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Public Costs of Florida Red Tides: A Survey of Coastal Managers

By

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ABSTRACT

This study sought to determine the financial and managerial impacts of red tide events on nine county and eighteen city governments charged with management of public beaches along the Gulf coast in Florida. When included as a line item in annual budgets, earmarks for red tide were limited to beach cleanup activities and ranged from $50,000 to $100,000 in 2006. Invoices for red tide related beach clean up activities ranged from $11,114 to $250,000 per event from 2004-2007. Sarasota County spent an average of $4.87 per linear foot to remove the dead fish resulting from six recent red tide clean-up efforts. Seven cities in Pinellas County were reimbursed an average of $14.27 per linear foot of beach for red tide-related cleaning required throughout 2005. This information may provide a useful baseline for estimation of red tide-related budget needs for other cities and counties that are responsible for public beach management. Expenditures were directly correlated with public beach length, severity of fish kills, and available beach management budgets, but are conservative estimates since they did not include in-kind labor or equipment expenses.

Keywords: economic; harmful algal blooms (HABs); *Karenia brevis*; red tide; public managers; survey

INTRODUCTION

Florida is a popular tourist destination and is the top U.S. destination for at least one of 19 types of marine recreation including beach visitation, swimming, snorkeling, and scuba diving (Leeworthy). In 2005, Florida hosted 77.2 and 6.4 million domestic and international visitors, respectively, in 2005 (VISIT FLA). In addition, approximately 80% of Florida's population resides in coastal counties such that the state's overall economy is critically dependent on the health of the supporting marine ecosystem (Kildow). Harmful algal blooms (HABs) are one threat to marine environmental quality. In Florida, blooms of *Karenia brevis,* which are known as "red tides", have occurred along some part of the marine coastline in nearly every year. The toxins that are produced during a red tide can kill marine life that eventually washes ashore and creates a public nuisance (Baden, Steidinger, Flewelling). In addition, the aerosolized toxins create a potential public health threat by irritating the eyes, nose, and respiratory system up to three miles inland (Backer, Kirkpatrick).

A 2001 report submitted by the National Oceanic and Atmospheric Administration's National Sea Grant College Program to the Committees on Appropriations suggested national and local socio-economic impacts of red tide events that need to be quantified and addressed in order to develop efficient, timely management responses. The report stated that research efforts are needed to determine the nature and extent of private and public sector interactions in the case of a HAB event. Once these affected areas and corresponding issues are identified, accurate and efficient management decisions and aid estimates could be calculated and implemented at both the local and national levels.

To date, however, no studies have attempted to quantify costs incurred by resource managers to address the impacts caused by red tides, despite the need for resource allocation decisions. To help address the is paucity of needed information, this study attempted to quantify public expenditures and procedures resulting from red tide-related management and mitigation issues which have affected publicly managed beaches. In this study, municipal and county-level managers located on Florida's Gulf Coast were queried for specific information on (1) costs associated with red tide blooms, (2) beach and red tide management protocols, (3) funding sources and allocations, and (4) the existence and types of public relations efforts. The results of this survey effort are expected to provide estimates of red tide-related expenditures incurred by local governments that can be used to guide financial planning for other public agencies.

PROCEDURES

Nine Florida counties were selected for the analysis due to the historical patterns of exposure to red tide blooms and popularity as tourist destinations. The counties selected (from northwest to southeast) were Okaloosa, Franklin, Gulf, Pinellas, Manatee, Sarasota, Charlotte, Lee and Collier. All are coastal counties that border the Gulf of Mexico. In an effort to estimate the fiscal costs of red tide events at a local level, 28 municipalities within the nine sample counties were additionally selected based on their location to Gulf waters.

Top-level administrators within these locations were identified as the sample population, which was effectively a census within the defined study region. A database of names and contact information was compiled using the 2006 Membership Directory published by the Florida Association of Counties and the Florida League of Cities, Inc. The interviews were conducted by telephone by a single trained interviewer at the Florida Survey Research Center from January through March 2007.

The interviewer initially contacted the top-level county or city administrator to obtain permission and recommendations with respect to identifying appropriate individuals within their organizations that would most likely have access to the information associated with red tide events. Due to the sporadic nature of red tide blooms and the complexity of government titles and responsibilities across locales characterized by large ranges of population numbers, tourism dollars, and public beach areas, it was necessary to broaden the traditional scope of potential respondents. To that end, an effort was made to canvas all individuals that were actively involved with beach management issues or funding and employee management responsibilities within each public agency.

Respondents were first asked to discuss general beach management programs, and then queried about costs and activities specifically associated with red tide events. Respondents were encouraged to describe general types of beach management or maintenance programs, and to provide data concerning fiscal year expenditures on both labor and equipment used in support of these programs.

Questions pertaining to red tide events were designed to elicit detailed information for each responding county or city agency. The red tide-specific section included actual or estimated labor and equipment costs, evidence of communication protocols related to either clean-up activities or public relations, types of activities undertaken or sponsored by the agency, funds allocated to red tide mitigation or management, historical responses to red tide events, and identification of agency departments charged with red tide-related responsibilities.

SCOPE OF STUDY

The total population for each county ranged from approximately 11,000 in Franklin to 905,000 in Pinellas, with an average of 307,000 persons. Lee and Collier counties each experienced population growth rates exceeding 20% from 2002 to 2005. Manatee, Sarasota, and Charlotte also witnessed an influx of residents over this same time period, with populations increasing by 13.9%, 10.4% and 9.5%, respectively. Pinellas was the only county that experienced a negative growth rate, less than two percent, from 2002 to 2005.

Okaloosa County hosted nearly three million visitors in 2005, with slightly fewer visiting Pinellas and Lee counties, which received 2.4 and 2.3 million domestic visitors, respectively (VISIT FLA). Sarasota and Collier each attracted more than one and half million tourists in 2005, while Manatee saw 770,000 visitors to its area.

With the exception of Franklin County, each of the remaining eight counties in the sample had some number of publicly managed beachfront, ranging from a maximum of 35 miles in Pinellas to a minimum of seven miles in Sarasota, for an average of nearly 17 miles (Table 1). While Sarasota had the fewest overall miles, it had nearly as many public access point, or parks, as Pinellas, with each having 30 and 31, respectively. Access to public beaches may be free or fee-based, and can include boardwalks, piers, jetties, parking lots, state parks, and in some cases are accessible by motorized vehicle. Each county's beaches exhibit a range of characteristics, from the sugar-white sands of the Panhandle beaches, the flat expanses in Pinellas, the barrier islands of Sarasota and Manatee, and the interwoven marshes of Collier.

To support the tourism industries in these regions, all of the counties collect tourist development taxes that are administered through the related Tourism Development Councils (Table 1). Tax rates ranged from two percent in Franklin to five percent in Pinellas, Charlotte, and Lee. The remaining five counties collected four percent in taxes on tourism-dependent

business revenues. In total, FY 2005-06 tourist development collections ranged from $304,000 in Gulf, up to nearly $22 million in Pinellas, with an average of over $8 million across all nine counties. Lee and Collier ranked just behind Pinellas, with total tourist tax collections of $17 and $13 million, respectively. Okaloosa and Sarasota each collected just over $7 million and Manatee slightly less than $5 million annually.

Four of the counties indicated that at least 25% of annual tourism tax collections were earmarked for public beach management, maintenance, and improvements. In order to generate a scale of beach-related expenditures for each county, one-fourth of annual tourism tax collections were divided by miles of public beach managed by each county (Table 1). Tax collection records revealed that Sarasota and Lee Counties could spend $265,429 and $236,528, respectively, per mile of public beach. Pinellas and Collier Counties were each capable of allocating $164,023 and $148,364 per public beach mile.

Eight of the 18 cities surveyed, or 44%, were located in Pinellas County, while Manatee had three cities (Anna Maria, Bradenton Beach, and Holmes Beach) with an average of 2,754 residents. Sarasota, Lee, and Collier counties were each represented by two cities, with average populations of 35,240, 6,313, and 17,928, respectively. Longboat Key claimed county affiliations with both Manatee and Sarasota, and is home to an estimated 7,603 people. Overall, the Census population estimates ranged from the small community of North Redington Beach, with 1,482 inhabitants, to the sprawling metropolis of St. Petersburg, with nearly a quarter-million individuals, both of which are located in Pinellas.

SURVEY RESULTS

Response Rate

Completed interviews were obtained on a total of 27 cities or counties for a response rate of 87.1%. These 27 agencies included all nine counties (Okaloosa, Gulf, Franklin, Pinellas, Manatee, Sarasota, Charlotte, Lee and Collier) and 18 cites located within these counties. The 18 municipalities are located within the boundaries of five of the nine counties – Pinellas, Manatee, Sarasota, Lee and Collier. Six municipalities were either unreachable, or unwilling to respond to the survey questionnaire. Of the total number of completions, four agencies were deemed ineligible due to their distance from Gulf waters or their lack of publicly managed Gulf-facing beaches.

Agencies

Six counties involved at least two or more of their departments in the physical management of beach/red tide management responsibilities. Parks and Recreation and Public Works/Utility departments were mentioned by the majority of county respondents (4 or more). Natural Resources or Environment/Pollution Control departments were mentioned by three of the counties. Sarasota and Gulf mentioned the involvement of their local branches of the Florida Department of Health, while Gulf also included the Florida Department of Environmental Protection. Franklin and Pinellas both mentioned the role of their Public Waste departments in fish kill clean-ups. Sarasota and Lee referred to the roles of outside private contractors in water monitoring and beach cleaning responsibilities, respectively. Okaloosa was the only county to refer to the role of their Tourism Development Council. Finally, Pinellas, Manatee and Sarasota stated the inclusion of the Management and Budget Office, the Division of Marine Rescue, and Emergency Services, respectively, as holding responsibilities for beach-related physical management tasks.

The majority of cities interviewed, 12 out of 18, or 67%, assigned physical beach or red tide tasks to their Public Works department, while more than half of all cities (10) hired private contractors, contract labor, consulting firms, commercial fishers, marine inspectors, or equipment and boat rental suppliers to handle beach cleaning work. Five cities mentioned the top administrator, i.e. Town Clerk, City Manager, City Council, or Mayor, as having primary responsibilities for managing beaches and red tide events. Three cities, Sarasota, Venice, and Marco Island, noted that their beaches were physically cared for by their counties. Parks and Recreation and Natural Resource departments were mentioned by three cities each, four of which are located in Pinellas. Anna Maria was the only one to mention the Garbage Collection department, although this could be considered equivalent to larger cities' Public Works departments. Madeira Beach involved their Finance Director in physical management tasks, primarily in the role of assigning funds to beach-related responsibilities.

Not surprisingly, three-quarters of the counties claimed their Tourism Tax Funds as the source of dollars used in both beach maintenance and red tide management chores. Five of the counties also mentioned their own county government "regular", "emergency" or "contingency reserves" funds, with Pinellas and Charlotte relying solely on their own budgets for funding (no mention of tourism tax funding). While Franklin County used its own funds to clean its beaches, the respondent claimed that it "has no cities on the Gulf and is not greatly bothered by, nor concerned with, red tide or other HABs."

Funding Sources and Expenditures

Overall, six counties provided estimated and historical financial information with respect to overall beach maintenance efforts. General annual beach management and maintenance costs ranged from nearly $1.5 million in Sarasota, down to $76,000 in Gulf. While some counties did not provide red tide-related costs, several respondents noted allocations of large portions of tourism tax dollars towards annual emergency beach cleaning accounts (which would be used in the event of a red tide), which ranged from $25,000 in Okaloosa up to $400,000 in Sarasota.

Four counties had kept precise records of red tide related beach cleaning expenditures, and included Pinellas, Sarasota, Lee and Collier. Sarasota respondents provided current red tide cleaning expenditures of $51,148 for six separate events in FY 2006-07, which included labor, equipment and vendor costs (Table 2). Pinellas offers a reimbursement program to its cities that had incurred costs related to red tide cleaning in 2005, and seven cities received $78,090 in total (Table 3). Pinellas' Office of Management and Budget has limited reimbursement parameters to include actual overtime, temporary labor, and equipment costs related directly to red tides that occurred during a specific time frame. Lee recorded costs of $250,000 for a single 2004 red tide event in Fort Myers, and Collier spent $250,000 in 2005 in red tide-related cleaning expenditures.

Seven cities are reimbursed by their host counties for at least some, but not all, of the labor or dollar expenditures on red tide cleaning efforts, six of these in Pinellas, and one in Lee. Four cities (Holmes Beach, Sarasota, Venice, and Marco Island) indicated that they would notify their host counties in the event of a fish kill and, therefore, were not responsible for fiscal or labor expenditures. Three municipalities (Bradenton Beach, Fort Myers Beach, and Naples) indicated their own budgets were the only source of funds used to clean beaches after a red tide event. Two cities, Clearwater and St. Petersburg, used beach parking fee collections to maintain their beaches, and this would include cleaning up during a red tide event.

A total of 11 of the 18 cities, or 61%, provided red tide-related financial and/or labor costs. These numbers ranged from $1,420 received by Belleair Beach from Pinellas County for its 2005 red tide clean-up efforts, up to Long Boat Key's annual red tide line item budget allocation of $100,000 for cleaning its 10.5 miles of public beaches. The seven cities receiving reimbursement funds from their counties collected between $1,420 up to $45,310 as a result of 2005 red tide events. Naples was the sole self-funded city to have a historical red tide annual cleaning allocation of $50,000 in its budget, although Long Boat Key established its $100,000 red tide budget in 2006. The majority of labor and equipment used to clean red tide-related fish kills is provided by regular city staff and machinery, and most counties waived the dumping fees associated with dead fish disposal. However, several respondents mentioned the need for overtime, contract labor, and prisoner trustees required to expedite the cleaning process, depending on volume and location of dead marine creatures.

Overall, five counties shifted existing personnel and equipment for red tide cleaning efforts, including Pinellas, Manatee, Sarasota, Charlotte and Collier. These same five, plus Lee, hired additional temporary labor or private contractors and utilized prison trustees to achieve the timely removal of dead fish.

Communication or Activity Protocols

Five of the counties followed some program of public relations in the case of a red tide event. Sarasota and Manatee have equipped their lifeguards with Blackberries, which are used to send twice-daily reports of red tide conditions for their beaches that are staffed for 8-10 hours per day, year-round. These two are joined by Charlotte and Collier in placement of red tide warning signs on their public beaches. Gulf, Sarasota, Charlotte and Collier also issue press releases and emails to media, hotels, Tourism Development Council, Chamber of Commerce, health care agencies, and county websites. Manatee sends their Chief Lifeguard out into the community to educate beach users, schools and other organizations. Sarasota was the only county with a written, red tide-specific protocol designed to provide stringent guidelines as to policies and procedures for beach cleaning and public safety notifications. Two counties do not manage their beaches (Okaloosa) or do not have municipalities exposed to the Gulf of Mexico (Franklin). Lastly, Pinellas and Lee Counties did not engage in any type of public notification efforts.

A total of 13 of the 14 cities that were directly responsible for red tide beach cleaning followed similar action plans described as follows in the event of a red tide. Typically when a complaint (odor or dead fish) was received by the city it was then investigated by natural or marine resource personnel. Following their recommendations and any environmental or health guidelines established by state or federal agencies (e.g., Florida Department of Health, Environmental Protection Agency), the Public Works and/or Parks and Recreation departments combined existing personnel and/or temporary labor and equipment to begin the cleaning process. St. Petersburg, with its small beach length of approximately 650 feet, had their usual private contractor remove any dead fish resulting from red tide blooms, and provided no further elaborations. The remaining four cities notified their host counties as previously mentioned, although Holmes Beach was willing to assist the county on a "where needed and as manpower is available" basis. Holmes Beach is unique in that it possesses several "blind canals" where fish kills build up, and it has hired commercial fishers to collect these with nets and haul them back out into the Gulf. Only one city, Indian Rocks, provided the public with red tide information, including red tide fact sheets that were provided by Pinellas County.

CONCLUSIONS

The majority of funds for red tide-related cleanups were generated by tourism tax dollars, with only two counties relying strictly on their regular county dollars, perhaps due to the lack of public beaches in these areas (e.g., none were reported in Franklin and only one in Charlotte). In all, four counties and two cities were able to provide actual dollar amounts specific to red tide events that occurred on their public beaches. These six locations provided red tide-specific costs totaling $653,890 over the 2004-07 time period, with total expenditures per event (including labor, equipment, supplies and vendor fees) ranging from $11,114 to $250,000. Only two cities, Longboat Key and Naples, have placed red tide cleaning costs as a line-item in the annual budget, in the amounts of $100,000 and $50,000, respectively.

Although Sarasota County provided the only official written protocol outlining specific policies and procedures in the case of a red tide event, each of the other counties and cities appeared to follow a similar pattern of activity. Initially, a complaint of odor from a red tide-related fish kill was received by the agency, either from a member of the public or from beach or park personnel. An agency member, or private consultant, with some level of resource management experience, was sent to the area to investigate the claim and establish a cleaning protocol that would meet any human welfare, environmental and access restrictions (e.g., human health hazard, turtle nesting site, protected dunes, etc.). At this point, cleaning personnel were assigned from existing staff, outside labor agencies, or prison trustees, while machinery was also either diverted from usual uses or rented from local suppliers. Once the debris was collected in either trucks or garbage bags, it was hauled to local waste disposal sites following prescribed regulatory procedures (e.g., dead fish might be bagged, buried, or incinerated in designated locations).

In addition to data concerning red tide fiscal costs, respondents provided insight into the difficulties associated with cleaning public beaches in the event of a fish kill. For example, many of the Gulf County beaches harbor protected nesting areas for turtles and seabirds, as well as native flora that have low tolerance levels for invasive mechanized equipment. Several beaches have strict environment protocols in place to limit or prevent removal of washed up marine materials for a set period of time in an effort to preserve the natural state of coastal ecosystems. Such policies include criteria such as “no-rake” areas, cleaning only when there are “significant numbers” of dead fish, or they require “one large fish per foot of shoreline” or “substantial portion of the beach be covered by fish for 24-48 hours, or to a depth of six inches” before cleaning can occur. Adherence to environmental policies must be enforced by public officials on private businesses, and in some cases exceptions have been granted for resorts that have established cleaning policies. On at least one occasion, the state health department stepped in and required a county to clean private homeowners’ beaches as the fish kill was deemed a human health hazard.

Five of the counties, and only one city, mentioned public notification of an ongoing red tide event, typically by placing warning signs on the beach and sending alerts to tourism-related businesses. However, a few counties and cities mentioned financial support of the grassroots organization START, or Solutions To Avoid Red Tide, which has active membership in most of the responding regions and works to educate the public and businesses about red tide. Manatee and Sarasota counties have equipped their lifeguards with Blackberries, which are used to send twice-daily messages concerning red tide and other beach conditions.

An important finding is the estimated costs of a red tide event per linear foot of beach. Sarasota spent an average of $4.87 per linear foot of beach to provide the labor and equipment necessary to remove the dead fish resulting from a single red tide event that occurred in October 2006 through February 2007. In Pinellas, seven cities were reimbursed an average of $14.27 per linear foot of beach for red tide-related cleaning required throughout 2005; however, incidence and duration of the events were not mentioned, and city expenditures may have exceeded county reimbursements due to in-kind labor and equipment reallocations. This information may provide a useful baseline for estimation of red tide-related budget needs for other cities and counties that are responsible for public beach management. However, it should be noted that public government protocols associated with red tide events are strongly dependent on all of the following factors: the timing, duration and severity of an event; size of budget and labor force; overall importance of tourism (evidenced by tourism tax collections); quantity and accessibility of public beaches; and the environmental regulations that are specific to each locality.

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Table 1. Public beachfront area and tourist tax collection information for nine Florida Gulf Coast counties

		Tourist development tax, FY 2005-06[b]		
County	Public beachfront[a] (miles)	Rate (%)	Receipts ($1,000)	Dollars per mile[c] ($/beach mile)
Okaloosa	24	4.0	7,364	76,708
Franklin	0 [c]	2.0	669	N/A
Gulf	17	4.0	304	4,471
Pinellas	35	5.0	21,651	164,023
Manatee	14	4.0	4,760	85,000
Sarasota	7	4.0	7,432	265,429
Charlotte	12	5.0	1,625	33,854
Lee	18	5.0	17,030	236,528
Collier	22	4.0	13,056	148,364

[a] Public beachfront access miles retrieved from various online county government sources – Sarasota: http://apoxsee.co.sarasota.fl.us/ ; Charlotte: http://www.charlotte-florida.com/ ; Okaloosa: http://www.co.okaloosa.fl.us/ ; Lee: http://www.lee-county.com/ ; Pinellas: http://www.pinellascounty.org/ ; Gulf: http://www.visitgulf.com/ ; Collier: http://www.colliergov.net ; Manatee - http://www.flagulfislands.com/

[b] Validated tax receipts data for July 2005, through June 2006, Florida Department of Revenue, Office of Tax Research.

[c] Calculated as 25% of annual FY2005-06 Tourist Development Tax collections (see Table 2). Franklin County reported no Gulf-front public beaches.

Table 2. Sarasota County expenditures for six red tide events by public beach

Public beach / event number[a]	Red tide days (days)	Cost per event			Total ($/event)	Cost per beach area ($/ft)
		Labor ($)	Equipment ($)	Vendor ($)		
Siesta Beach#1	37	10,202	5,167	1,16	16,533	6.89
Siesta Beach#2	2	327	327	0	654	0.27
Siesta Beach#3	25	2,813	1,238	1,865	5,916	2.46
Siesta Beach#4	20	10,147	5,776	720	16,643	6.93
North Jetty#1	7	5,522	3,713	1,890	11,155	12.39
North Jetty#2	1	137	109	0	246	0.27
Average	15	4,863	2,722	1,410	8,525	4.87

[a] Siesta Beach #1: October 2 – November, 8, 2006; Siesta Beach #2: November 9-10, 2006; Siesta Beach #3: December 4-29, 2006; Siesta Beach #4: January 8-28, 2007; North Jetty #1: February 1-7, 2007; North Jetty #2: February 22, 2007.

Table 3. Pinellas County reimbursements for 2005 red tide events by city public beach

City	Labor ($)	Equipment / supplies ($)	Total ($)	Costs per beach area ($/ft)
Belleair Beach	985	127	1,112	10.14
Indian Rocks Beach	9,215	5,096	14,311	5.04
Indian Shores (1)	9,972	304	10,250	22.32
Indian Shores(2)	8,160	20,878	29,038	38.09
Madeira Beach	10,868	35,998	46,866	7.01
North Redington Beach	1,199	843	2,042	14.64
Treasure Island	7,851	12,634	20,485	2.61
Average	4,863	5,064	8,525	14.27