

Executive Overview

NRDC's annual analysis of water quality and public notification data at coastal U.S. beaches found that the number of beach closings and advisories in 2010 soared to its second-highest level in the 21-year history of our report. Beach closings and advisories were issued for 24,091 days in total, a 29% increase from 2009. More than two-thirds of those were issued because bacteria levels exceeded applicable standards. The portion of all monitoring samples that exceeded national health standards was essentially stable; in 2010, 8% of samples exceeded the national standard for designated beach areas, compared with 7% for the four previous years. In addition, fewer beaches were monitored in 2010 than in any year between 2006 and 2009. The 2010 results confirm that our nation's beaches continue to experience significant water pollution that puts swimmers and local economies at risk. Although NRDC continues to push for improvements to beach water quality standards and test methods, the best long-term approach is to adopt solutions to address the sources of beachwater pollution, particularly strategies for reducing contamination carried by stormwater runoff.

POLLUTED BEACHWATER MAKES SWIMMERS SICK AND HURTS COASTAL ECONOMIES

The Environmental Protection Agency (EPA) has estimated that up to 3.5 million people become ill from contact with raw sewage from sanitary sewer overflows alone each year.¹ Many public health experts believe that the number of illnesses caused by untreated sewage could be much higher than is currently recognized because people who get sick from swimming in polluted recreational waters are not always aware of the cause of their illness and don't report it to doctors or local health officials.

Illnesses associated with polluted beachwater include conditions such as stomach flu, skin rashes, pinkeye, respiratory infections, meningitis, and hepatitis. Children are especially vulnerable, perhaps because they tend to submerge their heads more often and are more likely to swallow water when swimming. The Centers for Disease Control and Prevention concluded that the incidence of infections associated with recreational water use has steadily increased over the past several decades;² one study found that swimmers at polluted beaches in the Great Lakes region were at more likely to have gastrointestinal illnesses as non-swimmers;³ and another study found that fecal contamination at Los Angeles and Orange County beaches caused between 627,800 and 1,479,200 annual excess gastrointestinal illnesses.⁴

Our coasts provide more than just local recreation—approximately 85% of all U.S. tourism revenue is received in coastal states. In 2007 the nation's shoreline-adjacent counties contributed \$5.6 trillion toward the nation's gross domestic product and 47 million jobs.⁸ Economists estimate that a typical swimming day is worth approximately \$35.00 to each individual,⁸ so depending on the number of potential visitors to a beach, the "consumer surplus" loss on a day that the beach is closed or under advisory for water quality problems can be quite significant. For example, one study estimated that economic losses as a result of closing a Lake Michigan beach due to pollution could be as high as \$37,030 per day.⁸ Similarly, the Los Angeles/Orange County study discussed above concluded that the public health cost of the excess gastrointestinal illnesses caused by poor water quality was \$21 million to \$51 million each year.⁴

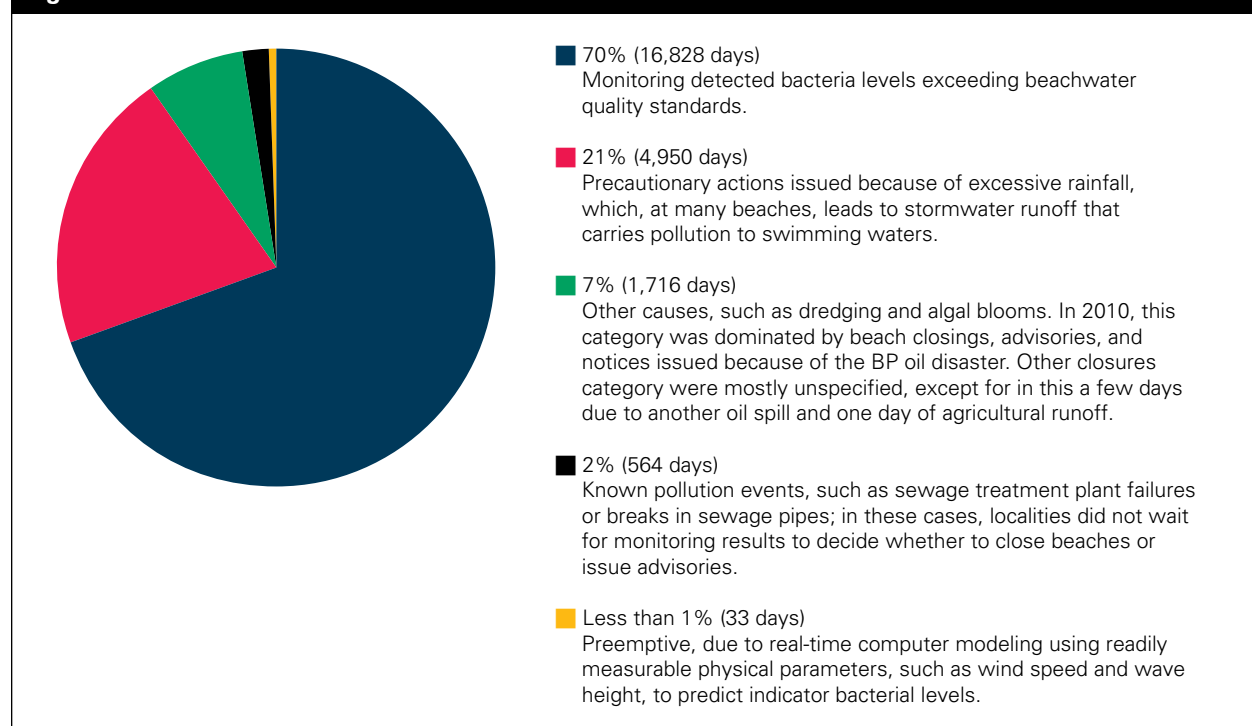
CLOSINGS AND ADVISORIES FOR 2010

In 2010, the number of closing and advisory days at ocean, bay, and Great Lakes beaches reached its second-highest level since NRDC began tracking these events 21 years ago: 24,091 days nationwide. This is an increase of 29% (5,409 days) from the previous year. The major factors contributing to the increase in closing and advisory days in 2010 appears to be a rise in the number of closing and advisory days in Hawaii and California and oil washing up on beaches due to the Gulf of Mexico oil spill. There was a 51% increase in the number of preemptive closing/advisory days (7,223) in 2010 from 2009 (4,773 days) and 2008 (5,341 days). More than 69% of preemptive closing/advisory days were issued because of heavy rainfall and 24% were issued because of other reasons, predominantly because of the Gulf of Mexico oil spill.

In addition, there were 72 closing and advisory events that lasted more than six but not more than 13 consecutive weeks (extended events), and 101 permanent closing and advisory events that lasted more than 13 consecutive weeks (permanent events). Including closing and advisory days that occurred during extended events, the total number of beach closing and advisory days in 2010 comes to 28,789.

Although the number of beaches monitored at least once a week decreased 2% to 2,815 in 2010 from 2,876 in 2009, the continued high level of closings and advisories is an indication that serious water pollution persists at our nation's beaches. The most common reason officials cited for closing beaches or issuing advisories in 2010 was bacteria levels that exceeded beachwater quality standards. However, precautionary issues were also a factor (see Figure EO-1: Reasons Officials Closed Beaches or Issued Advisories in 2010).

Figure EO-1: Reasons Officials Closed Beaches or Issued Advisories in 2010



Pollution Sources That Caused Closings and Advisories in 2010

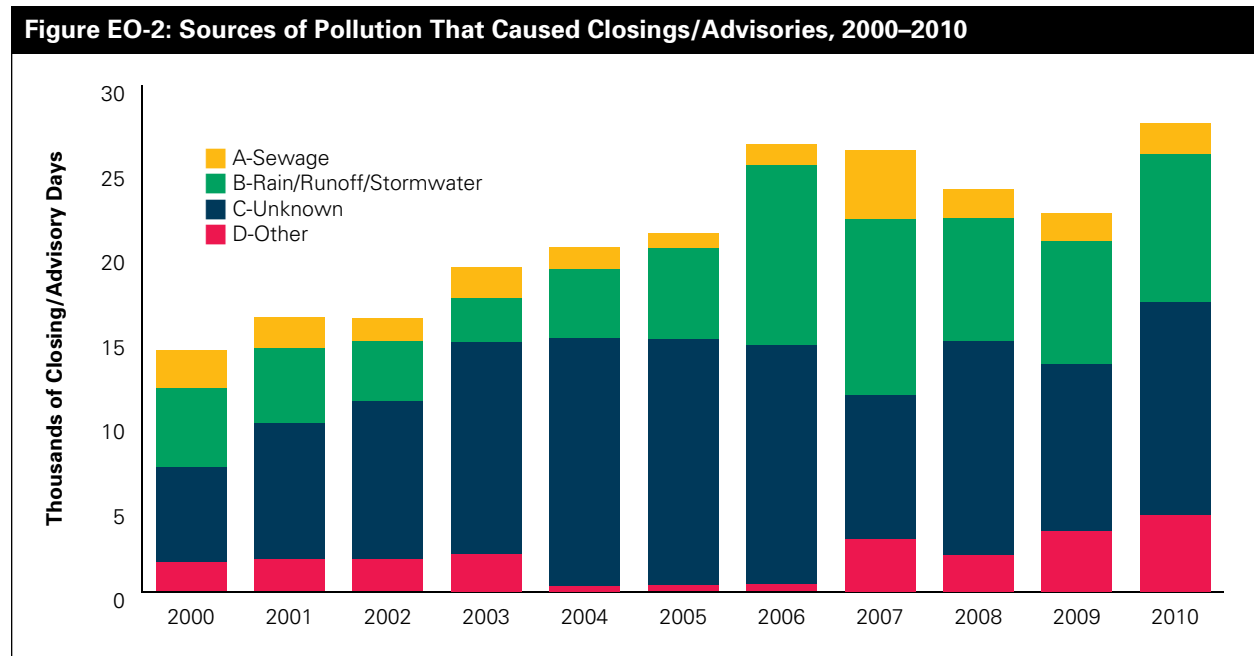
(Totals exceed total closing/advisory days and 100% because more than one contamination source was reported for some events.)

Most beach closings are issued because beachwater monitoring detects unsafe levels of bacteria. These unsafe levels indicate the presence of pathogens—microscopic organisms from human and animal waste that pose a threat to human health. The key reported contributors of these contaminants are (1) stormwater runoff, (2) sewage overflows and inadequately treated sewage, (3) agricultural runoff, and (4) other sources, such as beachgoers themselves, wildlife, septic systems, and boating waste.

Advisories may also be issued as precautionary measures when a pollution event is expected to occur, for instance during rainstorms. (See also Figure EO-2: Sources of Pollution That Caused Closings/Advisories, 2000–2010.)

- 52% (12,596 closing/advisory days) were attributed to unknown sources of pollution.
- 36% (8,712 closing/advisory days) were attributed to polluted runoff and stormwater.
- 19% (4,512 closing/advisory days) were attributed to miscellaneous pollution sources, such as boat discharges. Of those, 1,831 days were attributed to wildlife sources and about a third were due to the Gulf of Mexico oil spill.
- 8% (1,880 closing/advisory days) were attributed to sewage spills and overflows. This pollution source category includes combined sewer overflows, sanitary sewer overflows, breaks or blockages in sewer lines, and faulty septic systems.

There was no contamination source information for 203 closing/advisory days.



Total days shown are greater than annual totals because more than one pollution source may have contributed to each closing/advisory. **Key:** (A) Sewage spills and overflows. (B) Polluted runoff, stormwater, or preemptive due to rain. (C) Unknown. (D) Other reasons (including closings/advisories with no source information provided).

BEACHWATER MONITORING FOR 2010

In 2010, the portion of all monitoring samples exceeding national health standards increased slightly to 8% (7% in 2009, 2008, 2007, and 2006). Louisiana, Ohio, Indiana, and Michigan had the highest percent of samples exceeding the EPA's single-sample maximum standard for designated beach areas (see Table EO-1: Rank of States by Percentage of Beachwater Samples Received Exceeding the National Standard in 2010).⁵

Table EO-1: Rank of States by Percentage of Beachwater Samples Received Exceeding the National Standard in 2010

Rank	Percent Exceedance	State	2010 Total Samples	Beaches With Reported Monitoring Results
1	1%	New Hampshire	1,138	16
2	2%	New Jersey	3,955	219
3	3%	Oregon	946	28
4	3%	Hawaii	4,184	155
5	3%	Delaware	401	22
6	4%	Florida	15,841	305
7	4%	North Carolina	6,917	239
8	5%	Georgia	985	27
9	5%	South Carolina	2,481	23
10	5%	Alaska	299	12
11	5%	Minnesota	377	48
12	5%	Virginia	835	45
13	6%	Pennsylvania	887	12
14	6%	Washington	3,142	56
15	6%	Massachusetts	7,821	586
16	7%	Maryland	895	70
17	8%	Texas	14,169	65
18	8%	Rhode Island	1,855	70
19	9%	New York	9,253	350
20	10%	Mississippi	934	22
21	10%	Alabama	855	25
22	10%	California	26,399	456
23	11%	Maine	1,473	59
24	11%	Connecticut	2,502	65
25	11%	Wisconsin	4,527	117
26	14%	Illinois	4,569	50
27	15%	Michigan	7,392	214
28	16%	Indiana	2,643	31
29	21%	Ohio	2,931	62
30	37%	Louisiana	783	28

Ways in Which NRDC's Report Differs From the EPA's Beach Report

In May, the Environmental Protection Agency released a summary of closing/advisory information (see http://water.epa.gov/type/oceb/beaches/seasons_2010_national.cfm). NRDC's report is much different from the EPA's report.

1. NRDC includes an analysis of monitoring data.
2. NRDC includes area-wide preemptive rainfall advisories, but the EPA generally does not. Though only a few states issue such advisories, Hawaii issued more than 4,000 such days in 2010.
3. NRDC provides state-by-state reporting and analysis of individual beach programs.
4. With respect to closing/advisories, NRDC reports the total number of days and focuses its analysis on events lasting up to six consecutive weeks; events lasting longer are grouped as either extended or permanent events. The EPA reports the number of beaches with closings or advisories and the percent of the total "beach days" that were affected.
5. NRDC analyzes reported contamination sources associated with closings and advisories.
6. NRDC reports closings and advisories beyond monitored beaches. (Excluding Hawaii, there were 718 closing/advisory days at 45 non-monitored beaches in 5 states, plus 19 extended and 3 permanent events. Hawaii adds another 2,802 days.)
7. NRDC compares states and beaches on the basis of water quality.

It is important to note that while a high percent exceedance rate is a clear indication of contaminated coastal recreational waters, it is not necessarily an indication that the state's beachwater quality monitoring program is deficient or fails to protect public health when beachwater quality is poor. For example, four of the five states with the highest exceedance rates always or almost always close a beach or issue an advisory when a sample exceeds the standard; that is, they do not wait for the results of a resample or check other conditions first, as some other states do.

Regionally, the Great Lakes had the highest exceedance rate (15%) in 2010, followed by western states (8%), the Gulf Coast (8%), New England (7%), the Delmarva region (6%), the NY-NJ region (5%), and the Southeast (4%).

For the sixth consecutive year, NRDC determined the number of beaches exceeding the national daily standard more than 25% of the time. In 2010, this list included 171 beaches in 22 states, an increase over 2009, when there were 162 such beaches in 20 states. Thirteen beach areas in 7 states (California, Florida, Illinois, New Jersey, Ohio, Texas, and Wisconsin) made this list in each of the last five years, 2006 through 2010 (see Table EO-2: Repeat Offenders: Beaches With More Than 25 Percent of Samples Received Exceeding the EPA's Applicable Single-Sample Maximum Bacteria Standards for Designated Beach Areas, Each Year, 2006–2010). Chronically high bacteria counts indicate that the beachwater is probably contaminated with human or animal waste.

Table EO-2: Repeat Offenders: Beaches With More Than 25 Percent of Samples Received Exceeding the EPA's Applicable Single-Sample Maximum Bacteria Standards for Designated Beach Areas, Each Year, 2006–2010

State	County	Beach	Tier	Assigned Monitoring Frequency	Potential Pollution Sources (Reported by EPA)
California	Los Angeles	Avalon Beach–Near Busy B Cafe	1	1/wk	Unknown
California	Los Angeles	Avalon Beach–North of GP Pier	1	1/wk	Unknown
California	Los Angeles	Avalon Beach–South of GP Pier	1	1/wk	Unknown
California	Los Angeles	Cabrillo Beach Station	1	Daily	Unknown
California	Orange	Doheny State Beach–North of San Juan Creek	1	3/wk	Unknown
California	Orange	Doheny State Beach–Surf Zone at Outfall	1	3/wk	Unknown
Florida	Taylor	Keaton Beach	1	1/wk	Boats, Runoff, Wildlife, Stormwater, Other, Unknown
Illinois	Lake	North Point Marina North Beach	1	4/wk	Unknown
New Jersey	Ocean	Beachwood Beach West	1	1/wk	Stormwater, Wildlife
Ohio	Cuyahoga	Villa Angela State Park	1	Daily	None Listed
Texas	Nueces	Ropes Park	1	1/wk	Combined Sewer Overflow, Stormwater, Other, Unknown
Wisconsin	Kenosha	Eichelman	2	2/wk	Stormwater, Wildlife
Wisconsin	Milwaukee	South Shore Beach	1	4/wk	Unknown

For the 2010 beach season, the NRDC data set includes monitoring results for 131,389 samples at 3,277 beaches and beach segments (most state and local officials divide longer beaches into manageable monitoring segments). Fewer beaches were monitored last year than in any year between 2006 and 2009; the total was down from 125,551 samples at 3,333 beaches and beach segments in 2009, 132,465 samples at 3,601 beaches and beach segments in 2008, 131,977 samples at 3,516 beaches and beach segments in 2007, and up from 106,417 samples at 3,500 beaches and beach segments in 2006.

Methods Beach Officials Use to Sample, Monitor, and/or Predict Beachwater Quality

Beach officials in all states continue to use traditional methods approved by the EPA that require about 24 hours to quantify bacterial indicator levels in beachwater samples. In July 2010, a pilot project was launched at several beaches in Orange County, California, to demonstrate the use of qPCR, a rapid method of determining bacterial levels that allows beachwater quality warning decisions to be made on the same day a sample is taken. Traditional methods were used to analyze the samples alongside qPCR analysis, but the qPCR results were used to determine whether warnings about beachwater quality would be issued and signs posted at the pilot study beaches. Also during the summer of 2010, the Racine Health Department in Wisconsin used qPCR to determine levels of *E. coli* in beachwater and inform their management decisions at North Beach and Zoo Beach. These pilot studies were the first use of a rapid test method for issuing beachwater quality notifications at coastal beaches in the United States.

Beaches in Puerto Rico and a number of states, including Alabama, California, Florida, Michigan, Ohio, South Carolina, and Rhode Island, have participated in the EPA's National Epidemiological and Environmental Assessment of Recreational (NEEAR) Water Studies. These studies, which were urged on by an agreement that resulted from an NRDC lawsuit against the EPA for failing to fulfill the terms of the BEACH Act, were conducted to gain a better understanding of bacterial indicators, swimming at the beach, and people's health. Beachgoers were interviewed and water samples were collected and analyzed for bacteria using several analysis methods, including rapid testing.

In addition to the NEEAR project, several states have conducted their own studies of rapid test methods. California has invested an estimated \$3 million in rapid test method investigations, and Ohio, Wisconsin, and New Jersey have also conducted or participated in rapid test method research outside of the NEEAR studies.

Beachwater quality generally depends on many complex factors, but for some beaches, predictions of beachwater quality based on a few physical measurements of daily conditions can be calculated fairly accurately. Some states have taken advantage of this and have created computer models that rely on data from physical measurements such as rainfall levels, wind speed and direction, tides, wave heights, and currents. These models rapidly prepare predictions of beachwater quality and allow beaches to be closed or placed under advisory the day that bacterial levels are expected to be high, rather than 24 hours after high levels of bacteria exist. States using computer models to inform closing and advisory decisions for at least some of their beaches in 2010 were California, Illinois, Indiana, New York, Ohio, and Wisconsin.

Because the water quality at many beaches is adversely impacted by contaminated stormwater runoff, another, less sophisticated means of protecting public health is to preemptively close beaches or issue advisories when indicator bacteria levels are expected to be high after rainfall events. Many states report that they have developed standards for issuing preemptive rainfall advisories based on rainfall intensity or some other rain-related factor for at least some of their beaches. California, Connecticut, Delaware, Florida, Hawaii, Maine, Massachusetts, Michigan, New Jersey, New York, Pennsylvania, Rhode Island, South Carolina, and Wisconsin have quantitative rainfall standards at some of their beaches, and New Hampshire is developing them. Seventeen states reported preemptive rainfall closures or advisories at specific beaches in 2010: California, Connecticut, Delaware, Florida, Hawaii, Illinois, Indiana, Massachusetts, Michigan, Minnesota, New Jersey, New York, North Carolina, Oregon, Pennsylvania, Texas, and Wisconsin.

Some states, including California, Minnesota, Mississippi, North Carolina, Rhode Island, and Washington, issue standing advisories warning the public to avoid beachwater contact after heavy rainfall or when storm drains are running. These standing advisories are not reported in the closing and advisory data that the states send to the EPA. In North Carolina, standing rainfall advisories take the form of permanent signs posted on either side of storm drain outfalls stating that swimming between the signs is not recommended when there is water flowing through the drain.

Factors That Confound Interpretation of the Results

Although it is understandable to expect a correlation between year-to-year changes in water quality and the number of closing/advisory days, there are confounding factors that make such correlations unlikely. While year-to-year change in the percent of monitoring samples that exceed health standards is an objective assessment of water quality, year-to-year change in the total number of closing/advisory days is subject to differences in programs and practices. For example, some states or localities:

- ***Take multiple samples at each monitoring station.*** When making closing/advisory decisions, beach officials might use the average value of all samples taken that day. Using this method, the average value may not exceed the standard even though one (or more) of the multiple samples does. In such a case, the beach would not be closed or put under advisory. While this is an acceptable procedure for making closing/advisory determinations, NRDC includes the results of every reported sample when calculating the percent of all samples that exceed the standard in a given year.
- ***Resample a beach after an exceedance before issuing a closing or advisory.*** If the resample does not exceed the standard, the beach is not put under closing or advisory.

- *Preemptively close a beach or issue an advisory without waiting for the results* of beachwater monitoring if they suspect that pollution has affected beachwater quality or if they close a beach or issue an advisory for non-pollution reasons. The reasons for these preemptive actions are highly variable, including heavy rainfall events, known sewage leaks, chemical spills, and high winds and waves.
- *Continue monitoring at beaches that are closed for more than six consecutive weeks* during the reporting year. NRDC does not include extended or permanent beach closings or advisories when comparing closing/advisory days from year to year, but the monitoring data that are collected at these beaches are included in the percent exceedance analysis.
- *Continue monitoring at beaches that have been closed for reasons other than pollution*, such as budget cuts or low attendance. While routine monitoring samples continue to be collected and their results reported to the EPA, the beach closing days may not be reported or may occur during events that are classified as extended or permanent events that are excluded from NRDC's analysis.

Also, year-to-year changes in beach monitoring frequency could impact the total number of closing/advisory days but not the percentage of samples that exceed health standards. For example, increasing routine monitoring from once every two weeks to once a week could decrease the number of closing/advisory days for the same number of events because the duration of many events could go from two weeks to one week.

RECOMMENDATIONS FOR IMPROVING BEACHWATER QUALITY

While concerns about the adequacy of water quality standards and water quality test methods remain, NRDC's biggest concern is addressing the sources of beachwater pollution. Stormwater runoff is the most frequently identified source of beach closings and advisory days, and the EPA estimates that more than 10 trillion gallons of untreated stormwater make their way into our surface waters each year.⁸

Often, the best way of avoiding runoff-related pollution is to reduce the volume of stormwater flowing to the storm drains that carry it to nearby water bodies or, in some cases, to sewage treatment plants. Green infrastructure, which restores or mimics natural conditions, involves techniques that allow rainwater to infiltrate into the soil, reducing the volume of runoff. Green infrastructure includes the use of porous pavement, green roofs, parks, roadside plantings, and rain barrels, to stop rain where it falls, either storing it or letting it filter into the ground naturally. This keeps stormwater runoff from overloading sewage systems and triggering overflows or from carrying pollutants into natural bodies of water.

Not only do these smarter water practices on land not only prevent pollution at the beach—but they also beautify neighborhoods, cool and cleanse the air, reduce asthma and heat-related illnesses, save on heating and cooling energy costs, boost economies, and support millions of American jobs at the same time. Many cities and states have embraced green infrastructure practices.

Decision makers in Congress and the administration should act on national initiatives that would result in cleaner beachwater and improve beach water monitoring and public information:

- The EPA should take a once-in-a-generation opportunity to reform its water pollution regulations for stormwater sources. Strong stormwater retention requirements will help spur widespread implementation of green infrastructure and help keep urban and suburban runoff from reaching beaches.
- Congress should pass legislation called the Green Infrastructure for Clean Water Act. Currently under consideration, it would boost green infrastructure nationwide—meaning cleaner U.S. beaches for the future.
- Congress should restore—and enhance—critical funds for investment in water infrastructure via the Clean Water State Revolving Fund. In the long term, Congress should work toward the creation of a trust or other dedicated source of clean water funding.

- Congress should pass the Sewage Overflow Community Right-to-Know Act when it is introduced. The bill would amend the Clean Water Act by directing owners or operators of sewage treatment plants to improve their spill reporting and by ensuring better coordination between sanitation and public health officials.
- The EPA and state agencies should use their authority under the current law to ensure that communities with combined sewer overflow problems implement strong long-term control plans that achieve critical water quality goals for receiving waters, such as making them safe for swimming.
- The EPA should renew efforts to develop a sanitary sewer overflow rule that reaffirms the prohibition on “blending” partially treated sewage with fully treated sewage, except under extreme circumstances; creates standard requirements for upkeep and repair of aging sewer systems; and includes strong requirements for reporting, recordkeeping, monitoring, and providing public notice when sewage overflows occur.
- The EPA should plug loopholes that allow industrial livestock operations to continue to discharge animal wastes into waterways.
- Congress should reauthorize the BEACH Act and provide sufficient funding for its full implementation and should authorize the use of funds to identify and remedy beach contamination sources.
- The EPA should modernize the health-based standards for beach water quality and continue to work to develop methods for quickly assessing water quality.

NOTES

- 1 U.S. EPA, *Advanced Notice of Proposed Rulemaking, NPDES Permit Requirements for Municipal Sanitary Sewer Collection Systems, Municipal Satellite Collection Systems, and Sanitary Sewer Overflows* (Jan. 4, 2001) (withdrawn Jan. 20, 2011).
- 2 Yoder, J.S., et al., “Surveillance for Waterborne Disease and Outbreaks Associated With Recreational Water Use and Other Aquatic Facility–Associated Health Events—United States, 2005–2006,” Centers for Disease Control and Prevention, September 12, 2008/57(SS09) pp. 1–29, available at: <http://www.cdc.gov/mmwr/preview/mmwrhtml/ss5709a1.htm>.
- 3 Wade et al. 2006. *Rapidly Measured Indicators of Recreational Water Quality Are Predictive of Swimming-Associated Gastrointestinal Illness*. Environmental Health Perspectives, v. 114, no. 1, Jan. 2006, 24-28.
- 4 Given, S. et al., “Regional Public Health Cost Estimates of Contaminated Coastal Waters: A Case Study of Gastroenteritis at Southern California Beaches,” 40 *Environ. Sci. Technol.* 4851 (2006).
- 5 For the sixth consecutive year, NRDC used the BEACH Act’s single-sample maximum standards for designated beach areas to compare water quality at U.S. beaches. For marine waters, the standard for enterococcus density is 10⁴ cfu per 100 milliliters; for freshwater, the standard is 235 cfu *E. coli* per 100 milliliters.
- 6 National Ocean Economics Program, Market Data, Coastal Economy Data, Shore Adjacent Coastal Zone Counties, <http://noep.mbari.org/Market/coastal/coastalEcon.asp>.
- 7 Rabinovici, S.J., et al., “Economic and Health Risk Trade-Offs of Swim Closures at a Lake Michigan Beach,” *Environmental Science and Technology*, Vol. 38, No. 10, 2004, p. 2,742.
- 8 EPA, “Report to Congress: Impacts and Control of CSOs and SSOs,” April 26, 2004, EPA 833-R-04-001, p. 4-29, http://cfpub.epa.gov/npdes/cso/policy_report2004.cfm.