tidally flooded areas, removing debris in problem areas, and promoting infiltration in creek and watershed restoration plans. Of initial importance are identifying thresholds at which the performance of the sewage and stormwater conveyance system are compromised.

Recommendations

Recommendations in this report include:

1. Detailing strategies to address current data gaps uncovered during the water quality model development and calibration (§3.0);
2. Establishing future monitoring to assess and calculate bacteria loading (§5.1);
3. Implementing projects, programs and policies that reflect the current state of knowledge regarding stormwater treatment (§5.2) and potential partnerships;
4. Evaluating the remaining proposed 2011 Action Plan projects for relevance under current conditions (§5.3); and
5. Proposing new projects, cost estimates, and ranking/prioritization of these projects to consider for inclusion in the Town's long-range CIP budget (§5.4).

In general, the recommended strategies involve Four Ps: Partnerships, Policies, Programs, and Projects. Overall, the goal will be to follow Better Site Design principles to conserve natural areas including tree canopy, reduce impervious cover, and manage designated stormwater reduction volumes by infiltration and/or filtration techniques as first priority, or other approved volume reduction techniques as second priority. These strategies are in agreement with local research (Holland et al., 2004; Sanger et al., 2008; Sanger and Blair et al., 2015; Sanger and Tweel et al., 2015; Montie, 2019) pertaining to the negative impacts of impervious surfaces in southeastern estuarine environments and are supported with design guidance (such as *Low Impact Development in Coastal South Carolina: A Planning and Design Guide*, Ellis et al., 2014) and in local ordinances. The Town of Bluffton is currently in the process of adopting a new regional stormwater design manual and ordinance with Beaufort County, Jasper County, the City of Beaufort, City of Hardeeville, and Towns of Port Royal and Yemassee.

Partners

The Town should continue to seek and formalize partnerships with a variety of organizations to protect and improve water quality in the May River watershed. These organizations may include Federal, State, County, Academic Institutions, Non-Governmental Organizations and Private Commercial Properties. The level of partnership required may range from short-term, project-specific agreements to long-term Memorandums of Agreement or Understanding to accomplish Action Plan Update objectives.

Policy

Overall, the goal for the Town of Bluffton should be to follow Better Site Design principles to conserve existing natural areas and tree canopy, reduce impervious cover, and manage designated stormwater reduction volumes by infiltration and/or filtration techniques as first priority, or other approved volume reduction techniques as second priority. These strategies are in agreement with national and local research pertaining to the negative impacts of impervious surfaces in southeastern estuarine environments, and are supported with design guidance, such as *Low Impact Development in Coastal South Carolina: A Planning and Design Guide* (Ellis et al., 2014)

and *Southern Lowcountry Stormwater Design Manual* (Center for Watershed Protection and McCormick Taylor, 2020).

Policies to protect and improve water quality in the May River watershed include:

1. Adopt proposed regional *Southern Lowcountry Post Construction Stormwater Ordinance and Design Manual.*
    a. The Town should incorporate volume reduction BMPs (those that encourage infiltration) within existing and future CIP projects to the maximum extent practical, especially for project locations with well-drained soils (Hydrologic Soil Group A or B)
2. Eliminate clear cutting approach within developed areas.
3. Increase buffer areas and requirements.
4. Increase conservation and open space requirements and require recorded conservation easements.
5. Reduce planned density/re-zone.
6. Increase tree protection/conservation areas and requirements
    a. Increase tree protection area from drip line to an additional 25' from drip line.
7. Offer incentives to renegotiate existing land development agreements to reduce density and meet current environmental objectives.
8. Develop strategies to effectively execute public/private partnerships.

Programs

Continuing and new program recommendations intended to protect and improve water quality in the May River watershed include:

1. Continue to support the Municipal Separate Storm Sewer System (MS4) program in the Town and County as they work to achieve the six (6) Minimum Control Measures.
2. Neighborhood Assistance Program
    a. Septic System Assistance Program to assist Town residents with septic system maintenance to ensure proper functioning until sanitary sewer connections are available.
    b. Septic to Sewer Conversion Program to assist Town residents with offsetting the potential costs to abandon existing septic systems and connect to available public sanitary sewer.
3. Establish an Impervious Area Restoration/Retrofit Program in areas where development pre-dated stormwater management requirements or failed to meet on-site retention of the 95th percentile storm. The purpose of this Program is to target large impervious areas to be retrofitted to meet 95th percentile storm retention of impervious surfaces with infiltration/filtration BMP to the maximum extent possible.
4. Water Quality Monitoring Program modifications include
    a. Developing in-house microbial source tracking
    b. Recommendations for future bacteria monitoring locations
    c. Recommendations for future water flow monitoring locations

Projects

Stormwater ponds are the predominant structural BMP utilized in the May River Headwaters. The total number of ponds has increased from 22 in 2002 to 262 in 2018. In a departure from the recommendations from the 2011 Action Plan, ponds and ditches are not recommended as BMP practices to address the fecal coliform bacteria impairment in the May River. Although they do provide important services for flood attenuation and some pollutant removal, they do not promote the infiltration of precipitation, and thus do not provide any runoff reduction (refer to *Southern Lowcountry Stormwater Design Manual*). Stormwater enters the system and leaves at a controlled flowrate, which is advantageous for flood protection, but may not prevent the persistence of FIB downstream of the practice (as has been documented in the literature and the Town's monitoring data). Recommendations are provided that detail criteria to "retrofit" existing ponds to achieve FC reduction and WQ improvements.

Four (4) septic to sewer conversion projects were evaluated in the Rose Dhu Creek and Stoney Creek subwatersheds: Cahill, Gascoigne, Stoney Creek, and Pritchardville. These projects overlap with 42 subcatchments in the Stoney Creek watershed and 11 in Rose Dhu Creek. Based on WQ Model outputs, these projects alone may potentially reduce FC loading by 3.46×10^{13} FC per year.

As part of the Project Scope, eleven (11) project sites (incorporating various individual BMPs) were selected in consultation with the Town (prioritizing subcatchments with FC bacteria hotspot and/or large impervious areas). These sites were evaluated in terms of the potential benefits gained by retrofitting to meet the 95th percentile storm retention, to the maximum extent possible, under the proposed Impervious Area Restoration/Stormwater Retrofit Program. All 11 projects were in Rose Dhu Creek (6 projects) and Stoney Creek (5 projects). These included: Bluffton Early Learning Center (BELC); Boys and Girls Club of Bluffton (BGC); Benton House (BH); Bluffton High School (BHS); Buckwalter Recreation Center (BRC); Lowcountry Community Church (LCC); McCracken Middle School/Bluffton Elementary School (MMSBES); May River High School (MRHS); One Hampton Lake Apartments (OHLA); Pritchardville Elementary School (PES); and Palmetto Pointe Townes (PPT).

The project team in consultation with the Town decided that the spreadsheet-based tool, the Watershed Treatment Model (WTM), allowed for flexibility to quickly analyze and evaluate a variety of stormwater BMPs, including permeable pavement, bioretention, green roofs, rainwater harvesting, filters, and infiltration trenches and chambers. In order to narrow down the extensive list of potential restoration projects to highlight priorities for the May River Headwaters Watersheds, an evaluation matrix was developed (Section 5.4.5 of this report). Each project was scored with respect to feasibility for cost (20 points), location within a subcatchment flagged as a FC bacteria hotspot (10 pts.), subcatchment imperviousness (10 pts.), potential bacteria load reduction (20 pts.), potential runoff reduction (15 pts.), maintenance requirements (15 pts.), potential for agreeable partnerships with landowners (10 pts.), amount of effort required for permitting (15 pts.), how well the surrounding community will respond to the project's installation (10 pts.), and ease of access to the site for both construction and maintenance (10 pts.).

If all 15 of the proposed projects were implemented, the XPSWMM and WTM model results indicate there is the potential to remove 1.67×10^{14} FC bacteria/year from stormwater (for Full stormwater retention volume (SWRv)) or 2.53×10^{14} FC bacteria/year (Reduced SWRv scenario). This is about 35% and 30% of the 2018 FC load for all four subwatersheds in the May River Headwaters.

All of the septic to sewer conversion projects and stormwater retrofit projects were located in the Rose Dhu Creek and Stoney Creek subwatersheds. The total FC load in 2018 for these two subwatersheds was 3.95×10^{14} FC bacteria/year, which accounts for about 83% of the bacteria load for the entire May River Headwaters. The estimated goals for FC reduction in these two subwatersheds are 96.1% and 97% for Rose Dhu Creek and Stoney Creek, respectively, to meet the daily maximum concentration threshold for shellfish harvesting (43 MPN/100 mL). The combination of septic to sewer conversion with the Full SWRv provides about 50% reduction, which is about half of what would be necessary in these watersheds.

The potential benefits of recommended projects was estimated to be 3.46×10^{13} FC reduction for septic to sewer conversion (only calculates benefits of sewer conversions within the Headwaters), 2.99×10^{14} FC reduction for the Full SWRv stormwater retrofit projects, and 2.53×10^{14} FC reduction for the Reduced SWRv projects. The estimated costs of these projects are $20.8 million for septic to sewer conversion (based on 2019 BJWSA cost estimates); $32.7 million for the Full SWRv projects; and $22.6 million for the Reduced SWRv projects.

Additional recommended types of projects beyond the eleven that were modeled include:

1. Impervious Surface Rehabilitation/Retrofit
2. On-site Volume Reduction
3. Modifications to Make Ponds Bacteria Neutral (Pond Retrofit)
4. Proprietary Products to Eliminate Bacteria
5. Nature-Based Solutions