

Improve performance of drip irrigation in OSSF systems in Texas - Updates

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**Onsite
Wastewater
Mega-Conference**

2023
Hampton, Virginia



TEXAS A&M
AGRILIFE
EXTENSION

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**Materials being presented represent the author opinions, and do
NOT reflect the opinions of NOWRA**

Presentation Outline

- I. *Brief overview of TOGP funding mechanism in Texas, The Texas Model (see OSJ 2023 Spring Issue, p-10)*
- II. Drip Problems in Texas, from the Survey Results and as observed in the Real World
- III. Bench scale research at TAMU OSSF Center (clogging filter, drip tubing, and return line; adding toilet paper)
- IV. *Plans for Drip Research at TAMU OSSF Center in near future, may be next year!*

I. Texas On-Site Sewage Facility Grant Program (TOGP)

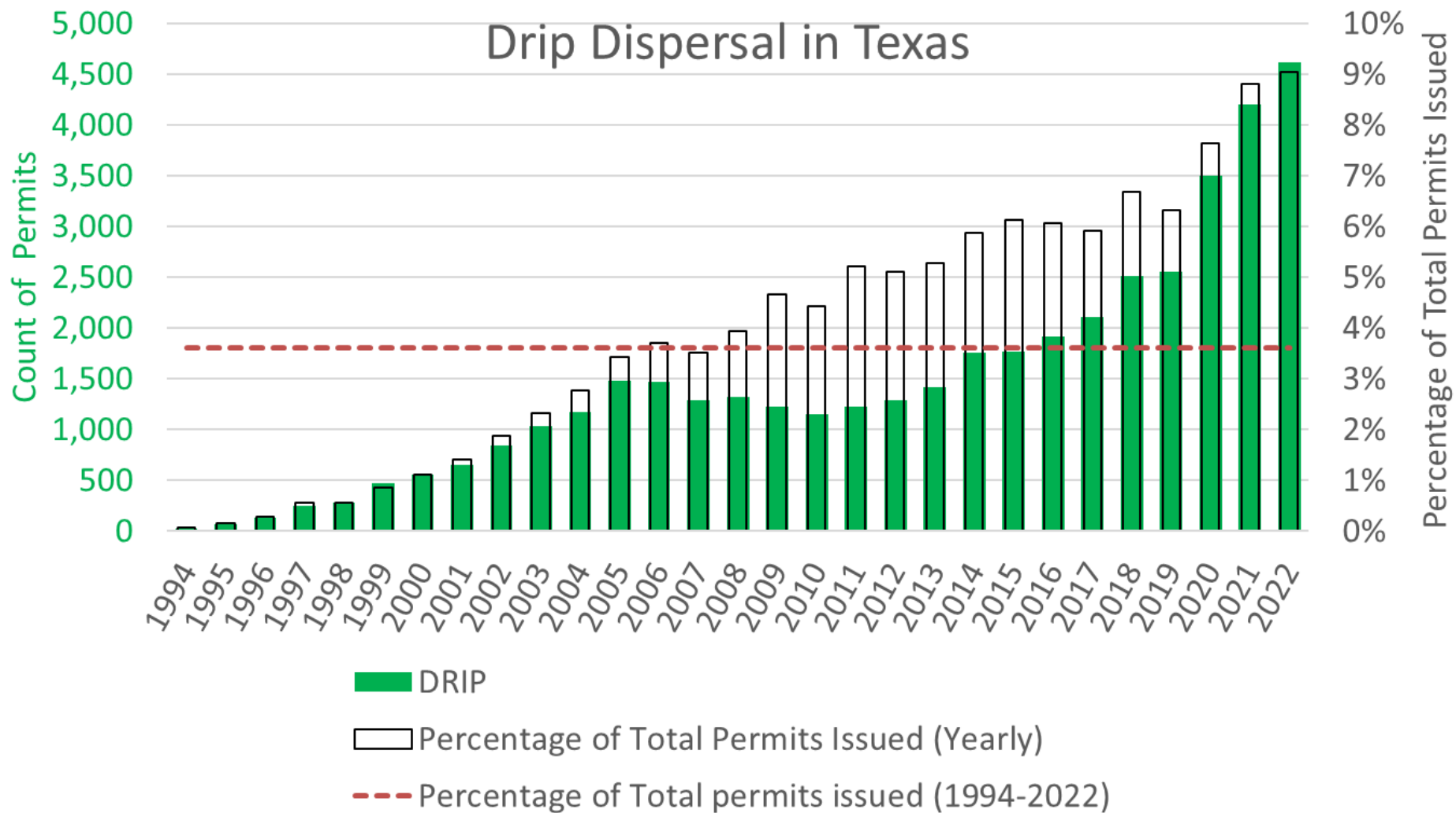
- ⦿ Funded by the Texas Commission on Environmental Quality (TCEQ) from permitting fees surcharge;
- ⦿ HB 2771 related to *“the fee collected for an on-site wastewater treatment permit application”* became AN ACT again in 2017 after several years of dormancy;
- ⦿ \$10 per permit issued from 9/1/’17 shall be used to support *“applied research and demonstration projects”*
- ⦿ However, after the agency overhead only HALF going to the research, which is still MORE THAN any other states!
- ⦿ See OSJ article in Spring 2023 Issue, [The Texas Model.](#)

- ⦿ On-Site Sewage Facilities [\(OSSF\) Team](#): Anish Jantrania, Ryan Gerlich, June Wolfe III, Joshua Segura + Students!
- ⦿ TOPG 1 (2019-21): ATU, LPD, Reuse
- ⦿ Round 2 (2021-23): RV Parks, **Drip**, Effluent Reduction
- ⦿ Round 3 (2023-25):
 - ⦿ RV Park
 - ⦿ Research the Research
 - ⦿ Flow Equalization or Dosing Refinement
- ⦿ “TOGP” Meetings with TCEQ and TOWA Team Members:
9/12/2019, 11/18/2020, 11/10/2021, 10/12/2022, 9/26/2023

TAMU TOGP Website <https://ossf.tamu.edu/togp-research/>

II. Drip Research (TOGP-II)

- ⊙ Increasing in response to issues such as limited space and challenging site conditions: 40,000+ since 1994 (3.6% of total), >9% in year 2022
- ⊙ Lack of standard procedures needed by designers, installers, and maintenance providers
- ⊙ Drip Systems Quite common in Central-East Texas, as by Rule they require LESS AREA THAN A SPRAY SYSTEM!

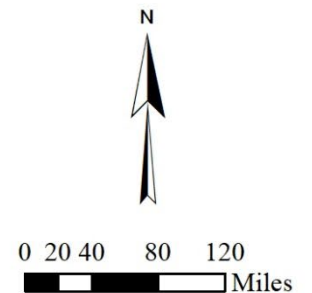
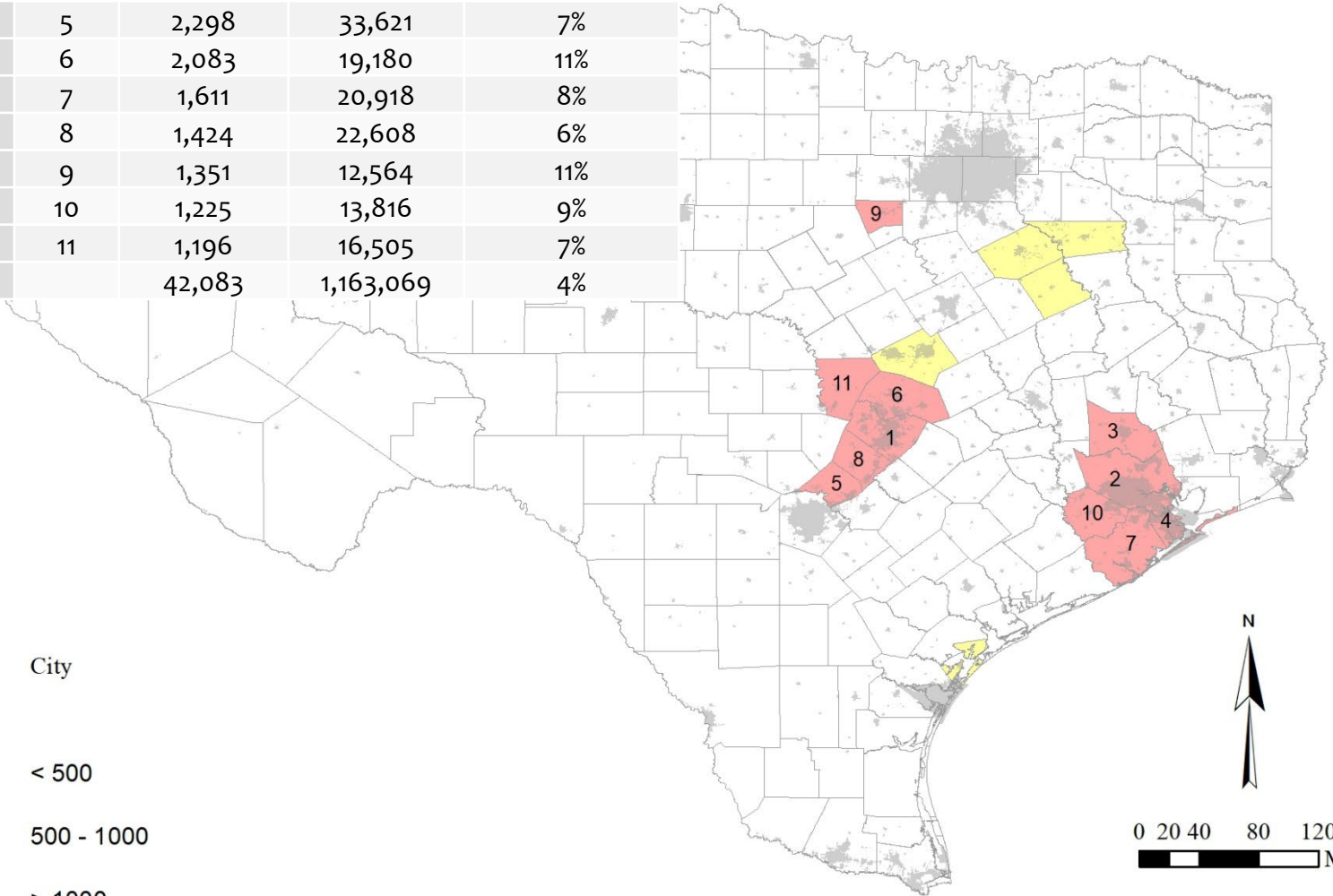
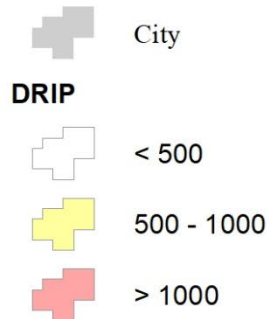


Drip irrigation permits (Aerobic Treatment Unit followed by Drip) issued as of 2022 in Texas. Data is compiled from TCEQ's annual permit dataset by TAMU OSSF Team

County	Rank	Drip Irrigation	ATC	Percentage of Texas ATC
Travis	1	6,045	23,143	26%
Harris	2	5,209	30,310	17%
Montgomery	3	3,969	55,865	7%
Galveston	4	3,947	10,691	37%
Comal	5	2,298	33,621	7%
Williamson	6	2,083	19,180	11%
Brazoria	7	1,611	20,918	8%
Hays	8	1,424	22,608	6%
Hood	9	1,351	12,564	11%
Fort bend	10	1,225	13,816	9%
Burnet	11	1,196	16,505	7%
Total (Texas)		42,083	1,163,069	4%

Drip Irrigation Systems

Count as of 2022



Goal

- ⦿ Develop guidance to assist Texas on-site sewage professionals regarding proper design, installation, operation, and maintenance, and to aid TCEQ identifying gaps in current regulations,
- ⦿ Because there are problems with some of the drip installations!

Research questions

- 1) Dosing techniques and application rates relative to structure and texture of soil (native vs import fill or disturbed, depth)
- 2) Installation configurations on flat terrain, slopes, and depressions
- 3) Continuous flushing vs periodic field flushing
- 4) Screened filters vs disc filters, and auto-backflushing
- 5) Techniques for cleaning and unclogging drip tubing

Our Plan

- ⦿ Survey to interview regulators and license holders, and literature review of scientific articles and existing local, state, and federal publications
- ⦿ Field experiments at the Texas A&M RELLIS Campus OSSF center, Bryan Texas (Questions 3-5)
- ⦿ Summarize gathered information into a Guidance document for Texas license holders and regulators

III. Survey and Site Visits

- ⦿ Experience (# systems), issues, and suggestions
- ⦿ Distribution: at face-to-face meetings, e-mails, online
- ⦿ Follow-up interviews
- ⦿ Failing systems will be characterized and compared to successful design in terms of dosing techniques, applications rates, and installation depth and configuration
- ⦿ Challenges: sufficient responses, follow-up interviews, comprehensive literature review

On the Website OR On the Phone



About you*

Indicate if you are a:

☐

Owner

☐

Designer

☐

Installer

☐

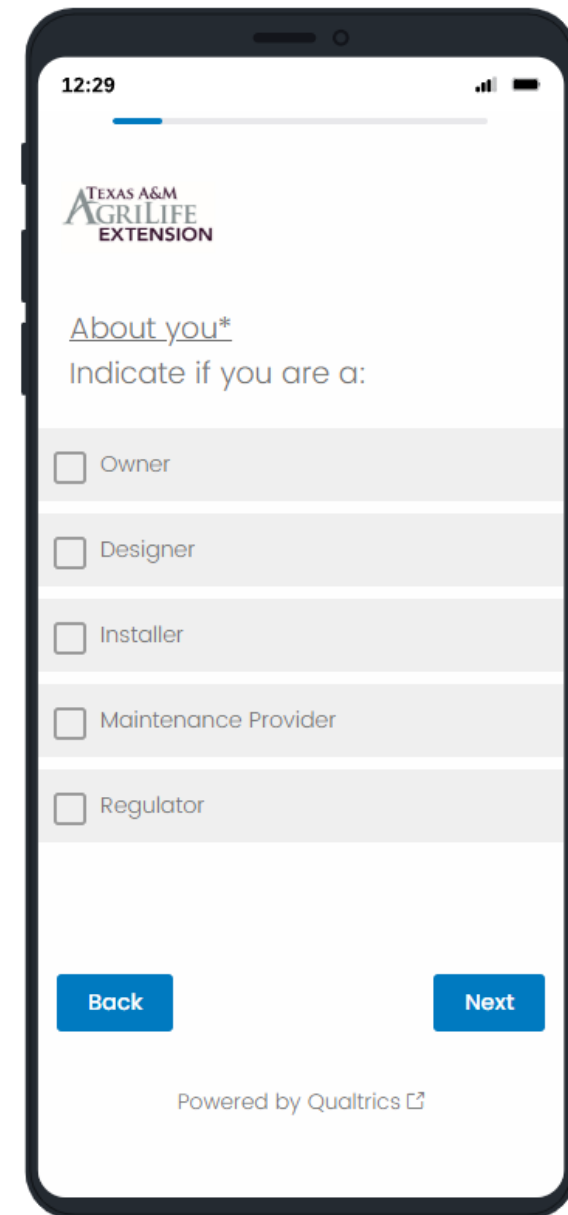
Maintenance Provider

☐

Regulator

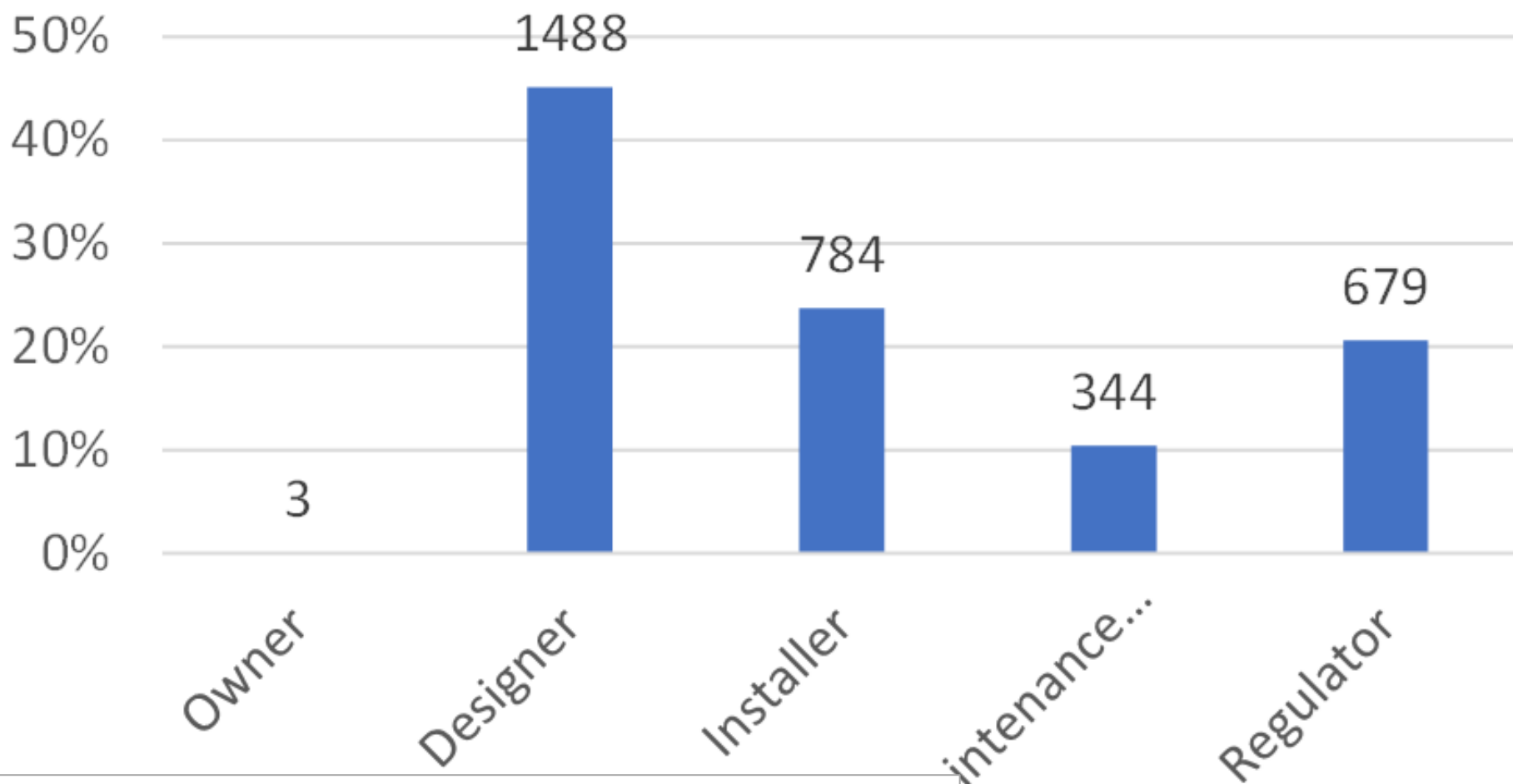
Back

Next



Response we got so far:

Indicate if you are a:

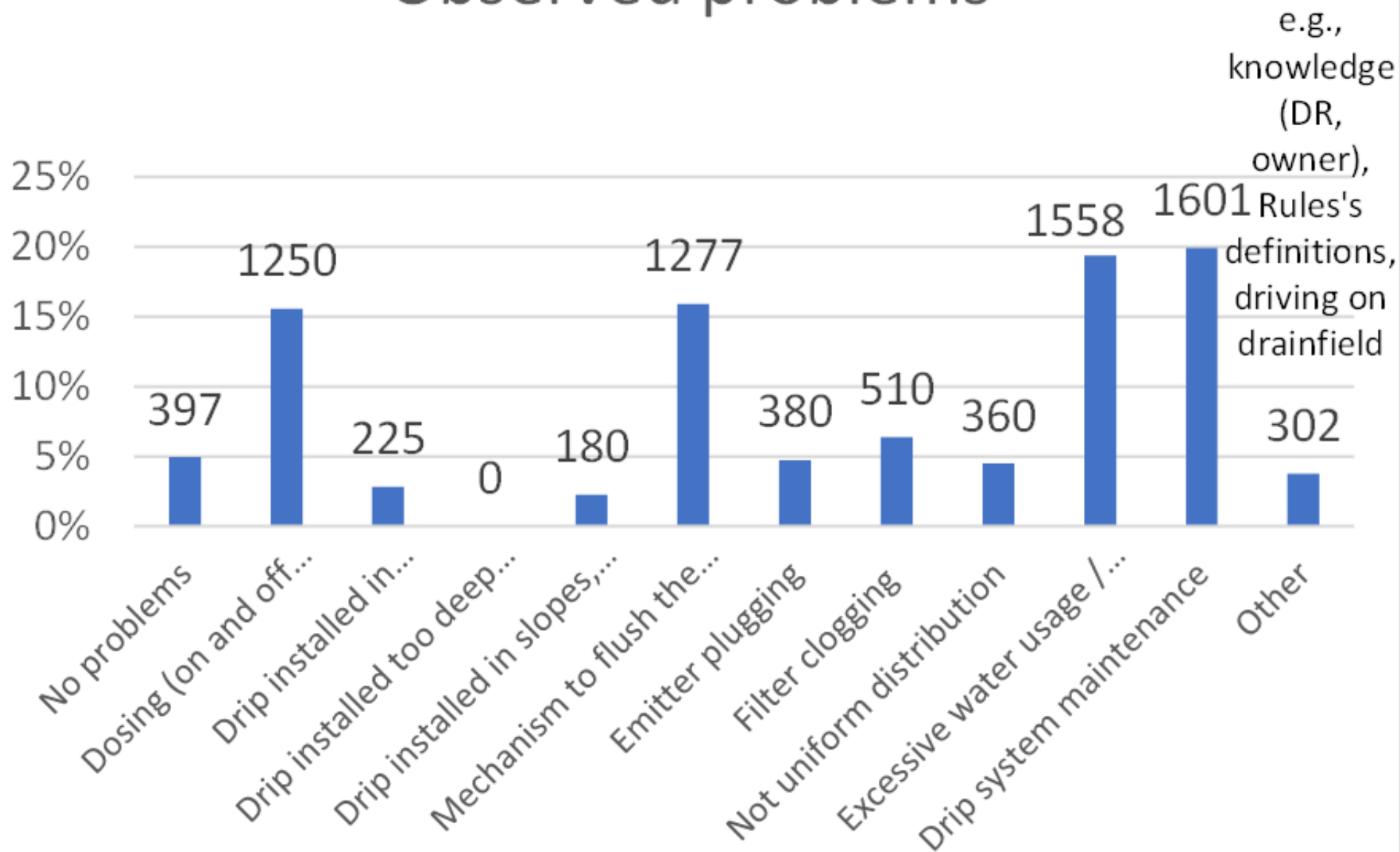


Complete Answers: 36

Total Systems represented: 2,646

Contacts interested in follow up: 50%

Observed problems



Problems

- **Other:** Ponding in a new installation, lift station, education (regulators/designer/homeowner), soil, engineering, filter not cleaned, compacting/chimneys, clarify definitions, mowers/landscaping over field
- **Insights:**
 - **X 11:** Hydraulic overload (e.g., main problem, suck toilet, occupancy going up, season, holiday use, poor soil flows goes up, sprinklers x3)
 - **X 7:** Maintenance (e.g., biggest issue, maintenance provider blaming installer and vice versa, convince owner is needed, new owner cancels contract “not needed”, fittings)
 - **X 6:** Filter clogging (e.g., cellulose, try to fix by pumping)
 - **X 5:** Education (e.g., installer, installer not educating owner, all involved), class 4, timer x2 (e.g., dose time reduced)
 - **X 1:** 50% fail, damages, no testing by regulator

Suggestions

- X 9: Design (e.g., larger tube openings and filters, deeper trenches, standard manual, simpler control → less to maintain and to go wrong, valves to isolate zones ≤ 600 ft, continuous flush/automated backflush, flushing tool, equalization, high resolution timers)
- X 7: Education (e.g., drip is new, DR to test flow and to inspect, DR/designer, design/implementation, owner)
- X 3: Vegetation (e.g., proper vegetation on mounds, Remove tree canopy, good grass/sod cover for ET)
- X 2: Soil (e.g., no import, cover soil)
- X 1: Maintenance, Simpler regulation/definitions, Installation

Other comments

- **X 12: Maintenance**: (e.g., not proper use ... nobody flush! ... 90%! ... 3 times/yr ... filters service and flushing ... Clean disc filters (home or 10 min soak) or replace ... provider work not well defined (check alarms and go) ... pump maintenance ... providers ...demo maintenance to owner ... discontinuing contract “not good” ... no maintenance until failure)
- **X 5: Design**: (e.g., design, same loading rates for all in rules, design, Tennessee rules, Arkansas not clear directions)
- **X 4: Texas**: (e.g., converting, continuous flush; usual issues, just new!)
- **X 2: Education** (e.g., ... customer education ... people do not know what continuous flush means)
- **X 1: ... grass ... improve soil ...**

...OPERATING CONDITIONS OF EXISTING DRIP SYSTEMS AND NEW INSTALLATIONS

- ◎ Hood County, May 3-4, 2023, health department staff
- ◎ Understand problems based on real-world experience by regulators, designers, and installer → recommendations

- ◎ Frequent issues:

- ◎ Wrong timer settings/models,
- ◎ Surfacing on first year,
- ◎ External runoff on drain field
- ◎ Intermitted use (e.g., B&B).

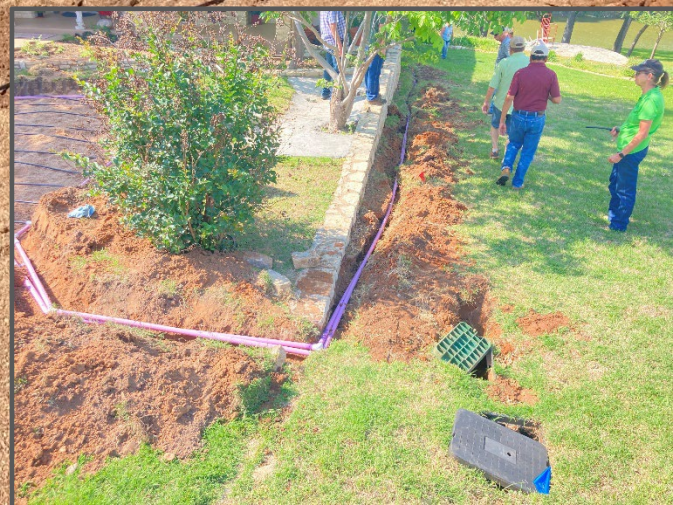
- ◎ Recommendations:

- ◎ Homeowner education

- ◎ Adding surface or/and valves to isolate areas
- ◎ Monitoring
- ◎ Timer settings
- ◎ Maintenance
- ◎ “Feed” system in vacant periods
- ◎ Managing runoff

Day 1

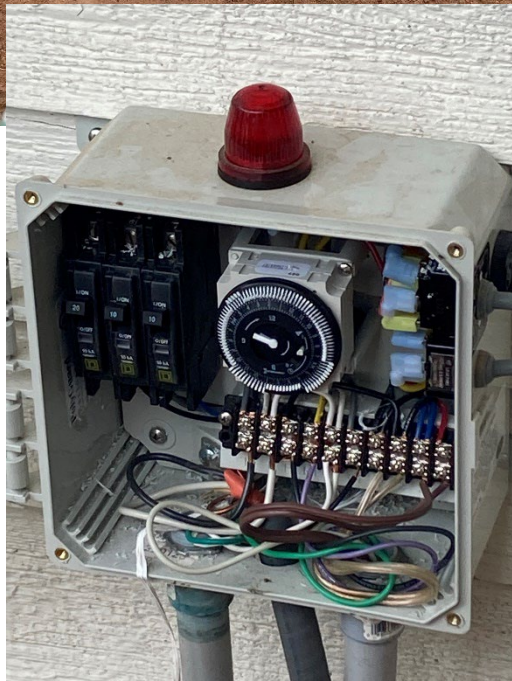






Day 2



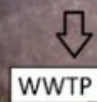
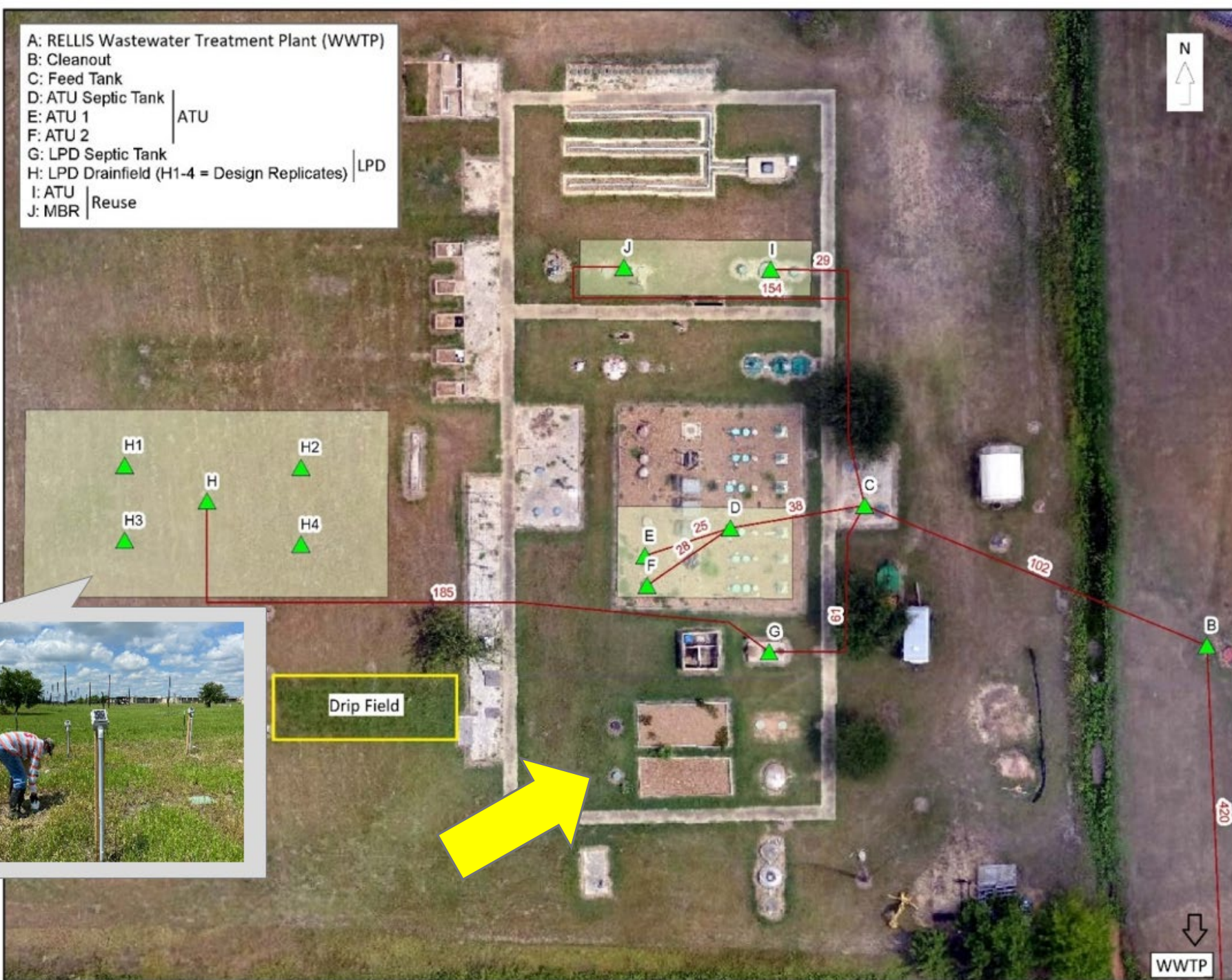


III. BENCH SCALE EXPERIMENT

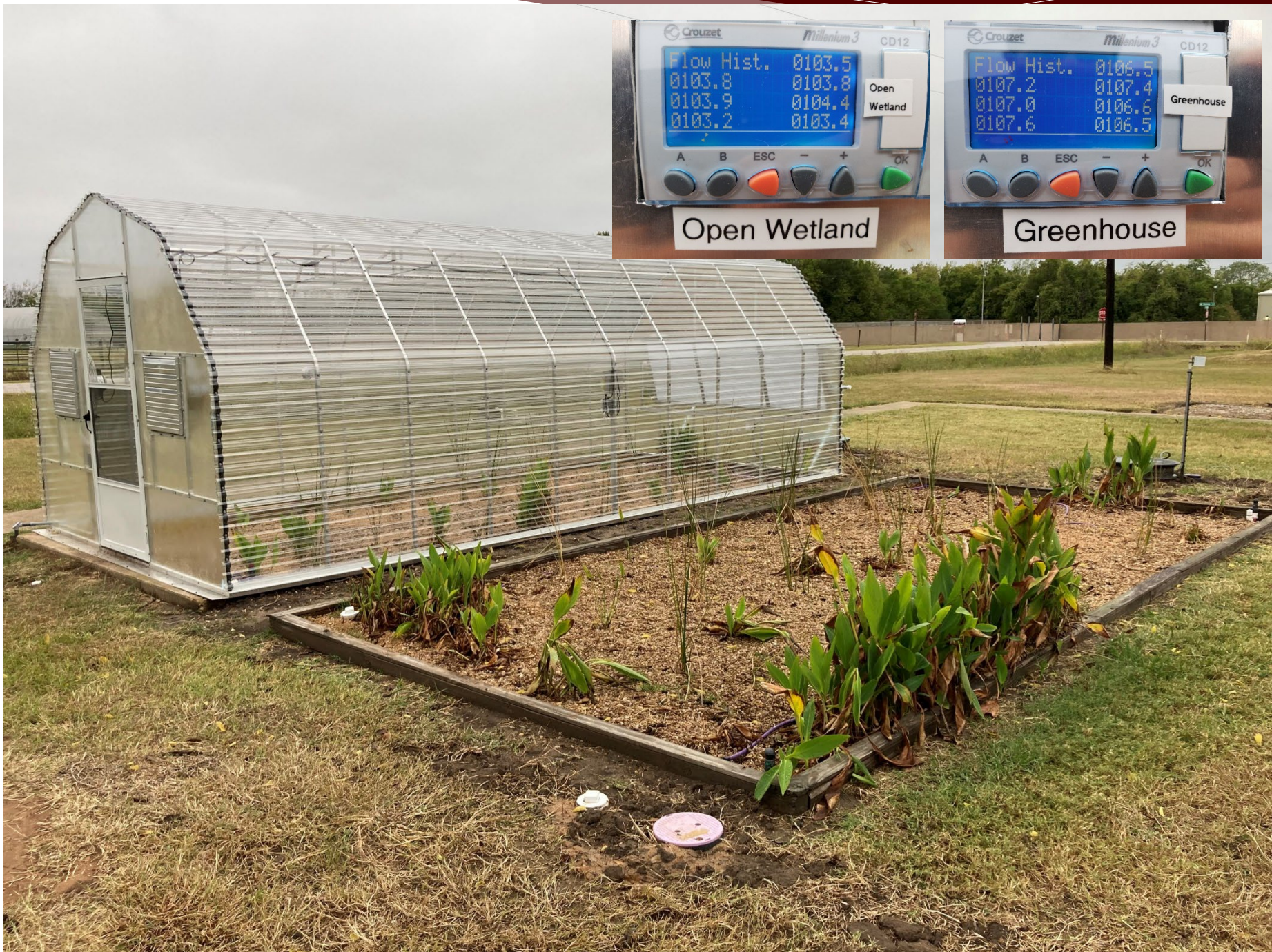
- ⊙ Performance determined by comparing measurements of Total Suspended Solids (TSS), and drip rate/volume and pressures
- ⊙ Challenges: set up time (requested 9-months/obtained 3-months extension to TCEQ)

- ◎ **RELLIS Campus effluent**, treated in two **ATU units**, and distributed inside **two wetlands' beds (11'x24')** used for the Effluent Flow Reduction project (one covered by greenhouse)
- ◎ About two 150-ft runs of drip tubing (total **300 ft**) of **drip tubing in each wetland**, laid out uniformly less than **two inches** below the gravel (October 24, 2022)
- ◎ **Pressure compensating** dripline: Netafim Bioline ISO 9261; Internal Diameter (I.D.): 0.560 in; Wall Thickness (W.T.): 0.045 in; Flow Rate: 0.61 GPH @ 14.5 PSI (max 58)

A: RELLIS Wastewater Treatment Plant (WWTP)
 B: Cleanout
 C: Feed Tank
 D: ATU Septic Tank
 E: ATU 1
 F: ATU 2
 G: LPD Septic Tank
 H: LPD Drainfield (H1-4 = Design Replicates)
 I: ATU
 J: MBR | Reuse





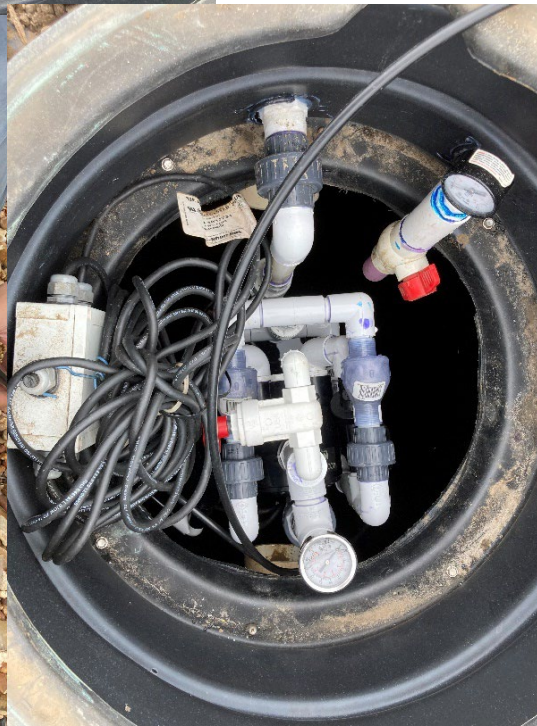




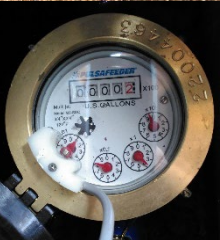
← simple
Clearstream
filter



Clearstream
Aztec Dual
Spin Filter →



TEXAS
AG EX



Started comparing filters (simple vs auto flash): testing artificially induced clogging, monitoring flow, pressure, and filter status

⦿ July 12-13:

- ⦿ ~ 15 gall of sludge in each pump tank (once/week)
- ⦿ 2400 mL of chicken feed in each pump tank (only July 12)
- ⦿ 2 rolls of toilet paper in each clean out between trash tank and aeration tank (2 times/week)
- ⦿ TSS samples in each pump tank (3 times/week)

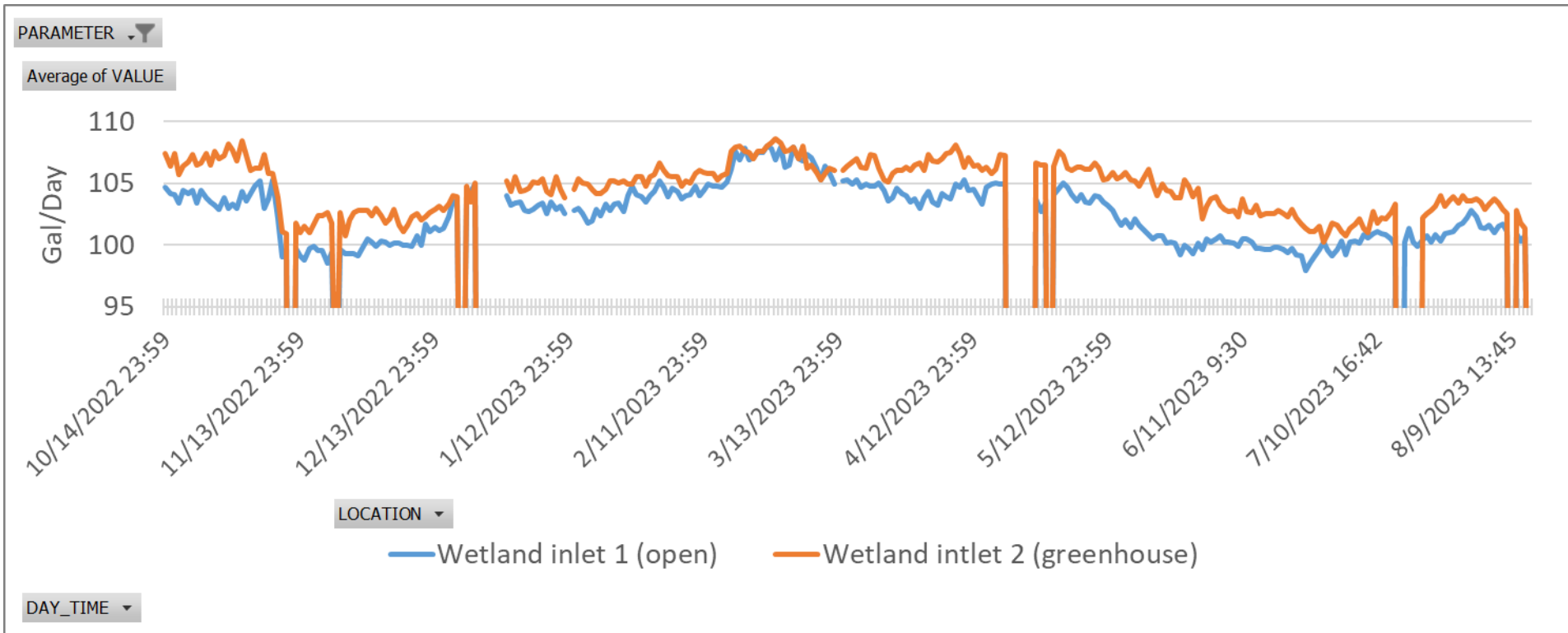
Clogging the filter was hard... but we managed to do it...



July-September 2023

	FILTER TYPE open	FILTER TYPE GH	ADD (sludge/chicken feed/toilet paper)	CLEAN <u>pump</u> filter	CLEAN <u>drip</u> filter	CAP back flow	FLUSH lines	ON/OFF pump trash	ON/OFF pump drip	! power outage	! high water	! drip filter plugged	other
12-Jul	screen	screen alt.	sl./ch.f.										
13-Jul			sl./ch.f./t.p.	x									
14-Jul				x									
15-Jul										x			
16-Jul								off GH	off GH				reprogrammed
17-Jul				x				on GH	on GH				added aeration pipe GH
18-Jul								off GH					
19-Jul				Open				on GH					
20-Jul				GH									
28-Jul			sl./t.p.										
31-Jul			sl./t.p.										
4-Aug			t.p.										
9-Aug										x			
14-Aug			t.p.			yes Open				x			
18-Aug			sl./t.p.										
22-Aug			t.p.										
28-Aug					Open	no Open					Open	Open	
29-Aug			t.p.										
31-Aug													
5-Sep			t.p.										
7-Sep			sl.				x						
8-Sep			t.p.										
11-Sep						yes Open							
12-Sep			t.p.										
13-Sep										x			
15-Sep			sl./t.p.										sludge is from aeration tanks
18-Sep					Open	no Open		off Open			Open	Open	
19-Sep								on Open					
20-Sep			t.p.										
22-Sep		disc		x									reset pressure GH, reset return pressure Open (air bubbles)

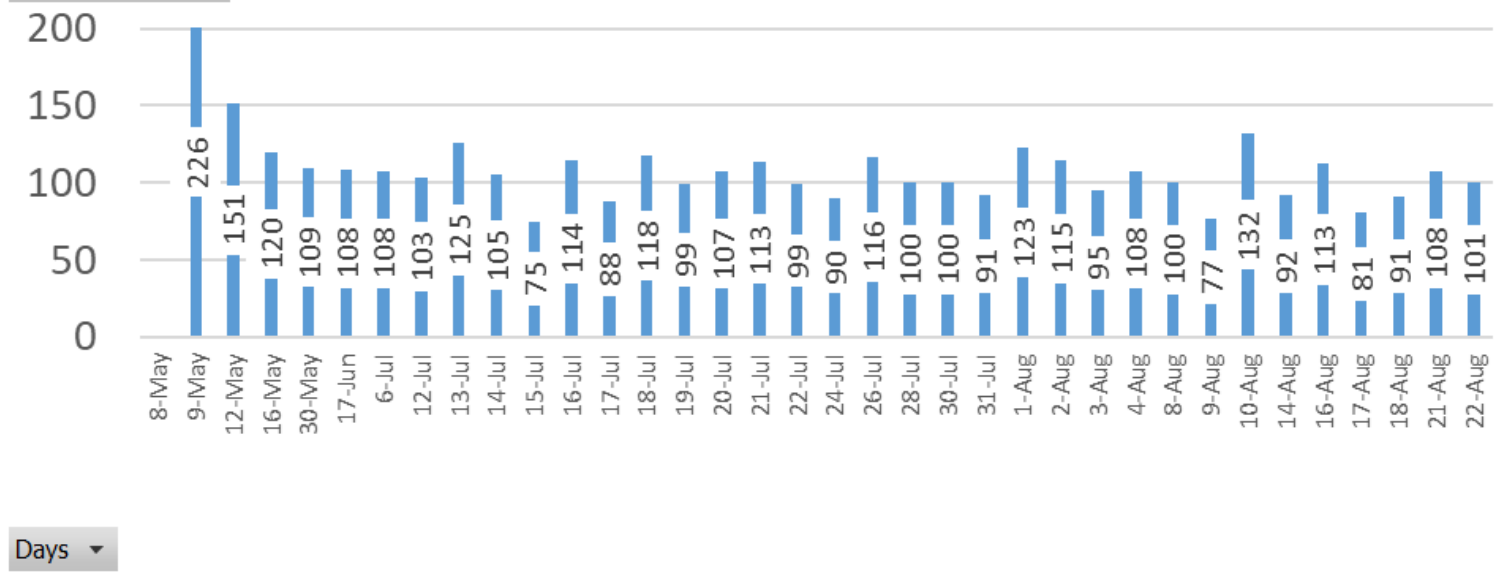
- ⦿ Simple filter (Open wetland)
- ⦿ Auto flash filter (Greenhouse)



open/GH measure

Daily flow - Open

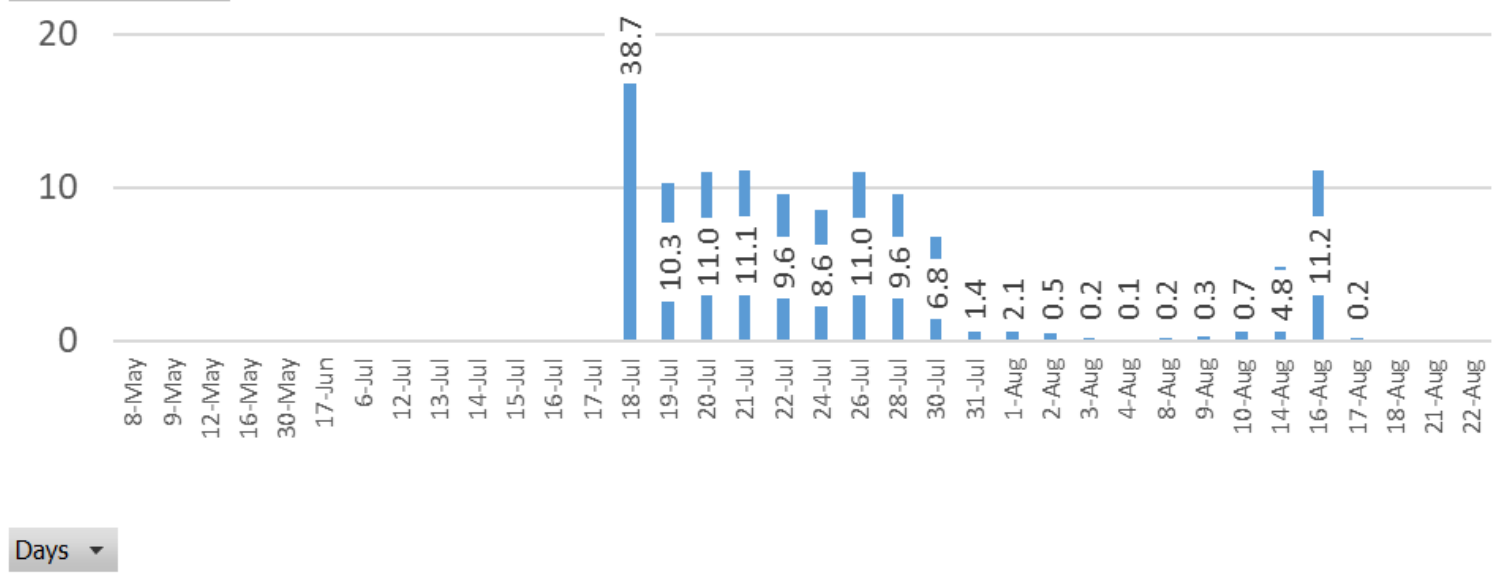
Sum of daily flow



open/GH measure

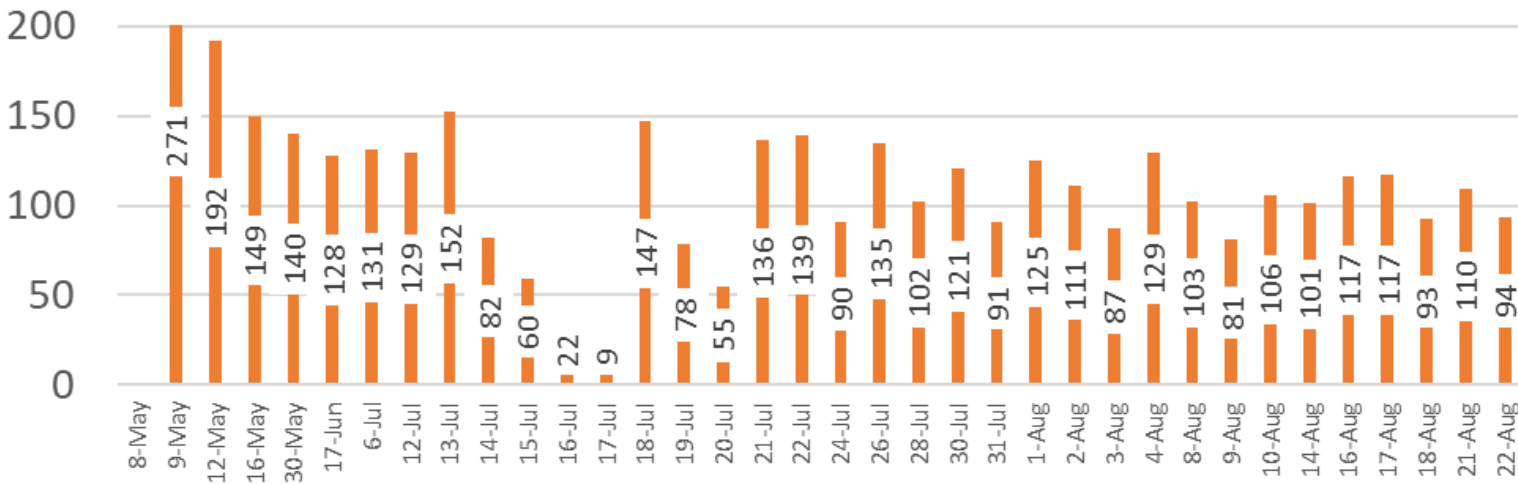
Daily Back Flow - Open

Sum of daily flow



Daily flow - GH

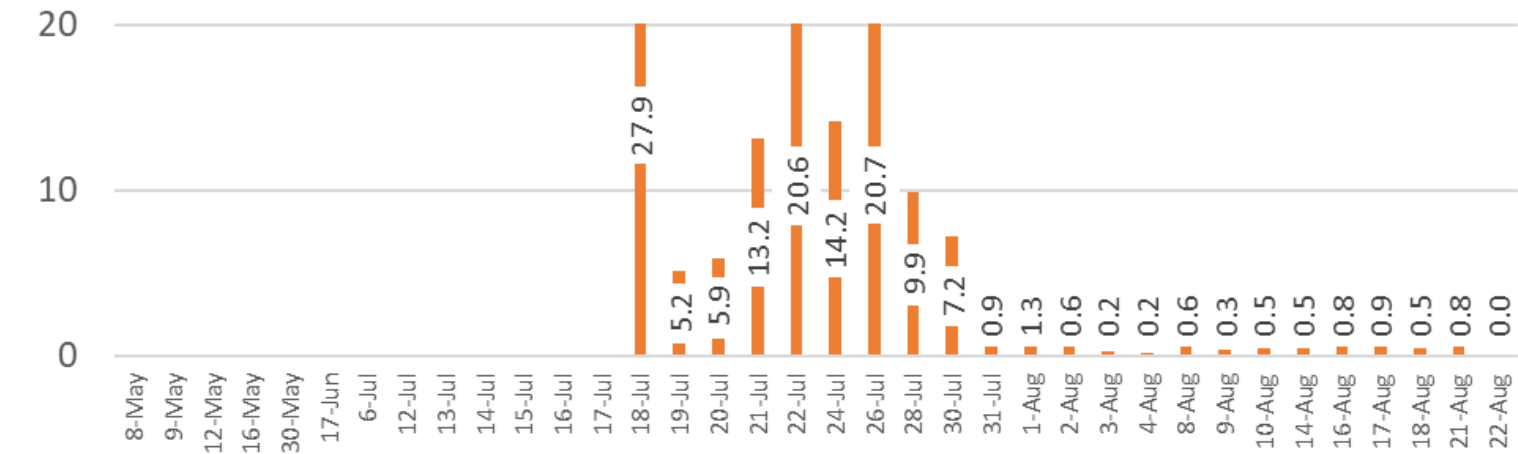
Sum of daily flow



Days

Daily Back Flow - GH

Sum of daily flow



Days

Observations continues...

- ⦿ Till middle of the next moth
- ⦿ Project end-date is November 30, 2023
- ⦿ Final report will be posted on our research webpage!
- ⦿ And the project continues without funding including field evaluation of a new drip design...

IV. Plans for future research/demonstration

- ⊙ Drip Dispersal Shallow System (DDSS or **D2S2**)
- ⊙ Why shallow? Why not go deep? i.e., DDDS or **D3S™?**
- ⊙ Virginal Westmoreland County Project (details on Tuesday Session 17 in Room Conf B, starting at 2PM)
- ⊙ 2nd D3S will be installed at our OSSF Center next year!

Questions?

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