Marjorie Holt

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Cc:	Zoe Colon, Aide; Marya.Labrador@ocfl.net; Danny.Riveria@ocfl.net; susan.markowski@ocfl.net; Julie.Bortles@ocfl.net; Lori.Cunniff@ocfl.net; Marjorie Holt
Subject:	Orange County Fertilizer Management Ordinance Amending Chapter 15, Article XVII
Attachments:	Strong Fertilizer Ordinance Coverage_Florida_as of 02 28 17 (1).pdf; EPA Nutrient Cost Data.pdf

Orange County Board of County Commissioners
201 S. Rosalind Ave.
Orlando, FL 32801

Dear Mayor Jacobs and Orange County Board of County Commissioners,

On behalf of the Sierra Club Central Florida Group, I respectfully request the Orange County Board of County Commissioners enact a strict rainy season ban from June 1 to September 30 that does not exempt certified applicators. The Fertilizer Management Ordinance is being updated due to the 2016 Springs and Aquifer Protection Act. Strict rainy season bans have been widely adopted by 11 other counties and more than 80 municipalities in Florida (see attachment). On March 17, 2017, the Seminole County BCC authorized a strict rainy season ban.

Attached is data from the Environmental Protection Agency (EPA), *A Compilation of Cost Data Associated With the Impacts and Control of Nutrient Pollution.* The data reveals the problems caused by nutrient pollution to the state of Florida. Urban fertilizer is part of the nutrient pollution that create economic losses or increased costs from harmful algal blooms (HABs) in Florida to the following categories: Tourism & Recreation , Commercial Fishing, Property Values, Human Drinking Water, Mitigation and Restoring impaired waterbodies.

Nitrogen and phosphorus nutrients in synthetic fertilizer are the leading pollutants in Orange County waters. Orange County is a Priority Springs stakeholder due to the proximity to Wekiwa Springs. Urban fertilizer is a recognized nitrogen source when evaluating Basin Management Action Plans, the groundwork for development of Florida's daily nutrient pollution limits.

Orange County watersheds flow north to the St. Johns River and flow south to the Florida Everglades. Drainage basins located within Orange County include the Big Econlockhatchee River, Little Econlockhatchee River, Boggy Creek, Cypress Creek, Howell Branch, Lake Apopka, Lake Hart, Little Wekiva, Reedy Creek, Shingle Creek, St. Johns River and Wekiva River.
http://dev.orange.wateratlas.usf.edu/wse/

The Sierra Club requests you enact a strong fertilizer ordinance that eliminates the exemption to certified applicators during the rainy season. Thank you for the opportunity to comment.

Sincerely,

Marjorie Holt

Marjorie Holt
Conservation Chair
Sierra Club Central Florida Group
P. O. Box 941692
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SIERRA CLUB

Attachments:
https://www.epa.gov/sites/production/files/2015-04/documents/nutrient-economics-report-2015.pdf *EPA – External Costs Associated with Nutrient Pollution Impacts*

- Category: Tourism and Recreation – declining restaurant sales, increased lakeside business closures, decreased tourism-associated spending in local areas and other negative economic of algal blooms
- Category: Human Health – A study from Florida documented increased emergency room visit costs in Sarasota County for respiratory illnesses resulting from algal blooms. During high algal bloom years, these visits can cost the county more than $130,000.
- Home Values in Orange County – Assessment of the impacts of multiple pollutant concentration on home values with 1,000 meters of lakes in Orange County, Florida. A 17% change in total nitrogen concentrations led to a 1.8% impact on home values; for total phosphorus the impact was 1.3%
- Data Limitations – There are a number of studies documenting the economic impacts of nutrient pollution in surface water across the united States. These studies demonstrate that the impacts associated with surface wat nutrient pollution can be very damaging to locally important economic industries (e.g. tourism in Florida communities…) These additional studies suggest that the economic impacts from nutrient pollution may be more widespread that the screened studies indicate.
- Summary of Nutrient Pollution Cost Documentation show impacts to tourism and recreation, commercial fishing, property values, human health and drinking water treatment costs in Florida.

External Costs Associated with Nutrient Pollution Impacts

Excessive nutrient loading to waterbodies can lead to excessive plant and algal growth, resulting in a range of adverse economic effects. Several studies have documented significant economic losses or increased costs[1] associated with anthropogenic nutrient pollution in the following categories:

- *Tourism and recreation.* Studies from Ohio, Florida, Texas, and Washington (Section III.A.1) provide quantitative estimates of declining restaurant sales, increased lakeside business closures, decreased tourism-associated spending in local areas, and other negative economic impacts of algal blooms. For example, a persistent algal bloom in an Ohio lake caused $37 million to $47 million in lost local tourism revenue over two years.
- *Commercial fishing.* Several studies (Section II.A.2) document the negative impacts of algal blooms to commercial fisheries throughout coastal areas of the United States, including reduced harvests, fishery closures, and increased processing costs associated with elevated shellfish poisoning risks. For example, a harmful algal bloom (HAB) outbreak on the Maine coast prompted shellfish bed closures, leading to losses of $2.5 million in soft shell clam harvests and $460,000 in mussel harvests.
- *Property values.* Elevated nutrient levels, low dissolved oxygen levels, and decreased water clarity can depress the property values of waterfront and nearby homes. Studies in the New England, Mid-Atlantic, Midwest, and Southeast regions (Section III.A.3) have demonstrated these impacts using hedonic analyses[2] that measure the impact of water clarity or direct water quality metrics such as pollutant concentrations on property sales price. In New England, for example, a 1-meter difference in water clarity is associated with property value changes up to $61,000 and in Minnesota, property values changed up to $85,000.
- *Human health.* Algal blooms can cause a variety of adverse health effects (in humans and animals) through direct contact with skin during recreation, consumption through drinking water, or consumption of contaminated shellfish, which can result in neurotoxic shellfish poisoning and other effects. For example, a study from Florida (Section III.A.4) documented increased emergency room visit costs in Sarasota County for respiratory illnesses resulting from algal blooms. During high algal bloom years, these visits can cost the county more than $130,000.
- *Drinking water treatment costs.* Excess nutrients in source water for drinking water treatment plants can result in increased costs associated with treatments for health risks and foul taste and odor. For example, a study in Ohio (Section III.B.1) documents expenditures of more than $13 million in two years to treat drinking water from a lake affected by algal blooms.
- *Mitigation.* Nutrients that enter waterbodies can accumulate in bottom sediments, acting as sources of loadings to the water column. In-lake mitigation measures such as aeration, alum treatments, biomanipulation, dredging, herbicide treatments, and hypolimnetic withdrawals may be necessary to address the resultant algal blooms. Several studies (Section III.B.2) have documented these measures and the costs associated with them for individual waterbodies. These costs range from $11,000 for a single year of barley straw treatment to more than $28

[1] Unless otherwise indicated, all dollar values are updated to 2012$ using appropriate indices.

[2] Hedonic means of or relating to utility. In a hedonic econometric model, the independent variables relate to quality, such as the quality of a home one might buy.

pollution providing significant quantities of nutrients that drive blooms, especially near shore (Heisler et al. 2008; Hochmuth et al. 2011).

The areas of economic impact are divided into tourism and recreation, commercial fishing, property values (separated into specific geographic areas of the country), and human health.

III.A.1. Tourism and Recreation

Harmful algal blooms were the primary examples of nutrient-related impacts found in the literature review. These blooms can lead to beach closures, health advisories, aesthetic degradation, and other impacts that are damaging to tourism industries surrounding affected waterbodies. Table III-1 summarizes documented impacts of HABs to local tourism and recreation industries from examples in Ohio, Texas, Washington, and Florida.

Table III-1. Examples of Estimated Tourism and Recreation Economic Losses due to HABs

Study	State	Waters	Economic Losses (2012$)[1]
Davenport and Drake (2011); Davenport et al. (2010)	OH	Grand Lake St. Marys	• $37–$47 million estimated loss in tourism revenues in 2009 and 2010. • 5 lakeside business closures. • $632,000 loss due to regatta cancellation. $263,000 decline in park revenues.
Oh and Ditton (2005)	TX	Possum Kingdom Lake	• 5% (2001) and 1.9% (2003) decrease in total economic output. • 57% (2001) and 19.6% (2003) decline in state park visitation.
Evans and Jones (2001)	TX	Galveston Bay	• In 2000, 85 shellfish bed closure days resulted in $13.2– $15.3 million direct impact and $21.3–$24.6 million total impact.
Larkin and Adams (2007)	FL	Ft Walton Beach and Destin areas	• $4.2 million and $5.6 million in reduced restaurant and lodging revenues, respectively, during HAB events.
Morgan et al. (2009)	FL	Southwest coast	• Reduced daily restaurant sales of $1,202 to $4,390 (13.7%–15.3%) during HAB events.
Dyson and Huppert (2010)	WA	Beaches in Grays Harbor and Pacific Counties	• Typical closure (2–5 days) results in $2.23 million in lost labor income and $6.13 million in sales impacts due to decreased visitation.

HABs = harmful algal blooms

[1] *All economic losses updated to 2012$ using the Consumer Price Index.*

For example, Grand Lake St. Marys is the largest inland lake in Ohio, covering 13,000 acres. It is a shallow lake that supplies water for the City of Celina and the Village of St. Marys. As a result of agricultural runoff, failing home sewage systems, internal nutrient loading, and other runoff, the lake is hyper-eutrophic, experiencing large algal blooms and frequent fish kills (Davenport and Drake, 2011). In 2009, sampling showed dangerously high levels of toxins produced by blue-green algae, and the Ohio EPA subsequently posted signs advising people to avoid contact with the water. Algal blooms in 2010 caused scum and fish kills throughout the lake, as well as 23 reported cases of human illnesses and dog deaths.

of shellfish bed closures, had a direct economic impact of $13.2 million to $15.3 million on the county. Including indirect and induced effects, the total impact was $21.3 million to $24.6 million.

Several authors have also used modeling to estimate the tourism and recreation impacts of red tide events in Florida. Larkin and Adams (2007) used a time series model to estimate that restaurant and lodging revenues decline by $4.2 million and $5.6 million, respectively, per month along a 10-mile stretch of shoreline. This represents 29% of revenue in the restaurant sector and 35% in lodging along that 10-mile stretch of shoreline. The authors note that their results capture only month-to-month variation, while the effects of daily fluctuations and other shorter term conditions are not captured.

According to Morgan et al. (2009), the Small Business Association provided 36 businesses in southwest Florida with loans between $5,680 and $96,295 as a result of red tide events between 1996 and 2002. Morgan et al. (2009) used daily sales data from three coastal restaurants in southwest Florida to estimate the impact of red tide events on revenues. They found that individual restaurant sales decreased by $868 to $3,734 (13.7% to 15.3%) each day during red tide events.

As noted by Morgan et al. (2009), Larkin and Adams (2007), and Evans and Jones (2001), the documented tourism impacts arising from algal blooms are localized. In response to outbreaks that impede recreation in one area, visitors may shift their activities to other areas. To the extent that this occurs, the adverse economic impacts associated with HABs represent transfers of economic activity between areas, rather than a true economic loss. As such, the tourism results presented in this section represent only the impacts within the geographic boundaries specified within each study. The impacts described do not necessarily represent true economic losses considering larger geographical areas. On the other hand, there may be a halo effect[11] in which localized events spur avoidance of a much larger area surrounding the affected waterbody, expanding the geographic size and severity of impacts associated with a particular event.

III.A.2. Commercial Fishing

Algal blooms can have extremely damaging impacts to commercial fishing industries in marine coastal areas of the United States due to fish kills, shellfish poisoning, and associated additional processing of affected harvests. In Galveston Bay, Texas, for example, the red tide event that resulted in significant adverse impacts to the tourism and recreation industries (as described in Section III.A.1) also caused economic losses to the commercial oyster industry when shellfish beds were closed for 85 days. According to Evans and Jones (2001), economic losses were valued at $240,000 for the decline in harvests between September and December 2000.

Red tide events also have significant adverse economic impacts elsewhere in the country. Jin et al. (2008) developed estimates of the impacts of a 2005 red tide event that affected commercial shellfisheries in New England. Due to that event, shellfish beds in Massachusetts, Maine, New Hampshire, and 15,000 square miles of federal waters were closed for more than a month during the peak harvest season. As a result, Maine and Massachusetts received federal emergency assistance. In Maine, these closures from April to August in 2005 caused losses of $2.5 million in soft shell clam harvests and $460,000 in harvests of mussels (Jin et al., 2008). Jin et al. (2008) also estimated that impacts to the shellfish industry in Massachusetts may have been as high as $21 million.

[11] The halo effect is a phenomenon in which a localized event causes larger collateral economic impacts, usually in reference to large-scale reductions in seafood consumption in response to local fish kills or health warnings (Anderson et al. 2000; Hoagland et al. 2002).

are not eutrophic. They found that in the degraded lakes, property values were lower by $128 to $402 per shoreline foot in relation to the next comparable lake.

Southeast— Walsh et al. (2012) assessed the impacts of multiple pollutant concentrations on home values within 1,000 meters of lakes in Orange County, Florida. They estimated the implicit price associated with a 17% change in concentrations of total nitrogen, total phosphorus, chlorophyll, and trophic state index (a composite of the three other nutrient pollutants). For waterfront properties, the impacts ranged from less than 1% of the sales price for chlorophyll to 2.1% for trophic state index. A 17% change in total nitrogen concentrations led to a 1.8% impact on home values; for total phosphorus the impact was 1.3%. The authors note that the impacts were much higher for waterfront homes, with the impacts diminishing with distance to the beach.

Also in Florida, Czajkowski and Bin (2010) used water quality data on the St. Lucie River, St. Lucie Estuary, and Indian River Lagoon to quantify the impact of water quality measures on waterfront home prices in urban coastal housing markets. They found that a 1% increase in water clarity results in the average property price increasing by $6,397 (0.6%), with a range of $2,240 to $10,597 (0.2% to 0.9%).

Variability and Uncertainty— There are several notable sources of variability and uncertainty in all hedonic studies that attempt to discern the impact of water quality on property values. Due to methodological, locational, and situational variability, comparisons across study results and applications of results to other waterbodies can be problematic.

First, the impacts of water clarity are location-dependent. As noted by Gibbs et al. (2002), real estate markets, baseline water clarity, environmental conditions, and population preferences are likely to be highly variable, including within a single region. Gibbs et al. (2002) found that there is little comparability even between Maine and neighboring New Hampshire, with different lake sizes, average home prices, levels of development, and proximity to highways and urban areas.

Poor et al. (2007) noted that their study area was a county adjacent to the Chesapeake Bay, where public opinion polls have shown that local homeowners are knowledgeable about water quality issues and willing to pay for improvements. As such, their results may not be representative of other areas where public education and advocacy for water quality is not as strong. Similarly, Walsh et al. (2012) evaluated the impact of voluntary neighborhood programs where residents pay taxes to control nutrients in particular lakes; in neighborhoods where these programs exist, impacts of water quality changes to home prices are more pronounced.

Baseline water clarity is also an important factor. If water quality is already poor, a 1-meter change can have a larger impact on public perception and sales price than if water quality is high (Michael et al. 2000; Gibbs et al. 2002).[15] Other lake or property characteristics can also influence purchase price, and excluding these characteristics from analyses can result in biased or uncertain results. For example, Gibbs et al. (2002) note that lake clarity has a larger impact on purchase prices when the lake has a larger surface area.

Methodological specifications can also influence the results of hedonic analyses, introducing additional uncertainty. As noted by Michael et al. (2000), authors frequently select water quality variables based on data availability rather than on the best representation of homebuyers' perceptions of water quality. They show that the use of different variables (such as seasonal

[15] Most authors address this issue by using non-linear functional forms for water quality variables.

variation, current water quality, or historical averages) results in a broad range of implicit prices for water quality. This result indicates that the selection of the water quality variable is important to the validity of the model, but that it is unclear which measure is the best indicator of water quality impacts.

Another source of variability across studies is the use of disparate variables to measure water quality. For example, some studies attempt to isolate the impact of water clarity alone, while others use interaction variables which capture the impacts of multiple characteristics. For example, Gibbs et al. (2002) use a water quality variable that accounts for lake size in conjunction with water clarity, arguing that their variable is more robust because it accounts for more of the lake's characteristics.

III.A.4. Human Health

HABs can cause a variety of adverse health effects (in humans and animals) through direct contact with skin during recreation, consumption through drinking water, or consumption of contaminated shellfish, which can result in neurotoxic shellfish poisoning and other effects. According to Davenport and Drake (2011), the HABs in Grand Lake St Marys (described in Section III.A.1) resulted in 23 reported cases of human illnesses and dog deaths. Additionally, proximity to coastal areas where red tide conditions are present may lead to respiratory illness through inhalation of associated airborne toxins (through beach visitation, for example) (Hoagland et al. 2009).

Hoagland et al. (2009) assessed the relationship between red tide blooms and emergency room visits for respiratory illnesses in Sarasota County, Florida and developed estimates of the associated costs. Controlling for other factors that may explain emergency room visits,[16] the authors used a statistical exposure-response model to estimate that there are approximately 39 annual emergency room visits due to red tide during low bloom levels and 218 during high bloom levels. Based on estimated medical treatment costs of $58 to $240 per illness and lost productivity of $335 per illness (for 3 days), red tide events in Sarasota County result in $21,000 to $138,600 in human health impacts.

Hoagland et al. (2009) noted that their study was limited to emergency room visits and excluded the impacts of milder cases of respiratory illnesses. The economic impacts of these cases are likely to be small on an individual case basis (for instance, requiring over-the-counter medicine purchases or short-term loss of work or leisure time; Hoagland et al. 2009), but could be significant when aggregated. Additionally, Hoagland et al. (2009) did not account for the pain and suffering associated with illnesses, nor for the potential for red tide to contribute to long-term chronic respiratory illnesses. Table III-4 summarizes the economic impacts of HABs with respect to human health.

Table III-4. Estimated Human Health Economic Impacts

Study	State	Waters	Water Quality	Health Impacts (2012$)[1]
Hoagland et al. (2009)	FL	Coast	HABs[2]	• $21,000 per year for low bloom levels. • $138,600 per year for high bloom levels.

HABs = harmful algal blooms
[1] All impacts updated to 2012$ using the Consumer Price Index.
[2] Varying level of HABs causing respiratory illnesses.

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[16] Including low temperatures, a high incidence of influenza outbreaks, high pollen levels, and large numbers of tourists.

Program Name (Location)	Type of Program	Nutrient(s) Involved	Description of Costs (2012$)
New York City Watershed Program (NY)	Offset	Phosphorus	For development of the comprehensive strategies in the Croton System, the New York City Department of Environmental Protection allocated up to $1.2 million to each county required to develop a water quality protection plan.
Tar-Pamlico Nutrient Reduction Trading Program (NC)	Trading	Nitrogen and phosphorus	The Tar-Pamlico Basin Association gave $182,000 to the state Department of Environmental Management during Phase I to fund a staff position, and the trading ratio includes 10% for administrative costs.
Great Miami River Watershed Water Quality Credit Trading Pilot Program (OH)	Trading	Nitrogen and phosphorus	Estimated 3-year project cost of $2,430,810 including $607,000 to fund BMPs. The program receives in-kind support primarily in the form of water quality monitoring, and the training of soil and water conservation professionals by other organizations.

Source: Breetz et al. (2004)

III.B.4. Anecdotal Evidence and Additional Studies

Similar to Section III.A.5, additional anecdotal evidence and studies related to increased costs of nutrient pollution, including drinking water treatment costs and mitigation costs are presented in Appendix A.

III.C. Data Limitations

As described in the previous section, there are a number of studies documenting the economic impacts of nutrient pollution in surface waters across the United States (Table III-9). These studies demonstrate that the impacts associated with surface water nutrient pollution can be very damaging to locally important economic industries (e.g., tourism in Florida communities, lakefront real estate in areas of Maine, and others). However, a number of additional reports do not meet the screening criteria for documentation of impacts due to various reasons (e.g., method not clearly described, data sources not identified or documented). These additional studies (also reflected in Table III-9) suggest that the economic impacts from nutrient pollution may be more widespread than the screened studies indicate.

Table III-9. Summary of Nutrient Pollution Cost Documentation

Impact	Number of Studies Found (Number that Match Criteria)	Waterbody Types	Locations
Tourism and recreation	13 (7)	Lakes, bays, rivers, coasts	MD, OH, FL, TX, WA; national
Commercial fishing	9 (5)	Bays, rivers, coasts	ME, MD, NC, FL, TX, AK; national
Property values	15 (9)	Lakes, rivers, coasts	ME, NH, VT, MD, OH, SC, FL, WI, MN, HI; national
Human health	2 (1)	Coasts	FL; national
Drinking water treatment costs	11 (2)	Lakes, rivers, coasts	OH, IA, FL, CA, KS, TX; national
Mitigation costs	31 (31)	Lakes	MN, MA, WA, WI, SD, NY
Restoration costs	14 (14)	Watersheds	CT, NY, PA, OH, MN, CO, CA, OR; national