perennial streams that flow year round and have deep, shaded pools refreshed by groundwater, surrounded by undeveloped slopes of coastal sage scrub and chaparral-scrub oak woodlands used to be common. As we extract groundwater, dam streams, convert natural channels into concrete, and direct surface run-off into the natural drainages, we shift the whole hydrologic regime.

In a 1986 survey, SWPT were found in over 30 locations throughout the Santa Monica Mountains, and larger populations (greater than 500 individuals) were known to occur in between 9 or 10 locations between Ventura and the Mexican Border.

As of 2009, there were only eight locations remaining in the Santa Monica Mts. where turtles are found, and of those, only two locations have more than 50 individuals. Data suggests that a minimum of 200 turtles are needed for a viable population. All of these remnant populations are isolated between mountain ridges, bisected by highways, and surrounded with development.

We need to provide opportunities for reconnection.

**BIOLOGICAL RESPONSE TO CLIMATE CHANGE:** Changes to phenology

**Reconciliation Opportunity: Encourage appropriate use of native plants in all developed landscapes that reflect locally appropriate communities.**

SWPT primarily eat when they are in the water, which means that the number of days when food is available is dependant on rainfall patterns and summer/fall temperatures. The timing of spring rains and blooming also directly impacts what kind of food is available and when. When the ponds dry up, the turtles migrate into surrounding chaparral to aestivate, counting on stored energy reserves and the shade of the shrubs to protect them from the hot, dry days. Incorporating appropriate native species into home landscapes can help compensate for losses due to land conversion, and possibly provide a pool of genetic variability allowing species to adapt as temperatures shift.

**BIOLOGICAL RESPONSE TO CLIMATE CHANGE:** Changes in reproduction rate and recruitment

**Reconciliation Opportunity: Provide habitat buffers suitable for nesting. Provide water to the ponds in dry years.**

SWPT only mate when they are in the water. Turtles can live for at least 30 years and gather in pools in late winter/early spring. While they may mate in many years, the number of eggs laid in wet years is greater than the number laid in dry years. Eggs remain in the nest, buried underground until the following spring. The baby turtles hatch when the rains soften the earth sufficiently for them to dig out.

By providing more water and nesting habitat, we can increase the number of years when turtles can successfully reproduce.

**BIOLOGICAL RESPONSE TO CLIMATE CHANGE:** Changes in community structure

**Reconciliation Opportunity: Provide diverse habitat with suitable nesting areas.**

Sex of turtles is determined by the temperature of the eggs during incubation.

Warmer temperatures = Females “hot chicks” over 86°F (30°C)

Cooler Temperatures = Males “cool dudes” under 80°F (27°C)

SWPT have evolved in an environment and climate regime that over time produced a relatively equal number of males and females. Because nest temperature is not only a function of location and soil type, but also of surrounding vegetation, when chaparral is cleared for fuel modification near houses, converted to vineyards, or invaded by non-native species, the whole community structure shifts often towards more females than males. Turtles get squeezed into smaller and smaller refugia areas. Restoring this habitat is critical.

**BIOLOGICAL RESPONSE TO CLIMATE CHANGE: Predator and Disease susceptibility. Reconciliation Opportunity: Keep dogs and cats and other pets indoors. Minimize edge effects using natural plant communities as buffer zones. Education is essential!**

SWPT are very tasty and have numerous predators. It is estimated that fewer than 10 out of every 100 hatchlings survives its first years to become a reproducing adult. In addition to the native predators such as coyotes, bobcats, weasels, raccoons, ravens and scrub jays. SWPT now face additional non-native predators: dogs, cats, bullfrogs, largemouth bass and crayfish. These and other edge effects associated with fragmented habitat, smaller reserves, and increased development throughout their range are severe.

Like most organisms, turtles can only stand so much before their systems are weakened and become susceptible to diseases and parasites. One day in September 2011, we found four turtles infested with leeches in one day, compared to only one or two individuals in all of the six previous years. These turtles live in a protected open space area, but surrounding development has steadily encroached on the boundaries, resulting in sedimentation of refugia pools following illegal grading, introduction of star-thistle which is changing the plant community, and increased exposure to dogs off-leash, feral cats and increased populations of coyotes, raccoons and ravens, all associated with development. Release of exotic pet turtle species into native ponds is also a source of disease.

#### WHY DOES THIS MATTER?

While most of us will never come face to face with a mountain lion or a pond turtle, maintaining ecosystems that support these species fundamentally provides the same important basics humans need as well – air to breathe, water to drink, suitable places to live.

#### WHAT WE CAN DO

Incorporate Reconciliation Ecology into our policies and decision making.  
“Reconciliation Ecology is the science of inventing, establishing, and maintaining new habitats to conserve species where people live, work, or play.” (Rosenzweig, 2003)

#### HOW DO WE DO THIS?

These are not new ideas, but they remain the foundation of actions we can take.

We need to recognize that watershed boundaries are real, geographic limits that are inextricably linked to ecosystem function and health. Aligning our decision making boundaries with watersheds builds in the opportunity to protect, preserve and restore connectivity.

- MAINTAIN AND RESTORE ECOSYSTEM FUNCTIONS, ESPECIALLY HYDROLOGIC REGIMES  
Integrate economic benefits of natural systems into our cost-benefit analysis
- MANAGE ACROSS LANDSCAPES

- REDUCE OTHER STRESSORS – Impacts such as pollution, invasive species, recreational/edge intrusions are additive and synergistic multipliers.

#### RECONCILIATION POLICY LITMUS TEST

How do we make this work?

Does this policy/action recognize watershed connectivity, promote ecosystem functions AND integrate humans in a long-term sustainable way?

What are the ways to build upon the “big and pure refuges/reserves that focus on Keystone species” concept to include recovery of “small and critical areas with multiple species benefits” that can be re-integrated and inter-woven into a carefully balanced developed landscape?

#### - RECONNECT PEOPLE WITH THEIR WORLD

“People create landscapes that reflect their morality, humanity and culture, and these landscapes, then in turn, determine our fate.” Sam Broder 1986

A Sense of Place is crucial! We can all take care of our own homes, and extend the invitation for other species to join us. Modifying our built environment to support native species, from a butterfly garden to a backyard pond, we expand the opportunities for their survival. While this does not replace the need for reserves and restoration, it expands the footprint of potential.

We are all in this together, and together we can make choices to increase the odds of keeping the biodiversity boat afloat as our climate changes.