

BROWARD COUNTY
DEPARTMENT OF PLANNING AND ENVIRONMENTAL PROTECTION

ENVIRONMENTAL BENCHMARKS REPORT

Broward County Board of County Commissioners
October 2001

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INTRODUCTION

PROGRAM PURPOSE

A benchmark is a standard to judge or measure something. The Department of Planning and Environmental Protection's Environmental Benchmarks Program strives to judge how the environmental quality of life in Broward County has changed over the years. It will also help measure how changes in natural resource management initiatives today and in the future translate into improvements in the environment. The program is an outgrowth of the County Commission's *New Vision* to review efforts to protect the environment and develop a comprehensive environmental strategy.

INDICATORS AND PERFORMANCE MEASURES

A variety of "indicators" have been selected to evaluate our progress. For instance, we selected "ambient air quality" as an indicator of the health of our air resources. For each indicator, we developed one or more "performance measures" to assess changes in the indicator. In this example, "the percentage of days when the air quality was rated as 'good'," is the performance measure.

STATE-PRESSURE-RESPONSE CONCEPT

The example performance measure above is useful for tracking the *state* or condition of the air resource. From a resource management perspective, however, we must be aware of the *pressures* or driving forces that influence air quality. By maintaining awareness of the pressures that influence the resource and how they are changing, we can strive to formulate *responses* to help mitigate adverse impacts on the state of the resource. Continuing with the example, the performance measure "number of vehicle miles traveled" would be an example of a pressure performance measure; vehicle emissions are one of the most significant sources of air pollution. Then we might strive to promote the use of mass transit or use of vehicles that run on cleaner fuels such as electricity or propane to mitigate this impact. This leads to response-type performance measures such as "the number of mass transit trips per year" or the "number of alternative-fueled vehicles" in use.

NATURAL RESOURCE CATEGORIES

The Benchmarks Program concentrates on four primary natural resources; air, water, land and marine resources. For each of these resources, we have identified one or more state, pressure and response indicators and performance measures. If historical data are available, we will chart it to show trends. For newly-formulated performance measures, historical data may not be available. In these cases, we plot first year baseline data and trends will become evident in future reports.

DATA COLLECTION INTERVALS

When it is available, we will present new data annually. Some data, however, are not available on an annual basis. This is particularly evident when the information collection process is difficult. For instance, information on air emissions and domestic sewer service is only collected in 3-5 year intervals and annual population projections are based on the decennial census.

INDICATOR OVERLAP

Sometimes an indicator may reflect upon more than one resource. For instance, waste management, tracked as the "total solid waste produced," might affect groundwater quality (through percolation or runoff) and ambient air quality (by odor production). When such overlap occurs, we use the indicator to evaluate the resource that it affects most adversely.

ENDNOTES

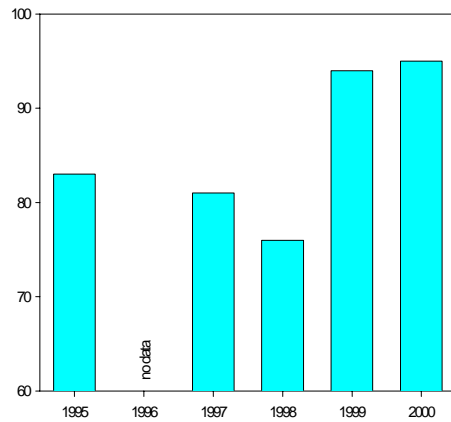
Near the end of the report you will find a section on *Endnotes*. Each performance measure has an associated set of endnotes. Each endnote is comprised of three sections: *measurement*, *explanation*, and *data source*. The *measurement* provides some detail on how we calculated the specific performance measure. The *explanation* describes the significance of the performance measure with respect to how it might impact the resource. The *data source* provides identification of a contact with telephone number for readers wanting additional information on the performance measure. Identifying the data source will also simplify the update process. You may contact the Director of the Environmental Monitoring Division at 954-519-1241 to obtain the data for any of the charts in this document.

We hope you find the report interesting and informative. The Benchmarks Program is clearly an on-going process. As time goes on, we may see that some performance measures we have selected are less useful than others and we will need to make changes. We solicit your ideas on how we can make the program and report more effective and useful.

STATE OF OUR AIR RESOURCES

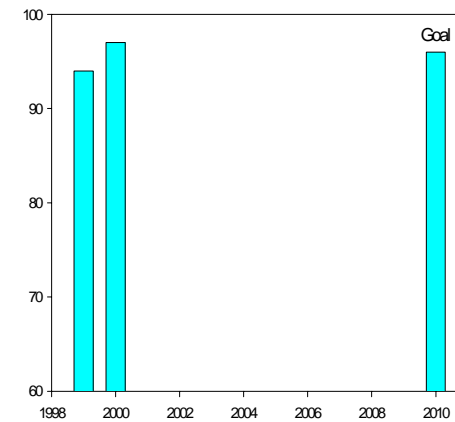
Ambient Air Quality

Percentage of days when the outdoor air quality was good, as calculated pre-1999 (Endnotes page 36)



Ambient air quality

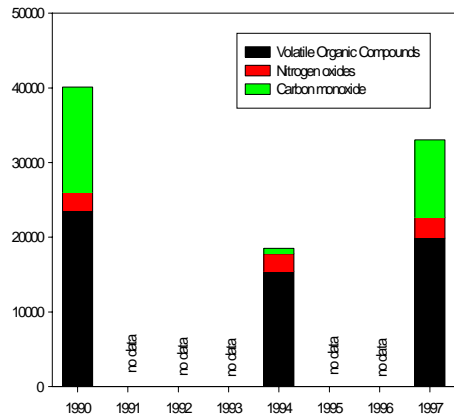
Percentage of days when the outdoor air quality was good, as calculated post-1999 (Endnotes page 36)



PRESSURES ON AIR RESOURCES

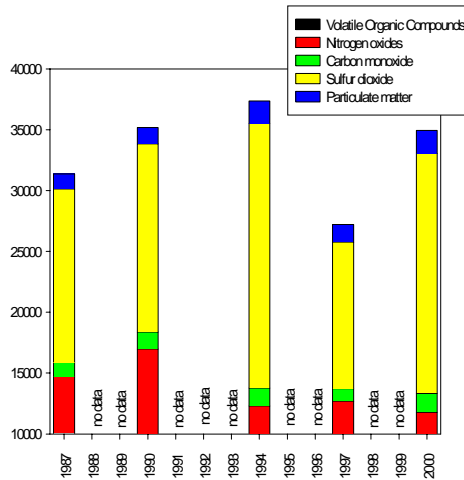
Air pollutant emissions

Emissions from stationary sources, other than power plants, tons/yr (Endnotes page 36)



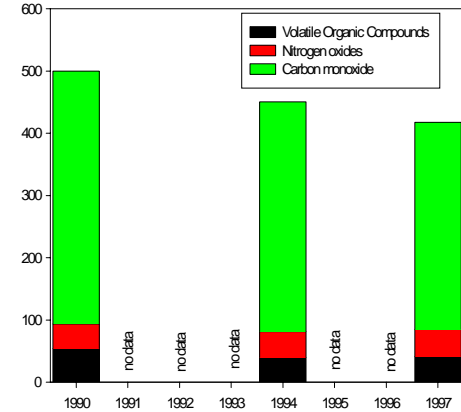
Air pollutant emissions

Emissions from power plants, tons/yr (Endnotes page 37)



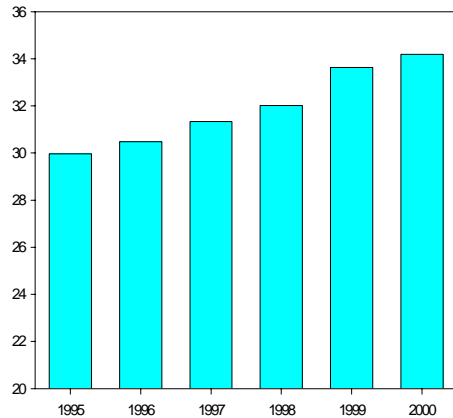
Air pollutant emissions

Mobile source emissions, kilotons/yr (Endnotes page 37)



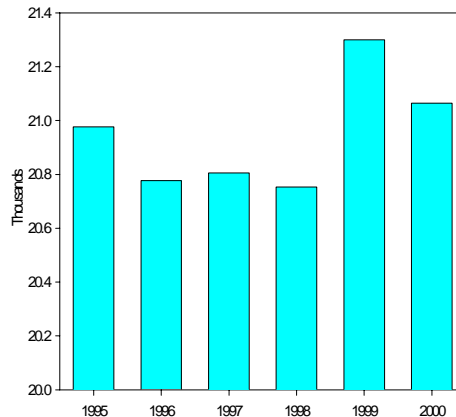
Vehicle use

Vehicle miles traveled per yr, millions (Endnotes page 37)



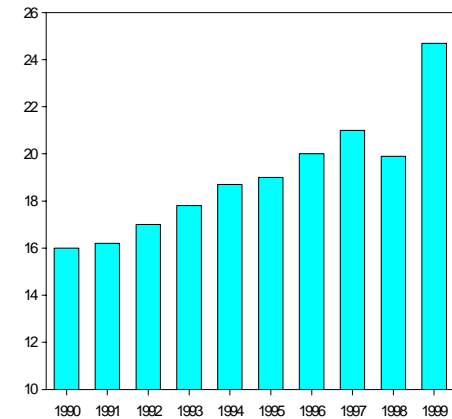
Vehicle use

Vehicle miles traveled/day/1000 people (Endnotes page 38)



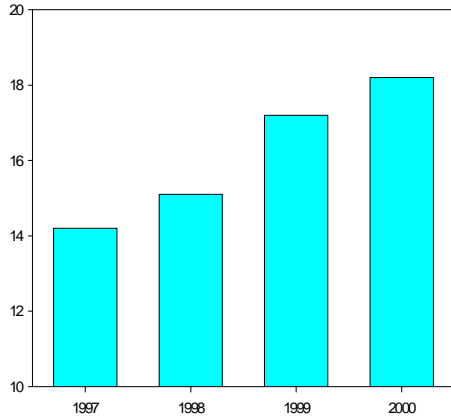
Roadway congestion

Percentage of over-capacity roadway segments (Endnotes page 38)



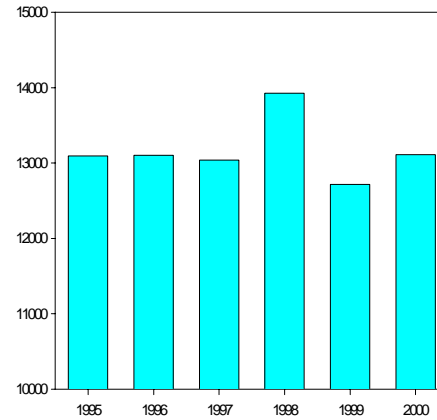
Energy consumption

Total electricity consumption, billions of KWH/yr (Endnotes page 38)



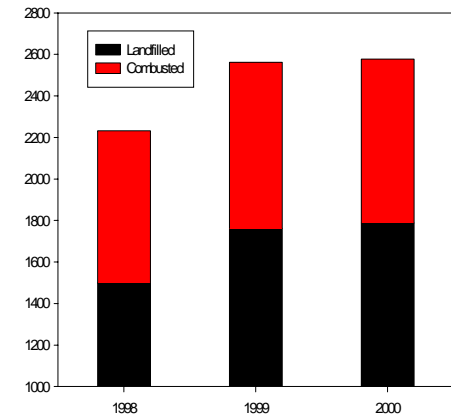
Energy consumption

Per capita electricity consumption, KWH/yr (Endnotes page 38)



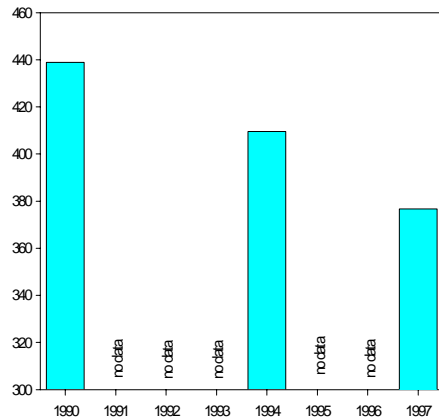
Waste management

Total waste landfilled & combusted, kilotons/yr (Endnotes page 39)



Airport Emissions

Number of takeoff & landing cycles, thousands/yr (Endnotes page 39)



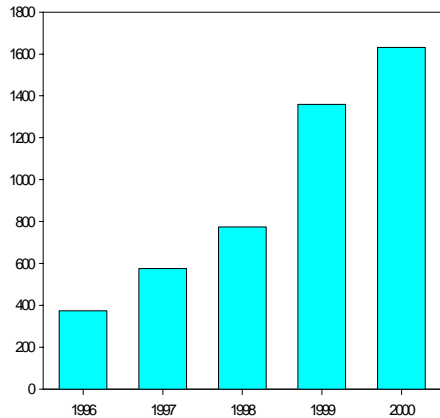
RESPONSES TO AIR RESOURCE PRESSURES

Alternative Fueled Vehicle Use

Air pollutant reductions

Promotion of bicycle use as transport

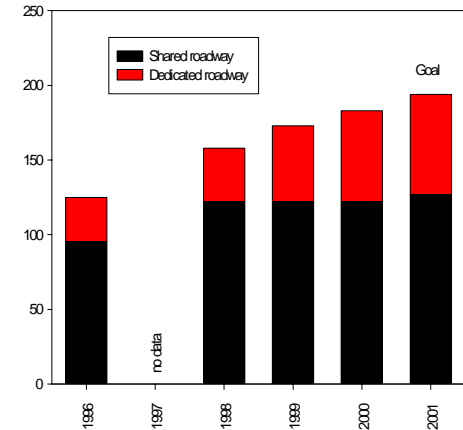
Number of alternative fueled vehicles in government fleets (Endnotes page 40)



Reduction in emissions of hazardous air pollutants, tons/yr. (Endnotes page 40)

Coming in 2002!

Bicycle-friendly roadways, miles (Endnotes page 40)

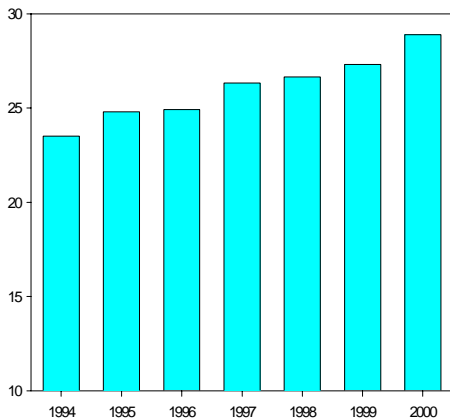


Mass Transit Use

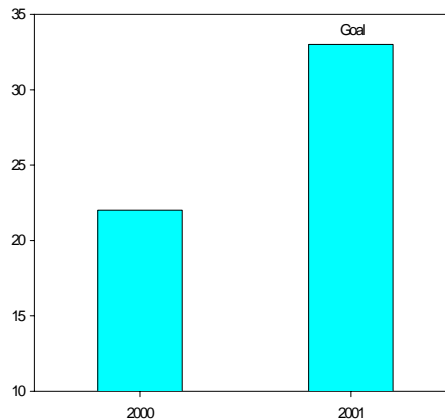
Community Bus Service

Community Bus Service

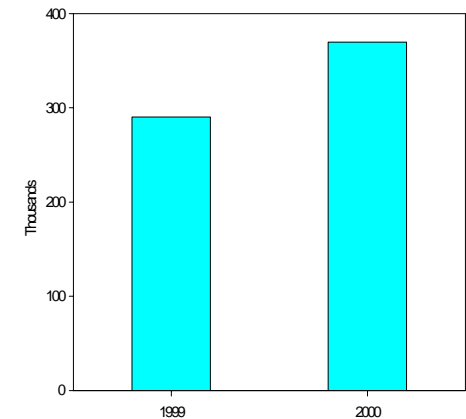
No. of mass transit passenger trips/yr; millions (Endnotes page 41)



Number of community shuttles (Endnotes page 41)

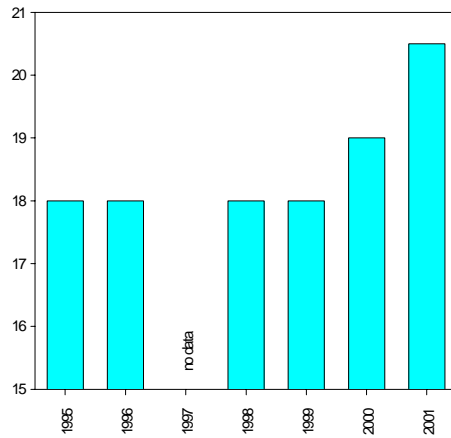


Community shuttle ridership; trips/yr (Endnotes page 41)



Recreational transportation access

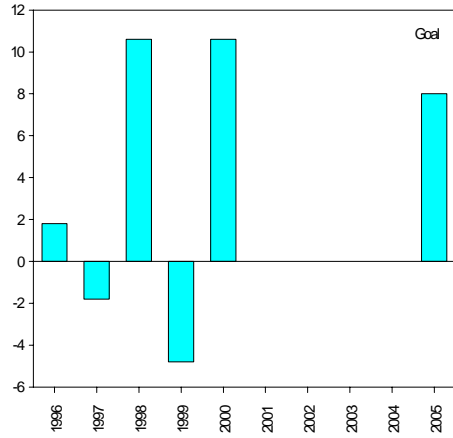
Miles of Greenways (Endnotes page 42)



STATE OF OUR WATER RESOURCES

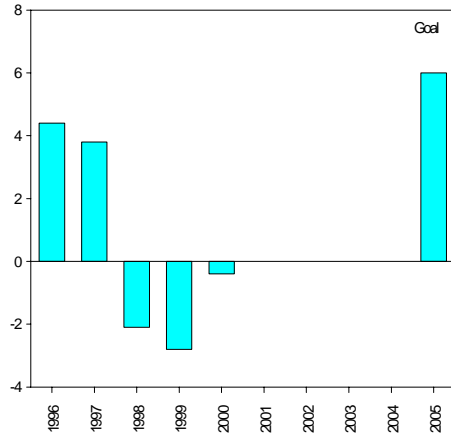
Surface water quality

% improvement in fresh water quality in C-13 canal, compared to 1995 baseline (Endnotes page 42)



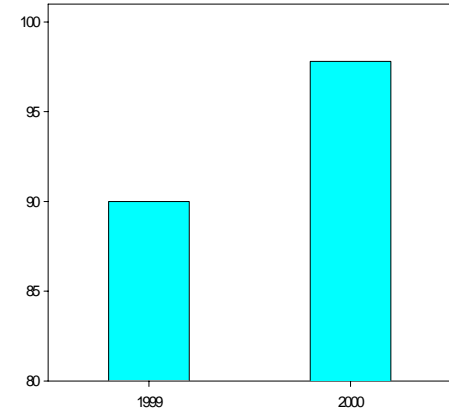
Surface water quality

% improvement in marine water quality, C-13 & C-14 canals, compared to 1995 baseline (Endnotes page 43)



Surface water quality

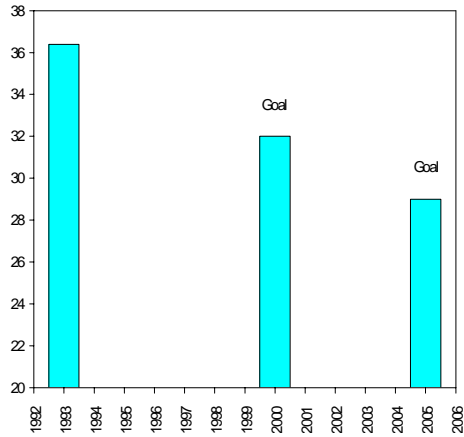
% of beach water quality test results rated as satisfactory (Endnotes page 43)



PRESSURES ON WATER RESOURCES

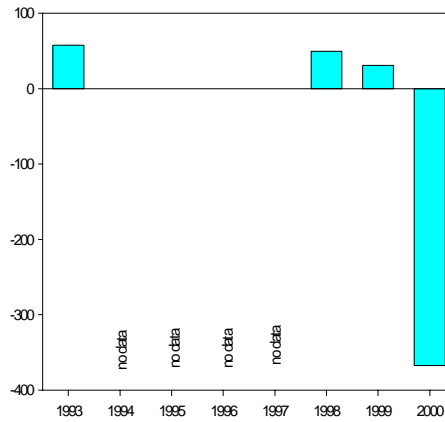
Ground water quality

Percent of county where central domestic sewer service is not available (Endnotes page 44)



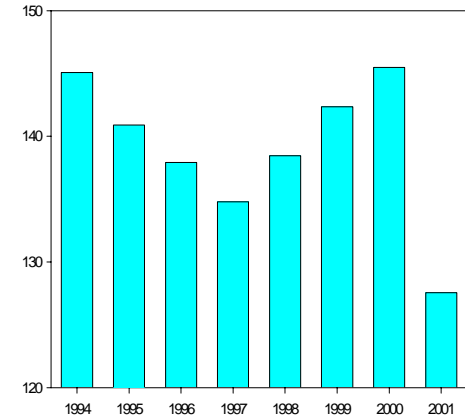
Ground water quality

Net gain/loss in septic system wastewater flow, thousands of gallons/day (Endnotes page 44)



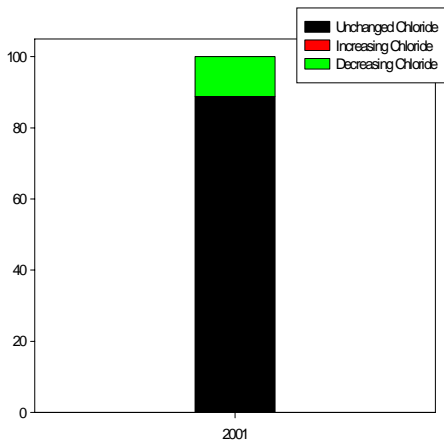
Ground water quantity

Municipal water consumption, per capita, gallons/day (Endnotes page 44)



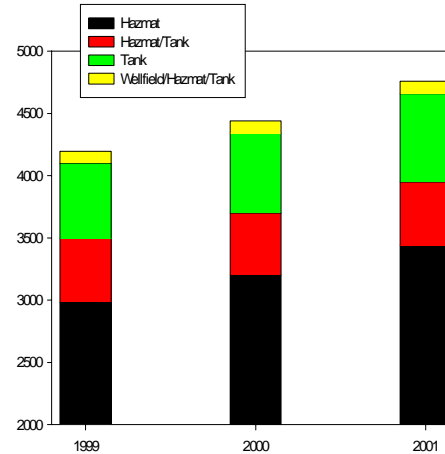
Ground water quality

Percentage of saltwater monitoring wells showing changes in chloride concentration (Endnotes page 45)



Groundwater quality

Number of hazmat & storage tank licenses (Endnotes page 45)



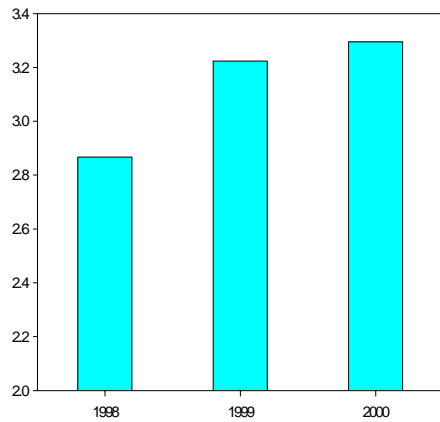
Construction activity

Percent of developed land subject to surface water management regulation (endnotes page 46)

Coming in 2002!

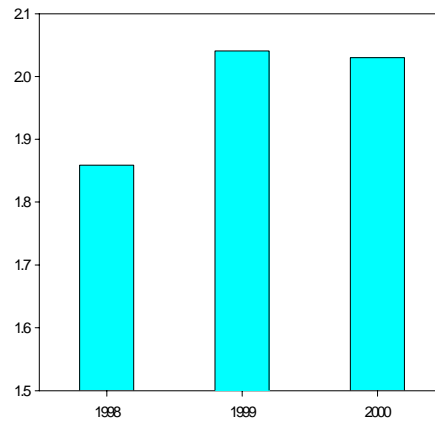
Waste production

Total solid waste produced, millions of tons/yr (Endnotes page 46)



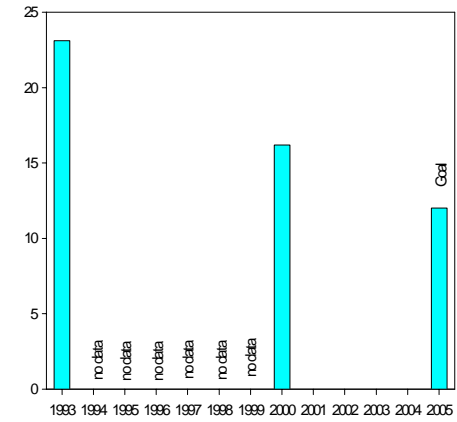
Waste production

Per capita solid waste produced, tons/yr (Endnotes page 46)



Surface/ground water quality

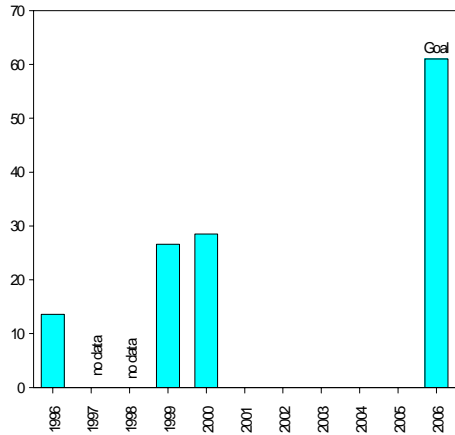
Percent of available waste water treatment capacity (Endnotes page 46)



RESPONSES TO WATER RESOURCE PRESSURES

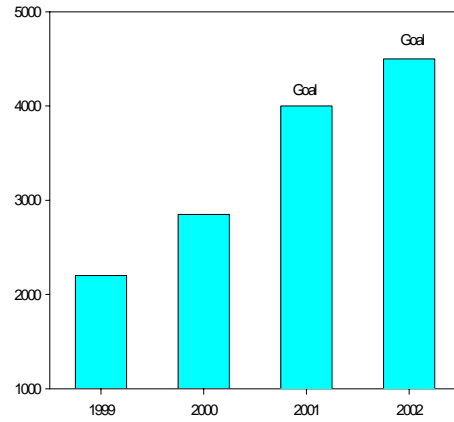
Ground water quality

Percent of contaminated sites cleaned up to state standards (Endnotes page 47)



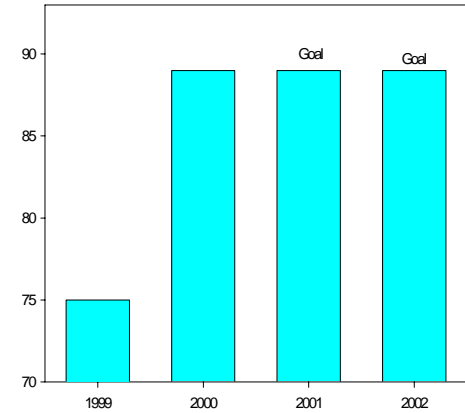
Pollution prevention

Number of licensed hazardous material facilities inspected/yr (Endnotes page 47)



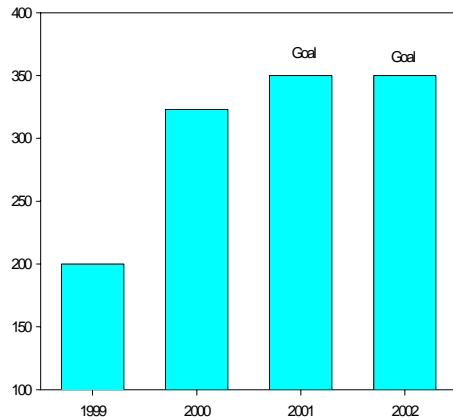
Pollution Prevention

Percent of licensed hazmat sites inspected & found to be in compliance (Endnotes page 47)



Pollution Prevention

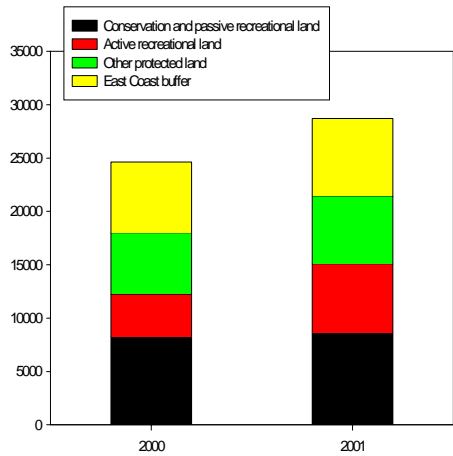
Number of facilities receiving a direct 1-on-1 pollution prevention initiative (Endnotes page 48)



STATE OF OUR LAND RESOURCES

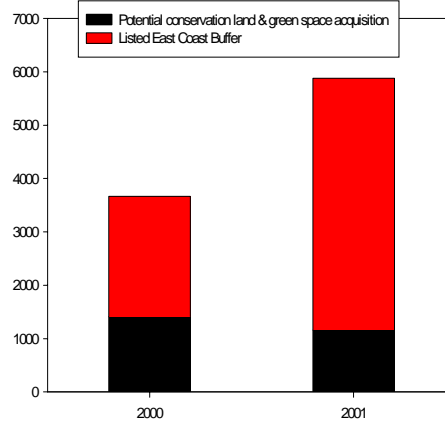
Existing protected land

Protected land, acres (Endnotes page 48)



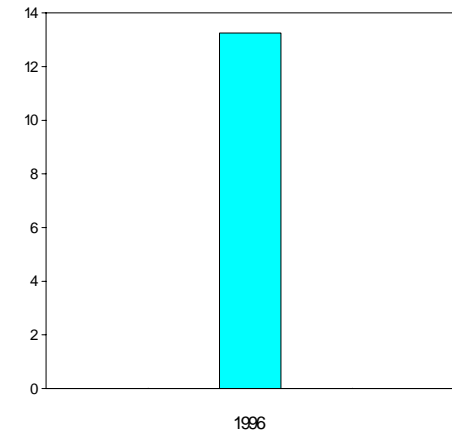
Unprotected land (developable)

Unprotected (developable) land, acres (Endnotes page 48)



Tree canopy

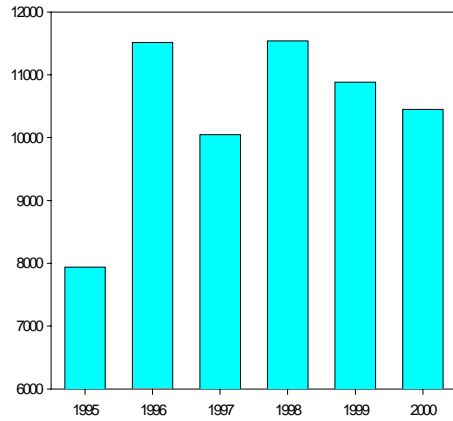
Percent tree canopy coverage in Broward County, east of conservation areas (Endnotes page 49)



PRESSURES ON LAND RESOURCES

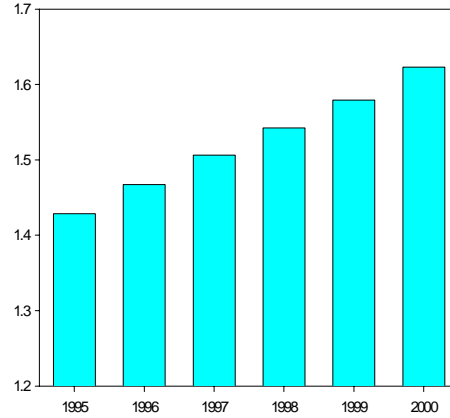
Construction activity

Number of new commercial structure/addition approvals issued (Endnotes page 50)



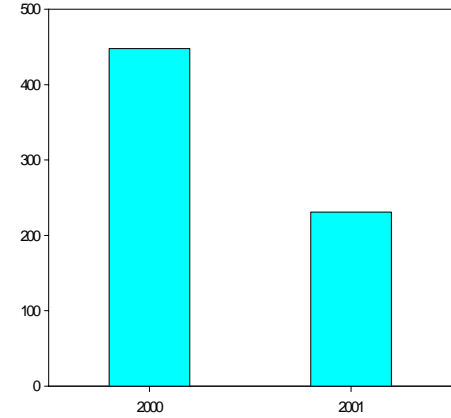
Population growth

Broward County population, millions (Endnotes page 50)



Construction activity

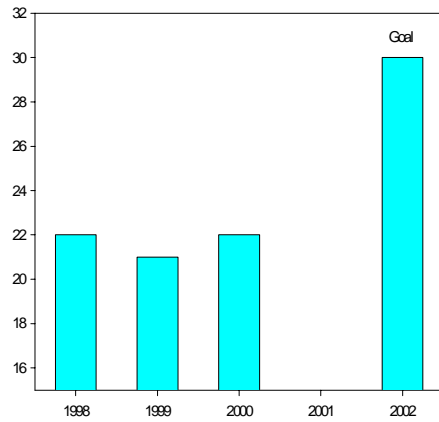
New wetland acreage impacted by development, acres (Endnotes page 50)



RESPONSES TO LAND RESOURCE PRESSURES

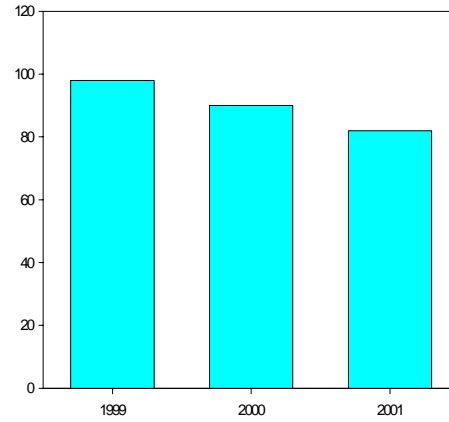
Waste management

Percent of solid waste recycled
(Endnotes page 51)



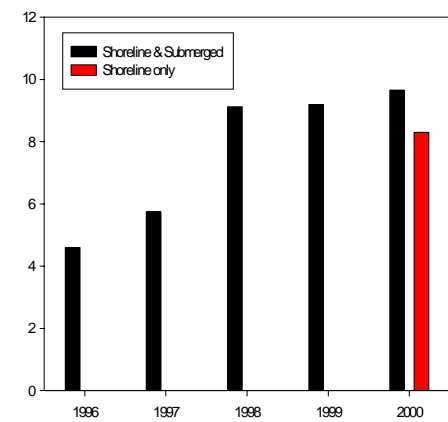
Waste Management

Miles of adopted highway (Endnotes
page 51)



Waste Management

Litter cleanup campaigns, lbs collected
per event/volunteer (Endnotes page 51)



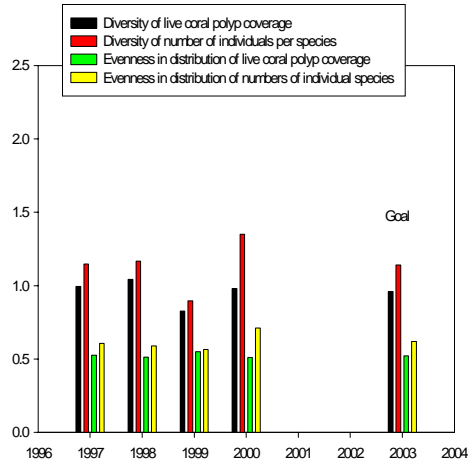
STATE OF OUR MARINE RESOURCES

Coral reef health

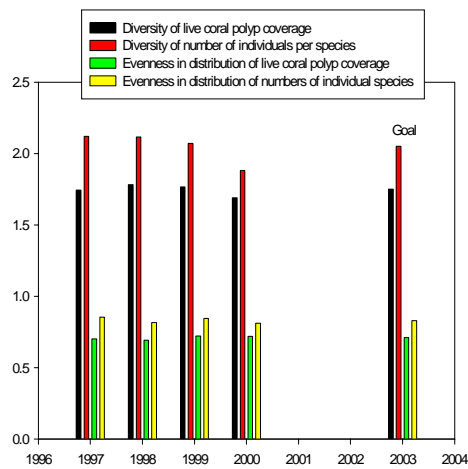
Coral reef health

Coral reef health

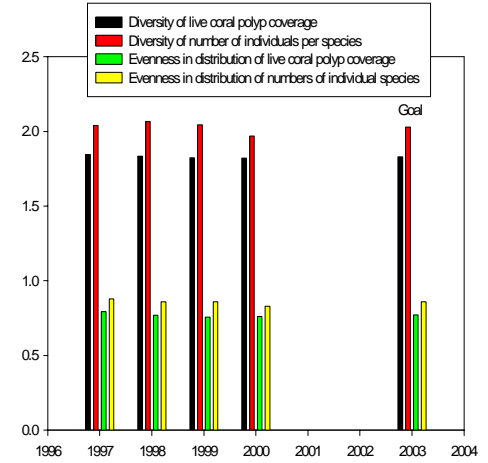
Coral reef health indices, 1st reef (Endnotes page 52)



Coral reef health indices, 2nd reef (Endnotes page 52)



Coral reef health indices, 3rd reef (Endnotes page 52)

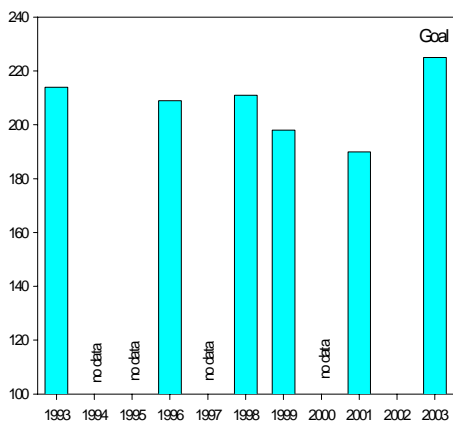


Beach adequacy

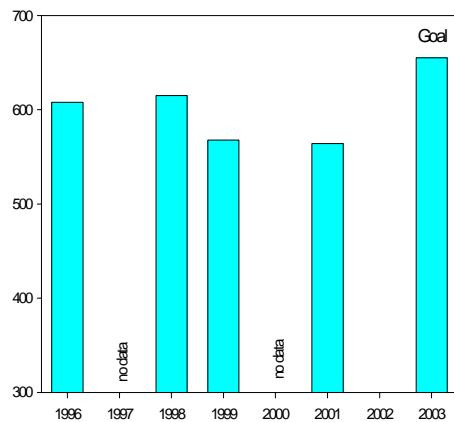
Beach adequacy

Beach adequacy

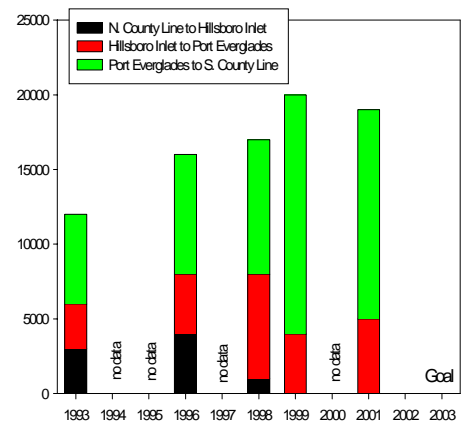
Average beach width at high tide, feet (Endnotes page 53)



Total beach acreage (Endnotes page 53)

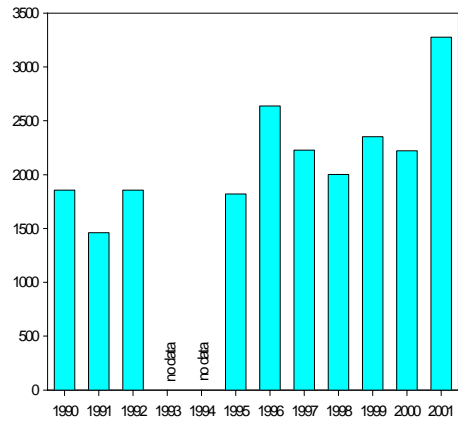


Critically-eroded beach, linear feet (Endnotes page 53)



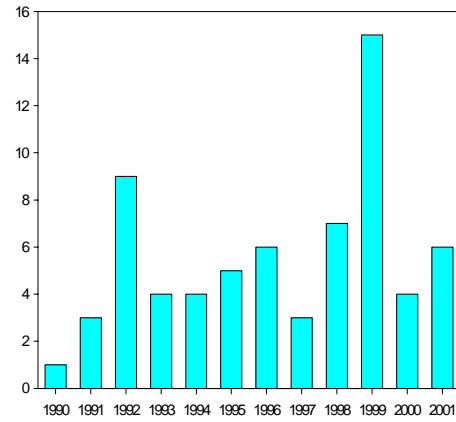
Protected Wildlife

West Indian manatee population in Florida (Endnotes page 53)



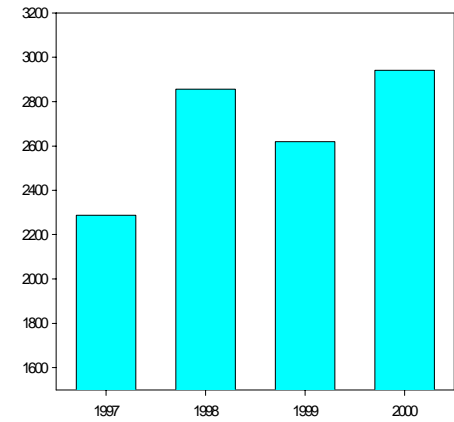
Protected Wildlife

West Indian manatee mortality in Broward County (Endnotes page 53)



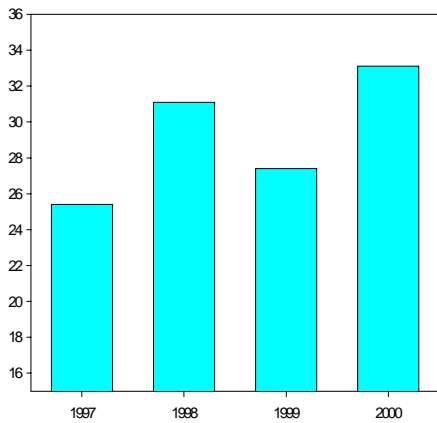
Protected Wildlife

Number of sea turtle nests (Endnotes page 54)



Protected wildlife

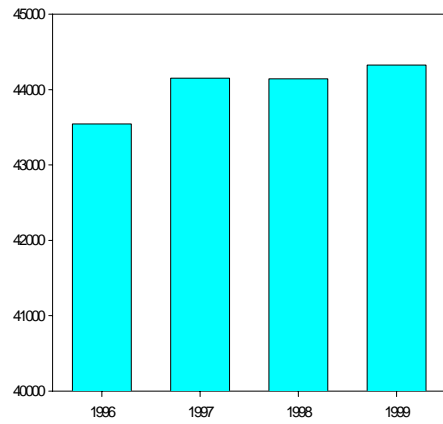
Percent of sea turtle nests left in place (Endnotes page 54)



PRESSURES ON MARINE RESOURCES

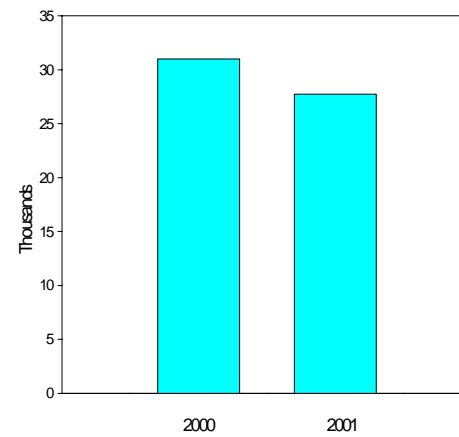
Boating activity

Number of registered vessels in Broward County (Endnotes page 55)



Recreational fishing effort

Number of saltwater fishing licenses in Broward County (Endnotes page 55)

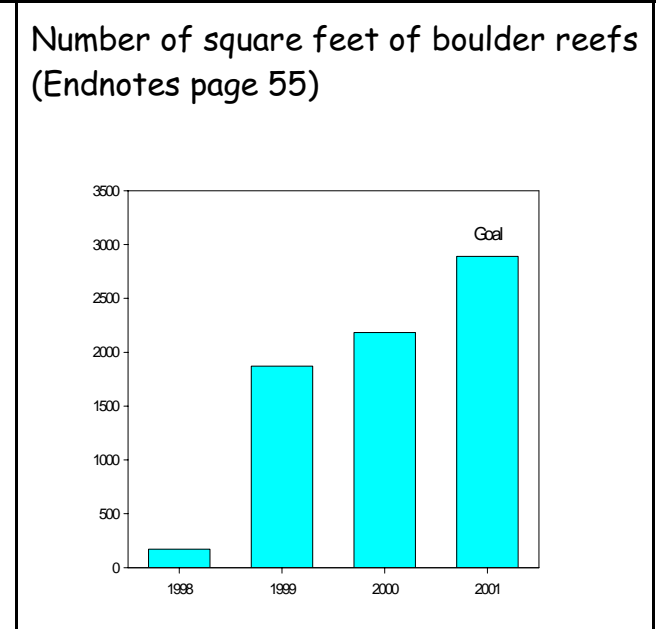
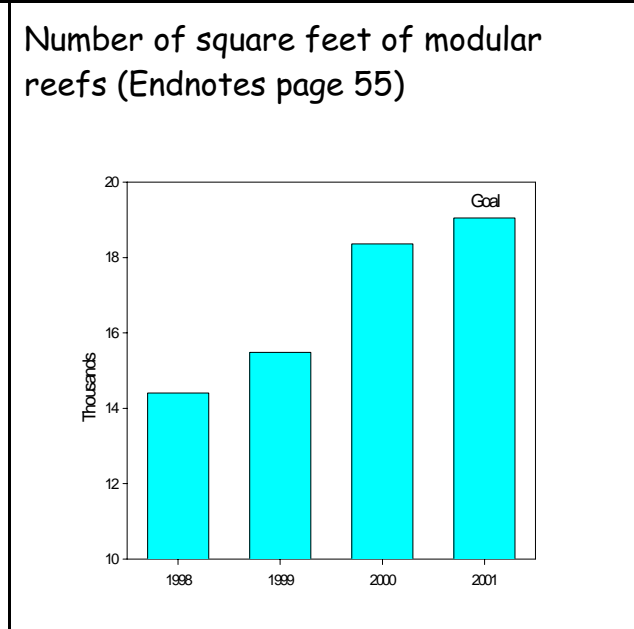
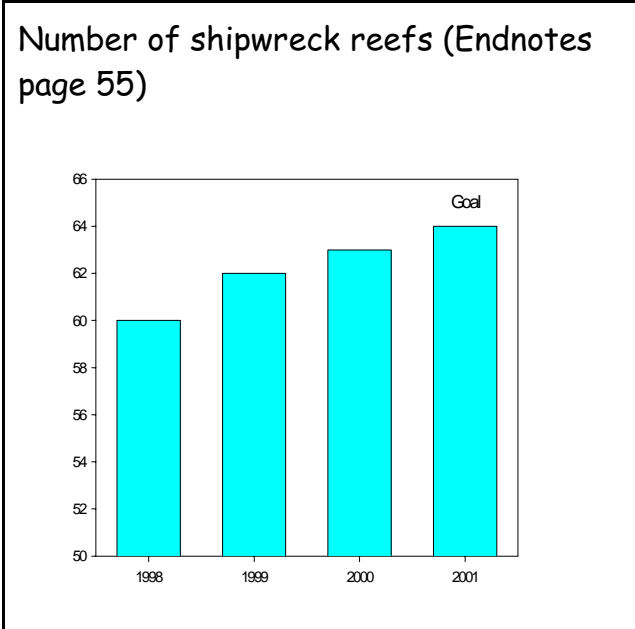


RESPONSES TO MARINE RESOURCE PRESSURES

Artificial reefs

Artificial reefs

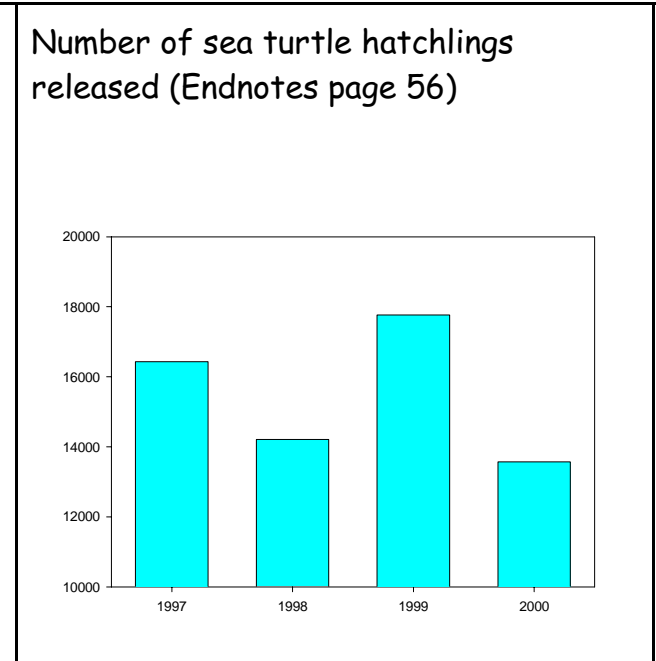
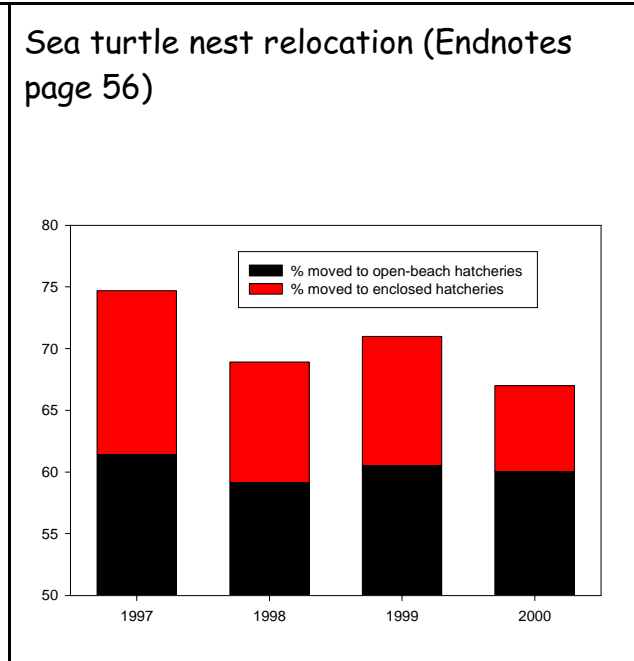
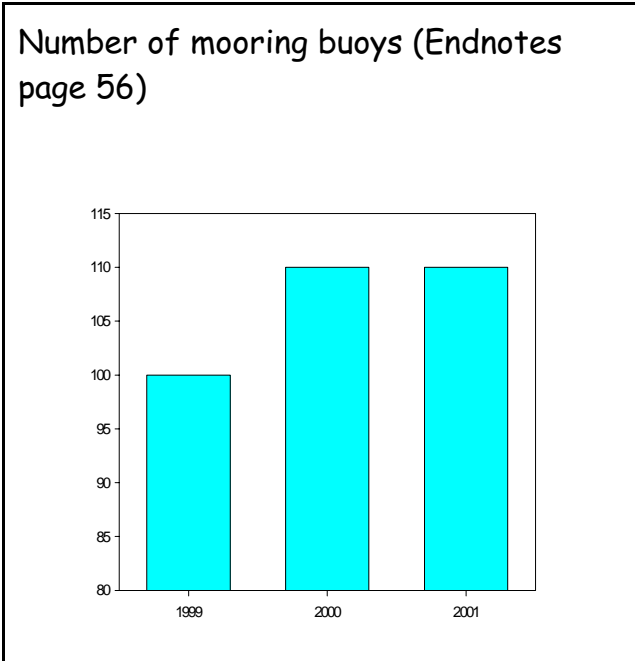
Artificial reefs



Reef Protection

Protected wildlife

Protected wildlife



ENDNOTES

STATE OF OUR AIR RESOURCES

PERCENTAGE OF DAYS WHEN OUTDOOR AIR QUALITY WAS RATED AS GOOD

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 519-1280.

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

PRESSURES ON OUR AIR RESOURCES

EMISSIONS FROM STATIONARY SOURCES OTHER THAN POWER PLANTS; TONS/YEAR

Measurement: This performance measure tracks the amount of criteria pollutant (volatile organic compounds, oxides of nitrogen, particulate matter, sulfur dioxide, carbon monoxide) emissions from point and area sources. We obtain data from the Broward County Emissions Inventory prepared every three years. Data for year 2000 will be available December of 2001.

Explanation: Emissions from stationary sources contribute to air pollution in Broward County. Power plants, industrial, commercial, and residential operations and activities generate such emissions and together affect the quality of air. Emissions from major industrial sources and select commercial sources are subject to federal, state and local regulations. Volatile organic compounds (VOCs) and oxides of nitrogen (NO_x) are precursors for ozone, the pollutant of concern in Broward County. Ozone exceedances result not only in poor air quality but can also trigger costly, regulatory controls and loss of federal funding for construction/transportation development. Sulfur dioxide and oxides of nitrogen are precursors for acid rain that in turn contribute to poor air and water quality.

Note: Reductions in carbon monoxide (CO) emissions for 1994 were due to the fact that wildfires were considerably less extensive than 1990 and 1997.

Data Source: Calendar Year (CY) data, Broward County DPEP, Air Quality Division, Cindy Corbett-Elder, (954) 519-1247

EMISSIONS FROM POWER PLANTS; TONS/YEAR

Measurement: The amount of criteria pollutants (volatile organic compounds, nitrogen oxides, particulate matter, sulfur dioxide, carbon monoxide) emissions coming from power plants in Broward County. We obtained the yearly data from the Florida Power & Light Company.

Explanation: Emissions from stationary sources contribute to air pollution in Broward County. Power plants, industrial, commercial and residential operations/activities generate such emissions and together affect the quality of air. Emissions from major industrial sources and select commercial sources are subject to federal, state and local regulations. VOCs and NO_x are precursors for ozone, the pollutant of concern in Broward. Ozone exceedances result not only in poor air quality but can also trigger costly, regulatory controls and loss of federal funding for construction/transportation development. Sulfur dioxide and oxides of nitrogen are precursors for acid rain that in turn contribute to poor air and water quality.

Data Source: Calendar Year (CY) data, Broward County DPEP, Air Quality Division, Cindy Corbett-Elder, (954) 519-1247

MOBILE SOURCE EMISSIONS, TONS/YEAR

Measurement: This performance measure tracks the amount of volatile organic compounds, oxides of nitrogen, and carbon monoxide emissions from mobile sources (automobiles, trucks, lawn mowers, airplanes, vessels). We obtain the data from the Broward County Emissions Inventory prepared every three years. Data for year 2000 will be available December of 2001.

Explanation: Emissions from mobile sources remain a major air quality concern in Broward County. VOCs and NO_x emissions from mobile sources are precursors for ozone, the pollutant of concern in Broward. Ozone exceedances result not only in poor air quality but can also trigger additional costly, regulatory controls and loss of federal funding for construction/transportation development. Through more stringent fleet performance standards and transportation conformity, the 1990 Clean Air Act Amendments implemented additional programs to offset the increase of mobile source emissions due to population and vehicle miles traveled (VMTs) growth.

Data Source: Calendar Year (CY) data, Broward County DPEP, Air Quality Division, Cindy Corbett-Elder, (954) 519-1247

VEHICLE MILES TRAVELED/YEAR

Measurement: This is a measure of vehicular traffic representing the total miles traveled (VMT) in a given area for indicated calendar year.

Explanation: Poor air quality affects public health, especially of children and the elderly. In Broward County vehicular traffic is a major source of air pollution and a major source of precursors for the pollutant ozone. The level of vehicular traffic directly impacts air quality and Broward County's ability to meet the National Ambient Air Quality Standard for ozone. Ozone

exceedances result not only in poor air quality but can also trigger additional costly, regulatory controls and loss of federal funding for construction/transportation development. Through more stringent fleet performance standards and transportation conformity, the 1990 Clean Air Act will implement additional programs to offset the increasing VMT, due to population increase.

Data source: Broward County DPEP, Transportation Planning Division, Ossama Al Aschkar (954) 357-6653

VEHICLE MILES TRAVELED/DAY/1000 PEOPLE

Measurement: This is a measure of vehicular traffic and represents the average miles traveled per day in Broward County for the indicated calendar year by 1,000 people, based upon Census 2000 population figures as adjusted by Bureau of Economic and Business Research.

Explanation: See explanation for "Vehicle Miles Traveled" above. Note: This performance measure is different from the "Vehicle miles traveled" performance measure; since population changes in a linear fashion (estimates are assumed to be linear and based upon decennial census) downward trends reflect vehicular traffic emissions decrease resulting from improvements in transportation planning, land use planning and technological improvements. The evolution of this performance measure will provide information regarding transportation planning, land use planning and technological improvements.

Data source: Broward County DPEP, Transportation Planning Division, Ossama Al Aschkar (954) 357-6653.

PERCENTAGE OF OVER-CAPACITY ROADWAY SEGMENTS

Measurement: This performance measure tracks the relative proportion of roadway segments operating below the designated level of service standard in the specified calendar year.

Explanation: 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." This performance measure supplements the information provided by the two "Vehicle miles traveled" performance measures. It provides a more comprehensive picture of how vehicular traffic and the adequacy of the roadway system can affect the environmental quality of life in a county experiencing continuing urbanization.

Data source: Broward County DPEP, Transportation Planning Division, Ossama Al Aschkar (954) 357-6653.

TOTAL AND PER CAPITA ELECTRICITY CONSUMPTION

Measurement: This is a measure of the total 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 (SO₂) and carbon dioxide (CO₂). VOCs and NO_x are precursors for ozone, whereas CO₂ is a greenhouse gas that increases the risk of climate change. NO_x and SO₂ 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

TOTAL WASTE LANDFILLED AND COMBUSTED, TONS/YEAR

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 DPEP, Pollution Prevention and Remediation Division, Sermin Unsal, (954) 519-1460

NUMBER OF TAKEOFF/LANDING CYCLES/YEAR

Measurement: This is a computer model-generated measure representing emissions of aircraft that normalizes the pollutant emitting characteristics of the different aircraft and activities. It is based upon aircraft type and five specific operating modes in the cycle; approach, taxi/idle-in, taxi/idle-out, takeoff and climb out. We obtain the data from the Broward County Emissions Inventory which is prepared every three years. Data for year 2000 will be available in December 2001.

Explanation: Aircraft activities which affect ground level air pollutant concentrations occur within a mixing zone. We define them as landing and takeoff cycles (LTO's). The emissions of concern are based on the duration of the LTO cycle and the engine operation mode for a given aircraft category (commercial, military, etc.). Aircraft operations generate emissions of volatile organic compounds (VOCs), nitrogen oxides (NO_x), carbon monoxide (CO), sulfur dioxide (SO₂), and particulate matter (PM).

These pollutants are precursors for ozone and acid rain that in turn contribute to poor air and water quality. Poor air affects public health, especially of children and the elderly. The decrease in the number of cycles (LTOs) per year is due to the gradual replacement of smaller aircraft by larger aircraft with more efficient engines.

Data source: Calendar Year (CY) data, Broward County DPEP, Air Quality Division, Cindy Corbett-Elder, (954) 519-1247

RESPONSES TO AIR RESOURCE PRESSURES

NUMBER OF ALTERNATIVE FUEL VEHICLES IN GOVERNMENT FLEETS

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

Explanation: Vehicular traffic is a major source of air pollution. The incomplete combustion of gasoline in motor vehicles results in the emissions of hydrocarbons, oxides of nitrogen, and carbon monoxide. These pollutants react in the presence of sunlight to produce ozone, the pollutant of main concern in 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 source: Calendar Year (CY) data, Broward County Public Works Department, Energy Management Section, Anthony Rosa, (954) 357-6506 and the South Florida Regional Planning Council, Carlos Gonzalez, (954) 985-4416

REDUCTIONS IN EMISSIONS OF HAZARDOUS AIR POLLUTANTS, TONS/YEAR

Measurement: This is the amount of hazardous air pollutants reduced from stationary source categories such as power plants, municipal waste, biological incinerators, dry cleaners, furniture manufacturing, etc. The EPA has promulgated regulatory emission standards for these pollutants. We will begin tracking this performance measure in 2002.

Explanation: Emissions of hazardous air pollutants contribute to air pollution in Broward County and have a negative health impact. Various industrial and commercial operations generate such emissions. The 1990 Clean Air Act Amendments directed the United States Environmental Protection Agency (USEPA) to control hazardous air pollutants. The reduction of hazardous air pollutant emissions will result in improved air quality and health effects.

Data Source: Calendar Year (CY) data, Broward County DPEP, Air Quality Division, Daniel Dossman, (954) 519-1242

BICYCLE-FRIENDLY ROADWAY, MILES

Measurement: This performance measure tracks the miles of bicycle-friendly designed roadway available to the residents of the county to encourage the use of bicycles as an alternative means of transportation as of the fiscal year ending September 30th. The categories of such roadways include the following:

Dedicated lanes

- o miles of bicycle lanes

- o miles of non-designated lane

Shared lanes

- o miles of wide-curb lanes
- o miles of paved shoulder

Explanation: Motor vehicle traffic is a major source of air pollution and a major source of precursors for the pollutant ozone. Poor air quality affects public health, especially children and the elderly. In 1989 the Broward County Commission adopted the Bikeway Element of the Broward County Comprehensive Plan. This plan provided direction to implement a bicycle program and the framework for the infrastructure improvements. To encourage the use of bicycles as a means of transportation it is important to integrate bicycle facilities into the transportation network. Doing this will help preserve air quality by reducing the production of ozone precursors.

Data source: Broward County DPEP, Administration, Mark Horowitz (954) 519-1487.

NUMBER OF MASS TRANSIT PASSENGER TRIPS/YR

Measurement: The number of trips made by the citizens of Broward County utilizing mass transit (i.e., buses, shuttles, Tri-Rail) in the fiscal year indicated.

Explanation: Alternative means of transportation such as buses, shuttles, and trains, reduce traffic activities and improve air quality. In Broward County, vehicular traffic is a major source of air pollution, posing threats to both public health and the environment. It is also a major source of precursors for ozone, the pollutant of major concern in the area. Poor air quality affects public health, especially children and the elderly. The use of public transportation services will help to meet stringent air quality standards and therefore reduce air pollution, reduce single occupancy vehicle trips, and improve transit efficiency.

Data source: Broward County Mass Transit Division, Tri-County Commuter Rail Authority, Marketing Department, Robert Fossa (954)357-8336 and Bonnie Arnold (954) 788-7937 or (954) 942-7245

NUMBER OF COMMUNITY SHUTTLES

COMMUNITY SHUTTLE RIDERSHIP, TRIPS/YR

Measurement: The fleet size is the number of vehicles (mid-size buses) operated by municipal and local governments, Transportation Management Associations (TMAs), public/private partnerships, and other neighborhood/civic associations. Ridership is the number of trips made by the users of the Community Bus Services in the fiscal year indicated.

Explanation: The Broward Division of Mass Transit (BCT) in cooperation with the Community Transportation Initiative (CTI) of the Department of Planning and Environmental Protection (DPEP) are promoting the efficient mobility of persons and goods

through the Community Bus Service program. The Community Transportation Initiative encourages the use of alternative fuel vehicles (AFV) for neighborhood buses, addressing issues of air quality and traffic congestion, while providing user-friendly transit services.

Data Source: Broward County Division of Mass Transit, Service Development Team, Bob Fossa (954) 357-8336 and the Broward County DPEP, Transportation Planning Division, Enrique Zelaya (954) 357-6635

MILES OF GREENWAYS

Measurement: This is the number of miles of pathways dedicated for bicyclists, pedestrians and equestrians for utilitarian and recreational or transportation uses that are in or next to canal, utility or transportation rights-of way as of the fiscal year ending September 30th.

Explanation: Motor vehicle traffic is a major source of air pollution and an overriding concern of many Broward County residents when choosing travel modes. Providing an enjoyable environment of interconnected and multipurpose paths for bicyclists and pedestrians increases the likelihood that Broward County residents will choose non-polluting modes of travel.

Data source: Broward County DPEP, Administration, Mark Horowitz (954) 519-1487.

STATE OF OUR WATER RESOURCES

PERCENT IMPROVEMENT IN FRESH WATER QUALITY IN C-13 CANAL, COMPARED TO 1995 BASELINE

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 of these three stations against their 1995 (baseline) 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 governments have developed and improved regulations and programs intended to impact 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 National Pollution Discharge Elimination System Municipal Separate Storm Sewer System Permit. The C-13 Canal basin was selected because most of the basin is outside independent drainage districts and is subject to DPEP's surface water management regulations.

Data source: Broward County DPEP, Environmental Monitoring Division, George Riley, (954) 519-1241

PERCENT IMPROVEMENT IN MARINE WATER QUALITY IN C-13/C-14 CANAL COMPARED TO 1995 BASELINE

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 Tropic 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 phosphorus 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 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 outside independent drainage districts and are subject to DPEP surface water management regulations.

Data source: Broward County DPEP, Environmental Monitoring Division, George Riley, (954) 519-1241

PERCENT OF BEACH WATER QUALITY TEST RESULTS RATED AS SATISFACTORY

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.

PRESSURES ON WATER RESOURCES

PERCENT OF THE COUNTY WHERE CENTRAL DOMESTIC SEWER SERVICE IS NOT AVAILABLE

Measurement: We compute the percentage of the county where central domestic sewer service is not available on a calendar basis by dividing the developed area within the urban portion of the County lacking centralized domestic wastewater sewer service by the total area of developed land requiring sewer service. We assume on-site sewage treatment facilities, such as septic systems serve areas without central, domestic sewer service.

Explanation: Broward County's drinking water comes primarily from the Biscayne Aquifer, a shallow groundwater aquifer. Its proximity to the surface leaves it vulnerable to various types of contamination including septic systems. In older areas of the county, aging tanks and drain fields may cause the septic system to fail to treat incoming sewage and household waste effectively. A reduction of these systems especially in industrial areas will lower the contamination threat to the aquifer.

Data source: Broward County DPEP, Water Resources Division, John Crouse, (954) 519-1264

NET GAIN/LOSS IN SEPTIC SYSTEM WASTEWATER FLOW, GALLONS/DAY

Measurement: This is the net gain or loss in wastewater flow handled by septic tank facilities associated with certain building permit approvals granted for the subject period. The flow figures used are those identified for new septic tank installations minus those identified for septic to sewer conversions by calendar year.

Explanation: This performance measure complements the information provided by the **Percentage of the county where central domestic sewer service is not available** performance measure. It is a measure of progress designed to deal with both sides of the equation. It provides a comparative analysis of development approvals that either involve flows associated with new on-site treatment and disposal system installations or add to the total flows handled by sanitary sewer facilities.

Data source: Broward County DPEP, LUPD, Monthly Reports - Development Review Section, Martin Weigand, (954) 519-1251

MUNICIPAL WATER CONSUMPTION, PER CAPITA, GALLONS/DAY

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 source: Broward County Office of Environmental Services, Chuck Flynn, (954) 831-0886 and Broward County DPEP, Water Resources Division, Nancy Gassman, PhD, (954) 519-1464

PERCENTAGE OF SALTWATER MONITORING WELLS SHOWING CHANGES IN CHLORIDE CONCENTRATION

Measurement: This performance measure reflects the potential for saltwater intrusion to impact potable water supplies. It is based upon data from monitoring of the Regional Saltwater Intrusion Monitoring Network in Broward County. The changes are classified as the percentage of all monitored wells in the Regional Network whose chloride concentration increased or decreased, expressed as a logarithm, by 0.5 or remained unchanged from the baseline year (2000). Individual well chloride concentrations are annual averages recorded for the well in the calendar year indicated with the exception of the current year which is as of June 30th.

The following wells, using their USGS identification numbers, are monitored for this performance measure:

G-2149	G-2445	G-2694	G-2697	G-2752	G-2785
G-2893	G-2894	G-2896	G-2897	G-2898	G-2899
G-2900	G-2901	G-2902	G-2903	G-2904	G-2906

Explanation: The presence of elevated levels of chloride in potable water supplies can cause treatment problems because it cannot be removed by certain types of treatment plants and the treated water is subject to the secondary water quality standard for chloride. We think that changes in chloride concentrations, expressed as the common logarithm, of 0.50 tend to correlate with the degree of coastal saltwater intrusion, and low values indicate a lack of saltwater contamination at the monitoring point.

Data source: Broward County DPEP, Water Resources Division, Darrel Dunn, PhD, (954) 519-1450

NUMBER OF HAZARDOUS MATERIAL & STORAGE TANK LICENSES

Measurement: This is the number of hazardous materials and storage tank licenses issued by DPEP as of June 30th of the year reported. It includes facilities with current facility management licenses for hazardous materials, storage tank, or well field hazardous materials activities. It also includes the number of facilities with current consolidated facility management licenses for hazardous materials/storage tank activities and well field hazardous materials/storage tank activities. A current license

is one that DPEP issues before the end of the quarter and that expires on or after the end of the quarter. The number does not include unissued new licenses in process or facilities facing enforcement action for non-renewal or operating without a license.

Explanation: Businesses that handle and store hazardous materials represent a potential threat to ground and surface water quality. The DPEP licenses and inspects facilities operated by these businesses to minimize the threat.

Data Source: Broward County DPEP, Land Use and Permit Division, Connie Boden, (954) 519-1215

PERCENTAGE OF DEVELOPED LAND SUBJECT TO SURFACE WATER MANAGEMENT REGULATION

Measurement: We compute the percentage of developed land that includes surface water management features on a calendar year basis by dividing the area of developed land with surface water management features by the total area of developed land and multiplying by one hundred. We will begin tracking this performance measure in 2002.

Explanation: Developed property can contribute a significant amount of non-point source pollution to receiving water bodies. Before the 1970s, runoff from developed property and the associated non-point source pollution was directed away from the property as quickly as practical. Development regulations in effect since the 1970s that instituted surface water management practices have mitigated the water quality and quantity impacts of construction activities. Regulation of the redevelopment of the areas developed before the 1970s will result in improved water quality and quantity in receiving water bodies.

Data Source: Broward County Surface Water Coordination Committee, South Broward Drainage District, Neil Kalin (954) 680-3337 and the South Florida Water Management District, Tony Waterhouse (561) 686-8800

TOTAL AND PER CAPITA SOLID WASTE PRODUCED, TONS/YEAR

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 DPEP, Pollution Prevention and Remediation Division, Sermin Unsal, (954) 519-1460

PERCENT OF AVAILABLE WASTE WATER TREATMENT DISPOSAL CAPACITY

Measurement: We compute the percentage of available disposal capacity by dividing the sum of each wastewater treatment and disposal facility's average annual daily flow plus committed flow through building permits by the current capacity of the

facility, subtracting this value from one, and multiplying by one hundred. Disposal methods include ocean outfalls, deep injection wells, spray irrigation and surface water (for effluent processed to advanced treatment standards only). We compute the available average annual daily flow as a rolling 12-month average as reported by treatment facilities within Broward County.

Explanation: The availability of wastewater disposal capacity can be a limiting factor for the economic health of the community. The development review process includes an evaluation of the wastewater treatment and disposal capacity of the treatment facility that will receive wastewater from a proposed development. Demand for development that exceeds disposal capacity may result in reduced levels of treatment or the need to commit funds for infrastructure improvements. Regulatory agencies may withhold development permits if adequate treatment and disposal capacity is not available.

Data source: Broward County DPEP, Water Resources Division, John Crouse, (954) 519-1264

RESPONSES TO WATER RESOURCE PRESSURES

PERCENTAGE OF CONTAMINATED SITES CLEANED UP TO STATE STANDARDS

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 thru 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

NUMBER OF LICENSED HAZMAT SITES INSPECTED/YEAR

PERCENT OF LICENSED HAZMAT SITES INSPECTED AND FOUND IN COMPLIANCE

Measurement: This is a measure of the activities of DPEP to inspect the holders of hazardous material licenses in Broward County during the fiscal year indicated. We find the total number of inspections via a query of the agency's computerized Compliance Management System. The query provides the number of sites inspected in a given month. The output is then corrected for sites that have received a Licensing Non-Compliance Notice or Warning Notice for the same month. This leaves all sites visited and found to have no compliance issues for a given month. We compile annual figures from the monthly reports.

Explanation: Compliance with hazardous material and storage tank regulations will result in decreased incidences of pollution. Furthermore site visits by Pollution Prevention inspectors, general knowledge within the regulated community of an ongoing inspection program, and the potential of enforcement action for non-compliance will result in increased compliance. We designed these measurements to track both the activity and outcome associated with the number of satisfactory hazardous material facility inspections.

Data Source: Broward County DPEP, Pollution Prevention and Remediation Division, Jeff Halsey, (954) 519-1468

NUMBER OF FACILITIES RECEIVING A DIRECT, 1-ON-1 POLLUTION PREVENTION INITIATIVE

Measurement: This performance measure tracks the total number of facilities receiving one or more pollution prevention consultations designed to reduce sources of hazardous waste during the fiscal year indicated.

Explanation: At its core, pollution prevention (P2) means to reduce waste at the source of the waste generation. We designed compliance *inspections* to ensure the proper handling of a waste once a facility has created it. The purpose of pollution prevention *consultations* is to help prevent or reduce the creation of that waste in the first place. Pollution prevention and compliance inspections together provide a full spectrum of regulatory services. In 1999, we began in earnest developing a P2 program. The ultimate goal of this program is to reduce the amount and toxicity of waste generated in Broward County.

Data source: Broward County DPEP, Pollution Prevention and Remediation Division, Jeff Halsey, (954) 519-1468

STATE OF OUR LAND RESOURCES

PROTECTED LAND

- o Conservation and passive recreational land
- o Active recreational land
- o Other protected land
- o East coast buffer

UNPROTECTED LAND

- o Potential conservation land and green space acquisition/ management agreement
- o Listed east coast buffer

Measurement: The Land Preservation Section 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 recreational 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 land managed for conservation.

East coast buffer:

These sites have been acquired by the South Florida Water Management District.

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 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 DPEP, Biological Resources Division, Valaria Volin, (954) 519-1297

PERCENT OF TREE CANOPY COVERAGE IN BROWARD COUNTY, EAST OF CONSERVATION AREAS

Measurement: We are creating the Broward County Tree Canopy coverage from 1996 infra-red aerial photo images by isolating the unique "color signature" of trees. Specific methodology first eliminates all built structures from the raw image and then processes the remaining image to identify trees.

Explanation: As part of the 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. They also reduce noise pollution,

support our multi-billion dollar tourist industry, support birds and wildlife and make our community more attractive, cohesive and livable. Plans for periodic updates of this coverage are pending.

Data source: Broward County DPEP, Planning Services Division, Victoria Morrow, (954) 357-6618

PRESSURES ON LAND RESOURCES

NUMBER OF NEW COMMERCIAL STRUCTURE/ADDITION APPROVALS ISSUED

Measurement: Before the issuance of construction permits for all new commercial structures and additions within Broward County, developers must obtain approvals from DPEP. The approval process includes an evaluation of potential environmental impacts of the proposed construction. To find the number of approvals issued, we query the DPEP Permit Monitoring System for the number of approvals issued during the calendar year.

Explanation: A measure of pressures on our land resources is the number of commercial building permits issued by municipalities and Broward County. All building permits require review and approval by DPEP. Readers should interpret the data with the understanding that developers must obtain building permits for both new construction on vacant land and renovations of existing buildings. Furthermore, a developer may not actually execute the construction of an approved project.

Data source: Broward County DPEP, Land Use and Permitting Division, Martin Weigand, (954) 519-1251

BROWARD COUNTY POPULATION

Measurement: Annual Broward County population estimates are based upon the 2000 Census. The Bureau of Economic and Business Research at the University of Florida provides the annual projections.

Explanation: Population increase is direct impact on our land resources. The temperate weather of South Florida is a powerful lure to the area and will result in continued land resource impacts.

Data source: Broward County DPEP, Planning Services Division, Bill Leonard, (954) 357-6033

NEW WETLAND ACREAGE IMPACTED BY DEVELOPMENT, ACRES

Measurement: We obtain a value for this performance measure during the processing of the Environmental Resource License. We compute the data by adding the total acreage of impacted wetlands licensed during the 12-month period ending June 30th of the reported year.

Explanation: Wetlands serve as habitat for a variety of plant and animal life and can serve water storage and purification functions essential to the maintenance of the county's water supplies. We track impacts on wetlands resulting from development activities through the Environmental Resource Licensing process. This process includes provisions for mitigation of any

unavoidable impacts on wetlands.

Data Source: Broward County DPEP, Biological Resources Division, Barbara Chow, (954) 519-1419

RESPONSES TO LAND RESOURCE PRESSURES

PERCENT OF SOLID WASTE RECYCLED

Measurement: This performance measure tracks the percent of recyclable materials separated from the total waste stream.

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 DPEP, Pollution Prevention and Remediation Division, Sermin Unsal, (954) 519-1460

MILES OF ADOPTED HIGHWAY

Measurement: Florida Department of Transportation's Adopt-A-Highway Program is a volunteer partnership for litter cleanup and prevention education. Groups are enlisted to maintain two-mile portions of highway shoulder. We compute the total miles by multiplying the number of volunteer groups in the program by two. The reported data is as of the end of the fiscal year on June 30, of the year indicated.

Explanation: This is a measure of the effectiveness and public involvement in litter cleanup campaigns within the county.

Data source: Florida Department of Transportation, Barbara Kelleher, (954) 777-4090

LITTER CLEANUP CAMPAIGNS, POUNDS/EVENT/VOLUNTEER OF LITTER COLLECTED

Measurement: The "pounds/event/volunteer of shoreline litter collected" is a measure of the quantity and type of litter collected per person during annual coastal cleanup campaigns.

The Ocean Conservancy (formerly the Center for Marine Conservation), a nonprofit organization committed to protecting ocean environments, sponsors the International Coastal Cleanup annually on the third Saturday of September. There are approximately eleven beach cleanup locations and one underwater site along the 23 miles of Broward County shoreline. The information gathered provides a snapshot in time of the types of debris being found on beaches and waterways around the world. The Ocean Conservancy then tailors their education campaigns to address reducing the most abundant types of litter found in each region.

Explanation: This is a measure of the effectiveness and public involvement in litter cleanup campaigns within the county.

In 2000, the Coastal Cleanup included one underwater site located at the base of a fishing pier. This site significantly increased the annual *pounds collected per event per volunteer* due to the removal of lead weights found near the pier. For this reason, the results were calculated to reflect an average number of pounds of debris per person, per diver and combined total of beach

walkers and divers.

Data source: Broward County DPEP, Biological Resources Division, Pamela Fletcher, (954) 519-1218

STATE OF OUR MARINE RESOURCES

CORAL REEF HEALTH INDICES; 1ST, 2ND, & 3RD REEFS

- o Diversity of coral polyp coverage
- o Diversity of number of individuals per species
- o Evenness in distribution of live coral polyp coverage
- o Evenness in distribution of numbers of individual species

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 DPEP, Biological Resources Division, Louis Fisher. (954) 519-1255

AVERAGE BEACH WIDTH AT HIGH TIDE, FEET

TOTAL BEACH ACREAGE

CRITICALLY-ERODED BEACH, LINEAR FEET

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 DPEP, Biological Resources Division, Steve Higgins, (954) 519-1265

WEST INDIAN MANATEE POPULATION IN FLORIDA

WEST INDIAN MANATEE MORTALITY IN BROWARD COUNTY

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, which 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 surveys 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 algae 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 source: Survey data from 1990 to 2000 was provided by The Florida Fish and Wildlife Conservation Commission, Marine Research Institute, Information and Education Office (727) 896-8626.

NUMBER OF SEA TURTLE NESTS

PERCENT OF SURVEYED NESTS LEFT IN PLACE

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 emergence 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 sea turtle lighting ordinances 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 DPEP, Biological Resources Division, Louis Fisher, (954) 519-1255

PRESSURES ON OUR MARINE RESOURCES

NUMBER OF REGISTERED VESSELS IN BROWARD COUNTY

Measurement: We obtain the number of vessels registered in the county from the number of renewal notices mailed in Broward County by the Florida Department of Motor Vehicles (DMV). The DMV provides an annual report to the Broward County Revenue Collection Division. The total number includes pleasure and commercial vessels. NOTE: Due to the use of a new computer system in 2000, the Broward County Revenue Collection Division now only tracks registration "transactions"; the actual number of registered vessels is no longer available.

Explanation: The number of registered vessels in the County provides an indirect measure of the fishing and diving pressures on the County's marine resources.

Data source: Broward County Revenue Collection Division, Eileen Kavanaugh, (954) 765-5050

NUMBER OF SALTWATER FISHING LICENSES IN BROWARD COUNTY

Measurement: The total number of saltwater fishing licenses issued (July 1 to June 30) includes resident and non-resident sportsman saltwater licenses of all duration periods, including lifetime and senior licenses. It also includes charter vessel licenses.

Explanation: Recreational and commercial fishing activities exert a direct impact on our marine resources. State regulations require a saltwater fishing license to fish in marine waters. This number serves as a proxy for pressures on County marine resources.

Data source: Florida Fish and Wildlife Conservation Commission, Tallahassee, Sandra Gilliam, (850) 488-3641

RESPONSES TO MARINE RESOURCE PRESSURES

NUMBER OF SHIPWRECK REEFS

NUMBER OF SQUARE FEET OF MODULAR REEFS

NUMBER OF SQUARE FEET OF BOULDER REEFS

Measurement: This measure tracks the numbers of three types of artificial reefs. The three types of reefs include those

constructed of natural boulders, molded-concrete modules and purposely sunken decommissioned ships. The data reported is for the fiscal year indicated.

Explanation: Very little baseline data exists for fish populations on Broward County's natural and artificial reefs. A study is currently underway (sponsored by the National Marine Fisheries Service) to census and determine seasonal dynamics of the fish assemblages on the county's *natural* reefs. If funding becomes available, we will expand this to perform similar measurements on the *artificial* reefs. Comparison of natural reef populations to artificial reef populations will allow the development of reefs that function more like natural reef systems. We may redefine the performance measures to consider this information.

Data source: Broward County DPEP, Biological Resources Division, Ken Banks, (954) 519-1207

NUMBER OF MOORING BUOYS

Measurement: Broward County has installed and maintains buoys along popular diving and fishing portions of our coral reef system. The goal is to maintain the ones in place and add more in the future.

Explanation: Coral reef communities and the associated benthic communities are an important natural resource for recreation and the fishing and diving industries. We intend mooring buoys to reduce the impacts associated with anchoring of boats on the reefs. We have not done a quantitative analysis, but use of the mooring buoys currently in place seems high and presumably that use is eliminating some anchor damage. We would like to increase the number of mooring buoys in the more popular areas as we secure funds for installation and maintenance. The Biological Resources Division has applied for a Coastal Impact Assistance Program Grant from The Florida Department of Environmental Protection (FDEP) and the National Oceanic and Atmospheric Administration (NOAA) to expand, maintain and monitor, the Broward County Mooring Buoy System. We should know by September 2001 if the grant application gets funded.

Data source: Broward County DPEP, Biological Resources Division, David Stout, (954) 519-1452

SEA TURTLE NEST RELOCATIONS & HATCHLINGS RELEASED

- o Percent of sea turtle nests relocated to open-beach hatcheries
- o Percent of sea turtle nest relocated to enclosed hatcheries
- o Number of sea turtle hatchlings released

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 emergence 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

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Data source: Broward County DPEP, Biological Resources Division, Louis Fisher, (954) 519-1255