Extractive Industries in Oregon and the US

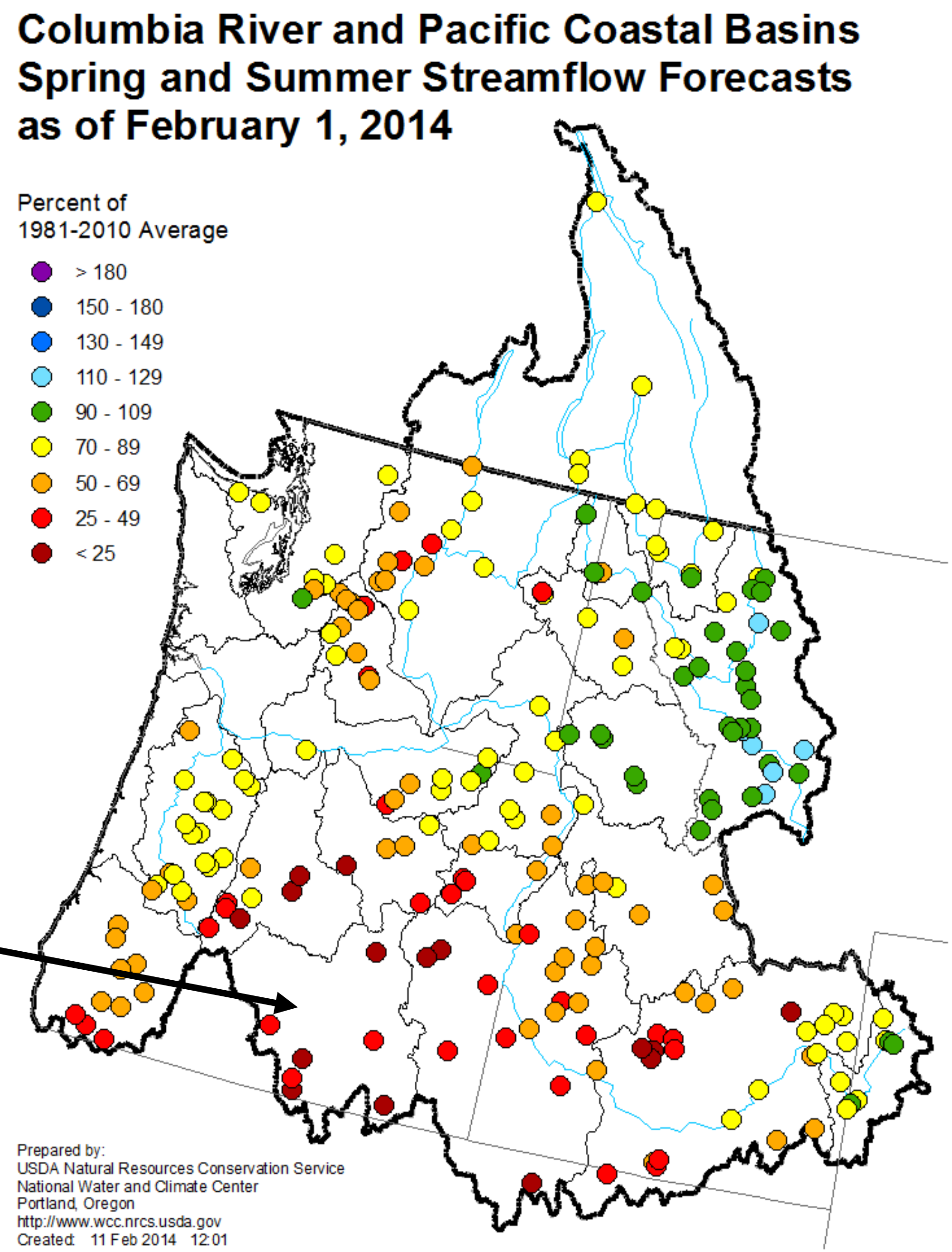
Mt Etna Eruption 30 Oct 02

Klamath Basin Water Allocation

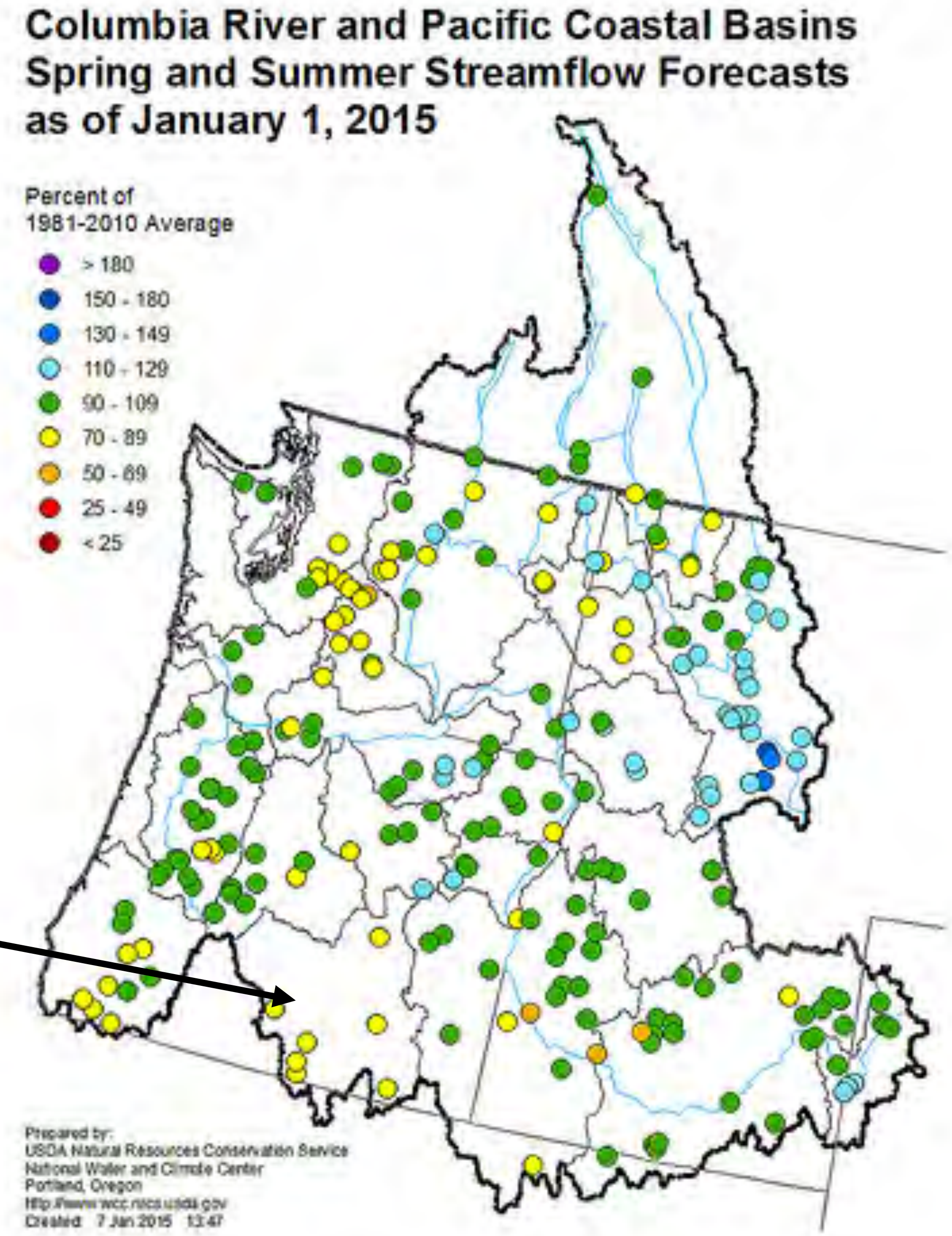
2000: Average Year

2001: Dry Year

Klamath Basin Water Allocation

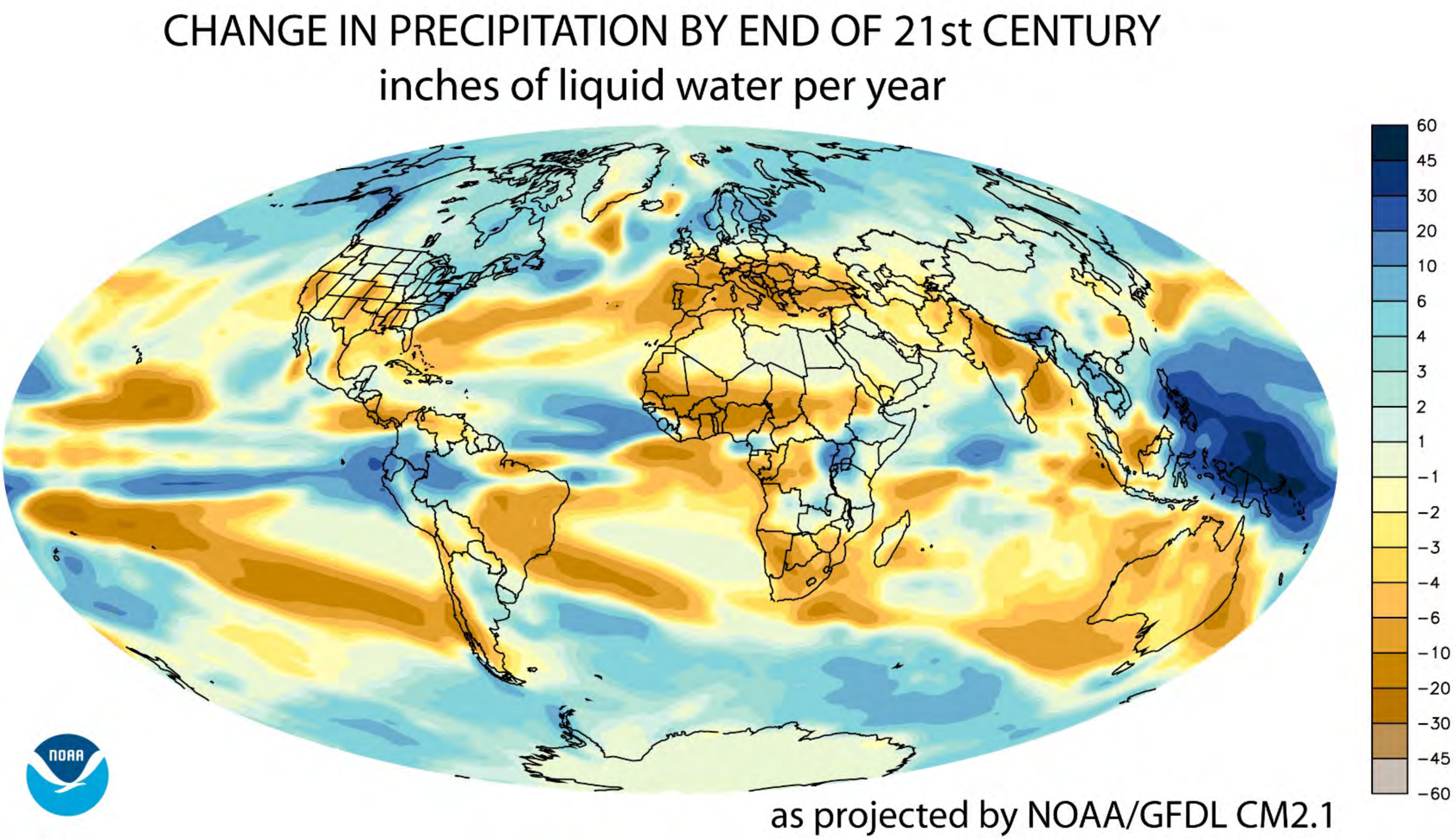


Klamath Basin Water Allocation

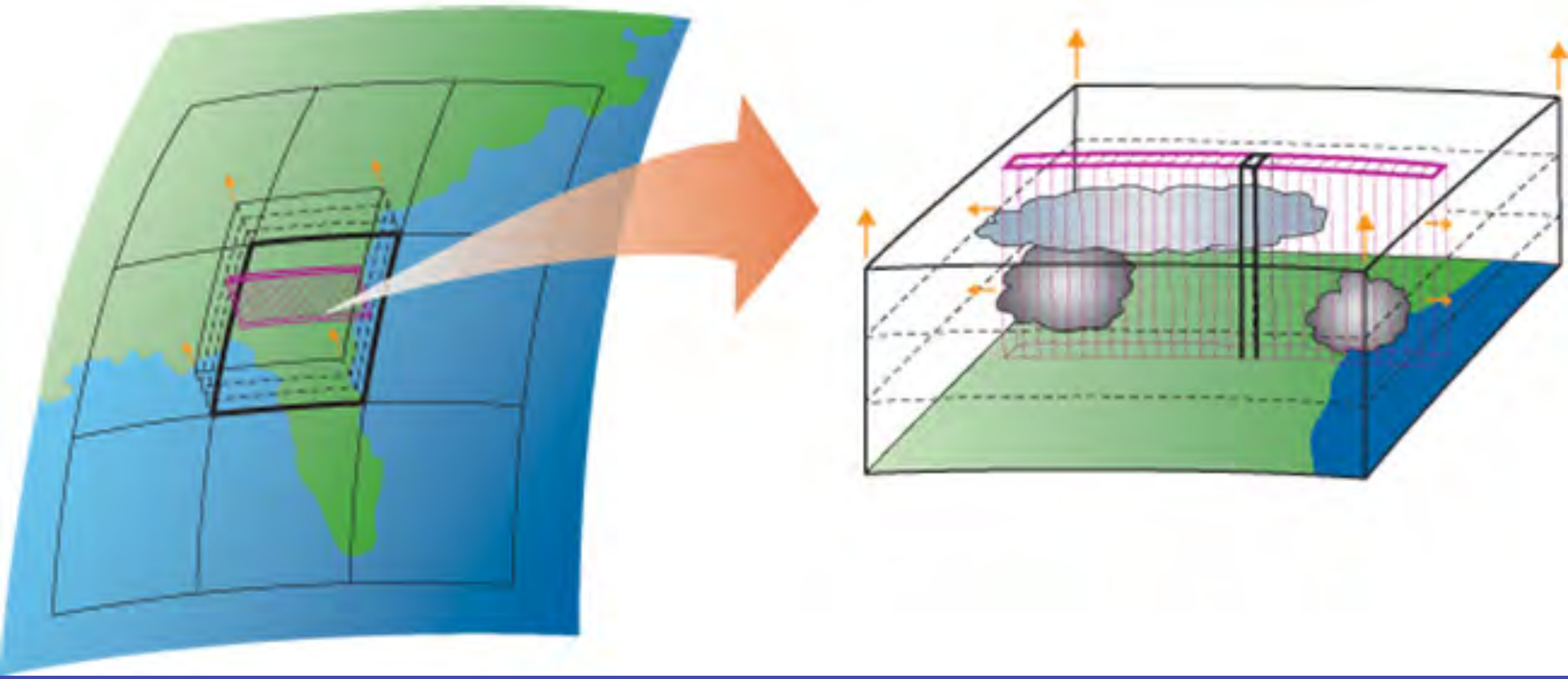


Klamath Basin Water Allocation: Impact of Climate Change

Klamath Basin Water Allocation: Impact of Climate Change

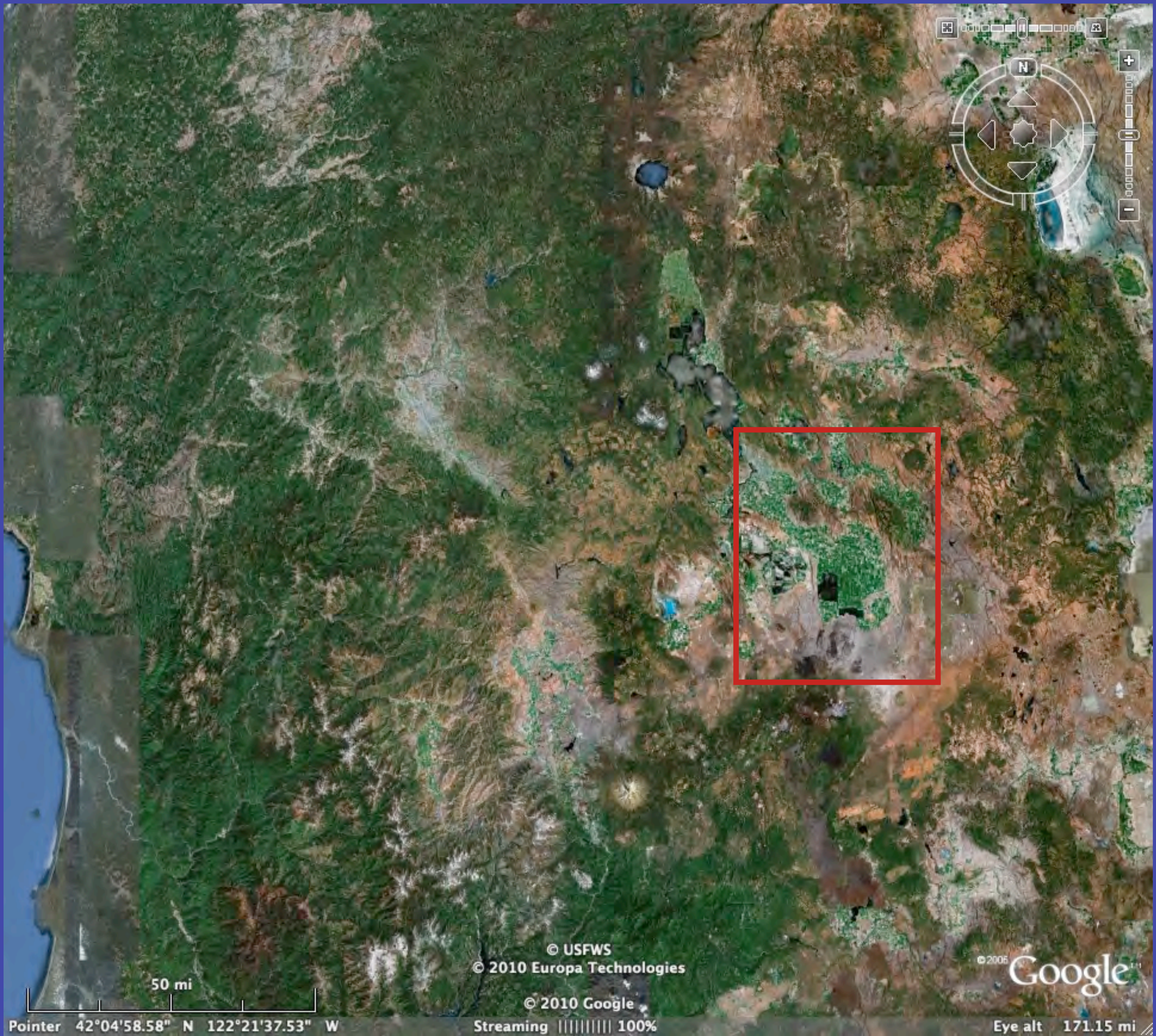


Klamath Basin Water Allocation: Impact of Climate Change



Global Circulation Models employ grid cells ~300 x 250 km

Klamath Basin Water Allocation: Impact of Climate Change



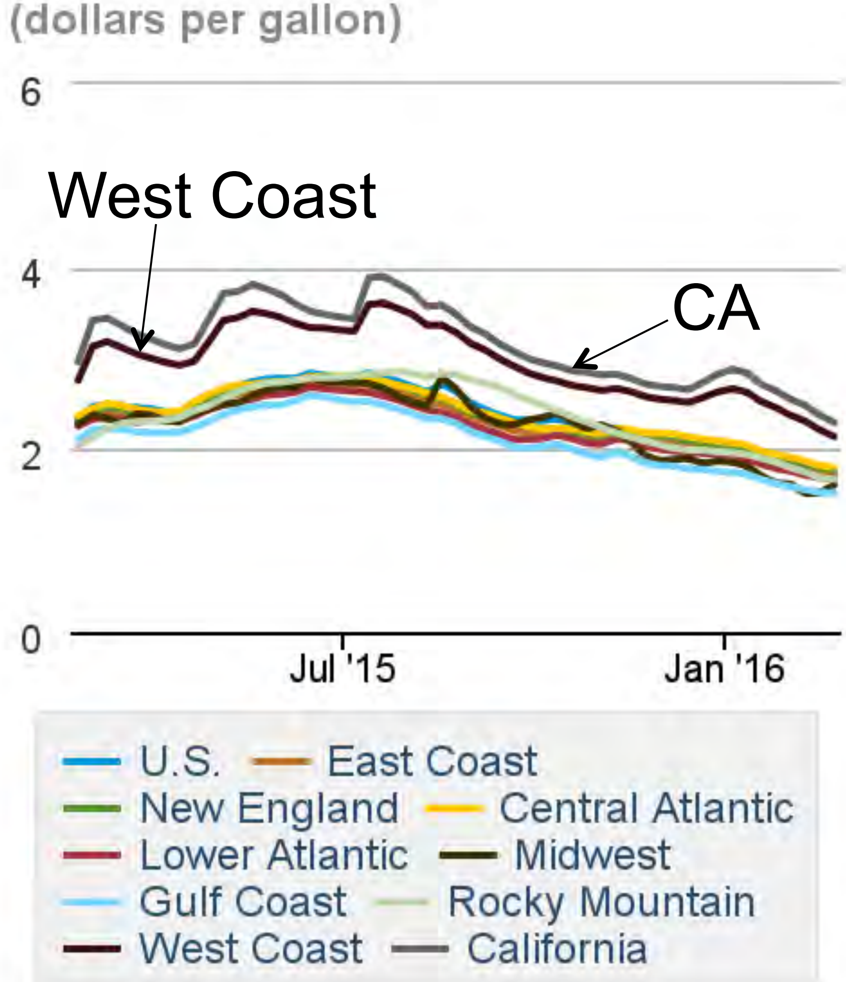
Western Oregon Water Allocation: Impact of Climate Change

Water in Oregon

- Klamath Basin is probably over allocated
- State-wide conflict between commercial fishing and irrigation
- Long-term impact of climate change is poorly understood
- Present General Circulation Models are too coarse to guide local policy decisions
- GCM’s will be more useful in the coming years

Energy in Oregon

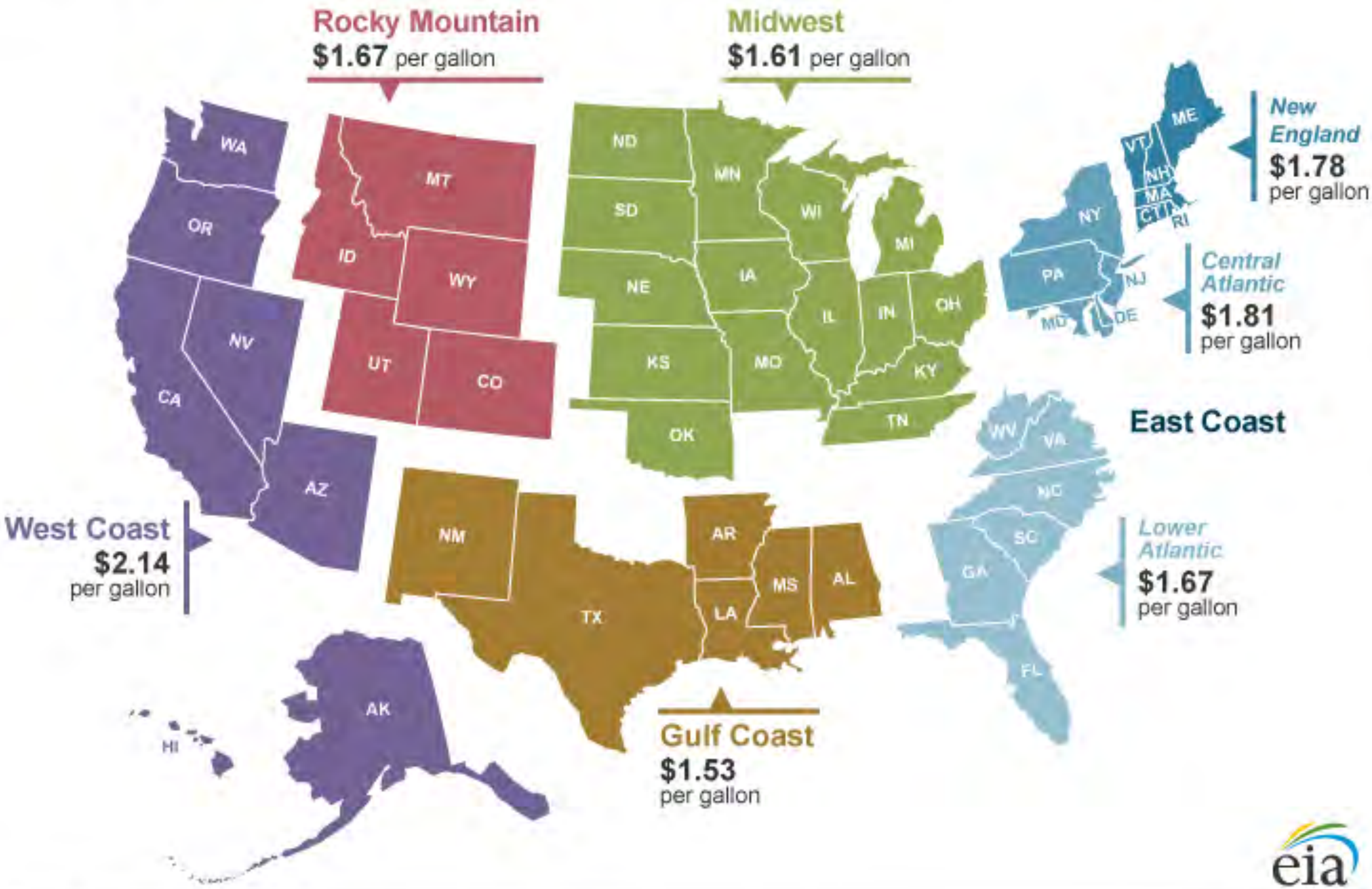
Regular Gasoline Prices



Source: Energy Information Administration

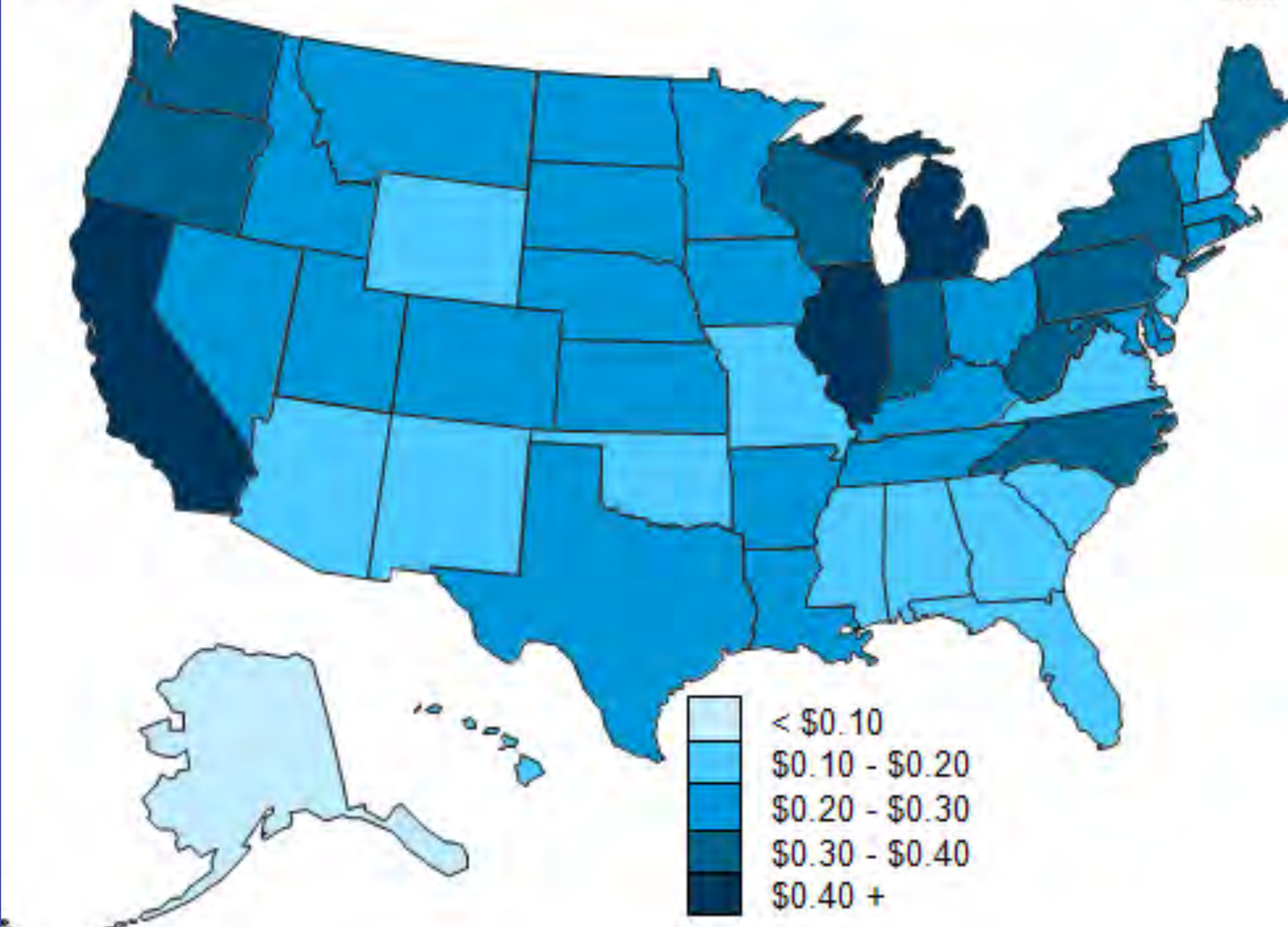
Regular grade gasoline prices at retail outlets by region

February 22, 2016

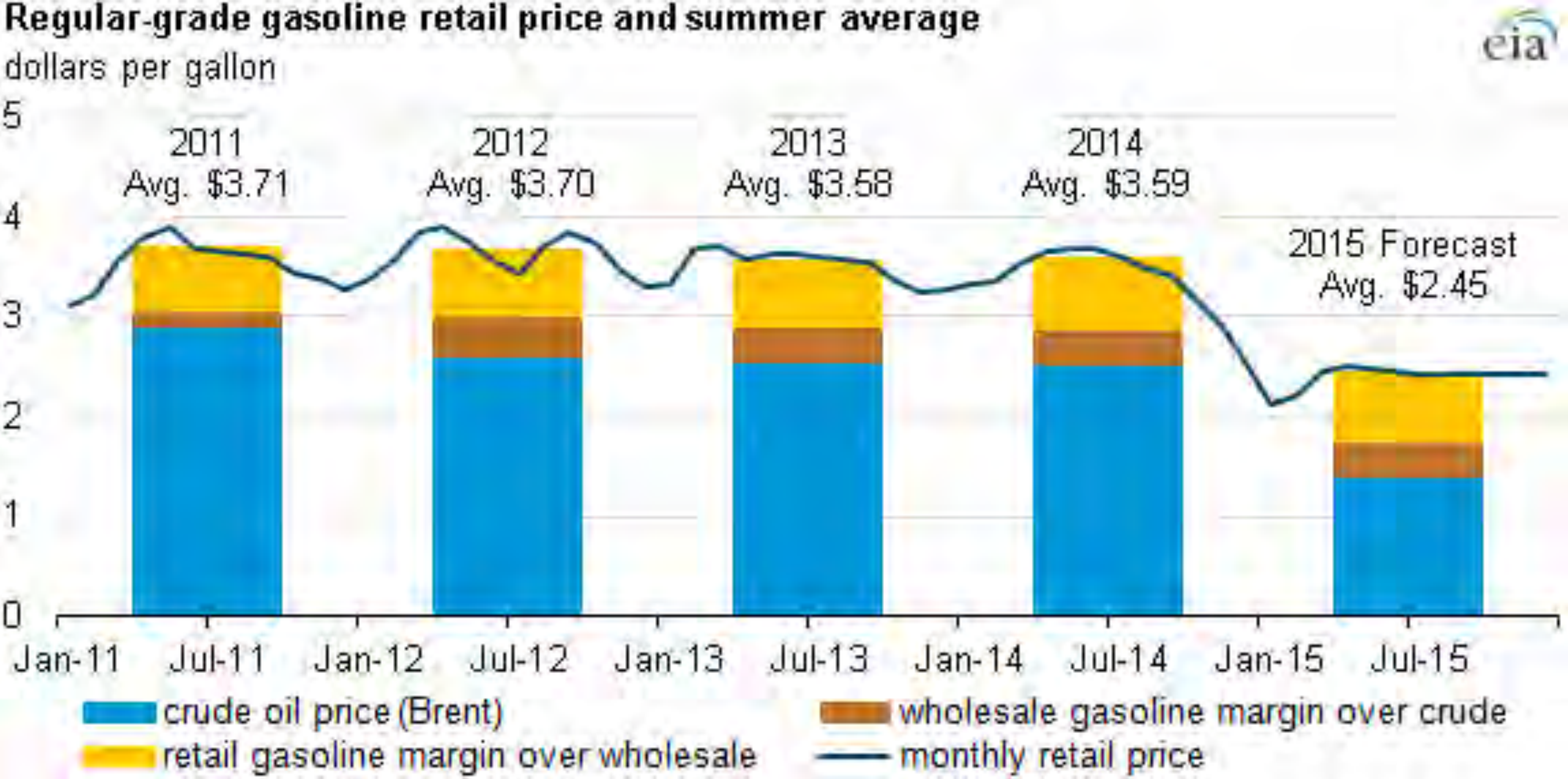


Note: Includes taxes.
Source: U.S. Energy Information Administration, EIA-878 Motor Gasoline Price Survey.

State-level excise and sales taxes for retail gasoline, January 2012
dollars per gallon



http://www.eia.gov/todayinenergy/detail.cfm?id=5790

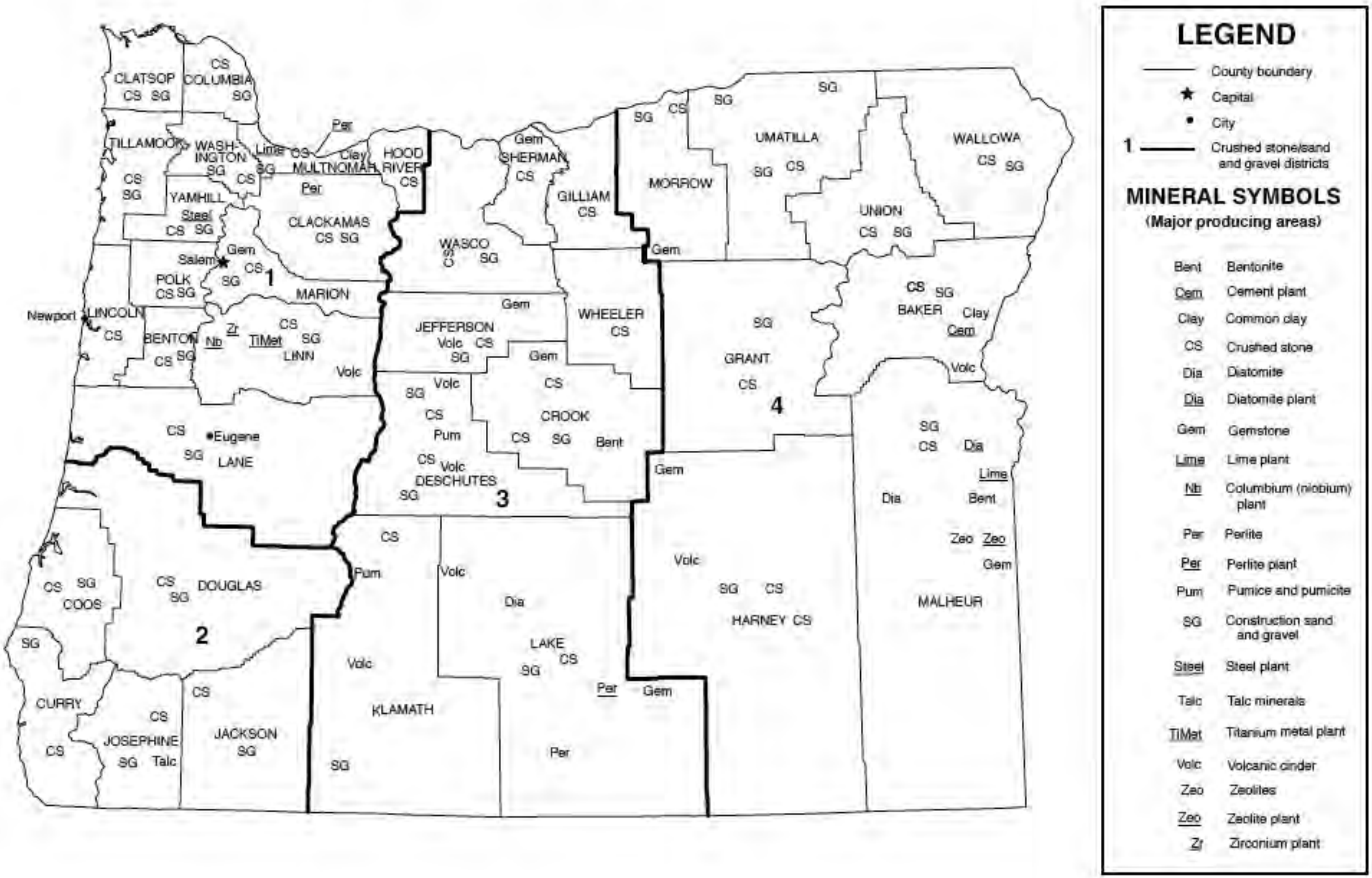


Regular-grade gasoline retail price and summer average
dollars per gallon
eia
2011
Avg. $3.71
2012
Avg. $3.70
2013
Avg. $3.58
2014
Avg. $3.59
2015 Forecast
Avg. $2.45
5
4
3
2
1
0
Jan-11
Jul-11
Jan-12
Jul-12
Jan-13
Jul-13
Jan-14
Jul-14
Jan-15
Jul-15
crude oil price (Brent)
wholesale gasoline margin over crude
retail gasoline margin over wholesale
monthly retail price

Gasoline in Oregon

- Derived from North Slope & Bakken Crude
- Most Refined in Washington-Puget Sound
- 90% shipped by pipeline from Puget Sound
- 10% shipped by barge or pipe from CA or CO
- Oregon gasoline taxes are above US average

OREGON



CLATSOP CS SG
COLUMBIA CS SG
TILLAMOOK CS SG
WASHINGTON SG CS
Lime CS Clay Per SG
MULTNOMAH Per
HOOD RIVER CS
SHERMAN Gem CS
GILLIAM CS
MORROW SG CS Gem
UMATILLA SG SG CS
WALLOWA CS SG
UNION CS SG
YAMHILL Steel CS SG
CLACKAMAS CS SG
WASCO CS SG
Salem
POLK CS SG
Gem CS SG
1
MARION
Newport
LINCOLN CS
BENTON CS SG
Nb Zr TiMet CS SG
LINN Volc
JEFFERSON Gem Volc CS SG
WHEELER CS
GRANT SG CS
4
BAKER CS SG Clay Cem Volc
CROOK Gem CS CS SG Bent
SG Volc CS Pum CS Volc
DESCHUTES SG
3
Gem
Eugene
LANE CS SG
DOUGLAS CS SG
2
COOS CS SG
SG
CURRY CS
JOSEPHINE CS SG Talc
JACKSON CS SG
KLAMATH CS Pum Volc SG
LAKE Volc Dia CS SG Per Gem Per
HARNEY Volc SG CS CS
MALHEUR SG CS Dia Lime Dia Bent Zeo Zeo Gem
LEGEND
County boundary
Capital
City
1 Crushed stone/sand and gravel districts
MINERAL SYMBOLS
(Major producing areas)
Bent Bentonite
Cem Cement plant
Clay Common clay
CS Crushed stone
Dia Diatomite
Dia Diatomite plant
Gem Gemstone
Lime Lime plant
Nb Columbium (niobium) plant
Per Perlite
Per Perlite plant
Pum Pumice and pumicite
SG Construction sand and gravel
Steel Steel plant
Talc Talc minerals
TiMet Titanium metal plant
Volc Volcanic cinder
Zeo Zeolites
Zeo Zeolite plant
Zr Zirconium plant

Oregon Extractive Industry 2011
(Does DOGAMI still collect this data?)

- $1,130,000 Gemstones
- $90,400,000 Sand and Gravel
- $118,000,000 Crushed Stone
- $117,000,000 Cement, clay, diatomite, lime, perlite, pumice, & talc
- $305,000,000 Total for Oregon

United States Extractive Industries

Lake Shasta Summer 2008

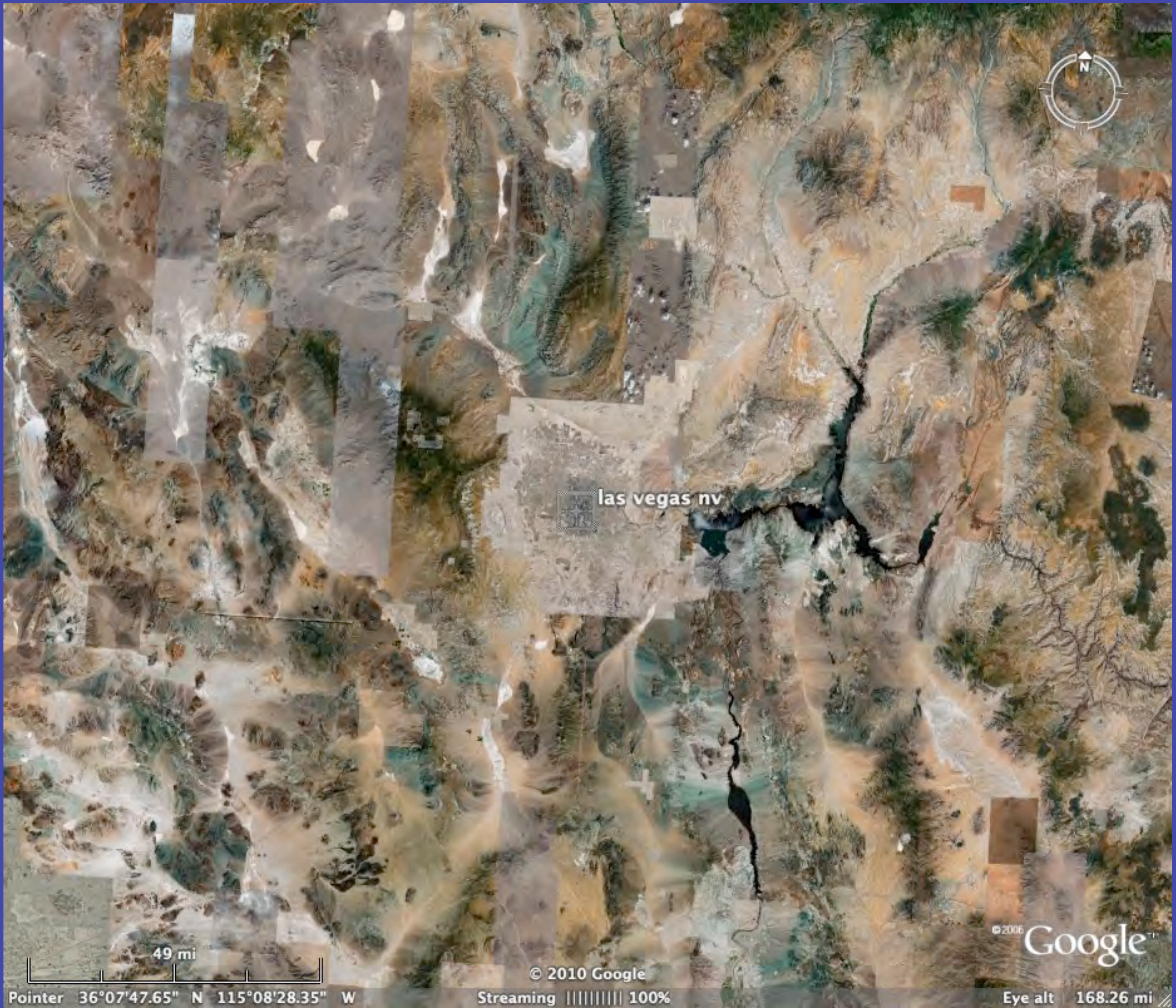

© USFWS
© 2010 Europa Technologies
50 mi
© 2010 Google
Google

Hoover Dam and Lake Mead Summer 2008

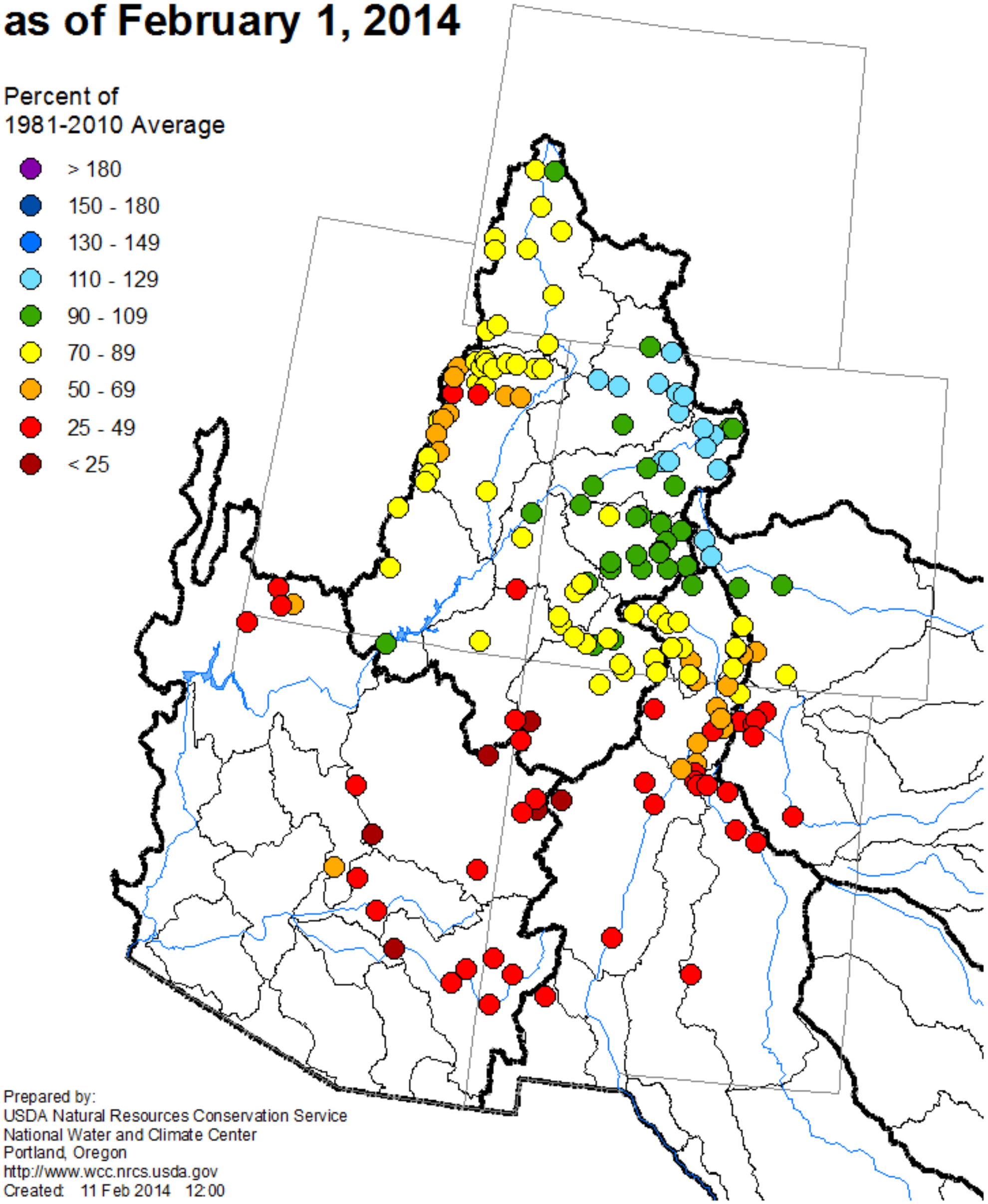
Hoover Dam with caliche

Pierce Ferry

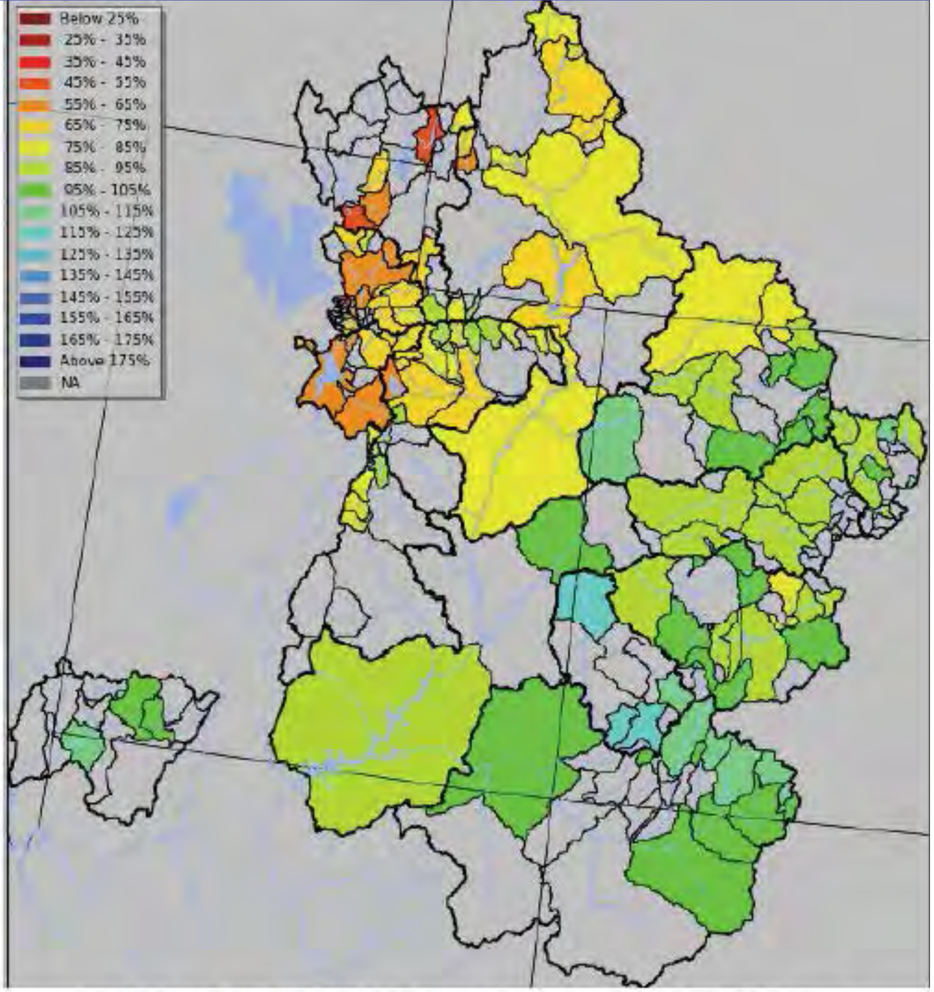
Colorado River Basin Water Allocation: Impact of Climate Change



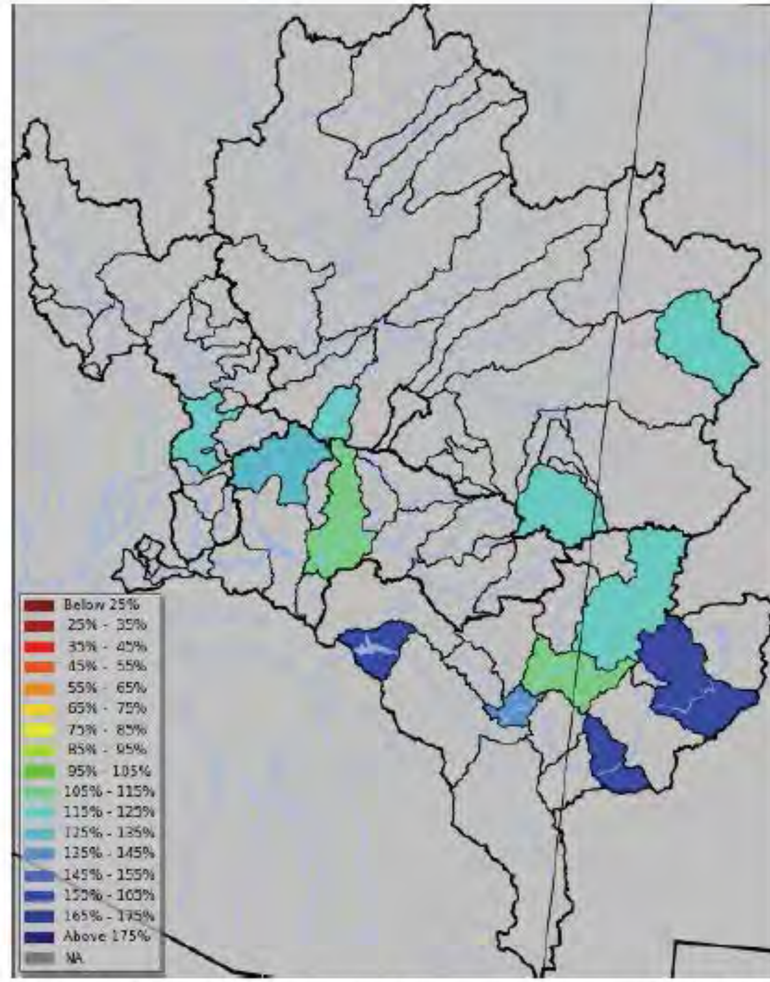
Colorado, Rio Grande, and Arkansas River Basins Spring and Summer Streamflow Forecasts as of February 1, 2014



Prepared by:
USDA Natural Resources Conservation Service
National Water and Climate Center
Portland, Oregon
http://www.wcc.nrcs.usda.gov
Created: 11 Feb 2014 12:00



Upper Colorado Basin: 2016 April-July forecast volumes as a percent of 1981-2010 average
(50% exceedance probability forecast)



Lower Colorado Basin (AZ/NM): 2016 January-May forecast volumes as a percent of 1981-2010 median
(50% exceedance probability forecast)

Upper Colorado Basin
Streamflow Forecast
Spring 2016

Lower Colorado Basin
Streamflow Forecast
Spring 2016

Lake Lanier, Atlanta, Georgia Summer 2008

Flooding in downtown Atlanta, September 2009

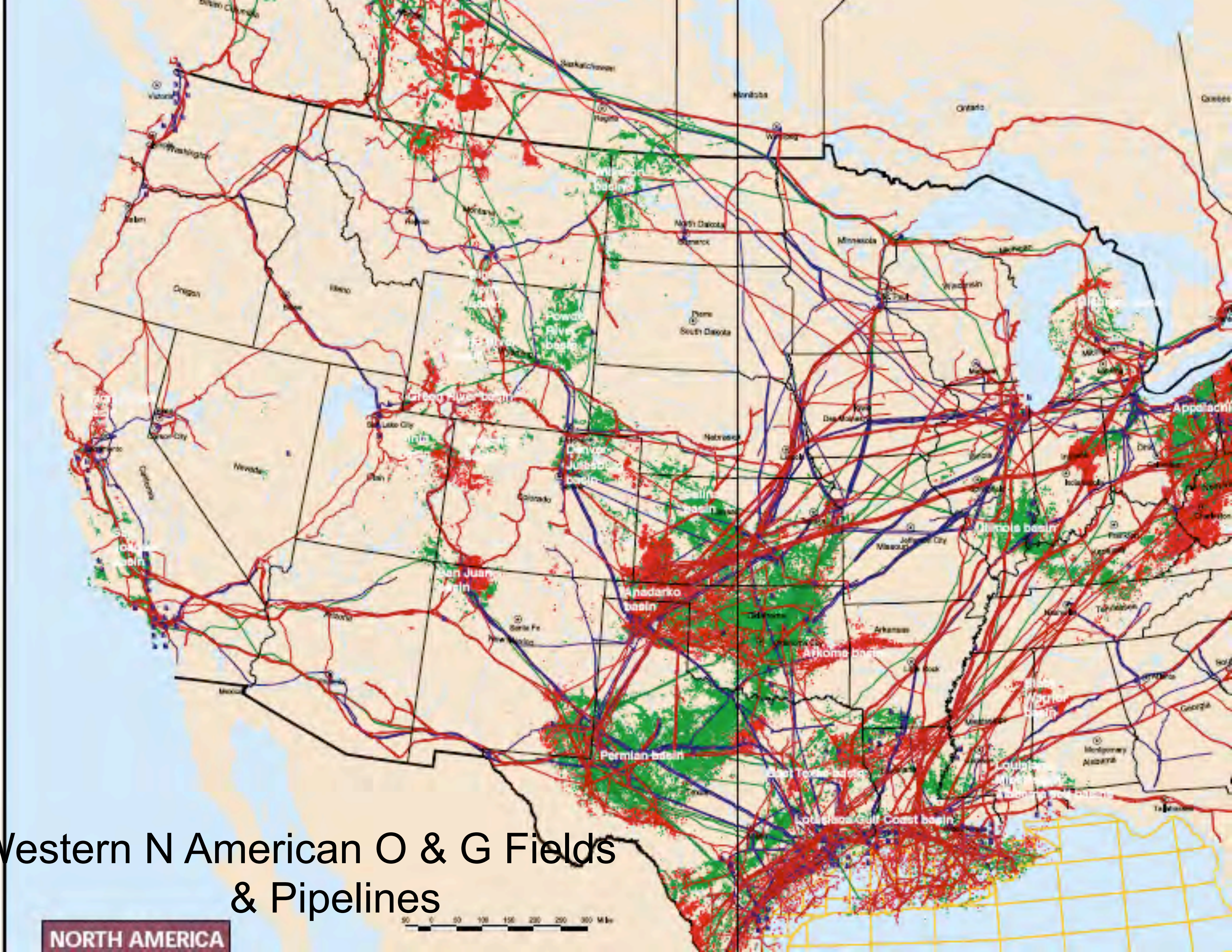
Metro Atlanta Water Allocation: Impact of Climate Change

Metro Atlanta Water Allocation: Impact of Climate Change

South Florida Sea Level: Impact of Climate Change

Water in the US

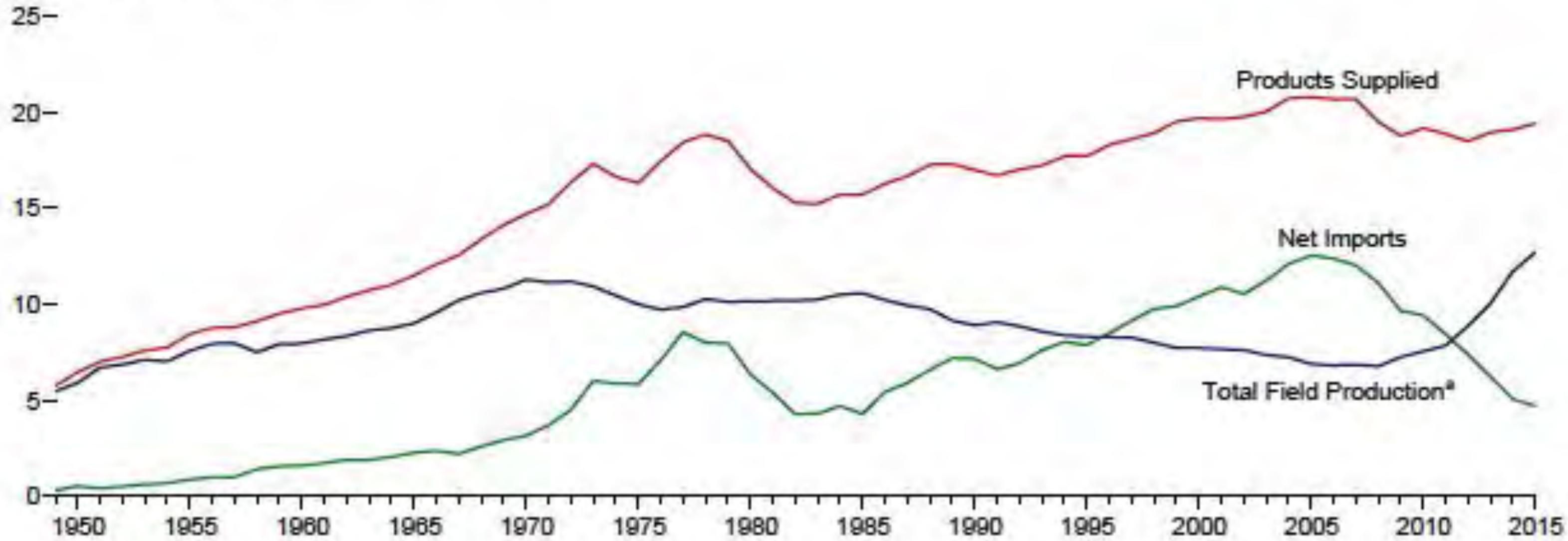
- Colorado River Basin is over-allocated
- Rio Grande Basin may be over-allocated
- Municipal water supply problems are widespread
- Multi-decade water cycle is poorly understood
- Impact of long term climate change is poorly understood, especially at the local level
- GCM’s in near future will improve resolution



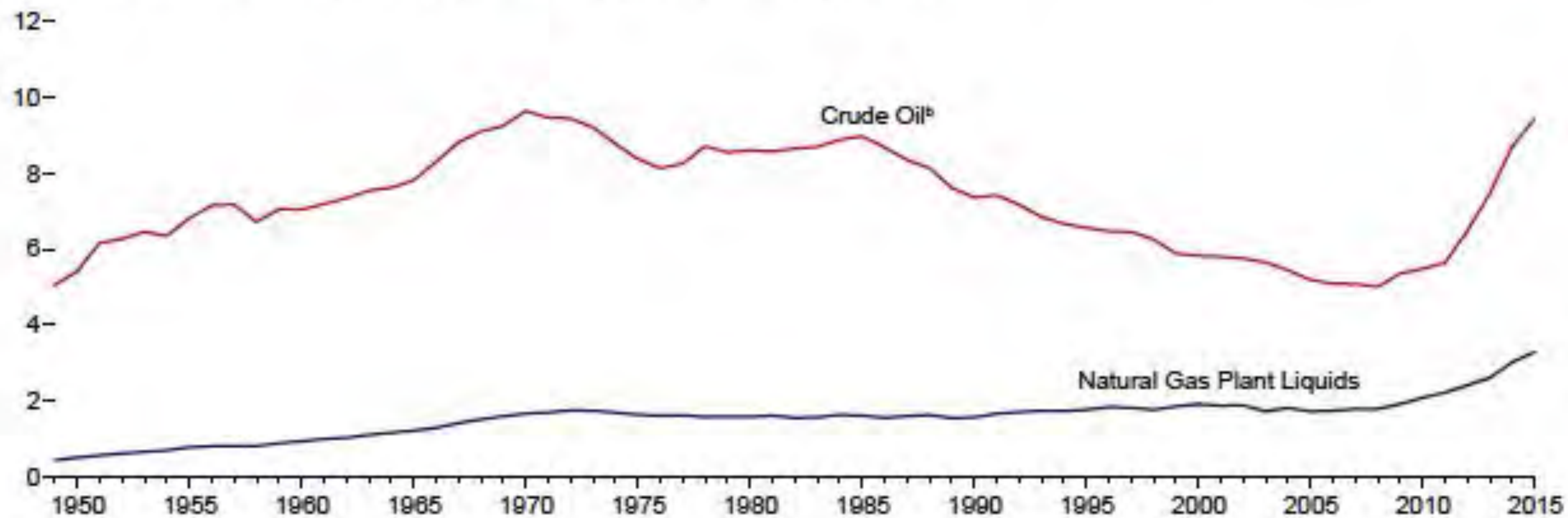
Western N American O & G Fields
& Pipelines

Figure 3.1 Petroleum Overview
(Million Barrels per Day)

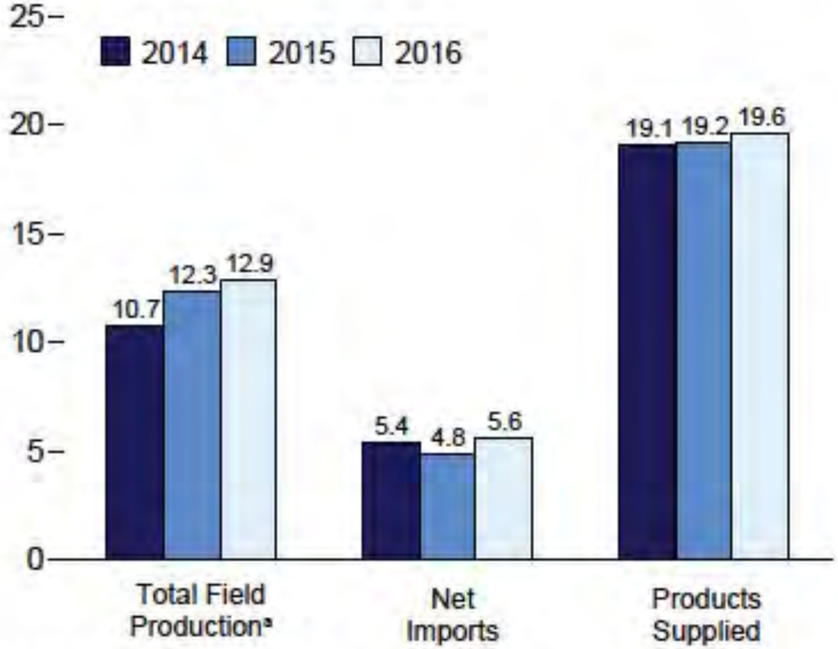
Overview, 1949–2015



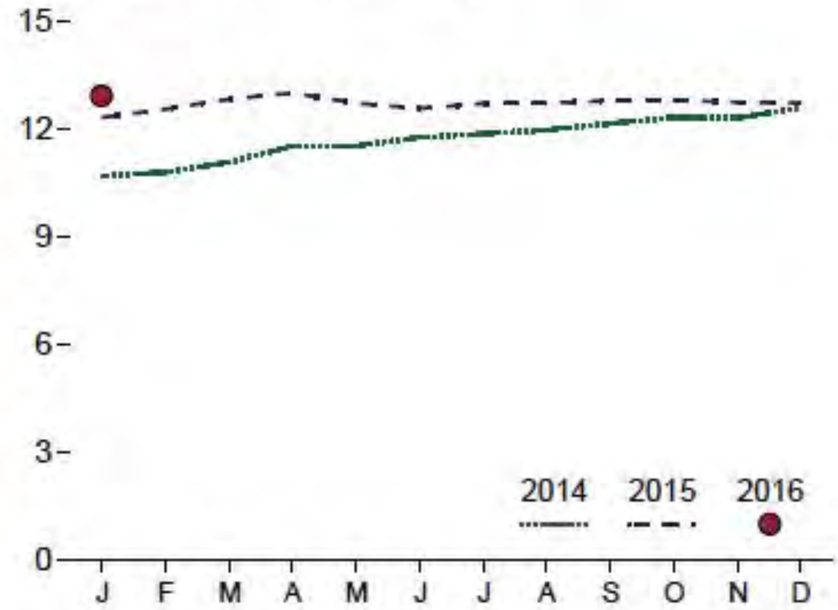
Crude Oil and Natural Gas Plant Liquids Field Production, 1949–2015



Overview, January



Total Field Production,[a] Monthly



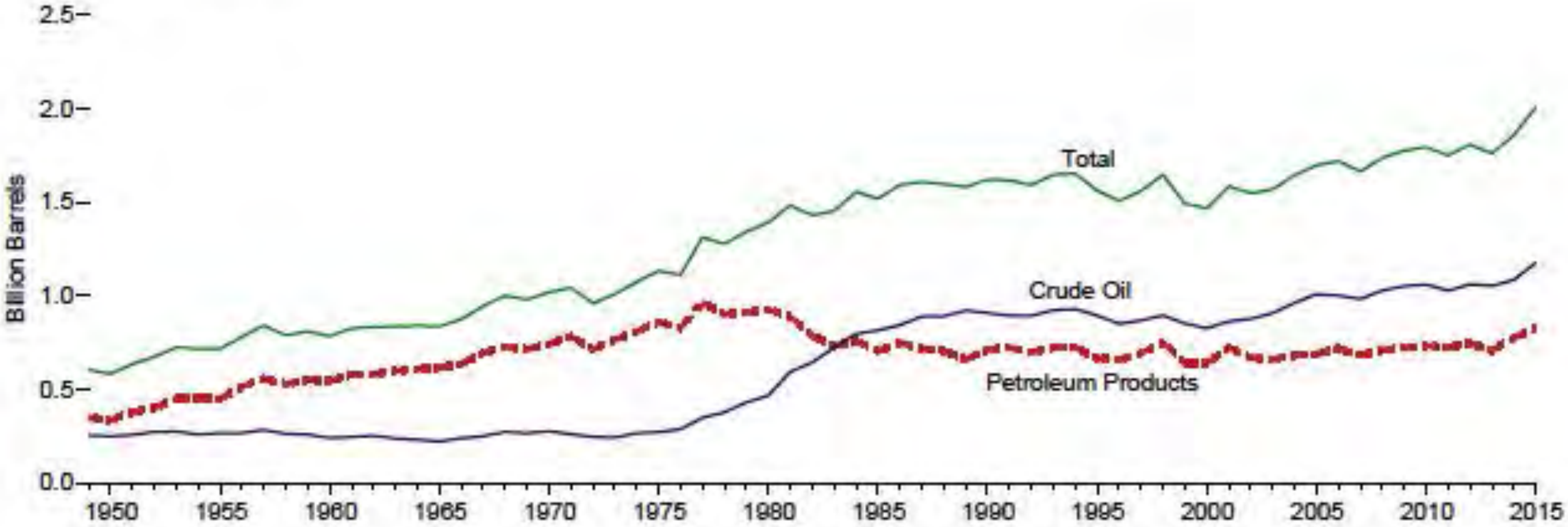
[a] Crude oil, including lease condensate, and natural gas plant liquids field production.

[b] Includes lease condensate.

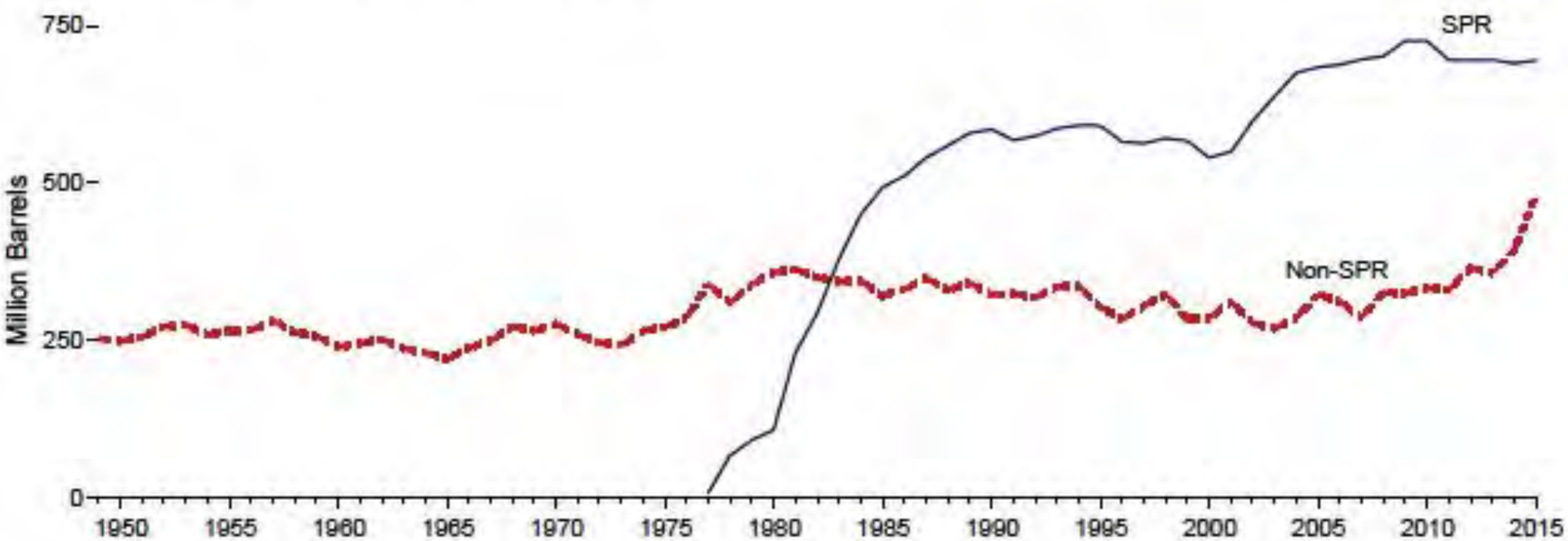
Web Page: http://www.eia.gov/totalenergy/data/monthly/#petroleum.
Source: Table 3.1.

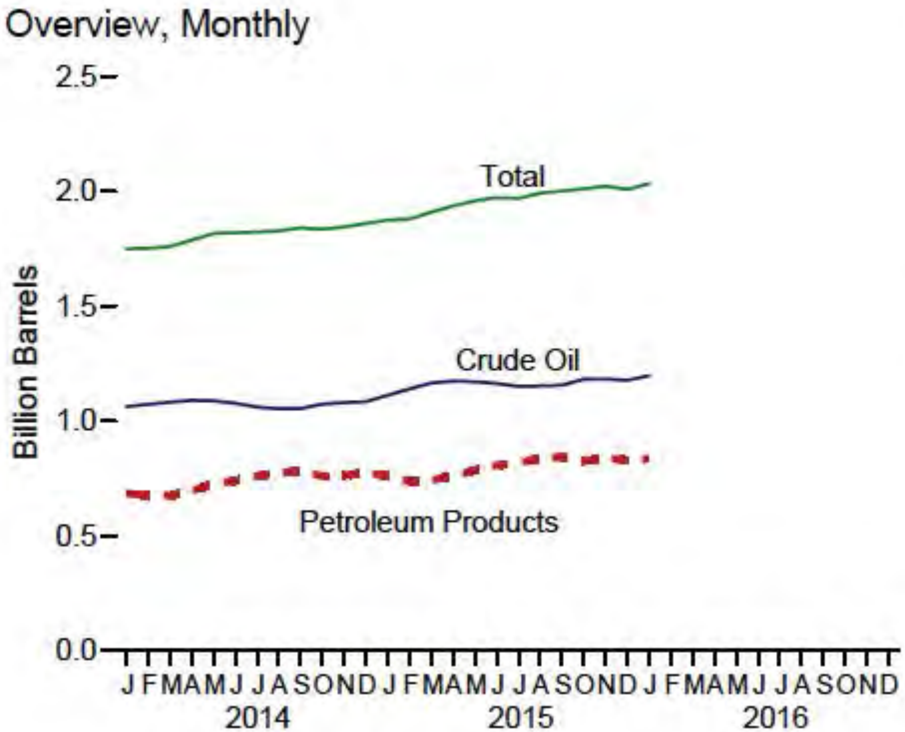
Figure 3.4 Petroleum Stocks

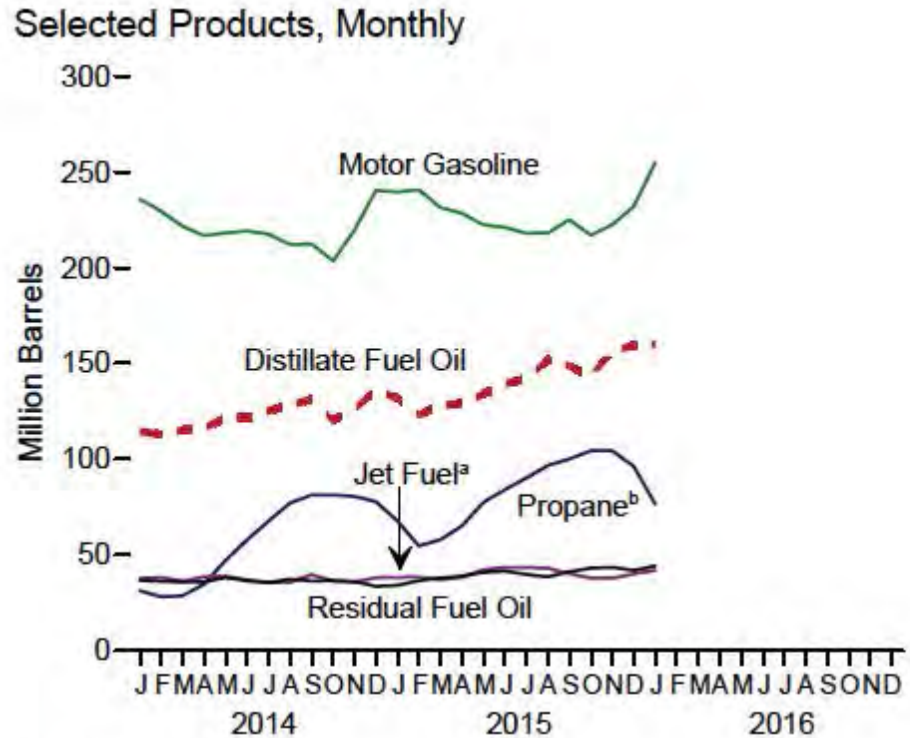
Overview, 1949–2015



SPR and Non-SPR Crude Oil Stocks, 1949–2015

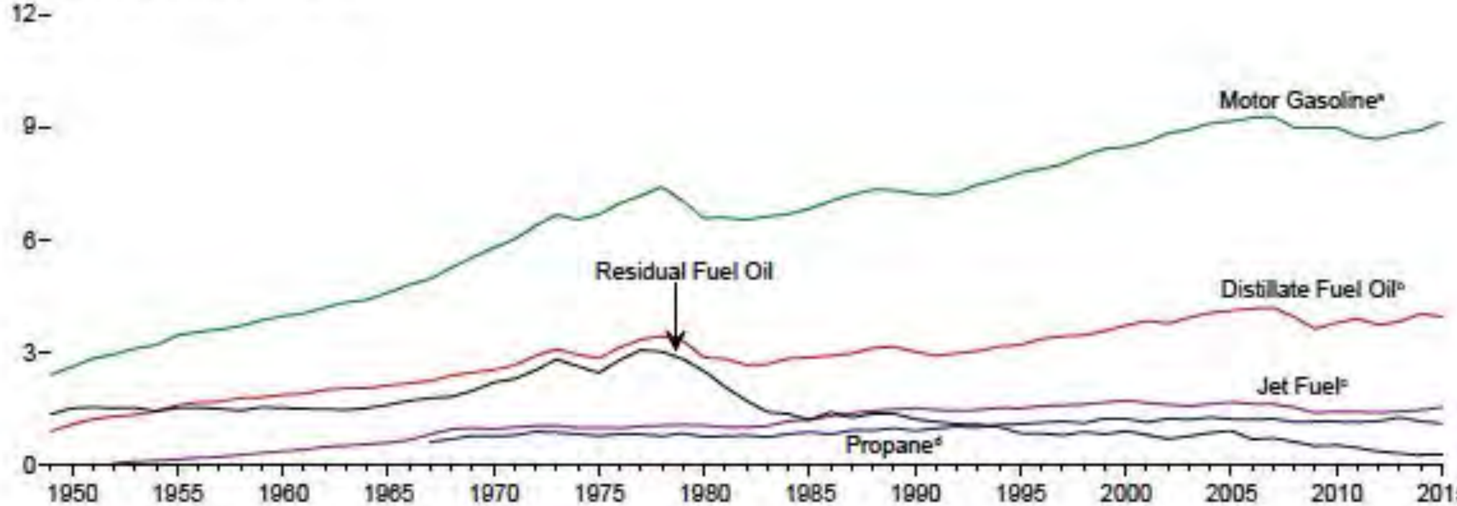




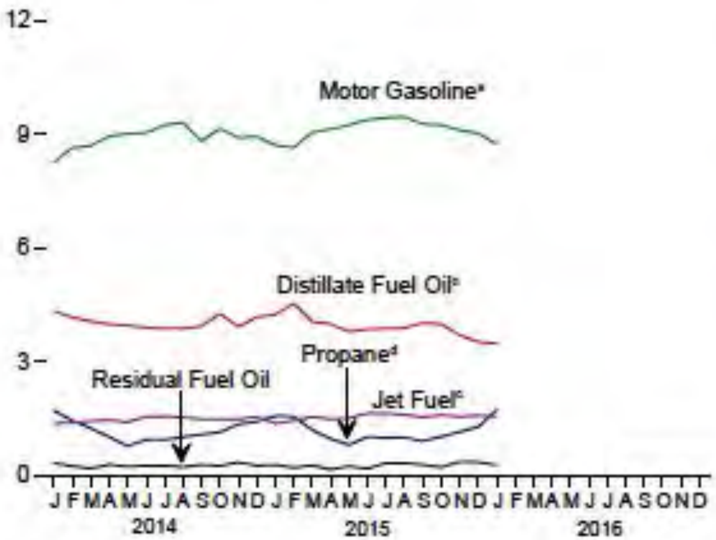


[a] Includes kerosene-type jet fuel only.
[b] Includes propylene.
Notes: • SPR=Strategic Petroleum Reserve. • Stocks are at end of period.
Web Page: http://www.eia.gov/totalenergy/data/monthly/#petroleum.
Source: Table 3.4.

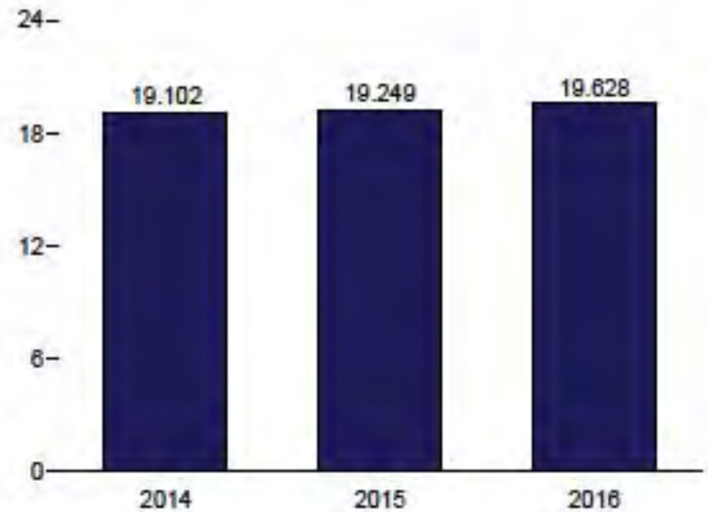
Selected Products, 1949–2015



Selected Products, Monthly



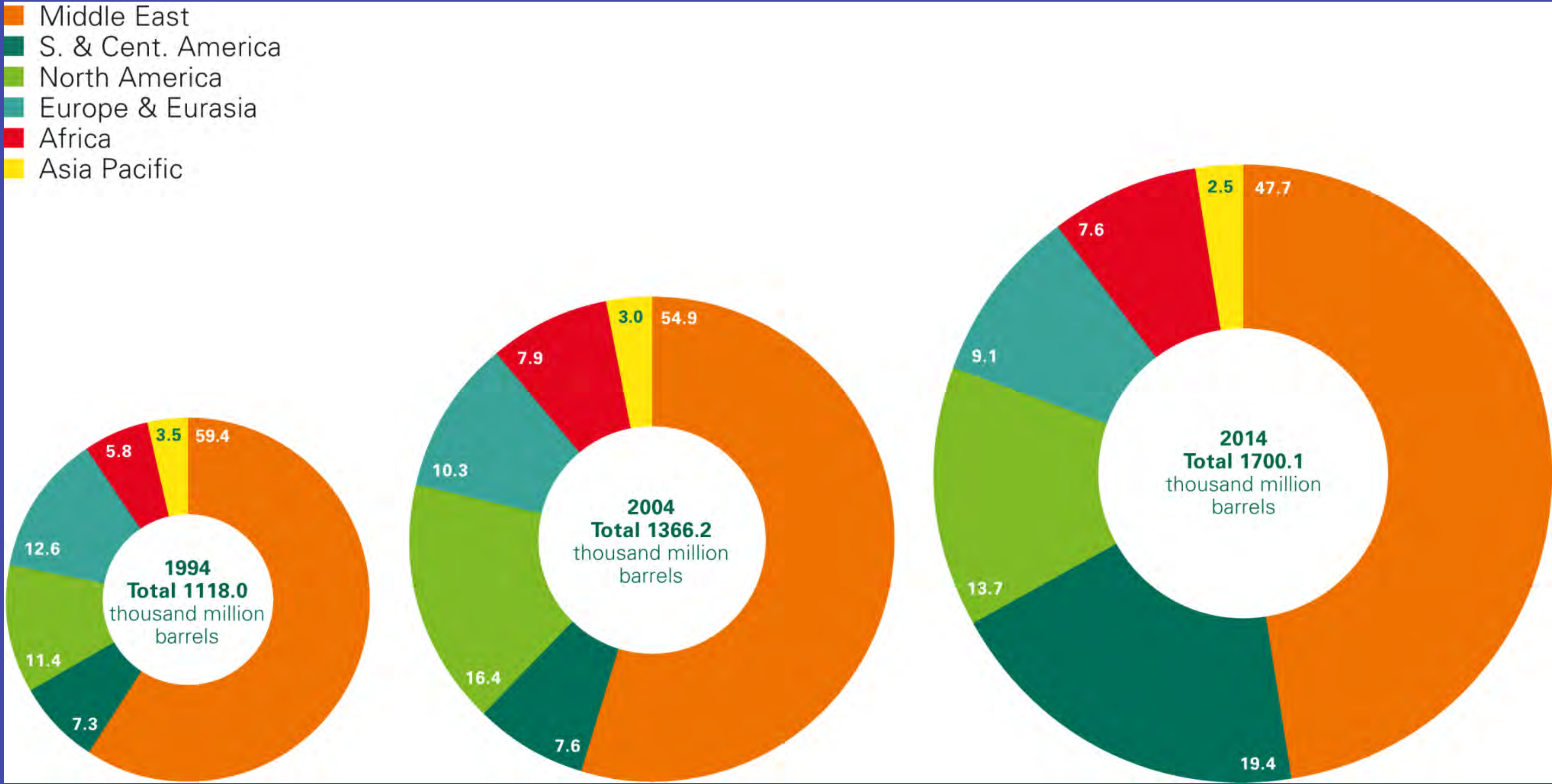
Total, January



[a] Beginning in 1993, includes fuel ethanol blended into motor gasoline.
[b] Beginning in 2009, includes renewable diesel fuel (including biodiesel) blended into distillate fuel oil.
[c] Beginning in 2005, includes kerosene-type jet fuel only.
[d] Includes propylene.
Note: SPR=Strategic Petroleum Reserve.
Web Page: http://www.eia.gov/totalenergy/data/monthly/#petroleum.
Source: Table 3.5.

Distribution of proved oil reserves: 1994, 2004 and 2014

Percentage



BP Statistical Review of World Energy 2015

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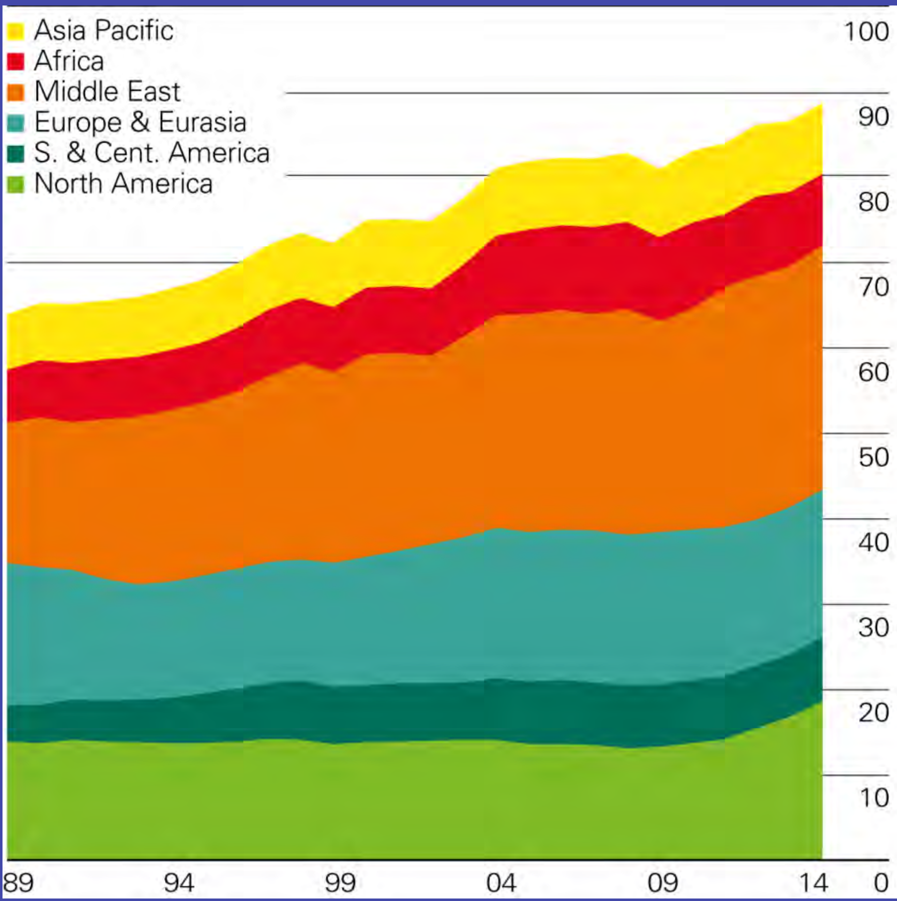
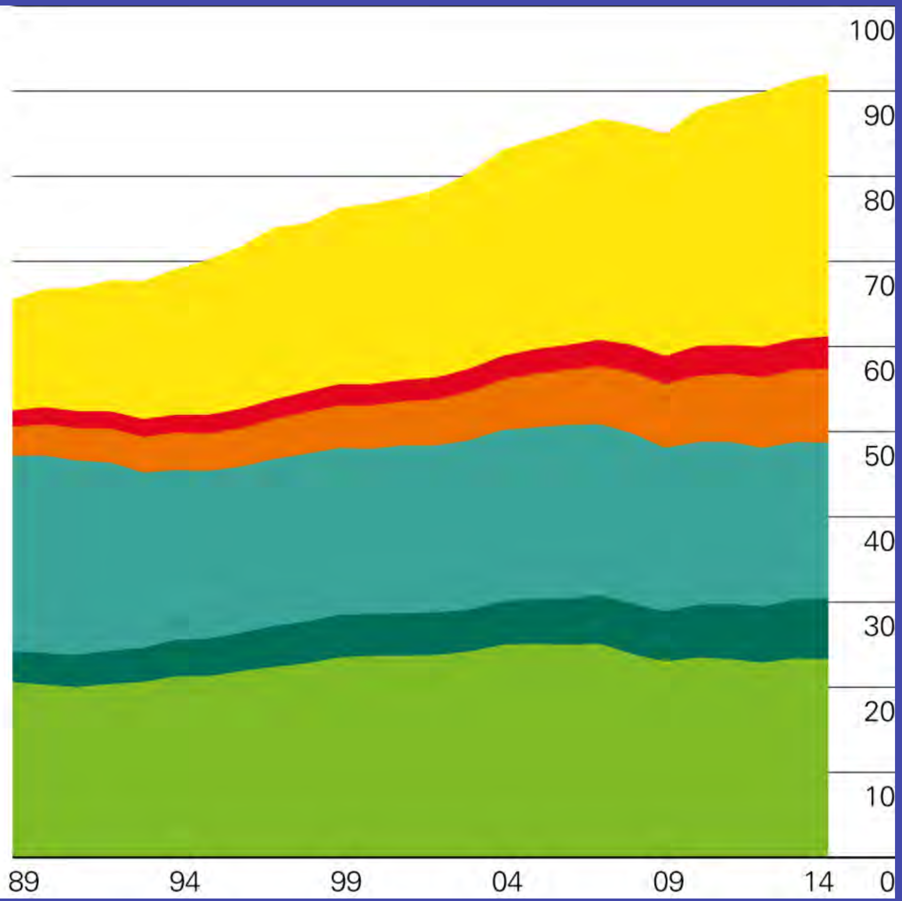
Oil production/consumption by region
Million barrels daily

Production by region



Consumption by region



BP Statistical Review of World Energy 2015
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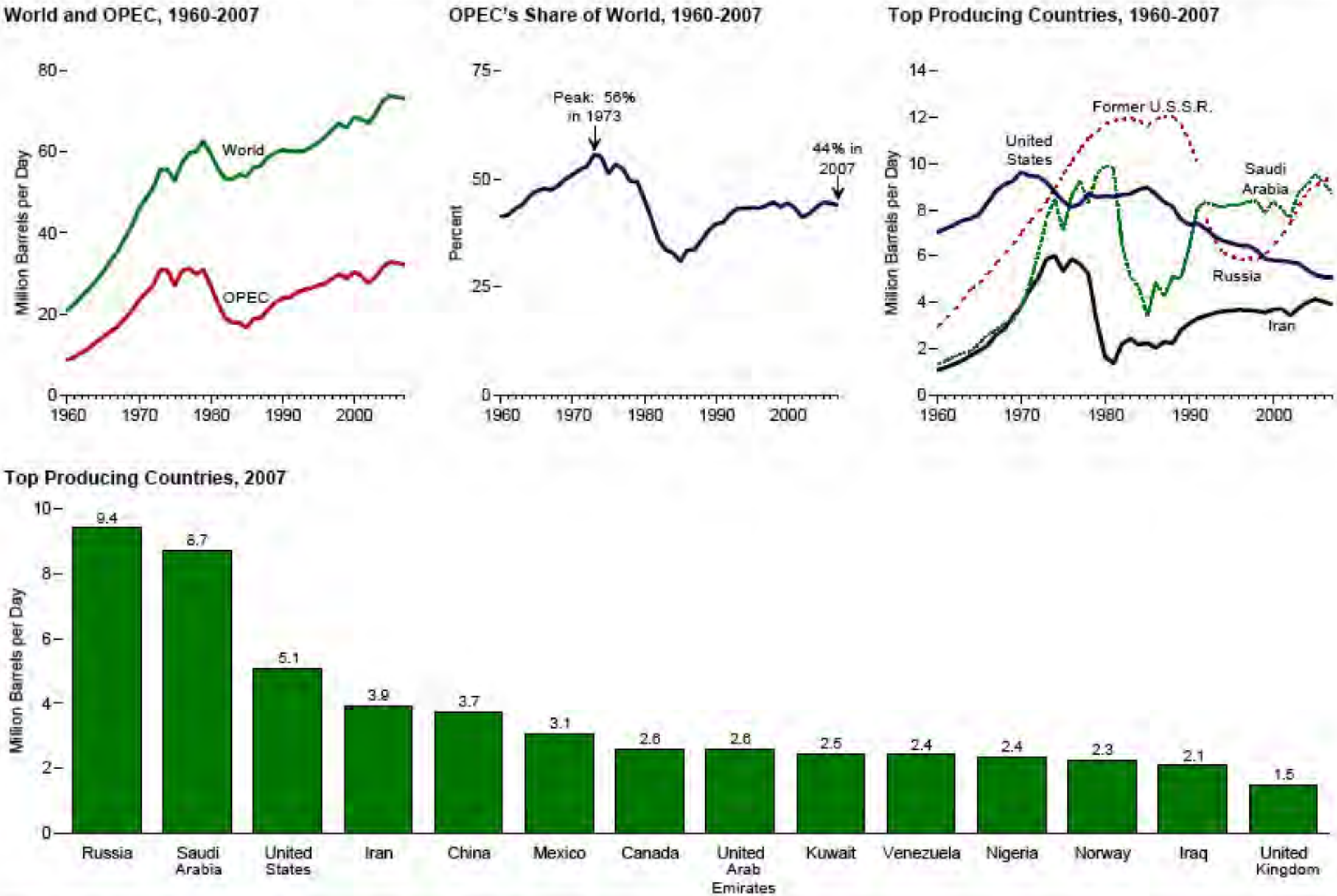
Figure 11.5 World Crude Oil Production

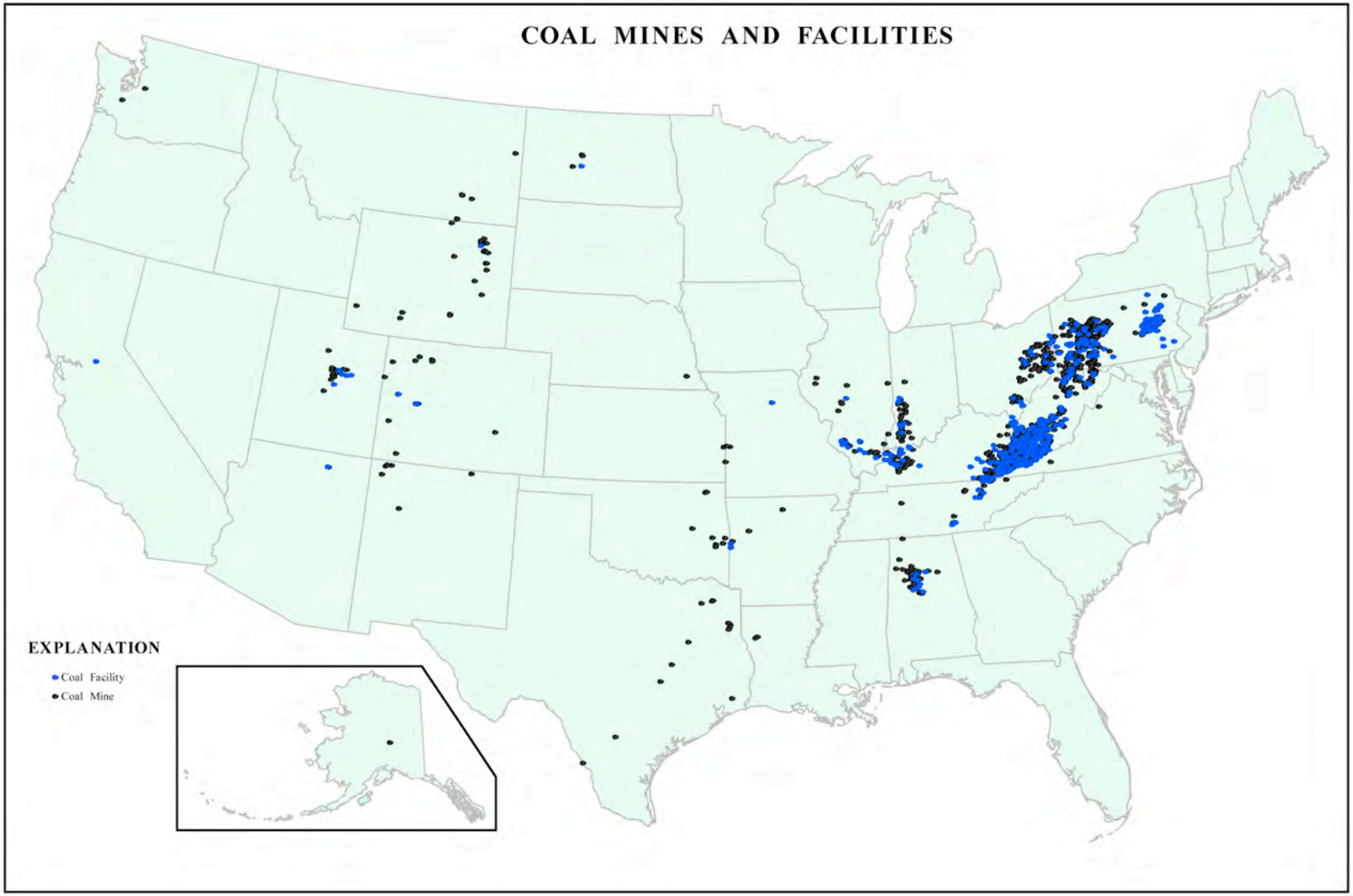


Notes: • OPEC=Organization of the Petroleum Exporting Countries. • Because vertical scales differ, graphs should not be compared.

Source: Table 11.5.

Oil and Gas Industry

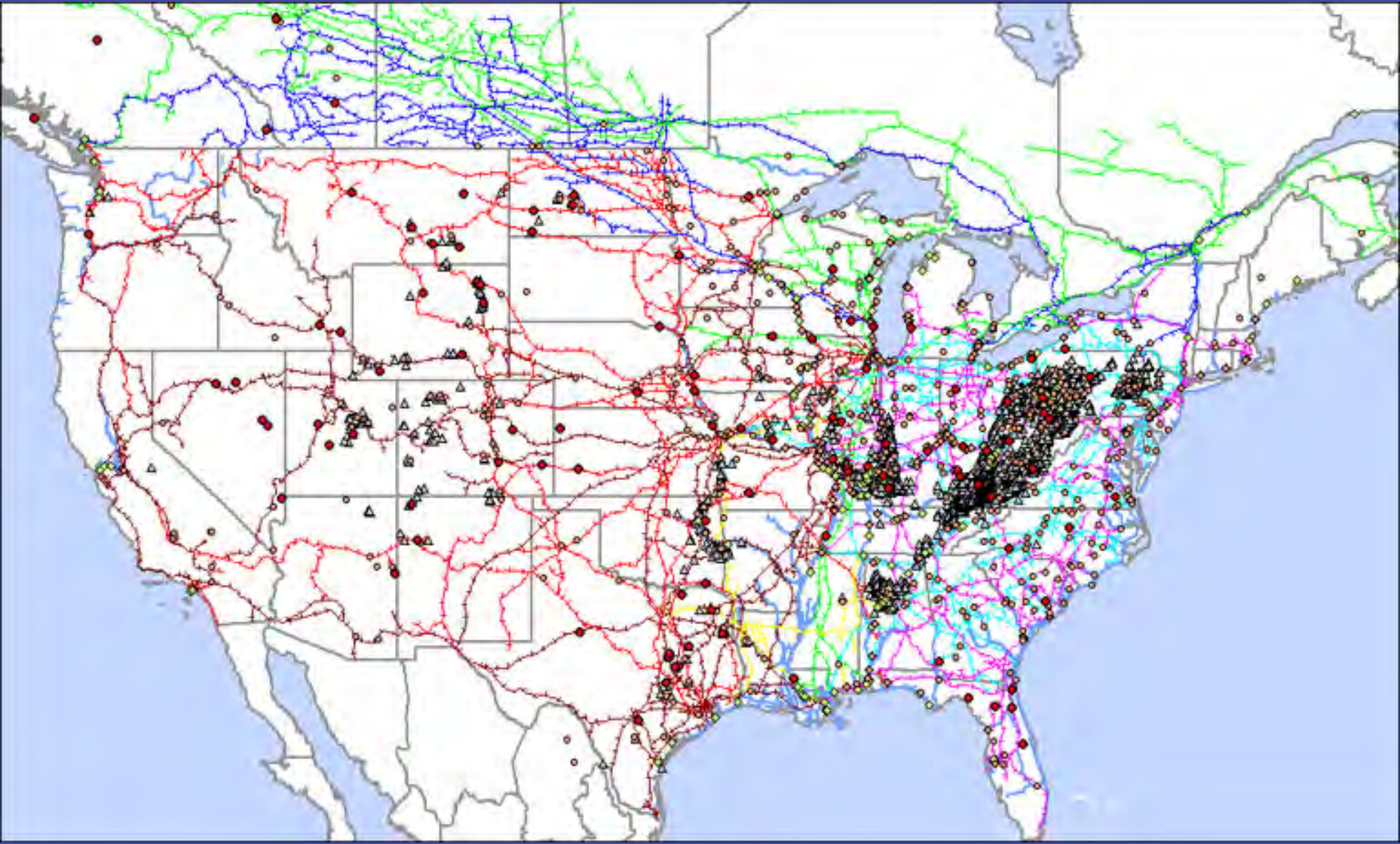
- Fields are primarily on Gulf Coast
- Most refineries near fields
- Some refineries in Northeast
- US production increasing recently
- Imported oil and gas decreasing
- Natural gas price is not linked to oil price


COAL MINES AND FACILITIES
EXPLANATION
Coal Facility
Coal Mine

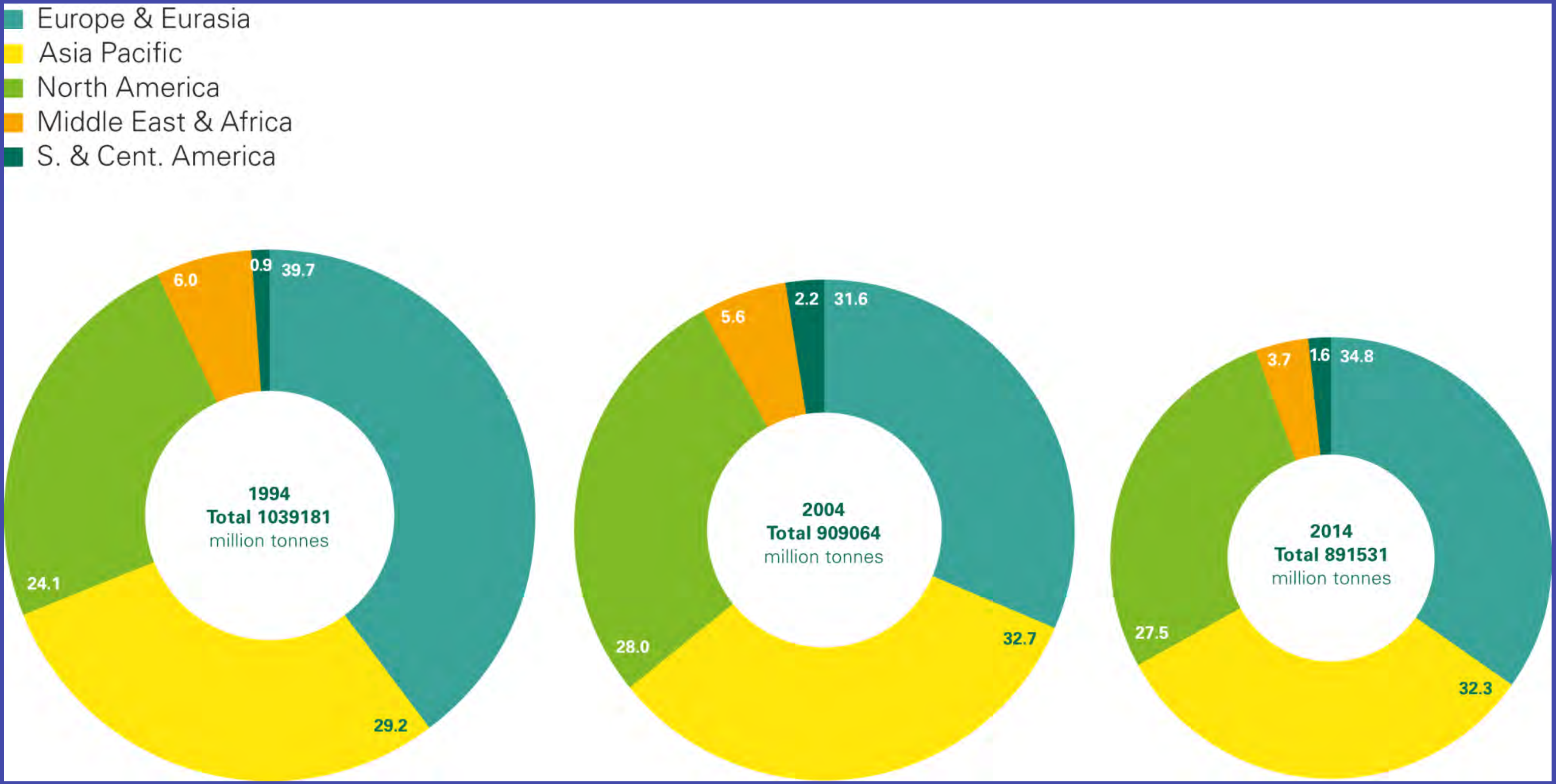
Peabody Coal Mine, Powder River Basin, Wyoming

Coal Train, Crawford Hill Nebraska

Coal Infrastructure Map



Distribution of proved coal reserves: 1994, 2004 and 2014
Percentage



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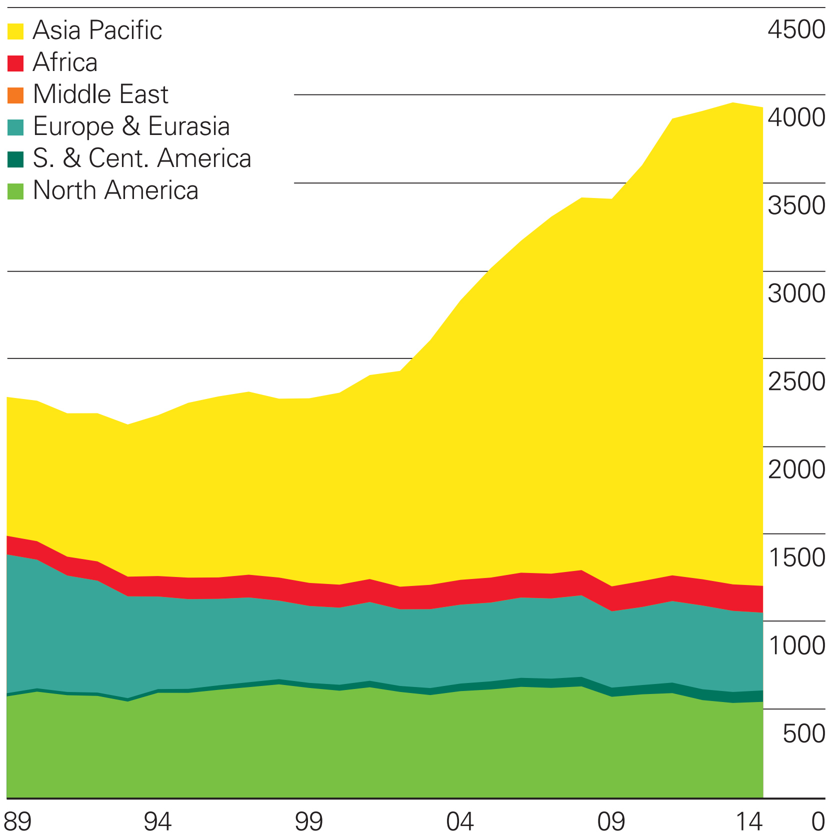
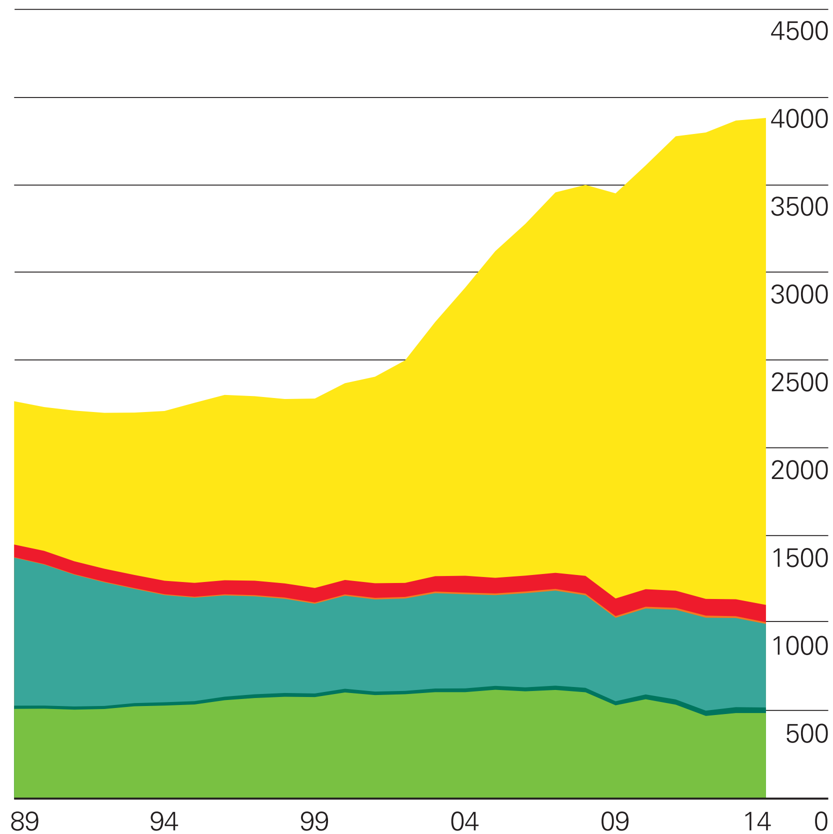
Coal production/consumption by region

Million tonnes oil equivalent

Production by region



Consumption by region



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U.S. Energy Flow, 2014

(Quadrillion Btu)

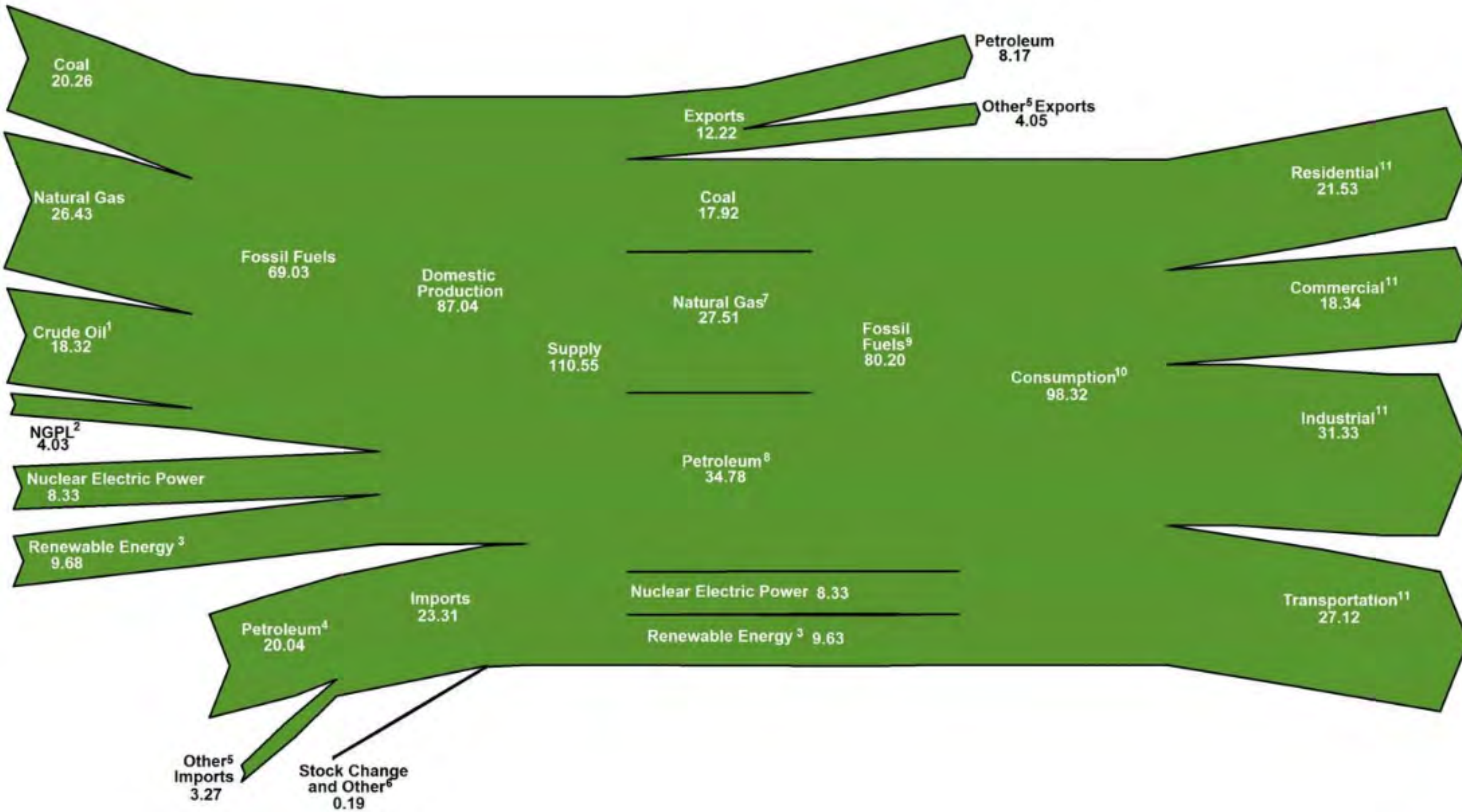
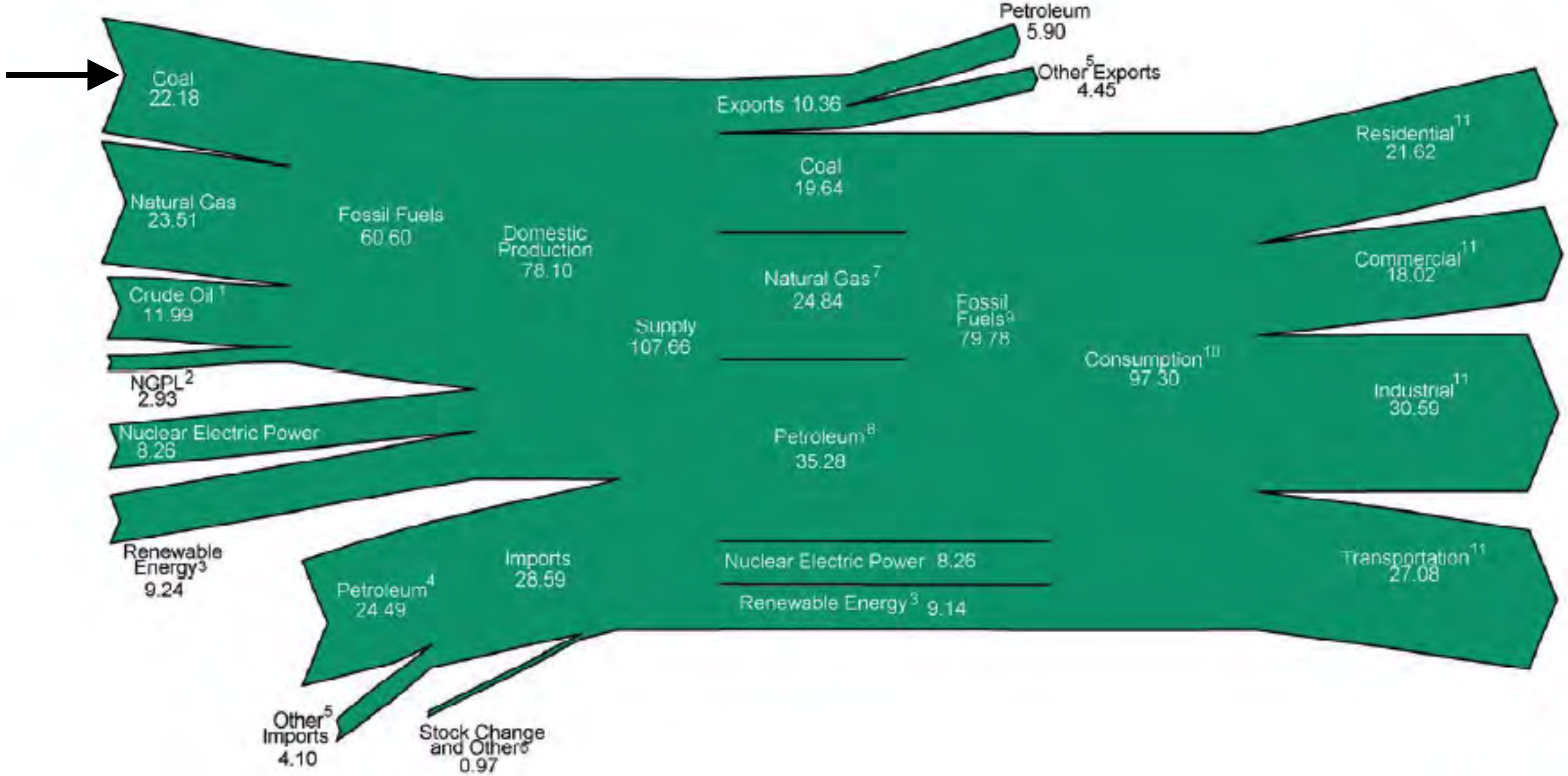
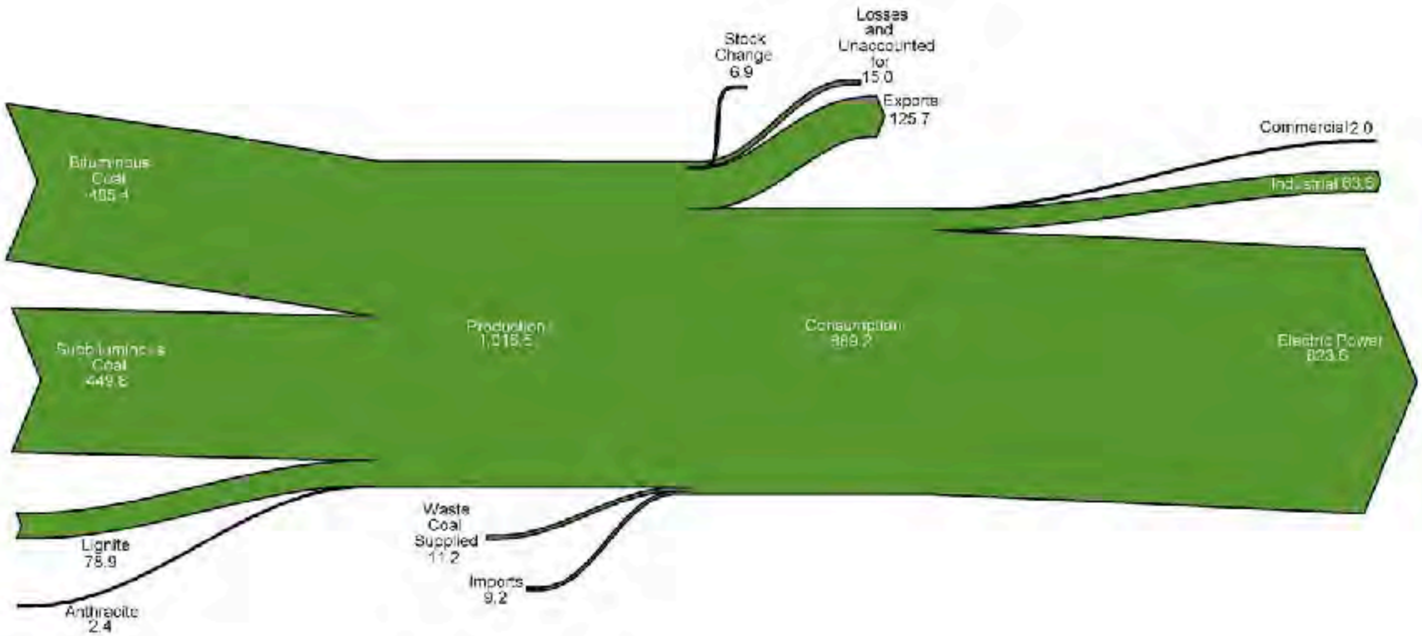


Figure 1.0 Energy Flow, 2011
(Quadrillion Btu)



Coal Flow, 2012
(Million Short Tons)



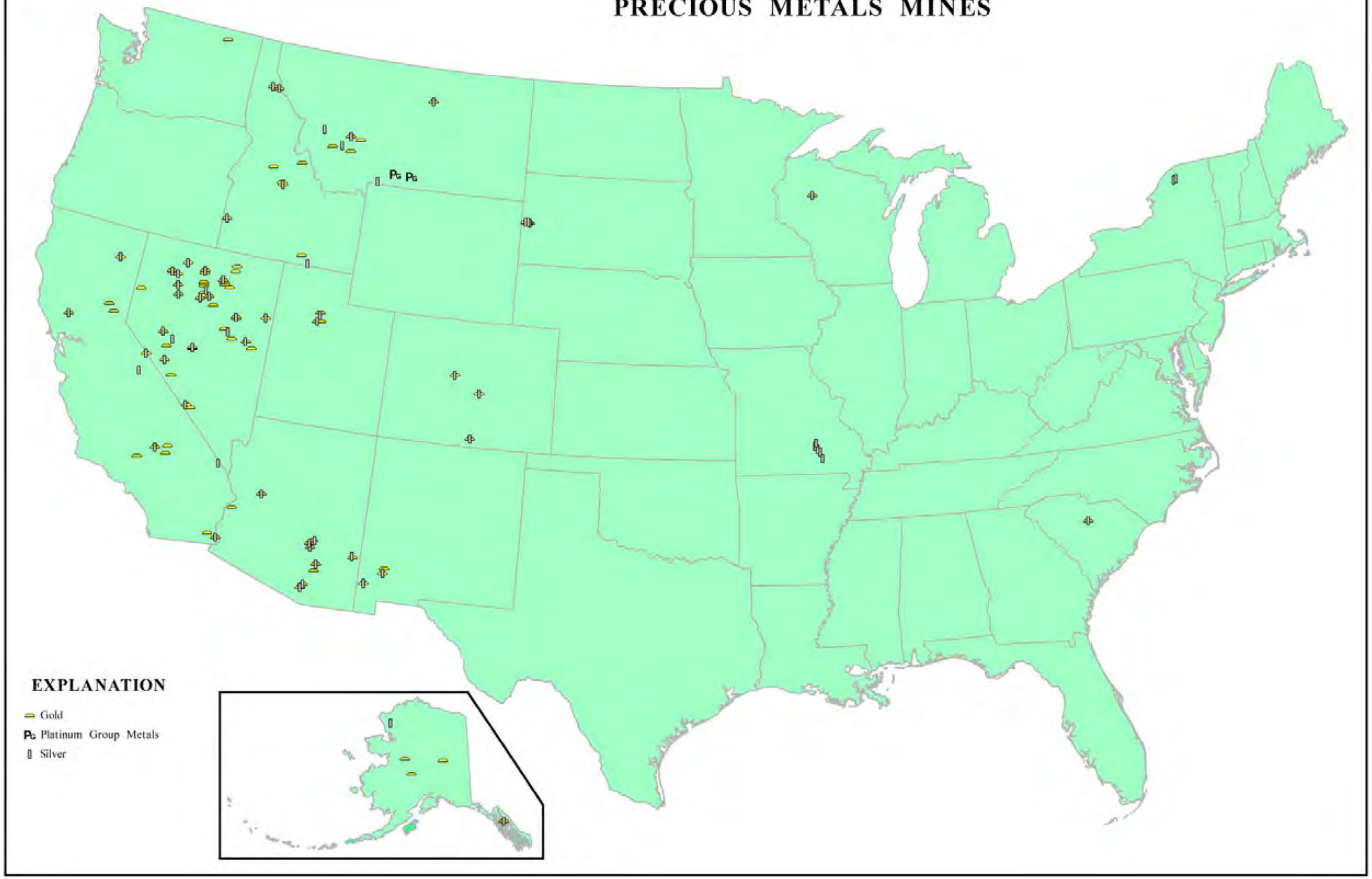
Notes: • Values are derived from source data prior to rounding for publication. • Totals may not equal sum of components due to independent rounding.

Sources: U.S. Energy Information Administration (EIA), *Monthly Energy Review* (January 2014), Tables 6.1 and 6.2; and EIA, *Annual Coal Report 2012*, Table 6.

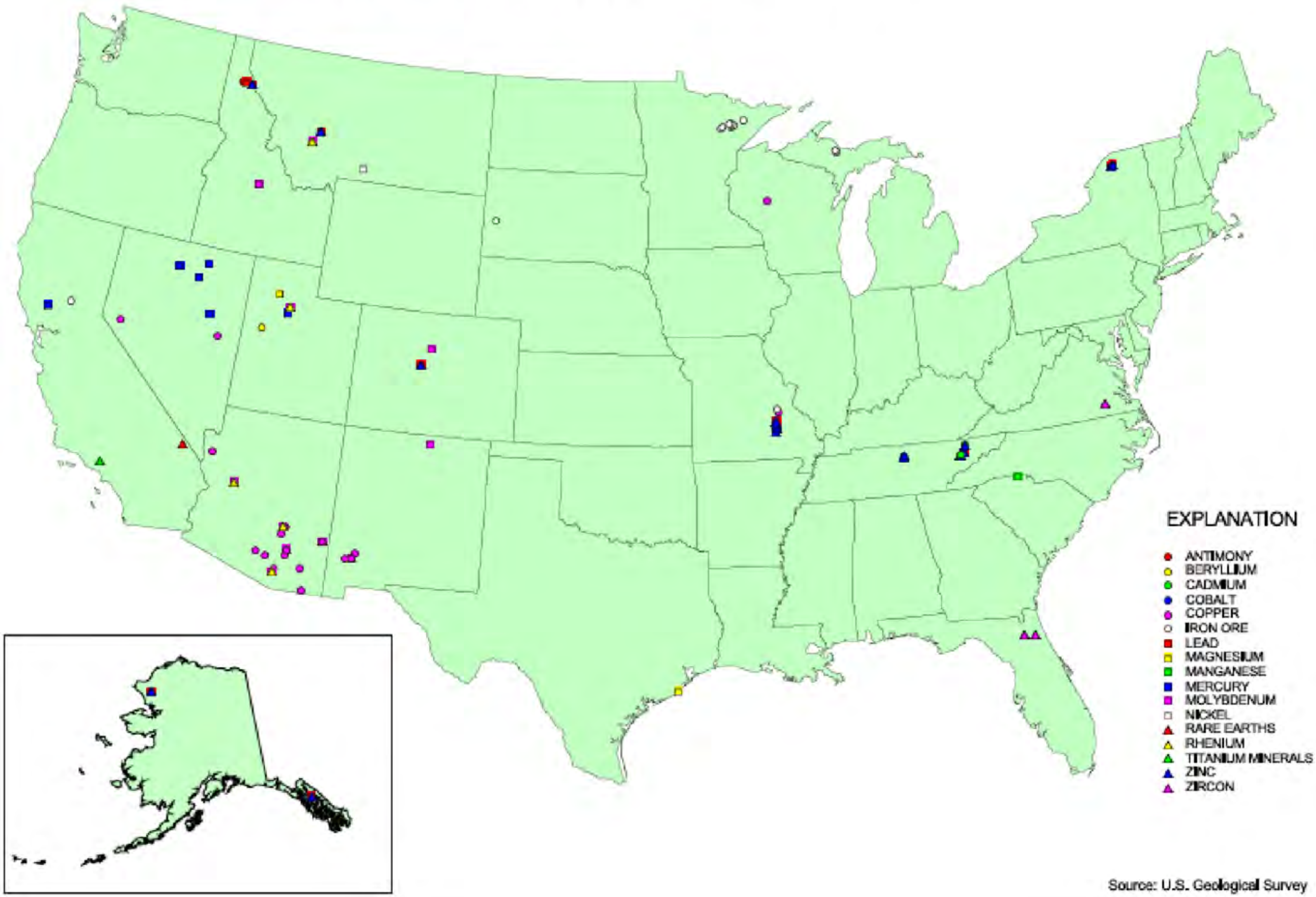
Coal in the US

- US has major coal reserves
- Reserves are unevenly distributed
- Coal transportation is a major problem
- US is major coal producer
- US is major coal consumer
- Asia-Pacific coal use dwarfs the US
- Asia-Pacific growth of coal dwarfs the US
- Implications of increasing natural gas production

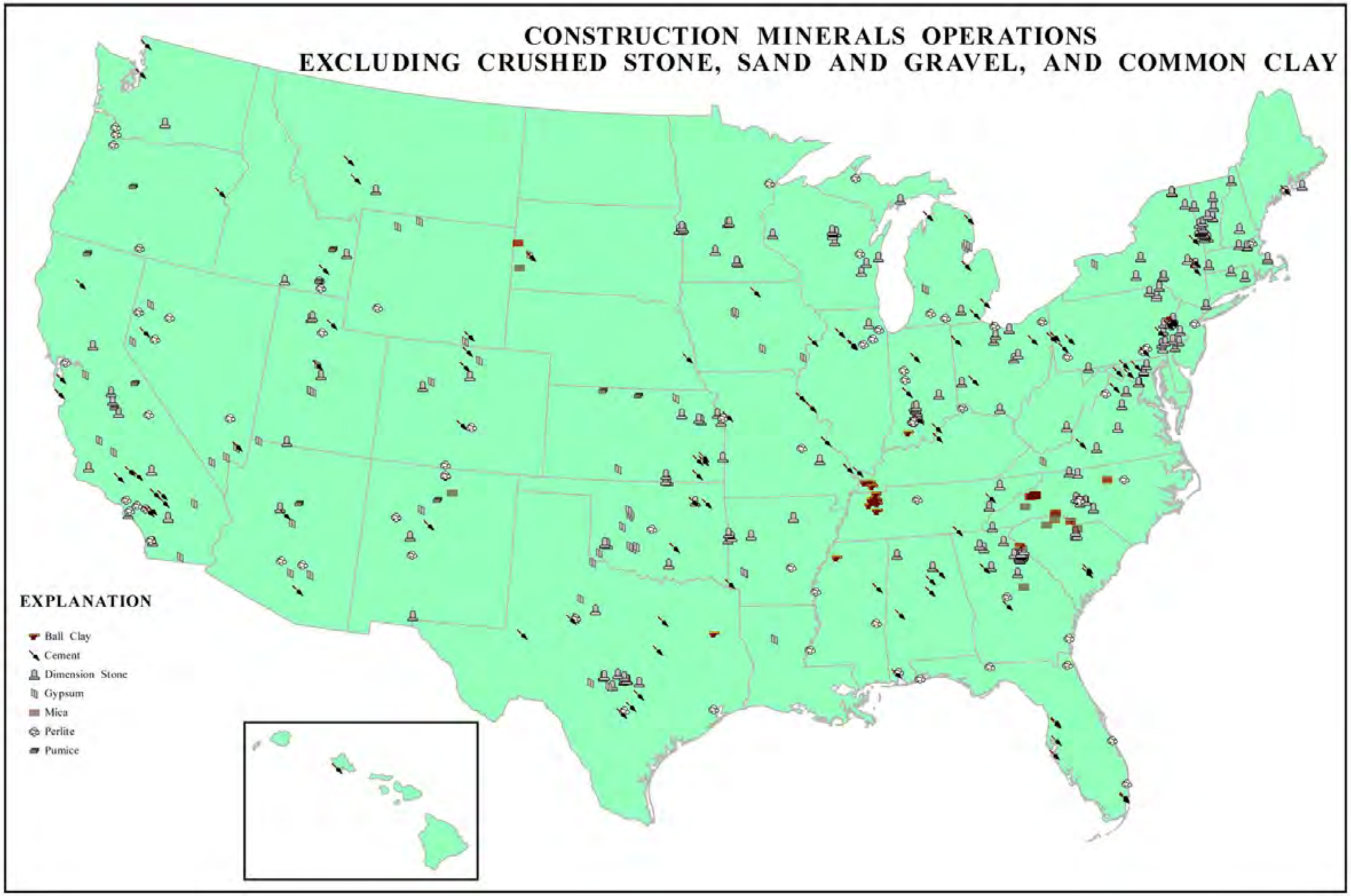
PRECIOUS METALS MINES



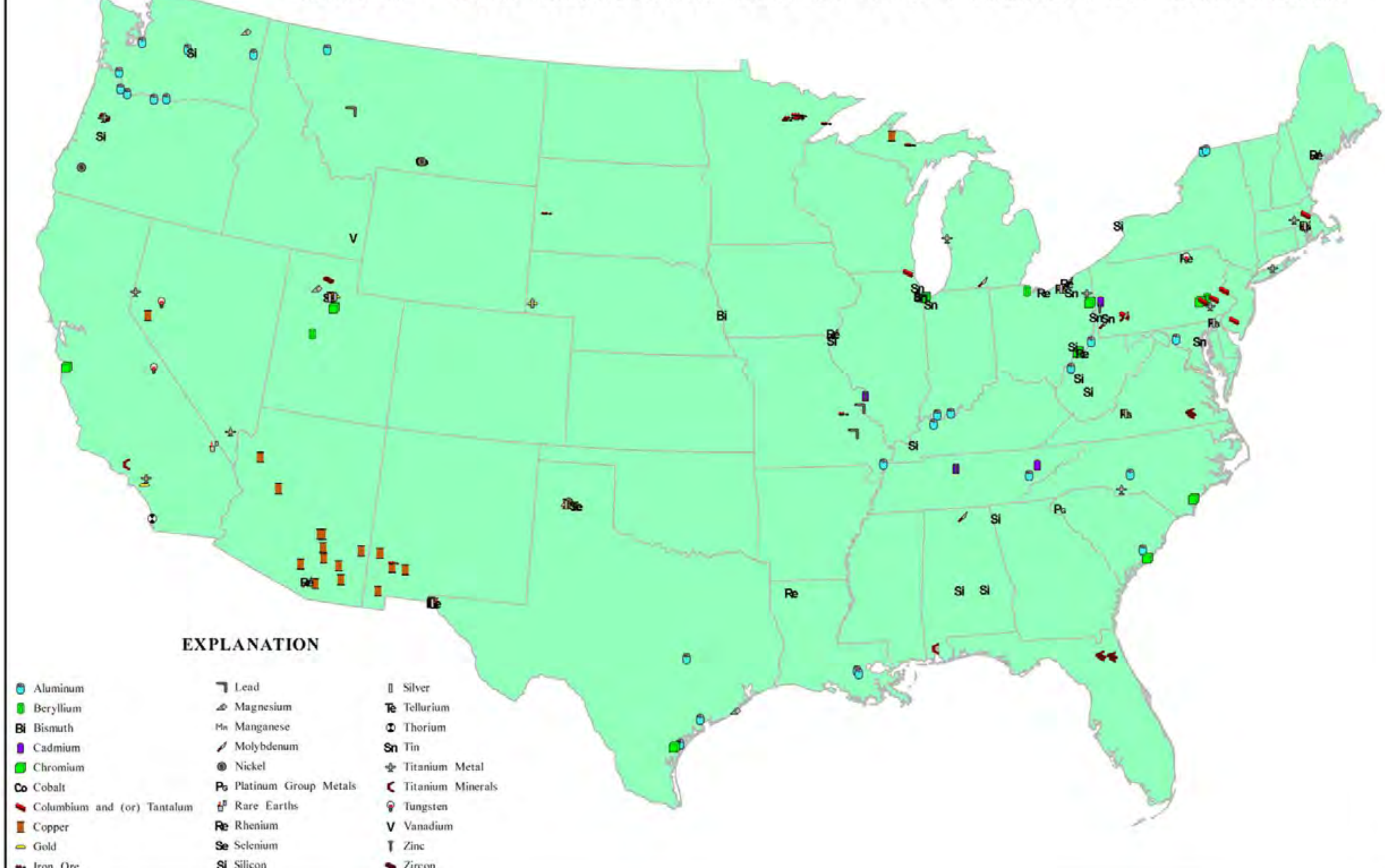
NONPRECIOUS METALS MINES



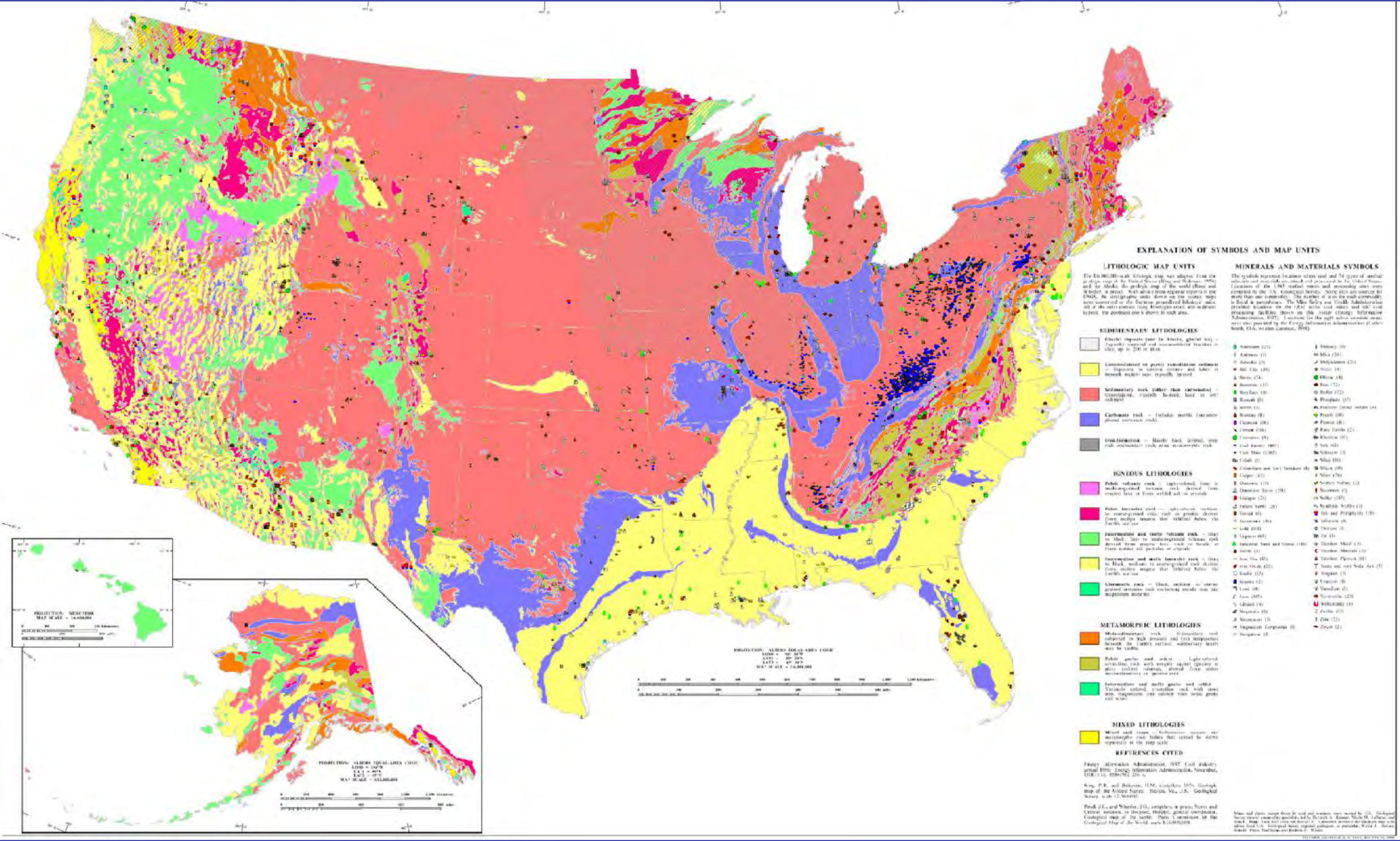
Source: U.S. Geological Survey


CONSTRUCTION MINERALS OPERATIONS
EXCLUDING CRUSHED STONE, SAND AND GRAVEL, AND COMMON CLAY
EXPLANATION
Ball Clay
Cement
Dimension Stone
Gypsum
Mica
Perlite
Pumice

METALS -- ORE PROCESSING PLANTS AND SMELTERS OR REFINERIES



Geological Map of Lower 48 with Mines



Non-Fuel Extractive Industries

- Resources unevenly distributed
- A few states produce most of minerals
- Federal Land is site of most production

Environmental Issues

- NOT IN MY BACKYARD
- Sand-Gravel-Crushed Stone are major industries in most states, unwanted in cities
- Oil & Gas-not wanted in cities: LA, Houston, Oklahoma City, Midland, Ohio, PA, WV
- Coal Mining in PA Anthracite Belt
- Dust associated with many processes
- Hydrogen sulfide with many oil & gas fields
- Acid mine drainage
- Ground & Surface Water impact of shale gas

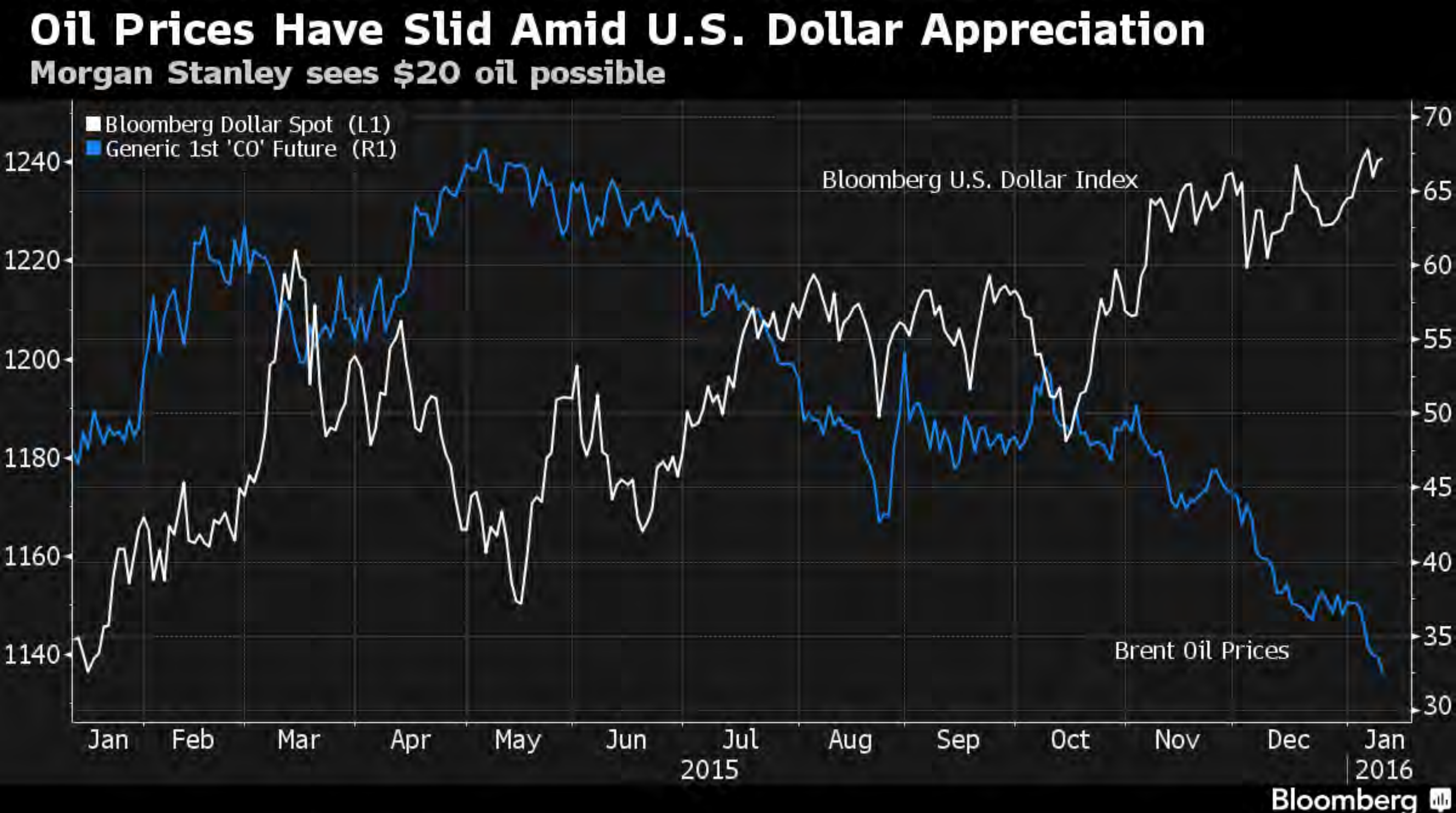
SELECTED NONFUEL MINERAL MATERIALS

Commodity	Percent	Major Sources (1995-98)[1]
ARSENIC TRIOXIDE	100	China, Chile, Mexico
BAUXITE and ALUMINA	100	Australia, Guinea, Jamaica, Brazil
BISMUTH	100	Belgium, Mexico, United Kingdom, China
COLUMBIUM (niobium)	100	Brazil, Canada, Germany, Russia
FLUORSPAR	100	China, South Africa, Mexico
GRAPHITE (natural)	100	Mexico, Canada, China, Madagascar
MANGANESE	100	South Africa, Gabon, Australia, France
MICA, sheet (natural)	100	India, Belgium, Germany, China
STRONTIUM	100	Mexico, Germany
THALLIUM	100	Belgium, Mexico, Germany, United Kingdom
THORIUM	100	France
YTTRIUM	100	China, France, United Kingdom, Japan
GEMSTONES	99	Israel, Belgium, India
ANTIMONY	85	China, Bolivia, Mexico, South Africa
TIN	85	Brazil, Indonesia, Bolivia, China
TUNGSTEN	81	China, Russia, Bolivia, Germany
CHROMIUM	80	South Africa, Russia, Turkey, Zimbabwe
POTASH	80	Canada, Russia, Belarus
TANTALUM	80	Australia, Thailand, China, Germany
STONE (dimension)	77	Italy, India, Canada, Spain
TITANIUM CONCENTRATES	77	South Africa, Australia, Canada, India
COBALT	73	Norway, Finland, Canada, Zambia
RARE EARTHS	72	China, France, Japan, United Kingdom
IODINE	68	Chile, Japan, Russia
BARITE	67	China, India, Mexico, Morocco
NICKEL	63	Canada, Russia, Norway, Australia
PEAT	57	Canada
TITANIUM (sponge)	44	Russia, Japan, Kazakhstan, China
DIAMOND (dust, grit and powder)	41	Ireland, China, Russia
MAGNESIUM COMPOUNDS	40	China, Canada, Austria, Greece
PUMICE	35	Greece, Turkey, Ecuador, Italy
ALUMINUM	30	Canada, Russia, Venezuela, Mexico
SILICON	30	Norway, Russia, Brazil, Canada
ZINC	30	Canada, Mexico, Peru
GYPSUM	29	Canada, Mexico, Spain
MAGNESIUM METAL	29	Canada, Russia, China, Israel
COPPER	27	Canada, Chile, Mexico
NITROGEN (fixed), AMMONIA	26	Trinidad and Tobago, Canada, Mexico, Venezuela
CEMENT	23	Canada, Spain, Venezuela, Greece
MICA, scrap and flake (natural)	23	Canada, India, Finland, Japan
IRON and STEEL	22	European Union, Canada, Japan, Russia
LEAD	20	Canada, Mexico, Peru, Australia
CADMIUM	19	Canada, Belgium, Germany, Australia
IRON ORE	17	Canada, Brazil, Venezuela, Australia
SULFUR	17	Canada, Mexico, Venezuela
SALT	16	Canada, Chile, Mexico, The Bahamas
SILVER	14	Mexico, Canada, Peru, Chile
PERLITE	13	Greece
ASBESTOS	7	Canada
PHOSPHATE ROCK	7	Morocco
TALC	6	China, Canada, Japan
IRON and STEEL SCRAP	3	Canada, United Kingdom, Venezuela, Mexico
BERYLLIUM	2	Kazakhstan, Russia, Canada, Germany

[1] In descending order of import share.

Additional mineral commodities for which there is some import dependency include:

Gallium	France, Russia, Canada, Kazakhstan
Germanium	Russia, Belgium, China, United Kingdom
Indium	Canada, China, Russia, France
Mercury	Russia, Canada, Kyrgyzstan, Spain
Platinum	South Africa, United Kingdom, Russia, Germany
Rhenium	Chile, Germany, Kazakhstan, Russia
Selenium	Canada, Philippines, Belgium, Japan
Vanadium	South Africa, China
Vermiculite	South Africa, China
Zirconium	South Africa, Australia


Oil Prices Have Slid Amid U.S. Dollar Appreciation
Morgan Stanley sees $20 oil possible
Bloomberg Dollar Spot (L1)
Generic 1st 'CO' Future (R1)
Bloomberg U.S. Dollar Index
Brent Oil Prices
1240
1220
1200
1180
1160
1140
70
65
60
55
50
45
40
35
30
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Jan
2015
2016
Bloomberg

Fuel and Metals Trade

- Fuels are a leading cause of balance of payments problems for US
- Increasing value of dollar possibly linked to decreasing cost of oil

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