

MYAKKA RIVER BASIN PROJECT

PROGRESS REPORT

**July, August, September
1991**

Contract Number CM279

Submitted to:

Florida Department of Environmental Regulation
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

Submitted by:

Sarasota County
Land Management Division
Natural Resources Department
Post Office Box 8
Sarasota, Florida 34230

*Hart & Wood's
Report*

Funds for this project are provided by the Florida Department of Environmental Regulation, Office of Coastal Management, using funds made available through the National Oceanic and Atmospheric Administration under the Coastal Zone Management Act of 1972, as amended.

October 1, 1991
Date

Robin L. Hart
Robin L. Hart, Ph.D.

TABLE OF CONTENTS

Table of Contents.....i
Sarasota County Staff.....ii
Progress Report.....1
Appendices.....3

Appendices

Appendix 1 Dr. Herb Windom's Analyses

Attachment

Attachment A Resume of Dr. Robin Hart

Attachment B Newspaper Article

SARASOTA COUNTY STAFF

Robin L. Hart, Ph.D., Assistant Director, Natural Resources
Department

E. F. (Fran) Stallings, Ph.D., Manager, Land Management Division

Susan Licari, Technical Support

MYAKKA RIVER BASIN PROJECT

Progress Report

This report is being submitted pursuant to DER Contract No. CM279 Section 6B. It includes a summary of activities conducted to date by task designation.

- Task 1. **Compile/Summarize Pertinent Technical Information and Project Refinement.** This task was accomplished during the first two years of the project and the first two quarters of this year.
- Task 2. **Mapping, Evaluation of Management Programs, and Development of Data Management Systems.** The Southwest Florida Water Management District (SWFWMD) has completed digitization of soils. There are errors in the product due to incorrect data input; some locations of soil types may be off by 15-20 meters. A new corrected disk will be provided at no cost to us on about April 1, 1992.

SWFWMD is still digitizing land use data and 5' contour topographic maps. These will be ready by 12/31/91 and 2/92, respectively.

- Task 8. **Policy and Strategy Refinements, Including Recommendations on Water Management Practices, Land Use Plans and Ordinances, and Special Area Management for Flood, Wetland, Water Quality, and Living Resource Protection.** This task involves the development of a plan for management of the Myakka River basin.

Subtask A: Dr. Herb Windom's sub-basin analyses have been completed and are included in this report as Appendix 1.

Subtask B: Kim Babbitt talked with Carl Giovenco of SWFWMD regarding the Charlotte Harbor SWIM program. Mr. Giovenco is aware of the information that has been compiled as a result of the Myakka River Basin Project. It will be made available to him upon request for any of the SWIM projects.

Subtask C: The salinity model developed by Mote Marine Laboratory needs refinement before it can be used to examine varying flow and water use scenarios for the Myakka River. Development of this model has been funded by the County, not by the Myakka River Basin Project. The County has decided not to fund further work on the model and, therefore, it will not be available to assist in preparing a management plan for the Myakka River Basin Project.

Subtask D: Environmental Science and Engineering, Inc. has been contracted to prepare the GIS Needs Assessment. It is scheduled for completion on October 15, 1991.

Subtask E: Recommendations on protection of riverine and tributary habitats, including evaluation of special permitting and planning program actions will be incorporated into the final report. They will be based on GIS analyses.

Task 9. **Public Information/Coordination.** The work conducted for this task involves dissemination of information to the public, decision-makers and other interested parties, as well as the development of a program for citizen participation in water quality monitoring within the Myakka River basin.

Subtask A: Dr. Mary Jelks, chairwoman of the Myakka River Coordinating Council is organizing a volunteer group of citizens to continue the citizen's monitoring program after the Myakka River Basin Project ends. The Myakka River State Park may be able to sponsor the program.

Subtask B: The Air and Water Pollution Control Advisory Board, a citizen's advisory board whose members are appointed by the Board of County Commissioners, has asked for a special presentation on the Myakka River Basin Project when the project is completed. They would like to make recommendations for land use and land management policies within the Myakka River basin that are based on the conclusions presented in the final report.

APPENDICES

APPENDIX 1

Dr. Herb Windom's Analyses

July 12, 1991

RECEIVED

JUL 17 1991

ECOLOGICAL MONITORING

Ms. Kimberly J. Babbitt
Environmental Specialist II
Myakka River Basin Project
Ecological Monitoring Division
1301 Cattlemen Road
Building C
Sarasota, FL 34232

Dear Kim:

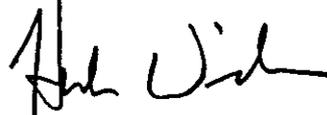
Well I made my deadline after all! Enclosed are two additions to the report; one headed "Material Transport Efficiency of Subbasins" and another headed "Estuarine Material Mass Balance". I wrote these so that they could fit directly into the existing report. I would think that the best place to insert the first section is on page no.86 just before the section headed "Estuarine Water Chemistry Results". The other section would probably go best on page no.88 just before "Sediment Chemistry Results".

Each of the two new additions have tables and figures which I have numbered similarly but arbitrarily so these will have to be changed to fit in with the existing figures and tables already in the report.

I have also inclosed a floppy disk with the text of the two additions in separate Word Perfect files.

If you have any questions about any of this please give me a call at 912-598-2490.

Best Wishes



cc/ Fred Calder

Material Transport Efficiency of Subbasins

The relative efficiency of material transport from a watershed depends on its hydrological characteristics and on land use practices within the watershed which control sources. These characteristics ultimately determine whether a substance is exported from a watershed or is retained there. For substances such as nutrients, which can be transformed from one form to another (e.g., dissolved, particulate, oxidized, or reduced), hydrology also controls the form in which the substance is exported. The reason for this is that residence time, or the time of retention, of substances in the watershed controls the time for chemical processing, much like an oxidation pond in a waste treatment system.

The purpose of this section of the report is to utilize data gathered on annual nutrient loads and hydrology, at subbasin gauging stations, to assess and compare the export/retention characteristics of the individual subbasin watersheds. For this assessment, the eight subbasins described in Section II can be divided into upper and lower watersheds (Figure 1).

The upper four watersheds, Myakka Head, Howard Creek, Upper Big Slough and Deer Prairie, receive no allogenic inputs but export material mobilized within the subbasin to lower subbasins. Some portion of the input received from the upper subbasins may be retained and/or augmented by additional inputs of material mobilized within the lower subbasin. For example, $E_{110} + E_{120}$ is the input of material to the Tatum Sawgrass/Upper Myakka Lake subbasin watershed from the Myakka Head and Howard Creek subbasins. If E_{140} , the output from the Tatum Sawgrass/Upper Myakka Lake subbasin, is greater than $E_{110} + E_{120}$, the difference is considered as an additional input. Conversely, if E_{140} is less than $E_{110} + E_{120}$, then the difference is considered to represent the amount retained in the subbasin.

It is clear that this evaluation of the export/retention characteristics of lower watersheds is only used for comparative purposes. For example, within the lower watersheds, there will always be some inputs of nutrients in addition to those from upper watersheds. But, since these additions cannot be quantified, the "percent retention" or "additional input," which will be referred to below, will be based solely on the difference between inputs from upper watersheds and exports from lower watersheds.

Upper Watersheds:

The exports of dissolved nutrients from the two upper-most watersheds or subbasins of the Myakka system (i.e., Myakka Head and Howard Creek, Table 1) are very similar. This probably reflects the sources associated with agricultural activity which is a major land use practice in both subbasins. The export of particulate material from the two subbasins, however, is quite different. Particulate organic carbon (POC) export from the Myakka Head subbasin is considerably higher than that from Howard Creek, but the latter exports approximately four times higher total solids which have a phosphorous content of about one percent. This reflects the greater abundance of swampy terrain in the Myakka Head subbasin and greater soil erosion in the Howard Creek subbasin.

The other two upper watersheds (i.e., Upper Big Slough and Deer Prairie) have material export characteristics quite different from those of the Myakka Head and Howard Creek subbasins (Table 1). The total dissolved nitrogen exported from Upper Big Sough per unit area is about 55 to 66 percent of that exported from Myakka Head and Howard Creek watersheds respectively. Dissolved phosphate export is less than 20 percent of that from either of these two latter watersheds. The exports of dissolved nitrogen and phosphate from the Deer

Prairie subbasin are respectively a third and a fifth of those from Upper Big Slough. This is consistent with the Deer Prairie subbasin being the least developed of the four watersheds. The export of particulate material generally reflects similar trends.

Lower Watersheds:

The material export-retention characteristics of two lower watersheds or subbasins on the Myakka River can be assessed. The first, the combined Tatum Sawgrass/Upper Myakka Lake watershed, receives inputs from the Howard Creek and Myakka Head subbasins (Table 2). A comparison of the export from this combined watershed at B140 to the input it receives from the upper watersheds (E_{110} and E_{120} , Figure 1), indicates that this subbasin retains dissolved organic carbon (26%), nitrate + nitrite (11%), phosphate (34%) and particulate phosphorous (19%) and total solids (7%). This is not surprising given the water retention characteristics of the watershed based on the evaluation presented in the section on Storm Hydrographs and Rainfall.

The retention of nutrients in this watershed result in much of the dissolved nitrogen input (from both allogenic sources and sources within the subbasin) being converted into particulate organic nitrogen which, in turn, accounts for the large additional export (i.e., additional input in Table 2) of organic matter (i.e., POC). The greater retention is also reflected in the nitrogen reduction to ammonia indicating generally reduced oxygen concentrations in the subbasin due to dissolved organic carbon oxidation.

The next watershed down the Myakka River, Lower Lake, receives the export, and additional input, from Tatum Sawgrass/Upper Myakka subbasins at B140 (Table 2). It is clear from the results that the damming of Lower Lake results in the almost quantitative

retention of nutrients which are recycled or buried within the watershed or are volatilized (i.e., DOC and POC converted to CO₂, or denitrification) out of the watershed.

In essence, the retention characteristics of the two lower watersheds on the Myakka River serve as "oxidation ponds" or "treatment plants" for all the sources within the entire Myakka watershed. Increased activities which increase nutrient mobilization upstream of B160 will have greatest impacts in these lower two subbasins.

Lower Big Slough receives inputs from Upper Big Slough at B150. The export at B180 (Table 2) requires an additional input of materials mobilized within the Lower Big Slough watershed. These additional inputs are generally similar to those for Upper Big Slough (Table 1). It is clear that the dredging of this watershed has facilitated the more efficient through-put of materials.

Summary

A comparison of the relative efficiency of mobilization of materials in the different subbasins is presented in Figures 2 and 3. In general, the Myakka Head and Howard Creek watersheds have similar mobilization characteristics with the exception of particulate phosphate and total solids which are mobilized at a much greater rate from Howard Creek. The other watersheds have mobilization efficiencies similar to each other but different from, and usually lower than, the Myakka Head and Howard Creek watersheds, with the exception of dissolved nitrate + nitrite. The Lower Myakka Lake watershed has mobilization characteristics considerably different from all of the other watersheds owing to its increased ability to retain water.

TABLE 1
MATERIAL EXPORT (in kg/km²)¹ CHARACTERISTICS OF UPPER WATERSHEDS

Gauge Station	Watershed	-----Dissolved-----				-----Particulate-----			Total Susp. Solids ¹
		Organic Carbon ¹	Nitrate + Nitrite	Ammonia	Phosphate	Organic Carbon	Organic Nitrogen	Phosphorous	
B110	Myakka Head	18.2	17.9	40	302	30.6	4	4	0.96
B120	Howard Creek	16.9	11.5	58	420	3.9	0.4	58	4.40
B150	Upper Big Slough	4.5	32	6.4	53	17	2.1	3.2	0.41
B170	Deer Prairie	6.6	5.8	4.7	11	9.3	2.3	4.7	0.78

¹Export values for DOC and suspended solids are in metric tons per km²

TABLE 2
MATERIAL EXPORT-RETENTION CHARACTERISTICS OF LOWER WATERSHEDS
 (Input/Export in metric tons per year)

Gauge Station	Watershed		-----Dissolved-----				-----Particulate-----			Total Susp. Solids
			Organic Carbon	Nitrate + Nitrite	Ammonia	Phosphate	Organic Carbon	Organic Nitrogen	Phosphorous	
B140	Tatum Sawgrass/ Upper Myakka Lake (Area = 228 km ²)	Input	6,780	6.4	16	120	10.1	1.3	4.3	540
		Export	5,000	5.7	22	79	59.0	7.6	3.5	500
		% Retention	26	11	-	34	-	-	19	7
		Additional Input (kg/km ²)			26		214	28		
B160	Lower Lake (Area = 62 km ²)	Export	97	0.1	0.3	1	2.3	0.4	0.07	11
		% Retention	98	98	99	99	96	95	98	98
B180	Lower Big Slough (Area = 130 km ²)	Input	420	3.0	0.6	5	1.6	0.2	0.3	39
		Export	1,800	7.6	2.1	14	3.6	0.5	1.6	230
		Additional Input (kg/km ²)	10.6 ¹	35	11.5	69	15	2.3	10	1.5 ¹

¹in metric tons per km²

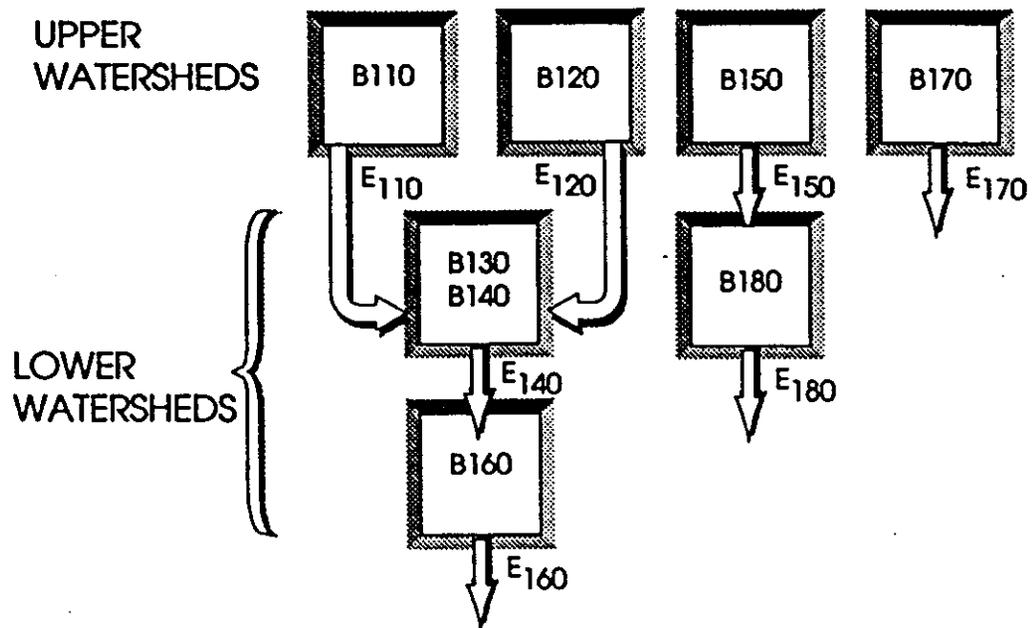


Figure 1. Schematic diagram of subbasin watershed relationships. Arrows designate outputs from each subbasin.

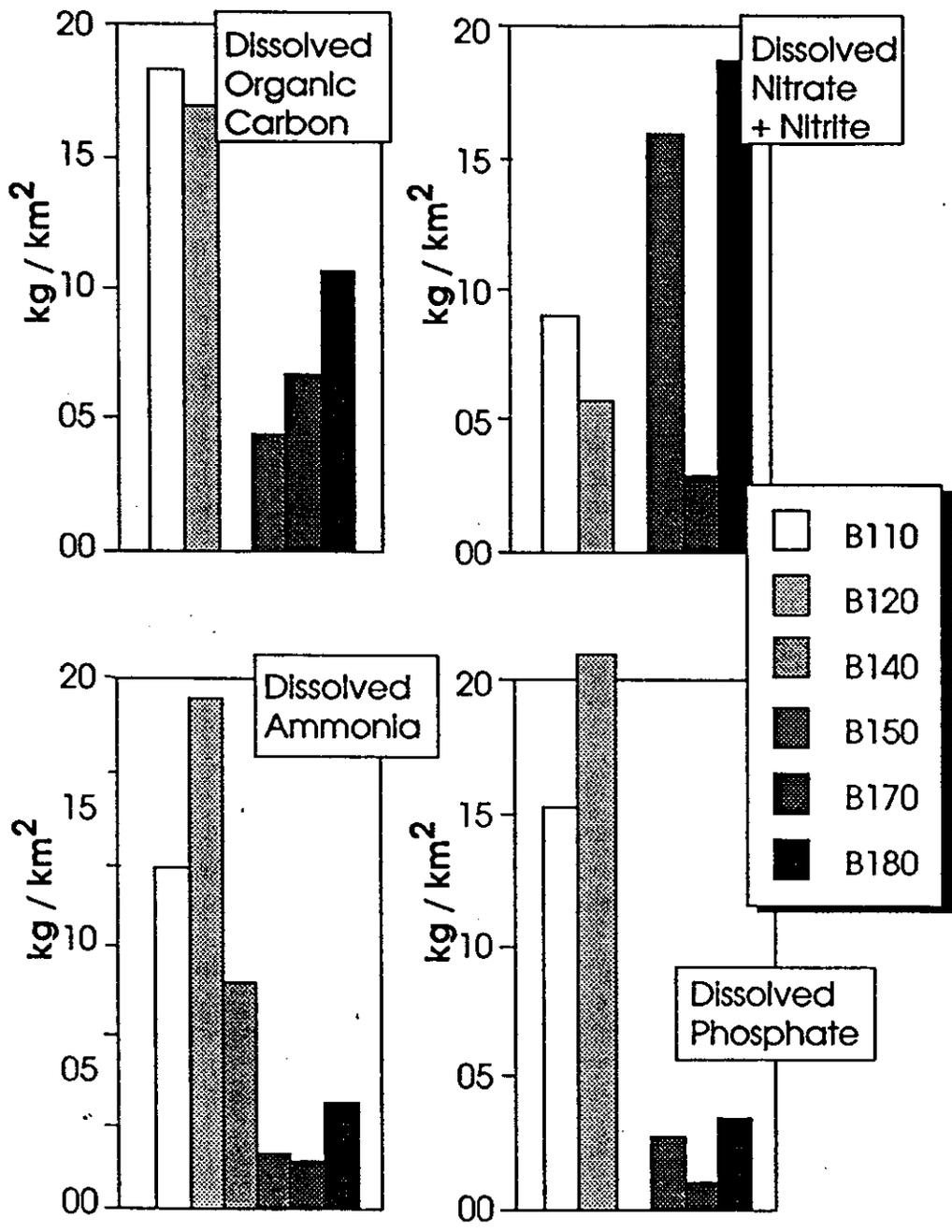


Figure 2. Comparison of mobilization efficiency of dissolved nutrients from subbasins.

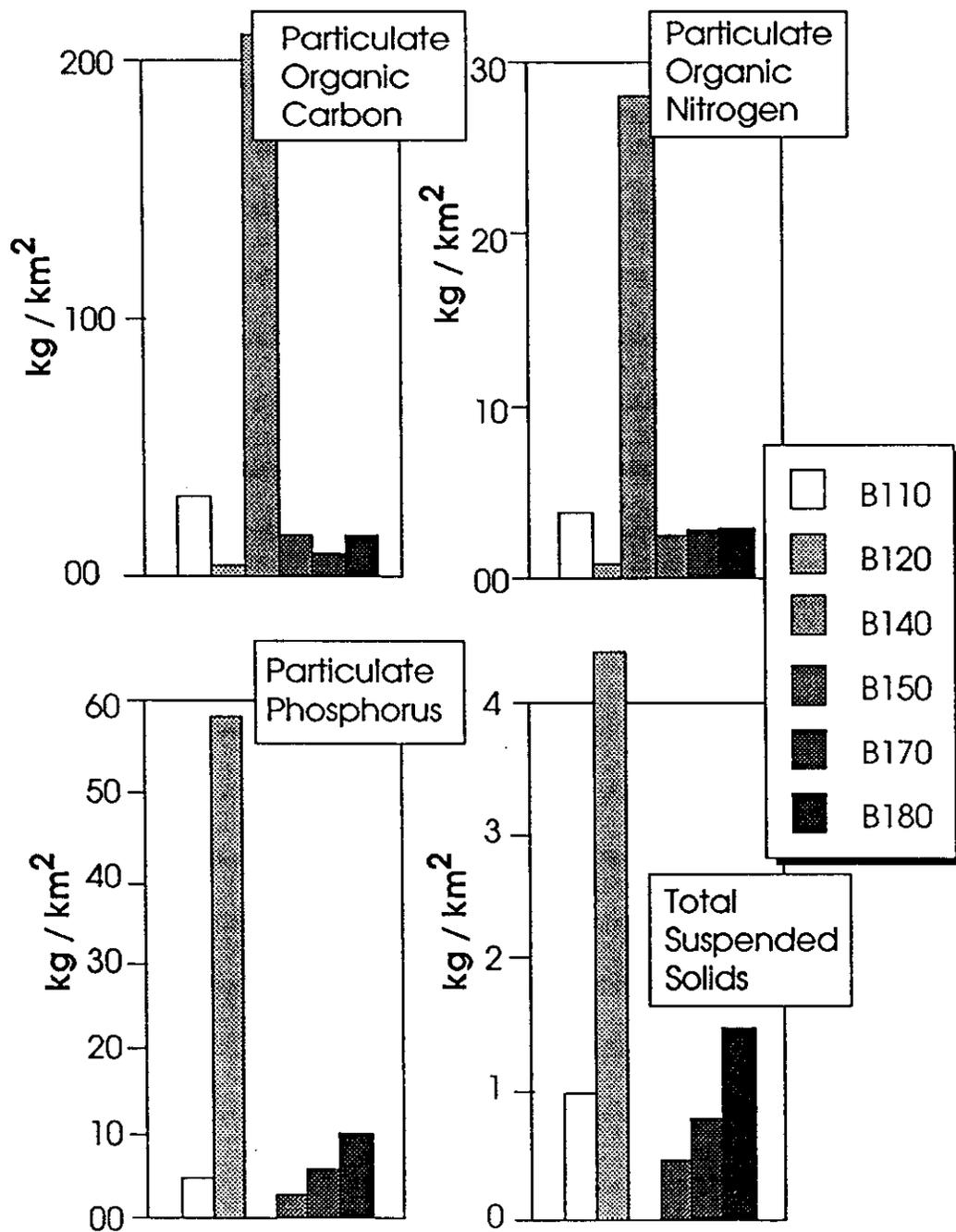


Figure 3. Comparison of mobilization efficiency of particulate substances from subbasins.

Estuarine Material Mass Balance

A mass balance approach can be used to obtain a better understanding of how the Myakka estuarine system processes material introduced in freshwater runoff. For this purpose, the estuarine data are averaged over the annual cycle. Data on the annual inputs of material are taken from Table R using the sums of the annual fluxes at B160, B170 and B180.

To make the mass balance calculations, the estuary is divided into eight sections, the volumes of which are estimated from the average cross-sectional area and length of the section (Figure 1). Each section is bounded on either end by one of the estuarine water sampling stations with the Myakka River Station B160 providing the freshwater boundary of the most up-estuary section. Because of the geometry of the estuary, the water volumes of the sections decrease going up the estuary (Table 1).

The average salinity of the water in each section can be estimated based on the mean salinity data for each station given in Table C. Based on these average salinities, the mean freshwater volume of each of the eight sections can be estimated (Table 1).

Averaged over an annual cycle, the estuarine system, comprising the eight sections, is assumed to be in steady state which means that the total content of a material in the estuary is constant and equal to the average content. The content of any substance is the sum of the concentrations in each section times the volume of the section.

Using freshwater as a tracer of conservative substances (i.e., those which are not removed or formed within the estuarine system) the residence time, T , of conservative materials can be calculated using the equation,

$$T = \frac{V_{fw}}{Q}$$

where V_{fw} is the volume of freshwater in the estuary and Q is the total freshwater discharge to the estuary. It is assumed that the freshwater input, Q , of $38.2 \times 10^6 \text{ m}^3/\text{y}$ to the system only occurs at the head of the estuary (i.e., through B160) although approximately $12.2 \times 10^6 \text{ m}^3/\text{y}$ of this input enters the estuary from the Deer Prairie and Big Slough watersheds. This has minimum affect on the calculations since all of the freshwater input enters in the upper 16 percent of the volume of the estuary (i.e., above Station E240).

Using the data in Table 1, the residence time of water in the Myakka Estuary is calculated to be *ca* 120 days or about four months. If nutrients delivered to the estuarine system are behaving conservatively, then they would also have an approximate 4 months residence time. If, on the other hand, they are trapped in the estuarine system, their residence time would be longer and this would be reflected in higher standing stock concentrations.

The mass balance of nutrients can be estimated by first assuming that they behave conservatively, thus their residence time, T , averaged over the annual cycle, would be the same as for freshwater. If such is the case, then the total observed content of a given nutrient in the estuary (i.e, the sum of the content of the eight estuarine stations), would be approximately given by the following equation,

$$C_{calc} = T \cdot I$$

where C_{calc} is the calculated content of the nutrient in the estuary, I is the total annual input of the nutrient and T is the residence time of water.

The difference between the observed and calculated content implies either a deficiency or an excess in the given nutrient. In other words, an additional input or removal term must be added to the above equation. This additional input or removal is needed to balance the input for the annual cycle.

The following discussion of nutrient mass balance uses the data presented in Table 2. In this table, the observed content of the nutrients in the estuary are compared to the calculated content assuming conservative behavior.

Carbon

The calculated content of dissolved organic carbon (DOC) is approximately three times higher than the observed content. This suggests that two thirds of the dissolved carbon input or about 1650 metric tons per year of DOC is lost or removed in the estuary.

Some of the DOC could be converted to particulate organic carbon (POC), but results (Table 2) indicate that only about 60 metric tons of the annual input of DOC could be annually accounted for by conversion to POC. Clearly, some additional DOC (i.e., above the 60 metric tons per year) could be converted to POC and buried in estuarine sediments, but it is more likely that most of the DOC is oxidized and lost as CO₂ to the atmosphere.

If it is assumed that about 1600 metric tons of DOC is lost by the following reaction:



Where 2.7 grams of oxygen are consumed for every given of organic carbon oxidized, this would exert an annual oxygen demand of 61 ppm averaged over the entire estuary. The daily demand would average 0.17 ppm but would be highest during the summer. Certainly an average daily oxygen demand of 0.5 ppm during the summer would not be unreasonable.

Nitrogen

Dissolved species of nitrogen (i.e., ammonia, nitrate and nitrite) are considerably depleted in the estuary relative to concentrations predicted based on conservative behavior (Table 2). The combined calculated content of dissolved nitrogen species is about 2,690 kg less than expected given the estimated annual inputs and assuming conservative behavior. This implies that about 8,150 kg, or approximately 74%, of the total 11,000 kg annual input is removed in the estuary.

The observed content of particulate organic nitrogen (PON) is about three times higher than the calculated content. This implies an additional PON input of approximately 8,240 kg per year. This additional input closely balances the dissolved nitrogen removal suggesting primary production within the estuary maintains the nitrogen balance. The average POC:PON ratio in the estuary of 7.4 is consistent with phytoplankton being the major form in which particulate carbon and nitrogen exist in the estuary.

These results suggest that, averaged over an annual cycle, the Myakka estuary does not recycle appreciable amounts of stored nitrogen (i.e., it does not act as a nitrogen sink).

Phosphorous

The calculated dissolved phosphate content of the Myakka estuary is about one and a half times higher than the observed content. This increase requires a removal of about 4,900 kg per year from the estuary. Some of this removal could be accommodated in phytoplankton uptake, but using a ratio of N:P of about 6.5 only about a fourth of the removal could be accounted for by this process.

The observed content of particulate phosphorous in the estuary is about sixteen times the calculated value, requiring considerable additional inputs. There is little doubt that most of the particulate phosphorous is associated with inorganic phosphate minerals which are efficiently trapped in the estuary. The large apparent additional inputs would be explained by resuspension. This along with the dissolved phosphate removal implies estuarine recycling of phosphorous. The mass balances of the nutrients, however, clearly indicate that phosphorous is not limiting in the estuary.

TABLE 1**Water Volume, Salinity and Freshwater
Content of the Myakka Estuary**

Estuarine Section	Water Volume (10⁶m³)	Mean Salinity (ppt)	Fresh Water (10⁶m³)	
1	E210-E220	12.3	21.1	4.18
2	E220-E230	4.78	17.2	2.21
3	E230-E240	4.72	12.8	2.83
4	E240-E250	1.46	9.1	1.04
5	E250-E260	0.78	6.9	0.61
6	E260-E270	0.71	4.5	0.61
7	E270-E280	0.55	2.4	0.51
8	E280-B160	0.72	0.75	0.70
Total		26.0		12.7
Annual Discharge				38.2

TABLE 2

Nutrient Content of the Myakka Estuary

Estuarine Section	NH ₄		NO ₃ + NO ₂		PO ₄		DOC		POC		PON		Part P	
	Conc. (mg/l)	Total (kg)	Conc. (mg/l)	Total (kg)	Conc. (mg/l)	Total (kg)	Conc. (mg/l)	Total (MT)	Conc. mg/l)	Total (MT)	Conc. (mg/l)	Total (kg)	Conc. (mg/l)	Total (kg)
1	0.017	209	0.009	111	0.111	1,365	7.7	94.7	0.86	10.6	0.10	1,230	0.42	5,170
2	0.019	91	0.016	76	0.133	636	9.8	46.8	0.96	4.6	0.13	620	0.42	2,340
3	0.022	104	0.022	104	0.160	755	12.3	58.0	0.85	4.0	0.13	614	0.46	2,170
4	0.026	38	0.025	37	0.189	276	14.8	21.6	0.81	1.2	0.16	234	0.40	584
5	0.026	20	0.027	21	0.207	161	16.3	12.7	0.83	0.6	0.16	125	0.35	273
6	0.026	18	0.031	22	0.227	161	17.8	12.6	0.88	0.6	0.13	92	0.34	241
7	0.029	16	0.036	20	0.247	136	19.0	10.5	0.93	0.5	0.13	72	0.36	198
8	0.043	30	0.042	29	0.247	173	19.8	13.9	0.79	0.6	0.13	94	0.38	274
Observed Content		526		420		3,663		271		22.7		3,081		11,250
Annual Input		2,800		8,200		16,000		2,470		6.7		1,100		2,070
Calculated Content		930		2,706		5,280		815		2.2		363		683

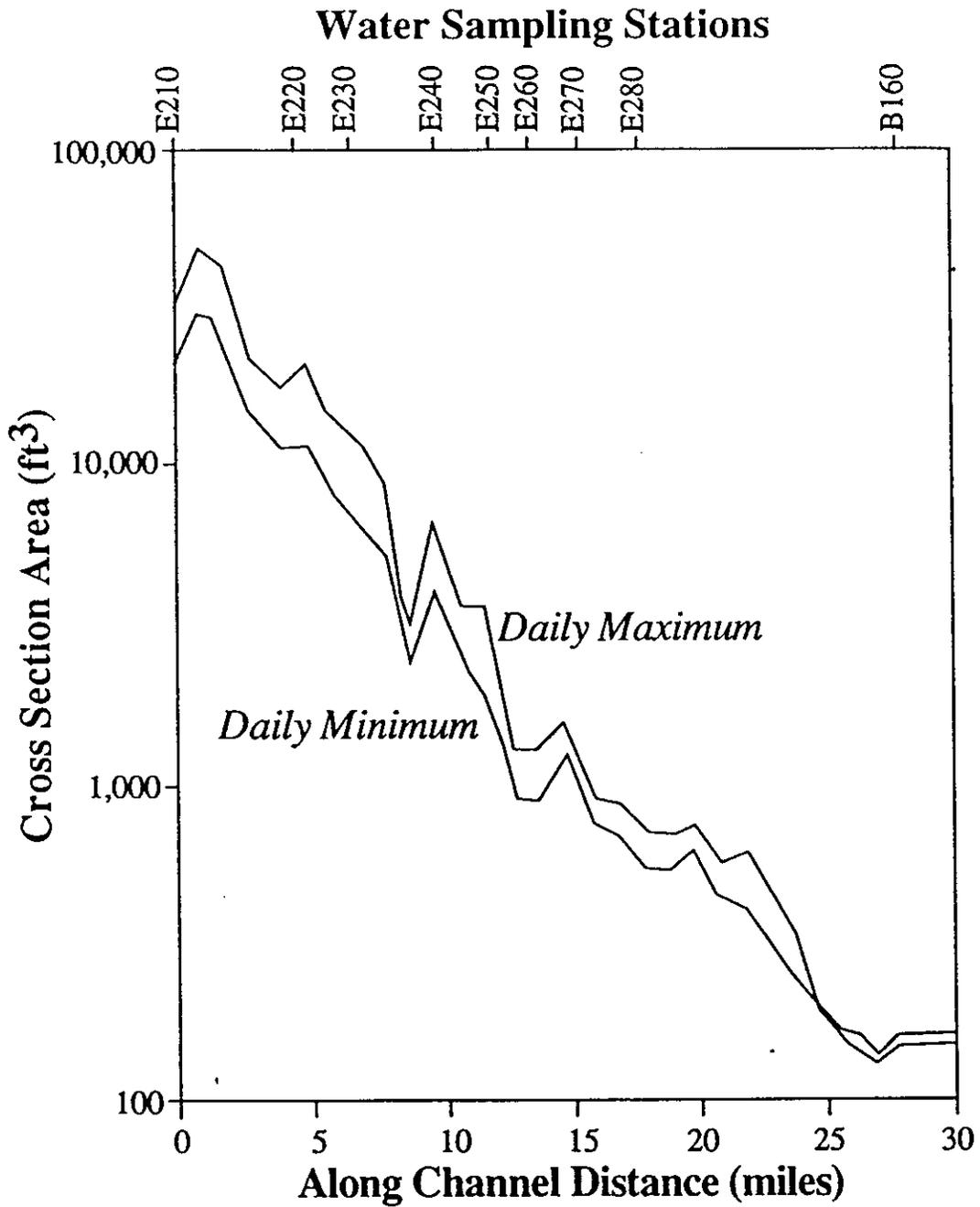


Figure 1. Cross-sectional area of the Myakka estuary versus distance along the estuary. Estuarine Section 1 is between E210 and E220, Section 2 is between E220 and E230, etc.

ATTACHMENTS

ATTACHMENT A

Resume of Dr. Robin Hart

ROBIN L. HART, Ph.D.

AREAS OF SPECIALIZATION

Environmental Research, Wetland Evaluation, Natural Area Assessment and Management, Environmental Policy

GENERAL EXPERIENCE AND EDUCATION

Assistant Director, Sarasota County Natural Resources Department. 1990-present

Independent Consultant. 1987-1990

Staff Scientist, Environmental Science and Engineering, Inc. (ESE), Gainesville, FL. 1980-1987

Associate Scientist, Envirosphere Company, New York. 1977-1980

Botany Instructor, Thomas Jefferson University, Philadelphia 1977

University of Pennsylvania. Ph.D. 1977

Cornell University. B.S. 1957

SELECTED ACHIEVEMENTS

Project Manager or Principal Investigator for the following projects:

Environmental Research

Literature review and report on values of isolated wetlands to fish and wildlife in Florida - Nongame Program of Florida Game and Fresh Water Fish Commission. 1989.

Field study of succession on agriculturally abandoned lands - Southwest Florida Water Management District. 1988.

Laboratory and field study of sulfur dioxide effects on lichens in Everglades National Park - National Park Service and University of Florida. 1985-1986.

Laboratory study of sulfur dioxide effects on lichens in Cape Romain, South Carolina - Amoco Realty Corp. 1985.

Field investigation of microclimate effects of vegetation clearing on remnant forest patches - Fairfield Communities. 1985.

Peat mining reclamation demonstration project and literature review to evaluate state wide impacts of use of peat for energy - New York State Energy Research and Development Authority. 1984-1985.

Literature review and laboratory study of acid deposition effects on Florida vegetation - Florida Electric Power

Coordinating Group and University of Florida. 1984.

Evaluation of studies conducted to determine fate and effect of priority chemicals on plants - Environmental Protection Agency. 1981.

Field study of wetland boundary delineation in wetlands in Florida and Georgia - Corps of Engineers Waterways Experiment Station. 1979.

Field and laboratory study of growth of weeds and endemic native plants on serpentine barrens - University of Pennsylvania. 1975-1977.

Wetland Evaluation

Evaluation and expert witness testimony on functional value of wetlands on Waccasassa Flats - Gilchrist County Commission. 1989.

Evaluation and expert witness testimony on functional values and impacts of a landfill on wetlands of Durbin Swamp - St. Johns County Commission; McCormick family. 1989, 1988.

Wetland assessments and boundary delineations for numerous proposed development projects to determine permitting feasibility and assist in land use design in Florida, North Carolina, South Carolina, New Jersey, New York, Kentucky, Mississippi, Louisiana - Reynolds, Smith and Hills; Haskell Company; many individuals and corporations in land development, utilities, mineral extraction, and industry. 1977-1989.

Assessment of hazardous waste on wetlands near San Jacinto River, Texas and Marianna, Florida - Texas Water Authority. 1983; Florida Department of Environmental Regulation. 1984.

Wetland reclamation plans: pumped storage project - Allegheny Power Corporation. 1978; coal mine in Montana - Westmoreland Resources, Inc. 1979; oil drilling site in Big Cypress National Preserve - Exxon Corporation. 1987.

Environmental inventory and assessment of vegetation along five tributaries to the Mississippi River - Army Corps of Engineers, Memphis District. 1979-1980

Natural Area Assessment

Lake George Basin Wildlife Habitat Management Study - St. Johns River Water Management District. 1990-1991

Assessment of candidate acquisition sites in Hillsborough County - Hillsborough County Parks and Recreation Department. 1989.

Vegetation community and floodplain assessment of proposed development site near Wekiva River - East Central Regional Planning Council. 1988.

Evaluation of air quality effects on vegetation and expert witness testimony in Cape Romain and Congaree National Monument; Smokey Mountains National Park and Sugarloaf Mountain; Everglades National Park; Broward County parks, Orange County - National Park Service; PEPCO (electrical utility); Florida Power and Light; Broward County; Orlando Utilities. 1981-1989.

Endangered plant species management plans in New Jersey, South Carolina, and South Florida - Atlantic Electric Co., Davy McKee-Takeda Corp.; Florida Power and Light. 1981, 1984, 1985.

Technical consultant for acquisition of endangered plant species habitat in Chester County, Pennsylvania - Nature Conservancy. 1980.

Endangered species survey in Gaspe and Newfoundland, Canada - Philadelphia Academy of Natural Sciences. 1975.

Environmental Policy

Recommended upland habitat rule for Development of Regional Impacts as member of Wildlife Advisory Group - appointed by Secretary of Department of Community Affairs. 1988.

Technical advisor to Florida electrical utilities during DER rule-making and legislative consideration of Wetland Protection Act - Florida Electric Power Coordinating Group. 1983-1984.

Technical advisor for wetland dredge-and-fill permitting, site certification, air quality permitting, mine permitting, siting studies, permitting feasibility studies, developments of regional impacts, and stormwater and wastewater treatment permitting for numerous developers, industries, and counties. Also reviewed development impacts for state and local government and regional planning councils. 1977-1990.

Testified during rule-making about wetland and upland mitigation; presented conference papers and authored articles about environmental policy. 1984-present.

PROFESSIONAL AFFILIATIONS

Ecological Society of America
Natural Areas Association
Society for Ecological Restoration

Society of Wetland Scientists
Florida Native Plant Society
Philadelphia Botanical Club

AWARDS AND GRANTS

Four research grants for conducting vegetation studies, including a National Science Foundation travel grant. 1974-1977. Elected as research associate to Philadelphia Academy of Natural Sciences. 1977-1980.

Trustee, Florida Defenders of the Environment. 1989-present.

PUBLICATIONS AND PRESENTATIONS (partial list)

- Hart, R. 1990. *Aster depauperatus*: A midwestern aster on eastern serpentine barrens? *Bartonia* 56: 23-28.
- Hart, R. and J.R. Newman. 1990. The Importance of Isolated Wetlands to Fish and Wildlife in Florida. Final Report. Non-Game Wildlife Program. Florida Game and Fresh Water Fish Commission.
- Hart, R., P.G. Webb, R.H. Biggs and K. Portier. 1988. The use of lichen fumigation studies to evaluate the effects of new emission sources on Class I areas. *J. Air Pollution Control Association* 38: 144-147.
- Hart, R. 1988. Protection of endangered species: Plants should have the same protection as animals. *The Palmetto*.
- Hart, R. 1987. Can biologists be trusted? *Environmental and Land Use Law Section Reporter* 9: 6-8.
- Hart, R., R.H. Biggs, P.G. Webb. 1986. The effect of simulated acid rain on growth and yield on Valencia orange, Floradade tomato, and slash pine. *Environmental Toxicology and Chemistry* 5: 79-86.
- Hart, R. 1984. Evaluation of methods for sampling vegetation and delineating wetland transition zones in coastal West Central Florida. Technical Report (Y-84-2). U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS.
- Hart, R. 1984. The Basis for Wetland Protection Examined with Special Reference to Recent Proposed Legislation in Florida. Fifth Annual Meeting of Society of Wetland Scientists. San Francisco, CA.
- Hart, R. 1982. Air Pollution Effects Research and Real World Exposures--An Information Gap. Annual Meeting Air Pollution Control Association-Florida Section. Tampa, FL
- Hart, R. 1980. The coexistence of weeds and restricted native plants on serpentine barrens in southeastern Pennsylvania. *Ecology* 63: 688-701.
- Hart, R. 1977. Why are biennials so few? *American Naturalist* 111: 792-799.
- Hart, R. 1976. An index for comparing weediness in plants. *Taxon* 25: 245-247.

ATTACHMENT B
Newspaper Article

Advisory Panel Recommends Watershed Land Purchase

By KATHERINE HUTT
Staff Writer

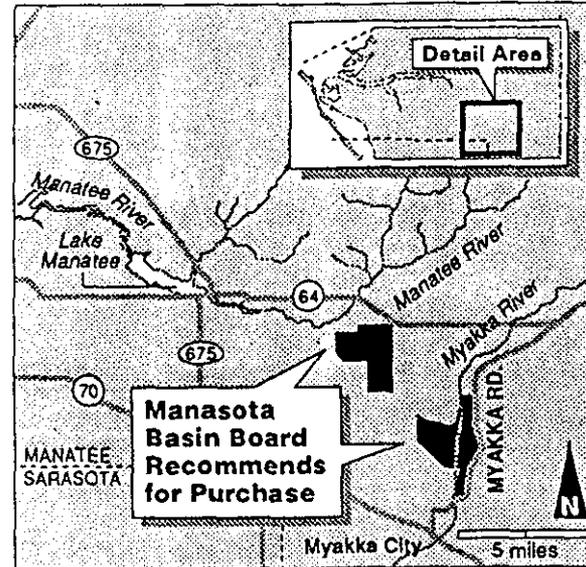
A plan for water managers to buy 4,493 acres of watershed lands to protect Manatee's drinking water supply and Sarasota's future water source won the blessing of an advisory panel Friday.

If, as expected, the land purchase is approved, it would be the first by the Southwest Florida Water Management District in Manatee County.

The Manasota Basin Board, five residents appointed by the governor to oversee funding of water projects in the two counties, decided to recommend that the water district buy land in the Lake Manatee watershed and another parcel along the Myakka River. Both properties are in Manatee County.

Under the recommendation, the water district, known as Swiftmud, would buy the parcels under a state preservation program called Save Our Rivers. It would get \$4 million from the state's Preservation 2000 program that finances the purchase of environmentally sensitive lands.

"I personally am delighted because this (Save Our Rivers) program has been going on for years and the district has been buying land all over creation but has never bought anything in the Manasota basin," said John Hamner, a Swiftmud governing board member and non-voting member of the



Manasota Basin Board members say purchasing these 4,493 acres will protect Manatee's current and Sarasota's future source of water. The governing board will consider the recommendation next week.

STAFF MAP

basin board.

The state established its Save Our Rivers program in 1981.

Swiftmud's governing board is scheduled to consider the basin board's recommendation at a meeting Tuesday and probably will approve the purchase, said Fritz Musselmann, director of land resources for Swiftmud.

The basin board voted 3-0 to recommend spending \$1.9 million to buy 2,136 acres of watershed lands that drain into Lake Manatee, which supplies drinking water to Manatee County and part of Sarasota County. The property is

south of State Road 64 and east of County Road 675.

Basin board members Edwin Rathke and Calvin Bryant were absent.

The board also voted 2-1 in favor of spending \$2.1 million to buy 2,357 acres of land along the headwaters of the Myakka River, about two miles north of Myakka City and immediately west of Wauchula Road.

The river flows through Myakka River State Park and pristine lands adjoining Sarasota County's future water supply on the T. Mabry Carlton Jr. Memori-

al Reserve. Eventually, it flows out into Charlotte Harbor, a state-protected body of water.

Board member Robert Spencer, who cast the dissenting vote, said he thought \$2 million was too much for land that is 70 percent wetlands.

"We're paying too much for swampland," Spencer said.

But board member Elizabeth Owen argued that if the land remains in private hands, it could be developed. Board member Doris Schember also voted for the purchase.

"I assume the appraisers valued it that high because they saw the potential in the future," Owen said.

Both parcels are owned by B/B Manatee Associates, a Florida general partnership, and are used for cattle grazing and hunting.

The proposed purchase in the Lake Manatee watershed is the first chunk of 24,000 acres the basin board and Swiftmud have agreed they want to buy and preserve, Musselmann said.

Manatee County, which has a long-standing policy of buying property to protect the lake, has spent \$36 million to buy 23,000 acres of watershed lands and 1,600 acres outside the watershed.

The proposed Myakka River purchase is a section of 7,700 acres that the basin board and Swiftmud have agreed they want to buy. Sarasota County Administrator John Wesley White said the purchase would dovetail with his county's goal to protect its T. Mabry Carlton Jr. Memorial Reserve.

"It's a very positive development and very consistent with the direction we'd like to see Swiftmud go in," White said.