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# Water can't be separated from life

In early summer we celebrate the Declaration of Independence from colonial rule; it's also a good time to celebrate our interdependence. Our culture reveres independence and personal and national power, but today I am going to discuss the interdependence of water and life.

Water is the medium of life – from the oceans, to the blood in our veins, to the sap in a tree that flows from the roots to the leaves and then passes as vapor into the air.

Let's start with the oceans, that vast reservoir not only of water, but all the DNA building blocks of life. We revere the whales, dolphins and polar bears, but like us they depend on the web of life. When we burn fossil fuels, carbon dioxide gas is released into the earth's atmosphere. Some of this CO<sub>2</sub> stays in the atmosphere, where CO<sub>2</sub> levels are now rising rapidly. And some of the CO<sub>2</sub> is dissolving in the oceans and making the water more acidic.

The microbial life in the oceans, the genetic memory of life for the past billion years, must now adapt to this new environment, evolve and restore a new balance for the oceans and our planet. We have set this process in motion, but we don't know where it will lead. We don't know what the new balance will be, or what species of life it will support.

Water evaporates from the oceans into the air. This water vapor is a greenhouse gas that helps keep our planet warm and prevents the oceans from freezing (except close to the poles, where the sun is low). As increasing CO<sub>2</sub> in the atmosphere warms the planet, there is more evaporation and more water vapor in the air – and so the warming cycle is accelerated.

Moisture and clouds from the oceans blow over the continents and give us rain that moistens the soil and gives life to plants and trees. The rain fills the reservoirs (underground and man-made) that supply the water we drink.

As moisture in the air increases, heavy rainstorms and flooding become more frequent. We rely on plants and trees to bind the soil, so it does not wash away in storms. Forests buffer the climate of our planet by absorbing sunlight and transpiring water that cools the surface. Through long droughts, their deep roots can draw on water stored in the ground. Without them we might have a desert climate.

June was very wet this year. Frequent rains gave us moist soils and forests, with lots of evaporation every day. This process is very obvious when the leaves are dripping wet, and you can see clouds blowing off the forested hills: water evaporating and condensing at once as it rises. My garden was lush – but some vegetables that prefer hot weather and sunshine, like eggplant and basil, grew rather slowly. In any case, there certainly was no need to water anything all month! In fact, enough water is now stored in the ground to support two weeks of summer growth.

Evaporation cools the earth directly and also indirectly during the daytime because it encourages the formation of clouds that block the sun's rays from reaching the earth. However, at night the clouds and moisture in the air keep the earth from cooling much. More clouds produce more rain showers, and the wet cycle goes on. This pattern can only be broken by a shift in the large-scale weather – what the forecasters call a "ridge of high pressure," where subsiding air gives us a dry spell with no rain. If it lasts long enough, the ground dries out.

As the climate gets warmer, the cycle of water on the earth is altered. Summer rains get heavier (think of downpours in the tropics). More rainwater runs off into rivers, because it comes down so fast. And because there's more evaporation as the climate warms, the ground dries out faster between storms.

Some plants grow well as the temperature goes up. But for much of the warmer regions of the United States, summer temperatures are approaching limits where plant growth starts to slow down. Up here in Vermont, where our average climate is cooler, we can withstand more summer warming than, say, the southeastern United States. But our forests, which are used to cooler temperatures, will suffer. If we go on burning fossil fuels at our present rate, the climate of Vermont in the year 2100 will be like the climate of northern Georgia in the year 2000.

Right now Vermont has enough water, but looking ahead, we should be concerned. As rainfall gets heavier, we

must store more water and let more sink into the ground, where it will be available for later use – not only for us but also for our crops and forests. One point of reference is this: Every summer month in Vermont, about 3000 gallons of rainwater fall on the roof of your home. That seems like a lot, but some households use more than this in a month.

Drink the precious water of life and celebrate our interdependence. Many traditions consider it the spirit of life, the spirit of forgiveness that cleanses us and washes away our mistakes.

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#### ON THE NET

Union of Concerned Scientists: [www.climatechoices.org](http://www.climatechoices.org)

Vermont State Climate Office: [www.uvm.edu/~ldupigny/sc/](http://www.uvm.edu/~ldupigny/sc/)

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