

**Comments on Chapter 6: Vulnerability**  
**Draft 2001 U.S. Climate Action Report**

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**General Comments:**

The greatest shortcoming of this document is the nearly complete lack of attribution for data, analysis and conclusions. The area of climate change science is rich with disagreement regarding future projections when it comes to specific predictions. This document fails to treat this appropriately by citing the origin of the findings it includes. As a result, no reviewer can adequately investigate the interpretations. There is nary a paragraph for which this is not the case. Especially egregious is the use of phrases like, “Model-based projections for the 21<sup>st</sup> century indicate...,” and “Model projections suggest...” with no clarification as to which models are being discussed.

Great efforts seem to be made to always present the advantageous conclusions first whenever two or more outcomes are possible. This is done even when the positive outcome is the least likely. For example in a discussion of forest fires, the idea of trees with thicker bark being more resilient is explored before the more likely loss of species and populations. However this approach also suffers from unconvincing and unsupported presentation (see comment above).

Many important habitat types are ignored, including deserts, freshwater systems, arctic/tundra, islands and alpine regions. There are some of the most sensitive systems and they are brushed aside for drawn out discussions of forestry and agriculture. Also missing is the subject of migratory species and non-tree, non-agriculture plant species.

The forest section seems to ignore public forests. Given the large amount of area covered by public forests in the U.S. there will be a need for adaptation strategies for these forests and it may be Federal gov't money, not market money that pays for it. Some discussion of these lands seems to be needed in this document.

The overall focus on the idea of “market solutions” seems to miss all of the natural resource goals. There is no market incentive to protect most natural resources. Does this mean that they are without value? Emphatically, “no.” So to protect natural resources from the ravages of climate change we must adopt the “contaminant paradigm.” In this approach we have realized that the only way to protect natural resources from the impacts of anthropogenic contaminants is to impose regulations and clean-up measures to limit or correct damage. The same approach must be taken with regard to climate change. Greenhouse gases are anthropogenic in source. We must limit their emissions to stop further impacts and help systems adapt to impacts that have already occurred or are committed to occur. For example, market solutions would not have removed lead from gasoline. Nor would they have cleaned up contaminated sites.

It is important to recognize the many intricate links between human success and the protection of natural resources and systems. This document seems to ignore those links and focus almost exclusively on the direct economic extractions ignoring the crucial support structure that our natural world provides.

### **Specific Comments:**

Overview: All of the overview is in the context of societal impacts. It overlooks natural resource issues. These need equally represented in this report.

Page 2, line 7: Discussion of reductions in GHGs over the course of the 21<sup>st</sup> century without reference to the timeframe of atmospheric concentration stabilization is misleading. You must include discussion of the amount of time required to stabilize concentrations.

Weather and Climate Context introductory paragraph: This doesn't really say anything pertinent. It is a broad overview designed to minimize our interpretation of the impacts of climate change. It needs more substance.

Page 3, line 36: What is the word "what" doing in this sentence?

Page 4, lines 1 and 18: What models are being referred to in these sections? We need citations to evaluate their accuracy. This whole section actually needs many citations to support the claims made.

Page 6, line 4: How long is the "long, upward trend"? 50 years, 100 years, 1000 years.

Page 7, line 2: Discussion of "adequate supplies of nutrients" should include a discussion of the widespread issues of nitrogen pollution. There is a wealth of research on this topic out there. Some of it should be integrated here. It is a problem increasing in magnitude and is only predicted to get worse and no actions are being taken to correct it. It is very likely that there will be detrimental synergistic interactions between climate change based stresses and nitrogen based stresses on systems in the United States (possibly the dead zone in the Gulf of Mexico).

Page 7, line 16: Listing wheat and rice as crops with uncertain impacts and leaving it at that is a bit disconcerting. These are big crops for feeding the world. Not knowing their future makes one less confident that this won't be a problem for agriculture.

Page 8, lines 10-22: This section fails to mention the detrimental impacts of water use (for agriculture and municipalities) on the ecosystems from which it is extracted. For example the Owens Valley of California, and other Western water projects, some of which have required judicial action to protect endangered species water rights.

Page 8, line 19-22: No and reduced tillage farming methods have been promoted since the late 70s and early 80s in the Midwest to reduce erosion and water use. I find it highly unlikely (especially since there is a complete failure to present any compelling citations) that future efforts will be more successful, with additional buy-in.

Page 8, lines 24-34: This section is in need of myriad citations to support the many claims. Especially lines 29-31 and lines 31-33. The final lines (33-34) present a solution with no indication of whether or not such research is underway. This definitely needs a citation.

Page 9, lines 4-10: This report is happy to make random predictions in all the other topic areas. Why not make some predictions about what might be the outcome of increasing pesticide use. It will likely have ill effects. To the best of my knowledge there is no existing research that says that increased pesticide loads in nature ecosystems improves their success.

Page 9, line 21: “lower precipitation may reduce such impacts.” The converse can not necessarily be assumed to be true. Drying conditions (wind erosion and episodic rain moving dusty soils) can also cause erosion. Additionally drying can limit dilution making contaminant point sources more concentrated.

Page 9, lines 30-33: The assumption that we can prepare for weather anomalies if we have sufficient prediction time fails to note that we can not even do this adequately for established weather patterns. I don’t think that the predictive meteorological science exists yet for what is being asked of it here. A citation otherwise would be useful in making your point.

Page 9, line 41-43: A citation would be swell.

Page 10, lines 2-4: Landscape use of trees is not generally considered range expansion. Two major reasons: 1) often this does not include reproductively viable populations (i.e. sex selection in ginkos, lack of surrounding land for expansion of cluster) and 2) landscaping frequently uses exotic species not indigenous to even the continent on which they are planted. There are also additional issues of hybrids and genetic selection.

Page 11, line 14: What are the “some warmer scenarios” that are referred to in the text? Citations, parameters, explanations...

Page 11, lines 10-18: What about land use loss? Forest (or other wildlands) conversion to development (buildings, roads, etc...) or poor harvest practice loss of forests and “carbon.”

Page 11, lines 21-22, 23-26, 27-28: All of these points need citations to support them.

Page 11, lines 32-33: Alternatively some species are very susceptible to fire, or require periodic fires regimes (of a certain intensity) to reproduce successfully. Large-scale, intense and frequent fires do no good for these types of vegetation.

Page 11, line 36: “These changes in disturbance regimes are a natural part of all ecosystems.” This statement is pointless. Every parameter discussed in this entire chapter falls under this clause (precipitation, atmospheric gas concentrations, etc...). Making this statement simply ties to lessen the potential importance of the impacts.

Page 12, line 7: The title of this section should be, “Effects of Climate Change on Forest Biodiversity”

Page 12, lines 7-24: Throughout this document but especially here it should be recognized that it is not just species that need to be addressed but populations. The world of conservation biology and ecology now focuses on the importance of populations and the unique genetic composition each encompasses. Protection and adaptation to climate change impacts must focus on populations as the crucial unit of biodiversity.

Page 12, lines 7-10: What about other abiotic factors? Weather, contaminants, nutrients, etc...

Page 12, line 14: Please not that “time and space scales” are correctly referred to as “temporal and spatial scales.”

Page 12, lines 15-16: Add abiotic habitat to the list of factors that determine the distribution of plants and animals.

Page 12, line 16: Again “ecological models” are mentioned with no indication of which ones.

Page 12, lines 21-24: It should also be noted that populations isolated on mountains will be lost as they can only shift up in altitude, not latitude, due to their isolation which is likened to an island. If you had a section on island populations you could also discuss populations of biota isolated on true islands, as this is another important topic.

Page 12, line 40: Rather than “weed” species the terms used are generally “weedy” or “cosmopolitan”

Page 13, lines 1-2: A citation of these assertions would be helpful.

Page 13, line 15: “Analysis indicates...” requires that the reader know what kind of analysis was done and who did it.

Page 13, line 21: An alternative approach might be to increase harvesting to make up lost revenues (due to decreased prices) this would adversely impact forest habitat.

Page 13, lines 24-29: Lots of assertions in need of citations.

Page 13, line 32: Here is a mention of the concept of benefits, yet the paragraph goes on to only describe detrimental aspects. Why include the mention of unsupported benefits? If it is to be kept in the text, I suggest the addition of a supporting citation.

Page 13, line 40: “..opportunities for some warm water species...” What does this mean? Does the extinction or extirpation of one species, or population, is not offset by the expansion of another. While a rose may be a rose, a rose is not a hydrangea. The loss of species and populations is not a net balance equation. Each one is of value and concern. I would like to think that we know a bit more about the nature of ecosystems at this point in time than is taken in the lighthearted view that one fish is just as good as any other fish. Even if you ignore the inherent value of each species and population, you need to look at what niche each fish fills to know if the new fish really is a replacement.

Page 13, lines 43-45: Economic activity and economically motivated adaptation strategies will not benefit natural resources, only economically maintained systems (agriculture, development, infrastructure, commercial forestry) not natural systems.

Page 14, line 1: "...changes in taste, and general preferences..." This disregards the idea of stewardship of national natural resources. By leaving them to the marketplace we remove governmental responsibility for all people.

Page 14, lines 4-6: Action is mandated for protected areas regardless of the cause of the threat. Once something is designated as protected there is an obligation to development mechanisms for its protection. Such actions regarding climate change protections and adaptations must be supported in the development and expansion of all protective mechanisms (reserves, parks, sustainable harvest, etc...).

Page 14-15, lines 44-1: Will this process make land cleaner or water more polluted?

Page 15, lines 2-5: This example needs a citation.

Page 15, line 7: What interactions are "these interactions?"

Page 15, line 8: Should read, "Melting of glaciers and ice sheets..." Ice sheets are included farther down the page, they should be mentioned here too.

Page 15, lines 11-13: citation required

Page 15, lines 21-23: citation required

Page 15, line 36: in addition to "fisheries", " other coastal biodiversity" should also be added to the list of factors to be affected. Perhaps there could even be some discussion of sea turtles losing breeding habitat with sea level rise.

Page 15, line 45: Filtration and water purification is also seen as a benefit of estuaries.

Page 16, line 1-4: citation required

Page 16, line 10: "blooms of algae" are more commonly referred to as "algal blooms"

Page 16, line 11: What are the "stresses" that will increase on "sea grass, fish, shellfish and other organisms..." Please be less vague.

Page 16, lines 12-14: The statement "estuary habitat susceptible to predators and pathogens of shellfish" needs a citation and greater explanation.

Estuaries section in general: Also to be included in the list of impacts on estuaries should be sea level rise induced salt-water intrusion and shifting of habitats.

Page 16, line 23: Here is discussed the idea that wetlands may be able to migrate inland. This overlooks what then happens to the inland habitat that it is moving into. You are seeing the reduction of one problem with the creation of another.

Page 16, lines 26-28: How will the impacts vary among regions? What is the citation?

Page 16, line 35: What is meant by “genetic resources”?

Page 16, line 36: How many years are the “last few years”? Be more precise.

Page 16, line 43: Perhaps it could be rewritten as: “In addition to increasing sea surface temperatures, a number of factors are likely to also be contributing to the decline....”

Page 17, line 3: Using the term “increased vulnerability to erosion” requires more detail. Are you referring to bioerosion?

Page 17, line 4: “margins of coral reef distribution” might better be described in terms of range. Also be clear about what limits are of concern (latitude, depth, currents, or any range limits).

Page 17, line 7: Artificial reef is generally employed to protect and promote fish growth, not coral growth.

Page 17, Marine fisheries section: Many citations are required.

Page 17, line 22: “sea lion” might more accurately be described as by including the actual species name, perhaps you mean the “California sea lion.”

Page 17, line 36: Please further describe the “adaptation to climate change”

Page 17-18, lines 45-2: Point well made. But again, a citation would be nice.

Page 18, lines 24-27: Again, point well made.

Page 19, lines 21-30: Why isn't the issue of available water supplies linked to agricultural issues as well?

Page 19, lines 35-37: Don't forget to add local species that are reliant on water being in those waterways.

Page 20, line 1-2: Again, point well made.

Page 20, lines 1-2: Additionally reduced water can lead to concentration of contaminants in waterbodies and therefore lead to increased toxicity.

Page 20, lines 8-12: Citation required.

Page 20, line 10: See previous comments regarding the need to examine what we already know about the success of promoting no and reduced till agriculture. A citation would, as always, be nice.

Page 20, line 18: Perhaps this could be better worded as, "...U.S., gradually releasing its water in spring and even summer." The inclusion of "presently" is only necessary if the melting will no longer occur in spring and summer. Rather it seems that the point being made is that there will be less snow.

Page 20, line 18: Again, name the models. You show them in the figures, cite them in the text.

Page 20, line 25: Add "species" in addition to "natural habitats."

Page 20, lines 27-29: Point well made but a citation is required.

Page 21, line 28: "Species live in the larger context of ecosystems..." What does this mean? This is a vague assertion with no real point.

Page 21, line 29: "differing environmental needs" does this mean "unique niches"?

Page 21, lines 29-31: What existing threats could be reduced if "soil moisture increases or the incidence of freezing conditions is reduced"? Again this is looking at the bright side with no real facts to indicate why. Please provide an example and citation to support this assertion.

Page 21, lines 35-37: Citation required.

Page 21, lines 39-45: Again I point out that extinction of one species is not ameliorated by the expansion of another.

Page 22, line 2: It might be better to word this as, "...further depleting..."

Page 22, Potential adaptation options to ensure adequate water resources: There needs to be some discussion of protection of natural ecosystem water needs.

Page 22, lines 26-28: What criteria will be used to determine when and to what degree "social, equity and environmental considerations" will be addressed?

Page 23, Temperature related illness and death: Some discussion of heat stress with air pollution is needed. It has its own section later but you need to allude to it here.

Page 24, lines 31-32: A better discussion of the timing of winter death is needed, especially after the statement on page 23 which indicates that heat is the most detrimental extreme weather. Some discussion of causes (unrelated to temperature) involving winter death is made but perhaps a more thorough examination is needed.

Page 25, line 25: This vague reference to “ongoing changes in technology” is not useful. It provides no real information and is nothing more than hopeful handwaving. The only example that is provided in the paragraph pertains to regulatory improvements, not technology.

Page 26, lines 1-2: Is this decline U.S. only? How large is “dramatic”? Is there a citation?

Page 26, lines 19-20: How does this increase relate to the decrease discussed in lines 1-2?

Page 27, line 15: It is customary to write the entire genus name the first time it is mentioned in a document.