Straight TALK

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Our Common Endangered Brook Trout

Our state fish, the Brook Trout (*Salvelinus fontinalis*), is at a critical point in its life. It has approached a fork in the stream and needs to decide which branch of the stream to take to its spawning grounds. Yogi Berra once famously said, "When you come to a fork in the road, take it." The Brook Trout will keep swimming upstream to spawn by choosing one of the branches—a critical decision that can determine its fate. It will mean the difference between life or death for all Brook Trout that live within Pennsylvania. The Brook Trout's trouble is that it doesn't have a vote in this decision. No, it really doesn't have a choice. Society (the people) will make the decision for the Brook Trout.

The National Wildlife Federation (NWF) recently published the report—*Game Changers Climate Impacts to America's Hunting, Fishing and Wildlife Heritage*. Anglers, boaters, conservationists and the public at large should appreciate NWF's efforts to bring attention to the climate change issue. Since the term "climate change" evokes polarized opinions, I have decided to focus this column on what the future looks like for our state fish—the Brook Trout. I will do this by discussing three topics—climate, change and responsibility.

Climate

Climate is defined as the variability of weather over a long period of time ranging from months to thousands or millions of years. On the other hand, average weather condition or climate is typically evaluated in periods of 30 years or longer. This approach gives us the ability to smooth out the variation in weather patterns in order to compare how things may be changing (**https://en.wikipedia.org/wiki/Climate**).

We primarily measure temperature, precipitation and wind patterns, and statistically describe the state of climate as the climate system, which includes our air, water, sea ice and glaciers, the earth's crust and our biosphere. Our biosphere includes all of us and all other living things on earth including our Brook Trout. You can understand how important climate is to Pennsylvania's fish and wildlife resources and why anglers and boaters need to be interested in how and why it's changing.

photo-Dr. Mike Millard, USFWS

Change

In order for us to decide if things are changing or not, we need to determine what is "normal." We do this by establishing a baseline condition that we can all accept. As you can imagine, today's baseline is much different than it was at other times in the history of our planet. As we all know, change can be good or bad. That's why it is incumbent upon us to monitor change, so we can decide whether we need to do something about it. For example, the NWF report discusses the negative impacts expected for our native Brook Trout if we continue on our current path with carbon emissions. Since we are a trout state, with 70 percent of our anglers fishing for trout, our trout anglers should be concerned and interested in understanding these changes. These changing weather patterns will benefit some species and negatively impact others. We expect many of our native cold water fish populations to shrink, disappear and be replaced by species, like Largemouth Bass and other species, that can tolerate warmer water temperatures. The future is less clear for amphibians and reptiles since they will respond to changing habitats and air temperatures instead of water temperatures. They will either adapt to a changing environment or disappear and be replaced by other species that may not be native to Pennsylvania.

The United States Environmental Protection Agency (EPA) (2015) found that without greenhouse gas (GHG) mitigation, climate change is projected to have a significant impact on freshwater fishing across the United States including Pennsylvania. Stream temperatures will increase, and stream flows will change in response to changes in precipitation patterns that will dramatically change stream habitats. EPA predicts that if we don't act by 2100, coldwater fish will virtually disappear from the Appalachian Mountains and only remain in the high altitudes of the western United States (Figure 1). However, if we begin to act now, change will still occur but will be significantly reduced—only 19 percent of the estimated change without mitigation (Figure 2). If we choose to mitigate the impacts of GHG emissions, the economic benefit estimated to occur for coldwater fishing alone is $1.5 billion.

Climate researchers first began looking at the world's climate in 1929 when the International Meteorological Organization set up a technical commission to study climatology. Since then, we have been measuring climate changes in 30 year periods, and our world leaders just concluded at the COP21 Paris Climate Conference that the changes occurring with our world's climate are bad, and we can and have to do something about them. I won't try to explain the plan but would like to point out that when I was born, we had 2.5 billion people on earth. Today, we have almost 7 billion, and it's

EPA. 2015. Climate Change in the United States: Benefits of Global Action. United States Environmental Protection Agency, Office of Atmospheric Programs, EPA 430-R-15-001.

Figure 1. Projected Impact of Unmitigated Climate Change on Potential Freshwater Fish Habitat in 2100

Change in distribution of areas where stream temperature supports different fisheries under the Reference scenario using the IGSM-CAM climate model. Results are presented for the 8-digit hydrologic unit codes (HUCs) of the contiguous U.S.

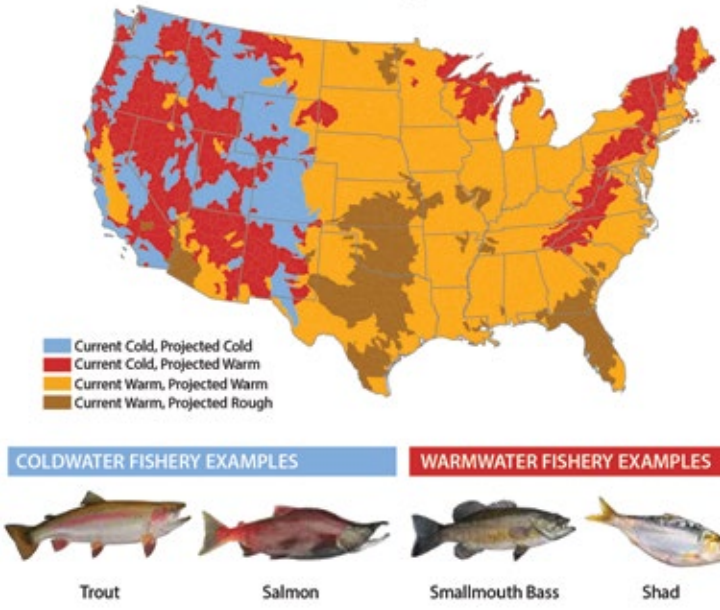
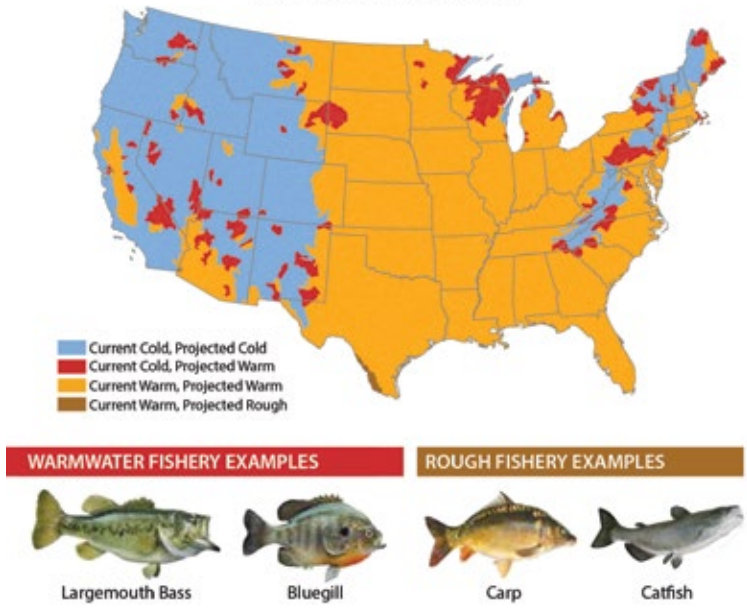


Figure 2. Projected Impact on Potential Freshwater Fish Habitat in 2100 with Global GHG Mitigation

Change in distribution of areas where stream temperature supports different fisheries under the Mitigation scenario using the IGSM-CAM climate model. Results are presented for the 8-digit HUCs of the contiguous U.S.



estimated that we will exceed 10 billion by 2080. We know that everything has a carrying capacity, whether it is your kitchen sink, one of our state fish hatcheries or the planet. We must stay diligent in our continued monitoring of the changes that are occurring and do our best to minimize the impacts that we are causing to our planet and our fish and wildlife resources.

Responsibility

Pennsylvania has been long recognized as a leader in the fight for clean water and a protector of our natural resources. Our Clean Streams Law was a model for the federal Clean Water Act, and our Surface Mining Conservation and Reclamation Act (SMCRA) was a model for the federal Surface Mining Control and Reclamation Act (SMCRA). It is not a coincidence that the acronyms are the same. Pennsylvania has a legacy of water pollution problems that we have confronted with legislative solutions and regulatory standards. These changes have created the environmental improvements that now allow us to be able to fish in more streams today than when I was a child. Our generation has successfully used science to identify our problems, developed engineering solutions to fix them and created funding mechanisms to allow us to accomplish tremendous successes despite ongoing challenges. We need to apply the same formula to our air as we did to our water.

Those of us in public service in Pennsylvania have a constitutional duty and responsibility, assigned to us by Article 1, Section 27 of our Constitution, to be the trustees of our air, water and our public natural resources—the public's property, and conserve and maintain them for all the people including generations yet to come.

Summary

I will conclude with a quote from our nation's Father of Conservation, Aldo Leopold who said, "*The land ethic simply enlarges the boundaries of the community to include soils, waters, plants, and animals, or collectively: the land... In short, a land ethic changes the role of Homo sapiens from conqueror of the land-community to plain member and citizen of it. It implies respect for his fellow-members, and also respect for the community as such.*" I believe that it is time to add the air we breathe to Leopold's definition as our forefather's did in our own Constitution. We need to begin the development and implementation of a plan to clean our air like we did our water. This plan would not only provide the necessary certainty for 10 billion of us but also for the Brook Trout in our coldwater streams, our canaries in the coal mine, that currently don't have to worry about the decision of which fork of the stream to take to successfully reproduce.

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The mission of the Pennsylvania Fish & Boat Commission is to protect, conserve and enhance the Commonwealth's aquatic resources and provide fishing and boating opportunities.

Your Director,
><(John{(°>