

## THE CALIFORNIA NATURALIST HANDBOOK

“The California Naturalist Handbook,” by Greg de Nevers, Deborah Stanger Edelman and Adina Merenlender (2013) is the primary text for the California Naturalist certification program. Promoting environmental literacy and stewardship, the program aims “to inspire adults to become active citizen scientists” and hence to create “a stronger constituency for nature.”

It’s also a fine read, introducing everything from the source of all energy and life, to minute details about California’s plants and animals.

We learn how unique California is -- that Clear Lake is perhaps the most ancient lake in North America, that a bristlecone pine in the White Mountains is the oldest living tree in the Western Hemisphere; that a giant sequoia is the biggest tree by volume in the world, and coast redwoods the world’s tallest. California includes the lowest point and the highest peak in the contiguous U.S., as well, alas, as the hottest and driest.

The authors remind us that nature cares for things we can’t. Perhaps 99 percent of individual trees can’t feed themselves – instead they depend on fungi – mycorrhizae – to surround and penetrate their roots and provide nutrients in exchange for sugars. Insects wear their skeletons outside – exoskeletons made of chitin – and without microorganisms capable of

digesting that chitin, those tiny castoffs would soon bury everything on earth.

Regarding energy, we're reminded that it's never created or destroyed, but simply changes forms – electrical to thermal to chemical to mechanical, for instance. And all this comes from the sun's electromagnetic energy or from geothermal energy deep in the earth.

Plants, through photosynthesis, capture solar energy and convert it into glucose, creating the basis of all life. And because 90 percent of energy is converted into indigestibles at each step in the food chain, it's much more efficient to eat grain than grain fed beef.

Other conversions drive our planetary climate – water transforms to vapor, to ice, and back again, releasing energy at each conversion.

Currently fossil fuels provide 90% of our energy, “a one-time bonanza” whose waste is converted into greenhouse gases driving global warming. And even nuclear power, a questionable alternative at best, is non-renewable; U-235 will be exhausted by 2200.

Graphs of CO<sub>2</sub> emissions and historical temperature rise show nearly identical curves, soaring almost perpendicularly between 1950 and 2000. As the authors say, we can't keep using our

atmosphere as a dumping ground for methane, ozone, CO2 and other gases.

Global warming alone could cost California trillions. I can imagine one of the graduates of this naturalist certification program, having heard the latest scientific take on California's natural systems, being asked "What does California's future look like?" And answering, "In 35 years the average Sierra snowpack could be reduced by 25%, and there could be 20-30 more heat wave days a year. In 10 years Lake Mead could be dry, and many California reservoirs so filled with sediment they could scarcely store water.

"There will be more rain and less snow, and thus wet season dam releases, more floods and droughts, and less water for agriculture. There will be more of us. At 7 billion worldwide in 2011, we're projected to 'stabilize' at 10 billion by 2200."

That will almost certainly be bad news for nature in California and everywhere else. But as the authors say, "we have powerful tools that make it abundantly clear that we live on one planet, with nowhere else to go."

This important book can help us appreciate, accurately, the natural systems upon which our very lives depend, and how seriously many of these systems are threatened in our wonderful Golden State.

