

Implementation Strategy 8.0: Residential

Individual residents in the BIG area make only small contributions to waterway pollution. However, the cumulative effect can be significantly detrimental. Similarly, the combined effort of millions of residents participating in activities that reduce bacteria pollution can have a significant positive effect. As the population in the region grows (see Figure 7), the collective actions of individuals will have a greater impact.

Residential contributions to bacteria loading in waterways include bacteria discharging from a residential site either during runoff events or directly, and fats, oils, and grease clogging sanitary sewer lines and resulting in overflows. Decorative ponds, OSSFs, and pet waste can contribute bacteria during runoff events or through direct discharge. Fertilizers, grass clippings, runoff from overwatering, and general lawn care practices may enhance the ability of bacteria to grow and regrow in the environment. Pouring fats, oils, and grease down sink drains can clog sanitary sewer lines, potentially leading to SSOs and direct discharges of bacteria to the bayous.

This implementation strategy is aimed at changing public behaviors through education efforts that empower residents to participate in actions that improve water quality. While enforcement, or the threat of enforcement, may be effective against stakeholders regulated by permits, this strategy instead focuses on positive activities that promote public education.

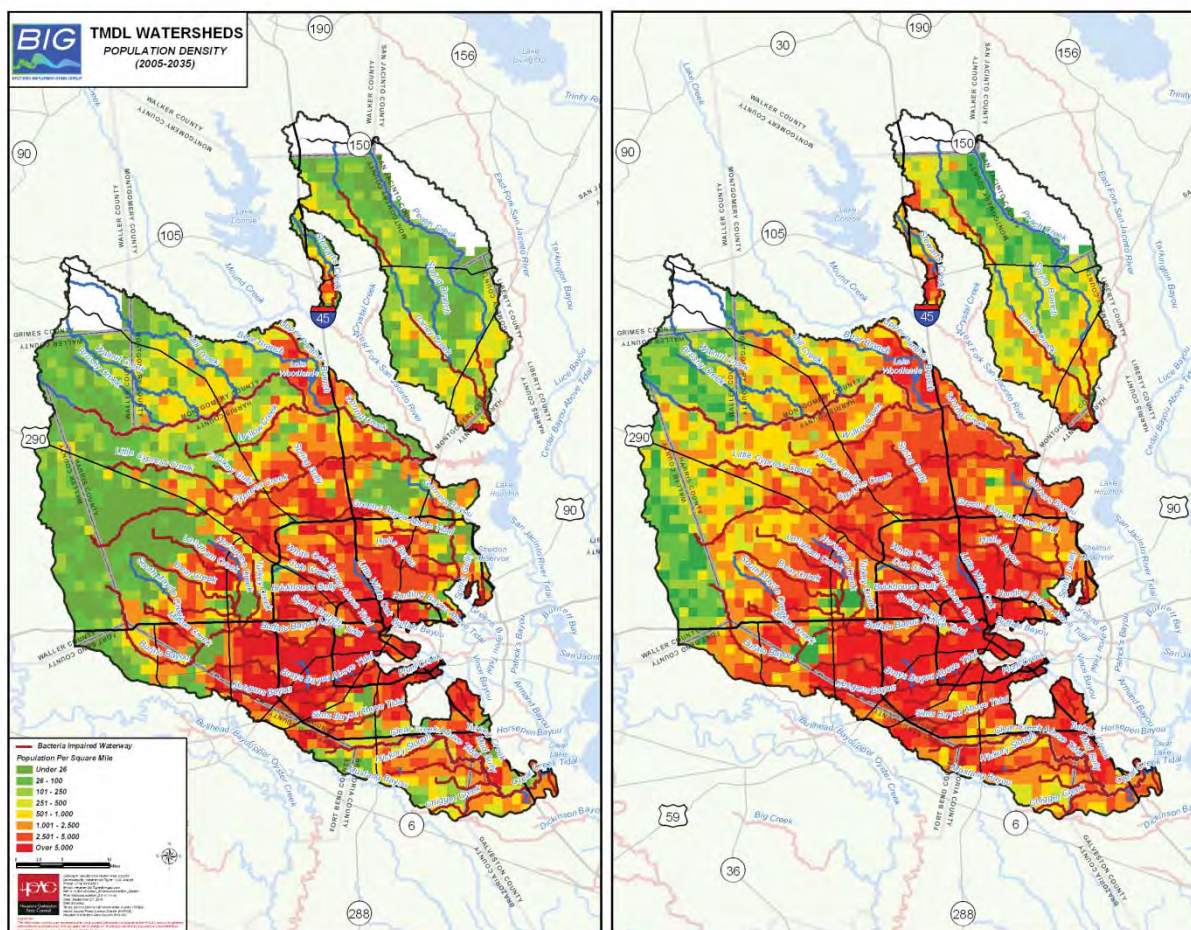
Public education efforts should inform the public about:

- Why waterways are important to the region,
- Why bacteria is an issue, and
- What they can do to reduce bacteria in area waterways.

Many of the activities are easy and inexpensive. Residents can properly dispose of cooking grease, use appropriate lawn care practices, and pick up and properly dispose of pet waste. The simple task of picking up after pets can improve water quality. If individuals can change their behavior, they can help improve water quality.

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Figure 7: Map of Projected Changes in Population Density



Implementation Activity 8.1: Expand Homeowner Education Efforts Throughout the BIG Project Area

As resources become available, communities, cities, counties, and other entities shall provide public education that individual residents can use to reduce bacterial loading to area waterways. Topics that should be addressed in a homeowner education program include pet waste disposal, best management practices for yard care, OSSF tips, and proper disposal of fats, oils, and grease.

This implementation activity will take advantage of existing public education programs and materials. Some communities in the region already have educational programs that address bacterial loading and are willing to share materials, including the cities of Houston and Pasadena and Harris County. The *Clean Water, Clear Choice* program¹⁰⁰ is an example of a multi-jurisdictional effort.

¹⁰⁰ (Stormwater Management Joint Task Force n.d.)

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Houston is currently developing a storm water education program where a state-approved, Houston-specific, storm water education curriculum is being created. Other regional, local governments may access, use, and promote the curriculum and other educational material at no charge.

The Harris County Regional Watershed Education Program¹⁰¹ allows MS4-permitted communities to buy into their education program at a current rate of 53 cents per resident. Materials available through this program include brochures, presentations, advertisements, and direct mail pieces.

Another resource for communities developing education programs is the Public Participation and Education Subcommittee¹⁰² of the Galveston Bay Estuary Program. This group provides opportunities for idea sharing, learning about resources, and coordinating education and outreach efforts throughout the region.

In addition to local programs, resources are available from outside the region. The EPA's Nonpoint Source Outreach Toolbox¹⁰³ is an excellent resource that provides public education materials, for radio, television, or print, as well as case studies on a wide range of topics, including OSSFs, pet waste, gardens and lawns, as well as general storm water and storm drain awareness. Some materials may require small changes for application in local communities, but many will not.

A community may create its own education program and materials if it prefers. Funding may be available for these projects from the Galveston Bay Estuary Program and Texas' Nonpoint Source Grant Program, among other sources.

8.1.1: Continue or begin a homeowner education program based on existing models

For areas currently under an MS4 permit, public education efforts shall continue to place a high priority on bacteria reduction activities. Communities that don't currently engage in homeowner education efforts will be strongly encouraged to implement a program with guidance from existing programs and materials. A consistent message throughout the area covered by this I-Plan is desirable and might be more effective. H-GAC or another appropriate agency shall convene an annual meeting to identify common messages appropriate for the region and specific to bacteria. This forum will also provide an opportunity to identify funding sources and highlight existing programs. When appropriate, this forum will be held in conjunction with a widely-attended, water-quality event. Messages may include bacteria reduction activities (such as a pet waste campaign), activities that promote responsibility and concern for the cleanliness of our waterways (such as water clean-up events like River, Lakes, Bays 'N Bayous

¹⁰¹ (Harris County n.d.)

¹⁰² (Galveston Bay Estuary Program n.d.)

¹⁰³ (U.S. Environmental Protection Agency n.d.)

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Trash Bash¹⁰⁴), storm drain awareness activities (such as inlet marking), wastewater education (such as reminding residents that sewer lines clogged with grease or other materials will overflow or backup into homes), and activities to reduce illegal dumping (such as the use of strategically placed signage throughout the region). These education efforts should coordinate with education requirements of storm water management permits.

8.1.2: Conduct pilot studies to evaluate results of education efforts

To measure success of public education efforts, communities shall, as resources are available, conduct studies to determine whether improvements in water quality have resulted from homeowner education efforts. Ambient water quality monitoring regularly conducted throughout the region may not adequately document the effectiveness of a specific education program at reducing bacteria in a water body. Pilot studies, which include water quality monitoring specific to the education efforts in question, should be conducted instead. For example, an appropriate location for a small-scale study could be a neighborhood whose storm water discharges through a limited number storm sewer outfalls. Opportunities for collaboration between communities on studies may exist and should be explored. Studies should include pre-education monitoring, an education effort, and post-education monitoring. Studies may also document load reductions, public awareness of water quality issues, and behavior change as reported by individual residents. H-GAC water quality staff could provide technical assistance in developing a monitoring strategy for individual pilot studies as appropriate. Any pilot studies should be undertaken in the context of Research Priority 10.1.

¹⁰⁴ (Houston-Galveston Area Council n.d.)

Appendix J: Load Reduction Value Information

Due to the large number of TMDLs covered by this I-Plan and the imprecise bacteria loading values from various sources, estimated load reductions more specific than those given in the following sections could not be determined. Load reductions for each source will vary from segment to segment based on a variety of factors including, but not limited to, the existing land uses in the watersheds and the current loadings from each source.

These load reduction percentages are not based on results of any direct, peer-reviewed, or technically supported studies performed on pathogens or fecal indicators in waterways in the greater Houston area. Many of the estimated reductions are presumptions based on the broad application of the referenced pollutant studies and behavior predictions, some of which are not specifically water related. Also, as this is only a presumed reduction in fecal load; it is still undetermined how this estimated reduction in fecal load would translate to reduction in fecal indicators or the level of pathogens in the water body. Given the untested nature of this information in our area, these estimated potential load reduction percentages should be considered as broad approximations based on limited information and subject to a large margin of error. More due diligence and validation should be required prior to obligating resources based on them.

Although the load reductions presented in the following sections may be less than the load reductions required by the TMDLs, the BIG intends that greater load reductions may be achieved through the iterative process of implementation. The ultimate goal of this I-Plan is continued progress toward greatly reduced bacteria levels.

Implementation Strategy 1.0: Wastewater Treatment Facilities (IS1)

10 percent-20 percent reduction in load assigned to WWTFs

The estimated load reductions for the seven main activities within IS1 range from zero to 45 percent of the load assigned to WWTF. Based on studies of compliance and enforcement in other fields, the hypothesis is that the strategy with the greatest potential for reducing loads would be improved compliance and enforcement, although concerns exist that resources available are insufficient to attain the full reduction estimate. Over 25 years these seven activities could result in a reduction of up to 20 percent in the load assigned to WWTF.

Implementation Activity 1.1: Impose More Rigorous Bacteria Monitoring Requirements is expected to reduce the waste load allocation assigned to WWTFs by 2-4 percent. The hypothesis is that this action will function in a manner similar to mass communication to change public behavior, which is typically

about 2 percent for public health campaigns.¹⁴⁵ In this instance, the behavior changes are mandated by permits, and so participation is expected to be greater than for campaigns directed at the general public.

Implementation Activity 1.3: Increase Compliance and Enforcement by the TCEQ is expected to reduce the waste load allocation assigned to WWTFs by up to 45 percent. In a study of random unannounced inspections of tobacco retailers over seven years regarding underage sales, compliance increased to approximately 90 percent when compliance began at 33 percent.¹⁴⁶ Targeted inspections at WWTFs may not show such a marked increase in compliance because they go after the repeat offenders and will start to leave out those consistently in compliance. Additionally, WWTF inspections look at numerous regulations as opposed to the one considered in the tobacco studies, which results in a greater opportunity for noncompliance. If only compliance with bacteria limits were considered for when measuring compliance trends would likely behave closer to the tobacco study results than otherwise.

Implementation Activity 1.5: Upgrade Facilities is expected to reduce the waste load allocation assigned to WWTFs by 12 percent. TCEQ data indicates that, at any one time, samples from 5-10 percent of select WWTFs in the BIG area do not meet the single grab sample limit of 197 *E. coli*/100 mL. This estimate of a 12 percent reduction, as a result of the implementation of 1.5, was based on a 6 percent non-compliance rate for WWTFs and the average concentration of *E. coli* samples during sampling of WWTFs between 2001 and 2006 in the Buffalo and Whiteoak Bayou watersheds.¹⁴⁷ In actuality, the loading from many plants would not be reduced at all by updates, while for some WWTFs, the load reduction from making updates would be far more substantial than 12 percent. Load reductions will probably not be 12 percent for any individual plant.

Implementation Activity 1.6: Consider Regionalization of WWTFs is estimated to produce no reduction in the waste load allocation assigned to WWTFs except in segments where chronically non-compliant WWTFs are identified and subsequently made compliant or regionalized. In these particular segments the reduction will be estimated after identification of the chronically non-compliant facilities is complete.

Implementation Strategy 2.0: Sanitary Sewer Systems (IS2)

75 percent reduction of calculated load from reported SSOs

The estimated load reduction for the six main activities within IS2 range from zero to 75 percent of the load from reported SSOs. Based on staff estimates, UAMP may substantially reduce the number of SSOs

¹⁴⁵ (Abroms and Maibach 2008)

¹⁴⁶ (Lally 2000)

¹⁴⁷ (TCEQ 2009a)

and the causes of those violations. Reported SSOs represent only a portion of the loading from sanitary sewer systems, however it should be possible to address most SSOs.

Implementation Strategy 3.0: On-Site Sewage Facilities (IS3)

75 percent reduction of current load from OSSF

The estimated load reduction from the three main activities within IS3 is a 75 percent reduction of the current load from OSSFs over 25 years. The TMDL projects identify approximately 2,100 failing OSSFs in the BIG region. Replacing or repairing 100 failing systems each year over 25 years is possible. Other measures should compensate for the expected increase in the number of systems that fail within the next 25 years. Of particular note is a Galveston County study that indicated that 20-46 percent of surveyed participants changed their behavior based on educational material.¹⁴⁸

Implementation Strategy 4.0: Storm Water and Land Development (IS4)

20 percent reduction in loading from storm water each year, compounded

The estimated annual load reduction from the six main activities within IS4 is 20 percent. Studies indicate that individual activities can range from increasing bacterial loads to a 99 percent reduction. In the absence of better data, analogous studies pertaining to other constituents in large scale development, as documented in *The Practice of Low Impact Development* sponsored by the U.S. Department of Housing and Urban Development, suggest a range of values in various situations, but can be conservatively be averaged to be about 20 percent.¹⁴⁹ Implementation activities related to storm water are expected to reduce bacteria loading from storm water and land development by up to 20 percent over the entire implementation process.

Implementation Strategy 5.0: Construction (IS5)

Up to 85 percent reduction in loading from construction sites

Up to an 85 percent annual load reduction is estimated from the main activity within IS5. Effectiveness studies for construction site best management practices have largely focused on removal of sediment from runoff. Subsequently, information regarding the effectiveness of erosion and sediment control measures at removing bacteria from runoff is lacking and sediment removal efficiencies are often used as a surrogate for bacteria removal efficiencies. A Virginia Implementation Plan, *A Total Maximum Daily*

¹⁴⁸ (Galveston County Health District 1998)

¹⁴⁹ (NAHB Research Center, Inc. 2003)

*Load Implementation Plan for Knox Creek and Pawpaw Creek,*¹⁵⁰ indicates bacteria and sediment removal rates of up to 85 percent for erosion and sediment controls. If the rules, guidelines, and best management practices for our region are implemented, best professional judgment suggests that bacteria loads from construction sites will be substantially reduced.

Implementation Strategy 6.0: Illicit Discharges and Dumping (IS6)

5 percent reduction in loading from illicit discharges and dumping each year

The estimated load reduction from the three main activities within IS6 is 5 percent. Best professional judgment suggests that a slight to moderate decrease in loading may be accomplished.

Implementation Strategy 7.0: Agriculture and Animals (IS7)

10 percent reduction in loading from agriculture and animals each year

The estimated load reduction from the two main activities within IS7 is ten percent each year. Studies of animal-population-based estimates show up to a 65 percent reduction in loading per population addressed¹⁵¹ This, combined with the assumption that a limited number of populations will be addressed each year, suggests only mild load reductions as a result of these activities.

Implementation Strategy 8.0: Residential (IS8)

2 percent reduction of load from residential sources each year

The estimated load reduction from the main activity within IS8 is 2 percent each year. Studies of public health campaigns suggest that advertising and marketing has a limited influence on behavior modification, although sustained efforts over multiple years can lead to improved results.¹⁵² Best professional judgment suggests a slight decrease in loading may be accomplished.

¹⁵⁰ (Map Tech, Inc. and New River-Highlands RC & D 2008)

¹⁵¹ (Wagner, et al. 2008)

¹⁵² (Abroms and Maibach 2008)

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Table 28: Implementation Strategy 8.0: Residential Sources

(a) Causes/ Sources	(b) Implementation Activities and Targeted Critical Areas	(c) Estimated Potential Load Reduction	(d) Technical and Financial Assistance Needed for Each Activity	(e) Education Component for Each Activity	(f) Schedule of Implementation for Each Activity	(g) Interim, Measureable Milestones for Each Activity	(h) Indicators to Measure Progress	(i) Monitoring Component	(j) Responsible Entity
Nonpoint sources from residential property	IA 8.1 - Expand homeowner education efforts throughout the BIG project area	Expanded homeowner education efforts are expected to reduce bacteria loading from residential sources by 5%.	<u>Technical</u> - communities will look to existing education programs and materials when developing their own. <u>Financial</u> - funding can be expected to come through a mixture of local and grant funding opportunities.	Homeowner education efforts may include printed materials and other media	Implementation of this activity will begin immediately and will continue for the entire implementation process.	Average 2% annual increase in number of communities participating in new or expanded programs One pilot study in the BIG project area every five years	Progress will be indicated by the number of new or expanded education programs and pilot studies noted in the annual reports	H-GAC staff will collect data from communities through the annual report process. Data collected will include the information distributed or publicized, the method of distribution or publication, the number of individuals or households reached, and the results from pilot studies.	Cities, counties, and special purpose districts: expand bacteria related education efforts and conduct pilot studies to evaluate the results of selected efforts H-GAC: collect and share information on the progress made each year BIG: Evaluate the progress made