

Comments on “The Waterfowlers’ Guide to Global Warming”

June 28, 2005



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“The Waterfowlers’ Guide to Global Warming” by the National Wildlife Federation (NWF) focuses on what impacts projected climate changes due to rising atmospheric concentrations of greenhouse gases may have on North American waterfowl. However, waterfowl do not respond to “projections” of climate change, rather they respond to *actual* climate change. Observations of both climate trends and the relationship between climate variations and waterfowl behavior indicate that the future of North American waterfowl is *not* as dire as the NWF makes it out to be.

For instance, the biggest worry about climate change in the NWF report surrounds the future moisture availability in the Prairie Pothole Region—identified as one of the most important waterfowl breeding areas in North America. The NWF concern is that the millions of shallow ponds and lakes that characterize the region will dry up or be wet for shorter periods making them less suitable waterfowl habitat. The NWF report states “Models project that global warming could lead to significant declines in Prairie Pothole wetlands (from no change to a loss of 91 percent) by the 2080s. This could translate into a decline in the abundance of breeding ducks in the region by 9 percent to 69 percent, ultimately having a drastic effect on duck populations across the country.” The “models” that the NWF refers to are computer model simulations of climate change caused by enhancing atmospheric carbon dioxide concentrations. The computer models project more frequent and severe droughts for the Prairie Pothole Region in the future.

However, *real data observations* of soil moisture trends do not support these model projections. A recent study was performed by researchers at the National Center for Atmospheric Research examining trends in soil moisture from around the globe (Dai et al., 2004). The researchers combined observed precipitation changes with observed temperature changes (which can influence the rate of evaporation) to derive historical values of the Palmer Drought Severity Index (PDSI)—the most common measure of soil moisture in use today. The PDSI is an indication of the soil moisture in the top 1-meter or so of soil and thus is a good representation of moisture availability. Higher PDSI values indicate more moisture availability (wet conditions); lower PDSI values indicate less moisture availability (dry conditions).

Figure 1 shows the observed changes in the PDSI values during two different periods, 1900-1949 and 1950-2002. During the earlier period, there was a decline in the PDSI throughout the Prairie Pothole Region (coarsely marked by a black box in **Figure 1**). However, during the most recent period—the time of the greatest increase in atmospheric greenhouse gas concentrations—there was a general *increase* (more moisture) in the PDSI values across the Prairie Pothole Region. This is precisely the *opposite* pattern than the NWF and their climate models would have you believe should have occurred—the NWF tells us that conditions should be drying in that sensitive region. This model/observation *mismatch* represents a clear indication that climate models do not accurately capture observed climate behaviors at regional scales—and thus should not be trusted to provide reliable projections on such scales for future climate conditions.

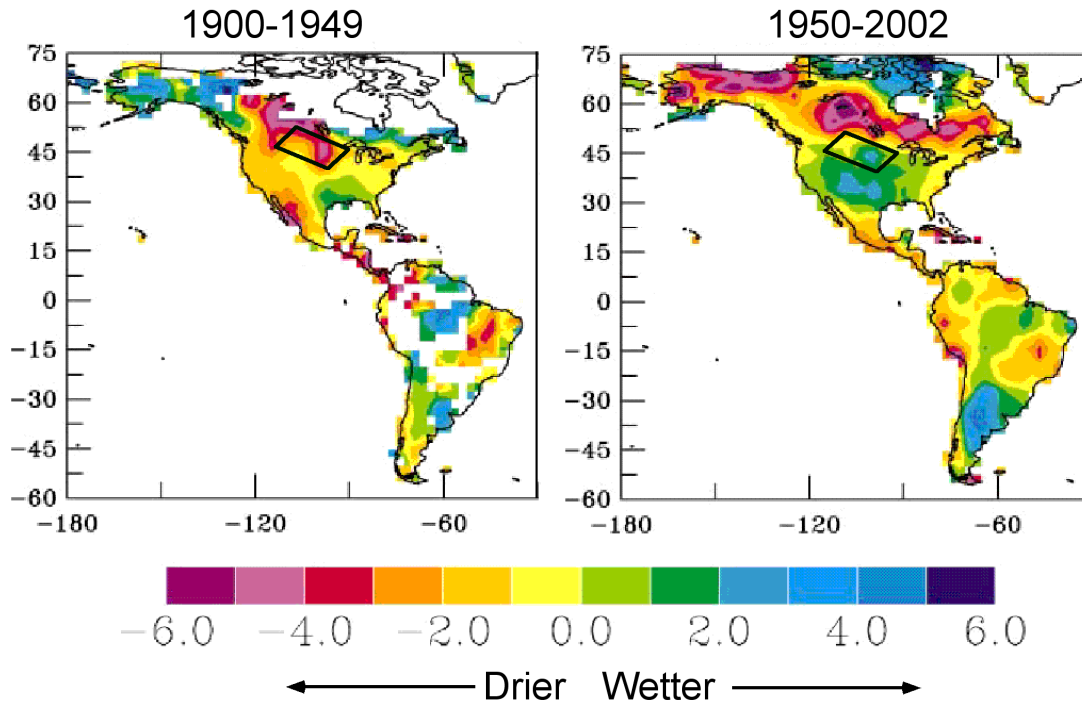


Figure 1. Observed trend in Palmer Drought Severity Index values for two different time periods. The Prairie Pothole Region is marked roughly by the black rectangle in central North America. During the period 1900-1949 the Region grew drier, while during the more recent period, 1950-2002—the period most influenced by high atmospheric greenhouse gas concentrations—the Prairie Pothole Region became wetter.

Thus, the observations depicted in **Figure 1** indicate that moisture conditions in the Prairie Pothole Regions have *improved* across the 20th century which, according to the NWF, should have led to *improved* breeding success of the waterfowl species that frequent that area. If increased breeding success has not been observed, then it suggests factors other than climate change (such as landscape changes, hunting patterns, etc.) as the primary causes.

But, as the NWF reports points out, changing climate conditions, such as those observed over the 20th century, are *not unusual* and North American waterfowl species have readily adapted to climatic fluctuations in the past. The NWF report describes how the selection of over-wintering grounds changes depending on whether conditions are cold, hot, wet, or dry. In fact, the draft version of the NWF report (released in February 2005) even stated that:

"Many duck species, for example, may not migrate at all if they don't have to. As long as they continue to have favorable habitat conditions and adequate food sources, often times they will remain farther north in their wintering range, or perhaps even near their breeding range, rather than venture south in the winter."

This is expanded upon in the final copy of the NWF report which added:

"As long as there is open water and plenty of available food, a number of waterfowl species will stay in northern areas rather than migrate south in winter months. Mallards and Canada geese, for example, can show

considerable variation in their wintering ground locations. Their distributions tend to be farther to the north in years when the northern part of their wintering range is warmer than normal and water remains open rather than freezing over. They also can take advantage of available waste grain in fields when snowfall is low.

"Wood ducks also are sensitive to temperatures and precipitation when migrating south each winter.⁴⁰ Young wood ducks, in particular, have shown a tendency to spend the winter farther north when temperatures in the region are warmer than average. Similarly, wetter than-normal summer seasons in their northern range often leads to greater availability of forested wetlands, diminishing the need for the birds to fly farther south where such wetlands are more permanent."

Obviously, from the ducks' standpoint, not having to migrate long distances is a superior circumstance as the risks associated with migration are reduced. Thus, climate conditions that give rise to less of a need to migrate long distances are better for ducks. And, as described by the NWF, waterfowl readily adapt to such climate opportunities.

For instance, according to the February draft of the NWF report,

"Not only may some waterfowl stay further north in the winter, but they may also breed further north in the spring. In the increasingly-warmer Northwest Territories of Canada, the mallard, green-winged teal, American wigeon, surf scoter, and common merganser are among 9 bird species that have expanded their ranges north of the treeline in the Thelon River Valley. And milder and warmer springs since 1975 have contributed to a change in goose distributions in the Maritimes of eastern Canada, where spring staging geese have recently expanded to Prince Edward Island."

The NWF report continues,

"Recent research by the USDA Forest Service suggests that changes in seasonal temperatures and precipitation associated with a doubling of carbon dioxide concentrations in the atmosphere from pre-industrial levels could contribute to a significant northward shift in the breeding range of mallards and blue-winged teal in the eastern half of North America before the end of this century."

The net result of all of this is that if the climate warms in the future, North American waterfowl will surely adapt to the changes just as they have to changes in the past, by altering their migratory behavior and shifting their preferred breeding and over-wintering ranges—evidence of this adaptive strategy already exists. In many cases, it appears that this will benefit that waterfowl species as their migrations routes may be shortened, and in some cases, the pressures to migrate may be abated entirely.

The concern with altered migration patterns, according to the NWF report, is that this will alter hunting opportunities. Hunters in the South and mid-Atlantic will have reduced opportunities to hunt waterfowl—a lucrative industry in many of these states. Hunting opportunities will be *enhanced* in the more northern-tiered states.

This impact, however, loses sight as to what is best for the ducks. Climate changes which cause them to migrate less and reduce their encounters with hunters lead to seemingly beneficial impacts. As the NWF reports that 8.3 million ducks were harvested in the Atlantic and Mississippi migratory flyways in 2003, the less time the ducks spend in those flyways the better (for them).

However, if waterfowl species are able to adapt to changing climate conditions, it seems reasonable to think that hunters can adapt to changing waterfowl conditions, even if it means traveling to best pursue their recreational hobby. Thus, increased travel expenditures may offset any decrease in hunting supply expenditures that may occur in association with decreased local hunting opportunities.

In summary, observed climate trends and observed relationships between climate variations and waterfowl behavior give no rise to alarm about the future of waterfowl success in North America. As the climate changes, waterfowl will adapt to those changing conditions by shifting their breeding and wintering ranges and consequently their migration patterns. Such waterfowl behavioral changes may lead to changes in bird watching and bird hunting opportunities. These changes may be overcome by a shift in hunting or bird watching strategies as the changed opportunities will likely not reflect an overall climate-induced decline in the waterfowl populations, but instead more likely will reflect behavior modification of the populations. This situation should not raise the alarm of waterfowl enthusiasts, but should verify natural, evolutionary adaptive habits predating man's appearance.

Other issues: Inconsistency

While the NWF is concerned that climate models indicate that wetlands in the prairie pothole region of the upper Midwest may begin to dry up and reduce the breeding habitat of many waterfowl species, they ignore some of the environmental problems that wetlands can contribute to. Thus their policy directives aimed at preserving wetlands run counter to some of their other claimed environmental goals.

First, the enhancement of wetlands seems at odds with their highly questionable claims that global warming will expand the reach of vector-borne diseases from mosquitoes (<http://www.cdc.gov/nczod/diseases/zoonotic/diseases/cspp/pdf/8-CSPP-gwdisease2005.pdf>). Wetlands are heavy breeding grounds for mosquitoes.

Secondly, wetland enhancement is definitely at odds with their alarmist public concerns over exposure of wild life to methylmercury.

As recent research points out (Marvin-DiPasquale et al. (2003) *Environmental Geology*, vol. 43, 260-267); wetlands are notorious cooking pots for turning natural elemental mercury (Hg) into the potentially toxic form of methylmercury (MeHg). Wetlands produce *25-50 times more MeHg* than open water systems (See **Figure 2**).

Marvin DiPasquale et al. reported from their study of water systems around San Pablo Bay:

"Marsh sediments located around the periphery of the bay appear to be the most active zone for net MeHg production, presumably because of both the organic-rich nature of these zones, and the ability of rooted

macrophytes [bottom water's large plant life] to supply molecular oxygen at depth in the sediment, thus keeping reduced-S levels low."

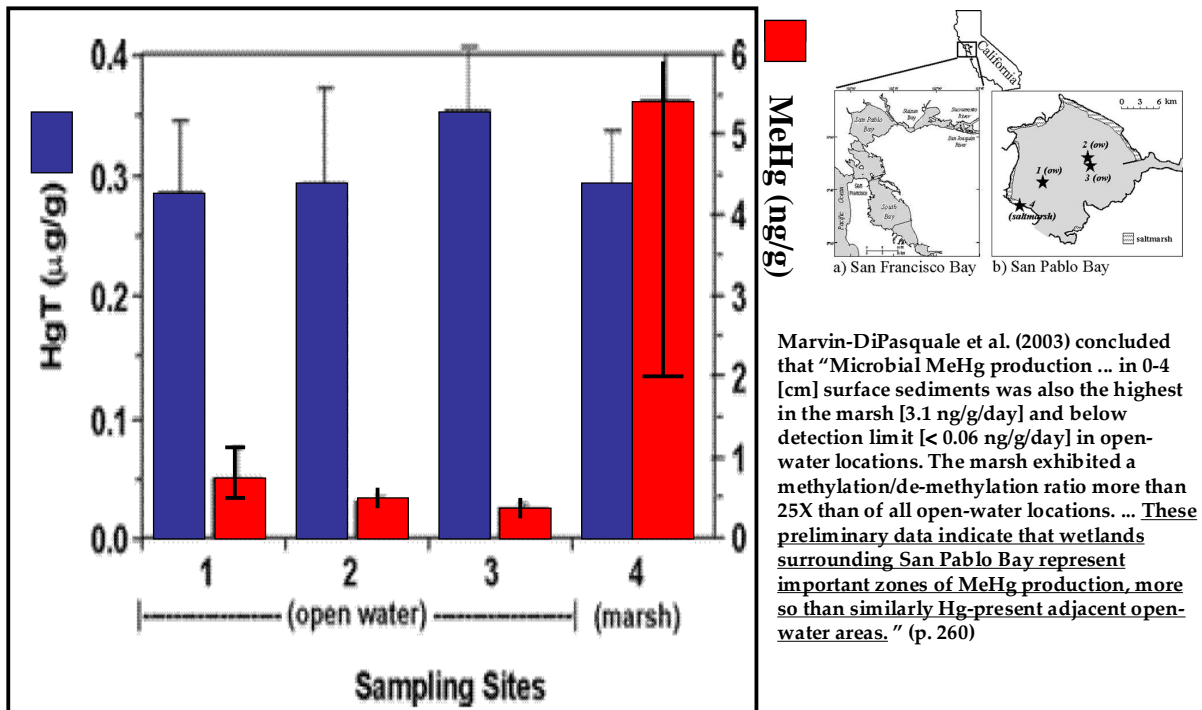
They continued,

"This has important implications for the wetland reconstruction proposed for this area. Without sufficient safeguards, substantial wetland reclamation efforts may result in an overall increase in MeHg production in these newly constructed wetlands, with net MeHg export to the larger bay."

In other words, reclamations of wetland may have to contend with potential complications of enhanced MeHg production and the ultimate transport elsewhere.

The fish in these marsh lands and the water systems into which they flow, eaten by some wildlife, bioaccumulate this MeHg in their tissue. Why would NWF want to attract wildlife to what they otherwise view as hotspots of "poison"? Why would they favor more production of MeHg in (microbial rich) wet lands in the first place?

Mircobial MeHg production in marsh wetlands is 25-50 times more than in open-water locations around San Pablo Bay area



Marvin-DiPasquale et al. (2003) concluded that "Microbial MeHg production ... in 0-4 [cm] surface sediments was also the highest in the marsh [3.1 ng/g/day] and below detection limit [< 0.06 ng/g/day] in open-water locations. The marsh exhibited a methylation/de-methylation ratio more than 25X than of all open-water locations. ... These preliminary data indicate that wetlands surrounding San Pablo Bay represent important zones of MeHg production, more so than similarly Hg-present adjacent open-water areas." (p. 260)

Reference: Marvin-DiPasquale et al. (2003) Environmental Geology, vol. 43, 260-267

Figure 2. Wetlands naturally produce high levels of potentially toxic methylmercury.

Finally, if one believes the climate models, warmer winter temperatures would place less demand on electricity production, in turn easing pressure to supply additional load from wind turbines which kill thousands of waterfowl each year. Professional environmentalists recently turned against the McCain-Lieberman climate amendment they had previously supported because it included new language favoring more nuclear power plants, which do not kill waterfowl. One reason given was that more nuclear-produced electricity would take pressure off building more bird-killing wind turbines.

In the present paper, NWF has apparently disregarded these other issues in their policy balance, resulting in an inconsistency tending toward trying to "have it both ways."