

# ANNUAL REPORT

ODNR DIVISION OF OIL AND GAS RESOURCES MANAGEMENT | 2021



The Division of Oil and Gas Resources Management, (“Division”), is a division within the Ohio Department of Natural Resources (ODNR). Its mission is to provide for safe and environmentally sound development and restoration of fossil fuel extraction sites with a vision to lead change in Ohio through innovation, excellence, and partnering in natural resources stewardship. The Division is governed by the authority of Chapter 1509 of the Ohio Revised Code (ORC) and Chapter 1501:9 of the Ohio Administrative Code (OAC), and regulates all oil and gas drilling, completion, production, underground injection, brine hauling, waste facilities, and plugging activities. The Division has sole and exclusive authority to regulate the permitting, location, and spacing of oil and gas wells within the state. The Division also plugs abandoned oil and gas wells through the Orphan Well program.

The Division’s organizational structure is comprised of multiple sections, composed of various program areas, each with oversight performed by the Division’s Administration section. Expertise is provided by a professional staff of geologists, soil scientists, radiologists, geoscientists and hydrogeologists. Program support services include permitting, bonding, underground injection control, hydrology, seismic, radiology, engineering, field inspection and enforcement, legal, and administration support. The expansion of the Division’s authority is directly correlated with the passage of many significant laws and rules over this time that have shaped Ohio’s oil and gas development.

*On the cover: orphan well plugging rig, Licking County*

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## INTRODUCTION

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This fifty-seventh edition of the Ohio Oil & Gas Summary (The McCormac Report) remains dedicated to accurately presenting statistics that may reflect trends important to Ohio's oil and gas industry, citizens and other governmental agencies.

After several years of developing and testing, the Division went live in June with a new electronic registration, bonding and permitting system known as RICS. This system allows an operator to register, submit and pay for an application and then receive a permit electronically. This is the first phase in replacing RBDMS, the database the Division has been using since 1996.

Horizontal shale activity increased in 2021; its impact on permitting, drilling and production was significant and is reflected throughout the report.

### Highlights include:

- 6,049 registered well owners, including 4,725 domestic owners operating 64,788 wells.
- Issued 640 permits, including 354 drilling permits.
- Issued 11 urbanized area permits in three counties.
- Drilled an estimated 207 oil and gas wells in 20 of Ohio's 88 counties.
- 187 wells were drilled to the Utica/Point Pleasant Shale formations accounting for 90% of all wells drilled.
- Jefferson County was the most active county with 42 wells drilled.
- A horizontal well was drilled to a record-setting length of 34,036 feet in Jefferson County.
- The horizontal rig count averaged 11 rigs per week; the vertical rig count averaged seven per week.
- 373 wells were plugged, including 144 contracted by the Orphan Well Program.
- Produced 18,999,720 barrels of crude oil, at an average price of \$63.86 per barrel.
- Produced 2,254 billion cubic feet of natural gas, at an average price of \$3.36 per mcf.
- The combined market value of crude oil and natural gas production was \$8,788,095,090.

### To make oil and gas well data more accessible, the division:

- Posts updated shale development activity weekly and cumulatively on our website.
- Operators of horizontal oil and gas wells in Ohio are required to submit production data quarterly. This information is posted on our website.
- An annual spreadsheet combining all four quarters of horizontal production was compiled and posted on our website.

On a personal note, this will be my last report, after compiling and writing this report for 37 years. I am re-retiring in 2023.

Mike McCormac

## PERMITTING

The permitting section includes geologists, environmental specialists and administrative professionals who review and approve permit applications for all oil and gas operations in Ohio. This requires an understanding of local stratigraphy, groundwater hydrology, petroleum geology, as well as knowledge of geographic information systems, cartography, potential hazards, and drilling and well construction practices. The technical review process ensures compliance with all applicable statutes and rules and includes approval of a casing program that protects all usable groundwater from contamination. The permitting section also designs and implements terms or conditions to the permit which can reasonably be expected to prevent violations that would present an imminent danger to public health, safety or the environment.

The Division issued 640 permits, an increase of 153 (31.4%) from 2020 (Figure 1). This total includes permits issued to convert, deepen, drill, plug back, plug and abandon, reissue and reopen.

Permits issued to drill for oil and gas totaled 354, a 32.1% increase (86 permits) from last year. These permits included 337 new permits and 17 reissued permits. Unconventional horizontal drilling permits far outnumber conventional vertical drilling permits issued each year in Ohio. There were 321 (91% of all permits) unconventional well drilling permits issued compared to 33 conventional well drilling permits. Utica/Point Pleasant shale permits increased by 80 for a total of 321, accounting for 91% of all drilling permits. There were zero permits issued for the Marcellus shale. Deep well permits increased by seven for a total of 15 (4%). Deep well permits are those issued to drill to formations below the Cambro-Ordovician Knox unconformity such as the Beekmantown dolomite, Rose Run sandstone, Trempealeau dolomite and to the Precambrian granite. Clinton sandstone permits increased by six for a total of 13 (4%). There were two permits issued for the Berea sandstone and two for the Trenton Limestone formations.

Two hundred sixty-nine plugging permits were issued, an increase of 67 (33.2%) from 2020.

Notable permitting highlights for 2021 include:

- Issued 11 urbanized area drilling permits (a decrease of 10) in three counties. Five were horizontal permits. The counties were Belmont (5) and Cuyahoga and Licking (3 each);
- There were no mandatory pooling applications;
- Participated in 83 unitization hearings;
- Processed 59,583 production reports.

Source: ODNR, Division of Oil and Gas

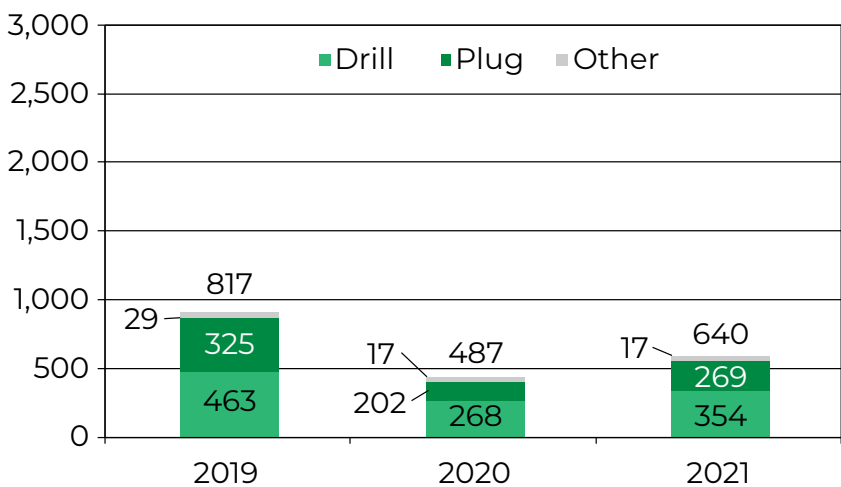


Figure 1. Oil and gas permits issued 2019 – 2021

## DIRECTIONAL AND HORIZONTAL DRILLING PERMITS

This technology is used to access oil and gas under environmentally sensitive or densely populated areas, and to drill horizontally to enhance production. There were 321 horizontal permits and five directional drilling permits issued to drill oil and gas wells in 11 counties, an increase of 101 permits from 2020. Permits were issued to these formations: Utica/Point Pleasant Shale (322) and Clinton (5). The most active counties were Jefferson (92), Harrison (50), Belmont (48), Columbiana (18), Carroll and Monroe (35 each).

## BONDING / OWNERSHIP

Oil and gas well bond release does not occur until an owner has successfully plugged and restored or transferred ownership and liability of all oil and gas wells under the owner's permits in Ohio.

During 2021, 51 bonds were released, and 113 new owners were registered.

Section staff also manages all information and records concerning current well ownership and well transfers. During 2021, records were managed for 6,049 registered well owners, including 4,725 domestic owners and 1,324 commercial owners. Staff also recorded 5,189 changes in well ownership. There are 64,788 active wells in Ohio.

## DRILLING

An estimated 207 oil and gas wells were drilled, which was an increase of 47 wells (29.4%) from 2020 (Figure 2). This is the second lowest number of wells drilled since drilling records have been recorded (1888) (Appendix I).

The increase in drilling was a result of higher oil and gas prices and adjusting to the worldwide pandemic. Drilling to the Utica/Point Pleasant shales accounted for 187 wells of the wells drilled in 2021. Wells were drilled in 20 of Ohio's 88 counties, an increase of four (Figure 3).

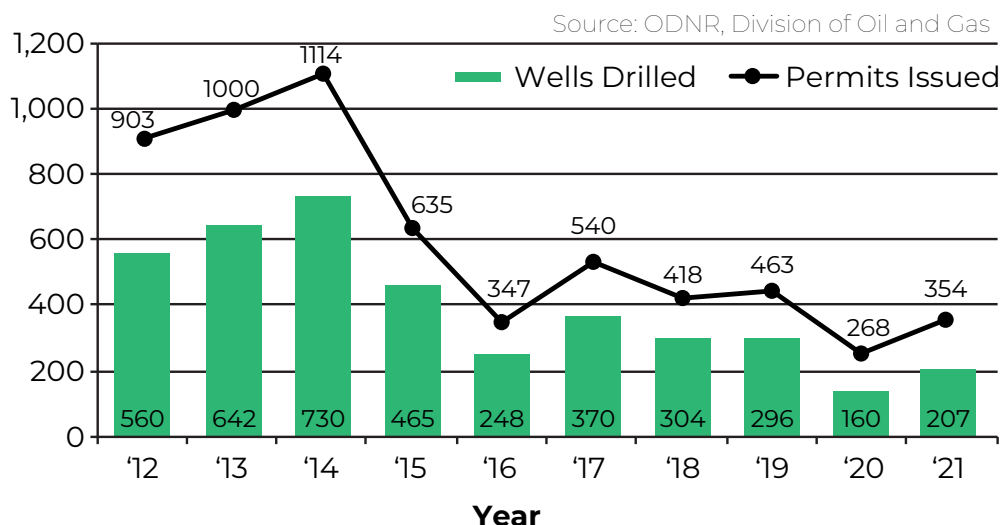


Figure 2. Wells drilled vs. permits issued 2012 – 2021

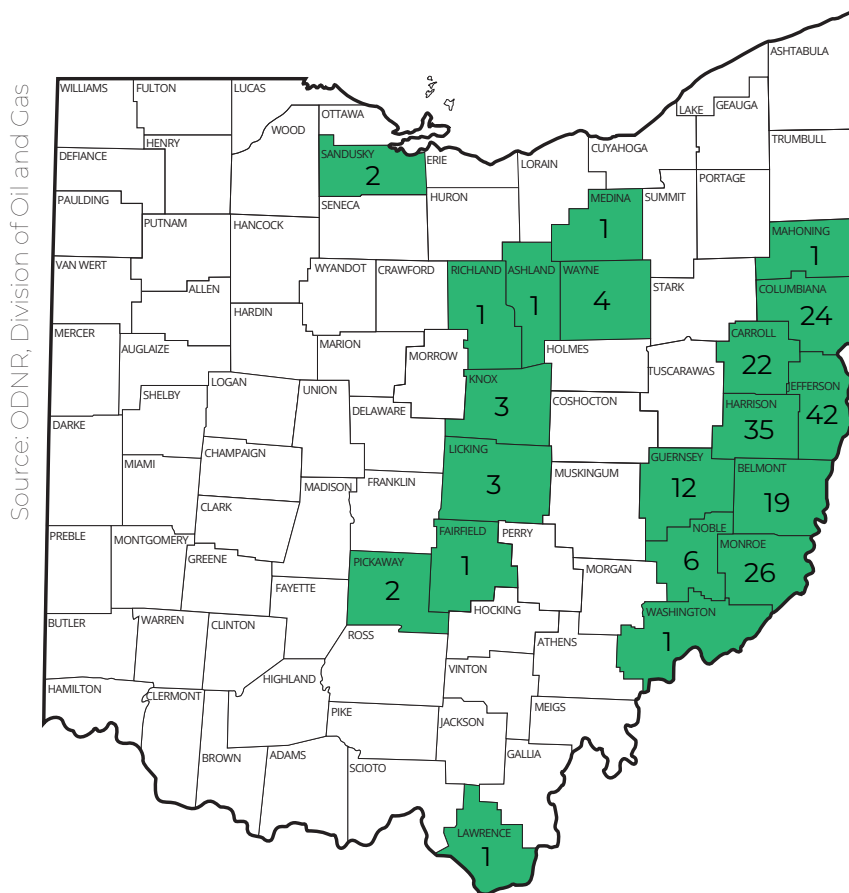


Figure 3. Wells drilled by county – 2021

## COMPLETIONS

Of the wells drilled, 202 were productive and 5 were dry holes, for a 98% productive rate (Table I).

- Total footage is estimated at 4,227,744 feet compared to 3,216,154 for 2020.
- The median well depth was 22,611 feet compared to 21,56 feet in 2020.
- Total depths ranged from 976 feet in the Cow Run Sandstone (Lawrence County) to 34,036 feet in the Point Pleasant Shale for a horizontal well (Jefferson County).

A summary of oil and gas completion statistics by county appears in Table II.

Completion zones ranged from the Pennsylvanian Cow Run Sandstone to the Cambrian Trempealeau dolomite. Only one county had wells drilled to two different geologic zones. The Utica/Point Pleasant shales accounted for 90% of all wells drilled. A summary of oil and gas completion statistics by producing zones appears in Table III.

Source: ODNR, Division of Oil and Gas

| TABLE I – DRILLING OPERATIONS BY TYPE OF WELL – 2021 |            |           |                  |
|--|------------|-----------|------------------|
|  | DRILLED    | CONVERTED | TOTAL FOOTAGE    |
| PRODUCTIVE WELLS                                     | 202        |           | 4,208,038        |
| DRY HOLES  | 5          |           | 19,076           |
| REOPENED WELLS                                       | 0          |           | 0                |
| LOST HOLES   | 2          |           | 22,905           |
| GAS STORAGE WELLS                                    | 5          | 0         | 22,762           |
| CONVENTIONAL BRINE INJECTION WELLS                   | 7          | 0         | 42,700           |
| STRATIGRAPHIC TEST WELLS                             | 0          |           | 0                |
| SOLUTION MINING WELLS                                | 0          | 0         | 0                |
| <b>TOTAL</b>   | <b>221</b> | <b>0</b>  | <b>4,316,111</b> |

Source: ODNR, Division of Oil and Gas

| TABLE II – OIL AND GAS COMPLETION STATISTICS BY COUNTY – 2021 |                           |        |                           |             |          |             |          |             |                    |                  |               |                  |
|---|---------------------------|--------|---------------------------|-------------|----------|-------------|----------|-------------|--------------------|------------------|---------------|------------------|
| COUNTY  | DEPTH RANGE OF RESERVOIRS |        | MAJOR TARGETED RESERVOIRS | DEVELOPMENT |          | EXPLORATORY |          | TOTAL WELLS | PERCENT PRODUCTIVE | DRILLED FOOTAGE  |               |                  |
|   | SHALLOW                   | DEEP   |                           | PRODUCTIVE  | DRY      | PRODUCTIVE  | DRY      |             |                    | PRODUCTIVE       | DRY           | TOTAL            |
| Ashland   | 4,811                     | 4,845  | Trempealeau               | 1           | 0        | 0           | 0        | 1           | 100.00             | 4,845            | 0             | 4,845            |
| Belmont   | 9,374                     | 25,713 | Point Pleasant            | 19          | 0        | 0           | 0        | 19          | 100.00             | 431,505          | 0             | 431,505          |
| Carroll   | 13,363                    | 26,693 | Point Pleasant            | 22          | 0        | 0           | 0        | 22          | 100.00             | 483,576          | 0             | 483,576          |
| Columbiana  | 8,502                     | 22,622 | Point Pleasant            | 24          | 0        | 0           | 0        | 24          | 100.00             | 397,036          | 0             | 397,036          |
| Fairfield   | 3,850                     | 3,900  | Rose Run                  | 0           | 0        | 0           | 1        | 1           | 0.00               | 0                | 3,905         | 3,905            |
| Guernsey  | 8,304                     | 25,550 | Point Pleasant            | 12          | 0        | 0           | 0        | 12          | 100.00             | 263,562          | 0             | 263,562          |
| Harrison  | 9,892                     | 27,416 | Point Pleasant            | 35          | 0        | 0           | 0        | 35          | 100.00             | 830,764          | 0             | 830,764          |
| Jefferson   | 10,440                    | 34,036 | Point Pleasant            | 42          | 0        | 0           | 0        | 42          | 100.00             | 1,001,858        | 0             | 1,001,858        |
| Knox  | 2,828                     | 2,960  | Clinton                   | 3           | 0        | 0           | 0        | 3           | 100.00             | 8,984            | 0             | 8,984            |
| Lawrence  | 970                       | 976    | Cow Run                   | 0           | 1        | 0           | 0        | 1           | 0.00               | 0                | 976           | 976              |
| Licking   | 4,200                     | 4,218  | Rose Run                  | 3           | 0        | 0           | 0        | 3           | 100.00             | 12,895           | 0             | 12,895           |
| Mahoning  | 5,500                     | 5,550  | Clinton                   | 1           | 0        | 0           | 0        | 1           | 100.00             | 5,558            | 0             | 5,558            |
| Medina  | 5,282                     | 5,325  | Trempealeau               | 0           | 1        | 0           | 0        | 1           | 0.00               | 0                | 5,325         | 5,325            |
| Monroe  | 8,559                     | 26,834 | Point Pleasant            | 26          | 0        | 0           | 0        | 26          | 100.00             | 598,025          | 0             | 598,025          |
| Noble   | 7,945                     | 24,458 | Point Pleasant            | 6           | 0        | 0           | 0        | 6           | 100.00             | 140,327          | 0             | 140,327          |
| Pickaway  | 2,047                     | 2,479  | Trempealeau               | 2           | 0        | 0           | 0        | 2           | 100.00             | 4,623            | 0             | 4,623            |
| Richland  | 4,096                     | 4,172  | Trempealeau               | 0           | 1        | 0           | 0        | 1           | 0.00               | 0                | 4,200         | 4,200            |
| Sandusky  | 1,370                     | 1,402  | Trenton                   | 1           | 0        | 1           | 0        | 2           | 100.00             | 3,480            | 0             | 3,480            |
| Washington  | 7,500                     | 8,000  | Utica                     | 0           | 0        | 1           | 0        | 1           | 100.00             | 8,000            | 0             | 8,000            |
| Wayne   | 3,700                     | 5,300  | Clinton                   | 3           | 1        | 0           | 0        | 4           | 75.00              | 13,000           | 5,300         | 18,300           |
| <b>TOTAL</b>  |                           |        |                           | <b>200</b>  | <b>4</b> | <b>2</b>    | <b>1</b> | <b>207</b>  | <b>97.58%</b>      | <b>4,208,038</b> | <b>19,706</b> | <b>4,227,744</b> |



Source: ODNR, Division of Oil and Gas

| TABLE III - OIL AND GAS COMPLETION STATISTICS BY PRODUCING ZONE - 2021 |                           |        |             |          |             |          |             |                    |                  |               |                  |
|--|---------------------------|--------|-------------|----------|-------------|----------|-------------|--------------------|------------------|---------------|------------------|
| PRODUCING ZONES  | DEPTH RANGE OF RESERVOIRS |        | DEVELOPMENT |          | EXPLORATORY |          | TOTAL WELLS | PERCENT PRODUCTIVE | DRILLED FOOTAGE  |               |                  |
|  | SHALLOW                   | DEEP   | PRODUCTIVE  | DRY      | PRODUCTIVE  | DRY      |             |                    | PRODUCTIVE       | DRY           | TOTAL            |
| "Pennsylvanian (Cow Run)"  | 970                       | 976    | 0           | 1        | 0           | 0        | 1           | 0                  | 0                | 976           | 976              |
| "Mississippian (1st & 2nd Berea)"                                      | -                         | -      | 0           | 0        | 0           | 0        | 0           | 0                  | 0                | 0             | 0                |
| "Devonian (Ohio Shale - Marcellus)"                                    | -                         | -      | 0           | 0        | 0           | 0        | 0           | 0                  | 0                | 0             | 0                |
| "Devonian (Oriskany)"  | -                         | -      | 0           | 0        | 0           | 0        | 0           | 0                  | 0                | 0             | 0                |
| "Silurian (Newburg)"   | -                         | -      | 0           | 0        | 0           | 0        | 0           | 0                  | 0                | 0             | 0                |
| "Silurian (Clinton - Medina)"  | 2,828                     | 5,550  | 6           | 0        | 0           | 0        | 6           | 100.00             | 22,042           | 0             | 22,042           |
| "Ordovician (Utica/Point Pleasant)"                                    | 7,500                     | 34,036 | 186         | 0        | 1           | 0        | 187         | 100.00             | 4,154,653        | 0             | 4,154,653        |
| "Ordovician (Trenton-Black River)"                                     | 1,370                     | 1,402  | 1           | 0        | 1           | 0        | 2           | 100.00             | 3,480            | 0             | 3,480            |
| "Ordovician (Beekmantown)"   | -                         | -      | 0           | 0        | 0           | 0        | 0           | 0                  | 0                | 0             | 0                |
| "Cambrian-Ordovician (Rose Run)"                                       | 3,850                     | 4,218  | 3           | 0        | 0           | 1        | 4           | 75.00              | 12,895           | 3,905         | 16,800           |
| "Cambrian (Trempealeau)"   | 2,047                     | 5,325  | 4           | 3        | 0           | 0        | 7           | 57.14              | 14,968           | 14,825        | 29,793           |
| "Cambrian (Mt. Simon)"   | -                         | -      | 0           | 0        | 0           | 0        | 0           | 0                  | 0                | 0             | 0                |
| <b>TOTAL</b>   |                           |        | <b>200</b>  | <b>4</b> | <b>2</b>    | <b>1</b> | <b>207</b>  | <b>97.58%</b>      | <b>4,208,038</b> | <b>19,706</b> | <b>4,227,744</b> |

## FORMATION HIGHLIGHTS

The Utica/Point Pleasant shales were the most actively explored formations accounting for 90% of all wells drilled. Overall, 187 wells were drilled, an increase of 42 wells from 2020. These wells were drilled in eight counties, the same as in 2020. Jefferson County (42) was the most active followed by Harrison (35), Monroe (26), Columbiana (24) and Carroll (22). The average depth per well was 22,217 feet, an increase of 313 feet per well. Production reports were submitted for 2,900 wells in 2021. Of these, 2,858 were commercial producing wells and 42 were waiting to be put into production (Appendix III). Additionally, 48 Point Pleasant wells were started in 2021 but will be completed in 2022.

Drilling to the Knox formations increased by seven wells to 11 wells drilled. Drilling occurred in these formations: Beekmantown (0), Rose Run (4) and Trempealeau (7). Drilling occurred in seven counties compared to four last year. The most active county was Licking (3), followed by Pickaway and Wayne (2 each). The average depth was 4,236 feet.

The Clinton sandstone was the next most actively drilled zone. Six wells were drilled, one less than last year. Clinton sandstone wells averaged 3,674 feet in depth, an increase of 306 feet per well. Clinton sandstone wells were drilled in three counties, the same as last year. The most active county was Knox (3).

There were no Berea Sandstone, Ohio Shale or Marcellus Shale wells drilled.

## WELLS COMPLETED BY MONTH AND OWNER

Drilling activity averaged 17 wells per month compared to 13 per month in 2020. November was the most active months with 26 wells (Figure 4).

Twenty-four owners drilled wells in 2021, 5 more than in 2020. Seventy-nine percent of these owners drilled less than 10 wells. The highest number of wells drilled by a single owner was 71 and the 5 most active operators drilled 82% (169) of all wells. Ten owners only drilled one well and 11 owners drilled horizontal shale wells.

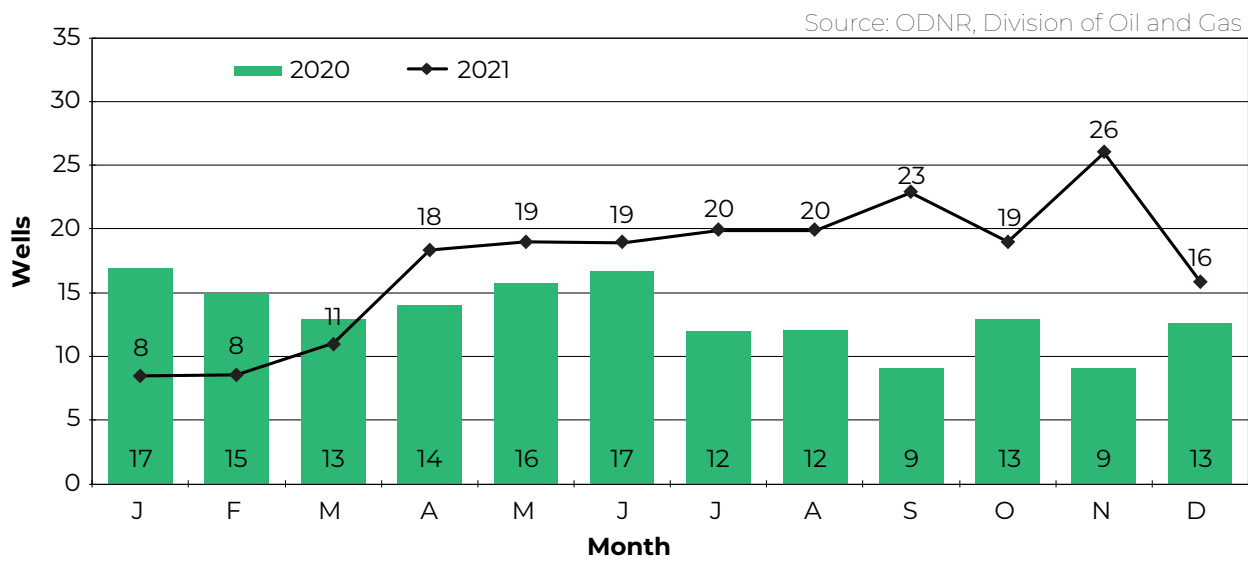


Figure 4. Wells completed by month – 2020 vs. 2021

## WELLS COMPLETED BY TYPE OF TOOL AND RIG COUNT

Rotary tools drilled the majority of wells. Cable-tool rigs drilled three wells and operated in one county. Knox County (3) had three wells drilled to the Clinton sandstone. The average depth per well drilled by cable tool was 2,995 feet, an increase of 1,228 feet; rotary-drilled wells averaged 20,680 feet, a decrease of 147 feet per well.

The horizontal rig count for unconventional or shale wells averaged 11 rigs per week compared to 9 rigs per week in 2020. The vertical rig count for conventional wells averaged 7 rigs per week compared to 8 rigs per week in 2020 (Figure 5).

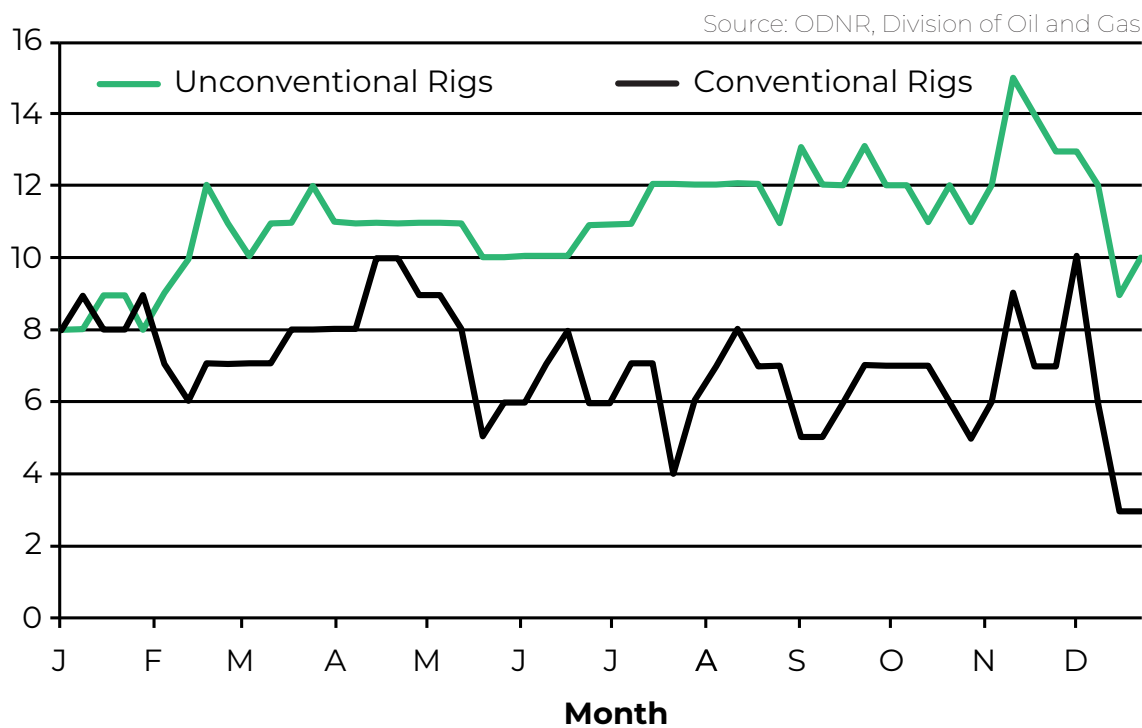


Figure 5. Horizontal (unconventional) vs. vertical (conventional) rig count by week – 2021

## PLUG-BACK AND DEEPEN OPERATIONS

There were no wells plugged back to a shallower formation or drilled to a deeper formation.

## TEN MOST ACTIVE COUNTIES

Jefferson County replaced Belmont County as the most active county with 42 wells drilled (Table IV). Harrison was second with 35 wells. Monroe was third with 26 wells followed by Columbiana (24 wells) which did not have a well drilled in 2020. The focus of drilling to the Utica/Point Pleasant shales was clearly seen in these top-ten counties. Every well in the top eight counties had these shales as the target.

Nine of these counties were in the top-ten last year. The biggest increase in drilling is reflected in the shale counties. It took place in Columbiana (24), Carroll (17), and Monroe (9) counties. The biggest decrease in drilling was in Belmont County (25). Columbiana County was last in the top ten in 2019 and Wayne (2018).

Source: ODNR, Division of Oil and Gas

| TABLE IV – TEN MOST ACTIVE COUNTIES – 2021 |            |               |           |                     |                           |
|--|------------|---------------|-----------|---------------------|---------------------------|
| 2021 RANK                                  | COUNTY     | WELLS DRILLED | 2020 RANK | AVG. DEPTH PER WELL | ESTIMATED FOOTAGE DRILLED |
| 1  | Jefferson  | 42            | (2)       | 23,854              | 1,001,858                 |
| 2  | Harrison   | 35            | (3)       | 23,736              | 830,764                   |
| 3  | Monroe     | 26            | (4)       | 23,001              | 598,025                   |
| 4  | Columbiana | 24            | (16)      | 16,543              | 397,036                   |
| 5  | Carroll    | 22            | (6)       | 21,981              | 483,576                   |
| 6  | Belmont    | 19            | (1)       | 22,711              | 431,505                   |
| 7  | Guernsey   | 12            | (5)       | 21,964              | 263,562                   |
| 8  | Noble      | 6             | (7)       | 23,388              | 140,327                   |
| 9  | Wayne      | 4             | (16)      | 4,575               | 18,300                    |
| 10   | Knox       | 3             | (7)       | 2,995               | 8,984                     |
| 10   | Licking    | 3             | (10)      | 4,298               | 12,895                    |

## EXPLORATORY WELLS

There were three exploratory wells drilled in 2021, compared to 4 in 2020 (Figure 6). Of these, all 2 were productive and one was dry.

Wells were drilled in three counties and three different formations. Each of these counties had one well drilled: Fairfield (Rose Run sandstone), Sandusky (Trenton Limestone) and Washington (Utica shale).

Wells were classified as follows: ‘outpost’ (1), ‘deeper pool wildcat’ (1) and ‘wildcat’ (1).

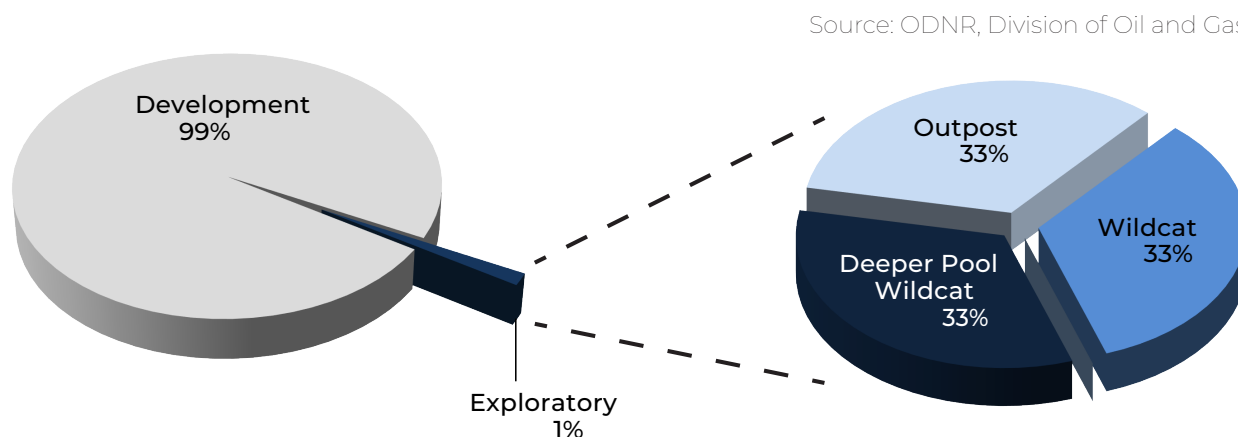


Figure 6. Development vs. exploratory wells – 2021

## COUNTY DRILLING DEPTH RECORDS

There were no new drilling depth records in 2021 (Appendix II). Longer horizontal wells were continued to be drilled. There were 147 horizontal wells drilled greater than 20,000 feet, compared to 113 wells in 2020. In 2021, one well was drilled greater than 30,000 feet. In Jefferson County, a horizontal well (Gabriel SW WEL JF #2H, Permit # 20924) was drilled 34,036 feet into the Point Pleasant Shale, making it the longest well ever drilled in Ohio. The longest well was 31,036 feet in Monroe County in 2020.

## PRODUCTION

Ohio's total reported crude oil production was 18,999,720 barrels, a decrease of 4,885,595 barrels (20.5%) from 2020 (Figure 7, Table V). In 2021, daily production averaged 52,054 barrels compared to 65,260 barrels in 2020. Through 2021, Ohio wells have produced 1,330,765,598 barrels.

Ohio wells produced 2,254,396,717 mcf of natural gas, a decrease of 108,964,886 mcf (4.6%) from 2020 (Figure 7, Table V). Gas production figures include an estimated 376,710 mcf of natural gas used on the lease. In 2021, daily production averaged 6,176,429 mcf compared to 6,457,272 mcf in 2020. Through 2021, Ohio wells have cumulatively produced 23,211,197,291 mcf of natural gas.

This year's production was influenced by the producing horizontal wells from the Marcellus and Utica/Point Pleasant shale formations. Wells producing from the Marcellus and Utica/Point Pleasant shale formations reported 16,392,167 barrels of oil (86.3% of total production) and 2,216,348,964 mcf of natural gas (98.3% of total production) (Appendix III).

The 2021 production numbers are an estimate based on available data reported to the Division of Oil & Gas Resources Management; oil reserve, gas reserve and gas consumption totals are based on data from the Department of Energy, Energy Information Administration..

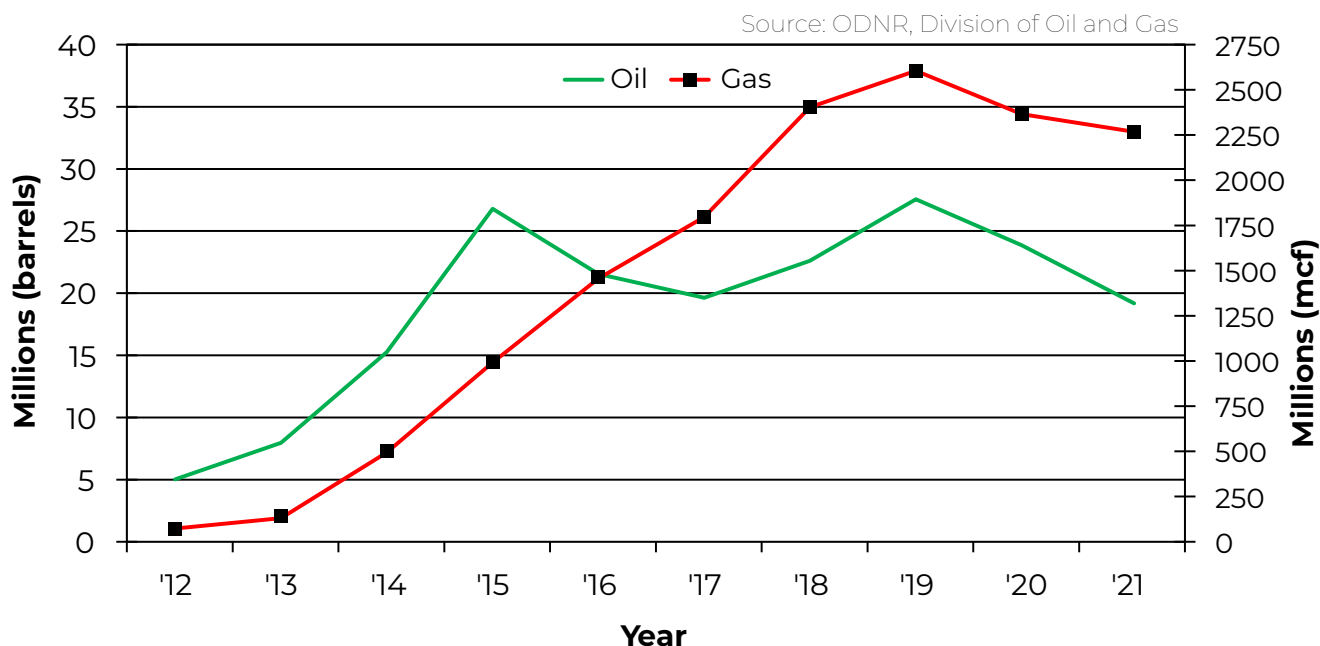


Figure 7. Oil and gas production 2012 – 2021

Source: ODNR, Division of Oil and Gas

| <b>TABLE V – CRUDE OIL &amp; NATURAL GAS PRODUCTION, RESERVES &amp; CONSUMPTION – 2012 – 2021</b> |                            |          |            |            |             |
|---|----------------------------|----------|------------|------------|-------------|
|   | OIL (thousands of barrels) |          | GAS (mmcf) |            |             |
| YEAR  | PRODUCTION                 | RESERVES | PRODUCTION | RESERVES   | CONSUMPTION |
| 2012  | 4,974                      | 39,000   | 86,700     | 1,233,000  | 842,959     |
| 2013  | 8,006                      | 42,000   | 167,008    | 3,161,000  | 912,403     |
| 2014  | 15,061                     | 78,000   | 512,777    | 6,723,000  | 1,002,345   |
| 2015  | 26,785                     | 62,000   | 1,009,049  | 12,104,000 | 966,492     |
| 2016  | 21,367                     | 38,000   | 1,437,006  | 15,143,000 | 928,492     |
| 2017  | 20,093                     | 47,000   | 1,771,294  | 26,123,000 | 948,324     |
| 2018  | 22,795                     | 80,000   | 2,398,387  | 23,759,000 | 1,162,745   |
| 2019  | 27,622                     | 88,000   | 2,616,223  | 34,056,000 | 1,183,927   |
| 2020  | 23,917                     | 74,000   | 2,365,475  | 27,514,000 | 1,155,217   |
| 2021  | 18,999                     | 105,000  | 2,259,425  | 31,580,000 | 1,205,084   |

## MARKET VALUE

Crude oil production valued at \$ 1,213,322,119 increased 42.1% (\$359,244,228) from its 2020 value. The average price per barrel was \$63.86, an increase of \$28.15 from 2020's average price of \$35.71 per barrel (Table VI). Posted oil prices ranged from a low of \$43.62 (January 4th) to a high of \$80.65 (October 26th) per barrel.

The market value of natural gas increased 98.9% (\$3,766,358,124) to \$7,574,772,971. The average price paid per mcf was \$3.36 in 2021, an increase of \$1.75 per mcf from 2020 (Table VI). The Appalachian price index ranged from a low of \$2.50 in January to a high of \$4.77 in October.

Ohio's combined oil and gas market value increased by 88.5% (\$4,125,602,352). The total dollar value of \$8,788,095,090 is the highest on record (Figure 8).

Source: ODNR, Division of Oil and Gas

| <b>TABLE VI – AVERAGE WELLHEAD PRICE OF OIL AND GAS 2012 – 2021</b> |            |            |
|---|------------|------------|
| YEAR  | OIL \$/Bbl | GAS \$/mcf |
| 2012  | \$92.05    | \$2.86     |
| 2013  | \$95.71    | \$3.51     |
| 2014  | \$79.92    | \$3.78     |
| 2015  | \$36.78    | \$1.96     |
| 2016  | \$39.36    | \$2.36     |
| 2017  | \$47.25    | \$2.80     |
| 2018  | \$60.14    | \$2.92     |
| 2019  | \$53.08    | \$2.21     |
| 2020  | \$35.71    | \$1.61     |
| 2021  | \$63.86    | \$3.36     |

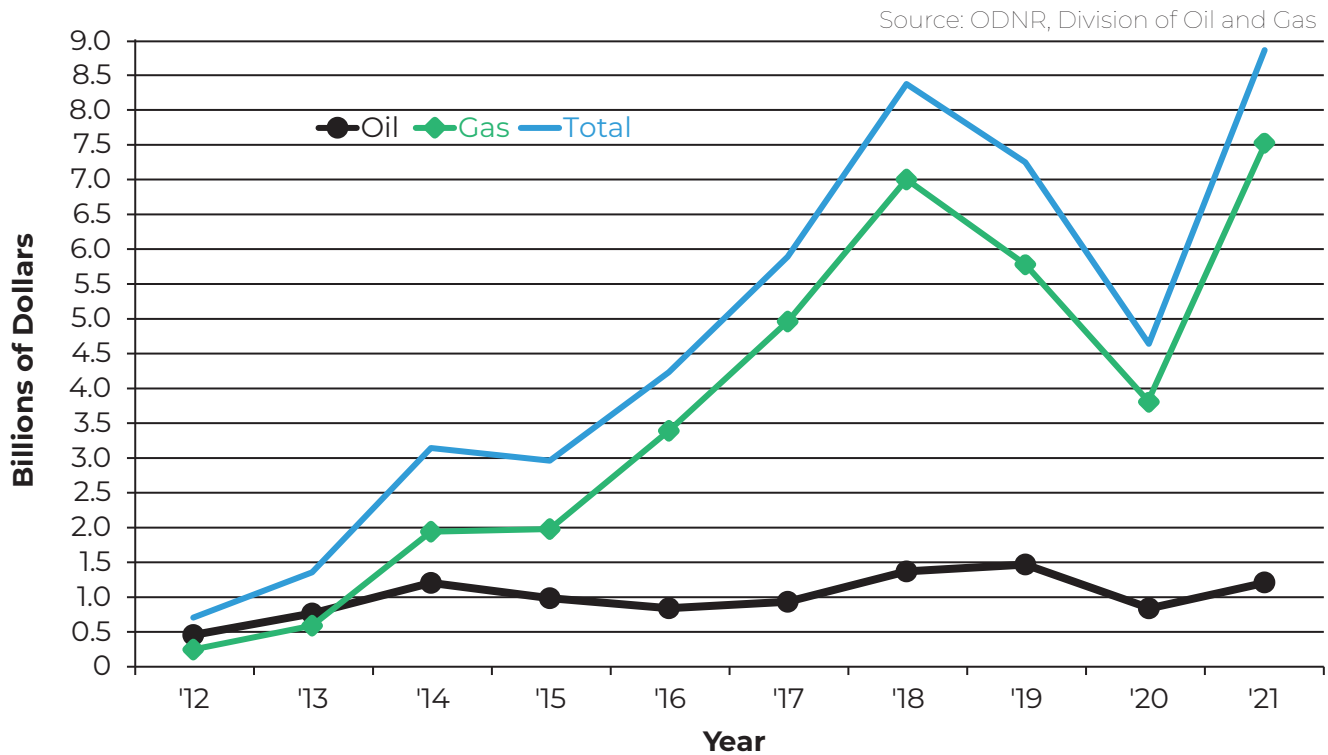


Figure 8. Dollar value of oil and gas 2012 – 2021

## PLUGGING ACTIVITY

Plugging activity increased by 28 wells. Figure 9 compares plugging and drilling activity. In 2021, 373 wells were plugged compared to 345 in 2020. This is the highest number of wells plugged since 2015. The total does not include dry or lost holes that were plugged in 2021. One hundred and forty-four of these wells were plugged through the Orphan Well Program. The Orphan Well Program’s Annual Report can be viewed on the Division’s website.

Wells were plugged in 48 counties (Figure 10). Medina (28) was the most active plugging county followed by Columbiana (26), Stark (23), Wayne (16) and Licking (15).



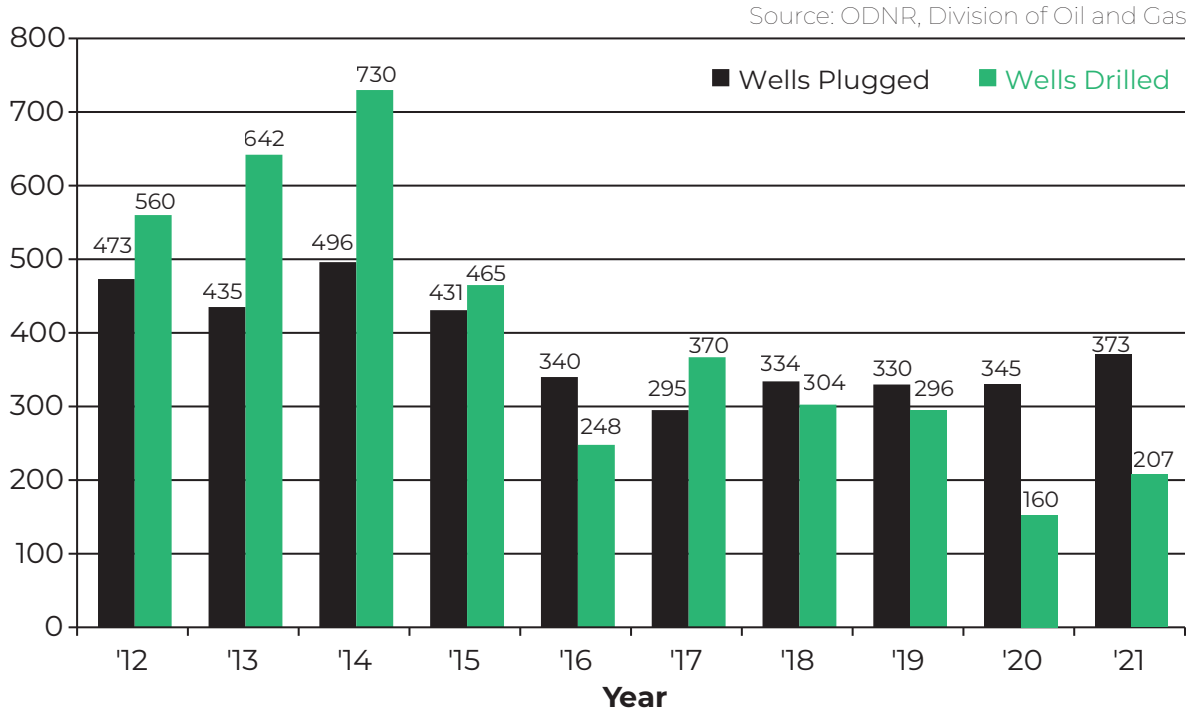


Figure 9. Wells plugged vs. wells drilled 2012 –2021

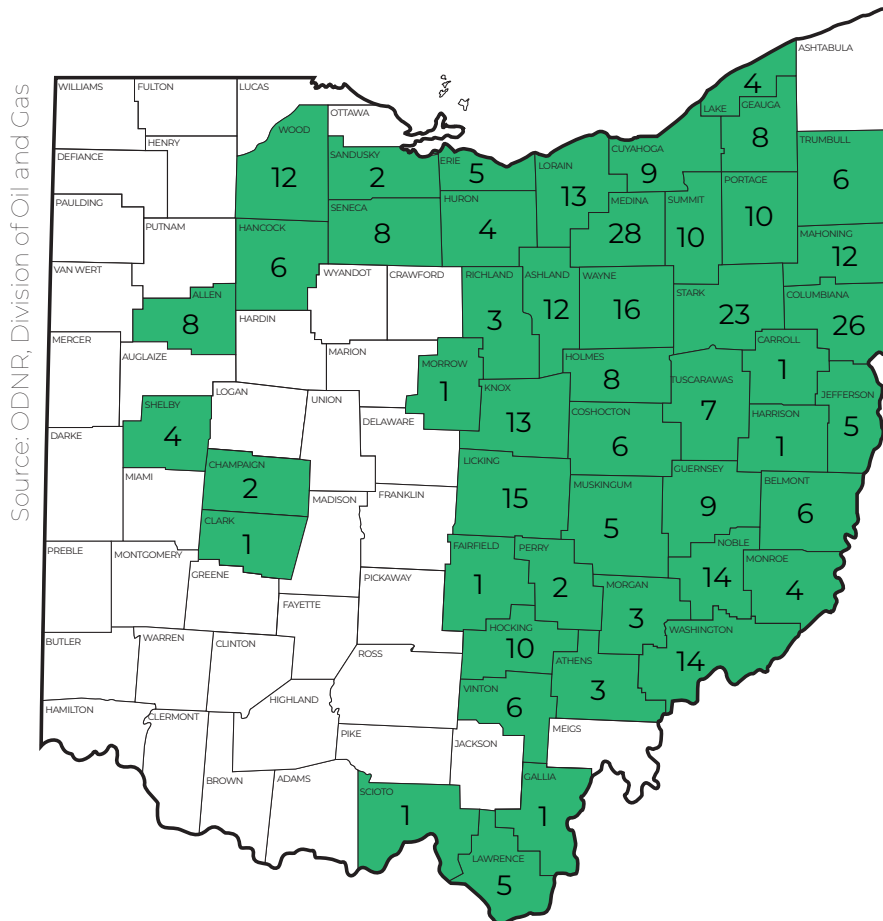


Figure 10. Wells plugged by county – 2021

Source: ODNR, Division of Oil and Gas

| APPENDIX I – WELLS DRILLED IN OHIO 1888 – 2021 |            |     |       |       |            |         |                          |         |          |          |
|--|------------|-----|-------|-------|------------|---------|--------------------------|---------|----------|----------|
| YEAR   | PRODUCTIVE | DRY | TOTAL | BEREA | OHIO SHALE | CLINTON | UTICA/<br>POINT PLEASANT | TRENTON | ROSE RUN | CAMBRIAN |
| Prior (a)<br>1888 (b)                          | 6,022      | --- | 6,022 |       |            |         |                          | 2,234   |          |          |
| 1888 (l)                                       | 617        | --- | 617   |       |            |         |                          | 542     |          |          |
| 1889   | 1,590      | 132 | 1,722 |       |            |         |                          | 702     |          |          |
| 1890   | 2,497      | 96  | 2,593 |       |            |         |                          | 2,151   |          |          |
| 1891   | 1,709      | 56  | 1,765 |       |            |         |                          | 1,572   |          |          |
| 1892   | 1,551      | 38  | 1,589 |       |            |         |                          | 1,465   |          |          |
| 1893   | 2,067      | 46  | 2,113 |       |            |         |                          | 1,877   |          |          |
| 1894 (c)                                       | 3,216      | 85  | 3,301 |       |            |         |                          | 3,001   |          |          |
| 1895   | 6,020      | 127 | 6,147 |       |            |         |                          | 5,559   |          |          |
| 1896 (d)                                       | 5,600      | 856 | 6,456 |       |            |         |                          | 4,339   |          |          |
| 1897   | 3,442      | 300 | 3,742 |       |            | 987     |                          | 2,755   |          |          |
| 1898   | 3,338      | 172 | 3,510 |       |            | 132     |                          | 2,852   |          |          |
| 1899   | 6,399      | 408 | 6,807 |       |            | 151     |                          | 4,469   |          |          |
| 1900   | 6,098      | 457 | 6,555 |       |            | 116     |                          | 5,013   |          |          |
| 1901   | 4,559      | 573 | 5,132 |       |            | 148     |                          | 3,524   |          |          |
| 1902   | 5,651      | 649 | 6,300 |       |            | 306     |                          | 4,213   |          |          |
| 1903   | 5,880      | 777 | 6,657 |       |            | 352     |                          | 4,072   |          |          |
| 1904   | 4,974      | 858 | 5,832 |       |            | 382     |                          | 3,141   |          |          |
| 1905   | 3,027      | 680 | 3,707 |       |            | 400     |                          | 1,578   |          |          |
| 1906   | 2,903      | 681 | 3,584 |       |            | 388     |                          | 1,535   |          |          |
| 1907   | 2,146      | 611 | 2,757 |       |            | 521     |                          | 890     |          |          |
| 1908   | 2,083      | 695 | 2,778 |       |            | 522     |                          | 848     |          |          |
| 1909   | 2,881      | 966 | 3,847 |       |            | 694     |                          | 873     |          |          |
| 1910   | 2,059      | 670 | 2,729 |       |            | 668     |                          | 572     |          |          |
| 1911   | 2,270      | 507 | 2,777 |       |            | 641     |                          | 527     |          |          |
| 1912   | 3,527      | 956 | 4,483 |       |            | 926     |                          | 551     |          |          |
| 1913   | 2,560      | 603 | 3,163 |       |            | 643     |                          | 972     |          |          |
| 1914   | 2,371      | 534 | 2,905 |       |            | 943     |                          | 861     |          |          |
| 1915   | 1,672      | 498 | 2,170 |       |            | 952     |                          | 260     |          |          |
| 1916   | 2,028      | 525 | 2,553 |       |            | 469     |                          | 699     |          |          |
| 1917   | 1,864      | 504 | 2,368 |       |            | 587     |                          | 535     |          |          |
| 1918   | 1,708      | 446 | 2,154 |       |            | 605     |                          | 466     |          |          |
| 1919   | 2,486      | 585 | 3,071 |       |            | 940     |                          | 385     |          |          |
| 1920   | 2,421      | 722 | 3,143 |       |            | 1,240   |                          | 565     |          |          |
| 1921   | 1,675      | 620 | 2,295 |       |            | 853     |                          | 461     |          |          |
| 1922   | 1,989      | 607 | 2,596 |       |            | 906     |                          | 522     |          |          |
| 1923   | 1,779      | 537 | 2,316 |       |            | 642     |                          | 697     |          |          |
| 1924   | 1,704      | 439 | 2,143 |       |            | 605     |                          | 592     |          |          |
| 1925   | 1,680      | 414 | 2,094 |       |            | 434     |                          | 627     |          |          |
| 1926   | 1,722      | 382 | 2,104 |       |            | 522     |                          | 460     |          |          |

| APPENDIX I - WELLS DRILLED IN OHIO 1888 - 2021 |            |       |       |       |            |         |                          |         |          |          |
|--|------------|-------|-------|-------|------------|---------|--------------------------|---------|----------|----------|
| YEAR   | PRODUCTIVE | DRY   | TOTAL | BEREA | OHIO SHALE | CLINTON | UTICA/<br>POINT PLEASANT | TRENTON | ROSE RUN | CAMBRIAN |
| 1927   | 1,286      | 337   | 1,623 |       |            |         |                          | 262     |          |          |
| 1928   | 1,305      | 395   | 1,700 |       |            |         |                          | 204     |          |          |
| 1929   | 1,936      | 634   | 2,570 |       |            |         |                          | 191     |          |          |
| 1930   | 1,562      | 572   | 2,134 |       |            |         |                          | 205     |          |          |
| 1931   | 789        | 287   | 1,076 |       |            |         |                          | 148     |          |          |
| 1932   | 546        | 224   | 770   |       |            |         |                          | 124     |          |          |
| 1933   | 496        | 183   | 679   |       |            |         |                          | 123     |          |          |
| 1934   | 883        | 276   | 1,159 |       |            |         |                          | 103     |          |          |
| 1935   | 544        | 192   | 736   |       |            |         |                          | 94      |          |          |
| 1936   | 754        | 246   | 1,000 |       |            |         |                          | 81      |          |          |
| 1937   | 813        | 432   | 1,245 |       |            |         |                          |         |          |          |
| 1938   | 622        | 288   | 910   |       |            |         |                          |         |          |          |
| 1939   | 713        | 319   | 1,032 |       |            |         |                          |         |          |          |
| 1940   | 818        | 410   | 1,228 |       |            |         |                          |         |          |          |
| 1941   | 1,034      | 527   | 1,561 |       |            |         |                          |         |          |          |
| 1942   | 652        | 356   | 1,008 |       |            |         |                          |         |          |          |
| 1943   | 625        | 391   | 1,016 |       |            |         |                          |         |          |          |
| 1944   | 647        | 393   | 1,040 |       |            |         |                          |         |          |          |
| 1945   | 649        | 385   | 1,034 |       |            |         |                          |         |          |          |
| 1946   | 885        | 408   | 1,293 |       |            |         |                          |         |          |          |
| 1947   | 899        | 484   | 1,383 |       |            |         |                          |         |          |          |
| 1948   | 921        | 534   | 1,455 |       |            |         |                          |         |          |          |
| 1949   | 626        | 426   | 1,052 |       |            |         |                          |         |          |          |
| 1950 (2)                                       | 666        | 476   | 1,142 | 436   | 8          | 418     |                          | 25      |          | 3        |
| 1951   | 626        | 435   | 1,061 | 394   | 10         | 406     |                          | 18      |          | 6        |
| 1952   | 670        | 470   | 1,140 | 368   | 15         | 459     |                          | 47      |          | 2        |
| 1953 (e)                                       | 711        | 386   | 1,097 | 359   | 21         | 402     |                          | 30      |          | 6        |
| 1954   | 788        | 407   | 1,195 | 441   | 13         | 395     |                          | 25      |          | 2        |
| 1955   | 898        | 336   | 1,234 |       |            |         |                          |         |          |          |
| 1956   | 878        | 367   | 1,245 | 364   | 13         | 663     |                          | 32      |          | 5        |
| 1957   | 773        | 268   | 1,041 | 260   | 12         | 579     |                          | 21      |          | 2        |
| 1958   | 852        | 316   | 1,168 | 303   | 13         | 650     |                          | 19      |          | 5        |
| 1959   | 843        | 315   | 1,158 | 300   | 11         | 672     |                          | 20      |          | 13       |
| 1960   | 707        | 309   | 1,016 | 218   | 5          | 597     |                          | 7       |          | 20       |
| 1961   | 809        | 295   | 1,104 | 257   | 10         | 619     |                          | 4       |          | 42       |
| 1962   | 820        | 326   | 1,146 | 358   | 2          | 542     |                          | 10      |          | 72       |
| 1963 (f)                                       | 748        | 407   | 1,155 | 266   | 2          | 443     |                          | 14      | 4        | 302      |
| 1964   | 1,075      | 1,579 | 2,654 | 197   | 2          | 499     |                          | 34      | 9        | 1,800    |
| 1965 (g)                                       | 904        | 801   | 1,705 | 195   | 2          | 635     |                          | 53      | 16       | 729      |
| 1966   | 872        | 399   | 1,271 | 227   | 4          | 692     |                          | 18      | 8        | 261      |
| 1967   | 953        | 258   | 1,211 | 170   | 17         | 853     |                          | 18      | 4        | 132      |

| APPENDIX I – WELLS DRILLED IN OHIO 1888 – 2021 |            |     |       |       |            |         |                          |         |          |          |
|--|------------|-----|-------|-------|------------|---------|--------------------------|---------|----------|----------|
| YEAR   | PRODUCTIVE | DRY | TOTAL | BEREA | OHIO SHALE | CLINTON | UTICA/<br>POINT PLEASANT | TRENTON | ROSE RUN | CAMBRIAN |
| 1968   | 988        | 229 | 1,217 | 136   | 66         | 832     |                          | 21      | 6        | 81       |
| 1969   | 926        | 183 | 1,109 | 104   | 17         | 863     |                          | 13      | 10       | 56       |
| 1970   | 1,165      | 190 | 1,355 | 84    | 15         | 1,146   |                          | 5       | 6        | 42       |
| 1971   | 1,065      | 173 | 1,238 | 98    | 11         | 1,038   |                          | 5       | 5        | 37       |
| 1972   | 1,125      | 168 | 1,293 | 112   | 21         | 1,082   |                          | 3       | 10       | 32       |
| 1973   | 1,337      | 166 | 1,503 | 76    | 31         | 1,345   |                          | 5       | 5        | 26       |
| 1974   | 1,601      | 167 | 1,768 | 91    | 13         | 1,587   |                          | 3       | 8        | 31       |
| 1975   | 1,105      | 115 | 1,220 | 62    | 6          | 1,103   |                          | 5       | 17       | 22       |
| 1976   | 1,774      | 164 | 1,938 | 165   | 30         | 1,631   |                          | 38      | 18       | 16       |
| 1977   | 2,455      | 171 | 2,626 | 390   | 34         | 2,083   |                          | 33      | 11       | 15       |
| 1978 (h)                                       | 3,132      | 283 | 3,415 | 430   | 22         | 2,834   |                          | 22      | 27       | 12       |
| 1979   | 3,480      | 179 | 3,659 | 542   | 131        | 2,848   |                          | 22      | 29       | 23       |
| 1980   | 4,935      | 165 | 5,100 | 867   | 78         | 3,734   |                          | 1       | 24       | 31       |
| 1981   | 5,685      | 400 | 6,085 | 733   | 543        | 4,366   |                          |         | 16       | 50       |
| 1982   | 4,488      | 342 | 4,830 | 756   | 458        | 3,426   |                          |         | 11       | 4        |
| 1983   | 4,000      | 299 | 4,299 | 557   | 533        | 3,203   |                          | 1       | 7        | 51       |
| 1984   | 4,593      | 370 | 4,963 | 612   | 329        | 3,827   |                          |         | 9        | 65       |
| 1985   | 3,546      | 214 | 3,760 | 345   | 315        | 3,042   |                          |         | 19       | 94       |
| 1986   | 1,725      | 125 | 1,850 | 185   | 76         | 1,482   |                          |         | 28       | 62       |
| 1987   | 1,721      | 161 | 1,882 | 153   | 40         | 1,454   |                          |         | 70       | 55       |
| 1988   | 1,267      | 156 | 1,423 | 112   | 43         | 1,037   |                          |         | 94       | 62       |
| 1989   | 1,153      | 159 | 1,312 | 69    | 145        | 890     |                          |         | 92       | 77       |
| 1990   | 1,147      | 180 | 1,327 | 61    | 97         | 863     |                          |         | 143      | 102      |
| 1991   | 1,001      | 170 | 1,171 | 89    | 89         | 794     |                          |         | 116      | 108      |
| 1992   | 710        | 165 | 875   | 100   | 51         | 465     |                          |         | 139      | 87       |
| 1993   | 643        | 180 | 823   | 60    | 35         | 330     |                          | 2       | 260      | 89       |
| 1994   | 601        | 182 | 783   | 26    | 13         | 301     |                          | 9       | 269      | 75       |
| 1995   | 507        | 163 | 670   | 25    | 11         | 253     |                          | 2       | 202      | 94       |
| 1996   | 559        | 166 | 725   | 35    | 42         | 253     |                          | 1       | 219      | 90       |
| 1997   | 620        | 178 | 798   | 33    | 20         | 277     |                          | 0       | 223      | 110      |
| 1998   | 383        | 135 | 518   | 66    | 16         | 154     |                          | 0       | 161      | 61       |
| 1999   | 407        | 95  | 502   | 32    | 65         | 177     |                          | 5       | 106      | 55       |
| 2000   | 455        | 112 | 567   | 18    | 14         | 281     |                          | 3       | 124      | 77       |
| 2001   | 599        | 100 | 699   | 36    | 29         | 396     |                          | 1       | 113      | 58       |
| 2002   | 432        | 72  | 504   | 8     | 48         | 265     |                          | 0       | 88       | 47       |
| 2003   | 455        | 65  | 520   | 30    | 60         | 258     |                          | 2       | 82       | 40       |
| 2004 (i)                                       | 534        | 55  | 589   | 32    | 97         | 319     |                          | 1       | 66       | 24       |
| 2005   | 658        | 69  | 727   | 48    | 116        | 409     |                          | 7       | 45       | 50       |
| 2006   | 915        | 45  | 960   | 90    | 134        | 636     |                          | 8       | 18       | 23       |
| 2007   | 1,022      | 46  | 1,068 | 90    | 157        | 672     |                          | 7       | 35       | 32       |
| 2008   | 1,028      | 61  | 1,089 | 124   | 155        | 662     |                          | 1       | 21       | 38       |

| APPENDIX I – WELLS DRILLED IN OHIO 1888 – 2021 |            |        |         |        |            |         |                          |         |          |          |
|--|------------|--------|---------|--------|------------|---------|--------------------------|---------|----------|----------|
| YEAR   | PRODUCTIVE | DRY    | TOTAL   | BEREA  | OHIO SHALE | CLINTON | UTICA/<br>POINT PLEASANT | TRENTON | ROSE RUN | CAMBRIAN |
| 2009   | 517        | 46     | 563     | 43     | 97         | 320     |                          | 2       | 30       | 25       |
| 2010 (j)                                       | 382        | 45     | 427     | 47     | 40         | 228     |                          | 5       | 18       | 42       |
| 2011 (k)                                       | 443        | 26     | 469     | 52     | 51         | 222     | 25                       | 2       | 26       | 47       |
| 2012 (l)                                       | 522        | 38     | 560     | 40     | 76         | 169     | 198                      | 8       | 14       | 40       |
| 2013   | 622        | 20     | 642     | 39     | 35         | 111     | 390                      | 4       | 12       | 26       |
| 2014   | 713        | 17     | 730     | 27     | 18         | 92      | 535                      | 4       | 10       | 33       |
| 2015   | 447        | 18     | 465     | 13     | 2          | 30      | 375                      | 10      | 14       | 17       |
| 2016   | 243        | 5      | 248     | 8      | 1          | 14      | 207                      | 3       | 5        | 9        |
| 2017   | 360        | 10     | 370     | 3      | 1          | 22      | 327                      | 2       | 4        | 11       |
| 2018   | 292        | 12     | 304     | 2      | 3          | 15      | 255                      | 5       | 9        | 14       |
| 2019 (m)                                       | 284        | 12     | 296     | 3      | 3          | 31      | 239                      | 1       | 5        | 13       |
| 2020   | 157        | 3      | 160     | 2      | 0          | 8       | 145                      | 1       | 3        | 1        |
| 2021   | 202        | 5      | 207     | 0      | 0          | 6       | 187                      | 2       | 4        | 7        |
| TOTAL (n)                                      | 225,489    | 42,736 | 268,225 | 13,076 | 4,693      | 81,085  | 2,883                    | 71,162  | 3,147    | 5,931    |

## REFERENCES

- Years 1888-1950: Alkire, Robert L., 1951, Oil and Gas Production, History, Regulation, Secondary Recovery and Bibliography, 8, part 2 of Ohio Division of Geological Survey Report of Investigations: 45-46 pp.
- Years 1950-2019: Statistics from Annual Oil & Gas Statistical Reports published by Ohio Divisions of Oil & Gas Resources Management and Geological Survey. Numbers were not available for blank formation fields.

## HISTORICAL FOOTNOTES

- Ohio lays claim to the first discovery of oil from a drilled well. In 1814, saltwater well drillers struck oil in Olive Township of Noble County at 475 feet.
- Ohio's first commercial oil and gas well was put into production in 1860 at Macksburg in Washington County.
- Alkire notes that the statistics for years 1894-1904 were incomplete and estimated that the total number of wells not accounted for during those years is approximately 12,000.
- Ohio was the nation's leading oil producer in 1896.
- Widespread acceptance of the hydraulic fracture method for increasing production in 1953.
- Morrow County Oil Boom in 1963.
- Creation of Ohio Division of Oil and Gas in 1965.
- Natural Gas Policy Act tax credit in 1978.
- Urbanized Drilling Law (HB 278) went into effect September 16, 2004.
- Senate Bill 165 went into effect June 30, 2010.
- The first horizontal Utica/Point Pleasant shale well was drilled and put into production June 14, 2011.
- Senate Bill 315 went into effect September 10, 2012.
- Well spacing rules were modified and effective October 10, 2019.
- Total number of wells may actually be 280,225 (see footnote c).

Source: ODNR, Division of Oil and Gas

| APPENDIX II – COUNTY DRILLING DEPTH RECORDS – 2021 |               |            |                           |          |                           |                 |             |                   |            |
|--|---------------|------------|---------------------------|----------|---------------------------|-----------------|-------------|-------------------|------------|
| COUNTY   | TOWNSHIP      | PERMIT NO. | OPERATOR                  | WELL NO. | LEASE NAME                | COMPLETION DATE | TOTAL DEPTH | FORMATION AT T.D. | WELL CLASS |
| ADAMS  | FRANKLIN      | 11         | OXFORD OIL CO.            | 1        | J. RUSSELL & M. TENER     | 07/07/79        | 3,886       | GRANITE WASH      | FWC        |
| ALLEN  | SPENCER       | 64         | ALCO OIL CO.              | 2        | POHLMAN, FRUEND, ETZ HORN | 12/31/65        | 3,266       | GRANITE           | FWC        |
| ASHLAND  | GREEN         | 4199       | CABOT OIL & GAS CORP.     | 001V     | T. KAMENIK                | 07/08/18        | 5,500       | ROME              | DPWC       |
| ASHTABULA  | NEW LYME      | 2272       | POI ENERGY                | 1        | LAUTANEN                  | 09/01/85        | 7,124       | GRANITE           | DPWC       |
| ATHENS   | DOVER         | 3062       | QUAKER STATE              | 2        | MILLFIELD COAL & MINING   | 07/17/84        | 6,525       | ROSE RUN          | FWC        |
| AUGLAIZE   | ST. MARYS     | 71         | WEST OHIO OIL & GAS       | 1        | D. & B. HOELSCHER         | 12/05/70        | 3,067       | GRANITE           | DPWC       |
| BELMONT  | PEASE         | 611        | DAVID R. HILL INC.        | 1        | GEORGETOWN MARINE         | 12/06/10        | 13,727      | GRANITE           | DPWC       |
| BROWN  | STERLING      | 6          | SPENCER PETROLEUM CORP.   | 1        | GRIFFITH                  | 03/13/93        | 3,350       | GRANITE           | FWC        |
| BUTLER   | LEMON         | 4          | ARMCO STEEL CORP.         | 1        | ARMCO STEEL CORP.         | 03/12/67        | 3,296       | "MIDDLE RUN"      | IWDW       |
| CARROLL  | LEE           | 2059       | ANSCHUTZ EXPLOR. CORP.    | 1        | WHITE                     | 09/15/10        | 9,503       | ROSE RUN          | DPWC       |
| CHAMPAIGN  | WAYNE         | 20         | INDUSTRIAL GAS ASSOC.     | 1        | P. & C. HOFFMAN           | 06/26/78        | 3,325       | MT. SIMON         | FWC        |
| CLARK  | MADISON       | D 2        | T. D. FRIEND              | 1        | MATTISON                  | 06/14/26        | 4,647       | PRE MT. SIMON     | FWC        |
| CLERMONT   | STONELICK     | 3          | CONTINENTAL OIL CO.       | 1        | C. WIKOFF                 | 07/03/60        | 3,435       | MT. SIMON         | FWC        |
| CLINTON  | WILSON        | 10         | STOCKER & SITLER INC.     | 1        | COY                       | 01/18/83        | 3,603       | GRANITE           | FWC        |
| COLUMBIANA   | HANOVER       | 648        | MANAGEMENT CONTROL        | 3        | F. MURRAY                 | 07/28/70        | 10,242      | GRANITE           | DPWC       |
| COSHOCTON  | CRAWFORD      | 6397       | LAKE REGION OIL INC.      | 2        | LEVI M. TROYER            | 07/23/92        | 7,950       | MT. SIMON         | DPWC       |
| CRAWFORD   | VERNON        | 6          | HAYNES O&G ENTERPRISES    | 1        | DON D. CRUM               | 01/09/63        | 3,879       | EAU CLAIRE        | FWC        |
| CUYAHOGA   | MAYFIELD      | 1625       | BASS ENERGY CO. INC.      | 1        | MARCONI MEDICAL SYSTEMS   | 03/07/01        | 6,550       | GRANITE           | DPWC       |
| DARKE  | GREENVILLE    | 13 A       | UNKNOWN                   | 1        | EDWARD BARNES             | 05/26/06        | 2,850       | CAMBRIAN          | FWC        |
| DEFIANCE   | MARK          | 28         | S. E. BROWN               | 1        | P. HAVER                  | 10/22/62        | 3,606       | MT. SIMON         | FWC        |
| DELAWARE   | TRENTON       | 354        | R.C. POLING CO. INC.      | 1        | COCKRELL-GODSHALL UNIT    | 01/22/91        | 4,873       | GRANITE           | DPWC       |
| ERIE   | FLORENCE      | 19         | SUN OIL CO.               | 1        | A. HERMAN ETAL.           | 05/01/67        | 4,466       | GRANITE           | SWIW       |
| FAIRFIELD  | RUSH CREEK    | 1136       | HOPEWELL O. & G. DEV. CO. | 1        | R. BIGHAM                 | 06/16/94        | 5,924       | GRANITE           | DPWC       |
| FAYETTE  | UNION         | 1          | KEWANEE OIL CO.           | 1        | E. HOPKINS                | 07/12/57        | 4,708       | GRANITE           | FWC        |
| FRANKLIN   | PLEASANT      | 7          | BARNWELL PRODUCING CO.    | 1        | OAKHURST COUNTRY CLUB     | 08/08/64        | 3,753       | MT. SIMON         | FWC        |
| FULTON   | CHESTER-FIELD | 47         | LIBERTY PETR. CORP.       | 1        | CLYDE JOHNSTON            | 03/21/69        | 3,793       | MT. SIMON         | FWC        |
| GALLIA   | HARRISON      | 985        | BAKERWELL INC.            | 1        | JARRELL UNIT              | 03/24/04        | 7,146       | TREMPEALEAU       | FWC        |
| GEAUGA   | TROY          | 1534       | LOMAK PETROLEUM           | 1        | J. VOYTKO                 | 07/01/88        | 6,888       | TREMPEALEAU       | DPWC       |
| GREENE   | ROSS          | 4          | TATUM PETR. CO. LLC.      | 1        | KELLY GREENE              | 08/17/10        | 3,347       | GRANITE           | FWC        |

## APPENDIX II – COUNTY DRILLING DEPTH RECORDS – 2021

| COUNTY     | TOWNSHIP   | PERMIT NO. | OPERATOR                 | WELL NO. | LEASE NAME             | COMPLETION DATE | TOTAL DEPTH | FORMATION AT T.D. | WELL CLASS |
|------------|------------|------------|--------------------------|----------|------------------------|-----------------|-------------|-------------------|------------|
| GUERNSEY   | CENTER     | 4473       | CLEARWATER THREE LLC.    | 1        | BO                     | 06/27/15        | 9,268       | ROME              | SWIW       |
| HAMILTON   | CROSBY     | 1          | CONTINENTAL OIL CO.      | 1        | WALTER C. BRISBIN      | 11/01/59        | 2,730       | EAU CLAIRE        | FWC        |
| HANCOCK    | UNION      | 139        | FRANK M. DEVER           | 1        | C. & M. FRAZIER        | 06/02/64        | 3,017       | GRANITE           | FWC        |
| HARDIN     | DUDLEY     | 79         | MCAHON BULLINGTON        | 1        | WOLF                   | 01/07/64        | 3,002       | KNOX              | FWC        |
| HARRISON   | GREEN      | 355        | STOCKER & SITLER INC.    | 1        | CHARLENE SCHANEY ETAL. | 07/30/79        | 10,288      | TREMPEALEAU       | DPWC       |
| HENRY      | HARRISON   | 36         | CALLANDER & KIMBREL      | 1        | K. HALL                | 10/10/73        | 3,480       | GRANITE           | DPWC       |
| HIGHLAND   | FAIRFIELD  | 7          | OHIO VALLEY OIL & GAS    | 1        | COURTNEY               | 01/20/72        | 3,610       | GRANITE           | FWC        |
| HOCKING    | STARR      | 1222       | E. J. DUNIGAN            | 1        | M. & H. HOCKMAN        | 06/30/66        | 6,495       | MT. SIMON         | FWC        |
| HOLMES     | SALT CREEK | 1283       | G.C. & J.A. PARKER       | 1        | DAN D. TROYER          | 11/12/63        | 7,369       | TREMPEALEAU       | FWC        |
| HURON      | WAKEMAN    | 103        | APPALACHIAN EXPLOR. INC. | 1        | WOLF                   | 10/05/81        | 4,574       | GRANITE WASH      | FWC        |
| JACKSON    | FRANKLIN   | 76         | WORTHINGTON OIL CO.      | 1        | G. & I. WOOD           | 07/08/64        | 6,320       | GRANITE           | FWC        |
| JEFFERSON  | WARREN     | 536        | CHESAPEAKE EXPL., LLC    | 25-5-2   | CREAMER                | 10/10/12        | 10,320      | TRENTON           | ST         |
| KNOX       | PIKE       | 1413       | DAVID L. CANTWAY         | 1        | E. CUNNINGHAM          | 08/07/61        | 5,745       | GRANITE           | FWC        |
| LAKE       | LEROY      | 1094       | GREAT PLAINS EXPL. LTD.  | 1        | VROOMAN                | 01/24/04        | 6,355       | GRANITE           | DPWC       |
| LAWRENCE   | SYMMES     | 174        | J. STANLEY GOLDBERG      | 1        | A. PAYNE               | 04/01/66        | 7,002       | GRANITE           | FWC        |
| LICKING    | PERRY      | 4792       | RONALD F. MORAN          | 1        | RON MORAN              | 03/08/84        | 6,237       | GRANITE           | SWIW       |
| LOGAN      | JEFFERSON  | 86         | WORTHINGTON OIL CO.      | 1        | LENA COMER             | 05/11/76        | 3,402       | MT. SIMON         | FWC        |
| LORAIN     | GRAFTON    | 1370       | KENOIL/KEN R. MILLER     | 1        | LAWRENCE PALL          | 08/24/91        | 5,018       | TREMPEALEAU       | DPWC       |
| LUCAS      | HARDING    | 60         | LIBERTY PETR. CORP.      | 1        | KETRING UNIT           | 08/24/72        | 3,915       | GRANITE           | FWC        |
| MADISON    | FAIRFIELD  | 3          | AMERADA PETR. CORP.      | 1        | J. HUME                | 11/01/65        | 3,631       | GRANITE           | FWC        |
| MAHONING   | BEAVER     | 3158       | D & L ENERGY, INC.       | 4        | NORTHSTAR LUCKY        | 10/21/11        | 10,088      | GRANITE           | SWIW       |
| MARION     | CLARIDON   | 8          | UNITED PRODUCING         | 1        | H. & M. MITCHELL       | 03/14/62        | 3,672       | GRANITE           | FWC        |
| MEDINA     | HINCKLEY   | 1143       | WISER OIL CO.            | 1A       | F. L. SMITH            | 01/03/59        | 7,040       | GRANITE           | FWC        |
| MEIGS      | LEBANON    | 3651       | MURPHY OIL CO.           | 3        | M. MCKELVEY            | 02/10/09        | 9,082       | TREMPEALEAU       | DPWC       |
| MERCER     | CENTER     | 141        | HARNER UNION OIL CO.     | 2        | M. & M. YEWY           | 02/09/71        | 3,215       | GRANITE           | DPWC       |
| MIAMI      | LOST CREEK | 3          | NATIONAL ASSOC. PETR.    | 1        | E. WALKER              | 10/30/58        | 3,513       | GRANITE           | FWC        |
| MONROE     | OHIO       | 4305       | PROTÉGÉ ENERGY II, LLC   | 1        | DANGEL                 | 01/18/12        | 10,980      | TRENTON           | ST         |
| MONTGOMERY | MAD RIVER  | D 2        | DAYTON                   | M        | DAYTON                 | 01/1887         | 2,440       | EAU CLAIRE        | ST         |
| MORGAN     | CENTER     | 4533       | ARTEX OIL COMPANY        | 1        | BICKFORD UNIT          | 08/20/05        | 8,222       | ROSE RUN          | DPWC       |
| MORROW     | PERRY      | 3737       | STAR EXPL. CORP.         | 1        | R. & W. BREWER         | 12/19/86        | 5,000       | GRANITE           | DPWC       |

**APPENDIX II – COUNTY DRILLING DEPTH RECORDS – 2021**

| COUNTY     | TOWNSHIP    | PERMIT NO. | OPERATOR                 | WELL NO. | LEASE NAME                 | COMPLETION DATE | TOTAL DEPTH | FORMATION AT T.D. | WELL CLASS |
|------------|-------------|------------|--------------------------|----------|----------------------------|-----------------|-------------|-------------------|------------|
| MUSKINGUM  | UNION       | 8776       | 1960 WELL SERVICES, LLC. | 1        | GOFF SWD                   | 05/14/13        | 8,014       | MT. SIMON         | SWIW       |
| NOBLE      | ELK         | 1278       | AMERADA PETR. CORP.      | 1        | R. ULLMAN                  | 02/01/67        | 11,442      | GRANITE           | DPWC       |
| OTTAWA     | CARROLL     | 50         | FRED E. FITZGERALD       | 1        | RAYMOND ARNDT              | 08/07/68        | 2,287       | ST. PETER         | FWC        |
| PAULDING   | JACKSON     | 13         | MT. PLEASANT MINES LTD.  | 1        | H. & E. AREND              | 10/30/76        | 3,440       | GRANITE           | FWC        |
| PERRY      | JACKSON     | 6595       | R.C. POLING CO. INC.     | 1        | RUSH CREEK PARTNERS, ETAL. | 04/20/85        | 6,395       | GRANITE           | SWIW       |
| PICKAWAY   | PICKAWAY    | 24         | RAMCO OIL & GAS CORP.    | 1        | M. KERNS                   | 01/17/85        | 4,500       | GRANITE           | FWC        |
| PIKE       | BEAVER      | 1          | FRANK D. STAHLER         | 1        | R. BAPST                   | 06/14/50        | 4,227       | ST. PETER?        | FWC        |
| PORTAGE    | DEERFIELD   | 2860       | VIKING RESOURCES CORP.   | 1        | VIKING RESOURCES CORP.     | 05/24/82        | 8,800       | GRANITE WASH      | DPWC       |
| PREBLE     | WASHINGTON  | D 3        | DOC TOLLIVER             | 3        | A. H. CHRISTMAN            | 06/01/29        | 1,750       | ST. PETER         | FWC        |
| PUTNAM     | LIBERTY     | 31         | OHIO OIL CO.             | 1        | L. BARLAGE                 | 03/21/44        | 3,377       | GRANITE           | FWC        |
| RICHLAND   | WASHINGTON  | 431        | TRI STATE PRODUCING CO.  | 2        | C. & K. SCOTT              | 09/05/66        | 5,503       | GRANITE           | DPWC       |
| ROSS       | GREEN       | 8          | WELL SUPERVISION INC.    | 1        | M. IMMELL                  | 08/24/64        | 4,168       | MT. SIMON         | FWC        |
| SANDUSKY   | TOWNSEND    | 77         | EAST OHIO GAS CO.        | 2        | V. & I. HAFF               | 11/17/60        | 3,128       | GRANITE           | FWC        |
| SCIOTO     | GREEN       | 212        | USS CHEMICALS/ US STEEL  | 1        | USS CHEMICALS/ US STEEL    | 07/05/68        | 5,617       | GRANITE           | IWDW       |
| SENECA     | ADAMS       | 128        | ASHLAND OIL              | 1        | W. STIGAMIRE               | 01/24/65        | 3,175       | MT. SIMON         | FWC        |
| SHELBY     | SALEM       | 13         | GUMP OIL CO.             | 1        | J. & B. FOGY               | 11/10/56        | 3,360       | GRANITE           | FWC        |
| STARK      | PARIS       | 5052       | VIKING RESOURCES CORP.   | 1        | HANNA UNIT                 | 09/02/97        | 8,292       | ROSE RUN          | POOL       |
| SUMMIT     | TWINSBURG   | 1591       | K.S.T. OIL & GAS CO.     | 5        | K.S.T. OIL & GAS CO.       | 07/18/84        | 7,225       | GRANITE WASH      | SWIW       |
| TRUMBULL   | LIBERTY     | 4043       | D & L ENERGY, INC.       | 2        | NORTHSTAR UNITED           | 08/21/11        | 9,038       | GRANITE           | SWIW       |
| TUSCARAWAS | OXFORD      | 5465       | RED HILL DEVELOPMENT     | 1        | GENERAL CLAY               | 01/23/11        | 8,720       | GRANITE           | DPWC       |
| UNION      | DOVER       | 69         | FUNK EXPLORATION         | 1        | YODER                      | 08/15/84        | 3,500       | GRANITE           | FWC        |
| VAN WERT   | JENNINGS    | 44         | WEST OHIO GAS CO.        | 5        | A. & M. MILLER             | 01/05/73        | 3,242       | GRANITE           | DPWC       |
| VINTON     | VINTON      | 924        | COLUMBIA NAT. RES. INC.  | 723984   | MORRIS                     | 03/25/00        | 5,700       | TREMPEALEAU       | FWC        |
| WARREN     | WAYNE       | C 2627     | OHIO GEOLOGICAL SURVEY   | DS 2     | AMERICAN AGGREGATES CORP.  | 04/26/89        | 5,380       | "MIDDLE RUN"      | CORE       |
| WASHINGTON | GRANDVIEW   | 9717       | FLAT ROCK DEV. LLC       | 19       | COLLINS                    | 10/17/12        | 10,220      | TRENTON           | ST         |
| WAYNE      | CHIPPEWA    | 71         | EAST OHIO GAS CO.        | 2        | N. STEINER                 | 08/12/61        | 6,919       | GRANITE           | DPWC       |
| WILLIAMS   | BRIDGEWATER | 46         | COLUMBIA GAS TRANS.      | 11061    | COOK                       | 12/31/71        | 4,497       | GRANITE WASH      | FWC        |
| WOOD       | LIBERTY     | D 6        | J. S. BRAILEY            | 1        | S. KILLIAN                 | 08/25/37        | 2,927       | GRANITE           | DPWC       |
| WYANDOT    | JACKSO      | D 8        | DIBBLE & MILLER          | 1        | P. PARSELL                 | 03/07/47        | 5,632       | GRANITE           | FWC        |



## HORIZONTAL SHALE PRODUCTION BY COUNTY

Quarterly production reports for all horizontal wells drilled and completed in the Marcellus and Utica/Point Pleasant formation(s) have been combined into an annual report. The combined report and quarterly shale reports and can be found at: [oilandgas.ohiodnr.gov/production](http://oilandgas.ohiodnr.gov/production).

The number of wells in production increased from 2,752 in the first quarter to 2,900 in the 4th quarter. Each quarter had production reports submitted on wells that were shut in and had not produced yet. Oil production decreased from 4,543,462 barrels for the first quarter to 3,913,186 barrels for the fourth quarter. Natural gas production increased from 545,261,990 mcf for the first quarter to 576,496,677 mcf for the fourth quarter. Gas reporting totals include Natural Gas Liquids (NGL) as Ohio law does not require the separate reporting of them. Total horizontal shale production for 2021 was 16,392,167 barrels of oil and 2,216,348,964 mcf of natural gas.

Eighteen counties submitted production reports for 2021. The totals by county are listed in Appendix III. The top three counties for oil production were: Guernsey, Harrison, and Carroll. The top three counties for gas production were: Belmont, Jefferson and Monroe.

It is very unlikely that the wells are being produced at anything near full capacity. Wells produced at high initial rates have the potential of being permanently damaged.

Source: ODNR, Division of Oil and Gas

| APPENDIX III – 2021 HORIZONTAL SHALE PRODUCTION BY COUNTY |                 |                   |                      |                     |
|---|-----------------|-------------------|----------------------|---------------------|
| COUNTY  | NUMBER OF WELLS | OIL TOTAL (bbls.) | GAS TOTAL (mcf)      | BRINE TOTAL (bbls.) |
| BELMONT   | 628             | 399,708           | 756,080,092          | 7,992,220           |
| CARROLL   | 491             | 2,126,005         | 78,980,277           | 1,734,182           |
| COLUMBIANA  | 100             | 23,949            | 32,800,904           | 526,287             |
| COSHOCTON   | 1               | 127               | 23,538               | 337                 |
| GUERNSEY  | 253             | 6,762,362         | 71,547,428           | 1,820,716           |
| HARRISON  | 457             | 6,057,381         | 259,004,011          | 3,620,857           |
| JEFFERSON   | 317             | 2                 | 511,378,321          | 5,844,967           |
| MAHONING  | 12              | 7,992             | 1,012,339            | 73,090              |
| MONROE  | 432             | 495,859           | 450,859,137          | 7,285,616           |
| MORGAN  | 2               | 5,045             | 134,498              | 2,899               |
| MUSKINGUM   | 2               | 43,068            | 474,415              | 40,623              |
| NOBLE   | 175             | 437,798           | 51,362,644           | 786,443             |
| PORTAGE   | 2               | 467               | 60,997               | 392                 |
| STARK   | 2               | 694               | 82,974               | 331                 |
| TRUMBULL  | 7               | 1,149             | 394,870              | 3,826               |
| TUSCARAWAS  | 7               | 16,581            | 340,694              | 4,937               |
| WASHINGTON  | 11              | 13,980            | 1,746,351            | 30,768              |
| WAYNE   | 1               | 0                 | 65,474               | 149                 |
| <b>TOTALS</b>   | <b>2,900</b>    | <b>16,392,167</b> | <b>2,216,348,964</b> | <b>29,768,640</b>   |

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**ODNR DIVISION OF OIL AND GAS RESOURCES  
MANAGEMENT 2021**

**GOVERNOR MIKE DEWINE  
DIRECTOR MARY MERTZ**

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