Lake bottom to farmland, a full solution for the entire Everglades.

Dr. Dan Canfield is a University of Florida professor who specializes in the management of aquatic systems and is one of LORI's valued scientific advisors. Working with colleagues from around the US and the European Union, they developed a concept called "**Put the land Back on the Land**" to address problems associated with the loss of organic topsoil on agricultural lands and the eutrophication of waterbodies due to the presence of decades of legacy nutrients. This concept was formulated because governments worldwide recognize the loss of organic topsoil, and the eutrophication of waterbodies pose national security risks. Technologies have also been developed where removed waterbody bottom sediments can be rapidly dewatered with treated water returned to that waterbody. The dewatered sediments that will be used on croplands also have unwanted debris removed and made truckable so that receiving farms can spread the material with on-hand farm implements.

The restoration of Lake Okeechobee has been much delayed because of past system alterations and, in large part, because of the wind resuspension of bottom sediments adversely affects water quality, making the "Liquid Heart of the Everglades" an excellent candidate for a Put the Land Back on the Land program. The fluid muds (mixotrophic sediments) and the underlying consolidated sediment can be vacuumed from the lake's bottom, dewatered, and then deposited on drained Everglades Okeelanta muck soil, This soil is now farmed for sugar cane and vegetables, strategically important crops for the nation.

The Everglades Okeelanta muck soil developed over thousands of years as organic materials from dying marsh plants like sawgrass [*Cladium jamaicence*] accumulated and wind resuspended sediments and nutrients leaving Lake Okeechobee during high water periods were trapped. The loss of these sediments to the Everglades provided a self-cleansing mechanism for the lake until lake levels were lowered and the Hoover dike was completed. By greatly restricting the southern flow of water, nutrient-rich sediments accumulated in the lake, shallowing the lake and reducing water storage capacity.

In 2023/24, Lake Okeechobee discharges to the St. Lucie River [SLR] follows the > 100,000ac.ft/yr. discharges of 1980,1983,1984, 1988, 1993, 1994, 1995, 1996, 1998, 1999, 2000, 2003, 2004, 2005, 2010, 2013, 2016, 2017, 2018.[O'Laughlin, Gilio J.L., 2018 white paper. These discharges were governed by Lake Okeechobee's water level guidelines which were developed to serve a multiplicity of stakeholders, but the guidelines are a prime example of Einstein's concept of lack of real solution. Missing is the critical need for a major water quality [WQ] improvement in Lake Okeechobee itself. A completed Comprehensive Everglades Restoration program (CERP) program will never eliminate discharges to the SLR via the C-44 man-made canal or excessive flows to the Caloosahatchee River [CAL]. Periods of no discharges followed by damaging discharges of sufficient volume and duration have returned these partially restored ecosystems back to past severe conditions. This continues to be a repetitive problem. WQ improvement of the lake water itself is the only solution to achieving fewer and less damaging discharges to the SLR and CAL with the aim of some net permanent ecosystem restoration. Better WQ in Lake Okeechobee would create conditions

where larger water volumes could be discharged south in conjunction with on-going CERP projects and established marsh treatment systems reducing water volume releases and pollutant loads to CAL and SLR.

The failure to achieve restoration of Lake Okeechobee after years of hard work and the expenditure of hundreds of millions of public funds requires a long overdue paradigm shift in our approach to restoration. Acceptance, funding and implementation of a new paradigm by stakeholders and agencies will be resisted unless the current water quantity policy shortcomings are clearly elucidated and ultimately accepted by all. LORI's job is to educate all stakeholders as to why the Put the Land Back on the Land approach is a win/win/win solution for all stakeholders.

There are two [2] distinct operations in converting lake bottom to farmland. First is "vacuuming" both mixotrophic and bottom consolidated sediment, dewatering, and depositing the truckable sediments in a select EAA area. Because the material is dry, the area will not need a retention dike. EAA acceptance will be predicated upon the new soil being EPA and USDA acceptable for sugar and vegetable crops. Currently the EAA must not change operations if there will be an increase in the discharge of total phosphorus over current levels. Placing dry material on the land should minimize any phosphorus losses, but more importantly decades of legacy sediment phosphorus will be removed from Lake Okeechobee.

The second operation is to replace cattails and accumulated muck in the existing SW marsh. Demucking cattail and retained muck soil to original base sediment will provide an organic rich dredge soil for farmlands. This will permit more desirable vegetation to develop, especially submersed vegetation in the lake.

Five potential negative conditions might negate the lake bottom to farmland concept: Everglades Agricultural Area [EAA] voluntary acceptance of "dredge" soil is unknown, agricultural suitability may be unacceptable for some crops, potential short-term increases in dredged location turbidity, possibility of mixotrophic layer quickly re-established, duration of the project and cost.

If EAA farmers reject dredge lake soil for unsuitability or business reasons, LORI will seek funding for alternative non-agricultural dredge soil uses. The lake muds are low in organic carbon [15%], high in settable solids [55% water] and possibly suitable for non-residential construction [Khan, A. 2000].

Assuming these negatives do not exist and/or are overcome, the net anticipated concept result is a lake bottom of reduced mixotrophic thickness and consolidated sediment with increased water clarity. That improvement should allow existing native submergent grasses [SAVs] to grow and spread over this dredged area increasing overall lake SAV coverage and into deeper waters with increased sediment stabilization. Increased SAV acreage will provide better habitat for bass, bream, catfish and invertebrates formerly typical of Lake Okeechobee and other shallow sub-tropical lakes.

The marsh area can be replanted and/or repopulated by native spike rush [*Eleocharis* spp.] and bulrushes *Schoenplectus californicus* as well as interdigital SAV's as I have found in Treasure Coast retention lakes.

Parties involved in lake bottom to farmland and their wins are:

1. EAA farmers: renew muck soil thickness and extend farm duration,
2. Lake communities that take potable and irrigation water from Lake Okeechobee have better water quality and greater storage capacity,
3. Fishers of Lake Okeechobee: recreational, Bass Anglers Sportsmen Society & Bass Pro shops: more 5-7 lb. bass, more trophy bass, greater fishing areas, easier access within new marshes.
4. Audubon: Larger marsh area, more snail habitat, larger aquatic bird areas,
5. Duck hunters: larger duck potential habitat, easier marsh access,
6. South Florida Water Management District: better Lake Okeechobee WQ means greater functionality of CERP projects, more lake water south, better WQ to Caloosahatchee, lower or possibly no discharges to St. Lucie River.
7. Army Corps of Engineers: greater water volumes discharged south puts less Lake Okeechobee System Operating Manual [LOSOM] pressure on releases to northern estuaries and increased water volume storage from consolidated sediment removal.
8. River Communities of CAL and SLR: LaBelle, Ft. Meyers and Stuart, respectively: better and ideal volume WQ releases to CAL leads to higher ecosystem in river and downstream; less to no discharges to SLR means it can finally be treated to remove lake released muck deposits,
9. Lake Worth: ibid
10. Eight million+ residents of Broward, Dade and Monroe counties: for potable water from the Biscayne aquifer's rainfall and south flowing discharges from Lake Okeechobee.

Sincerely,

Joseph L Gilio, PWS emeritus, CERP, LORI President

References

Khan, A. Lake Okeechobee Sediment management, HDR engineering, WPB, FL [2000 white paper]

O'Laughlin and Gilio, J.L., "Outside the Box"[1] Options for the EAA Reservoir/STA Project January 22, 2018, white paper.