Lemon Bay

WATERSHED MANAGEMENT PLAN

Sarasota County

Southwest Florida Water Management District

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Chapter 9

Monitoring and Implementation

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9.0 MONITORING AND IMPLEMENTATION

This section presents the following:

- A summary of the recommendations for monitoring environmental conditions in Lemon Bay and its watershed.
- A watershed report card used to present information regarding the status and trends in the water quality of Lemon Bay and its watershed.
- A summary of the recommendations for monitoring the management actions that comprise the watershed plan.
- A recommended methodology for tracking progress in implementing the Lemon Bay Watershed Plan.

9.1 ENVIRONMENTAL MONITORING

The Sarasota County Environmental Services Business Center conducts extensive monitoring of natural systems in Lemon Bay including:

- Estuarine and tributary water quality.
- Stage, flow, and rainfall.
- A biannual oyster bed health survey.
- An annual synoptic tidal creek index sampling.
- A volunteer-assisted seagrass characterization and validation survey.
- An annual parcel-level assessment of mangroves within the watershed.

Together these monitoring programs represent a concerted effort on the part of Sarasota County to provide proper stewardship of the natural resources of the Lemon Bay watershed.

In addition, the Charlotte Harbor National Estuary Program (CHNEP) cooperatively sponsors water quality monitoring in the Charlotte County portion of Lemon Bay and the Charlotte Harbor Aquatic Preserve conducts monthly sampling at fixed stations throughout Lemon Bay.

The development of this watershed management plan included three workshops to gather input from local environmental professionals on the critical aspects of the watershed management plan and to develop the critical questions that guided the plan's development. The majority of time during these workshops was spent considering the types of monitoring and reporting tools that could be best used to routinely evaluate the health of the valued natural resources of Lemon Bay and developing appropriate metrics. Outcomes of these discussions became tasks that were then completed as part of the watershed management plan for Lemon Bay. These tasks included:

- Reviewing current routine monitoring efforts.

- Evaluating the current routine monitoring programs for gaps and redundancies.
- Evaluating the overall monitoring program for providing information necessary to develop a reporting tool for the watershed.
- Recommending how the monitoring and reporting elements of the watershed management plan can be optimized to protect the valued natural resources of Lemon Bay.
- Developing a reporting tool to summarize and convey pertinent information to aid in watershed management decision making.

The County's overall strategic monitoring plan was reviewed in detail as part of the watershed management plan development for Lemon Bay (Janicki Environmental, 2009). This review document provided a detailed account of the routine monitoring elements currently conducted by Sarasota County Environmental Services Water Quality Division and an evaluation of how the monitoring programs may be optimized to provide the highest return on the resources invested. The review found that the current monitoring design was sufficient to track changes in many aspects of ecosystem health over time and report in a timely fashion for the development of a watershed reporting tool. Data gaps were identified with respect to the evaluation of some key elements in evaluating ecosystem health and minor improvements in the overall design for several aspects of the overall program were recommended:

The following summarizes the recommendations in the document:

- Estuarine Water Quality
  - Current sampling intensity is sufficient for regulatory-based inference and watershed management planning activities in Lemon Bay. The County should continue the current level of spatial and temporal sampling intensity.
- Watershed Water Quality
  - Routine watershed water quality sampling began in 2006 in tributaries throughout the County, and at the time the management plan was developed only approximately 15 samples were available for analysis, which was too few for statistical optimization of the design of the watershed water quality sampling program. It was recommended that once data are collected through December 2009 and available for analysis (~36 samples per station), a statistical analysis should be performed to assess the spatial correlation of sampling points within each water body to determine if redundancies exist in the sampling design that would allow for reducing the sampling effort at that time.
- Oyster Monitoring
  - The County should continue with its current oyster monitoring program.
  - As budgetary constraints allow, a mapping effort should be undertaken to document the extent of oyster habitat. Quantifying the extent of oyster

habitat and ensuring that an adequate representation of the available oyster habitat is maintained in the monitoring effort will be an important addition to the current program and assist in any oyster reef restoration efforts in the estuary.
  - As more data are collected, time series trends for individual oyster reefs should be reported as part of the routine reporting for this program.
- Tidal Creek Condition Index (TCCI)
  - The review supported the eventual use of the TCCI as part of the overall strategic monitoring plan for Sarasota County. As more years of data are collected, the variability in TCCI scores can be used to develop an appropriate mechanism for including this information for reporting on changes in this index over time.
- Seagrasses
  - The County should continue supporting State-sponsored seagrass monitoring activities in Sarasota County waters.
  - The County should also continue its own validation efforts using volunteers to validate localized inferences regarding the areal extent of seagrass with County waters.
  - As the volunteer monitoring program evolves, a more statistically rigorous sampling design should be developed to allow validation to be generalized to the sample space with more confidence.
- Benthos
  - A one-time synoptic benthic sampling effort should be conducted to characterize the benthos in Sarasota County's open bays as funding permits. Specifically, it was recommended that the sampling design follow that established by the United States Environmental Protection Agency's Coastal 2000 Inshore Marine Monitoring and Assessment Program, which uses a rigorous statistical sampling design to assess coastal estuarine waters throughout the United States. This effort will characterize spatial differences in sediments and benthos rather than tracking temporal changes in indicators over time. This spatial focus is needed in Sarasota County's estuarine waters to identify areas where the benthic integrity may be compromised and to estimate the areal extent of a community composition or pollutant-intolerant taxa value less than some pre-determined threshold value.
- Fish
  - The CHNEP is currently negotiating with the Florida Fish and Wildlife Conservation Commission to perform a synoptic study of Lemon Bay to determine species composition and spatial and temporal variation in community structure. The County should use the results of the 1-year study documenting the temporal variability in fisheries catch in the Lemon Bay estuary to explore the efficacy of developing an index to use for

incorporating a fisheries score into a report card. The index should include a baitfish species complex and a sportfish species complex sampled during an index period (i.e., summer) as an economical way to evaluate these important indicators of fisheries production.

- Mangroves
  - Lemon Bay was designated an aquatic preserve with the primary purpose of preserving the biological resources of endangered fringing mangroves and mangrove islands with clam beds, oyster bars, salt marsh, and other habitat (FDNR, 1992). The designation of Lemon Bay submerged lands as an aquatic preserve, along with the Bay's designation as an Outstanding Florida Waters (OFW) and Class II and Class III waterbodies, restricts the types of activities permitted in the watershed and estuary. While these designations are designed to protect and preserve conditions in the estuary, natural resource monitoring and management activities are required to ensure that natural systems such as the extent of mangroves in Lemon Bay are protected. A cost-effective means of evaluating changes in the aerial extent would be to use GIS technology and the biennial aerial seagrass monitoring data collected by SWFWMD. Ideally, synoptic mangrove health assessments could also be conducted and include estimates of elevation of mangrove base soils monitored providing information of changes in elevation relative to changes in coastal sea level rise.
- Special Studies
  - The recommendations above are generally long-term monitoring recommendations. In addition to the long-term monitoring, there may also be a need for special monitoring studies to understand a single issue, such as the influence of a particular practice. This type of monitoring does not need to be performed for the long term. Rather, it will be used to understand a single issue. Once the issue is understood, there will be no need for additional monitoring of the issue.

Sarasota County has been progressive in its efforts to track environmental conditions in watersheds in a quantitative manner that can be used to evaluate not only ecosystem health but also evaluate the effects of management actions on key indicators within the watershed and receiving estuary.

9.2 WATERSHED REPORT CARD

The successful management of coastal ecosystems requires accurate quantitative tools for managers, scientists, and the public at the local and regional levels to easily understand and apply basic principles of ecosystem management. Our current scientific knowledge allows us to understand the complexity and variability found in the marine environment. Considerable amounts of money and time are spent on environmental monitoring programs, but they often fail to provide the accurate information needed to understand the condition of the marine environment or to assess those human impacts (Mulvihill, 1990). Taking the data and applying them to management practices can be difficult based on the wide range of audiences to whom information must be conveyed. Monitoring programs are also often ineffective because the translation of data through analysis and subsequent conveyance to decision makers and the public are inadequate or confusing (Mulvihill, 1990). Most importantly, many monitoring programs extend over many years although data must regularly be analyzed and disseminated to the public so that management decisions can be made or monitoring can be changed to understand or reflect environmental change.

The following provides a review of two very successful monitoring programs used to assess water quality in San Francisco and Chesapeake Bay.

The San Francisco Estuary demonstrates many of the management issues faced by estuaries worldwide, including aquatic resource degradation, wetlands loss, decline of wildlife species, altered flow regimes, introduced species, increased pollution, and lack of integrated planning and management (EPA, 1999). The San Francisco Estuary Regional Monitoring Program (RMP) has monitored water quality since 1993. Through 2001, monitoring was conducted at 21 sites throughout the Bay. In 2002, the RMP implemented a new monitoring design to provide more spatial coverage and to include shallow and deep channels (Conner et al., 2007). The new design included 33 stations, 28 of which were randomly selected and located within the major hydrographic regions of the estuary. Additional stations are found in the deltas of Sacramento and San Joaquin rivers, upstream from the Lower South Bay, and outside the Golden Gate (Conner et al., 2007). In addition to water quality monitoring, the RMP has produced an extensive dataset on estuarine toxic contamination. Monitoring performed in the RMP determines spatial patterns and long-term trends in contamination through sampling of water, sediment, bivalves, and fish and also evaluates toxic effects on sensitive organisms and chemical loading to the Bay. The program combines RMP data with data from other sources to provide for comprehensive assessment of chemical contamination in the Bay. Monitoring at each station includes mercury, PCBs, selenium, copper, and perfluorinated chemicals (SFEI, 2006).

The RMP produces an Annual Monitoring Report called *Pulse of the Estuary* that summarizes the current state of the estuary with regard to contamination. The Pulse documents the extensive efforts made each year to manage and monitor water quality and estuarine conditions in the estuary and disseminate information at the public level detailing the state of San Francisco Estuary. Additionally, technical reports and journal publications document specific studies and RMP results. In this estuary the combination of the data-collection system along with the regular report of trends and status facilitate effective policy-making and management decisions, thus meeting the criteria previously established for a "successful" estuary recovery program.

Chesapeake Bay provides another example of a successful estuary recovery effort. Chesapeake Bay is the largest estuary in the United States and its watershed encompasses parts of six surrounding states, making effective management difficult. In 1984, state and federal agencies initiated a coordinated monitoring program in Chesapeake Bay for the mainstem and its tributaries. Integrated into the Bay Monitoring Program are routine measurements at over 165 stations in the tidal waters of the Bay and its tributaries (Boesch, 2000). Additionally, data are incorporated from a citizens monitoring program initiated in 1995. Progress towards a healthy bay is tracked with 13 indicators grouped into three priority areas that represent major components of the Bay ecosystem. The Bay Monitoring Program measures nutrients (nitrogen and phosphorus), chlorophyll a, suspended sediments, toxicants in water and sediment, water temperature, salinity, water circulation, fresh water inflows, dissolved oxygen, submersed aquatic vegetation, plankton, benthos, and fish and shellfish including blue crabs, striped bass, shad, menhaden, and oysters.

Yearly reports are published, including The State of the Chesapeake Bay (1984-2004) and Chesapeake Bay Health and Restoration Assessment (2005-2007), in which clear quantitative restoration goals have been set and a chart provided for each indicator to show the percent goal, current status, and history of progress towards achieving the goal. In addition to assessing ecosystem health the report also has three other chapters which address factors impacting the Bay, including population, land use, river flow, and pollution loads (CBF, 2008). Chapter 3 focuses on restoration efforts based on 20 indicators grouped into five priority areas and the quantitative goals set for each priority area. Chapter 4 focuses on the health of freshwater streams and rivers as set by Federal 305b/303d reporting requirements.

The following discussion describes the approach followed to establish a watershed report card that will provide information regarding the status and trends in the quality of Lemon Bay. The audience for the report card is the general public and the County Commission (and other decision-makers). The indicators and methodology for scoring are also defined as is a suggested format for hard-copy and digital versions.

To establish the watershed report card, three workshops were held to solicit input from County staff and other interested scientific professionals primarily on the content of the report card and the methodology for quantifying the scores for each indicator and the overall watershed score. Concurrent to these workshops was consideration of the County's current monitoring program and definition of a strategic monitoring program designed to meet the objectives defined by the workshop participants. This approach allowed additional justification for inclusion of particular indicators in the strategic monitoring program design that were identified as critical to the proposed report card.

In addition to the input from the technical audience, input from the County's public information/education staff on the format of the report card was also solicited.

Several key considerations regarding the report card were also expressed:

- The watershed report card will be based on key data provided by the County's Strategic Monitoring Program as well as on other data/information sources.
- The report card, while simple in its presentation and interpretation, will have a sound technical basis.
- The watershed report card will be updated annually. Data availability will determine the completeness of each annual report.
- The watershed report card will be disseminated in a hard-copy format and on the County's Water Atlas.
- The watershed report card will be complemented by two additional documents:
    - A County-wide report card that compares the status and trends in the quality of all major watersheds in the County.
    - A third document that explains:
        - The measurements used in the report cards.
        - The choice of indicators.
        - Why the indicators are important.
        - How the indicators are measured.
        - How the indicators are scored.

The following details the proposed report card contents, the justification for selected indicators, and the methodology for scoring.

The watershed report card will include:

- A description of the watershed characteristics that do not vary significantly between years but are important influences on watershed and receiving waterbody quality:
    - Land use/cover
    - Percent of Impervious Surface
    - Population
- A temporal context for assessing the status and trends in watershed and receiving waterbody quality:
    - Annual rainfall and comparison to the long-term record
    - Annual and monthly flows and comparison to long-term record (if possible)
    - Unusual events such as red tide blooms, accidental spills, etc.

The major elements of the watershed report card scoring will be:

- Chlorophyll *a*—Chlorophyll a is a pigment used in photosynthesis which serves as a measure of biomass (abundance) of phytoplankton in estuaries. Planktonic algae provide a food source for filter-feeding bivalves (oysters, mussels, scallops, clams) and zooplankton (including the larvae of crustaceans and finfish). Chlorophyll *a* concentrations can also be used as measure of overall ecosystem health. High amounts of chlorophyll *a* in estuarine waters are a primary indicator of nutrient pollution because excess nutrients fuel the growth of algae. High chlorophyll *a* values can have adverse impacts on aquatic life and human recreation.

- Water Clarity—Water Clarity is a measure of the amount of sunlight that can penetrate through the water. Water clarity is measured using two methods. With a device called a *Secchi disk*, the *Secchi depth*, is the measure of water clarity and the depth at which sunlight is able to penetrate through the water. Higher Secchi disc depths indicate increased water clarity. With a transmissometer, the amount of light that reaches a particular depth is compared to that reaching the water surface. The light extinction coefficient (referred to as K_d) is calculated based on this comparison. Higher K^d values indicate reduced water clarity. Clear waters indicate a healthy estuary, although many factors impact water clarity. Excess suspended sediments from runoff and rainfall can negatively impact water clarity. Nutrients, mainly nitrogen and phosphorus, can fuel the growth of photosynthesizing algae. High chlorophyll *a* concentrations associated with high algal biomass can decrease light penetration, decreasing water clarity. Decreased water clarity can negatively impact the estuary in many ways. Reduced light transmission can decrease seagrass abundance, which can impact the entire food web. Decreases in seagrass abundance reduce habitat for the hundreds of species which depend on the seagrass.

- Dissolved Oxygen—Dissolved Oxygen (DO) is a very important limiting factor impacting estuarine systems. DO can be used as an indicator of the health of the ecosystem. Cultural eutrophication (nutrient excess leading to overproduction of microalage and associated trophic imbalances) is common in estuaries near human population centers. Under conditions of eutrophication DO can exhibit extreme diel cycles. Photosynthesis via algae elevates DO levels in the water during the day but at night when respiration is high, the DO can drop dangerously low. Eutrophication can lead to periodic or long-term hypoxia (water column oxygen concentrations <2 mg O_2 l^{-1}) and anoxia in estuarine ecosystems. Fishes, crabs, and shrimp will attempt to move away from oxygen concentration of less than 2 mg O_2 l^{-1} and few marine animals survive in prolonged exposure to hypoxic conditions. DO levels are often quite variable in estuarine system due to fluctuations in temperature, salinity, basin morphology, and overall productivity.

- Pollutant Loading—Excess nutrients, mainly nitrogen and phosphorus, can also be considered pollutants. Nutrient inputs from watersheds adjacent to coastal and estuarine waters have significant impacts on estuarine function. Excess nitrogen and phosphorus in estuarine ecosystems lead to increased rates of primary production (termed *eutrophication*), reduced biodiversity, habitat alteration, and shifts in ecosystems. The total nitrogen (TN) loading is particularly critical to estuarine health and will be assessed in the report card.

- Seagrass—Seagrasses serve significant functions. They help maintain water clarity by trapping fine sediments and particles with their leaves and they stabilize the estuarine sediments with their roots. Seagrasses are very effective at removing dissolved nutrients from water that can enter from runoff from land. Removing sediment and nutrients helps improve water clarity, thereby improving overall ecosystem health. Seagrasses provide habitats for fish, crustaceans, and shellfish, providing a nursery ground for many recreationally and commercially valuable species. They are also food for organisms that inhabit them and marine mammals such as manatees and waterfowl such as ducks and geese. Human activities can harm seagrasses by degrading estuarine water quality and promoting physical disturbances and algal blooms. Reductions in light availability associated with nutrient inputs and sediments can damage or eliminate seagrass habitat.

- Oysters—Oysters are filter feeders able to filter out sediments which decrease water quality. They also help reduce nutrients and plankton from the water and keep the delicate food web in balance. One healthy oyster reef can be home to over 300 different organisms, including adult and juvenile fish, shrimp, crabs, and clams. Oysters are used as an indicator species in many of our nation's estuaries, meaning that if oysters are doing well many other species will also be doing well.

9.2.1 Report Card Scoring

Based on input from the workshop participants and County staff it was agreed that the scoring of each major element will depend on:

- A target or baseline value.
- A measure of deviation from the target.
- A measure of persistence of the deviation from the target.

For example, a score will be computed for any indicator given a defined target for that indicator, a defined measure of deviation from the target, and a defined measure of persistence of the deviation from the target. This approach recognizes that relatively chronic conditions (i.e., relatively small exceedances from the target for a relatively long period) can be as or even more undesirable than relatively acute conditions (i.e., relatively large exceedances from the target for a short period). If a water quality standard exists, e.g., DO, then the proposed scoring should mimic currently accepted methods used to identify impaired waters.

The proposed scoring for chlorophyll *a*, water clarity, and TN loading will be computed by comparing the mean annual value for the variable in question to the target value. If the annual mean is greater than the target value, the magnitude of the difference is compared to the standard deviation of the observed annual mean chlorophyll *a*, water clarity, and TN loading If the difference is less than or equal to the standard deviation, the difference is defined as a "small" magnitude difference (Figure 9-1). If the difference is greater than one standard deviation the difference is defined as a "large" magnitude difference (Figure 9-1). If the observed differences occur for at least 2 consecutive years but less than 4 consecutive years, the duration is defined as "short" (Figure 9-1). If the observed differences occur for at least 4 consecutive years, the duration is defined as "long" (Figure 9-1). Otherwise, for example if the exceedance is for only one year, the duration of the difference is not significant.

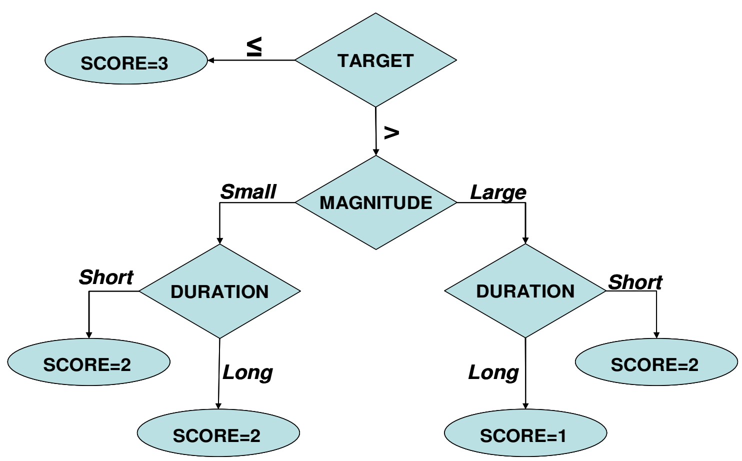

Figure 9-1 Proposed Scoring Methodology for the Chlorophyll *a*, Water Clarity, and TN Loading Indicators

The Charlotte Harbor National Estuary Program is currently working toward the development of numeric nutrient criteria for Lemon Bay and the other harbor segments within the program's area. A critical element of this work is definition of chlorophyll a thresholds. The Technical Advisory Committee will be reviewing this work in October 2010 and make recommendations to the Management and Policy committees. Proposed numeric nutrient criteria will be provided to the U.S. Environmental Protection Agency in December.

The following targets and standard deviations (for chlorophyll *a*, K_d, DO, and TN loading) are used to calculate the scores for chlorophyll *a*, water clarity, DO, and TN loading:

- Chlorophyll *a* concentration – 7.8 µg/L and 2.2 µg/L;
- K_d – 1.07 (m^1) and 0.1 (m^1);
- DO – 4 mg/L
- TN loading – 95 tons/year and 53 tons/year.

The proposed scoring for DO will be computed by tallying the number of excursions from the target DO of 4 mg/L (the State DO standard):

- If % excursions below 4 mg/L is greater than 10% the score is 1.
- If % excursions below 4 mg/L is 5-10% the score is 2.
- If % excursions below 4 mg/L is <5% the score is 3.

The sum of the chlorophyll *a*, water clarity, DO, and TN loading indicator scores is defined as *the Water Quality Score*.

The proposed scoring for seagrass is based upon the CHNEP seagrass targets for Upper and Lower Lemon Bays (Janicki Environmental, 2009). The seagrass targets for Lemon Bay are:

- Upper Lemon Bay
  - Protection Target – 1,009 aces
  - Total Target – 1,009 acres
- Lower Lemon Bay
  - Protection Target – 2,502 acres
  - Restoration Target – 380 acres
  - Total Target – 2,882 acres
- Total Lemon Bay
  - Protection Target – 3,511 acres
  - Restoration Target – 380 acres
  - Total Target – 3,891 acres

The assessment of the status of the seagrass cover relative to this target should take into account the natural variability in seagrass cover. To estimate this variability, the standard deviation of the biannual seagrass cover surveys was calculated. This value was 95 acres for Upper Lemon Bay, 75 acres for Lower Lemon Bay, and 100 acres for the total Lemon Bay estimates.

Both the seagrass target and the estimates of variability will be used to compute the seagrass score for Lemon Bay. The seagrass scoring rules are:

- Upper Lemon Bay
  - If the current year seagrass cover is greater than 1,103 acres then the score is 3;

- If the current year seagrass cover is between 914 and 1,104 acres then the score is 2;
- If the current year seagrass cover is less than 914 acres then the score is 1.

❖ Lower Lemon Bay
- If the current year seagrass cover is greater than 2,957 acres then the score is 3;
- If the current year seagrass cover is between 2,807 and 2,957 acres then the score is 2;
- If the current year seagrass cover is less than 2,807 acres then the score is 1.

❖ Total Lemon Bay
- If the current year seagrass cover is greater than 3,991 acres then the score is 3;
- If the current year seagrass cover is between 3,791 and 3,991 acres then the score is 2;
- If the current year seagrass cover is less than 3,791 acres then the score is 1.

This method allows for assessments to be completed for either Upper or Lower Lemon Bay as well as the total Lemon Bay.

The proposed scoring for oysters will be computed as follows:

❖ If oyster index (% alive) is <50%, the score is 1.
❖ If oyster index (% alive) is 50-75%, the score is 2.
❖ If oyster index (% alive) is >75%, the score is 3.

The sum of the seagrass and oyster indicator scores is defined as t*he Bay Quality Score*.

The overall Watershed Quality Score is proposed to be the sum of the Water Quality and Bay Quality scores. The maximum possible score is 18 and the minimum is 6. Scores that range from 15-18 are defined as "Better than Target"; scores that range from 9-15 are defined as "Meeting Target"; and scores that are less than 9 are defined as "Worse than Target."

Based on input from the workshop participants and County staff it was generally agreed that the overall and individual indicator scores will be presented in graphical form. Year-to-year trends in these scores will also be presented.

Appendix D presents a draft watershed report card format.

9.3 MONITORING OF RECOMMENDED PROJECTS AND PROGRAMS

We do not propose any additional monitoring for recommended projects or programs at this point. The recommended monitoring discussed in this chapter should provide adequate evidence of project and program implementation benefits at the watershed scale. Additionally, most of the recommended capital improvement projects use technology that is either understood reasonably well in terms of its effectiveness under various design conditions or is essentially self-monitored (e.g., stormwater harvesting projects would have flow meters that monitor the volume of flow that is reused).

9.4 ACTION PLAN DATABASE: TRACKING PROGRESS

The watershed plan presented above identifies management actions that could be taken to meet goals and priorities for protecting, preserving, and restoring critical resources and habitats. Of paramount importance is the linkage of management actions to these goals. One method of accomplishing this linkage is to develop an Action Plan Database. We recommend developing an Action Plan Database to help track progress towards the goals and objectives set forth in this Watershed Management Plan. The Action Plan Database provides a way to link expected results of management actions to goals and is a convenient and efficient way to track actions and progress towards goals. Specific project plans should include sufficient information to assign habitat and load-reduction projects to specific areas of the study area to allow tracking of expected plan results by basin and jurisdictional entity. As plans are implemented, additional information related to realized results can be used to refine the project effects with respect to habitat and/or load-reduction benefits.

Action plans for the Action Plan Database will include information that allows calculation of project habitat protection, preservation, and restoration areas by habitat type, as well as information to allow calculation of pollutant-load reductions due to land use change, change in land management practices, and directed load-reduction projects.

Another important aspect of the projects in the Action Plan Database will be the effective date of the project. Including planned and actual completion dates for projects allows management decisions to be made for selected time periods with complete information regarding when specific projects will be in place.

The database would be developed and maintained as a Microsoft Access database, allowing for efficient compiling and reporting of projects developed for specific action plans (i.e., habitat restoration, nutrient-load reduction) or for specific areas or responsible entities. Some key elements of the database include:

- The front page of the database would allow users to add projects and view compilations of project information based on certain criteria (i.e., location in the watershed, completion date). An example front page is shown in Figure 9-2.

- The project entry page provides for inclusion of project-specific information, including attachment of additional documentation in the form of electronic files (Word or Adobe documents, spreadsheets, text files) to support estimation of habitat acreages and/or nutrient-load reductions expected. The relevant information also includes location, cost, and schedule for the project. An example front page is shown in Figure 9-3.

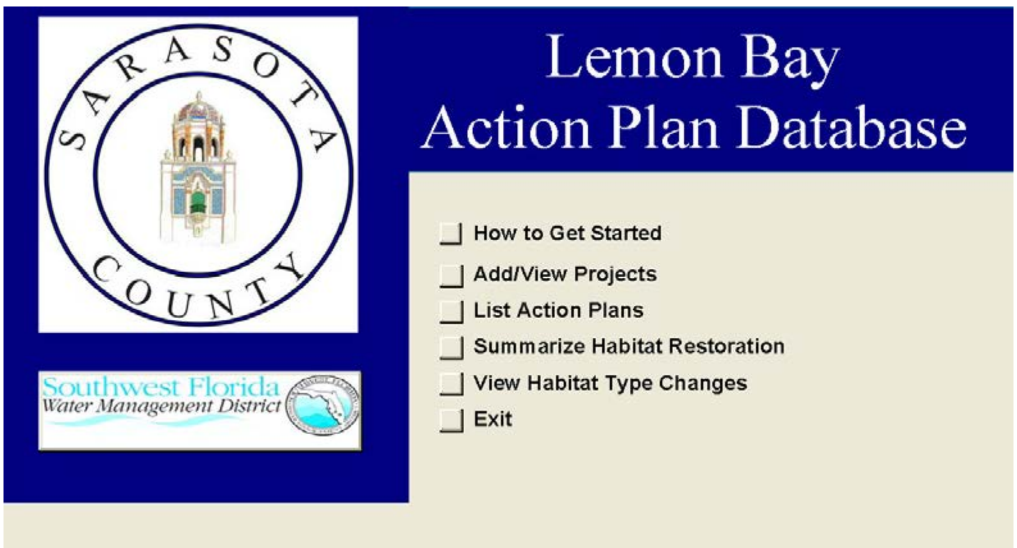

Figure 9-2 Example Front Page for the Lemon Bay Action Plan Database

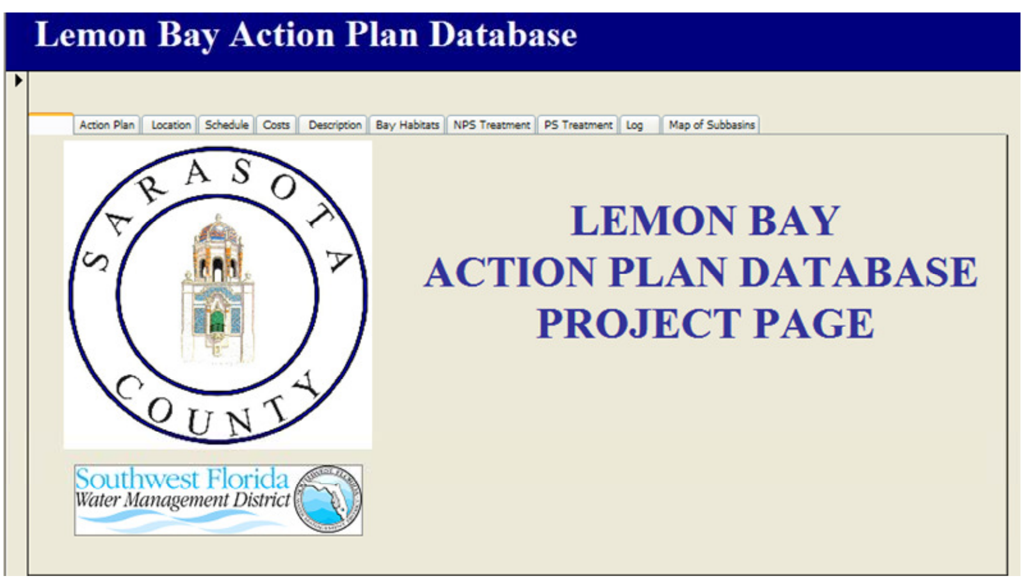

Figure 9-3 Example Project Entry Page for the Lemon Bay Action Plan Database