

Essays of a Peripheral Mind

Crystal Balls

By K. M. Havstad

In many senses, the management of natural resources is a profession based on historical knowledge. Both the management practices applied and the interpretations of resource responses to those practices are structured around what has been learned in the past. Often this historical knowledge is generational and local, but increasingly these historical perspectives are informed from broader spatial and temporal sets of information as we have increasing access to other data, either anecdotal or highly quantitative. The increasing use of state and transition models, for example, within ecological site descriptions, provides a mechanism developed, in part, to provide more ready access to historical information. We know that historical legacies from centuries past and from socioeconomic perspectives outside our normal realm of biophysical interests have important bearings on resource management.

Any predictive capacities we might have about future trajectories, a crucial element of natural resource management, is also rooted in an understanding of historical trends and patterns of system behaviors that we might think are legitimate and relevant. The past is prologue, and this has important applications to how we think about the future.

This also means that we should also pay attention to future projections, and prognostications, based on an understanding of past events, current resource scarcities, and emerging demographics that will have relevance to our management of natural resources. The following are three recent crystal-ball articulations that may be particularly relevant to our interests.

In November 2008, the US National Intelligence Council published a nonclassified document entitled *Global Trends 2025: A Transformed World*. This 100-page treatise provides a range of futuristic scenarios that certainly have direct relevance to our thinking and strategizing about natural resources. This report takes an optimistic approach to the growing energy crisis by assuming, to an extent, that globally we will have to transition away from our reliance on fossil fuels. This may not be realistic, but one can only hope that the increasing development of alternative sources of energy escalates in a significant and sufficient manner as this report suggests. However, there are other global trends over the next 15 years that are more certain and quite relevant to

our profession. First, as Asia, Africa, and Latin America comprise nearly all of the population growth in the coming two decades, expect a growing middle-income class with dietary preferences similar to our Western culture. This means increasing demand for meat protein and an increasing need for management practices to conserve natural resources under increasing production stress. The world population will increase by nearly 1.2 billion people in the next 20 years, and there will be more disposable income. Food demand will increase disproportionately.

Second, by 2025 36 countries, and ~1.4 billion people, will be either freshwater or cropland-water scarce. The most sobering figure in this report is “Projected Global Water Scarcity, 2025” (Fig. 1). North America (especially the western United States), northern Africa, northern Asia, and eastern Australia show massive regions of severe water scarcity by 2025 (Fig. 1, areas shown in red). Globally, per capita water consumption is projected to increase to ~38 m³ per person per year by 2025, and there are regions across the globe where water is likely to be seriously over-allocated. Policies and practices for management of watersheds for quantity and quality of water probably should trump any other resource objective in many areas of the world.

Earlier in 2010 Joel Kotkin’s book, *The Next 100 Million: America in 2050*, was published. Kotkin’s crystal ball is an optimistic (and, maybe, hugely so) extrapolation of selected current trends within the United States. Despite the questionable optimism, there are two near certainties within his projections—that the US population, even at a relatively small growth rate of <1%, will increase by 100 million people in the next 40 years, and that these people will not necessarily be tied to existing urban areas. He expects these masses to create new suburbs, even within existing rural expanses of the Great Plains, because this work force will be connected to its clients and partners via global communication and shipping networks. There are two particular elements to the growth outlined by Kotkin that I find significant to this treatise. First, by 2015 one-third of all children in the United States will be progeny of immigrants. In 2005 more immigrants became official US citizens than the combined total of the next nine countries from around the world. Second, this wave of growth will represent the

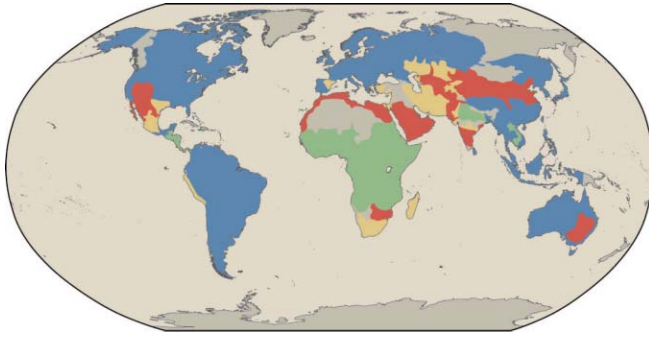


Figure 1. Projected global water scarcity in 2025 (areas shown in red) as estimated by the International Water Management Institute (from page 55 of *Global Trends 2025*).

next formation of a middle-class in America. Not since the middle of the twentieth century has the United States seen the creation of a middle class. Nearly 100 years later Kotkin expects the next middle class to be well developed. Kotkin expects that societal class to have attitudes and expectations similar to those we saw emerge out of suburbia nearly 50 years ago.

Which then brings us to a third crystal ball, of a sort, drawn from reports available through the US Geological Survey's (USGS) Land Cover Institute (see <http://landcover.usgs.gov/>). As a set up to this forecast I refer the reader to Figure 2, drawn from a 2005 USGS report (C. E. Soulard, Land cover trends of the central basin and range ecoregion, report #2006-5288). This figure reflects the differential rate of change of land use, and land cover conversion, as metropolitan areas within the Great Basin, primarily Reno and Salt Lake City, have grown over recent decades. This figure is certainly what we expect. More land has been converted from rangeland to developed landscapes as the US population has both increased and shifted to the West. However, this is not the crystal ball. The crystal ball projection is drawn from an article by John Carruthers and Gordon Mulligan (2007, Land absorption in U.S. metropolitan areas: estimates and projections from regional adjustment models, *Geographical Analysis* 39:78–104). In this paper these authors report results from their projections of the spatial outcomes of both population and employment growth for 50 metropolitan regions across the United States in the near future. We are fairly certain that these areas across the United States are going to see increased population growth and that land will be converted at faster rates in the coming years as depicted in Figure 2. However, Carruthers and Gordon illustrate that these conversions will be spatially explicit. In other words, the old adage of real estate applies. How an area will develop is dependant on location, location, location. Some areas, like Boise, Las Cruces, Sioux Falls, and Yuma will see the amount of land consumed per person decrease. In those areas the projections are that population density will increase, that the population and employment

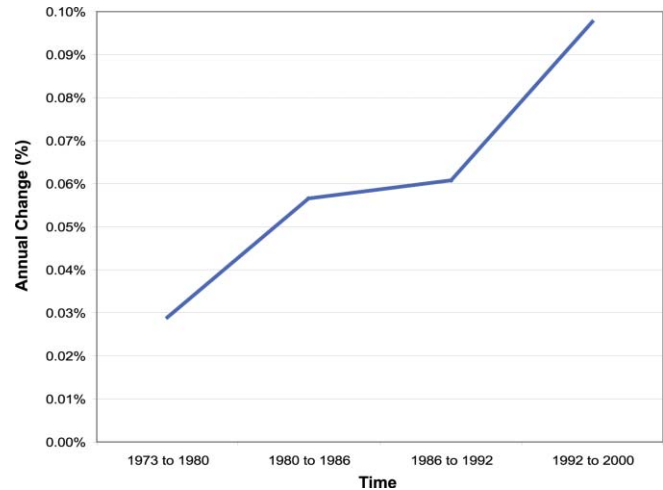


Figure 2. Average annual rates of land cover change for four periods from 1973 to 2000 across the central portion of the Basin and Range region of the western United States (primarily Nevada and western Utah) as described in Soulard, C.E., 2006, Land cover trends of the central basin and range ecoregion, USGS Scientific Investigations Report 2006-5288.

structure on the land will be more compact. In other regions, like Las Vegas, Reno, Tucson, and Denver, the amount of land consumed per person will increase, and these populations will continue to expand out into the suburbs that Joel Kotkin projects as our future. There are several reasons for these differential projected patterns of development and land conversion, but one of the key reasons is different local and regional policies on growth and development.

From these crystal balls, we are left with four near certainties that have relevance to our work in natural resource management. First, expect huge population growth on several other continents where resource conditions are already stressed with shifting dietary preferences that result in increased meat consumption. Second, water scarcities will be more evident across large regions of four continents. Third, expect accelerated land use changes on most, if not all continents, including within the developed world. Fourth, and most importantly, expect a growing population that is likely absent a locally developed land ethic, but with tremendous opportunities for indirect development of that ethic. All of this, of course, is a simple condensation of more thirsty people with more income and less connection to the land. Those of us in the natural resource science and management profession are going to be challenged to have connections to these people. We will have few opportunities to develop meaningful connections to these hundreds of millions of people.

We seemed to have learned that, ecologically, the past will not necessarily be recreated as surface resource conditions and drivers of those conditions change over time. However, we do know that understanding the past informs us about possible future conditions. The information drawn

from these three crystal balls should drive us toward focusing our present and future efforts on informing and shaping the policies and practices of the central agencies that will strongly shape resource management. Without connections to a significant number of the people on the land, we will need to work on our connections to the government agencies that will strongly influence the actions of these highly diverse populations. Our knowledge, skills, technologies,

and practices will have to be geared toward governments as our primary clients in this future world.

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