

**Testimony of Jeffrey P. Koenings, Ph.D.,
Director, Washington Department of Fish and Wildlife
To the United States Senate Commerce, Science and Transportation Committee
Field Hearing, Seattle, Washington
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Good morning, Senator Cantwell and honorable Committee members. I'm Dr. Jeff Koenings, director of the Washington state Department of Fish and Wildlife.

I appreciate this opportunity to speak to you on the impacts of climate change on Washington state's marine ecosystem. I can sum up this topic with one word—uncertainty!

When we embark on a discussion of global climate change impacts, let's first acknowledge that we are heading into uncharted territory. Unlike other areas of natural-resource science and management, we have no body of research to guide us, no historic models to foreshadow the shape of things to come, no proven formulas to follow.

Given this uncertainty, Washington state has embarked on several collaborative efforts to assess and begin planning for the potential impacts of climate change. The University of Washington Climate Impacts Group, part of the National Oceanic and Atmospheric Administration's Regional Integrated Sciences and Assessment (RISA) network, the Western Governor's Association Climate Initiatives work group and the Washington State Climate Challenge all offer the kind of broad-based forums that will be required to respond to climate change.

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We do know that climate change has the potential for enormous direct impact on delicate coastal ecosystems, as well as leaving them more vulnerable to secondary stressors.

Changing ocean water temperatures, currents, and stratification can lead to other changes we are only beginning to contemplate. As you know, impacts associated with climate change and climate variability are difficult to distinguish from other forces that stress the marine ecosystem.

With so much unknown, we must gather intelligence from a growing number of abnormal, even bizarre, events that signal the natural and economic catastrophe climate change could bring to our waters. Since 2002, a growing, oxygen-depleted ocean “dead zone” ocean has appeared and grown off our coast. Periodically non-native species such as the giant Pacific squid make sudden appearances in our waters. And this year, entire salmon runs have collapsed in Oregon and California.

We need no crystal ball to see the economic toll the salmon fishery collapse has taken on the West Coast. An unprecedented \$60 million in federal funds has been distributed since last summer to some 1,200 commercial fishermen in Oregon and California. The shadow cast on coastal communities—business lost to hotels, restaurants, charter operators, convenience stores and supply shops—is even wider. And even though we in Washington state are fortunate to have some fishing opportunity this year, our severely constrained fishery is projected to eat away nearly \$14 million in revenues from sport fisheries,

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\$15 million in lost revenue to businesses that provide goods and services that support fisheries, and another \$7.2 million in direct losses to commercial fishers.

This year's chinook salmon disaster offers a window on how the disruption of a single species reverberates throughout our communities. It also sounds a wake-up call. Because as difficult as this year's events are for our West Coast neighbors, this state, with its miles of complex marine coastline—bays, estuaries, great coastal rivers and, of course, Puget Sound—is potentially even more vulnerable to climate change.

I'd like to briefly outline three ways our marine areas are particularly vulnerable to climate change— first, through growing, oxygen-deprived ocean “dead zones;” secondly, from the appearance of non-native, invasive species; and third, from cumulative impacts to salmon and steelhead as they move throughout freshwater and marine ecosystems to complete their life cycle.

Scientists have yet to determine how closely oxygen-deprived ocean dead zones are linked to climate change. But we do know the oceanic and atmospheric conditions that create these areas are consistent with climate change predictions. These zones of oxygen-starved water—historically found only on the sea floor and the outer areas of the continental shelf—in 2002 began appearing much closer to the coasts of Oregon and Washington, persisting longer, and becoming more severely oxygen depleted. We also know that the longer they persist, the greater the impact on fish, crab and other marine

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life. By last year, the coastal dead zone that appeared only in 2002, had spread to extend from Washington to the California border.

Even absent the great uncertainties of climate change, non-native, potentially invasive species dispersed by ship ballast water discharges are among the top threats to the world's marine ecosystems. For thousands of years, marine species could spread only by drifting on current or debris. With the emergence of the modern shipping and growing trade between nations, natural barriers have been broken down, allowing the introduction of alien species that upset the equilibrium of native ecosystems. A recent report by the Environmental Protection Agency calls on states consider the effect of climate change on the already-challenging issue of aquatic invasive species, to identify ecosystem vulnerabilities, and to evaluate and improve controls.

Although there is much to be done to meet this growing challenge, I'm pleased to report that Washington state has enforced ballast water management requirements on all vessels of three hundred gross tons or more, domestic or foreign. Vessel operators are required to ensure that ballast water is exchanged at sea or treated before it is discharged into state waters, and to report discharges. Improper ballast water discharges into state waters are subject to civil penalties. And yes, we have invoked those penalties a half-dozen times in the past several years.

Besides the general threat from ballast water, we are also aware of specific invaders that threaten wide-scale havoc in our marine ecosystem and our state's economy. Just two

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invasive species—the green crab and the Chinese mitten crab—could overrun our native Dungeness crab, disrupting this state’s most lucrative coastal fishery.

In no area of state fishery management are the potential effects of climate change more sobering than for salmon and steelhead. That’s because these iconic Northwest species move throughout our entire ecosystem—beginning life in inland spawning streams, migrating down major river systems, sheltering along estuaries and coastlines, finally heading out to sea and then repeating their journey homeward—to complete their life cycle. With such a wide range, they are particularly vulnerable to flood events, competing water demands and temperature changes—all expected to increase with a changing climate. Because salmon and steelhead rely on clean, cool water for survival, and require undisturbed streambeds to produce offspring, entire runs can be threatened by water flow disruptions. Those disruptions include flooding such as we’ve seen this past winter and the one before it, as well as warm season low flows that can strand young fish en route to the ocean, or block the return of adult salmon headed back to their native streams to spawn. This year’s collapse of California’s Sacramento River and Oregon’s Klamath River salmon runs may offer the most detailed picture to date of the consequences of water-supply disruption.

Given the uncertainty of what lies ahead, the common denominator in all these concerns is the need for precautionary resource management. Faced with great unknowns, our best hope is to take the best possible care of the resources we still have.

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It's difficult to consider climate change impacts without becoming overwhelmed.

However, we can find some cause for optimism in an evolving spirit of cooperation as we face our shared burden. I'd like to share one recent example. Just days ago, the United States and Canada reached agreement on a new salmon-harvest plan, under the Pacific Salmon Treaty. Over the next 10 years, this groundbreaking agreement will return a million more salmon to Northwest waters. For example, the annual catch of chinook in southeast Alaska will be reduced by 15 percent. Off the west coast of Vancouver Island, British Columbia will lower its annual chinook harvest by 30 percent. Many of the salmon spared will return to Washington waters, furthering the recovery of fish populations listed for protection under the federal Endangered Species Act.

I can assure you that with this conservation-based agreement we are making a substantial down payment toward recovery of Washington's weak, wild, chinook salmon populations. This is a unique opportunity to pursue precautionary resource management on a far-reaching and long-lasting scale.

We can find other models of the kind of all-hands work needed to take on climate change issues. Right here in the Puget Sound region, a partnership established by Governor Gregoire is bringing governments on all levels together to restore the health of the Sound within a decade. On another front, my agency is working with scientists, tribes and legislators to completely retool our state's aging hatchery system—one of the world's largest—to support wild salmon recovery.

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The kind of large-scale commitment and cooperation exemplified in the Pacific Salmon Treaty—among nations, among agencies, among citizens—must be the cornerstone of any concrete effort to tackle the sweeping challenge of climate change. Unlike so many other concerns of government where the past is prelude to the future, in this arena we are faced with unknown challenges of monumental proportions. We go forward with the only tools that offer hope—our shared concern, our willingness to collaborate, and our combined commitment to conservation.

Thank you. If there are any questions, I'll be happy to try to provide you with a concise answer.

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