

IOR/EOR FIELD TEST RESULTS

HYPERSCRATCHER

Borehole Cleanout Tool

November 2020

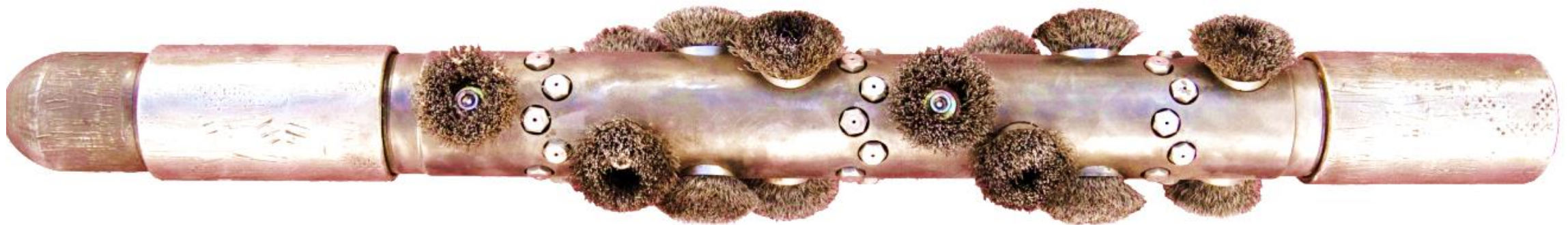
Enhanced Oil Recovery Institute

Stephen Whitaker



Purpose of This Study

To report on the effectiveness of the Hyperscratcher tool in improving production or injection by cleaning out boreholes that have reported problems with scale, paraffin, or asphaltene build-up.



Hyperscratcher Tool

- The Hyperscratcher tool was initially designed and used in California in the 1980s for workovers; as yet it has not been widely used in Wyoming
- Multiple cleaning methods in one tool
 - Jets direct water, acid, or other chemicals directly to targeted areas
 - Wire brushes physically clean the surface of casing, perforated liners, etc.



Hyperscratcher Tool Application

- The Hyperscratcher tool is conveyed via tubing or coiled tubing unit (CTU)
- Tool is normally lowered to a few feet below the lowermost perforations or zone of interest
- Pump is engaged to inject water or desired chemicals through tool jets; tool is reciprocated 2 to 3 times slowly while scrubbing back and forth across the perforated/slotted interval while pumping fluid at a rate of 1 to 3 bpm
- Repeat treatment across all targeted areas
- Wire brushes can be replaced as needed



Hyperscratcher Tool Application



Condition of replaceable wire brushes after a well cleanout



Hyperscratcher: Wells In Which Tool Was Deployed

The Hyperscratcher tool was used in 8 wells located in the Big Horn, Hanna, and Powder River basins
Two of the operators wished to remain anonymous.

Operator	Well Name	API Number	Run Date	Field	Formation	Basin	Issue	Fluid/Chemical
JJ Bunkirt	Federal 23-1	4900320282	5/20/2019	Coon Creek	Frontier	Big Horn	Paraffin	PAO 103, 20% Xylene
JJ Bunkirt	JE Pepper #3	4900320300	6/12/2019	Coon Creek	Frontier	Big Horn	Paraffin	PAO 103, 20% Xylene
Maverick	Gebo 69	4901720305	8/8/2019	Gebo	Tensleep	Big Horn	Scale	HCl 10%
Maverick	Gebo 2	?	4/3/2019	Gebo	Tensleep	Big Horn	Scale	HCl 10%
Company "A"	"A-1 Horizontal"	49005xxxxx	7/25/2019	WC	Parkman	Powder River	Paraffin/Scale	Acid/Horizontal Well
Company "A"	"A-2 Horizontal"	49005xxxxx	8/5/2019	WC	Turner	Powder River	Paraffin	Acid/Horizontal Well
Company "A"	"A-3 Horizontal"	49005xxxxx	9/19/2019	K-Bar	Parkman	Powder River	Paraffin/Scale	Acid/Horizontal Well
Company "B"	"B-1"	49007xxxxx	6/4/2019	Horne Bros.	Sundance	Hanna	Paraffin	WCW 8090 & PAO 103

No changes were made to these wells other than to run the Hyperscratcher tool and use its jetting capabilities to place whatever fluid was desired as part of the treatment.



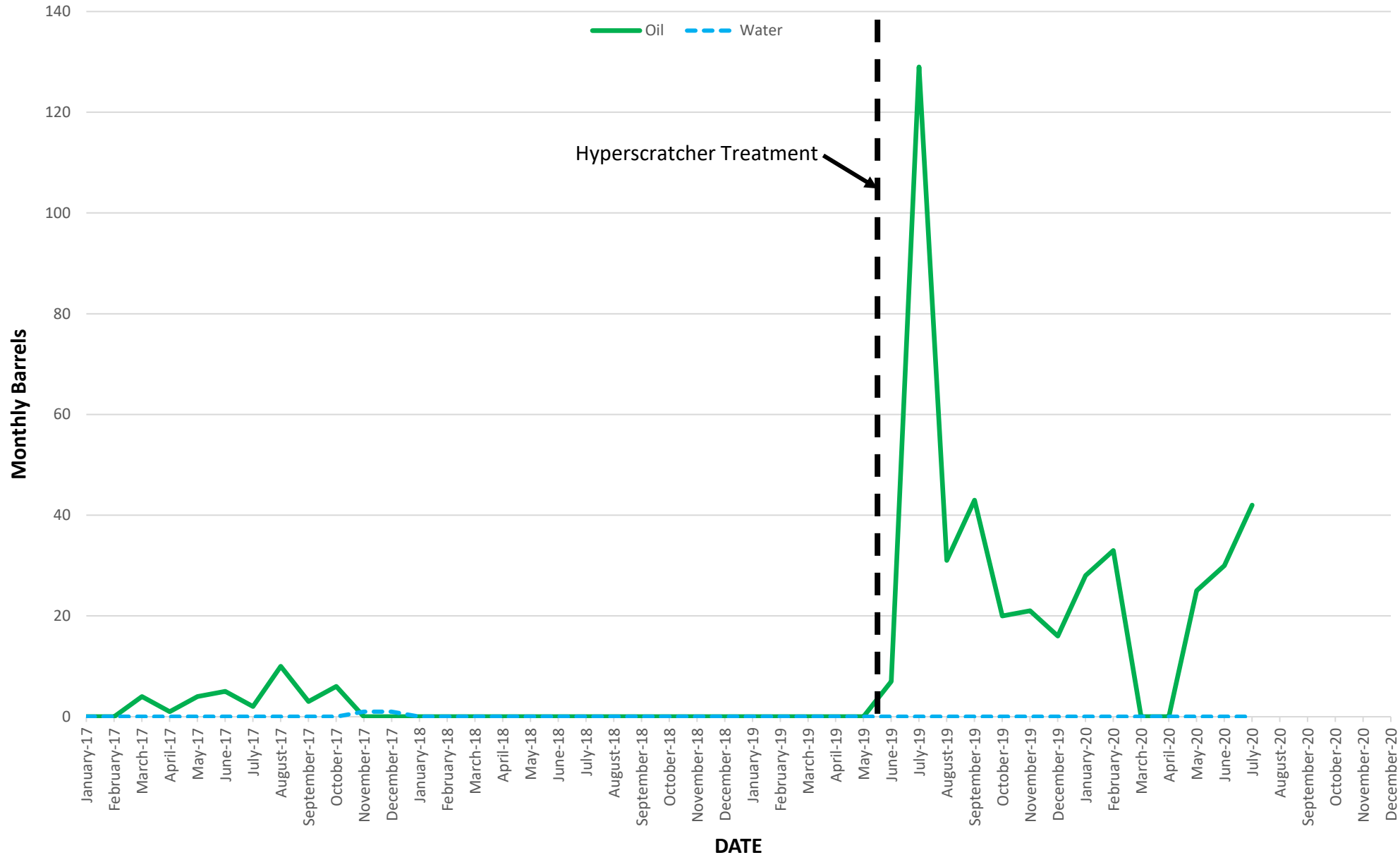


Hyperscratcher Tool Case Studies

JJ Bunkirt Federal 23-1: Monthly Production

JJ Bunkirt Federal 23-1 (monthly)

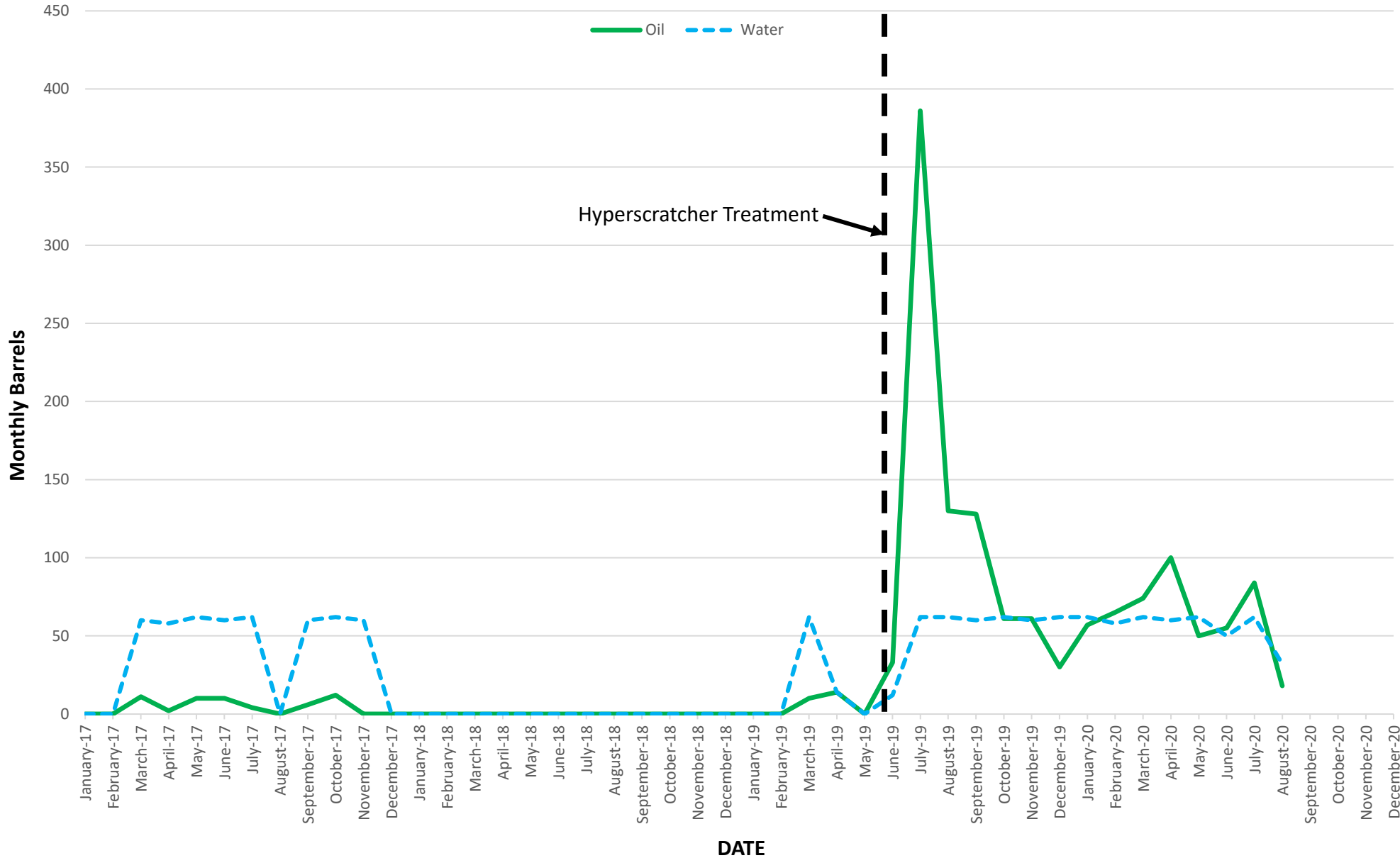
- Problem: Paraffin
- Treatment: 5/20/19
- Significant improvement in production after treatment



JJ Bunkirt J. E. Pepper #3: Monthly Production

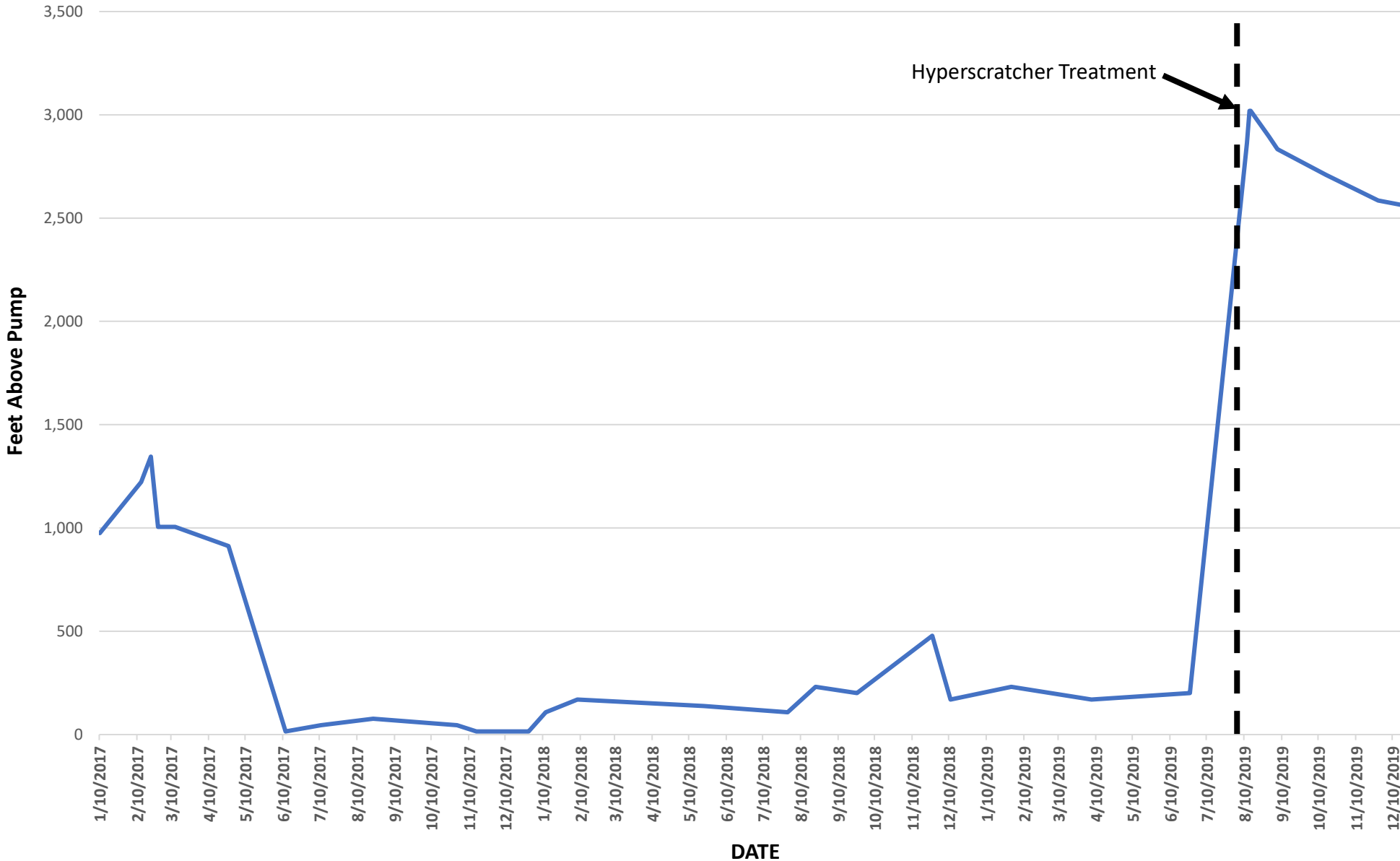
JJ Bunkirt J.E. Pepper 3 (monthly)

- Problem: Paraffin
- Treatment: 6/12/19
- Significant improvement in production after treatment



Breitburn Gebo #69: Fluid Level in Borehole Above Pump

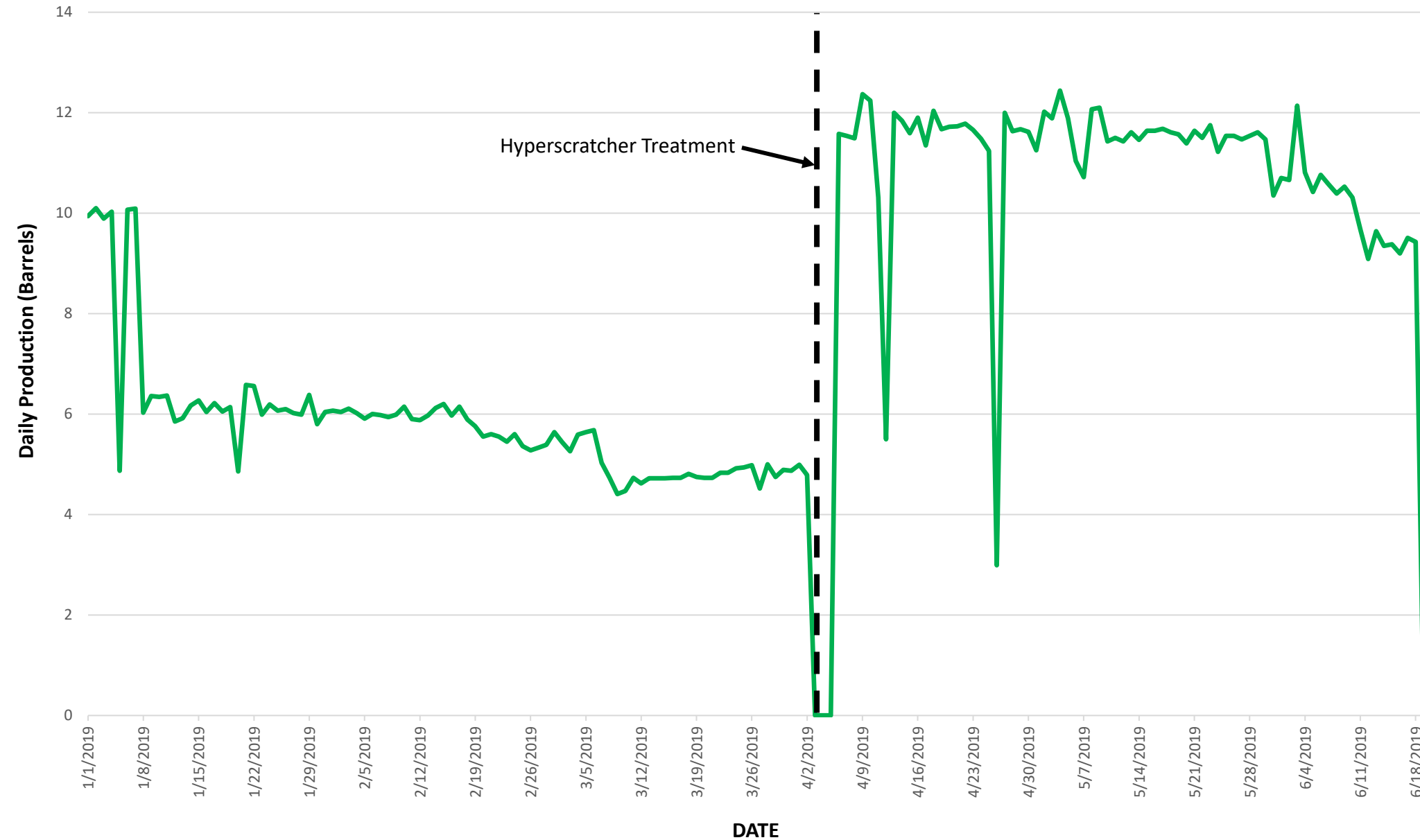
Breitburn Gebo #69 Fluid Level Feet Above Pump



- Problem: Scale & Paraffin
- Treatment: 8/8/19
- Fluid level measurements show significant increase in fluid flow into borehole after treatment
 - 4 months prior to treatment the avg fluid level was 185.5 feet above the pump
 - 4 months after treatment the avg fluid level was 2,810 feet above the pump
- No oil production data were submitted by the operator

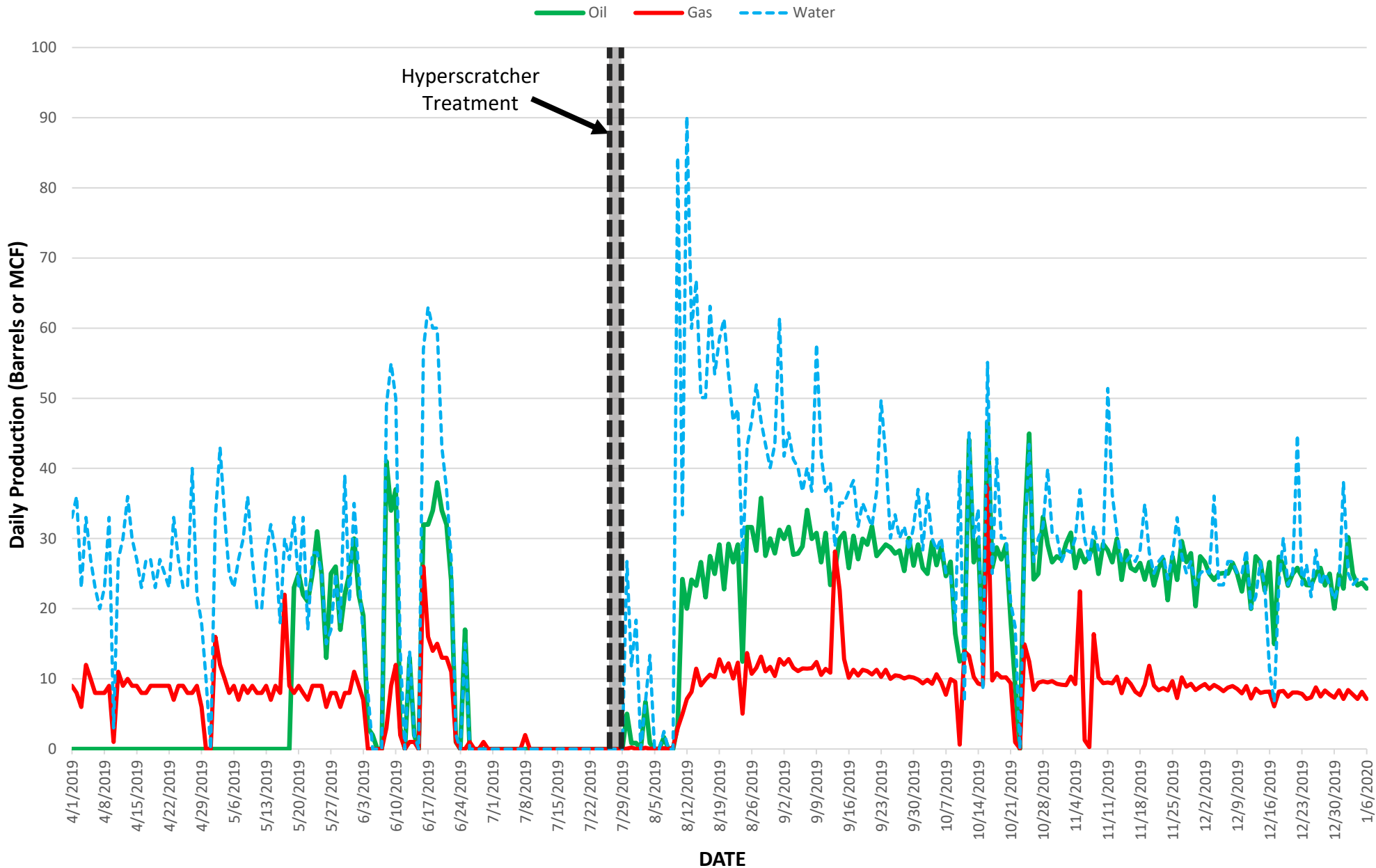
Breitburn Gebo #2: Allocated Daily Oil Production

Breitburn Gebo #2 (daily)



- Problem: Scale & Paraffin
- Treatment: 4/3/19
- Significant improvement in oil production after treatment
 - Prior to treatment, 60-day average production = 5.3 BOPD
 - After treatment, 60-day average production = 11.7 BOPD
 - ~120% improvement

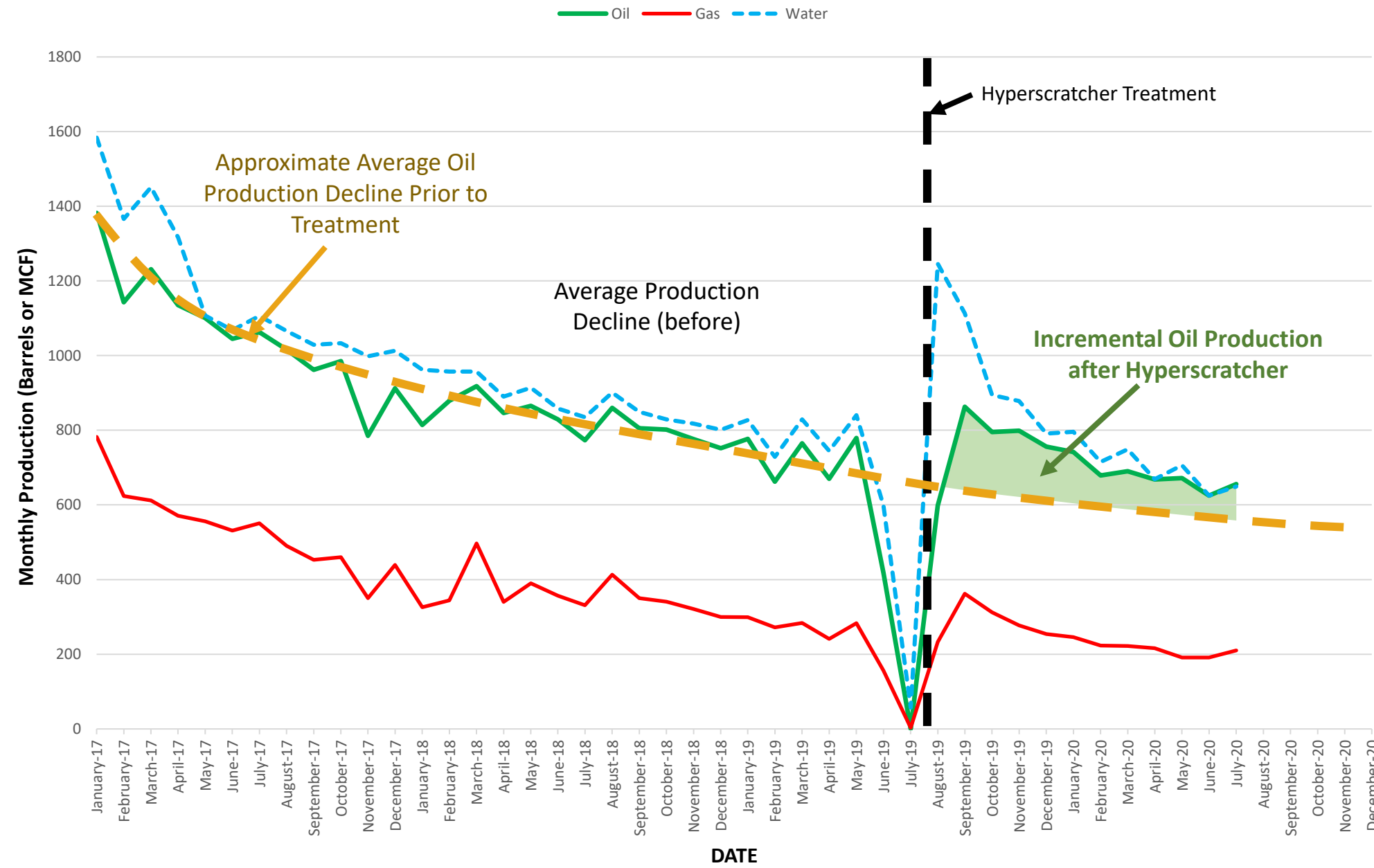
Company A "A-1 Horizontal": Daily Production



- Problem: Paraffin & Scale
- Treatment: 7/26-29/2019
 - Pumped 17 bbls of acid through tool
 - Flushed with 34 bbls water
 - Cleaned perfs with tool; jetted 20 bbls water/perf set
- Delay in full production after treatment due to disposing of water from location
- Production increased and was relatively steady after treatment



Company A "A-1 Horizontal": Monthly Production



- Problem: Paraffin & Scale
- Treatment: 7/26-29/2019
- Production improved after treatment
- Incremental oil production from 9/2019-7/2020 is ~1,480 BO
- ~23% improvement over projected pre-treatment production rate



Company A “A-1 Horizontal”: Tool Condition After Run

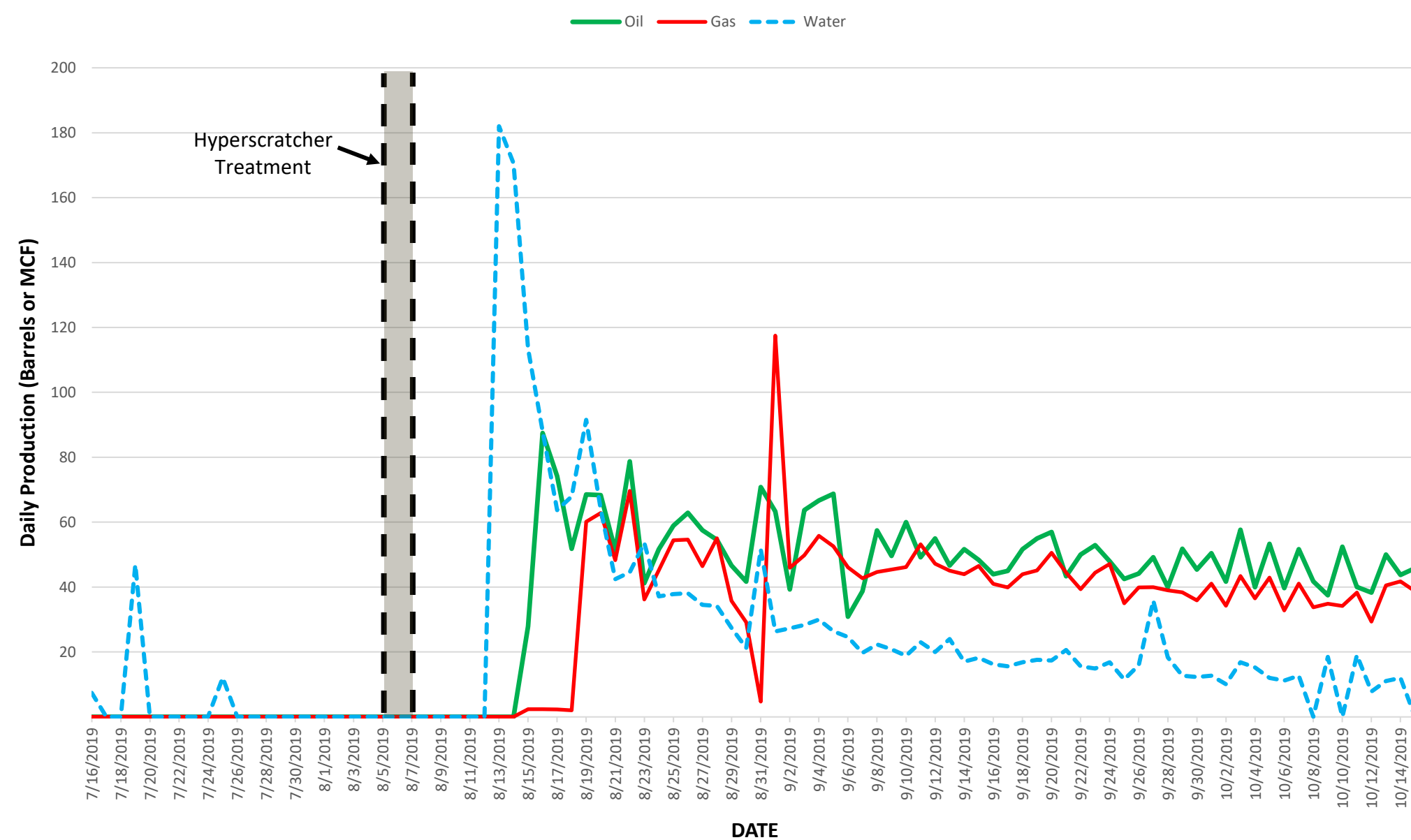


These photos show the condition of the replaceable wire brushes after a run in the “A-1 Horizontal”. This was the longest of the three horizontal wells in which the tool was used (approximately 4,200’ lateral). Multiple perforated intervals in the lateral required use of the tool over 3 days.

It is common for the brushes to be well worn after a treatment. They are replaced before the next use of the tool.



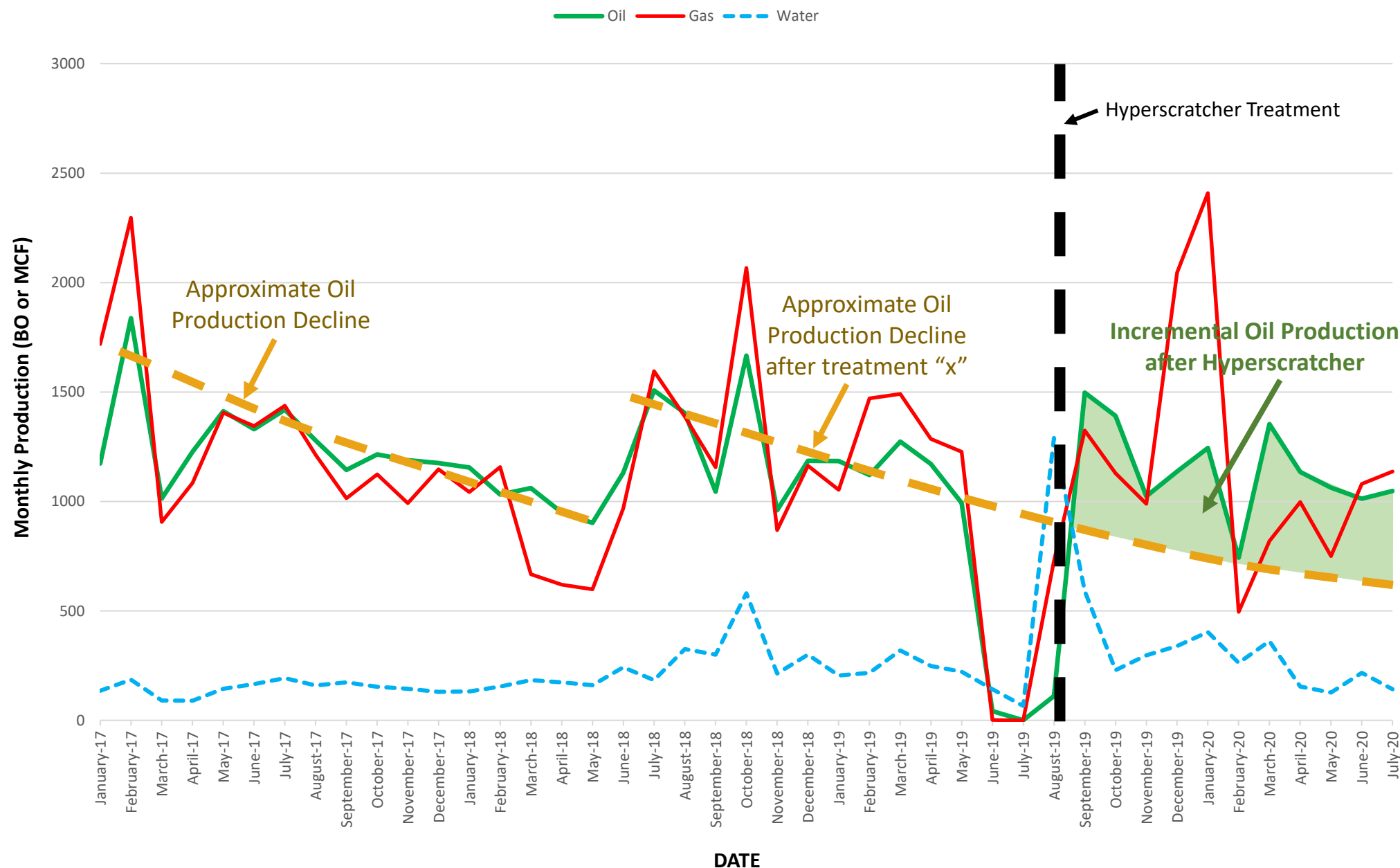
Company A "A-2 Horizontal": Daily Production



- Problem: Paraffin & Scale
- Treatment: 8/5-7/2019
 - 30 bbls water & acid injected at each perf set
- Delay in full production after treatment due to testing & disposing of water from location
- Production improved after treatment
- Immediate and temporary increase in water production due to volume of water used in treatment (stated by operator)

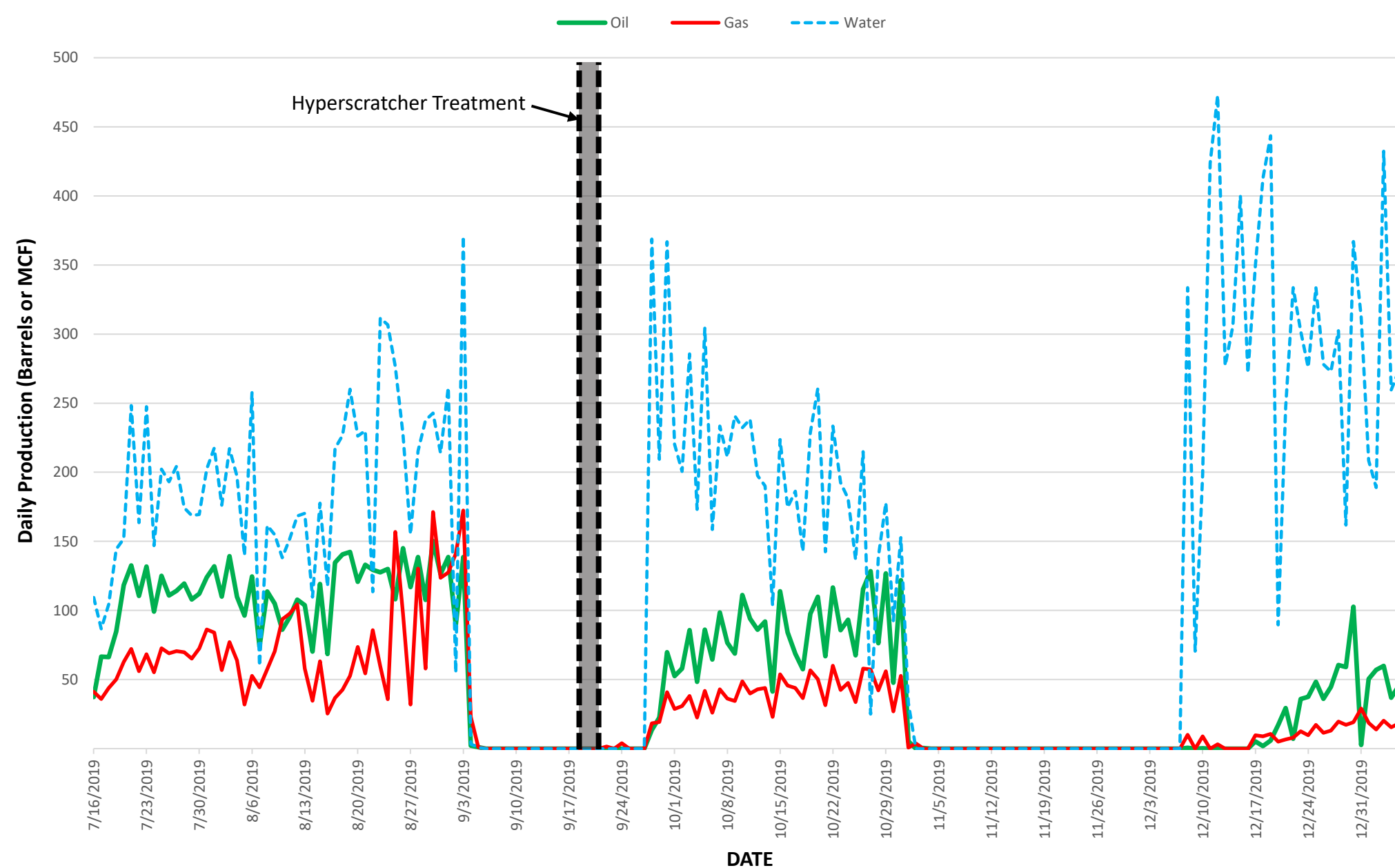


Company A "A-2 Horizontal": Monthly Production



- Problem: Paraffin & Scale
- Production improved after treatment
- Average decline rate after Hyperscratcher treatment similar to a different treatment a year prior
- Estimated incremental production from 9/2019 to 7/2020 is ~5,100 BO
- Approximately 67% improvement over projected pre-treatment production rate

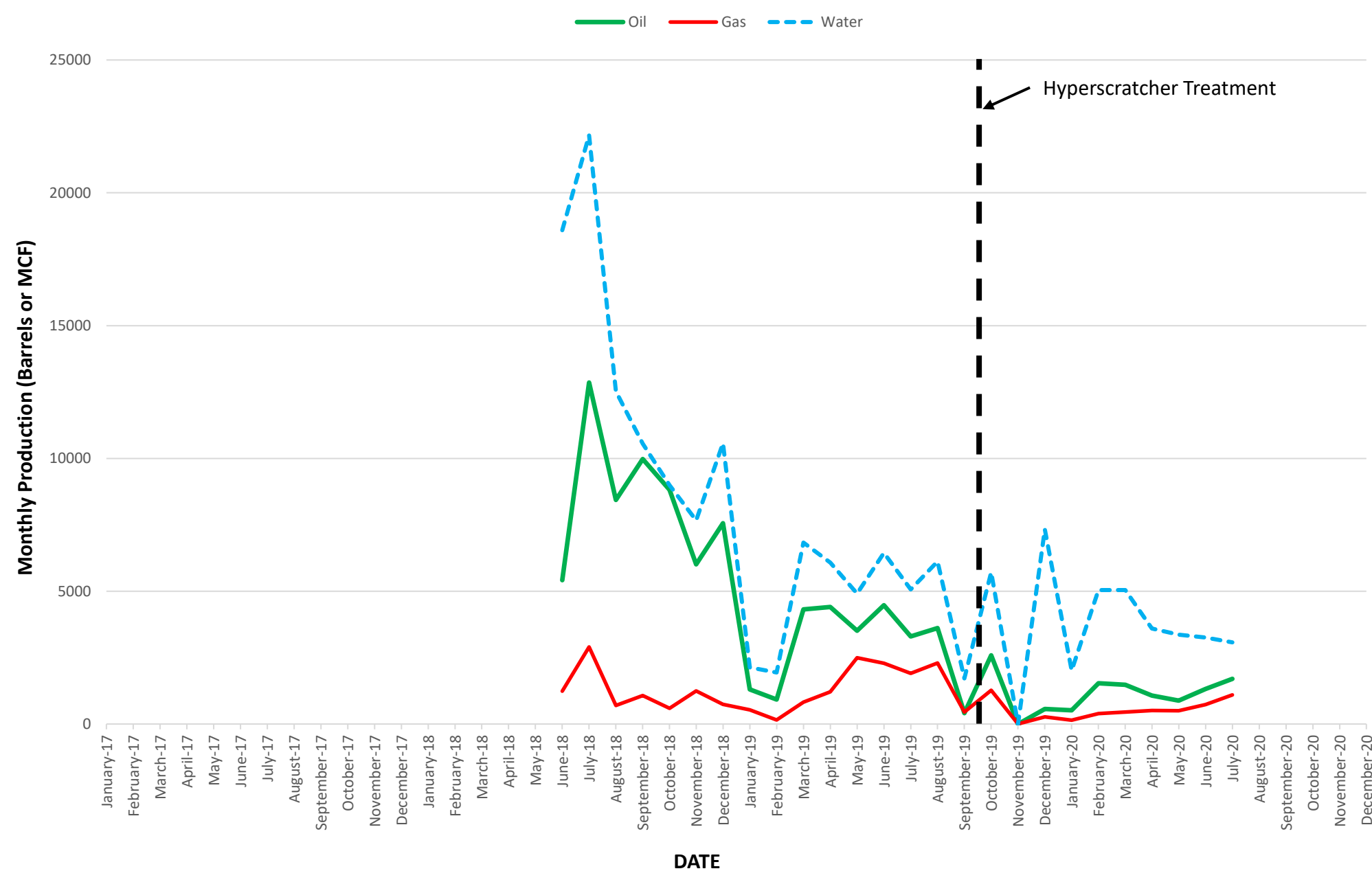
Company A "A-3 Horizontal": Daily Production



- Problem: Paraffin & Scale
- Treatment: 9/19-22/2019
- Pumped 5 bbls chem-treated water thru tool jets at each perf set
- Pumped 64 bbls acid after tool treatment
- Flushed with 150 bbls chem-treated produced water
- No improvement to oil production



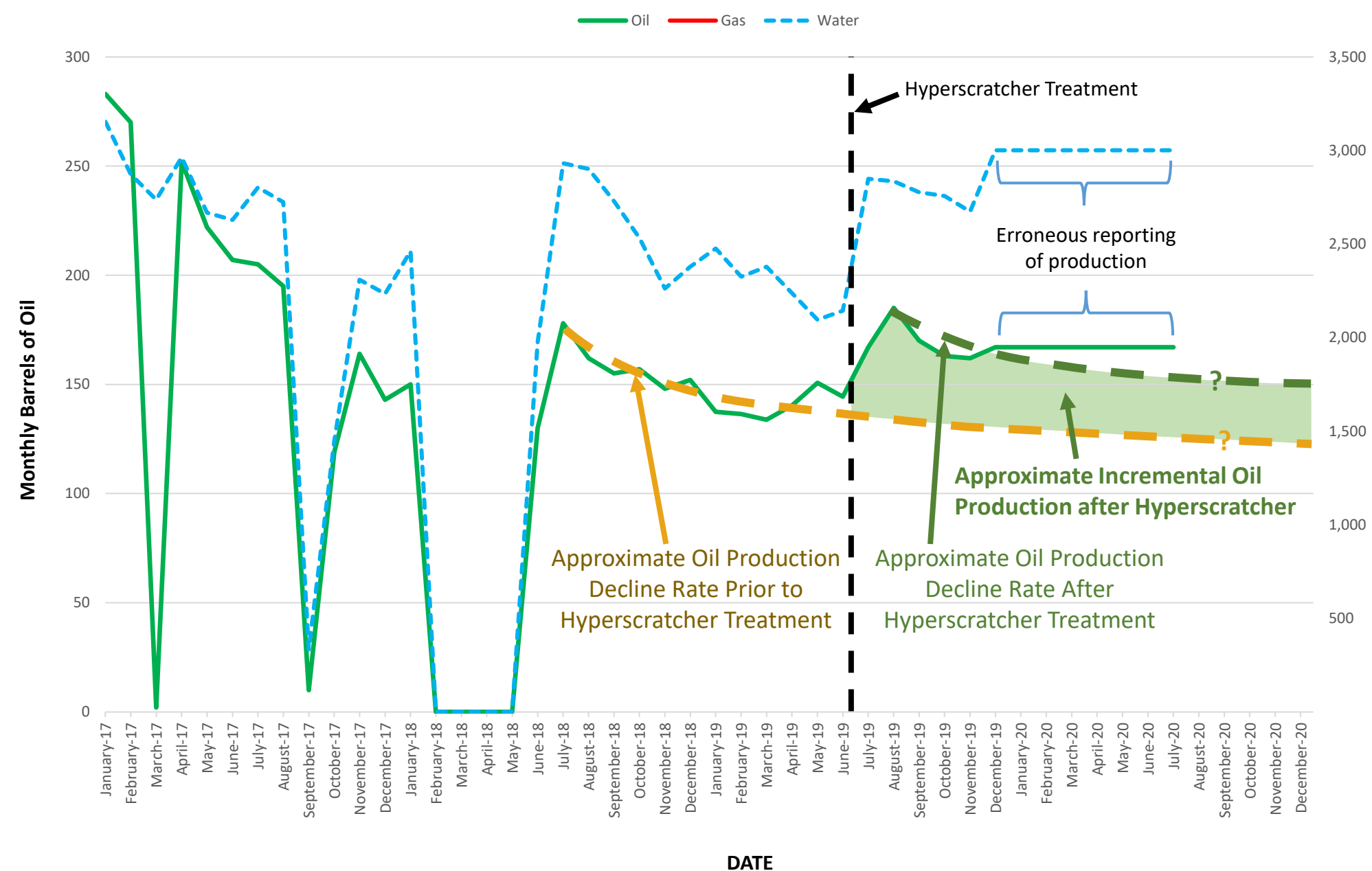
Company A "A-3 Horizontal": Monthly Production



- Problem: Paraffin & Scale
- Treatment: 9/19-22/2019
- No improvement in oil production after treatment
- Tool functioned properly (jets worked and brushes showed normal wear)
- Possible reasons for lack of improvement include:
 - Problems other than clogged perforations
 - Lack of reservoir pressure
 - Nearby horizontal wells were frac'd in November and may be interfering with this well



Company B "B-1" Well: Monthly Oil Production



- Problem: Paraffin
- Treatment: 6/3/2019
- Estimated Incremental recovery from 7/2019 to 7/2020 is ~400 BO
- Approximately 20% improvement in oil production over projected pre-treatment production rate
- Flat appearance to graph in 2020 production due to erroneous reporting



Hyperscratcher Tool Summary of Cases

Hyperscratcher Tool: Summary of Tests

- ★ The tool was used in wells that had reported paraffin and scale build-ups that were adversely affecting production
- ★ Use of the tool improved production in 7 of the 8 wells tested
 - When data were sufficient to enable calculations, production improvement varied from 20% to 120%
- ★ Cost comparisons between the Hyperscratcher tool and other borehole/perforation clean-up tools were beyond the scope of this report. Operators should contact Hyperscratcher directly for pricing information (307-234-1776; www.hyperscratcher.com/contact-us/)



Thank You

Questions, Comments, Concerns

Stephen Whitaker

Technical Director

Stephen.Whitaker@uwyo.edu

Office 307-315-6446

www.eoriwyoming.org

