Restoration Strategies Operations Study

November 19, 2013

Walter Wilcox
Section Leader
Hydrologic & Environmental Systems Modeling

Study Background

The study "Development of Operational Guidance for FEB and STA and Regional Operation Plans", commonly referred to as the RS Operations Study seeks to answer the following key questions:

- How can the FEBs be designed and operated to moderate phosphorus concentrations and optimize phosphorus loading rates and hydraulic loading rates entering the STAs, possibly in combination with water treatment technologies, or inflow canal management?
- What operational or design refinements could be implemented at existing STAs and future features (i.e., STA expansions, FEBs) to improve and sustain STA treatment performance.

Operations of the existing and planned infrastructure is a broad area of inquiry. The study approach for addressing this area takes the "long view" with multiple phases over the next 10 to 12 years.

Restoration Strategies Operational Considerations

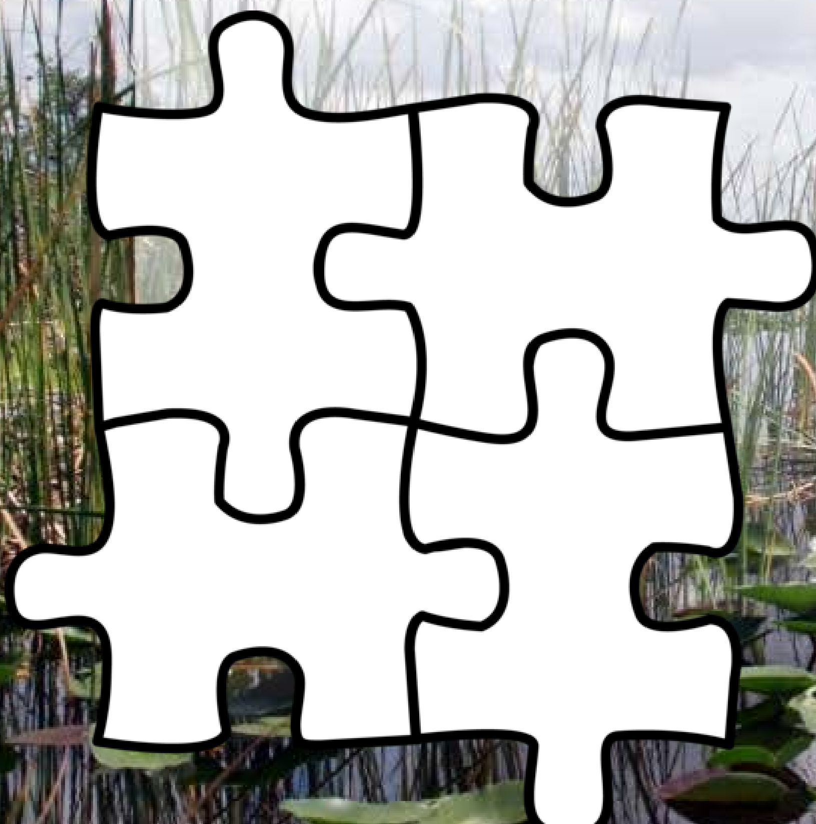
- State of the STAs & FEBs
    - Achieve P Treatment Objectives
    - Constraints
- State of the regional system
- Flexibility and/or limitations in infrastructure or operational control
- Regulatory framework
- Temporal and spatial considerations
- Others…

EACH CONSIDERATION IS ITS OWN PUZZLE PIECE…

EXAMPLE CONTROL ROOM CONSIDERATIONS

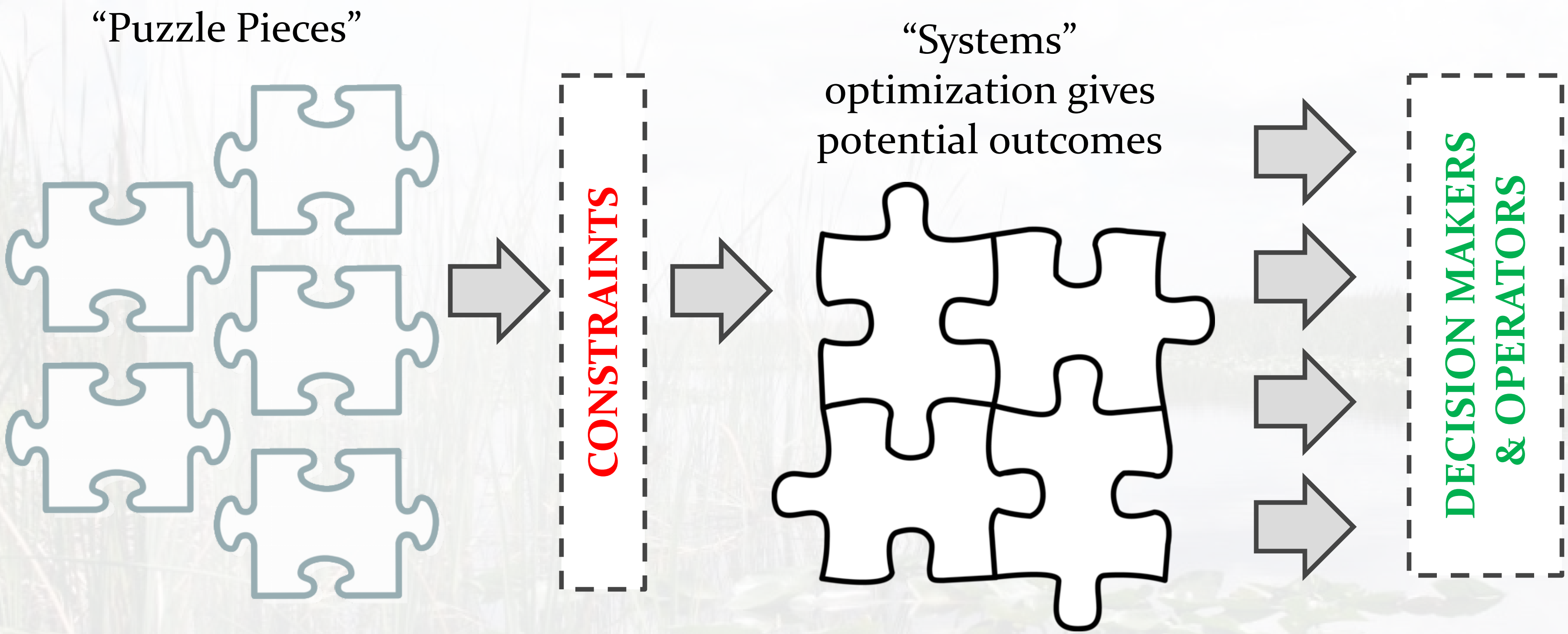
- Decision point: Water Managers / Technicians / ODSS / Others
- Pump operator shifts
- Temporal scale at which decisions need to be made
- Limitations in infrastructure / hydraulics
- Others

"SYSTEMS" THINKING AND OPTIMIZATION HELP US TO PUT THE PUZZLE PIECES TOGETHER TO PROVIDE INPUT TO DECISION MAKERS AND OPERATORS IN REAL TIME



- The primary goal is to develop a decision support system
- Likely this will wind up being a two-tiered system with constraints considered up front and then flexibility within allowable operations displayed in a risk/tradeoff context
- A "communications system" is envisioned that will explain and archive the rationale for decisions.

Example: A possible form of the decision support system



Note: A suite of potential outcomes is expected from the decision support system, likely characterized in a risk/tradeoff context.

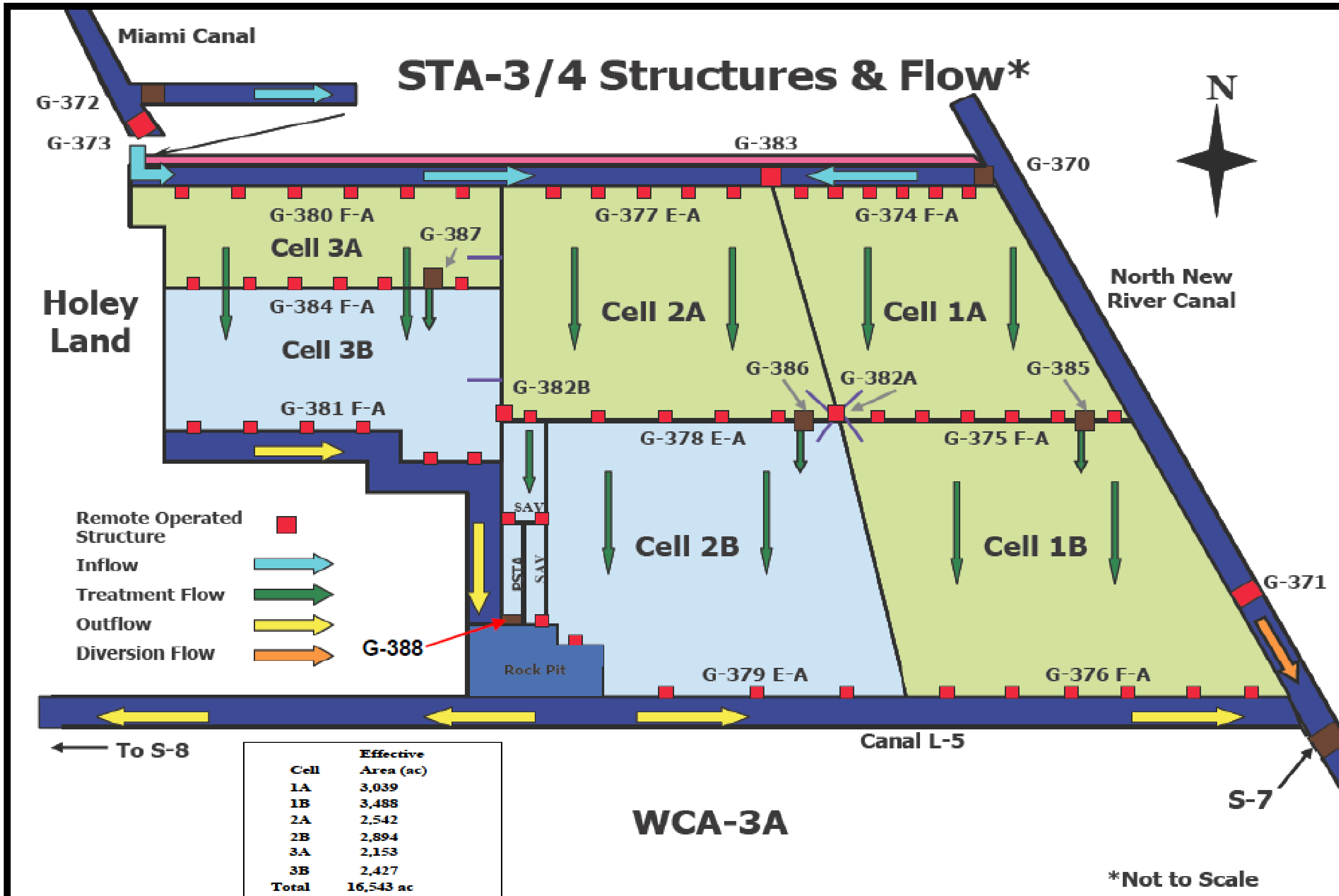
EXAMPLE STA FIELD TESTING

Three parameters to match three physical characterizations of hydraulics

- γ Gamma characterizes wave speed
- α Alpha characterized wave amplitude decay
- n_b Manning's constant characterizes the total discharge

$$q = \frac{1}{n_b} h^{1+\gamma} |s_f|^{\alpha} \operatorname{sgn}(s_f)$$

Field Experiment Site STA3/4 (Cell 3A)



Cell	Effective Area (ac)
1A	3,039
1B	3,488
2A	2,542
2B	2,894
3A	2,153
3B	2,427
Total	16,543 ac

"Resistant" Emergent Vegetation

Example: WAVE experiment field tests

Clipboard Font Alignment Number Styles Cells

R9

WaveBot v1.0

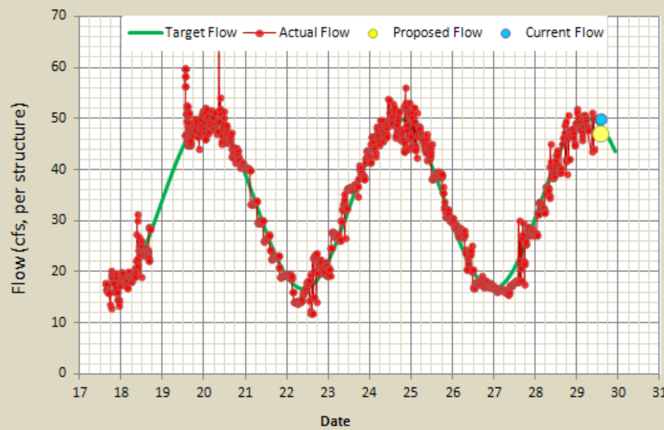
by Naiming wang and Jun Han HESM

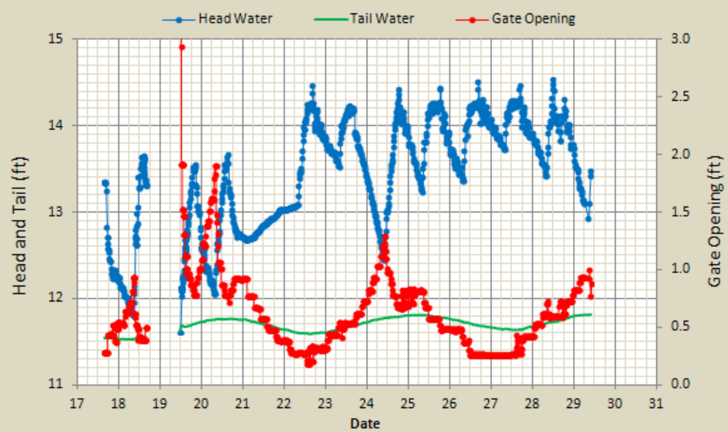
Timed

Instant

Starting	
Date	1/14/2013
Time	9:00 AM
Target Setting	
Average	200
Amplitude	100
Period	110
Email	
To	moustafa@sfwmd.gov
CC	nwang@sfwmd.gov

Pump G372	RPM
Current	721
Previous	721
Change	0





Example Results

$$q = q(h, s)$$

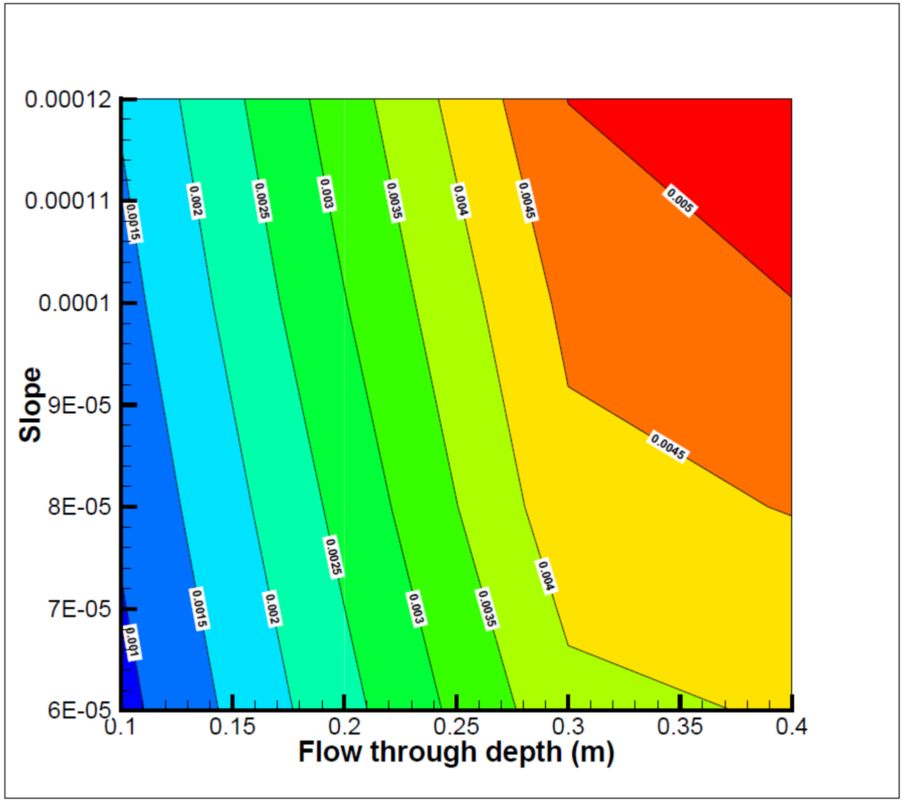


Figure 11.3: Vegetation resistance function developed using the results of the field test

The change in shape of the curves indicates a change from traditional "surface" flow to porous media flow (i.e. more like groundwater)

Questions?