

## **Our children's future is a changing natural world**

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I am often asked whether the more extreme weather of the past few years is caused by climate change. I do regard extreme weather as one symptom of the Earth's changing climate. But I am really being asked deeper questions, such as: "Is it our fault, and will things get worse as we continue to dump greenhouse gases into the atmosphere?"

The answer is probably yes, because our climate models predict this. But we still do not understand many of the details because the climate system is so complex and so interconnected.

We understand how water vapor increases as the climate warms, and we know that storms intensify when vapor condenses and releases energy in clouds. We understand that the flow of warm moist air from the Gulf of Mexico, capped by the flow of dry unstable air from the western mountains and deserts, sets up conditions for severe storms and tornadoes in spring. But it may take years of analysis to fully understand why the tornadic storms this spring were so violent, and why even Springfield, Mass., saw a damaging tornado.

Much extreme weather — especially floods and droughts — comes when the very large-scale weather patterns are nearly stationary for weeks or months. This can affect large regions around the globe.

From March to June, a band of states from Kentucky to Vermont had the highest precipitation in the 117-year record. I am sure you remember the spring floods. At the same time, Texas had the lowest precipitation on record. The same quasi-stationary weather pattern was the cause of both extremes; however, in a global sense, we don't know why stationary weather is becoming more frequent as the climate changes. We can see the Arctic is melting quite rapidly. We know this is caused by the warming of the earth, driven by increasing greenhouse gases. But so far we haven't understood in detail how this is changing our mid-latitude weather and climate.

Over the past decades we have developed measures to protect our national parks and forests. That felt good, and life in our cities went on as usual — until now, when our human impacts have become global. Stewardship of the Earth is much more difficult for humanity to accept, because now our way of life must change. The waste products of so many people, dumped without thought into the atmosphere and oceans, is unsustainable. And so the climate of the planet is changing. The northern icecap is melting, and storms are intensifying. The oceans are threatened by agricultural runoff, increasing acidity as carbon dioxide dissolves, and overfishing.

As a society we must change direction and build a more sustainable and resilient way of life. This is not easy because we don't like change, and there are so many wealthy vested interests opposing it. But change we must, because we cannot manage the Earth. We can only reduce our impacts, primarily our waste streams. This will slow the rate of climate change, and give the Earth and ourselves more time to adapt.

Responsibility for our children comes easily, because we love them and understand their needs. Their lives are interwoven with ours, and their survival and their future matter deeply to us. Responsibility for the Earth is just as important, so we must also understand and love the natural world — and see how it is interwoven with our lives, our food and our survival.

This summer, sit in the woods and by streams and lakes and immerse yourself in nature's world. This is your future and your children's future.