

Oil, Natural Gas, and Coal Exploration in U.S. Public Lands

The purpose of this project is to discover where, in U.S. public lands, we find the presence of oil and natural gas and coal fields. After identifying where these fields are located, I have determined what percentage of each public land they cover. To understand current explorations in public lands, I have used web mapping to display locations of already operating oil and natural gas wells and coal mines. Public lands in this project includes U.S. National Parks and Bureau of Land Management National Monuments and National Conservation Areas. Hawaii and outlying territories have not been included in this project due to lack of significant data. The findings in this project allow us to determine which national parks, monuments, and conservation areas are most at risk to drilling or mining based on the percentage of oil and gas fields or coal fields within their boundaries.

To complete this project I used geoprocessing and overlay analysis operations. To begin, I used the add geometry attribute tool to calculate the area of each public land in square miles. I also used the clip tool on the oil and gas fields and coal fields so that we only have the data for the fields in the U.S. I then used the intersect tool to find only those areas in which the oil and gas fields and coal fields intersect with a public land. This can lead to multiple entries for the same public land in the attribute table, so to combine these repeat entries, I performed a dissolve operation, preserving the park name, calculated area, and label. Next, I used the add geometry attribute tool to calculate the area of oil and gas fields and coal fields (in square miles) within each public land. To calculate the percentage of oil and gas fields and coal fields in each public land, I added an attribute column and used the field calculator to perform the mathematical operation. I chose to use a web map to display the current oil and gas wells and coal mines on public lands because there was a lot of density in certain areas. I believe the points can best be displayed in a multi-scalar map for easier reading and understanding. Note, that there is no layer for coal mines in U.S. National Parks because none exist according to my data set.

For the scope of this project we are assuming that those public lands with the highest percentage of their area covered by oil and gas fields or coal fields are most at risk to further exploration. Obviously, much more data and analysis is needed to determine accessibility and policy in extracting those natural resources. I chose to include BLM monuments and conservation areas in this project, rather than just focus on National Parks, because there is a significant amount of public land that is not included in the National Parks data. I felt it was important to include this land in my project since they are just as vulnerable to future exploration. I also felt it was important to map both oil and gas (which is one data set) and coal since these are the most controversial resources effecting public land and policy in recent events.

My findings show that there are 133 U.S. National Parks with at least some of their land containing oil and gas fields and 78 of those are 100 percent covered. There are 14 BLM monuments and/or conservation areas that have oil and gas fields within their bounds and 4 of those are completely covered. There are 65 National Parks with coal fields on their land and 31 of those have 100 percent coverage. There are 10 BLM monuments and/or conservation areas that contain coal fields. To easily view the full results and specifics of public lands covered by oil and gas fields and coal fields, please see the generated attached reports.

Link to Web Map:

<https://drive.google.com/open?id=11IKEOMaLmr7WRyfcqFIQIRxJFLvImNG2&usp=sharing>

Sources:

For Oil and Natural Gas Fields and Wells & Coal Fields and Mines -

<https://hifld-geoplatform.opendata.arcgis.com>

For U.S. National Parks – <https://irma.nps.gov/DataStore>

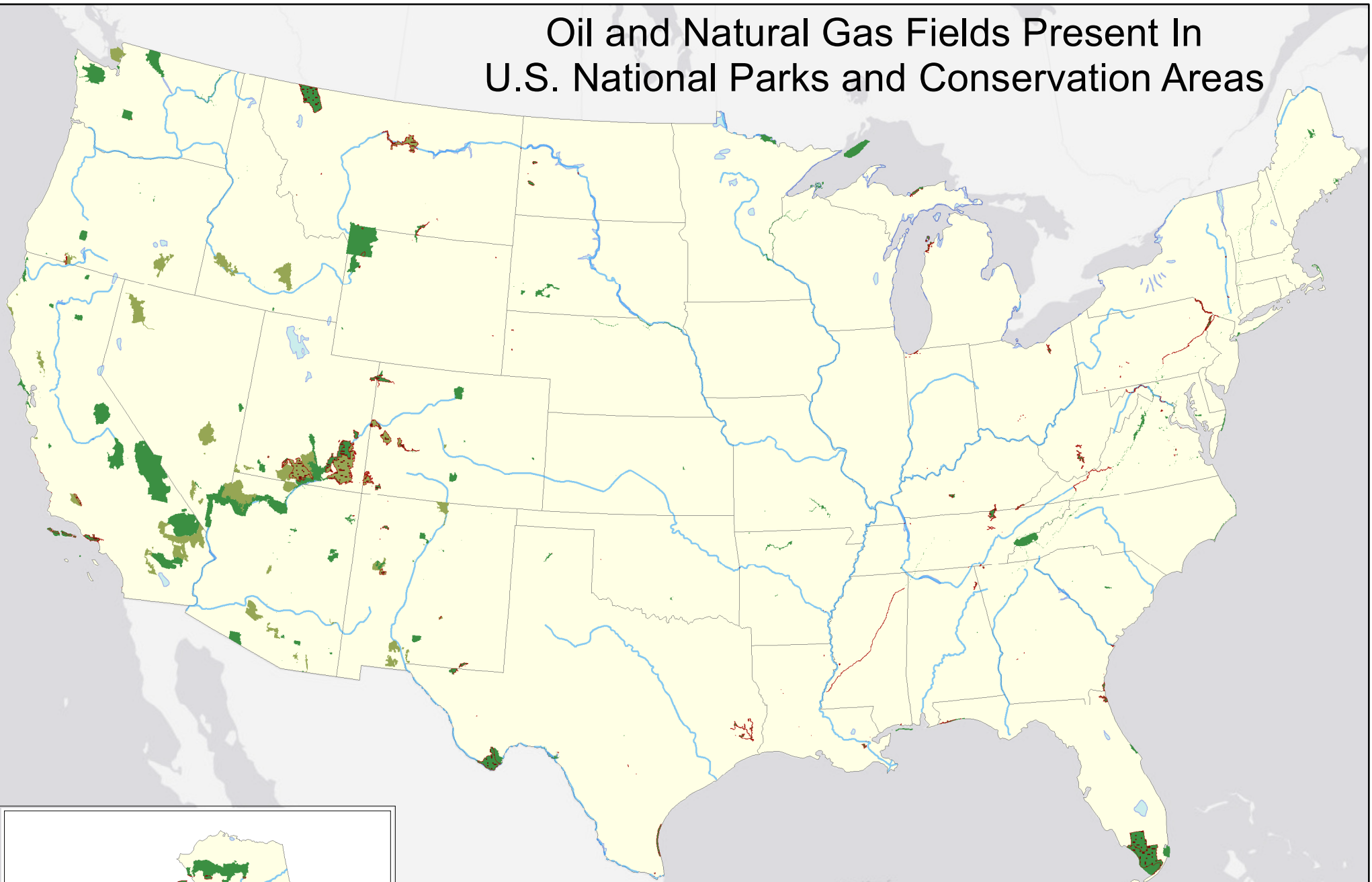
For BLM Monuments and Conservation Areas -

<https://landscape.blm.gov/geoportal/catalog/main/home.page>






For United States shapefile - <https://www.census.gov>

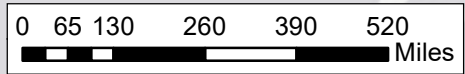
For rivers and lakes shapefiles - <http://www.naturalearthdata.com>

Oil and Natural Gas Fields Present In U.S. National Parks and Conservation Areas



Legend

-  Oil and Natural Gas Fields
-  National Parks
-  Conservation Areas
-  Lakes
-  Rivers



Cartography by Sara Diercks

Oil & Natural Gas Fields Within National Parks

| Name | Area (SqMi) | Area Covered by Oil/Gas (SqMi) | Percent Covered by Oil/Gas |
|--|-------------|--------------------------------|----------------------------|
| Black Canyon of the Gunnison National Park | 48.793492 | 48.793492 | 100 |
| First Ladies National Historic Site | 0.00071 | 0.00071 | 100 |
| Brown v. Board of Education National Historic Site | 0.003199 | 0.003199 | 100 |
| Tupelo National Battlefield | 0.001561 | 0.001561 | 100 |
| Lincoln Home National Historic Site | 0.021346 | 0.021346 | 100 |
| Home of Franklin D. Roosevelt National Historic Site | 1.404283 | 1.404283 | 100 |
| Canyonlands National Park | 522.260536 | 522.260536 | 100 |
| Eleanor Roosevelt National Historic Site | 0.277219 | 0.277219 | 100 |
| Harry S Truman National Historic Site | 0.016192 | 0.016192 | 100 |
| River Raisin National Battlefield Park | 0.06591 | 0.06591 | 100 |
| Big Cypress National Preserve | 1139.754679 | 1139.754679 | 100 |
| Big South Fork National River and Recreation Area | 191.412574 | 191.412574 | 100 |
| Bluestone National Scenic River | 6.780442 | 6.780442 | 100 |
| Chickamauga and Chattanooga National Military Park | 12.857984 | 12.857984 | 100 |
| Gauley River National Recreation Area | 17.434793 | 17.434793 | 100 |
| New River Gorge National River | 109.978785 | 109.978785 | 100 |
| Obed Wild and Scenic River | 8.318754 | 8.318754 | 100 |
| Poverty Point National Monument | 1.421076 | 1.421076 | 100 |
| Steamtown National Historic Site | 0.085197 | 0.085197 | 100 |
| Vicksburg National Military Park | 2.575795 | 2.575795 | 100 |
| Little Bighorn Battlefield National Monument | 1.218775 | 1.218775 | 100 |
| Manassas National Battlefield Park | 8.007744 | 8.007744 | 100 |
| Cumberland Gap National Historical Park | 38.836554 | 38.836554 | 100 |
| Arches National Park | 119.465404 | 119.465404 | 100 |
| Hovenweep National Monument | 1.263964 | 1.263964 | 100 |
| Natchez National Historical Park | 0.168628 | 0.168628 | 100 |

| Name | Area (SqMi) | Area Covered by Oil/Gas (SqMi) | Percent Covered by Oil/Gas |
|--|-------------|--------------------------------|----------------------------|
| Cane River Creole National Historical Park | 0.321678 | 0.321678 | 100 |
| Mesa Verde National Park | 83.876372 | 83.876372 | 100 |
| Little Rock Central High School National Historic Site | 0.042438 | 0.042438 | 100 |
| Jean Lafitte National Historical Park and Preserve | 33.931217 | 33.931217 | 100 |
| Fort Scott National Historic Site | 0.026023 | 0.026023 | 100 |
| Perry's Victory and International Peace Memorial | 0.0418 | 0.0418 | 100 |
| James A. Garfield National Historic Site | 0.012198 | 0.012198 | 100 |
| Natural Bridges National Monument | 11.890274 | 11.890274 | 100 |
| Arkansas Post National Memorial | 1.192583 | 1.192583 | 100 |
| Friendship Hill National Historic Site | 1.055023 | 1.055023 | 100 |
| Women's Rights National Historical Park | 0.011771 | 0.011771 | 100 |
| George Rogers Clark National Historical Park | 0.038057 | 0.038057 | 100 |
| Fort Davis National Historic Site | 0.808805 | 0.808805 | 100 |
| Knife River Indian Villages National Historic Site | 2.769239 | 2.769239 | 100 |
| Scotts Bluff National Monument | 5.026587 | 5.026587 | 100 |
| Johnstown Flood National Memorial | 0.280754 | 0.280754 | 100 |
| Washita Battlefield National Historic Site | 0.499709 | 0.499709 | 100 |
| Agate Fossil Beds National Monument | 4.758031 | 4.758031 | 100 |
| Flight 93 National Memorial | 3.537899 | 3.537899 | 100 |
| Palo Alto Battlefield National Historical Park | 5.334234 | 5.334234 | 100 |
| Little River Canyon National Preserve | 24.087714 | 24.087714 | 100 |
| Fort Necessity National Battlefield | 1.431255 | 1.431255 | 100 |
| Andersonville National Historic Site | 0.814132 | 0.814132 | 100 |
| Devils Tower National Monument | 2.109479 | 2.109479 | 100 |
| Vanderbilt Mansion National Historic Site | 0.329107 | 0.329107 | 100 |
| Upper Delaware Scenic and Recreational River | 89.306006 | 89.306006 | 100 |
| Fort Union Trading Post National Historic Site | 0.696999 | 0.696999 | 100 |

| Name | Area (SqMi) | Area Covered by Oil/Gas (SqMi) | Percent Covered by Oil/Gas |
|---|-------------|--------------------------------|----------------------------|
| Lincoln Boyhood National Memorial | 0.312631 | 0.312631 | 100 |
| Fort Laramie National Historic Site | 1.402119 | 1.402119 | 100 |
| Colorado National Monument | 31.950457 | 31.950457 | 100 |
| Fort Smith National Historic Site | 0.111008 | 0.111008 | 100 |
| Hopewell Culture National Historical Park | 2.796846 | 2.796846 | 100 |
| Lewis and Clark National Historic Trail | 0.125251 | 0.125251 | 100 |
| Delaware Water Gap National Recreation Area | 109.314887 | 109.314887 | 100 |
| Carlsbad Caverns National Park | 73.120392 | 73.120392 | 100 |
| Chaco Culture National Historical Park | 53.639685 | 53.639685 | 100 |
| San Antonio Missions National Historical Park | 1.473383 | 1.473383 | 100 |
| Grant-Kohrs Ranch National Historic Site | 2.46189 | 2.46189 | 100 |
| Theodore Roosevelt National Park | 110.095351 | 110.095351 | 100 |
| Cuyahoga Valley National Park | 51.162778 | 51.162778 | 100 |
| Big Thicket National Preserve | 176.779587 | 176.779587 | 100 |
| Fort Frederica National Monument | 0.441254 | 0.441254 | 100 |
| Russell Cave National Monument | 0.451054 | 0.451054 | 100 |
| Aztec Ruins National Monument | 0.494786 | 0.494786 | 100 |
| Allegheny Portage Railroad National Historic Site | 2.048229 | 2.048229 | 100 |
| Fort Donelson National Battlefield | 2.033111 | 2.033111 | 100 |
| Fort Stanwix National Monument | 0.02615 | 0.02615 | 100 |
| Jimmy Carter National Historic Site | 0.112611 | 0.112611 | 100 |
| Yucca House National Monument | 0.055642 | 0.055642 | 100 |
| Fort Caroline National Memorial | 0.219075 | 0.219075 | 100 |
| Theodore Roosevelt Inaugural National Historic Site | 0.001838 | 0.001838 | 100 |
| Pullman National Monument | 0.00063 | 0.00063 | 100 |
| Glacier National Park | 1575.147239 | 1575.126598 | 99.99869 |
| Indiana Dunes National Lakeshore | 24.893489 | 24.853974 | 99.841266 |
| Timucuan Ecological and Historic Preserve | 71.398141 | 71.242933 | 99.782615 |
| Santa Monica Mountains | 240.320921 | 239.548801 | 99.678713 |

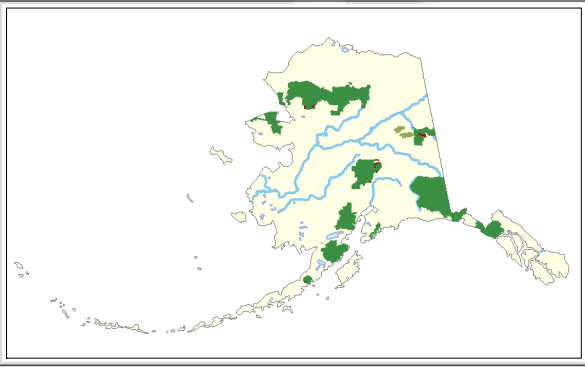
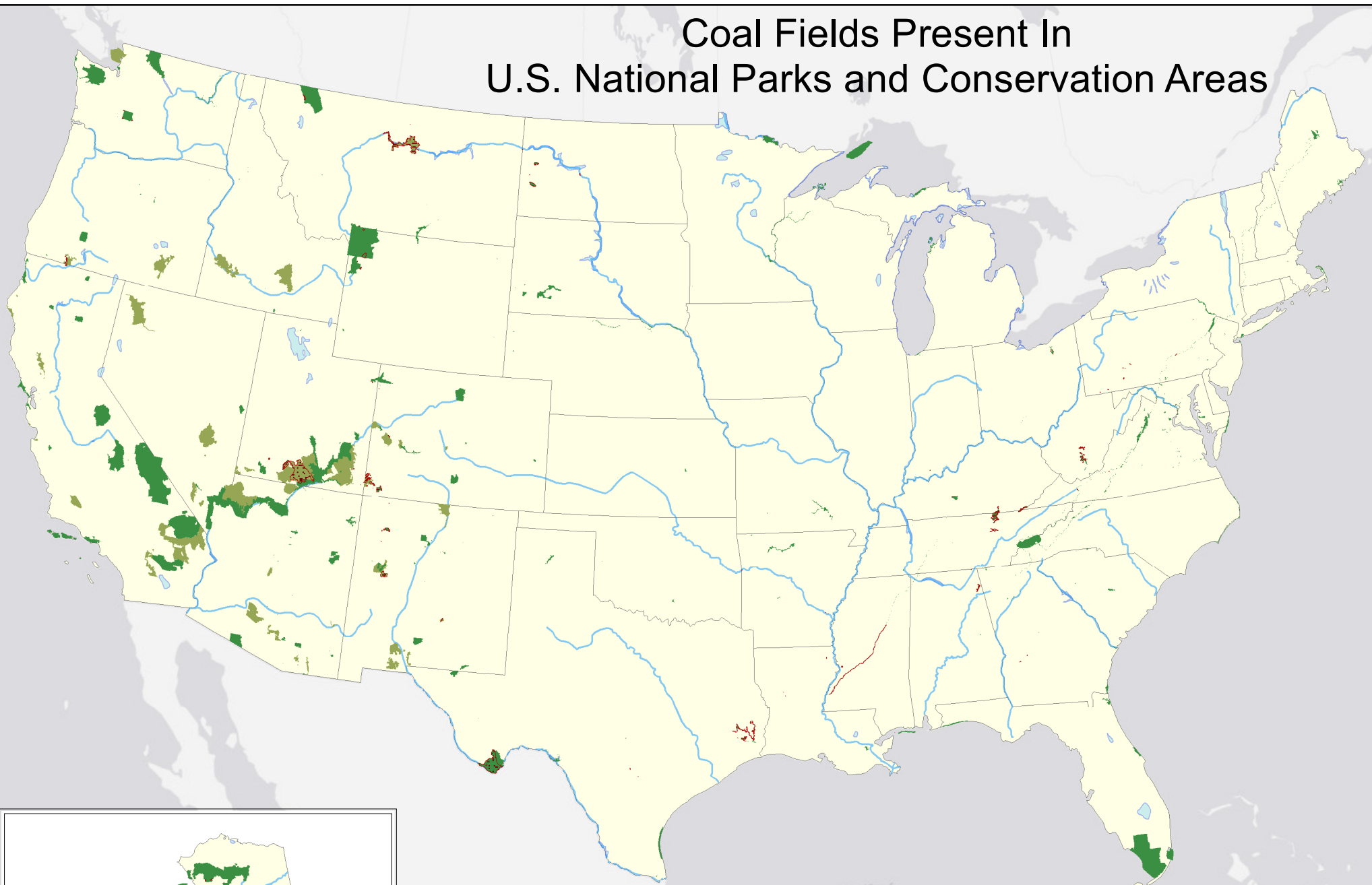
| Name | Area (SqMi) | Area Covered by Oil/Gas (SqMi) | Percent Covered by Oil/Gas |
|---|-------------|--------------------------------|----------------------------|
| National Recreation Area | | | |
| George Washington Birthplace National Monument | 1.027882 | 1.016161 | 98.859665 |
| Cedar Breaks National Monument | 9.588901 | 9.315439 | 97.148148 |
| Padre Island National Seashore | 204.93928 | 192.339858 | 93.852119 |
| Cumberland Island National Seashore | 56.922892 | 52.020381 | 91.387453 |
| Sleeping Bear Dunes National Lakeshore | 109.723848 | 96.33946 | 87.801751 |
| Dinosaur National Monument | 328.750603 | 282.689051 | 85.988907 |
| Bryce Canyon National Park | 56.22941 | 45.210417 | 80.403506 |
| Fort Pulaski National Monument | 8.463386 | 6.78397 | 80.156688 |
| Saratoga National Historical Park | 5.554227 | 4.139995 | 74.537742 |
| Everglades National Park | 2404.143217 | 1767.470803 | 73.5177 |
| Pictured Rocks National Lakeshore | 115.078135 | 80.48689 | 69.94108 |
| Big Bend National Park | 1267.572514 | 882.119879 | 69.591275 |
| Abraham Lincoln Birthplace National Historical Park | 0.529297 | 0.356282 | 67.312307 |
| Natchez Trace Parkway | 82.561992 | 55.528578 | 67.256828 |
| Guadalupe Mountains National Park | 136.287611 | 89.028353 | 65.323878 |
| Chesapeake and Ohio Canal National Historical Park | 32.947246 | 21.301113 | 64.652182 |
| Cabrillo National Monument | 0.250014 | 0.161105 | 64.438648 |
| Mammoth Cave National Park | 80.773126 | 47.503176 | 58.81062 |
| Curecanti National Recreation Area | 64.62961 | 32.797523 | 50.746899 |
| Manhattan Project National Historical Park | 0.177546 | 0.084841 | 47.785267 |
| Thomas Stone National Historic Site | 0.512517 | 0.241115 | 47.04531 |
| Jefferson National Expansion Memorial | 0.303791 | 0.140016 | 46.089697 |
| Channel Islands National Park | 383.881443 | 167.031272 | 43.511161 |
| Bighorn Canyon National Recreation Area | 187.230439 | 66.991906 | 35.780457 |
| Glen Canyon National Recreation Area | 1953.461185 | 668.239903 | 34.207995 |
| Kobuk Valley National Park | 2737.21851 | 827.712245 | 30.239173 |
| Big Hole National Battlefield | 1.527164 | 0.445948 | 29.201065 |
| Richmond National Battlefield Park | 12.817902 | 3.427769 | 26.74204 |

| Name | Area (SqMi) | Area Covered by Oil/Gas (SqMi) | Percent Covered by Oil/Gas |
|--|--------------|--------------------------------|----------------------------|
| Bering Land Bridge National Preserve | 4351.718391 | 1067.71299 | 24.535434 |
| Appalachian National Scenic Trail | 366.263907 | 72.259413 | 19.728784 |
| Gulf Islands National Seashore | 203.767851 | 35.77403 | 17.556268 |
| Yukon-Charley Rivers National Preserve | 3941.687984 | 607.219412 | 15.40506 |
| Aniakchak National Monument | 214.607709 | 30.916603 | 14.406101 |
| Denali National Park | 7326.344561 | 559.313587 | 7.634279 |
| Nez Perce National Historical Park | 5.389454 | 0.303164 | 5.625131 |
| Aniakchak National Preserve | 728.217459 | 28.064481 | 3.85386 |
| Cape Krusenstern National Monument | 1014.800705 | 38.663645 | 3.809974 |
| Denali National Preserve | 2090.39808 | 64.040923 | 3.063575 |
| Lake Clark National Park | 4108.526416 | 119.963541 | 2.919868 |
| Canyon de Chelly National Monument | 137.855667 | 3.27777 | 2.377683 |
| Yellowstone National Park | 3436.635634 | 71.510534 | 2.08083 |
| Grand Teton National Park | 484.394973 | 9.563778 | 1.974376 |
| Amistad National Recreation Area | 89.94622 | 1.265011 | 1.406408 |
| Gates of the Arctic National Park | 11760.261944 | 113.241052 | 0.962913 |
| Gates of the Arctic National Preserve | 1477.572428 | 10.967262 | 0.742249 |
| Lake Meredith National Recreation Area | 65.041691 | 0.251831 | 0.387184 |
| Mount Rainier National Park | 369.432284 | 0.951568 | 0.257576 |
| Noatak National Preserve | 10281.074381 | 8.898553 | 0.086553 |
| Capitol Reef National Park | 382.490641 | 0.123611 | 0.032317 |
| Blue Ridge Parkway | 141.445284 | 0.030514 | 0.021573 |
| Dry Tortugas National Park | 102.466816 | 0.001887 | 0.001841 |






Oil & Gas Fields Within Conservation Lands

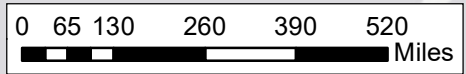
| Name | Area (SqMi) | Area Covered by Oil/Gas | Percent Covered by Oil/Gas |
|---|-------------|-------------------------|----------------------------|
| McInnis Canyons National Conservation Area | 193.940242 | 193.940242 | 100 |
| Gunnison Gorge National Conservation Area | 101.613744 | 101.613744 | 100 |
| Dominquez/Escalante National Conservation Area | 340.796931 | 340.796931 | 100 |
| Canyons of the Ancients National Monument | 285.284554 | 285.284554 | 100 |
| Bears Ears National Monument | 2311.220316 | 2304.846692 | 99.724231 |
| Upper Missouri River Breaks National Monument | 792.315206 | 777.089313 | 98.078303 |
| Grand Staircase Escalante National Monument | 2940.674343 | 1261.099309 | 42.884698 |
| Piedras Blancas Outstanding Natural Area | 0.746279 | 0.240513 | 32.228351 |
| Steese National Conservation Area | 16.249699 | 4.699238 | 28.918921 |
| Carrizo Plain National Monument | 386.062173 | 109.441505 | 28.348155 |
| El Malpais National Conservation Area | 410.864105 | 111.413541 | 27.116884 |
| Fort Stanton - Snowy River National Conservation Area | 43.68439 | 9.444469 | 21.619779 |
| Cascade-Siskiyou National Monument | 266.462113 | 35.644496 | 13.376947 |
| California Coastal National Monument | 13.267202 | 0.04379 | 0.330066 |

Coal Fields Present In U.S. National Parks and Conservation Areas



Legend

| | |
|--|---|
|  Coal Fields |  Lakes |
|  National Parks |  Rivers |
|  Conservation Areas | |



Cartography by Sara Diercks

Coal Fields Within U.S. National Parks

| Name | AREA (SqMi) | Coal Area (SqMi) | Percent Covered by Coal |
|--|-------------|------------------|-------------------------|
| Brown v. Board of Education National Historic Site | 0.003199 | 0.003199 | 100 |
| Fort Scott National Historic Site | 0.026023 | 0.026023 | 100 |
| Jimmy Carter National Historic Site | 0.112611 | 0.112611 | 100 |
| Steamtown National Historic Site | 0.085197 | 0.085197 | 100 |
| Harry S Truman National Historic Site | 0.016192 | 0.016192 | 100 |
| Roger Williams National Memorial | 0.007095 | 0.007095 | 100 |
| Fort Smith National Historic Site | 0.111008 | 0.111008 | 100 |
| Lincoln Home National Historic Site | 0.021346 | 0.021346 | 100 |
| Gauley River National Recreation Area | 17.434793 | 17.434793 | 100 |
| Poverty Point National Monument | 1.421076 | 1.421076 | 100 |
| Vicksburg National Military Park | 2.575795 | 2.575795 | 100 |
| Natchez National Historical Park | 0.168628 | 0.168628 | 100 |
| Cane River Creole National Historical Park | 0.321678 | 0.321678 | 100 |
| Arkansas Post National Memorial | 1.192583 | 1.192583 | 100 |
| Friendship Hill National Historic Site | 1.055023 | 1.055023 | 100 |
| Russell Cave National Monument | 0.451054 | 0.451054 | 100 |
| Knife River Indian Villages National Historic Site | 2.769239 | 2.769239 | 100 |
| Johnstown Flood National Memorial | 0.280754 | 0.280754 | 100 |
| Flight 93 National Memorial | 3.537899 | 3.537899 | 100 |
| Andersonville National Historic Site | 0.814132 | 0.814132 | 100 |
| Fort Union Trading Post National Historic Site | 0.696999 | 0.696999 | 100 |
| Lewis and Clark National Historic Trail | 0.125251 | 0.125251 | 100 |
| Chaco Culture National Historical Park | 53.639685 | 53.639685 | 100 |
| Theodore Roosevelt National Park | 110.095351 | 110.095351 | 100 |
| Obed Wild and Scenic River | 8.318754 | 8.318754 | 100 |
| Aztec Ruins National Monument | 0.494786 | 0.494786 | 100 |
| Lincoln Boyhood | 0.312631 | 0.312631 | 100 |

| Name | AREA (SqMi) | Coal Area (SqMi) | Percent Covered by Coal |
|--|-------------|------------------|-------------------------|
| National Memorial | | | |
| George Rogers Clark National Historical Park | 0.038057 | 0.038057 | 100 |
| Yucca House National Monument | 0.055642 | 0.055642 | 100 |
| Little Rock Central High School National Historic Site | 0.042438 | 0.042438 | 100 |
| First Ladies National Historic Site | 0.00071 | 0.00071 | 100 |
| Fort Necessity National Battlefield | 1.431255 | 1.431255 | 99.999989 |
| Mesa Verde National Park | 83.876372 | 83.876359 | 99.999984 |
| Cumberland Gap National Historical Park | 38.836554 | 38.233921 | 98.448285 |
| Cedar Breaks National Monument | 9.588901 | 9.315049 | 97.144077 |
| Hovenweep National Monument | 1.263964 | 1.201384 | 95.048912 |
| Little River Canyon National Preserve | 24.087714 | 22.539907 | 93.574291 |
| Big Thicket National Preserve | 176.779587 | 152.845061 | 86.460809 |
| Bryce Canyon National Park | 56.22941 | 45.216022 | 80.413474 |
| San Antonio Missions National Historical Park | 1.473383 | 1.165395 | 79.096488 |
| Big South Fork National River and Recreation Area | 191.412574 | 144.732034 | 75.612605 |
| Big Bend National Park | 1267.572514 | 925.754954 | 73.033688 |
| Allegheny Portage Railroad National Historic Site | 2.048229 | 1.480451 | 72.279555 |
| Natchez Trace Parkway | 82.561992 | 38.876531 | 47.087685 |
| Jefferson National Expansion Memorial | 0.303791 | 0.140016 | 46.089697 |
| New River Gorge National River | 109.978785 | 35.978573 | 32.714103 |
| Rio Grande Wild and Scenic River | 0.456422 | 0.05432 | 11.901176 |
| Mammoth Cave National Park | 80.773126 | 6.431371 | 7.962265 |
| Nez Perce National Historical Park | 5.389454 | 0.303164 | 5.625131 |
| Cuyahoga Valley National Park | 51.162778 | 1.932958 | 3.778056 |
| Yukon-Charley Rivers National Preserve | 3941.687984 | 144.326143 | 3.661531 |
| Glen Canyon National Recreation Area | 1953.461185 | 56.060461 | 2.869802 |
| Kobuk Valley National Park | 2737.21851 | 59.573003 | 2.176407 |
| Yellowstone National Park | 3436.635634 | 71.51205 | 2.080874 |
| Grand Teton National Park | 484.394973 | 9.567098 | 1.975061 |

| Name | AREA (SqMi) | Coal Area (SqMi) | Percent Covered by Coal |
|--|-------------|------------------|-------------------------|
| Denali National Park | 7326.344561 | 101.255773 | 1.382078 |
| Mount Rainier National Park | 369.432284 | 4.240443 | 1.147827 |
| Glacier National Park | 1575.147239 | 15.930145 | 1.011343 |
| Aniakchak National Preserve | 728.217459 | 6.886876 | 0.945717 |
| Appalachian National Scenic Trail | 366.263907 | 3.098788 | 0.846053 |
| Dinosaur National Monument | 328.750603 | 1.358662 | 0.41328 |
| Chickamauga and Chattanooga National Military Park | 12.857984 | 0.011696 | 0.090967 |
| Capitol Reef National Park | 382.490641 | 0.124199 | 0.032471 |
| Gulf Islands National Seashore | 203.767851 | 0.005823 | 0.002858 |
| Crater Lake National Park | 285.237336 | 0.000878 | 0.000308 |

Coal Fields Within Conservation Lands

| Name | Area (SqMi) | Coal Area (SqMi) | Percent Covered by Coal |
|---|-------------|------------------|-------------------------|
| Upper Missouri River Breaks National Monument | 792.315206 | 778.51222 | 98.257892 |
| Grand Staircase Escalante National Monument | 2940.674343 | 1261.089776 | 42.884374 |
| Canyons of the Ancients National Monument | 285.284554 | 94.845267 | 33.245847 |
| Steese National Conservation Area | 16.249699 | 4.69689 | 28.904475 |
| El Malpais National Conservation Area | 410.864105 | 111.418572 | 27.118108 |
| Fort Stanton - Snowy River National Conservation Area | 43.68439 | 9.442164 | 21.614504 |
| Cascade-Siskiyou National Monument | 266.462113 | 35.6355 | 13.373571 |
| Dominquez/Escalante National Conservation Area | 340.796931 | 1.666361 | 0.48896 |
| Bears Ears National Monument | 2311.220316 | 1.630117 | 0.070531 |
| San Juan Islands National Monument | 674.990442 | 0.002472 | 0.000366 |