There are thousands of species of algae — phytoplankton — in fresh and marine waters. They are essential to life as we know it, forming the basis of the food web and providing an important source of the oxygen we need to breathe. While most species are harmless to humans and animals, some are toxic. When these species multiply — creating harmful algal blooms (HABs) — they can wreak havoc on human and marine animal health, contaminate seafood and devastate local economies.
Research, education and monitoring are critical for protecting humans and economies from the effects of toxic algae. Thanks to research, we know that HABs are becoming more frequent, more toxic, longer lasting and more widespread. While we cannot eliminate them, we can monitor their movement and geographic spread and predict their negative consequences to help manage their impacts on communities.

Real Toxins — Real Life Impacts

**Maine**

- Maine’s shellfish industry is worth $56 million, including $29.9 million in employment income.
  - The first algae-caused domoic acid bloom reported, with toxin levels 5 times higher than considered safe for human consumption.
  - Roughly 5 tons of shellfish recalled.
  - Roughly 100 shellfish harvesters affected

**Lake Erie**

- Intense, record-setting blooms of toxic Microcystis
  - 500,000 residents issued a three-day “do not drink” tap water advisory in Toledo, Ohio, because of highly toxic Microcystis bloom

**Iowa**

- Microcystin impacts freshwater lakes.
  - Iowa sets a new record: 37 beach advisories issued for high levels of microcystin

When Blooms Happen

- Toxins can become airborne in seaspary and be inhaled by humans and marine animals, causing respiratory distress in humans and death in marine mammals.
- Toxins can contaminate seafood — oysters, clams and even fish. If humans or animals eat them, they can get sick or die.
- Blooms can lead to increased healthcare costs, fisheries closures, aquaculture losses, contaminated drinking water supplies and lost tourism revenues.
- Studies estimate that toxic algae cost communities several billion dollars annually.

**Utah**

- Unprecedented toxic algae affect waters throughout the state.
  - 4,000 visitors affected by Scofield Reservoir closure in late summer because of high levels of Microcystin
  - 330 people sickened at Utah Lake
  - Farmers not allowed to use water from Utah Lake and the Jordan River for irrigation so crops won’t be contaminated

**U.S. West Coast**

- The West Coast — from Southern California to Alaska — suffered the largest, most toxic domoic acid event recorded.
  - $9.2 million in lost income for Washington’s razor clam fishery
  - $49 million in lost income for California’s Dungeness crab fishery
  - Health advisories issued for anchovy and sardine fisheries
  - Thousands of sea lions dead or sickened by domoic acid
  - Toxins detected in whales, dolphins, porpoises, seals

**South Carolina**

- Stormwater retention ponds in new communities are often poorly flushed and receive high concentrations of nutrients from fertilizers.
  - Microcystin levels in stormwater ponds measure 15-times more than the threshold set by the World Health Organization for drinking water
  - More than 1,000 fish kills reported in stormwater ponds, with 25% of those attributed to toxic algae

**Florida**

- On the west coast, toxins from red tide blooms lead to fish kills, shellfish bed closures and deaths of marine species, costing local economies millions. Airborne toxins lead to more hospital visits and increased healthcare costs.
  - Indian River Lagoon bloom results in miles of dead and rotting fish due to depleted oxygen
  - Governor Rick Scott proclaims “state of emergency” ahead of July Fourth weekend due to toxic blue-green algae

- This town is 100% driven by tourism but the tourism is empty. You go to the beach and it’s the height of summer and we have empty beaches, empty restaurants, empty hotels.

- Ohana Surf Shop owner Jordan Schwartz in Stuart Beach, Florida

### Real Toxins — Real Human Health Consequences

<table>
<thead>
<tr>
<th>Toxin(s)</th>
<th>Syndrome</th>
<th>Symptoms</th>
<th>Representative Organism*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Saxitoxin and derivatives</td>
<td>Paralytic Shellfish Poisoning (PSP)</td>
<td>Numbness and tingling of lips, mouth, face and neck, nausea, and vomiting. Severe cases result in paralysis of the muscles of chest and abdomen and possibly death</td>
<td><em>Alexandrium</em></td>
</tr>
<tr>
<td>Domoic Acid</td>
<td>Amnesic Shellfish Poisoning (ASP)</td>
<td>Nausea, vomiting, diarrhea, headache, dizziness, confusion, disorientation, short-term memory deficits, motor weakness. Severe cases result in seizures, cardiac arrhythmia, respiratory distress, coma, and possibly death</td>
<td><em>Pseudo-nitzschia</em></td>
</tr>
<tr>
<td>Okadaic Acid and derivatives</td>
<td>Diarrhetic Shellfish Poisoning (DSP)</td>
<td>Nausea, vomiting, severe diarrhea, and abdominal cramps</td>
<td><em>Dinophysis</em></td>
</tr>
<tr>
<td>Yessotoxin</td>
<td>Diarrhetic Shellfish Poisoning (DSP)</td>
<td>Nausea, vomiting, abdominal cramps, reduced appetite, cardiotoxic effects, respiratory distress</td>
<td><em>Protoceratium</em></td>
</tr>
<tr>
<td>Brevetoxin</td>
<td>Neurotoxic Shellfish Poisoning (NSP)</td>
<td>Abdominal pain, vomiting, diarrhea, neurological symptoms including vertigo. If aerosolized and inhaled, respiratory distress</td>
<td><em>Karenia</em></td>
</tr>
<tr>
<td>Microcystin</td>
<td>Hepatotoxicity</td>
<td>Serious liver damage</td>
<td><em>Microcystis</em></td>
</tr>
</tbody>
</table>

* One of many species able to produce toxin

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Toxic algae blooms are scientifically complex and some of the most economically damaging issues facing our communities and challenging our ability to safeguard human health and the environment.

- Congress recognized the seriousness of the problem in 1998 and instituted the Harmful Algal Bloom and Hypoxia Research and Control Act (HABHRCA) to protect the public.
- This funding led to new research and monitoring programs that forecast bloom movements and help ensure a safe seafood supply.
- With environmental changes, toxic algae blooms are increasing.
- Today, almost every state in the U.S. experiences impacts from toxic algae blooms.

HABHRCA is due for reauthorization. Your support is crucial to help us manage and mitigate the toxic algae affecting our communities. For more information, contact:

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