

WEST VIRGINIA DEPARTMENT OF COMMERCE
GEOLOGICAL & ECONOMIC SURVEY

2022 Marcellus Shale and Utica-Point Pleasant Production Summary

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September, 27th 2023

This summary was prepared by the West Virginia Geological and Economic Survey (WVGES). The data summarized herein were reported by operators to the West Virginia Department of Environmental Protection (WVDEP) Office of Oil and Gas for calendar year 2022.



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Disclaimer:

These production volumes represent data posted by WV Department of Environmental Protection Office of Oil & Gas as of 7/23/2023. Data from several operators reporting Marcellus and Utica-Point Pleasant production in 2022 may not have been available at the time of this report; therefore, the values listed below may change as more data become available.

Glossary

bbl-barrel

Tcf-trillion cubic feet

Bcf-billion cubic feet

MMcf-million cubic

Mcf-thousand cubic feet

NGL-natural gas liquids

LL-completed lateral length

BOE-barrels of oil equivalent

2022 Marcellus Production Summary

Wells included in this overview were permitted as Horizontal 6A or H6A wells. In 2013, the West Virginia DEP changed the rules governing horizontal well development including the requirements for data reporting. These wells are referred to by the DEP as Horizontal 6A or H6A wells and since 2013 all Marcellus and Utica/Point-Pleasant horizontal wells were permitted as such. For H6A wells, the DEP requires much greater detail on the completion intensity and requires operators to report NGL's along with oil and gas. In 2022, there were over 63,000 total wells that reported production in West Virginia, but only 2818 or 4.5% of the total are classified as H6A. However, despite the relatively small number of wells, H6A wells accounted for 91% of the gas, 94% of the oil and 100% of the reported NGL's. Since most production and new drilling activity in West Virginia comes from H6A wells, this report will focus on H6A wells only.

Since H6A requirements were adopted, a detailed perforation record that highlights the depths of each perforation must be submitted to the state after completion. Completed lateral lengths can be calculated from these reports by subtracting the shallowest perforation from the deepest perforation. Because lateral length can vary greatly throughout a field, many operators normalize the well production by accounting for the lateral length. Most commonly this is done by dividing the volume of hydrocarbons produced (Gas, NGL, etc.) by the completed lateral length of the well in 1000's of feet. This report will include cumulative volume maps that highlight cumulative production by well and county, and maps showing normalized production per well.

Number of horizontal Marcellus H6A wells reporting production: 2712

Average Lateral Length: 12,741'

Longest lateral reported: 23,666'

Marcellus Gas

County	Marcellus Wells Reporting Production	2022 Marcellus H6A Cumulative Gas (Bcf)
Tyler	512	666.6
Marshall	394	316.7
Wetzel	322	306.9
Doddridge	501	276.3
Harrison	172	174.2
Monongalia	127	171.6
Ritchie	245	163.3
Ohio	155	89.8
Brooke	131	87.8
Lewis	26	86.3
Marion	55	49.8
Taylor	35	16.7
Barbour	22	8.9
Pleasants	7	5.2
Upshur	4	1.2
Gilmer	4	1.1

Table 1: Cumulative Marcellus H6A gas production and wells reporting gas production by county in 2022.

Annual Marcellus production and wellbore trends

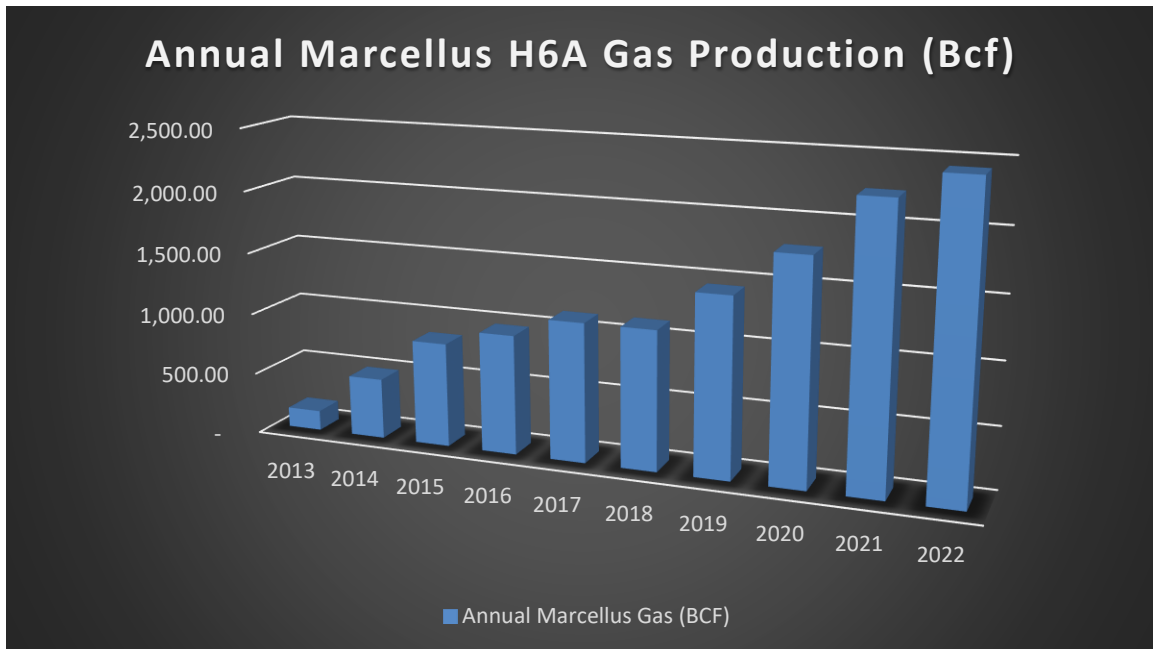


Figure 2: Chart showing the annual gas production for Marcellus H6A wells. In 2022, gas production from Marcellus H6A wells increased by 194 BCF and totaled over 2.4 Tcf for the year.

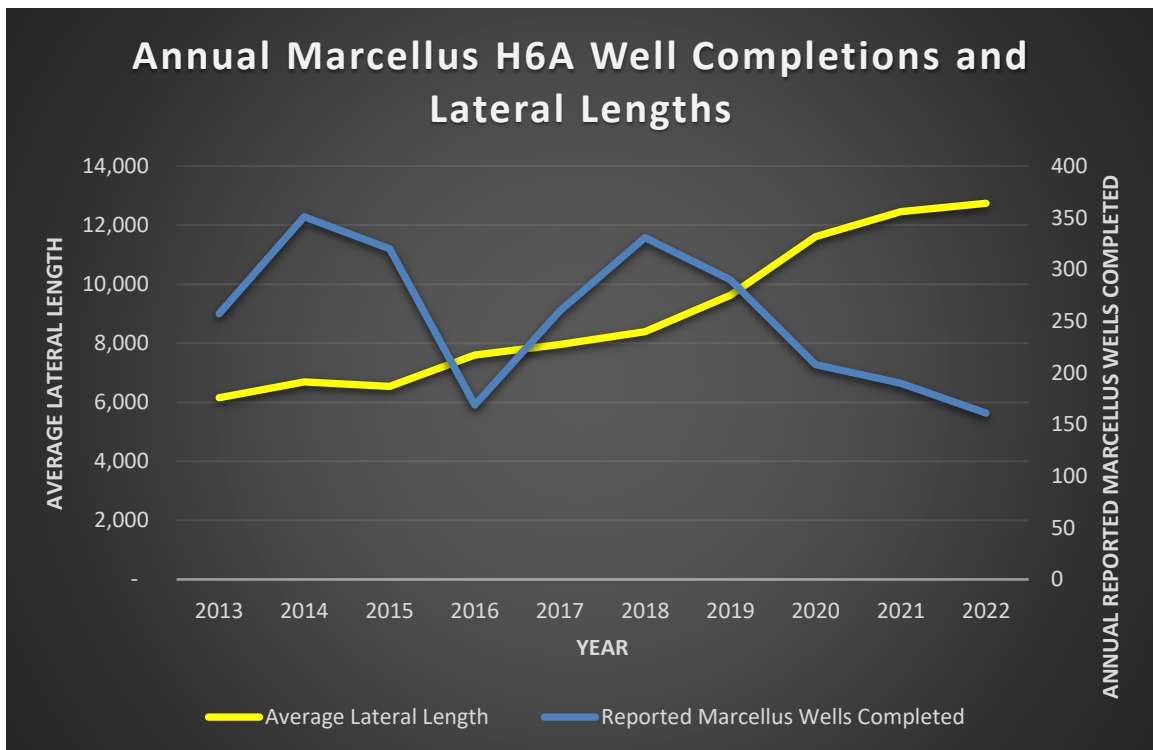


Figure 3: Chart plotting Marcellus H6A lateral lengths over the last 10 years and annual Marcellus H6A wells completed. Since 2013, the average lateral length for a Marcellus H6A well has doubled from just over 6000' in 2013 to over 12,000' in 2022.

Marcellus H6A Gas Maps

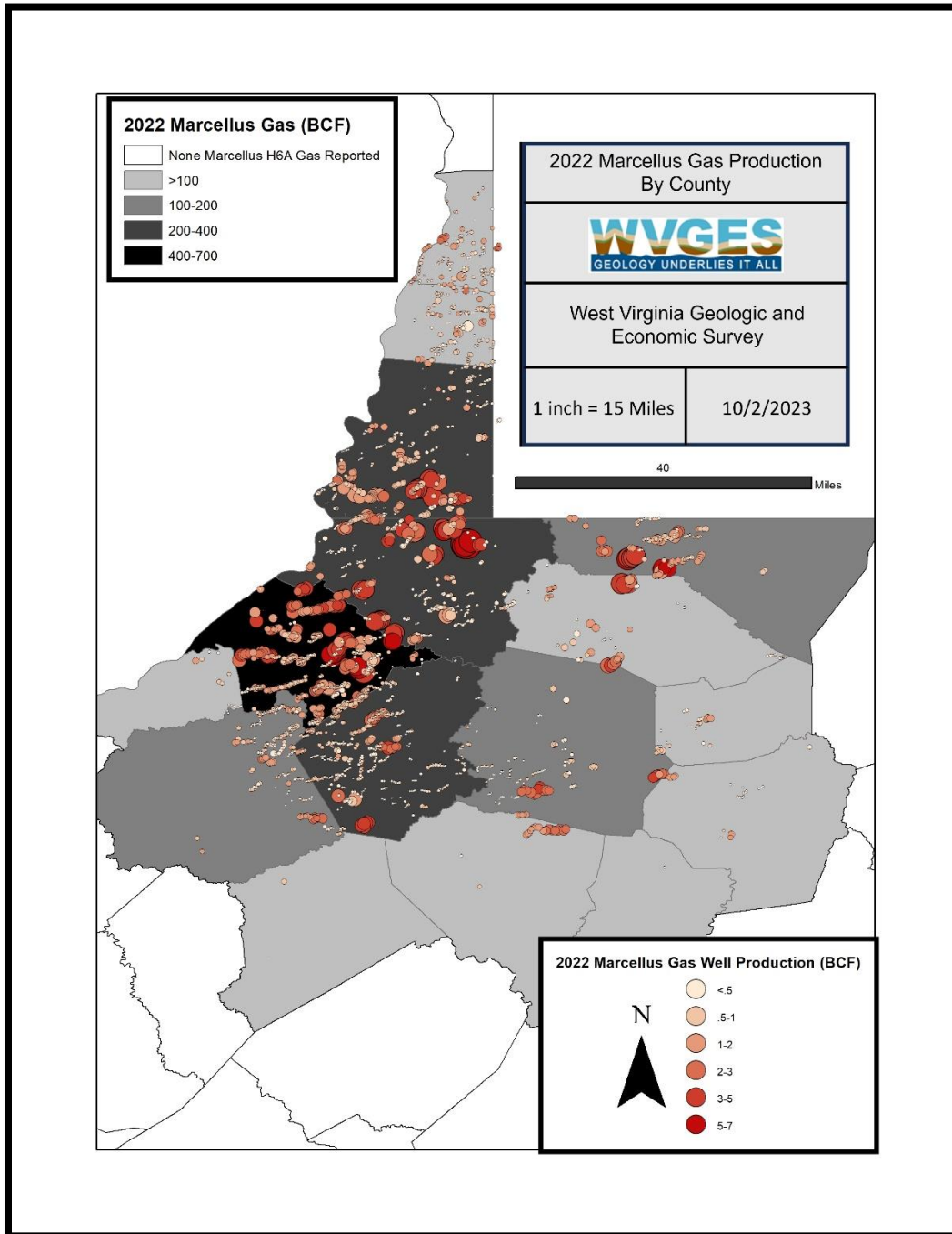


Figure 3. Map showing the reported Marcellus H6A gas production for 2022. According to the DEP, there were 2629 Marcellus H6A wells that reported production in 2022 from 16 different counties. Tyler County was the most productive with 667 Bcf of Marcellus H6A gas and had the largest number of wells with reported production (512).

Normalized Gas Production in the Marcellus

Horizontal well production is proportional to the lateral length, and longer laterals often produce greater cumulative volumes of gas than wells with shorter laterals. For this report, the lateral length refers to completed lateral length and is calculated from the completion report by subtracting the shallowest perf from the deepest perf. To account for variations in lateral length, the map below was made by dividing the gas produced in 2022 by the lateral length in 1000's of feet of lateral. While this method of normalization accounts for lateral length, it does not factor in how long the well has been producing or downstream production constraints.

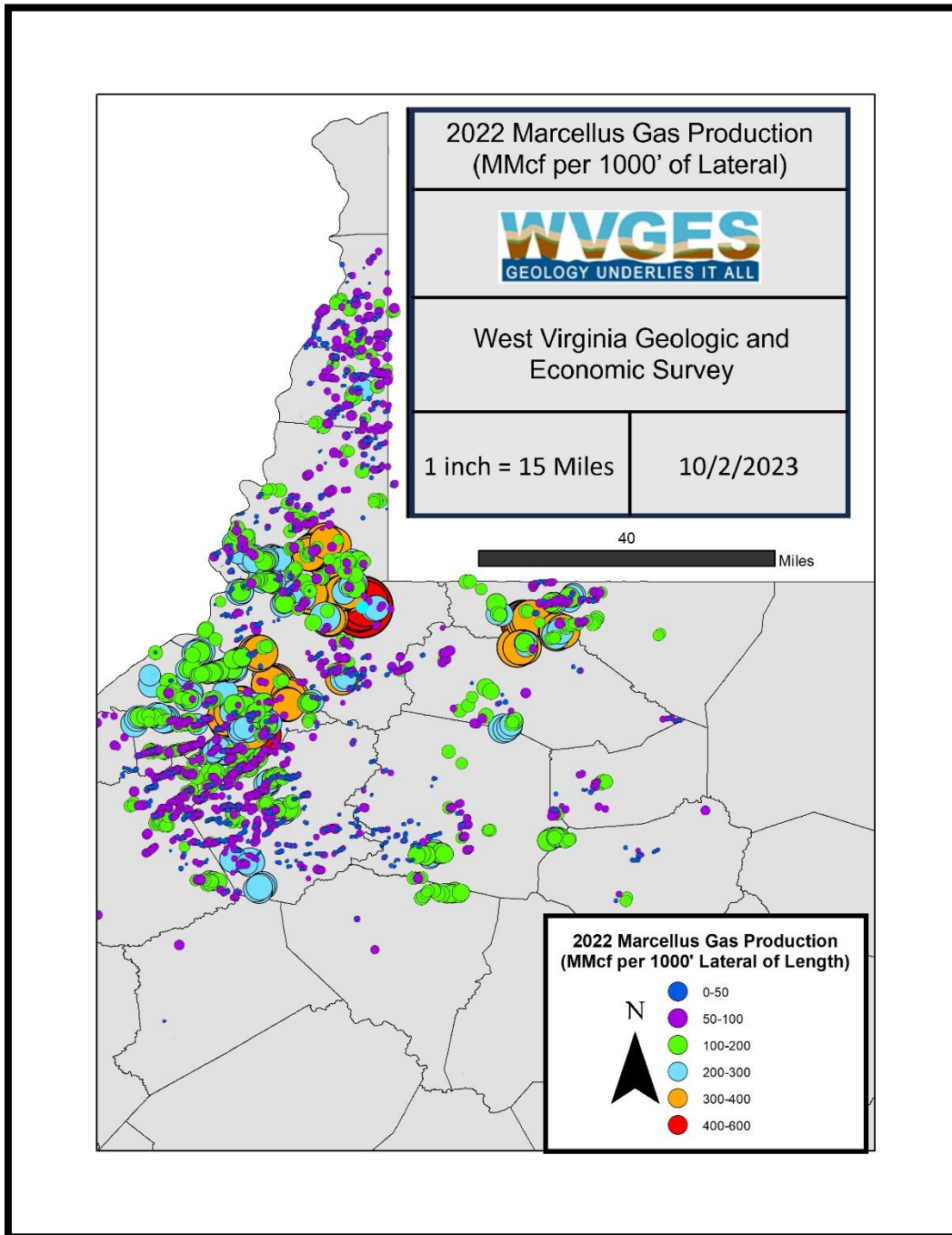


Figure 4: Map of 2022 Marcellus H6A gas production normalized by 1000' of lateral length.

Marcellus Combined Oil & Natural Gas Liquids (NGLs)

Total 2022 Combined Marcellus Oil & Natural Gas Liquids Production: 120, 855,355 bbls

HB4270 (effective for 2018 production reporting) requires that downstream natural gas liquids (NGL) accounted to a well will be reported as NGL to that well API while wellhead oil and lease condensate will be reported together as crude oil. Previously, a 2016 legislative rule change in West Virginia required that condensate (lease condensate) data rather than NGL data are to be reported to WVDEP. The volumes reported are to be liquid condensate at the wellhead, not NGL volumes extracted downstream at processing plants. For this report, oil and NGL volumes will yield a total volume of liquid hydrocarbons produced per well. Finally, some operators have different reporting practices for NGL volumes and may not have any liquids reported to the state.

2022 Annual Liquids Production Summary

County	Marcellus Wells Reporting Liquids Production	2022 Liquids Production (bbls)
Tyler	480	35,676,090
Marshall	377	24,285,628
Wetzel	302	15,233,304
Brooke	130	13,317,750
Doddridge	461	11,900,885
Ohio	153	11,203,814
Ritchie	243	8,743,296
Pleasants	7	352,288
Lewis	2	123,178
Gilmer	4	18,057
Taylor	5	1,065

Table 2: 2022 cumulative liquids (Oil + NGL) production for Marcellus H6A wells by county. Tyler County had over 35 million barrels of produced liquids in 2022 and the largest number of wells reporting liquid production in the state at 480. Only 11 counties had wells that recorded liquids production in 2022.

Marcellus H6A Liquids Production Maps

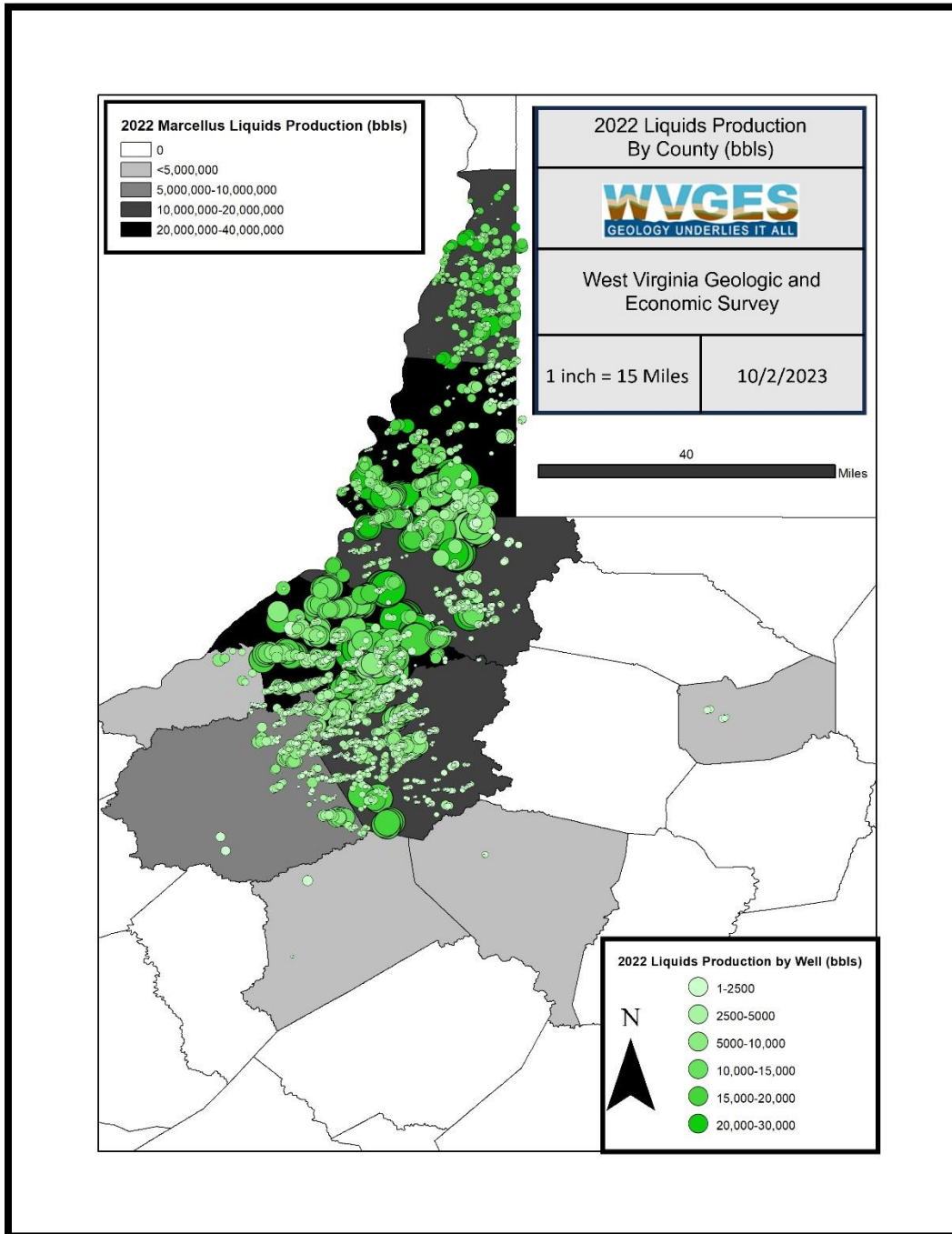


Figure 6: Bubble map showing the 2022 Marcellus H6A liquids (NGL+Oil) production by well. Cumulative 2022 production for the 11 counties that had Marcellus H6A liquids are shaded using graduated colors. Nearly half (49.6%) of the total Marcellus H6A liquids production came from two counties (Tyler and Marshall).

Normalized Liquids Production

Normalized liquids production for Marcellus H6A wells was calculated much the same way that normalized gas production was. Total liquids (Oil + NGL) were divided by the lateral length in 1000's of lateral. The map below plots normalized liquids production for 2022 in barrels of liquids (bbls) per 1000' of lateral.

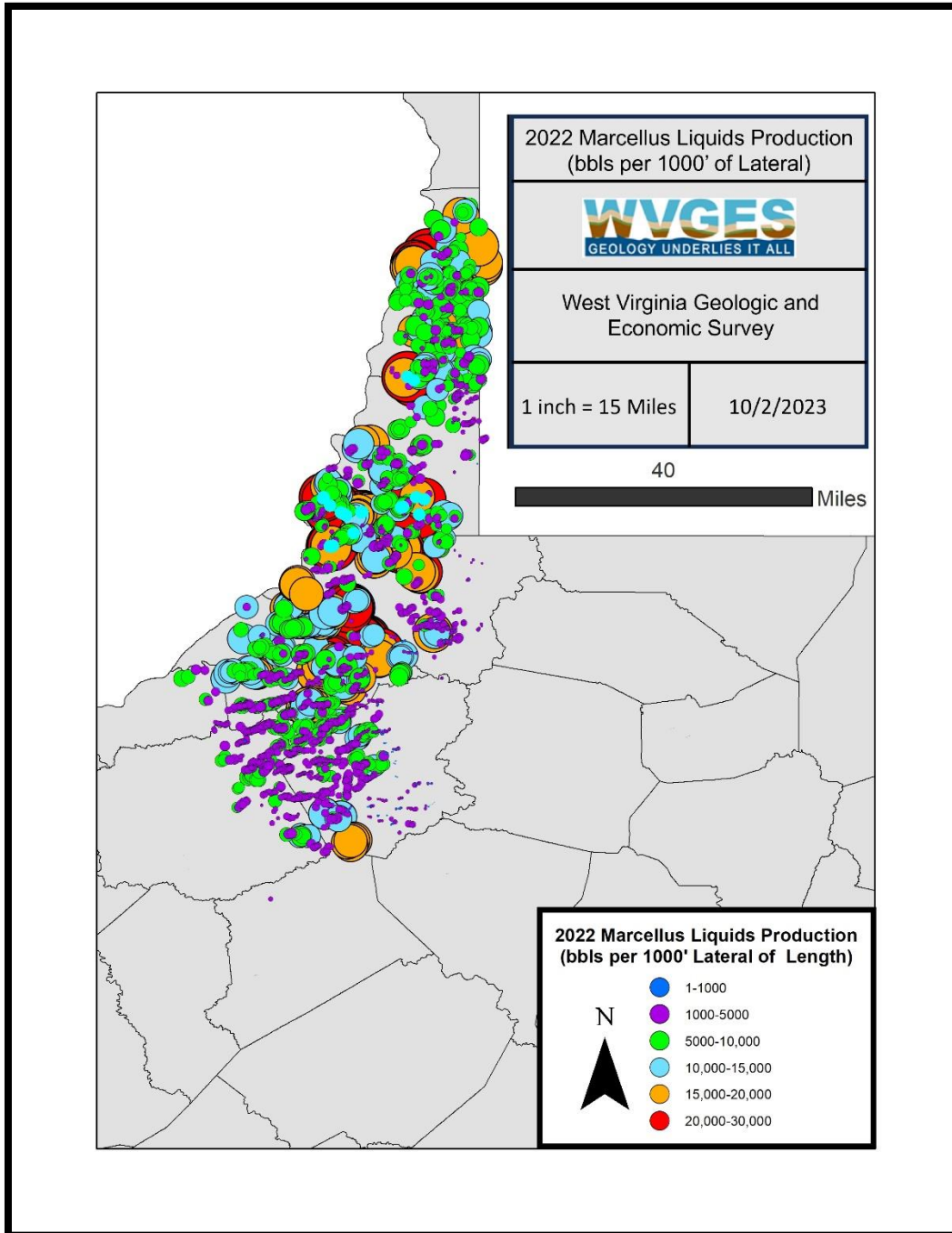


Figure 7: Normalized Marcellus H6A Liquids production in barrels (bbls). Marshall County has 7 of the top 10 producing and 19 wells with normalized production greater than 20,000 bbls/ 1000' of lateral.

Annual Liquids Production Charts

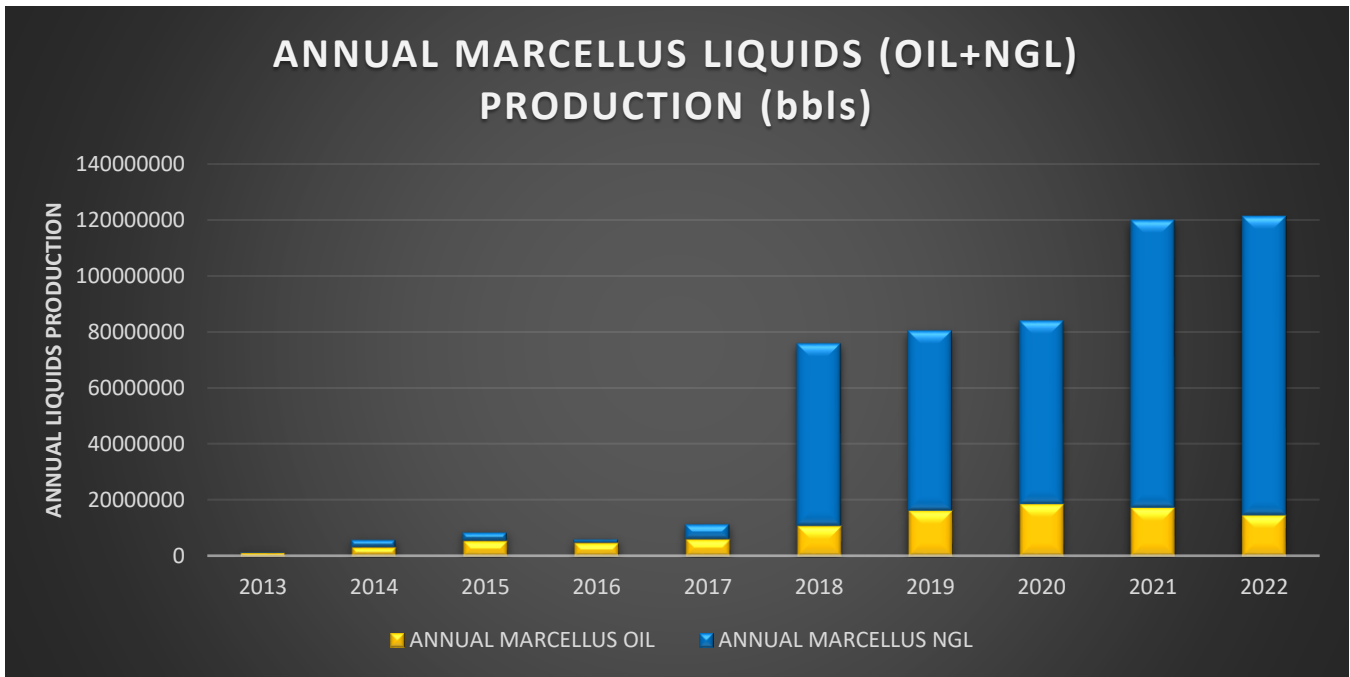


Figure 8: Stacked Column chart showing the Marcellus H6A annual liquids production (Oil + NGL) in barrels (bbls). Note the significant increase in NGL production beginning in 2018. This is largely due to the change in reporting requirements for H6A wells that were adopted that year.

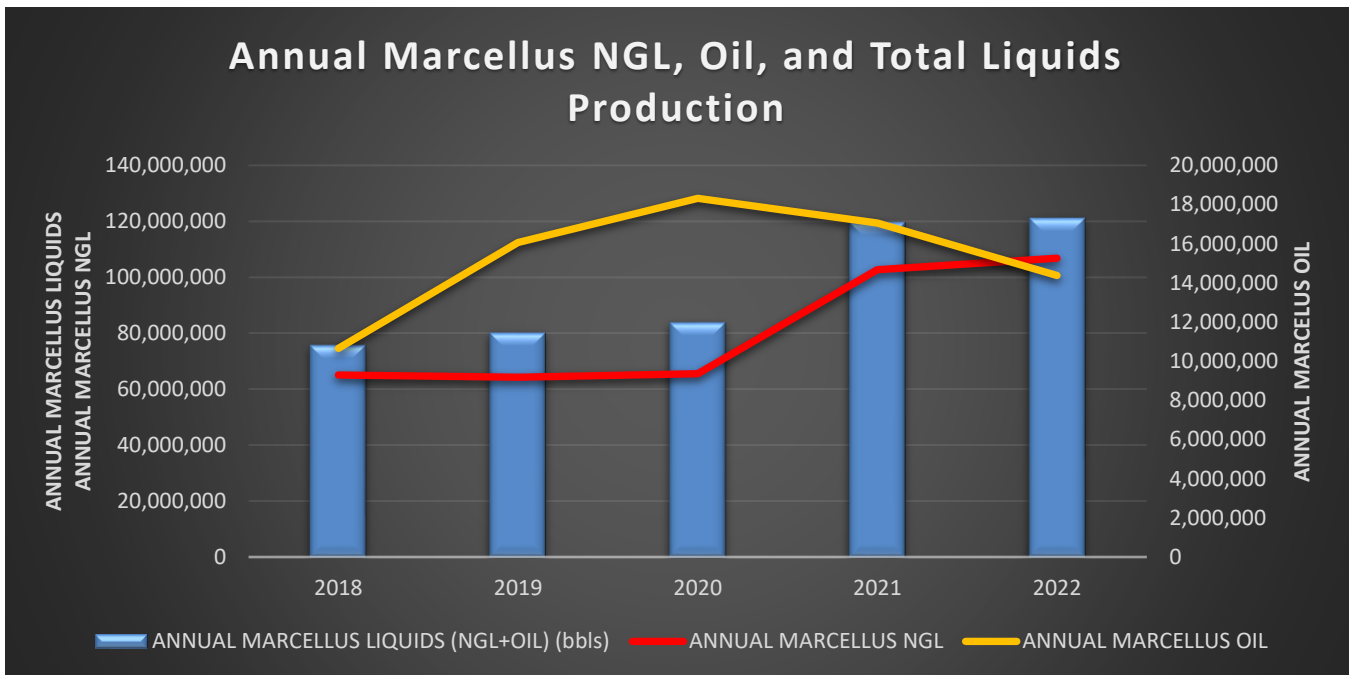


Figure 9: Combo chart detailing the Marcellus H6A liquids production. NGL volumes have continued to increase since the reporting requirements changed in 2018. However, oil production has decreased since 2020 and dropped 15% from 2021 to 2022 despite 198 new Marcellus wells being completed in 2022.

Marcellus Normalized BOE per 1,000' Lateral Length

Since 2020, a new metric for comparing well results across the state has been used. The metric is barrels of oil equivalent (BOE) per completed 1000' of lateral length, and is calculated by dividing the gas volume in Mcf by 5.8. These equivalent barrels (bbls) are then added to the previously reported oil and NGL barrels to generate a total BOE value. The BOE value is then divided by the lateral length in 1000's of feet of lateral to get a normalized production in bbls per 1000' of lateral.

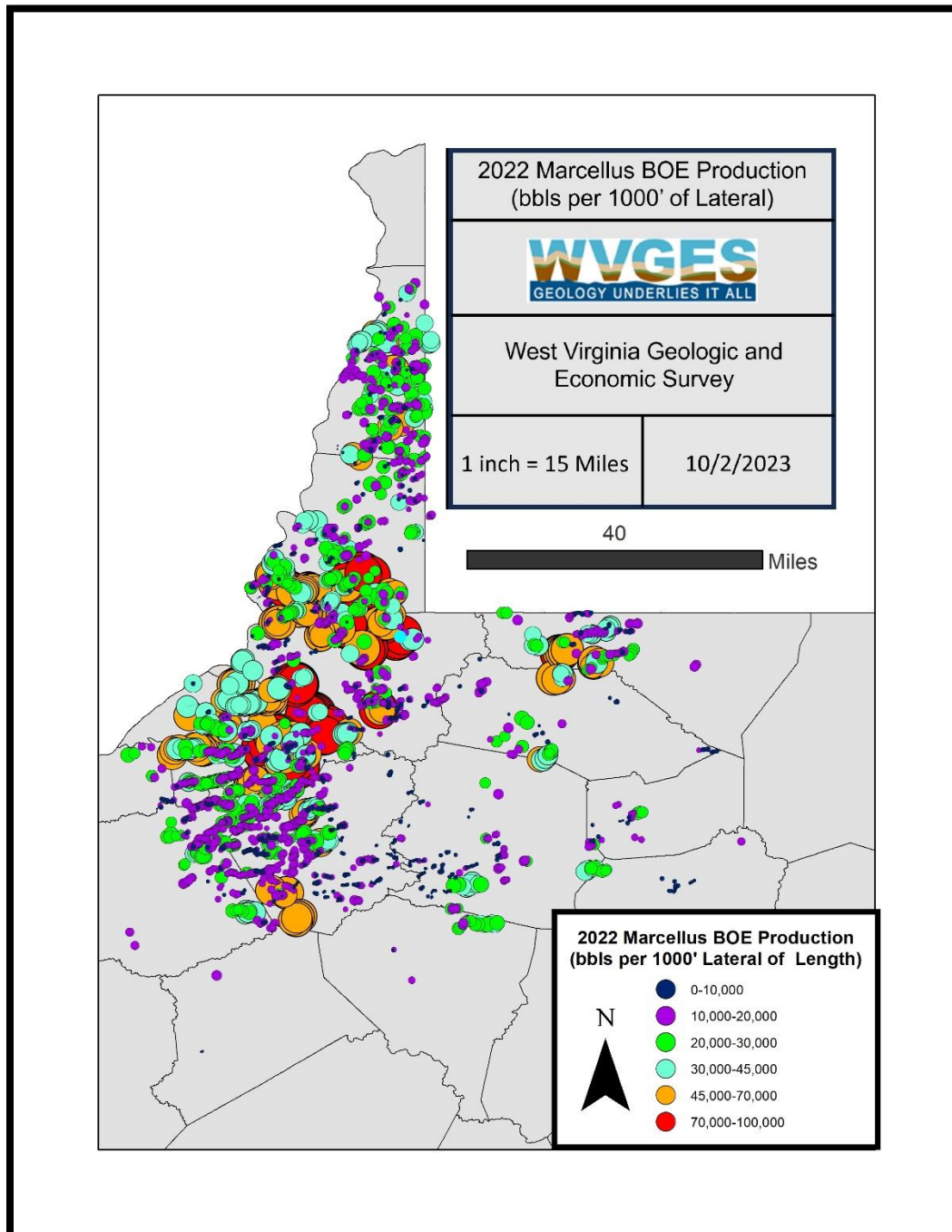


Figure 10: Normalized Marcellus H6A production in BOE. The calculated BOE for 2022 for each well was then divided by the lateral length to normalize production to BOE/1000' of lateral.

2022 Activity in Utica-Point Pleasant Play

Development of the Utica-Point Pleasant natural gas play in West Virginia continues to grow. Records currently on file with WVDEP and/or WVGES indicate that 109 wells have reported 2022 production, up from 82 in 2021. The Utica-Point Pleasant play is predominantly dry gas, with relatively very small amounts of oil or NGL reported. This report focuses on the gas only on Utica Gas production. Lastly, for this report, a “Utica” well is any well that has targeted and drilled in either the Utica or Point Pleasant.

Total 2021 Utica-Point Pleasant Gas Production: 169.53 Bcf

Average lateral length: 11,947'

Longest lateral length: 17, 413

County	Number of Utica Producers	2022 Utica Gas Production (Bcf)
Tyler	11	3.44
Wetzel	4	0.52
Monongalia	1	0.49
Marshall	78	150.83
Pleasants	15	13.30

Table 3: Table showing the total number of Utica H6A wells producing in each county and the total gas produced by Utica wells in that county. Marshall County leads all other counties in terms of Utica producers and total production.

Utica annual gas production and wellbore trends

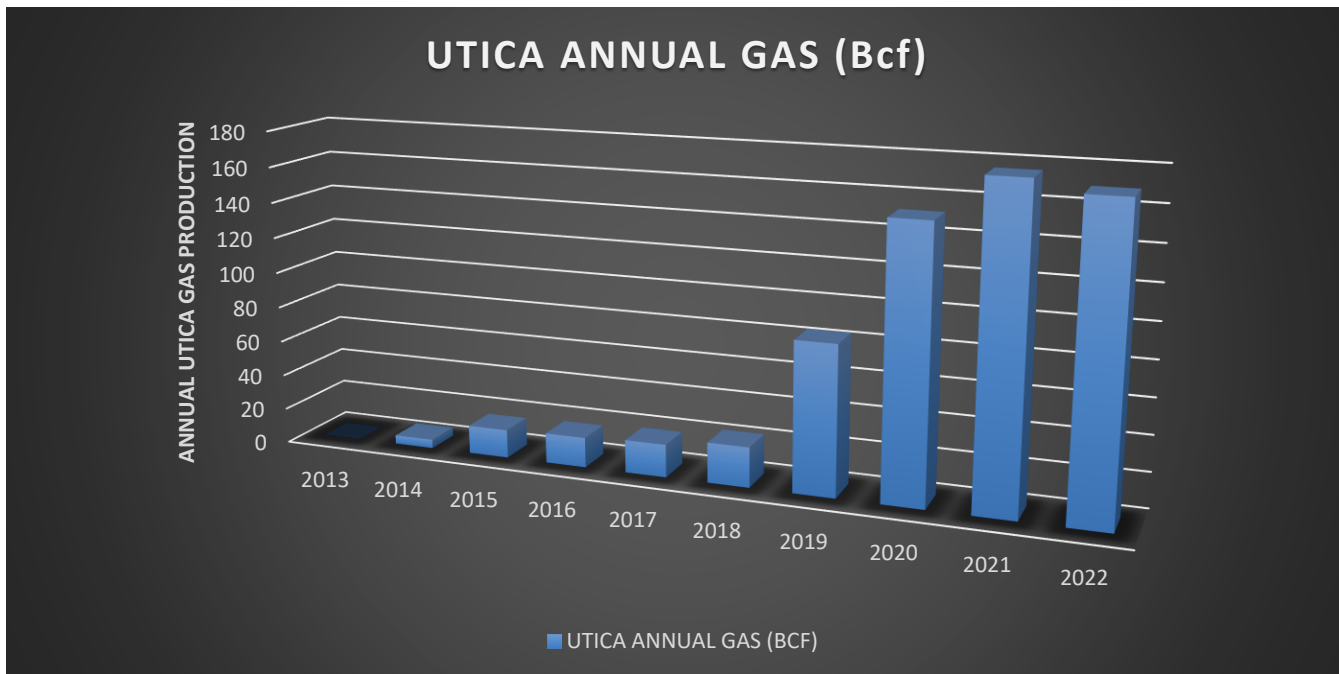


Figure 11: Annual Utica H6A gas production in the state of West Virginia. Production declined from 175.87 Bcf in 2021 to 169.5 Bcf in 2022.

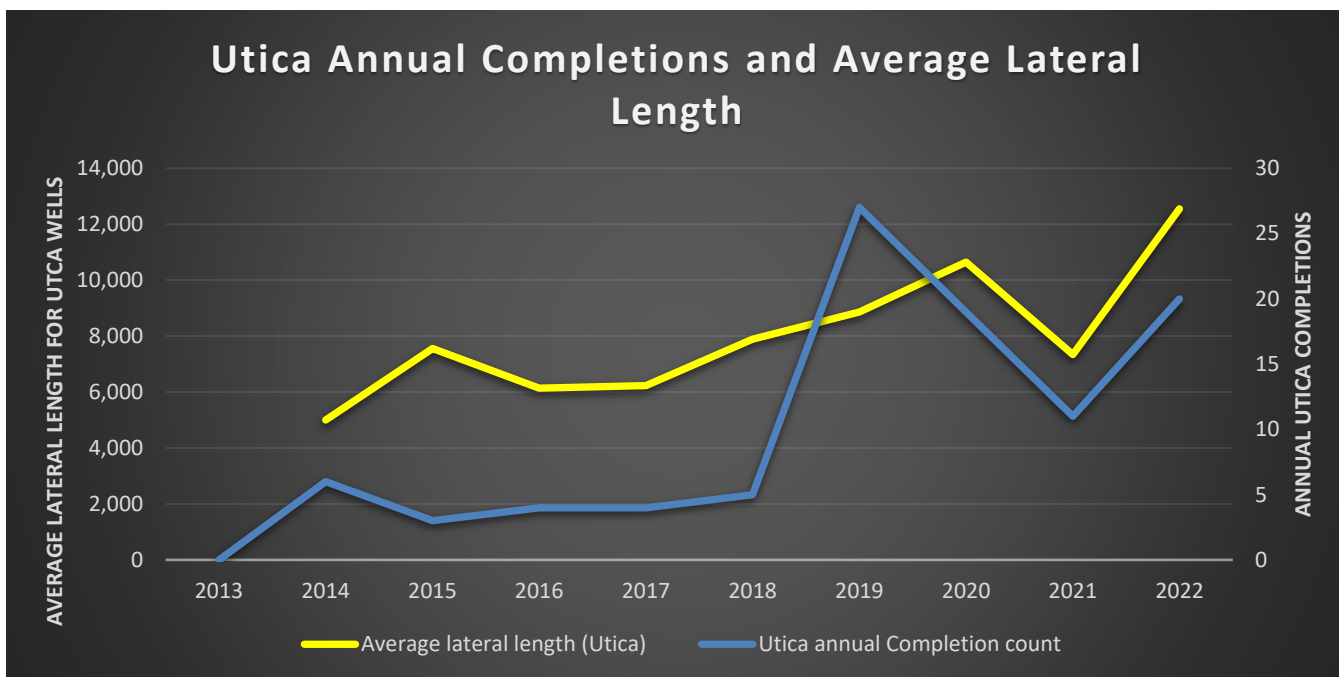


Figure 12: Average lateral length for Utica H6A wells and the annual number of Utica wells completed. Like the Marcellus, Utica H6A lateral lengths continue to increase and have more than doubled since 2017.

Utica Gas Maps

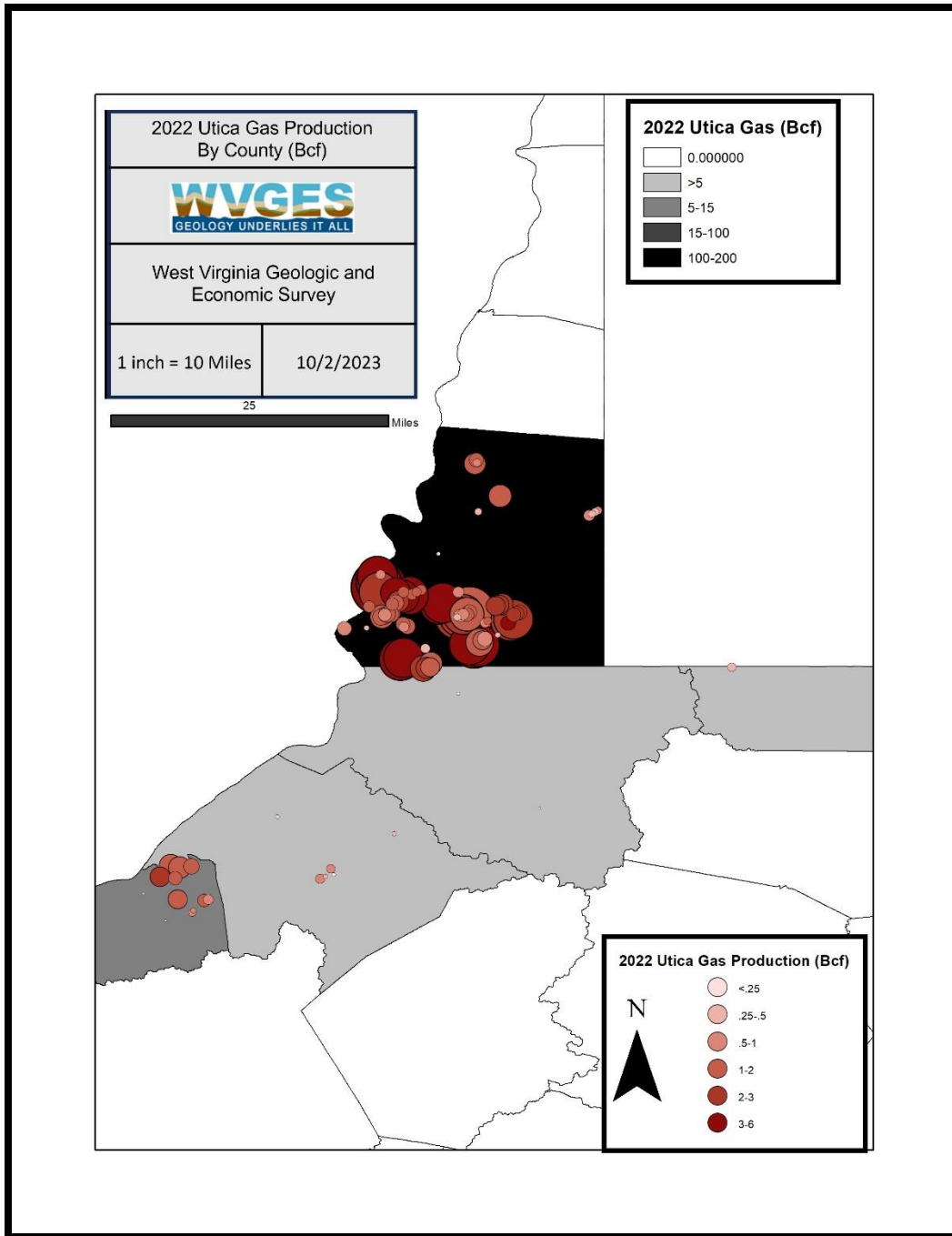


Figure 13: Map of Utica H6A gas production by county with the 2022 gas production reported in bubble.

Normalized Gas Production

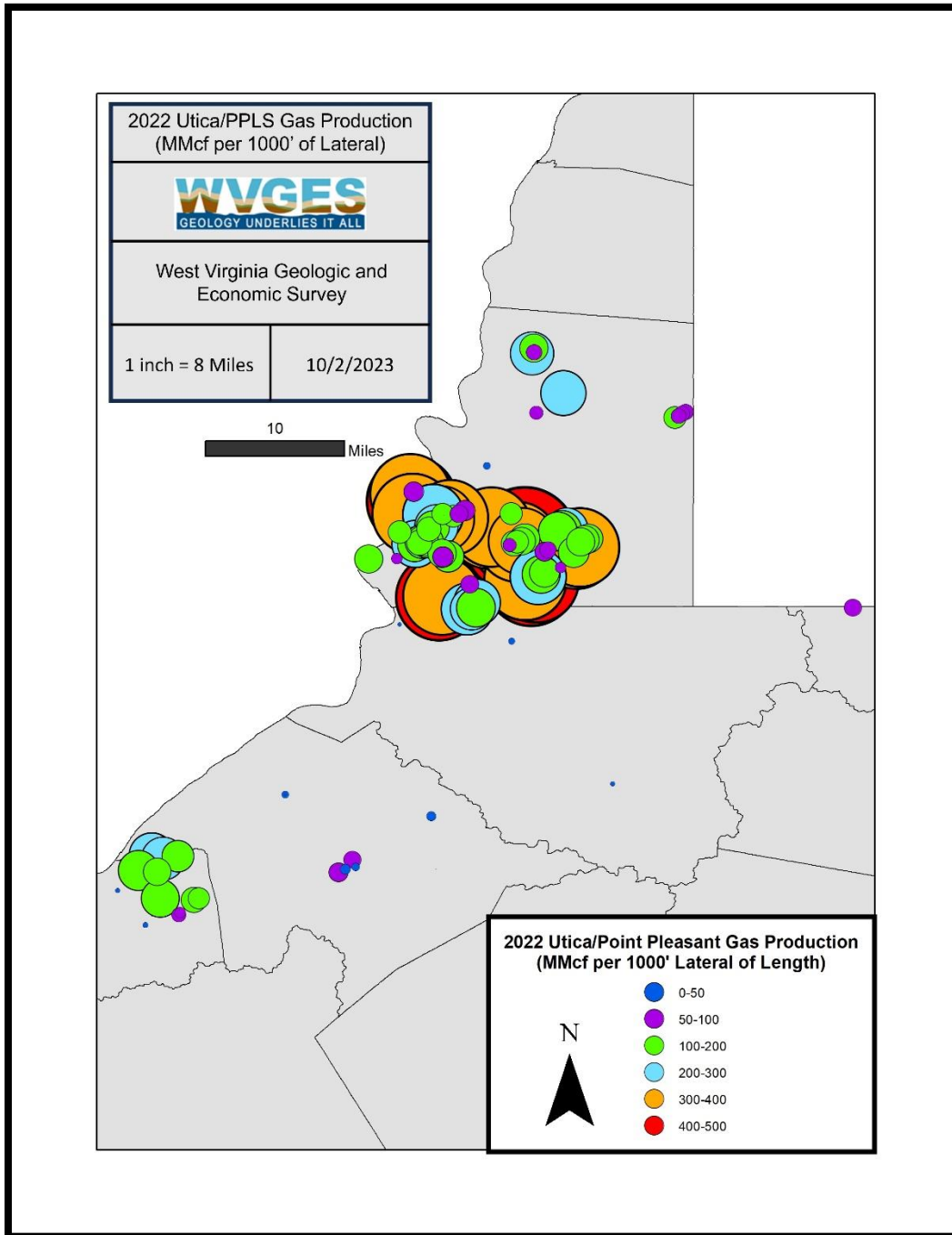


Figure 14: Map of Utica H6A gas production normalized by lateral length and represented by bubbling the production in MMcf/1000' of lateral.

Marcellus & Utica Production 2013-2022

This section of the report will focus on cumulative hydrocarbon volumes for H6A wells since 2013. Additionally, the maps will highlight the total volume of hydrocarbon for each county over that time period.

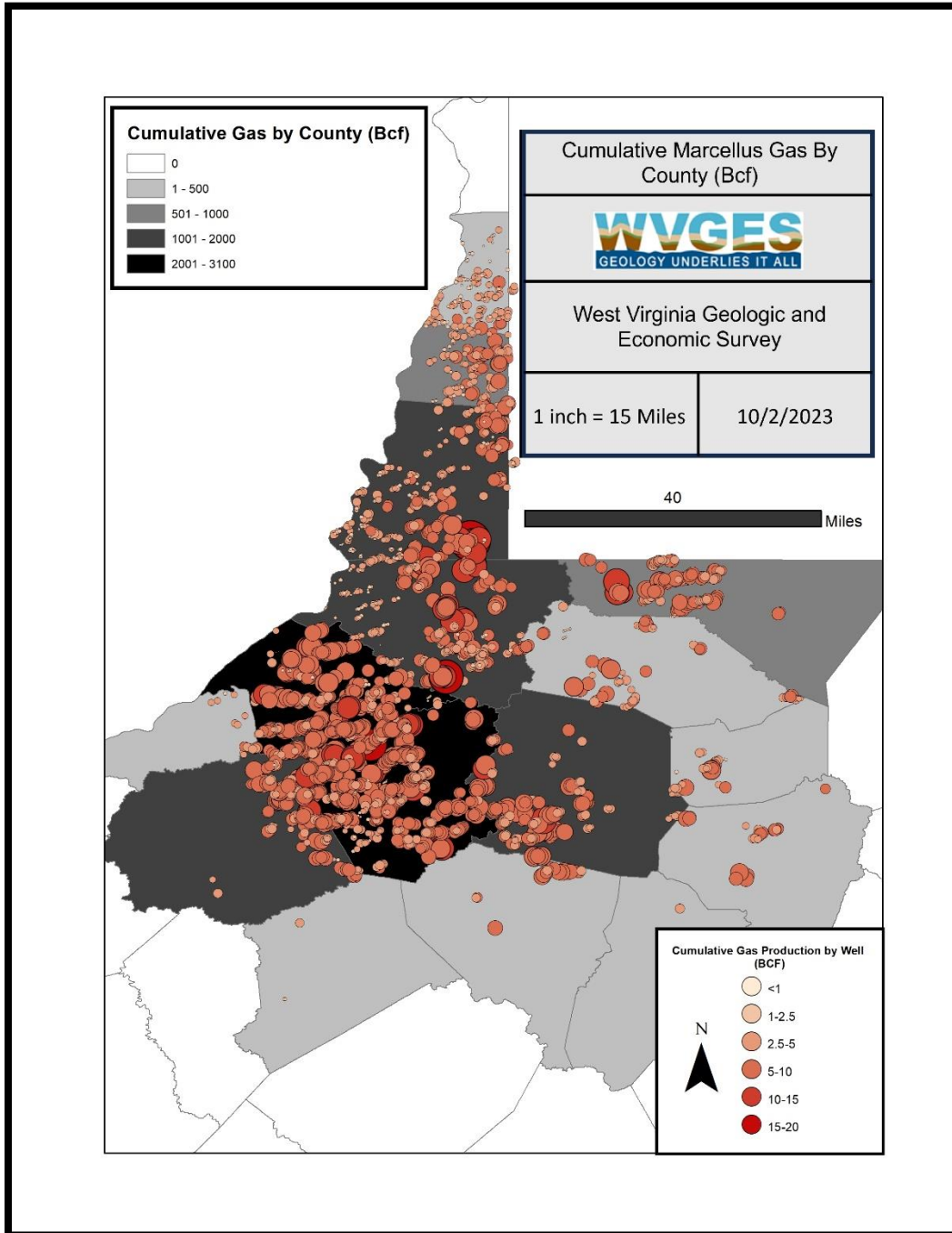


Figure 15: Cumulative gas production map for all Marcellus H6A wells. Since 2013 Tyler County has produced over 3 Tcf of gas and over 13.6 Tcf has been produced from all Marcellus H6A wells.

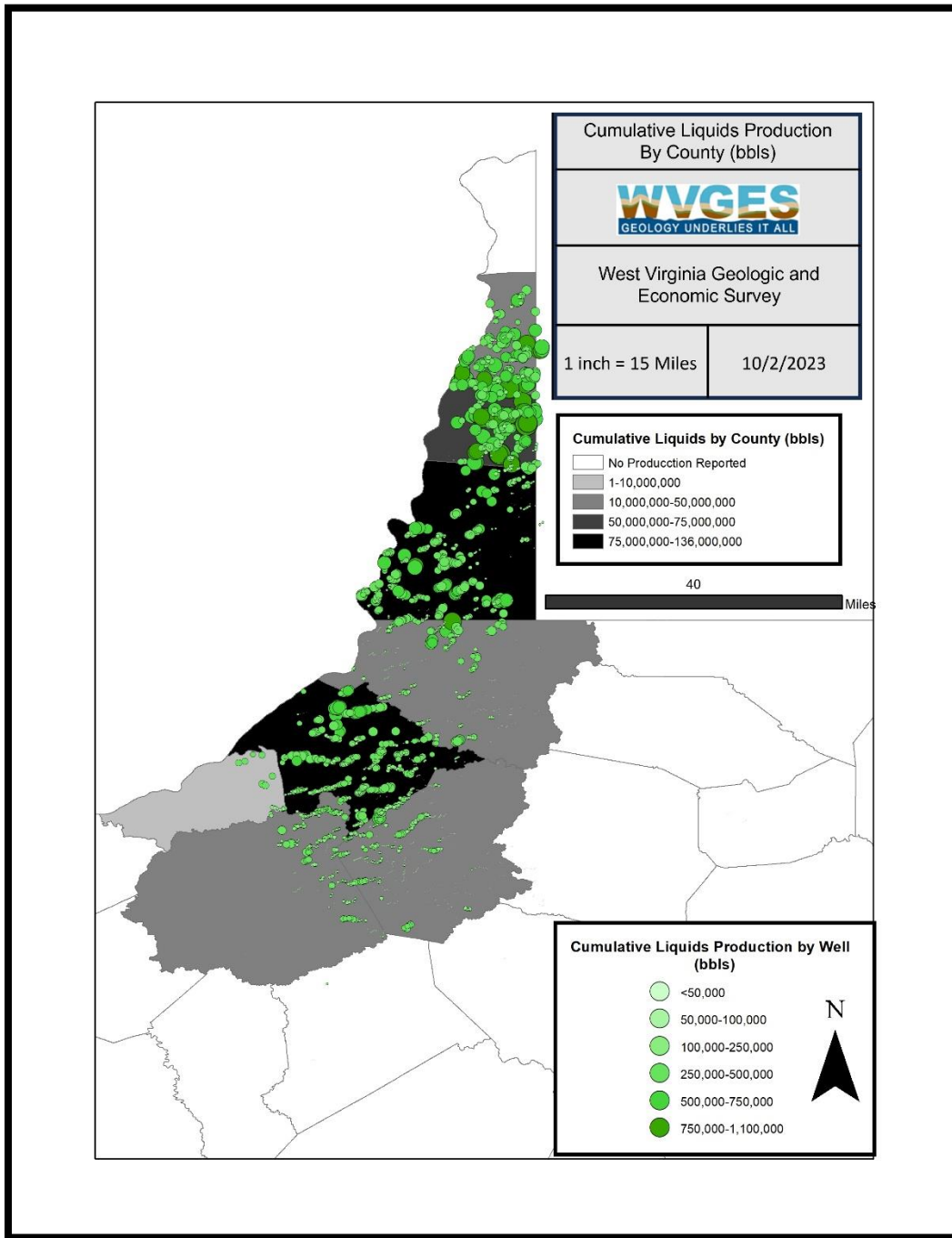


Figure 16: Cumulative liquids production (Oil+NGL) for all Marcellus H6A wells from 2013 to 2022. Much like the cumulative production for 2022, Tyler County and Marshall County have significantly more liquids than the other counties. Tyler County has been the most productive liquids producing county at 135 MMbbls since 2013 and over 513 MMbbls of liquids has been reported since 2013 for all Marcellus H6A wells.

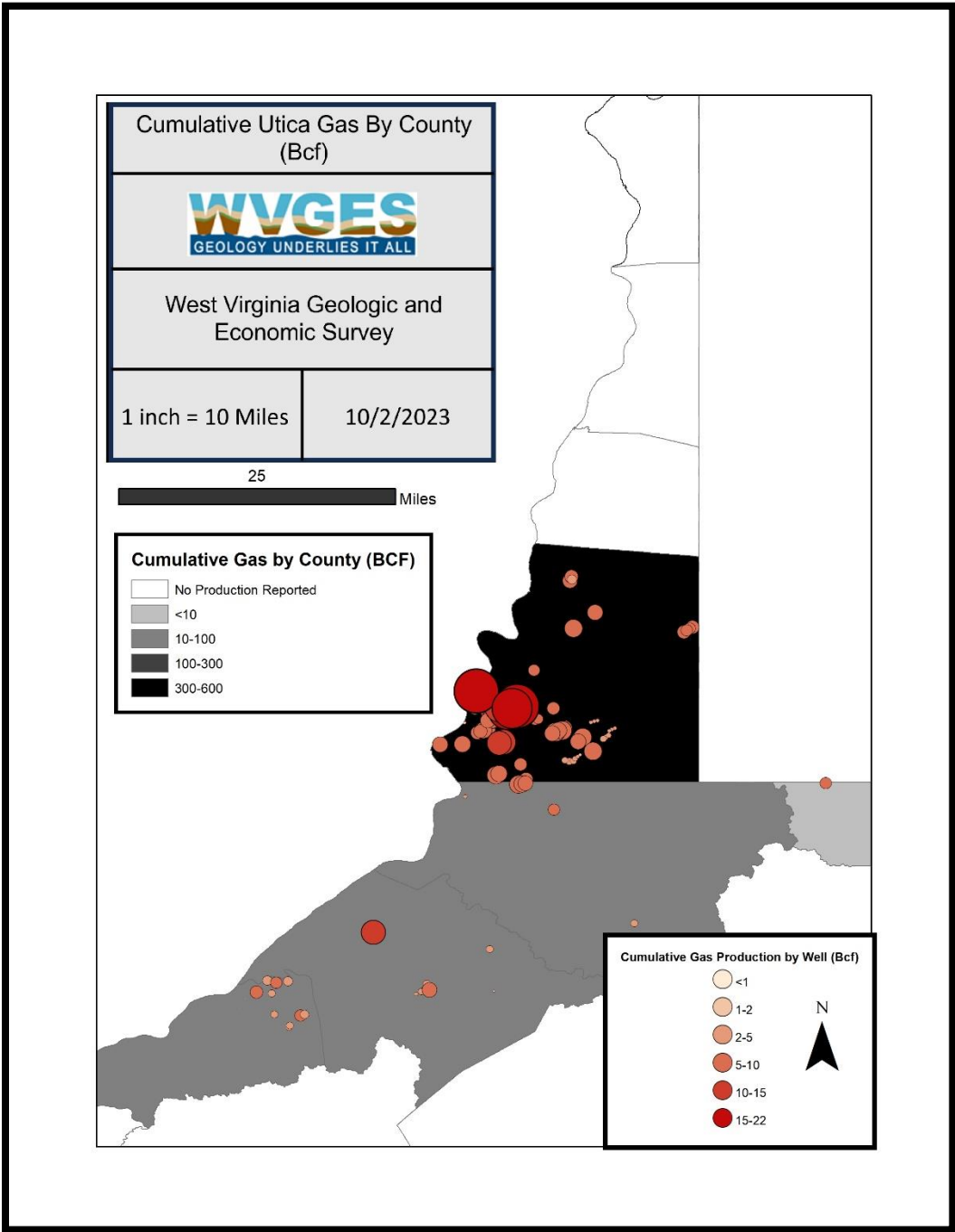


Figure 17: Cumulative gas production for all Utica H6A wells from 2013-2022. The overwhelming majority of gas production has come from Marshall County which produced 82% of the Utica gas during that time period. Furthermore, in terms of total gas production for any H6A well, 3 Utica wells in Marshall County have been the most productive individual wells and the best producer has made over 21 Bcf.