

**The Florida Senate**  
**BILL ANALYSIS AND FISCAL IMPACT STATEMENT**

(This document is based on the provisions contained in the legislation as of the latest date listed below.)

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Prepared By: The Professional Staff of the Committee on Environment and Natural Resources

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BILL: SB 1360

INTRODUCER: Senator Gruters

SUBJECT: Florida Red Tide Mitigation and Technology Development Initiative

DATE: January 16, 2024

REVISED: \_\_\_\_\_

	ANALYST	STAFF DIRECTOR	REFERENCE	ACTION
1.	Rogers	Rogers	EN	<b>Pre-meeting</b>
2.			AEG	
3.			FP	

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## I. Summary:

SB 1360 amends s. 379.2273, F.S., to:

- Extend the expiration date for the Florida Red Tide Mitigation and Technology Development Initiative from June 30, 2025 to June 30, 2027.
- Direct the initiative to develop field trials for red tide mitigation approaches and technologies.

When the initiative develops a field trial deployment technology, the initiative will submit a report with its findings to the Department of Environmental Protection (DEP). Within 30 days after receipt of the report, DEP must review the technology and approve, approve with conditions, or deny with explanation the use of the technology in state waters for certain red tide bloom concentrations. If DEP does not act in 30 days, the technology is deemed approved.

The bill appropriates \$2 million for fiscal year 2025-2026 and 2026-2027 from the General Revenue Fund to the Fish and Wildlife Conservation Commission for the purposes of the Florida Red Tide Mitigation and Technology Development Initiative.

## II. Present Situation:

### Red Tide

Algae are a diverse group of plant-like organisms that produce oxygen and form the base of aquatic food webs, and they range from microscopic, single-celled organisms to large seaweeds.<sup>1</sup> When algae reproduce or accumulate far beyond their normal levels for a specific geographic

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<sup>1</sup> U.S. National Oceanic and Atmospheric Administration (NOAA), *What is a Harmful Algal Bloom?*, <https://www.noaa.gov/what-is-harmful-algal-bloom> (last visited Jan. 10, 2024); Florida Fish and Wildlife Conservation Commission (FWC), *What Is a Harmful Algal Bloom*, <https://myfwc.com/research/redtide/general/harmful-algal-bloom/> (last visited Jan. 10, 2024). Microscopic algae produce around half of the oxygen we breathe.

area, it is known as a bloom.<sup>2</sup> When blooms occur they can have harmful effects such as smothering other marine life or blocking the sun, producing dangerous toxins, and depleting oxygen levels as the algae decays.<sup>3</sup> These events are known as harmful algal blooms.<sup>4</sup> In the waters around Florida, particularly in the Gulf of Mexico, such high concentrations of algae occur that the water turns red or brown.<sup>5</sup> These harmful algal blooms are known as “red tide,” and have been observed for centuries.<sup>6</sup> In the Gulf of Mexico and around Florida, the species that causes most red tide is *Karenia brevis* (*K. brevis*).<sup>7</sup>

*K. brevis* is a single-celled algae that occurs in marine and estuarine waters in Florida.<sup>8</sup> *K. brevis* is always present in low concentrations in the Gulf of Mexico with no apparent adverse effects.<sup>9</sup> However, when it blooms, typically in the late summer or early fall, this species can cause large-scale harmful algal blooms.<sup>10</sup> *K. brevis* produces neurotoxins called brevetoxins that can sicken or kill fish, seabirds, turtles, and marine mammals.<sup>11</sup> Wave action can break open *K. brevis* cells and release the brevetoxins into the air. With winds blowing onshore, this can lead to respiratory irritation in humans and potentially serious illness for people with severe or chronic respiratory conditions.<sup>12</sup> The red tide toxins can also accumulate in animals such as oysters and clams, which can lead to Neurotoxic Shellfish Poisoning in people who consume contaminated shellfish.<sup>13</sup> Though this is less common, blooms of *K. brevis* can also contribute to fish kills by depleting the water of dissolved oxygen.<sup>14</sup>

*K. brevis* cannot tolerate low-salinity waters for very long, so while red tide is found in bays and estuaries, it is not found in freshwater systems such as lakes or rivers.<sup>15</sup> The algae causing red tide is different from the cyanobacteria (often called “blue-green algae”) found in freshwater

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<sup>2</sup> FWC, *What Is a Harmful Algal Bloom?*, <https://myfwc.com/research/redtide/general/harmful-algal-bloom/> (last visited Jan. 10, 2024).

<sup>3</sup> *Id.*; NOAA, *What is a Harmful Algal Bloom?*, <https://www.noaa.gov/what-is-harmful-algal-bloom> (last visited Jan. 10, 2024).

<sup>4</sup> Gulf of Mexico Alliance, *A Primer on Gulf of Mexico Harmful Algal Blooms*, 2-5 (2013), available at <https://myfwc.com/media/15902/habprimer.pdf> (last visited Jan. 11, 2024). The term “harmful algal bloom” is sometimes abbreviated as “HAB.”

<sup>5</sup> FWC, *Red Tide FAQ*, <https://myfwc.com/research/redtide/faq/> (last visited Jan. 10, 2024).

<sup>6</sup> *Id.*

<sup>7</sup> *Id.*

<sup>8</sup> FWC, *Karenia Brevis: Fact Sheet*, <https://myfwc.com/media/12422/karenia-brevis-factsheet.pdf> (last visited Jan. 10, 2024); Mote Marine Laboratory, *Phytoplankton Ecology*, <https://mote.org/research/program/phytoplankton-ecology> (last visited Jan. 10, 2024). *K. brevis* is a “phytoplankton” because it does photosynthesis like a plant.

<sup>9</sup> R. H. Pierce and M. S. Henry, *Harmful Algal Toxins of the Florida Red Tide (Karenia brevis): Natural Chemical Stressors In South Florida Coastal Ecosystems*, ECOTOXICOLOGY, vol. 17, 7 (2008): 623-631, 2 (2008), available at <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2683401/pdf/nihms101414.pdf> (last visited Jan. 10, 2024).

<sup>10</sup> FWC, *Karenia Brevis: Fact Sheet*, <https://myfwc.com/media/12422/karenia-brevis-factsheet.pdf> (last visited Jan. 10, 2024); FWC, *Red Tide Current Status*, <https://myfwc.com/research/redtide/statewide/> (last visited Jan. 10, 2024). FWC reports the current status of red tide using the concentration of *K. brevis* cells per liter of water.

<sup>11</sup> FWC, *Karenia Brevis: Fact Sheet*, <https://myfwc.com/media/12422/karenia-brevis-factsheet.pdf> (last visited Jan. 10, 2024).

<sup>12</sup> Mote Marine Laboratory, *Florida Red Tide FAQ's*, <https://mote.org/news/florida-red-tide> (last visited Jan. 10, 2024).

<sup>13</sup> FWC, *Karenia Brevis: Fact Sheet*, <https://myfwc.com/media/12422/karenia-brevis-factsheet.pdf> (last visited Jan. 10, 2024).

<sup>14</sup> *Id.*

<sup>15</sup> FWC, *Red Tide FAQ*, <https://myfwc.com/research/redtide/faq/> (last visited Jan. 10, 2024).

systems such as Lake Okeechobee.<sup>16</sup> Cyanobacteria is found in lakes, rivers, and estuaries, and it too is toxic and harmful.<sup>17</sup>

There is no demonstrated direct link between nutrient pollution and *K. brevis* red tide formation or frequency, and red tide has been observed since before Florida's coastlines were heavily developed.<sup>18</sup> However, once red tides are transported to shore, they are capable of using human-caused nutrient pollution for their growth.<sup>19</sup> Currently, there is no practical and acceptable way to control or kill red tide blooms.<sup>20</sup> Harmful algal blooms can result in significant costs associated with public health, commercial fishery reduction, decreases in recreation and tourism, and management and monitoring.<sup>21</sup>

### **Fish and Wildlife Research Institute**

The Fish and Wildlife Conservation Commission (FWC) derives its authority from the State Constitution and chapter 379 of the Florida Statutes.<sup>22</sup> The FWC is authorized to exercise regulatory and executive powers of the state with respect to wild animal life, fresh water aquatic life, and marine life, and in these areas the FWC's staff is authorized to conduct management, research, and enforcement.<sup>23</sup> The Fish and Wildlife Research Institute (Institute) is the principal unit for research services within the FWC.<sup>24</sup>

The FWC assigns to the Institute all of the following responsibilities and functions:

- Serve as the primary source of research and technical information and expertise on the status of marine life, freshwater aquatic life, and wild animal life resources in this state.
- Monitor the status and health of marine life, freshwater aquatic life, and wild animal life species and their habitat.
- Develop restoration and management techniques for habitat and enhancement of plant and animal populations.
- Respond to and provide critical technical support for catastrophes including oil spills, ship groundings, major species die-offs, hazardous spills, and natural disasters.
- Identify and monitor harmful algal blooms including red tides, evaluate their impacts, and provide technical support concerning state and local public health concerns.
- Provide state and local governments with technical information and research results concerning fish and wild animal life.<sup>25</sup>

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<sup>16</sup> *Id.*

<sup>17</sup> FWC, *Cyanobacteria in Florida's Waters*, <https://myfwc.com/research/redtide/general/cyanobacteria/> (last visited Jan. 10, 2024); U.S. EPA, *Harmful Algal Blooms & Cyanobacteria Research*, <https://www.epa.gov/water-research/harmful-algal-blooms-cyanobacteria-research> (last visited Jan. 10, 2024). Although they are often called "blue-green algae" and exhibit characteristics of algae, cyanobacteria are classified as bacteria.

<sup>18</sup> Mote Marine Laboratory, *Florida Red Tide FAQ's*, <https://mote.org/news/florida-red-tide> (last visited Jan. 10, 2024).

<sup>19</sup> *Id.*

<sup>20</sup> FWC, *Red Tide FAQ*, <https://myfwc.com/research/redtide/faq/> (last visited Jan. 10, 2024).

<sup>21</sup> *Id.*

<sup>22</sup> FLA. CONST. art. IV, s. 9., s. 9; *see* chapter 379, F.S.; *see also* s. 20.331, F.S.

<sup>23</sup> FLA. CONST. art. IV, s. 9.

<sup>24</sup> Section 20.331(4)(b), F.S.; FWC, *Fish and Wildlife Research Institute*, <https://myfwc.com/about/inside-fwf/fwri/> (last visited Jan. 10, 2024).

<sup>25</sup> Section 20.331(7)(a), F.S.

The Harmful Algal Bloom Task Force, whose members are appointed by the Institute, was created for the purpose of determining research, monitoring, control, and mitigation strategies for red tide and other harmful algal blooms in Florida waters.<sup>26</sup> The task force develops priorities and strategies for mitigation and control of harmful algal blooms and is tasked with making recommendations to the Institute regarding harmful algal blooms.<sup>27</sup> The Legislature also requires the Institute to implement a program designed to improve understanding and allow for early detection of harmful algal blooms, including red tide, to facilitate accurate predictions and successful efforts to control and mitigate the effects of harmful algal blooms.<sup>28</sup>

The Institute provides many services and resources pertaining to red tide. It regularly publishes detailed information on the status of red tide in the state.<sup>29</sup> The Institute's teams of experts conduct cutting-edge ecological research and analysis on the organisms in Florida's waters, advancing the collective understanding of red tide and its impacts on the state.<sup>30</sup> The FWC scientists combine field sampling with tools maintained by state and federal partners to track red tide and its effects.<sup>31</sup> Through its webpages on the FWC's website, the Institute provides comprehensive information and resources to the public relating to red tide.<sup>32</sup> This includes resources for learning what causes red tide, tools for tracking red tide, and information for reporting on red tide and its effects.<sup>33</sup>

### **Mote Marine Laboratory**

Mote Marine Laboratory is a Florida nonprofit organization that was founded in 1955.<sup>34</sup> Mote Marine Laboratory's focus is the advancement of marine and environmental sciences through scientific research, education and public outreach, leading to new discoveries, revitalization and sustainability of the oceans and greater public understanding of marine resources.<sup>35</sup>

The nonprofit organization is funded through federal, state, and local grants and through individual donors and foundations.<sup>36</sup> The FWC is authorized to expend certain money through grants and contracts to fund research with the Mote Marine Laboratory.<sup>37</sup> The proceeds of the annual use fee for the "Protect Our Reefs" license plates are distributed to the Mote Marine Laboratory.<sup>38</sup>

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<sup>26</sup> Section 379.2271(1), F.S.

<sup>27</sup> Section 379.2271, F.S.

<sup>28</sup> Section 379.2272, (1)(a), F.S.

<sup>29</sup> FWC, *Red Tide Current Status*, <https://myfwc.com/research/redtide/statewide/> (last visited Jan. 10, 2024).

<sup>30</sup> FWC, *Labs and People: About*, <https://myfwc.com/research/redtide/labs-people/about/> (last visited Jan. 10, 2024).

<sup>31</sup> FWC, *Tools for Tracking Red Tides*, <https://myfwc.com/research/redtide/tools/> (last visited Jan. 10, 2024).

<sup>32</sup> FWC, *Research: Red Tide*, <https://myfwc.com/research/redtide/> (last visited Jan. 10, 2024).

<sup>33</sup> FWC, *Red Tide-Related Hotlines and Information Sources*, <https://myfwc.com/research/redtide/contact/> (last visited Jan. 10, 2024).

<sup>34</sup> Mote Marine Laboratory, *Beyond 2020 Vision and Strategic Plan*, 26, available at [https://mote.org/media/uploads/files/StratPlan3.0\\_ffw.pdf](https://mote.org/media/uploads/files/StratPlan3.0_ffw.pdf) (last visited Jan. 10, 2024).

<sup>35</sup> Mote Marine Laboratory, *Beyond 2020 Vision and Strategic Plan*, 15, available at [https://mote.org/media/uploads/files/StratPlan3.0\\_ffw.pdf](https://mote.org/media/uploads/files/StratPlan3.0_ffw.pdf) (last visited Jan. 10, 2024).

<sup>36</sup> Mote Marine Laboratory, *Mote Marine Laboratory and Aquarium*, <https://mote.org/locations/details/mote-marine-laboratory-aquarium> (last visited Jan. 10, 2024).

<sup>37</sup> Section 379.2202, F.S.; Section 379.2201(1)(c), F.S. The section authorizes money from saltwater license and permit fees to be used for marine research and management; see s. 379.354, F.S.

<sup>38</sup> Section 320.08058(38), F.S.

Since early on in its development, the Mote Marine Laboratory has been conducting research on red tide.<sup>39</sup> Its experts are conducting research on red tide with the goal of understanding how the blooms form, how they dissipate into the environment, and what effects it has on humans and marine animals.<sup>40</sup> The Mote Marine Laboratory monitors red tide by taking samples, including with the use of technology such as detectors specially developed by the laboratory and autonomous underwater vehicles, providing continuous data that is communicated back to the laboratory for analysis.<sup>41</sup> The laboratory's Beach Conditions Report provides detailed information on the conditions at a number of Florida beaches.<sup>42</sup> Several of the laboratory's research programs cover areas of science related to red tide, such as the effects of toxins on aquatic organisms, the environmental health aspects of airborne toxins in coastal areas, and phytoplankton ecology.<sup>43</sup>

### **Florida Red Tide Mitigation and Technology Development Initiative**

The Florida Red Tide Mitigation & Technology Development Initiative is a partnership between Mote Marine Laboratory (Mote) and the Institute codified in s. 379.2273, F.S., that establishes an independent and coordinated effort among public and private research entities to develop prevention, control and mitigation technologies and approaches that will decrease the impacts of Florida red tide on the environment, economy and quality of life in Florida. The state has appropriated \$3 million annually for Mote to secure additional private and federal funding in order to:

- Bring together the best and brightest scientists from Florida and around the world;
- Utilize innovative approaches and technologies to determine the most effective and ecologically sound methods for mitigating adverse impacts from red tide;
- Test technologies with combinations of lab-based, large-scale mesocosm and pilot-scale field studies ultimately leading to permitting for large-scale field testing and application;
- Develop novel detection systems to support public red tide forecasting, emergency response, and implementation of control strategies;
- Enhance public health protection with expansion of the Beach Conditions Reporting System ([visitbeaches.org](http://visitbeaches.org)), local community outreach and engagement; and
- Develop new technologies for smartphone apps to engage citizen science information collaborations and commercial fisherman reporting of red tide toxin concentrations.<sup>44</sup>

The initiative is required to submit an annual report that contains an overview of its accomplishments to date and priorities for subsequent years to the Governor and Legislature.<sup>45</sup> According to its January 2023 report, to date, Mote has examined over 200 chemicals and

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<sup>39</sup> Kumar Mahadevan, Mote Marine Laboratory, *Exploring the Secrets of the Sea Since 1955*, 3 (Nov. 19, 2010) available at <https://mote.org/media/uploads/files/MoteMarineLaboratory-history.pdf> (last visited Jan. 10, 2024).

<sup>40</sup> Mote Marine Laboratory, *Red Tide Research*, <https://mote.org/news/red-tide-research> (last visited Jan. 10, 2024).

<sup>41</sup> *Id.*

<sup>42</sup> Mote Marine Laboratory, Sarasota Operations Coastal Oceans Observation Lab, *Beach Conditions Reporting System*, <https://visitbeaches.org/#> (last visited Jan. 10, 2024).

<sup>43</sup> Mote Marine Laboratory, *Red Tide Research*, <https://mote.org/news/red-tide-research> (last visited Jan. 10, 2024).

<sup>44</sup> Florida Red Tide Mitigation and Technology Development Initiative, *Accomplishments and priorities report*, 2 (Jan. 2023) available at [https://mote.org/media/uploads/files/RedTideInitiative\\_AccomplishmentsPrioritiesReport2022\\_ffw.pdf](https://mote.org/media/uploads/files/RedTideInitiative_AccomplishmentsPrioritiesReport2022_ffw.pdf).

<sup>45</sup> Section 379.2273, F.S.

compounds and more than 30 projects have been completed or are underway.<sup>46</sup> Most of these projects focused on natural, manmade and technological mitigation techniques. A few projects are also dedicated to the development of red tide public communication and monitoring technologies specifically aimed at decreasing impacts of red tide. Such projects include updating the Programmable Hyperspectral Seawater Scanner, in-situ biosensor for detecting brevetoxins for use by shellfish farmers, cost/benefit analysis of removing red tide impacted dead fish and utilization as a fertilizer, unmanned aerial system for near-shore red tide reporting, updating the Beach Condition Reporting System (now with more than 50 reporting locations), and developing citizen science tools for red tide detection using a smartphone.<sup>47</sup>

From the hundreds of mitigation tools and technologies that the initiative examined over the past 3 years and the more than 30 projects completed or underway, below are the most promising mitigation tools and technologies at reducing *K. brevis* cells and toxins:

- Six algicidal compounds from natural macroalgae;
- Ozonation, cavitation, oxidation water treatment process;
- Controlled release oxidant pellets;
- Nanotechnology enabled products;
- UV-C radiation from LEDs;
- Quaternary Ammonium Compounds;
- Clay or flocculant combined with an algaecide compound;
- Existing products with similar proven/approved uses such as Microbe-lift, Xtreme, and De-Oil-It.

The initiative's next steps include mesocosms/raceways,<sup>48</sup> regulatory approvals and field testing, public engagement, and commercialization. As part of commercialization of its approaches to red tide mitigation, Mote is coordinating with state and federal agencies to examine existing water and pesticide regulatory and licensing frameworks for field red tide mitigation testing and implementation during future bloom events. Mote has also hosted workshops addressing project status, regulatory requirements, deployment technologies, scalability, intellectual property rights, and how to effectively bring these science-based tools and technologies to the marketplace.<sup>49</sup>

### III. Effect of Proposed Changes:

**Section 1** of the bill amends s. 379.2273, F.S., to:

- Extend the expiration date for the Florida Red Tide Mitigation and Technology Development Initiative from June 30, 2025 to June 30, 2027.
- Direct the initiative to develop field trials for red tide mitigation approaches and technologies.

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<sup>46</sup> Florida Red Tide Mitigation and Technology Development Initiative, *Accomplishments and priorities report*, 5 (Jan. 2023) available at [https://mote.org/media/uploads/files/RedTideInitiative\\_AccomplishmentsPrioritiesReport2022\\_ffw.pdf](https://mote.org/media/uploads/files/RedTideInitiative_AccomplishmentsPrioritiesReport2022_ffw.pdf).

<sup>47</sup> *Id.*

<sup>48</sup> A mesocosm is any outdoor experimental system that examines the natural environment under controlled conditions. A raceway, also known as a flow-through system, is an artificial channel used in aquaculture to culture aquatic organisms.

<sup>49</sup> Florida Red Tide Mitigation and Technology Development Initiative, *Accomplishments and priorities report*, 6 (Jan. 2023) available at [https://mote.org/media/uploads/files/RedTideInitiative\\_AccomplishmentsPrioritiesReport2022\\_ffw.pdf](https://mote.org/media/uploads/files/RedTideInitiative_AccomplishmentsPrioritiesReport2022_ffw.pdf).



Specifically, the bill states that upon successful completion of science-based laboratory testing of prevention, control, and mitigation approaches and technologies, the initiative shall develop field trial deployment technologies for the approaches and technologies. When the initiative develops a field trial deployment technology, the initiative shall submit a report with its findings to the Department of Environmental Protection (DEP). Within 30 business days after receipt of the report, DEP shall review the technology and approve, approve with conditions, or deny with explanation the use of the technology in state waters exhibiting red tide bloom concentrations of greater than 10,000 cells per liter. If DEP fails to approve, approve with conditions, or deny with explanation a field trial deployment technology within 30 business days after receipt of the report, the technology shall be deemed approved for use in state waters exhibiting red tide bloom concentrations of greater than 10,000 cells per liter.

**Section 2** of the bill appropriates \$2 million for fiscal year 2025-2026 and 2026-2027 from the General Revenue Fund to the Fish and Wildlife Conservation Commission for the purposes of the Florida Red Tide Mitigation and Technology Development Initiative.

**Section 3** of the bill provides an effective date of July 1, 2024.

#### **IV. Constitutional Issues:**

A. Municipality/County Mandates Restrictions:

None.

B. Public Records/Open Meetings Issues:

None.

C. Trust Funds Restrictions:

None.

D. State Tax or Fee Increases:

None.

E. Other Constitutional Issues:

None.

#### **V. Fiscal Impact Statement:**

A. Tax/Fee Issues:

None.

**B. Private Sector Impact:**

The bill provides for an additional \$4 million for Florida Red Tide Mitigation and Technology Development Initiative which is a partnership between the Fish and Wildlife Research Institute within the commission and Mote Marine Laboratory.

**C. Government Sector Impact:**

The Florida Red Tide Mitigation and Technology Development Initiative currently has an annual appropriation of \$3 million in the base budget. The language in the bill would create an additional appropriation of \$2 million annually for two more years.

**VI. Technical Deficiencies:**

None.

**VII. Related Issues:**

None.

**VIII. Statutes Affected:**

This bill substantially amends s. 379.2273 of the Florida Statutes.

**IX. Additional Information:****A. Committee Substitute – Statement of Changes:**

(Summarizing differences between the Committee Substitute and the prior version of the bill.)

None.

**B. Amendments:**

None.