

CONCEPTUAL “ SOLAR MARSH”: COMBINED STORMWATER TREATMENT AREA and ELECTRIC GENERATION

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SUMMARY PROPOSAL (CONCEPT)

It is proposed that Florida Power and Light (FP&L) or another electrical provider, in fiscal and managerial cooperation with the State of Florida, Palm Beach County, the South Florida Water Management District (SFWMD) and the US - Army Corps of Engineers (US-ACE) District, with academic support from the State University System, investigate, design, build and operate a co-operative solar power generation array co-located with (i.e. over) a filtering marsh (aka Stormwater Treatment Area {STA}) in western Palm Beach County.

REASONS

- Obtain clean ('green') energy and offset future expansion of greenhouse gas releases.
- Need for water storage and filtration south of Lake Okeechobee (78% vote for Amendment 1)
- Job creation on EAA lands removed from production (construction, maintenance etc.) and counters 'job loss' arguments re the EAA.
- Growth Management (removed lands from future development and sellers have profit).

LIGHT & PHOTOSYNTHESIS

- Figure 1a is the solar spectrum with the visible portion delineated. Wavelengths from 400-700nm is Photosynthetically Active Radiation (PAR) and results in photosynthetic production as in Figure 1b.
- Consider solar panels that generate electricity using all of the spectrum except PAR radiation. They exist. So do panels that use all of the spectrum but are tailored to transmit a specified percentage. The marsh could easily still function.

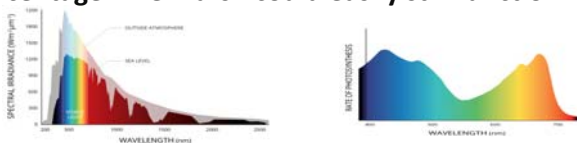
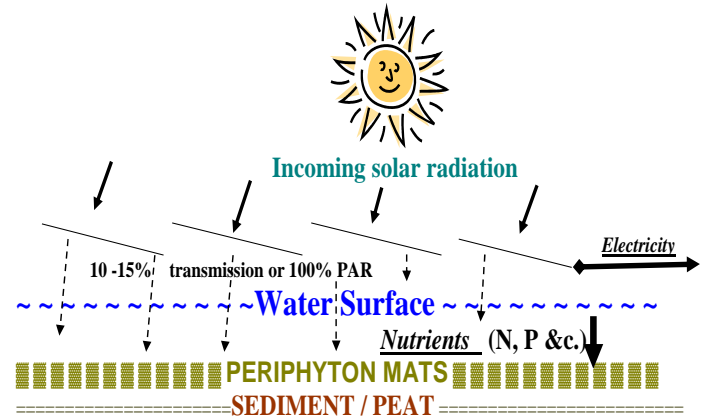


Figure 1. (a) Solar spectrum. (b) Photosynthetic response between 400-700nm (PAR)

Figures from <http://www.fondriest.com/Environmnetalmeasurements>

GRAPHIC CONCEPT



Will need novel engineering: track the sun, allow for marsh maintenance, etc. (Panels to rotate vertically ??)

EVERGLADES PERIPHYTON

- Periphyton in the Everglades receives much more light that it needs for optimum photosynthesis. I say this since analyses show that the microalgae and cyanobacteria produces large quantities of sunscreen pigments (Louda et al., 2015) to eliminate photoinhibition and potential generation of reactive oxygen species (ROS).
- The UV and Visible sunscreen scytonemin-imine is also present and has been shown to only be synthesized in extremely high light conditions (Grant and Louda, 20)

REFERENCES

- Grant C. and Louda J.W. (2013) Scytonemin-imine, a mahogany-colored UV/VIS sunscreen of cyanobacteria exposed to intense solar radiation. *Org. Geochem.* 65: 29-36.
- Louda J.W., Grant C., Browne J. and Hagerthey S.E. (2015) Pigment-based chemotaxonomy and its application to Everglades periphyton. In: J.A. Entry, K. Jayachandran, A.D. Gottlieb and A. Ogram (Eds.) *MICROBIOLOGY OF THE EVERGLADES ECOSYSTEM*. Science Publishers, Chpt. 13, pp. 287-347 plus Appendices pp. 455-468.