Havens deposition for Congressional Field Hearing,
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Senators Rubio and Nelson - thank you for the opportunity to provide information about water flow in the Apalachicola River and health of the Apalachicola Bay ecosystem.

Let me first discuss the history of water flows into the bay.

At one time, the Apalachicola was one of the largest rivers in the United States, with flows greater than the Colorado River. In the river's history there have been periods of low flow, coinciding with regional droughts. Sometimes these events have lasted for a year or two. Most recently, in 2011 and 2012, the river basin was the driest place in the United States. The low rainfall coincided with river flows dropping to the lowest levels ever recorded in the 89 years of record keeping by the US Geological Survey.

Now I will discuss impacts the recent low river flow on the bay.

When river water enters into the bay, it dilutes the salt content to a lower level than occurs in the open waters of the Gulf of Mexico. Oysters in the bay thrive, and grow in large colonies called ‘bars.’ Certain other animals, including crabs, conchs, clams, worms and sponges – which eat or damage oysters – are kept at lower levels when there is good river flow. When river flow is greatly reduced, conditions in the bay become favorable to these things that eat and parasitize oysters, and oysters are harmed.

We studied the response to low river flow in a research project undertaken by my colleagues at the University of Florida, working with scientists from several Florida agencies and the Seafood Workers Association. We looked at existing data and did considerable new sampling of oysters, other animals, and water quality in the bay.

When the river flows were low, salinities increased to levels similar to those found in the Gulf, and both predators and parasites of oysters were abundant. Oysters were heavily infested with boring clams, sponges and worms and they had a high level of internal parasites. What previously had been a place for oysters to thrive became a place for them to die.

The data we examined indicated a sudden crash in the oyster population in August 2012. A University of Florida oyster model indicated that the crash was due to high mortality of juvenile oysters. Our data analysis and modeling provided no evidence that over-harvesting was a cause of the decline, and we found no evidence of contamination by oil or dispersant. We don't know the proximal cause of the sudden decline in oysters, but it is reasonable to link it to a disease, predators or some other factor related to the long period of low river inflow and high salinity.

How might we help oysters be more resilient to future low flow events?

First, it is critical that long-term oyster population monitoring be done in a manner that provides guidance regarding the amount of oysters that can be harvested in any given year. This is especially important right now, when the population is greatly reduced and at greater risk of over-harvesting.

Second, there is a need to restore degraded oyster reefs in the bay. If nothing is done, our University of Florida oyster model indicates that it could take over 10 years for recovery – yet with 1,000 acres of reef restoration, recovery time could be as short as 3 years, assuming that

fishing pressure is controlled so that those restored reefs can develop robust oyster populations.

What is a logical path towards solving the river flow problem?

In my opinion, the first step must be getting a clear understanding about how human uses of water contribute to the low river flow. There is great need for a hydrologic model of the basin that includes rainfall, evaporation, reservoir operations and all of the consumptive uses of water by people. One of the first things that I would do is run that model to compare two scenarios – the last two years with and without human withdrawals of water. If there is little difference, there may be little opportunity to 'fix' the problem. On the other hand, if the difference in river flow is 10 or 20 percent (or more), there could be a solution, and the next step would be to find where the water is being used and what kinds of conservation measures are practical.

Finally, let me provide some comments on research and monitoring.

There is a critical need for good long-term monitoring of oyster population size, health and levels of predators and parasites – so if a drought happens again, we can more effectively identify the cause of an oyster response.

There also is a need for research to guide how restoration projects are done in the bay, so that if money is spent, it is done in a cost effective manner and has a good outcome.

Finally, there is a need to understand how fishing pressure, river flow and habitat quality interact to determine the sustainability of the oyster population in Apalachicola Bay. These factors are intertwined, and knowing how they are related is critical to sustainably managing the resource.

Thank you