

***A Critique of Water Management in South Florida***  
**Arthur R. Marshall, Ecologist**  
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## **INTRODUCTION**

I consider my time on this platform a moment of grace for me -- however fleeting. I genuinely thank the Board for inviting me. I suspect it was not easy for them to do. I consider their invitation a praiseworthy acknowledgement of the need for full and open communications between all parties in our difficult times - the kinds of communications essential not only to improving water management in south Florida but in respect to all the troubles of the region.

I hope, further, that this seminar is only the first of a series of similar enterprises.

Having just 20 minutes, I shall move rapidly ahead. For those who wish more details than I can give here, I shall supply your moderator with a copy of my recent paper, *Repairing the Florida Everglades Basin*. Please note 'Repairing' - not 'Restoring.' Repairing is possible; restoring is not.

## **GOALS FOR IMPROVING WATER MANAGEMENT**

In any human struggle we should first define its objectives - its goals. Where do we want to go?

There are six major goals which I consider top priorities in improving management of the water in the Everglades system:

1. Regeneration of muck in the Everglades. Muck - however prosaic it may seem - is the star indicator of the health of the system. Fortunately for all of us, it is a diagnostic sign which we can readily observe.
2. Reestablishment of wetland vegetation. Wetland vegetation is of course a necessary precursor to muck regeneration.
3. Enlarged populations of fresh water organisms - fish and shell fish - which are essential foods for people and wildlife.
4. Relief of stress on the endangered species of the Everglades, and on its mammalian species which are periodically decimated by high waters.
5. Enlarged populations of marine fishes and shell fishes in Florida Bay.
6. Enhanced recharge of the Biscayne Aquifer.

These all involve natural resources of increasing importance to South Florida's people and its wildlife. They are all interrelated by ecologic processes to such an extent that accomplishing one of them will cause improvement in all the rest. Conversely, failure to achieve any one of them will lead to failure in all the rest.

Ultimately, many Floridians will evaluate these objectives in terms of their worth to mankind. The values of four of them - muck for food production; marine and fresh water fishes for human

food; recharge of the Biscayne Aquifer for water supply - are evident in our world of increasing needs and diminishing resources.

It is not easy to recognize the value to people of wetland vegetation. Its contribution to the quality of drinking water - as I shall mention later - are also little recognized.

The value of birds and other wildlife? Some of us simply enjoy them. Others recognize that the well being of the Everglades's wildlife is linked in complex ways with the well-being of the people on the Gold and Treasure Coasts. Everglades wildlife thrives on extended hydroperiods; on wetland vegetation; on the generation of muck and on the bountiful production of marine and fresh water organisms - just as people do.

## **INEVITABLE ECOLOGIC PROCESSES**

My second purpose here is to describe a particular set of ecologic functions and processes which cannot be ignored in seeking to achieve the six objectives. In whatever decision result from this conference and others to follow, these processes will be functioning - beneficially or adversely.

The first is "sheet flow." Some refer to it as "extended hydroperiods." I prefer the "River of Grass" because that term implies vital ecologic functions which neither of the two physical terms provide.

In order to generate muck, seven to eight months of surface sheet flow are required. Four or five months of surface flooding will produce wetland vegetation. Another three or four months of flooding, or at least of saturation, are required to convert the annual detritus (leaf fall) of wetland vegetation into muck. If wetland detritus is dried soon after the rainy season, it will pass by means of oxidation into the atmosphere rather than into the muck bed.

If we achieve an extension of hydroperiod sufficient to produce muck, the Everglades system will also produce more forage fishes and shell fishes for wading birds and other wildlife; increases in the larger fresh water fishes and the marine fishes sought by man; increased recharges of shallow aquifers.

There is also the possibility - in accord with concepts developed by Dr. Patrick Gannon - that additional rainfall on south Florida will be induced.

When we have hydroperiod shortfalls, muck is decomposed rather than produced. This not only releases the nutrients stored in the plant tissues - as is well known - but also leads to the transport of finely divided muck particles in flowing canal waters. The blankets of ooze lying on the quiet bottoms of the St. Lucie Estuary have for many years demonstrated the effects of that kind of transport.

It is also possible that decomposition of muck and transport of its fine particles add to the organic load in Miami's drinking water which requires chlorine treatment. This has not to my knowledge been investigated, but it surely should be. If this does happen, then we have a seventh

major objective beyond the six I have listed - a reduction in that organic load by replacing muck decomposition with its regeneration through an extension of the hydroperiod.

An extremely important character of sheet flow is that it involves moving - rather than standing - water. Water moving through the Everglades, no matter how slowly, produces muck. Standing water produces ooze as is well-demonstrated in Conservation Area 2A. I do not know why this is so; I can find no one who does. The differences in the products of water moving - even at the slow rate of 20 feet per day - and water standing are marked - muck or ooze. I think it is akin to the dramatic difference between being old and being dead.

The adherence to water regulation schedules in the three Conservation Areas is antithetical to extension of sheet flow in the Everglades. It is not possible to manage water with emphasis being placed on the vertical component and to recreate extended sheet flow on a horizontal plane through the system.

None of these characteristics of sheet flow are difficult to understand. They do require more contemplation than we can enjoy here and I ask that you do that in your leisure.

## **THE MARSHALL PLAN**

There are other issues in the Everglades system but these are enough to indicate my thinking, Time shortens and I now move on to the "Marshall Plan" for improving water management in the system.

I begin with the Kissimmee Lakes. Their existing water quality problem - as exemplified by Lake Tohopekaliga - must be resolved by some means other than discharge of wastes into them. Some years ago, there was widespread acknowledgement that "dilution is no solution to pollution."

I would dechannelize the lower Kissimmee. In addition to the benefits envisioned by the Legislature - benefits expected largely within the lower valley and Lake Okeechobee - dechannelization has great potential for slowing the inflow of the whole valley into Lake Okeechobee. Not only would that be desirable in periods of water deficiency as Okeechobee is now experiencing, but it could also provide an extension of sheet flow south of the lake to enable muck regeneration now and in the future.

Following removal of the "hump" in the Miami Canal, I would pass Kissimmee- Okeechobee waters **through** the present agricultural area via that canal as slowly as possible into the Holey Land and Rotenberger Tracts. Where it is possible, I would also return good quality waters which now go to tide, and which are not necessary to maintenance of marine productivity, to the Holey Land and Rotenberger Tracts or to Conservation Area Three. The purpose of such re-diversions would not be solely to increase the depth of waters in the rainy season, but primarily to extend the period of sheet flow after the end of the rains.

I would sheet the water through Conservation Area Three by: culverting its north levee and Alligator Alley; by blocking the Miami Canal, and the Alley's borrow canal and the Conveyance Canal for L-67-A; and by opening the S-12 structures for flow into Everglades National Park.

I would establish hydrologic connections between Area Three and the Big Cypress Preserve. I would reestablish sheet flow into the North East Shark River Slough. I would refill that portion of Canal 111 which lies under U.S. Highway 1, and all of Canals 109 and 110 now existing.

I would restore the Turner River in the Big Cypress Fresh Water Preserve.

As the agricultural muck diminishes over the years around the Holey Land and Rotenberger Tracts, I would periodically move the line of reflooding northward.

These actions can return sheet flow to hundreds and perhaps a thousand square miles of the Everglades system. They can teach us how to restore muck; the water regimes which are required to do it; and how rapidly we can do it with the nutrient-enriched waters we have available in the system today.

Every objective I presented earlier would be benefited.

## **SUPER SOLAR BENEFITS**

All of the benefits achieved by the plan of repair would derive from solar energy. Which is itself another prime objective of our day.

The great "River of Grass" served as a giant "solar panel" in the pristine Everglades. All of the rich resources of the Everglades were produced by solar energy operating through its surface sheet flow. The sun is still there.

Restoration of sheet flow can utilize enormous amounts of solar energy to produce the valuable benefits I have described. Solar panels on the roofs of the Gold Coast would provide hot water only - no muck; no aquifer recharge; no food for wildlife or people; no improvement in water quality. In further comparison, in terms of total solar energy utilized, a solar panel on every roof of the Gold and Treasure Coasts would fall far short of the amount utilized by a repaired "River of Grass."

## **OTHER SUBSCRIBERS**

There are others beside myself who are moving in these directions, or at least analyzing the possibilities:

The National Park Service, the Fish and Wildlife Service, the Corps of Engineers and the East Everglades Resources Planning Project in their reviews of the North East Shark River Slough.

The Fish and Wildlife Service in its review of water supply augmentation in South Florida.

The Florida Game and Fresh Water Fish Commission in its recent publication on the Fishery Resources of Florida.

Walt Dineen contemplated some major aspects in "Life in the Tenacious Everglades" - 1972, and in "Examination of Water Management Alternatives in Conservation Area 2A", 1974.

Dan Haunert ventured into possibilities for conserving fresh waters for return to the Everglades in his review of the effects of fresh water discharges into the St. Lucie Estuary, 1980.

The Governing Board of the District and the Corps of Engineers have certainly moved on the sheet flow issue by construction of S-339, S-140 and allied structures in Conservation Area 3A. They are also involved in the matter by the planned three-year drawdown of Conservation Area 2A.

And, of course there are legions of conservationists in and out of Florida who are eager for the repair of the Florida Everglades.

All of which are thoughts related to the well-being of south Floridians and south Florida's wildlife from an ecologic derivation.

## **GOOD NEWS**

In the event efforts are implemented to extend sheet flow in the Everglades, I suggest that these items be monitored.

1. Recharge of the Biscayne Aquifer
2. Increases in muck
3. Extent of reestablishment of sheet flow
4. Extent of reestablishment of wetland vegetation
5. Ooze siltation in the St. Lucie Estuary, Conservation Area 2A and the ponding which occurs just north of the Tamiami Trail in Conservation Area 3A
6. Water quality in respect to organic loading in Miami's well fields
7. Responses of bird life and terrestrial wildlife
8. Responses of fresh water and marine animal populations for both bird forage and human food
9. Effects on rainfall under the concepts of Dr. Gannon
10. Effects on exotic trees - Melaleuca, Brazilian pepper, etc.

In connection with these, I have long thought that researchers who follow the condition of the Everglades would find monitoring its recovery much more enjoyable than monitoring its degradation.

I thank each of you. Have fun in your shirt sleeves as I have had in mine.