

JULIA A. OLSON (OR Bar 062230)
JuliaAOlson@gmail.com
Wild Earth Advocates
1216 Lincoln Street
Eugene, OR 97401
Tel: (415) 786-4825

ANDREA K. RODGERS (OR Bar 041029)
Andrearodgers42@gmail.com
Law Offices of Andrea K. Rodgers
3026 NW Esplanade
Seattle, WA 98117
Tel: (206) 696-2851

PHILIP L. GREGORY (*pro hac vice*)
pgregory@gregorylawgroup.com
Gregory Law Group
1250 Godetia Drive
Redwood City, CA 94062
Tel: (650) 278-2957

Attorneys for Plaintiffs

UNITED STATES DISTRICT COURT

DISTRICT OF OREGON

KELSEY CASCADIA ROSE JULIANA;
XIUHTEZCATL TONATIUH M., through his
Guardian Tamara Roske-Martinez; et al.,

Plaintiffs,

v.

The UNITED STATES OF AMERICA;
DONALD TRUMP, in his official capacity as
President of the United States; et al.,

Defendants.

Case No.: 6:15-cv-01517-TC

**DECLARATION OF DR. HAROLD R.
WANLESS in Support of Plaintiffs'
Response in Opposition to Defendants'
Motion for Summary Judgment**

**Declaration of Dr. Harold R. Wanless in Support of Plaintiffs' Response in Opposition to
Defendants' Motion for Summary Judgment**

I, Dr. Harold R. Wanless, hereby declare and if called upon would testify as follows:

1. My name is Harold Rogers Wanless. I am a Professor in the Department of Geological Sciences and was Cooper Fellow of the College of Arts and Sciences at the University of Miami. My office is located in Coral Gables, Florida. I am a Registered Professional Geologist in the State of Florida #985.
2. I have been retained as an expert on behalf of Plaintiffs in this matter.
3. I have prepared an expert report for this litigation (“Expert Report”), a true and correct copy of which is attached hereto as **Exhibit 1**. My Expert Report is signed by me. A copy of my Expert Report was served on Defendants on April 6, 2018.
4. My Expert Report contains: a complete statement of all opinions I will express at trial and the basis and reasons for these opinions; the facts or data considered by me in forming my opinions; any exhibits that I currently plan to use to summarize or support my opinions; my qualifications, including a list of all publications authored by me in the previous 10 years; a list of all other cases in which, during the previous 4 years, I testified as an expert at trial or by deposition, if any; and a statement of the compensation to be paid for the study and testimony in the case.
5. If called to testify in this matter, I would provide testimony as described in the attached Expert Report and as follows.
6. Our sandy barrier islands and low-lying coastal communities are at extreme risk for inundation and total loss this century because of accelerating polar ice melt and sea level rise resulting from the buildup of excess greenhouse gases from the burning of fossil fuels. Meaningful U.S. Government Global Mean Sea Level projections are for a further 5 to 8.2 feet of rise this century. When regional sea level rise projections are added in,

southeast Florida should be anticipating from 7.0 to as much as 14.1 feet of further sea level rise by 2100. This could be 2 more feet of rise by 2039-2041, enough to limit habitability of our barrier islands and other low coasts.

7. Figure 1 documents the significant acceleration in the Global Mean Sea Level rise that has occurred since 1900. The rate doubled following 1930 as warming sea water began significant expansion oceans. Following 1990, as polar ice melt initiated and accelerated resulting in a further nearly four-fold increase in the global rise. The graph ends in 2015, and the acceleration is continuing.

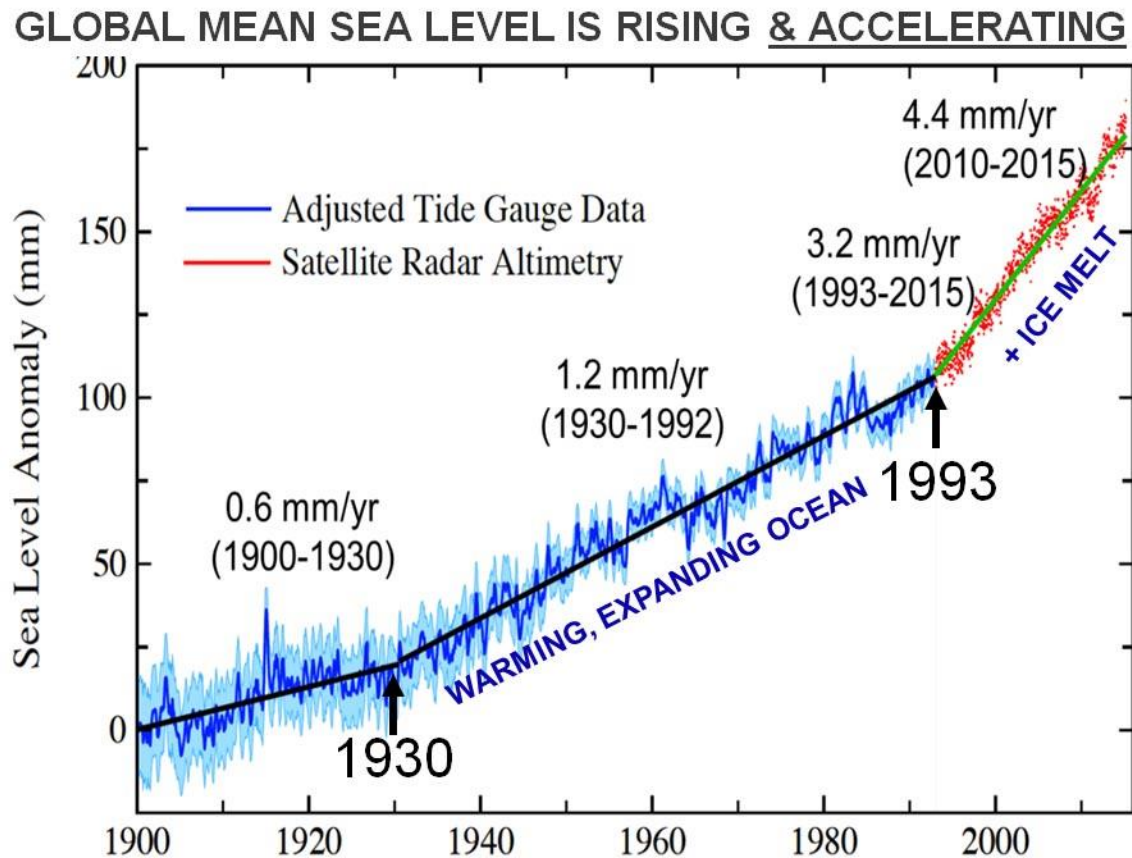


Figure 1. Reconstruction of historical global mean sea level rise since 1900. Adapted from James Hansen.

8. In June, 2018, 80 leading Antarctic researchers published an article pointing out that in the last decade Antarctica has tripled its rate of ice melt and its contribution to sea level rise (IMBIE, 2018), and they point out that this may well continue (both the melt and its acceleration) and has the potential to produce very serious consequences much sooner than previously anticipated. A true and correct copy of this study is attached to my declaration as **Exhibit 2**.
9. A recent study offers more support for the notion that the observed accelerating feedbacks are speeding up ice melt on Greenland and Antarctica. The persistent thickness of the buoyant freshwater outflow isolates the warm water below from seasonal cooling by the cold polar atmosphere thus accelerating the melting power of the warm water penetrating beneath the ice (Silvio *et al.*, 2018). A true and correct copy of this study is attached to my declaration as **Exhibit 3**.
10. Although Florida has been subjected to basically the global rise in sea level until now, there are two features which indicate that Florida's sea level rise will be significantly greater than the future Mean Global Sea Level rise.
11. First, the huge masses of ice on Greenland and Antarctica actually have a significant extra gravitational attraction, pulling ocean water towards these areas. This raises sea level near Greenland and Antarctica and lowers sea level elsewhere. As Greenland and Antarctica ice sheet melt is accelerating, the gravitational attraction of that decreasing ice mass is weakening, and the pull of water towards these ice masses is less. Lemonick (2010) estimated that this redistribution of mass balance will result in an additional 25-37 percent of ice-melt global sea level rise. More recently, Hsu and Velicogna (2017) estimate that this redistribution of gravitational attraction with continued ice melt will

result in southeast Florida's sea level rise being 52 percent greater than the Global Mean Sea Level rise. That could mean that a 1 meter (3.3 foot) global sea level rise would become a 1.52 meter (5 foot) rise in South Florida, or a 3 meter (10 foot) global rise would become 4.5 meters (15 feet). Much of the Atlantic coast of the United States should have a similar response.

12. Second, it is forecast that the speed of the Florida Current and Gulf Stream will decrease through the century as less water is drawn north around Greenland to replace water that has sunk to form the deep water of the Ocean Conveyor Belt. This Florida Current/Gulf Stream slowdown is predicted in Atlantic Ocean circulation models (Kirtman et al., 2012), and has been documented in recent observations (Park and Sweet, 2015; Rahmstorf et al., 2015). The north-flowing Florida Current is pulled to the right by the Coriolis Force or Effect,¹ a force related to the spin of the Earth. In the northern hemisphere, the Coriolis Force acts to turn a moving water current to the right piling up water to the right and creating a slope of the water surface, higher on the right or east side of the Florida Current. Regionally, the Coriolis effect on the Florida Current, Gulf Stream flow and North Atlantic circulation results in water building up on the right side of these currents and being lowered on the landward left side. Sea level averages nearly one meter (3.3 feet) higher at Bimini, Bahamas, than at Miami just across the Florida Current. The Florida current and North Atlantic circulation is driven by a combination of (a) wind (Westerlies to the north and Easterlies to the south) and (b) water moving north to replace

¹ The Coriolis Effect or Force is an influence on moving things because of the spin of the Earth. In the Northern Hemisphere, a moving bullet or ocean current will be turned to the right. Because of the clockwise circulation of the North Atlantic gyre, the Coriolis Effect results in water being pulled away from the Atlantic coast and pushed towards and piling up on the right side of the current and in the middle of the ocean. In contrast, westerly winds around Antarctica in the Southern Hemisphere create an easterly moving (counterclockwise) ocean current which is turned to the left. This pulls surface water away from the coast causing upwelling of warmer water from below.

cold dense water sinking in the vicinity of Greenland to form the North Atlantic Deep Water and the Ocean Conveyor Belt.

13. As the Arctic has warmed and the Arctic surface water freshened over the past 60 years, the formation of saline, cold dense North Atlantic Deep Water has dramatically decreased (Rahmstorf *et al.*, 2015). If this persists, we can expect the Florida Current/Gulf Stream velocity to slow since less water is being pulled off to replace that which sank. Thus, one of the driving forces maintaining a lower sea level in south Florida than across the Straits in the Bahamas has weakened.
14. Because of the anticipated slowdown of the Florida Current as this century progresses, the Southeast Florida Regional Planning Council's "Regional Compact" has recommended adding 15 percent to future Global Mean Sea Level rise to account for the anticipated decreasing velocity of the Florida Current and Gulf Stream (Technical Ad Hoc Work Group, 2015).²
15. Adding an additional 20 percent to the Global Mean Sea Level rise of 1 meter (3.3 feet) discussed above would give an additional 20 cm (0.7 feet). Combining the changing redistribution of mass balance (+52 per cent) and slowing speed of the Florida Current (+20 per cent) would give a total sea level rise of 1 meter (GMSL) plus an additional 72 percent for a total of 1.72 meters (5.6 feet).

² Another article came out very recently addressing this recent increase (Valle-Levinson *et al.*, 2017). The article points out that the recent rapid acceleration in sea level rise has affected Miami to Cape Hatteras, again because of slowdown in the Florida Current/Gulf Stream flow plus El Niño dynamics influences. A true and correct copy of this study is attached as **Exhibit 4** to my declaration.

16. By the end of the century the southeast Florida regional sea level, according to the three U.S. Government projections, will be 1.5 to 2.5 meters (5 to 8.2 feet) GMSL plus somewhere between 35 and 72 per cent regional influence for a total regional sea level rise of 2.1 to 4.3 meters (7 to 14.1 feet) (**Figure 2**, below).

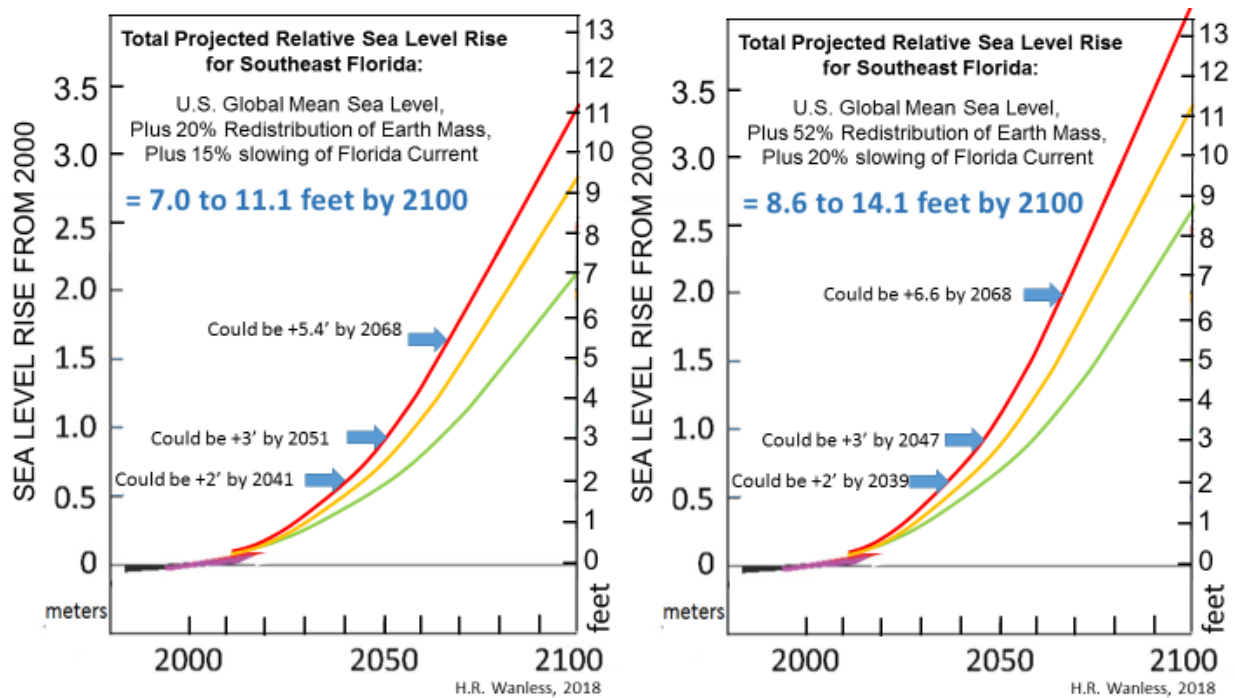


Figure 2. Low and high projected total relative sea level rise for South Florida based from the three higher U.S. Government Global Mean Sea Level rise projections (Intermediate High, High, and Extreme) shown in Figure 43 plus regional influences. Left: Low projection from adding 20 percent for redistribution of Earth mass and 15 percent for slowing of Florida Current/Gulf Stream. Right: High projection using Global Mean Sea Level plus 20 and 52 percent respectively for regional influences.

17. Finally, on top of that we should add the frequent king tides (strongest full-moon and new-moon tides) affecting southeast Florida. These are about 30 centimeters (12 inches) above normal tide levels. These affect southeast Florida most strongly in October, November and December.

18. We now see clearly that the continued unlimited use of fossil fuel has created a situation which will result in the total inundation of our coastal cities and environments. The

acceleration in ice melt we are now seeing and the knowledge of the very rapid pulses of ice melt and sea level rise following the last glaciation presents a dire warning of what lies ahead for this century. Because nearly all the excess heat from global warming has transferred to the ocean, this is not something that can be stopped in the near term, but we must immediately eliminate the use of fossil fuels to prevent even greater inundation and harm to the Plaintiffs and people of the United States and the World.

In accordance with 28 U.S.C. § 1746, I declare under penalty of perjury that the foregoing is true and correct.

DATED this 25th day of June, 2018.

Respectfully submitted,



Dr. Harold R. Wanless