be high, based on observations of offshore transport of nutrients in this eddy.

Coastal waters supplying Haida-1998 carry high nutrient loads. A profile of nitrate through the core of Haida-1998 in August 1998 shows that nutrient levels below the surface mixed layer in late summer are 10 μmol/L higher than normal. These nutrients seem to mix into surface waters during the deepening of the mixed layer in autumn.

Indeed, Line P cruises during the 1990s show that, compared to the 1970s, the winter supply of nutrients to surface waters has declined in conjunction with a warming and thinning of the mixed layer [*Whitney and Freeland*, in press]. As a result, nitrate has been depleted in 4 of the last 5 summers in the area where Haida-1998 was sampled. Thus, the transport of coastal nitrate (and iron) into this region will enhance the productivity of these offshore waters. We estimate that the excess nitrate remaining in Haida-1998 in August 1998 was adequate to double the annual new production of the mixed layer over its 30,000 km^2 area.

We have proposed a climate program to the Canadian government to take water samples from such eddies in future years to measure offshore transport of nutrients, including iron, and their impact on life in the Gulf of Alaska.

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U.S. Federal Government Tries to Get Ahead of the Curve with Drought Planning

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Richard Tinker, a meteorologist with the National Weather Service (NWS), has seen severe droughts in other parts of the country during previous years. But current conditions in the United States are stunting row crops, lowering the levels of reservoirs and rivers, and parching especially hard the Mid-Atlantic states in addition to parts of California and other regions. The Mid-Atlantic is a region perhaps not as sensitized to the creepingly slow troubles droughts can wreak, as are the water-lorn West and the once-Dust Bowled Great Plains.

The drought—which the National Oceanic and Atmospheric Administration (NOAA) said on August 6 already has caused the driest seasons in four Mid-Atlantic states since record-keeping began 105 years ago—is also taking its toll on Tinker's backyard in the metropolitan Washington, D.C. area.

"If you look real closely on the Palmer drought index," he said, referring to a drought measurement system, "right in the middle of the worst area, you can see my lawn."

Right in the middle of this drought also is the heavily populated and media-saturated East Coast. During typical summers, at least 15% of the United States is subject to drought, according to NWS, a division of NOAA. But the geography, plus the timing, separates this drought from others that might hit non-metropolitan areas such as the Dakotas. Concern about the drought is echoing through corn fields and news rooms at the same time that a National Drought Policy Commission has begun deliberating about the best course for dealing with future dry spells.

These factors could bring enough attention to the problem to finally put droughts on the natural disaster map, according to some experts. Hurricanes, floods, and earthquakes, they say, usually garner much more attention. But droughts can be just as devastating, and carry a bigger price tag. Droughts cost the United States $6 to $8 billion annually—though a severe U.S. drought in 1988 cost an estimated $40 billion—compared to $2.4 billion for floods, and $1.2 to $4.8 billion for hurricanes, according to the Federal Emergency Management Agency and the U.S. Department of Agriculture (USDA).

Droughts receive less attention because they are slow-moving disasters, say experts. There is no such thing as a flash drought, for instance, and droughts edge up without lightning bolts or tremors that people experience directly.

"Drought is something of a unique catastrophe," said Agriculture Secretary Dan Glickman. "If I can make something of a morbid analogy, tornadoes and floods are more like heart attacks: quick strikes that compel people to spring immediately into action. But drought is more like a cancer: slow, insidious, and not always easy to detect in the early stages. That makes drought harder to respond to."

But Glickman said the current drought could be an exception. "As unfortunate as it seems, when you get a disaster of this magnitude affecting large metropolitan areas in the Northeast, it gets a lot more attention than if it affected farm areas where it is not as well populated."

Droughts, as with other natural disasters, are political, said Donald Wilhite, an agricultural climatologist and director of the National Drought Mitigation Center (NDMC) at the University of Nebraska's Institute of Agriculture and Natural Resources. The geographic impact of the current drought "puts a huge spotlight on [the drought commission's] work," he said. "Maybe it's a twist of fate that the East is getting hammered this year at the time when the drought policy commission is just beginning its work."

Drought Policy Commission Executive Director Leona Dittus agreed that the current drought "will give a lot of priority to what the commission is doing."

"We are just coming to see [droughts] as natural disasters," added Commerce Department Deputy Secretary Robert Mallet. "Frankly, we have not been doing enough to plan ahead for this kind of emergency."

The U.S. Congress, too, admitted to this lack of long-term planning in the National Drought Policy Act of 1998, which received bipartisan support and which U.S. President Bill Clinton signed into law in July 1998 to establish the drought commission. The act states that there is currently no coordinated federal strategy to respond to drought emergencies, and no single federal agency taking a leading or coordinating role.

"At the federal level," the act states, "even though historically there have been frequent, significant droughts of national consequence, drought is addressed mainly through special legislation and ad hoc action rather than through a systematic and permanent process as occurs with other natural disasters."

The current drought, which started in the Mid-Atlantic region during the summer of 1998, has included a heat wave and a rainfall deficit of 8 to 18 inches in many affected areas, according to NOAA. The agency said four states—New Jersey, Delaware, Maryland, and Rhode Island—were measured as the driest they have been between an April through July growing period since recordings began. Four others—Connecticut, Massachusetts, New York, and West Virginia—recorded their second-driest periods during that time. In addition, USDA has declared all of Connecticut, New Jersey, and West Virginia—as well as many counties in other states—as agricultural disaster areas. USDA is considering declaring

other counties and states as agricultural disaster areas, which qualifies those regions for low interest loans and other assistance.

While droughts, in general, heavily affect agriculture, the current drought is particularly painful, said Agriculture Secretary Glickman. "This drought could not come at a worse time for farmers, who are already coping with some of the weakest prices in decades and soft global demand for their commodities," he said. "They have got a double whammy in that they have got here very dry temperatures coupled with low prices, at least with respect to row crops."

The drought is due to a combination of an irregular jet stream pattern that has caused a persistent heat wave, the effects of La Niña, and typical summer weather, according to NOAA.

"The drought and the heat wave are typical of summer conditions. We always see this," NOAA Administrator James Baker said. "But it is the kind of thing you are going to see more of when you have global warming. We have, since the 1970s, seen an increase in the numbers and the frequency of droughts and heat waves. And we are seeing an increase in nighttime temperatures." Baker said models indicate that one result from increased greenhouse gases is increased strength of the hydrological cycle. But he added that this increase in extreme events "is still within the climatic noise of our overall system."

NWS Director Jack Kelly added, "It's difficult to relate a particular climate event to global warming, but if the atmosphere warms, you would expect more heat waves and longer periods of drought. But relating this to global warming, I'll get you an equal number of scientists who will argue both sides of that."

NOAA forecasts the current drought to become worse in some regions, and says that even with some precipitation it could last for a while longer—to make up for the rainfall deficit. "This could be a drought that continues on for a long time," Baker said.

The drought could ease during the winter in some regions, with cooler temperatures and less evaporation, according to NOAA. The agency also expects a more active than normal hurricane season, which may bring some tropical storms to the drought regions.

"The drought is worsening and is beginning to spread," added U.S. Geological Survey (USGS) Chief Hydrologist Robert Hirsch. "Conditions do not look positive for any improvement in the immediate future." USGS said the drought is spreading throughout the Northeast, and also into the Carolinas and west into Ohio and Indiana.

Hirsch said USGS also is concerned about possible encroachment of the salt front on municipal water supplies in Philadelphia, Poughkeepsie, NY, and other cities. Saltwater can move upstream due to reduced stream, he said.

USGS employs several tools to help monitor for droughts. A nationwide system of stream gauges allows the agency to monitor water levels. And a USGS daily streamflow conditions map provides an update of conditions on about 2300 streams around the country every three hours.

Other tools agencies utilize for tracking droughts include supercomputers, ocean buoy arrays, and knowledge gained during successful forecasting of the recent El Niño.

On August 11, the Clinton Administration announced several new initiatives to deal with drought. These include posting on NOAA's drought Web site a weekly "threats assessment" that includes heat and other weather conditions, and a drought monitoring and forecast service. In addition, NOAA and other agencies are fast-tracking research to provide extreme heat forecasts up to two weeks in advance by next summer.

Other efforts also could help the nation deal with droughts. An interagency task force established by the White House on August 6 will coordinate the federal response to the drought and federal input to the drought policy commission.

Glickman urged Congress to add funding for short-term drought relief to the final version of the agriculture appropriations bill. And experts are hopeful that the drought commission will present good recommendations that are well-received by Congress and the administration.

"We are looking at [the commission] from two basic perspectives," said Glickman. "Should farm policy have more of a weather and disaster component to it than it currently does? Should our research budget be more focused on drought resistant crops than they are? And should our risk management policy—that is, how we help farmers when times get really rough, like this—should it be based more on some sort of predictable risk management policy rather than this kind of ad hoc assistance that tends to come almost every year?"

Wilhite of NDMC said he hopes the drought commission is more than an administrative exercise, and that it leads to a coordinated drought policy that emphasizes mitigation, risk management, and community self-reliance. He also wants the policy to emphasize sustainable use of agriculture and the natural resource base—particularly during droughts and other periods of climatic stress.

"We are on the edge of an incredible opportunity here to make real inroads in how the country historically has dealt with drought," Wilhite said, referring to the national focus the current drought is receiving and the commission's work. "We have never before had this level of attention at the national level of drought as a natural hazard."

For further information about the National Drought Policy Commission, visit the Web site: http://www.fsa.usda.gov/drought. The commission plans to hold several public hearings, and is accepting comments through at least September 17, 1999. The commission currently plans to issue its final report in January 2000, but that date could be extended if needed, according to Executive Director Dittus.

Additional information is available from the National Drought Mitigation Center at its Web site: http://enso.unl.edu.ndmc/; from NOAA at http://www.drought.noaa.gov/; and from USGS at http://water.usgs.gov.

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