6.1 Air Quality

6.1.1 State of the air quality

Measurement: This performance measure shows the percentage of monitored days when the air quality is rated good based on the highest pollutant concentration of that day. *Effective in 1999, the measurement of the ozone concentration has changed. As a result, the Air Quality Index reported for 1999 is not comparable to the AQI reported for the previous years.*

Explanation: Poor air quality affects public health, especially children and the elderly. The EPA has established National Ambient Air Quality Standards for ozone, particulate matter, nitrogen dioxide, sulfur dioxide, carbon monoxide and lead to ensure adequate public health and environmental protection. The EPA developed a national Air Quality Index to reflect air quality on any given day. Daily Air Quality Index information for Broward County is available to the public by dialing (954) 519-1280.

Data source: Calendar Year (CY) data, Broward County DPEP, Air Quality Division, Ken Larson, (954) 519-1293.

6.1.2 Fleet of alternative fuel vehicles

Measurement: This is the number of vehicles used by federal, municipal, and local governments that operate on alternative fuels including compressed and liquefied natural gas, liquefied petroleum gas (LPG), propane, ethanol, bio-diesel, and electricity.

Explanation: Vehicular traffic is a major source of air pollution in general. The incomplete combustion of gasoline in motor vehicles results in the emissions of hydrocarbons and oxides of nitrogen, and carbon monoxide. These pollutants react in the presence of sunlight to produce ozone, the pollutant of main concern in the Broward County. Ozone can cause respiratory distress to individuals with impaired respiratory functions, especially children and the elderly. The Energy Policy Act of 1992, established goals to reduce dependence on imported oil by requiring federal and state fleets to increase the percentage of their vehicles operating on alternative fuels. Energy diversification protects our energy security, enhances environmental protection, and promotes economic development.

Data sources: Calendar Year (CY) data, Broward County Public Works, Energy Management Section, Anthony Rosa, (954) 357-6506 and the South Florida Regional Planning Council, Carlos Gonzalez, (954) 985-4416.

6.1.3 Roadway capacity

Measurement: The established roadway level of service standard used in the Broward County Comprehensive Plan defines "overcapacity" segments as those operating at levels of service worse than Level of Service "D." The percentage is derived by dividing the number of roadway segments operating below the designated level of service standard in the specified calendar year by the total number of roadway segments measured in that year.

Explanation: This performance measure provides a comprehensive picture of how vehicular traffic and the adequacy of the roadway system can affect the environmental quality of life in an urban county experiencing continuing growth.

Data source: Broward County Department of Planning and Environmental Protection, Transportation Planning Division, Ossama Al Aschkar, (954) 357-6653.

6.2 Groundwater Quality

6.2.1 Quality of groundwater

Measurement: This is the cumulative percentage of petroleum-contaminated sites cleaned up to state standards in the indicated calendar year. In 1998 a statistical analysis revealed that 99% of all contaminated sites would be cleaned up by 2009. This prediction was based on the assumption that no new discharges would occur. Unfortunately, about three hundred new discharges have occurred since 1998. The percentage of contaminated sites cleaned up to state standards through December 2000 is now 28.5%.

Explanation: One of the greatest threats to our drinking water supply is contamination from leaking underground petroleum storage tanks, especially where these sources are within drinking water well field zones. The Biscayne Aquifer, Broward County's sole source of drinking water supplies, lies very close to the surface, making it extremely vulnerable to contamination from surface and near-surface pollution sources. Underground petroleum storage tanks are the most common of these sources.

Data source: Broward County DPEP, Pollution Prevention and Remediation Division, Lorenzo Fernandez, (954) 519-1249.

6.3 Surface Water Quality

6.3.1 Surface water quality, fresh water streams

Measurement: This performance measure is calculated based on the data obtained from DPEP's surface water quality monitoring network along the fresh water portion of the C-13 (Middle River) canal (University Drive to

Interstate 95) as measured at DPEP station numbers 12, 13 and 14. Percent improvement is measured by comparing the overall annual average water quality index. The index is calculated using the Florida Department of Environmental Protection's Florida Stream Water Quality Index (WQI) to rate the quality of fresh water systems. The WQI is based on the measurement of six water quality categories: water clarity, dissolved oxygen, oxygen-demanding substances, bacteria, nutrients and biological diversity with each category potentially having more than one parameter. We converted annual average raw data for the six categories to index values from 0-99 and assigned a percentile value based on Florida stream water quality data. The DPEP WQI is based on the five water chemistry parameters as biological diversity measurements are not available for Broward County surface waters.

Explanation: County and federal agencies have developed and improved regulations and programs to affect surface water quality positively since 1995. These regulations and programs encompass three areas: 1) redevelopment of areas constructed before the implementation of surface water management regulations, 2) the 5-year renewal of surface water management licenses issued before 1989, and 3) the Broward County NPDES Municipal Separate Storm Sewer System Permit. The C-13 and C-14 Canal basins were selected because most of the basins are located outside independent drainage districts and are subject to DPEP surface water management regulations.

Data source: Broward County DPEP, Environmental Monitoring Division, Nancy Gassman, (954) 519-1241.

6.3.2 Surface Water Quality, Marine Waters

Measurement: This performance measure is calculated based on the data obtained from DPEP's surface water quality monitoring network within the tidal portion of the eastern C-13 (Middle River and Coastal Basin) and eastern C-14 Canals (Cypress Creek and Pompano Canals, east of I-95) as measured at DPEP station numbers 5 and 10. Percent improvement is measured by comparing the overall annual average Trophic State Index (TSI) of these two stations against their 1995 (baseline) overall annual average TSI. The index is calculated using the Florida Department of Environmental Protection's Trophic State Index, to rate the quality of estuarine systems. The annual TSI is based on raw annual average measurements of chlorophyll and nutrients. Calculating an overall TSI value requires both nitrogen and phosphorous measurements.

Explanation: County and federal agencies have developed and improved regulations and programs to affect surface water quality positively since 1995. These regulations and programs encompass three areas: 1) redevelopment of areas constructed before the implementation of surface water management regulations, 2) the 5-year renewal of surface water management and licenses issued prior to 1989, and 3) the Broward County NPDES Municipal Separate Storm Sewer System Permit. The C-13 and C-14 Canal basins were selected because most of the basins are located outside independent drainage districts and are subject to DPEP surface water management regulations.

Data source: Broward County DPEP, Environmental Monitoring Division, Nancy Gassman, (954) 519-1241.

6.3.3 Quality of marine bathing water, from a bacteriological standpoint

Measurement: This performance measure tracks the percentage of beach water quality measurements rated as satisfactory, based upon weekly enterococci and fecal coliform testing at fifteen public beaches and recreational waterways in Broward County. The reporting period is the year ending on June 30th of the indicated year.

Explanation: The Broward County Health Department, with the State Department of Health has initiated (1998) a program to provide scientific information on the quality of coastal beach and recreational waters to the public. The program involves monitoring of enterococci species and fecal coliform bacteria levels at fifteen locations along Broward's Atlantic coast and Intracoastal waterway. The density of enterococci species and fecal coliform bacteria as indicator groups in seawater show the relationship to swimming-associated gastroenteritis.

Data sources: Broward County Health Department and Florida Department of Health, Howard Rosen, (954) 467-4854.

6.4 Water Use

6.4.1 Water consumption

Measurement: This performance measure reflects trends in the consumption of water resources by the residents of Broward County. The data are based upon total finished and purchased water consumed annually in each Broward County Office of Environmental Services (OES) district divided by our best estimate of population derived from the historical number of customers and equivalent residential connections in each district.

Explanation: Per capita water consumption reflects residents' attitudes regarding water use and conservation as indicated by a sub-set of users within the OES franchise area. It can be influenced by rates charged by the provider and by regional use restrictions applied by the South Florida Water Management District.
Data sources: Broward County Office of Environmental Services, Chuck Flynn, (954) 831-0886 and Broward County DPEP, Water Resources Division, (954) 519-1464.

6.4.2 Water use restrictions

Measurement: Water-use restrictions are imposed by the South Florida Water Management District (SFWMD) during drought conditions when water levels in the regional system or groundwater levels monitored locally fall below a target level. The measure is calculated by dividing the number of months when water restrictions were imposed (even for a single day) by 60 months (5 year period). SFWMD predicts that without enhancements in our current water management system, Service Area 1 (North Broward and Lower Palm Beach County) and Service Area 2 (Central and Southern Broward County) will experience increasing shortages from 15% and 16% of the time in 1990 to 37% and 29% in 2010 respectively[1]. Three major water resources planning efforts are currently underway to reduce water use restrictions by increasing storage capabilities and improving the efficiency of water management. The three plans are: Everglades Restoration (Restudy) - a state and federal partnership; the Lower East Coast Regional Water Supply Plan (LEC); and the SFWMD and Broward Countywide Integrated Water Resources Plan (IWRP). As these planning efforts move forward, the number of days in water shortage should be maintained or reduced despite increasing demands on water resources with increasing population. The Restudy and LEC components alone are expected to reduce these shortages to 9% and 14%. The IWRP should further enhance these improvements. The number is based on the number of months over a 26-year model simulation resulting in water shortages of any type.
Explanation: This benchmark measures the ability of water managers in Broward County and South Florida's ability to effectively deal with drought conditions.
Data source: South Florida Water Management District; [1]*South Florida Water Management District Lower East Coast Regional Water Supply Plan (Draft)*, March 1997.

6.5 Wildlife Habitat

6.5.1 Natural resource land in managed areas east of conservation area levees

This indicator has been retired.

Measurement: The number of acres of land in public ownership / protection where some degree of protection and management is offered to native plants and animals pursuant to an approved and funded management plan for their natural resource values.
Explanation: Natural resource lands are important to the community as examples of Broward's ecological history and provide important habitat for local and migratory wildlife and indigenous plants. To maintain or regain their function and values these lands must be protected from development and the effects of invasive plants, over drainage and other deleterious effects.
Data source: Broward County Department of Planning and Environmental Protection, collection of data from management agencies, Heather Carman.

6.5.2 Total tree canopy coverage in Broward County, east of Conservation Areas

This indicator has been retired.

Measurement: To be defined.
Explanation: As part of the Broward County Commission's New Vision goal to protect the environment, the DPEP has embarked on a project to map the tree canopy in Broward into their Geographical Information Management System. This is being done to give local jurisdictions a tool for managing their urban forest. Trees reduce our energy bills, clean our air, keep pollution out of our waterways, save tax dollars for storm water drainage, recharge our drinking water supply, reduce noise pollution, support our multi-billion dollar tourist industry, support birds and wildlife and make our community more attractive, cohesive and livable.
Data source: Broward County Department of Planning and Environmental Protection, Sean McSweeney.

6.5.3 Conservation and recreation areas

Measurement: The Land Preservation Sections maintains an inventory of protected conservation and recreation lands as well as unprotected natural lands targeted for preservation through the Land Preservation Bond program (2000 Safe Parks and Land Preservation Bond Referendum). The protected lands inventory includes environmentally sensitive lands, passive parks, and active recreational facilities. The unprotected lands are those for which Broward County is pursuing preservation through acquisition and / or management agreement.
Protected Land

Conservation and passive recreation land - this category consists of environmentally sensitive lands and passive recreational parks.
Active Recreational Land - this category includes active recreational facilities and parks.
Other Protected Land - this category contains mitigation sites and other public or private lands managed for conservation.
East Coast Buffer - these sites have been acquired by the South Florida Water Management District (SFWMD).
Unprotected Land
Potential conservation land and green space acquisition / management agreement - these parcels have been approved for preservation by the Broward County Board of County Commissioners through acquisition and / or management agreement.
Listed East Coast Buffer - lands pursued by the South Florida Water Management District.
Explanation: Natural resource lands are important to the community as examples of Broward's ecological history and provide important habitat for local and migratory wildlife and indigenous plants. We wish to protect these lands from development, the effects of invasive plants, over-drainage and other deleterious effects to maintain or regain their function and values.
Data source: Broward County Department of Planning and Environmental Protection, Biological Resources Division, Valaria Volin, (954) 519-1297.

6.6 Threatened and Endangered Species

6.6.1 Manatee population

Measurement: Manatees are counted statewide to determine manatee distribution, abundance and use of habitat. In Broward County, two types of surveys are conducted, aerial surveys and power plant surveys. The Department of Planning and Environmental Protection participates in a statewide interagency team conducting winter aerial surveys during the months of December through March. The Florida Fish and Wildlife Conservation Commission, Marine Research Institute coordinates these surveys. A second type of survey is conducted in Broward County by researchers from Eckerd College. The winter aerial surveys are conducted following the passage of cold fronts when weather is clear and wind is minimal. Under such conditions, manatees that have congregated around the power plant discharge are commonly observed resting at the surface of the water in an effort to be warmed up by the sun. Favorable weather conditions affect the accuracy of these synoptic counts.
Aerial surveys are not an accurate representation of the Florida West Indian manatee population. Statewide numbers obtained through aerial surveys are misleading due to the transient nature of manatees. The aerial survey is also impaired by water clarity and weather conditions, which may facilitate or obstruct survey success. These counts vary by hundreds between surveys. This suggests aerial surveys, being used as a research tool to determine population, need to be improved.
Explanation: The manatee is an endangered species whose existence is threatened by several anthropomorphic activities including injuries or death from boat and ship impacts, water control structures, habitat reduction, water pollution, toxic algal blooms, etc. These problems are addressed through various means. It is the goal of the state and federal government to increase the manatee population to a point where the U. S. Fish and Wildlife Service "Multi-Species Recovery Plan for South Florida" reclassifies them as "threatened" and eventually removes them from the endangered species list. The annual statewide count is important in identifying population trends. Likewise, County mortality data may show the population's health or the effectiveness of local manatee protection.
Data sources: Survey data from 1990 to 2001 was provided by The Florida Fish and Wildlife Conservation Commission, Marine Research Institute, Information and Education Office, (727) 896-8626.

6.6.2 Sea Turtle survey

Measurement: Broward County's 24 miles of beaches are surveyed daily during the sea turtle nesting season, March through October. We record the number of nests deposited and the location of each. We move to hatcheries those nests in sites that are not amenable to successful emergency and entry of hatchling sea turtles into the surf.
Explanation: The Broward County Sea Turtle Conservation Program was originally instituted through specific requirements of dredge and fill permits issued to DPEP for beach renourishment projects. The goal of the program is to reduce the number of sea turtle nests that required relocation and maximize the survivability of nests left on the beach. We conduct the Conservation Program during non-renourishment years to allow for continuity of data collection and analysis. We expect that the number of sea turtle nests that require relocation in the year 2001 will be less due to the enactment of a sea turtle lighting ordinance in the Cities of Pompano Beach and Deerfield Beach. These ordinances require shading or suspension of beach lighting from sunset to sunrise during the nesting and hatching season. Compliance will allow additional nests to be left in place.

Data source: Broward County Department of Planning and Environmental Protection, Biological Resources Division, Louis Fisher, (954) 519-1255.

6.7 Coastline

6.7.1 Beach adequacy

Measurement: This is a measure of the ability of Broward County's beaches to provide storm protection and recreational beach area. Critically-eroded beaches are those beaches whose width at high tide we deem inadequate to provide storm wave damage protection and / or recreational opportunities. For the purposes of this survey, we assume the threshold width is 75 feet from road, seawall, or toe of the dune to the high water contour. This definition is different from that used by the State of Florida in determining critically-eroded beaches. FDEP monuments are used for beach measurements. These monuments are sometimes located in roads, in yards, or on sidewalks or seawalls, but "beach width" is presumed to include only sandy recreational beach. Distance measurements are derived from the most recent countywide beach surveys.

Explanation: Broward's beaches serve two critical functions: to provide storm wave protection for upland property, structures, and infrastructure, and to drive our recreational economic engine. Vital to the beaches' storm protective function is their width. Adequate beach width allows storm waves to break and dissipate energy harmlessly; however, in so protecting the upland, storm waves cause some net erosion of beach sand. Broward County's beaches protect almost $4 billion in upland structures and property and generate $600 million in annual spending in the County. Maintenance of beach width adequate to protect against a moderate frequency storm event is very important. Beach acreage is a useful measure because it indicates the amount of recreational space available to beach users. As a $600 million annual contributor to Broward County's economy, the beaches are a foundation of our tourist economy. Our beaches also provide critical nesting habitats for several threatened and endangered species of sea turtles and adequate acreage is necessary for this purpose. We measure beach width from the shorefront reference monument (established by the State of Florida) to the zero foot elevation contour (NGVD). Acreage is based on 24 miles of beachfront in Broward County.

Data source: Broward County Department of Planning and Environmental Protection, Biological Resources Division, Steve Higgins, (954) 519-1265.

6.8 Coral Reefs

6.8.1 Coral reef health

Measurement: Stony coral abundance, diversity, and evenness are calculated values commonly used to characterize the relative health of coral reef communities. In general, a diversity index value (H') for stony corals is a way of comparing the relative abundance of each species of coral among different populations of corals or among different reef sites. Evenness (J') is the calculated ratio value of H' divided by H' max and it increases in value as the number of species increases and reaches its maximum value of one when the number of individuals of each species at a given site is the same. We don't expect to see substantial increases or decreases in index values over time and would hope for maintenance of existing values. Data collection annually will continue beyond the year 2001. Collection of data for year 2000 began in December 2000 and finished in February 2001. As yearly data becomes available, comparison to previous years will allow detailed evaluation of trends in the ecological condition and relative health of the reef community.

C = Coverage of stony coral live polyps (%)
N = Numbers of individuals of each species
H' = Diversity index
J' = Evenness (H' / H' max)
H' max = (# of species)
H'C = Diversity of live coral polyp coverage
H'N = Diversity of numbers of individuals per species
J'C = Evenness in distribution of live coral polyp coverage
J'N = Evenness in distribution of numbers of individuals per species

Explanation: Broward County initiated a coral reef community monitoring program involving the measurement of the relative abundance and diversity of stony corals and the abundance of octocorals and sponges at twenty-three reef sites throughout Broward's coastal waters. Coral reef communities and associated sea life of those communities are an important natural resource for recreational fishing and diving industries in Broward. The sound ecological condition of this resource community is a key indicator of the general condition of all marine resources adjacent to the Broward coast.

Data source: Broward County Department of Planning and Environmental Protection, Biological Resources Division, Louis Fisher. (954) 519-1255.

6.9 Energy Use

6.9.1 Total and per capita electricity consumption

Measurement: This is a measure of the total and per capita electric power consumed in Broward County annually including residential and nonresidential (kilowatt-hours).

Explanation: The production and consumption of electric energy are significant sources of air pollution. Generating electricity by burning oil and natural gas generates emissions of volatile organic compounds (VOCs), nitrogen oxides (NO_x), carbon monoxide (CO), sulfur dioxide (SO_2) and carbon dioxide (CO_2). VOCs and NO_x are precursors for ozone, whereas CO_2 is a greenhouse gas that increases the risk of climate change. NO_x and SO_2 are also precursors for acid rain that in turn contribute to poor air and water quality. Poor air quality affects public health, especially of children and the elderly.

Data source: Calendar Year (CY) data, Florida Power & Light Co., Lynn Shatas, (954) 321-2215.

6.10 Waste Management

6.10.1 Waste production

Measurement: This performance measure tracks the quantity of solid waste produced in Broward County. Broward County OIWM provides data on waste production by Broward County to the FDEP. The FDEP, Bureau of Solid and Hazardous Waste, Division of Waste Management, publishes the data in the Solid Waste Management in Florida Annual Report. The total waste tonnage includes construction and demolition debris. Per capita amounts are based upon Census 2000 figures.

Explanation: Tracking of the handling, management and disposal of solid waste helps to prevent illegal dumping and allows the maintaining of sufficient disposal options for future generations.

Data source: Broward County Department of Planning and Environmental Protection, Pollution Prevention and Remediation Division, Sermin Unsal, (954) 519-1460.

6.10.2 Waste disposal

Measurement: Data are provided to the Florida Department of Environmental Protection (FDEP) by the Broward County Office of Integrated Waste Management (OIWM) and published by FDEP, Bureau of Solid and Hazardous Waste, Division of Waste Management, in the Solid Waste Management in Florida Annual Report. Landfilled tonnage includes construction and demolition materials.

Explanation: Tracking of the handling, management and disposal of solid waste helps to prevent illegal dumping and allows the maintaining of sufficient disposal options for future generations.

Data source: Broward County Department of Planning and Environmental Protection, Pollution Prevention and Remediation Division, Sermin Unsal, (954) 519-1460.