From:	Boughton, Elizabeth
To:	Olson, Steffany
Cc:	Swain, Hilary
Subject:	RE: <External>RE: 40E- 61 Archbold Biological Station comments
Date:	Friday, December 13, 2019 2:58:35 PM
Attachments:	image002.png image003.png Archbold_BIR_40e-61Comments.pdf

Hi Steffany,

Here they are.

Thanks,

Betsey

Elizabeth (Betsey) Boughton | Program Director, Agroecology | Associate Research Biologist
Phone: (863) 699-0242 ext.2 | Mobile: (863) 840-3673
eboughton@archbold-station.org

Archbold Biological Station
Buck Island Ranch
300 Buck Island Ranch Road
Lake Placid, FL 33852

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From: Olson, Steffany <solson@sfwmd.gov>
Sent: Friday, December 13, 2019 2:30 PM
To: Boughton, Elizabeth <eboughton@archbold-station.org>
Cc: Swain, Hilary <hswain@archbold-station.org>
Subject: <External>RE: 40E- 61 Archbold Biological Station comments

Hi Betsey,

I didn't receive the 2-page document with this email. Would you please resend?

Thanks,

Steffany Olson
Supervisor, Environmental Analysts
Ecosystem Restoration & Capital Projects Division
South Florida Water Management District
3301 Gun Club Road, MS 8410 • West Palm Beach, Florida 33406
561 682-2759 • 800 432-2045 Ext. 2759

From: Boughton, Elizabeth <eboughton@archbold-station.org>
Sent: Friday, December 13, 2019 12:04 PM
To: Olson, Steffany <solson@sfwmd.gov>
Cc: Swain, Hilary <hswain@archbold-station.org>
Subject: Re: 40E- 61 Archbold Biological Station comments

Dear Steffany,

On behalf of Archbold Biological Station's Buck Island Ranch, we are submitting a 2-page document summarizing lessons learned at Buck Island Ranch from years of research evaluating water quantity and quality on a working ranchland ecosystem, including:

1. A short summary of the issue of legacy P in sandy, acidic ranchland soils,
2. Our work on evaluating BMPs and Dispersed Water Management projects,
3. Potential future solutions, and
4. Our thoughts regarding regulations and new/changing policies for agricultural lands with a low financial return on investment.

Thank you for the opportunity to comment. Please contact us if you have any questions; we are happy to assist the SFWMD on issues regarding ranchland ecosystems and environmental issues in the Headwaters of the Everglades. We are here for you if you need us!

Sincerely,

Betsey Boughton and Hilary Swain

Elizabeth (Betsey) Boughton | Program Director, Agroecology | Associate Research Biologist
Phone: (863) 699-0242 ext.2 | Mobile: (863) 840-3673
eboughton@archbold-station.org

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Buck Island Ranch
300 Buck Island Ranch Road
Lake Placid, FL 33852

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Buck Island Ranch

Archbold Biological Station's Buck Island Ranch (BIR)

Background

Legacy phosphorus (P) is an important issue in ranchland sandy, low pH soils:

- At BIR, we ceased P fertilizer in 1986, and in an experiment conducted >15 years after stopping P fertilizer, improved pastures still had 5-7x the Total P loading (concentration x flow volume) compared to native pastures (never fertilized) (Capece et al. 2007).
- A Uranium-tracer study (Zielinski et al, 2006) showed that most of the Total P leaving the pastures was fertilized-derived. P fertilizer was applied from 1940's-1986 at BIR.
- Long-term ('90's to current) N and Total P concentration has been monitored at 15-20 sites at Archbold's BIR (some edge of field, others edge of ranch). Analysis was done at BIR's chemistry lab. Average concentration of Total P at edge of ranch was 0.24 ppm integrated across ~50% improved and 50% semi-native and native pastures (10,500 acres).
- There has been no significant change in water Total P concentrations over time despite extensive implementation of BMPs at BIR (e.g. solar wells, cross fencing/rotational grazing, supp feed placement, soil/forage testing, fire, ditch cleaning, etc.).
- Further funding is needed to undertake detailed analyses of Total P concentration data in relation to hydrological, meteorological, and land management drivers.

Assessment of Best Management Practices (BMPs)

2. We agree with recent reports (e.g. Blue-green Algae Task Force) that emphasize the need for **more experimental assessment of individual BMP effectiveness** in the Northern Everglades watershed. However, there have been several publications on BMPs in grazing lands with sandy soils with high legacy P loading (e.g. Clark, Reddy, Silveira).
3. Further research is also needed to undertake detailed analyses of P concentration and P loadings in relation to multiple BMPs on P concentrations at BIR.
4. **Reducing stocking density (cows) at BIR did not reduce Total P loading from pastures (Capece et al. 2007).** We compared no cattle, low, medium, and high stocking densities and found no difference in Total P discharge. However, Total P loading from previously fertilized improved pastures was > never-fertilized unimproved pastures.
5. **Water retention reduced Total P loads in average years, but can risk increased Mehlich-1 P release from soils under high flooding conditions** (Villapando and Bohlen, 2011). There is a need for long-term measurements of P releases in relation to management and flooding under dispersed water retention.
6. **A WAM model of BIR** conducted by SFWMD modeled a **reduction of 16-19%** in flow and Total P loading with 0.25 - 0.5 inch of water retention across the improved and semi-native pastures (Zhang et al. 2006).
7. Measurements under Dispersed Water Management (DWM) (e.g. Northern Everglades Payment for Environmental Services (NE-PES)) and Florida Ranchlands Environmental Services Program (FRESP) and BIR modeling indicate a ~20% reduction in flow as well as a reduction in peak flows under water retention (Shukla et al. unpublished).

8. **Water retention reduces flow and N loading by ~ 50% from improved pastures.**
9. **Natural and modified wetlands may offer high nutrient removal.** The active pumping project at Lyke's West Waterhole has retained, on average, ~76% of P entering the ~2,500-acre marsh (on average ~6.4 metric tons of P/year), over a10 year period.
10. Harvesting of haylage shows early promise for P removal at BIR**.**
11. BIR has not applied biosolids and has no research data on the impacts of biosolids or AA fertilizer on water quality.

Future Solutions

12. DWM (including NE-PES, NE-PPP) and USDA wetland restoration easements (WREs) retain shallow water on ranchlands. BIR research has documented that DWM projects provide water quantity and quality improvements and benefits to wildlife, biodiversity, and wetland health (Boughton et al. 2019).
13. **Scaled-up modeling north of Lake Okeechobee is needed to assess expanded DWM at a watershed and basin-wide scale** for water quantity, quality and timing of P and N loading, as well as relative to other proposed storage and treatment projects. Large-scale, spatially-explicit modeling is needed (Graham et al. 2015, Bottcher 2018) for all six sub-basins in the 2.67 million-acre Headwaters watershed and would indicate where DWM would be most effective in the landscape.
14. **Innumerable small seasonal wetlands** embedded in ranchlands of the N. Everglades watershed have **high diversity of plants and animals** (Medley et al. 2015)**.** Conservation, restoration, and DWM in these wetlands **provides multiple benefits, i.e. synergies, to society including** biodiversity, carbon and nutrient cycling, as well as water retention, and is compatible with livestock production.
15. Development of P budgets (inflows, stocks, outflows) is needed at the beef cattle ranch enterprise scale (underway at BIR and UF-Ona) and at the regional scale in relation to different land uses (underway by UF – Silveira et al.)

Regulations and New Policies and Programs

- Need to address sandy soils, extensive legacy P, subsurface flow, and an extensive matrix of semi-native, native, and improved grassland habitats.
- Need to conduct modeling and assessments to **avoid inadvertent consequences of increasing regulations or changing policies in agricultural lands** with a low financial return on investment. Potential consequences are:
  - **Increased risk of land use intensification** (e.g. from native or improved pastures to crops (e.g. sugar, turf sod) or development
  - **Concomitant declines in water quality and quantity with intensification of land use**
  - Need to model socioeconomic consequences
  - Declines in biodiversity and landscape connectivity with land use intensification
- Compare the flexibility of options with grazing lands for conservation/restoration/water retention in contrast to row crops or development
- **What new regulations and policies could provide incentives and opportunities for ranchers to remain economically sustainable?** – e.g. providing alternatives to crop intensification or land use sale for development – while retaining biodiversity and enhanced water retention.