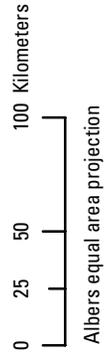
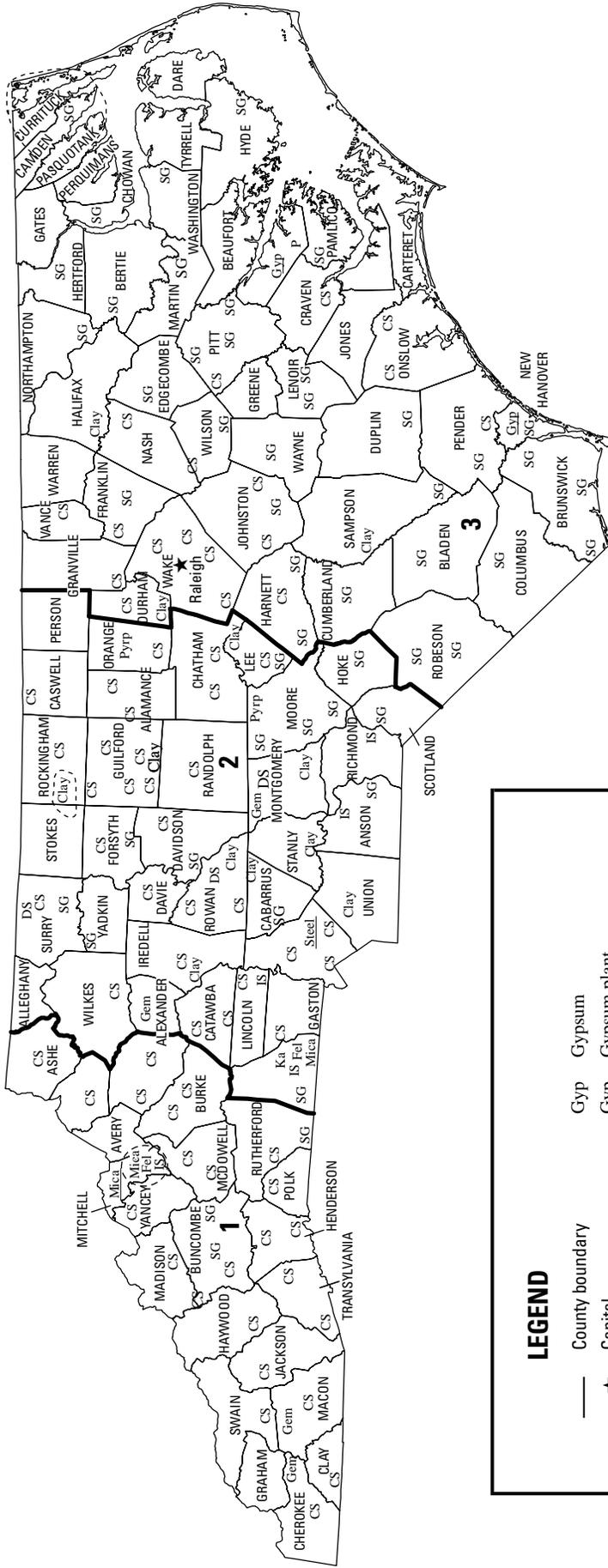




2006 Minerals Yearbook

NORTH CAROLINA

NORTH CAROLINA



LEGEND

- County boundary
- ★ Capital
- City
- 1— Crushed stone and sand and gravel boundary

MINERAL SYMBOLS
(Major producing areas)

Clay	CS	Common clay	Gyp	Gypsum
Crushed stone	CS	Crushed stone	Gyp	Gypsum plant
Dimension stone	DS	Dimension stone	IS	Industrial sand
Feldspar	Fel	Feldspar	Ka	Kaolin
Gemstones	Gem	Gemstones	Mica	Mica
			Mica	Mica plant
			P	Phosphate rock
			Pyrrp	Pyrophyllite
			SG	Construction sand and gravel
			Steel	Steel plant
			○	Concentration of mineral operations

Source: North Carolina Geological Survey/U.S. Geological Survey (2006).

THE MINERAL INDUSTRY OF NORTH CAROLINA

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the North Carolina Geological Survey for collecting information on all nonfuel minerals.

In 2006, North Carolina's nonfuel raw mineral production¹ was valued at \$1.02 billion,² based upon annual U.S. Geological Survey (USGS) data. This was a \$158 million, or more than 18%, increase from the State's total nonfuel mineral value of \$862 million in 2005, which was up \$57 million, or 7%, from that of 2004. North Carolina rose to 22d² from 25th in rank among the 50 States in total nonfuel mineral production value and accounted for more than 1.5% of the U.S. total.

Crushed stone remained North Carolina's leading nonfuel raw mineral in 2006, accounting for nearly 84% of the State's total value of nonfuel mineral production (in particular, excluding that of phosphate rock²). It was followed (in descending order of value) by phosphate rock, construction sand and gravel, industrial sand and gravel, common clays, feldspar, dimension stone, and mica (crude). The largest increases in value for the year were in crushed stone, up \$144 million, and in common clays, up more than \$10 million. The increase in crushed stone value was the largest and most obvious increase supporting the State's increase in nonfuel mineral value, but the increase in the unit value of common clays was also very significant. While the unit value of crushed stone was up slightly more than 14%, that of common clays was up a substantial 62%. Smaller yet significant increases in value also took place in the values of construction sand and gravel, (up by about \$6 million), crude mica (up by more than \$2 million), and phosphate rock (withheld—company proprietary data). The mineral commodity with the largest decrease in value (down by \$4.5 million) was industrial sand and gravel; although production was up about 6%, its value of production was down by about 15% (table 1).

In 2005, North Carolina continued to be the only State that produced pyrophyllite; to lead the Nation in the quantities of feldspar and mica produced; to be 2d of four phosphate rock-producing States; and to be 10th in industrial sand and gravel production. North Carolina increased in State production ranking in several mineral commodities. The State rose to 2d from 3d in the production of common clays, to 6th from 9th in crushed stone, to 7th from 10th in dimension stone, and to 10th from 11th in gemstones (gemstones based upon value). Additionally, significant quantities of construction sand and

gravel were produced in North Carolina. Metal production in the State, especially that of raw steel, resulted from the processing of recycled materials or raw materials received from other domestic and foreign sources.

The following narrative information was provided by the North Carolina Geological Survey³ (NCGS).

Commodity Review

Industrial Minerals

Sand and Gravel, Industrial.—Split-spoon samples of six drill cores obtained from the Pinehurst Formation, Richmond County, NC, were evaluated for glass sand raw material potential. Laboratory analyses results of the samples, recovered at a depth of 18 meters from within 1,130 hectares (ha) of the Pinehurst Formation, were documented in NCGS Circular 33, "Suitability of Pinehurst Formation as a glass sand, Richmond County, North Carolina." Commercial glass sand had been produced previously from a nearby site at the Pinehurst Formation. After attrition scrubbing, sizing, and magnetic separation treatments, this glass sand product had been shown to contain 0.13% to 0.16 % aluminum oxide, 0.02% to 0.04% iron oxide, < 0.01% to 0.02% titanium oxide, and traces of other minor impurities. With this level of impurities, it was considered to be well within the specifications for typical glass sand and suitable for many glass sand applications. Studies to further reduce the impurity levels in the Pinehurst Formation sand were planned that included the use of flotation as an additional separation process.

Environmental Issues

Landslide mapping was completed for Macon County during the year. The prepared maps illustrating high-risk, geologic-hazard area locations were presented to county officials. Further mapping was initiated in the western North Carolina counties of Buncombe and Watauga during the year. The NCGS landslide mapping program also responded to numerous requests from local government officials for assistance in evaluating potentially dangerous slope stability situations. Presentations by members of the program were delivered to public interest groups, the local government, and developers in order to further educate interested parties as to the existence of geologic-hazard areas.

Geologic hazard-related studies also were undertaken at Cape Hatteras National Seashore in cooperation with the North Carolina Division of Emergency Management to identify areas vulnerable to overwash from coastal storms. A geological map,

¹The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2006 USGS mineral production data published in this chapter are those available as of March 2008. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—can be retrieved over the Internet at URL <http://minerals.usgs.gov/minerals>.

²The State's actual total nonfuel mineral values for 2005-06 were substantially higher than those reported in table 1, from which specific production values for phosphate rock, pyrophyllite (crude), and stone [crushed quartzite (2005)] were withheld so as to conceal company proprietary data. If these data were included in the State's total value, North Carolina would rank 21st among the 50 States in total nonfuel mineral production value.

³Jeffrey C. Reid, Senior Geologist, minerals and Geographic Information Systems, authored the text for the State mineral industry information provided by the North Carolina Geological Survey.

including geologic hazards, was completed for the southern segment of the Blue Ridge Parkway and Carl Sandberg home in a GIS format for the National Park Service.

Legislation and Government Programs

Outreach

The Aurora Fossil Museum opened a new learning center near its main museum location, thereby expanding its exhibit area. The learning center contains a small lending library and a collection of fossils, minerals, and rocks. Additional information about the museum can be obtained at <http://www.aurorafossilmuseum.com>. The 13th Annual Fossil Festival was held in Aurora in May.

The National Association of Geoscience Teachers, the NCGS, and the North Carolina Mining Commission, cosponsors of the Outstanding Earth Science Teacher (OEST) Award, presented a Middle Creek High School teacher with the 2006 award. The OEST Award was presented at the North Carolina State Science Teachers' Association meeting in Greensboro, where about 1,500 teachers received rock and mineral specimens and other earth science classroom teaching resources.

The NCGS hosted the 42d Forum on the Geology of Industrial Minerals in Asheville in May. The meeting included two and one-half days of presentations on industrial minerals. Nine field trips showcased North Carolina's geology and industrial minerals. The meeting was attended by more than 200 people from 25 States and 9 foreign countries. Proceedings of the meeting were published as NCGS Information Circular 34.

Geologic Mapping

The NCGS has been an active participant in the STATEMAP program. STATEMAP is a component of the congressionally mandated National Cooperative Geologic Mapping Program (NCGMP), through which the USGS distributes Federal funds to support geologic mapping efforts through a competitive funding process. The NCGMP has three primary components: (1) FEDMAP, which funds Federal geologic mapping projects, (2) STATEMAP, which is a matching-funds grant program with State geological surveys, and (3) EDMAP, a matching-funds grant program with universities that has a goal to train the next generation of geologic mappers. In 2006, the NCGS completed several geologic maps in western North Carolina and in the Piedmont under the STATEMAP program. The NCGS also established an online map viewer that is available at <http://wfs.enr.state.nc.us/NCGeologicMaps/>. The online map viewer accesses scanned and georeferenced geologic maps

prepared under the STATEMAP program which are included in the inventory of the National Geologic Map Data Base (<http://ngmdb.usgs.gov/>).

Mining

The Mining Program of the NCGS, Division of Land Resources, reviewed 304 applications to open, modify, renew, or release mines in 2006. Several of the applications required analysis of hydrogeology, blasting, endangered species or erosion, and sedimentation control. Public hearings were held on four applications for mining permits. By yearend, nearly 900 mines were permitted, affecting about 15,800 ha of land. During the year, 415 ha of land was reclaimed and released for other uses.

Minerals Research

The Minerals Research Laboratory (MRL), Asheville, a unit of North Carolina State University, began offering, for the first time in its 60-year history, a course on separation technology. The course covers the basic principles of ore dressing and is being taught at the University of North Carolina at Asheville.

The MRL began the formation of an Advisory Council whose duties would be to prioritize minerals related programs within the State in order to generate more economic development in both the mining and manufacturing sectors. The initial emphasis would be directed toward commercialization of new mineral resources not currently mined in the State, and utilization of industry tailings for new product applications. Council membership was to be derived from various State regulatory departments and experienced mineral marketing individuals, as well as industry engineers and scientists.

Current research efforts at MRL span several States and foreign countries where its focus has been to develop mineral resources used in the abrasive, ceramic, drilling, and plastic industries. Details on the MRL's activities can be accessed at <http://www.engr.ncsu.edu/mrl/>.

Other

The NCGS initiated a 2-year project funded by the North Carolina Department of Transportation to delineate sand resources offshore at Hatteras and Ocracoke Islands for use as either beach replenishment or inlet fill material. Related coastal sand studies included the collecting and analyzing of data from 18 cores drilled using a rotasonic method. These studies were conducted off the Outer Banks extending between Corolla and Ocracoke Island.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN NORTH CAROLINA^{1,2}

(Thousand metric tons and thousand dollars)

Mineral	2004		2005		2006	
	Quantity	Value	Quantity	Value	Quantity	Value
Clays:						
Common	2,260	12,900	2,180	13,900	2,340	24,200
Kaolin	34	764	27	593	26	950
Feldspar	351	20,500	351	19,000	362	19,100
Gemstones, natural	NA	280	NA	280	NA	282
Mica, crude	40	9,600	39	10,200	57	12,600
Sand and gravel:						
Construction	11,500	59,700	12,000	63,900	12,900	70,000
Industrial	1,630	29,000	1,150	29,200	1,220	24,700
Stone:						
Crushed	72,300	549,000	73,600 ^{r,3}	708,000 ^{r,3}	77,500	852,000
Dimension	43	18,200	39	17,000	41	17,800
Combined values of olivine (2004), phosphate rock, pyrophyllite (crude), stone [crushed quartzite (2005)]	XX	105,000	XX	(4)	XX	(4)
Total	XX	805,000	XX	862,000 ^r	XX	1,020,000

^rRevised. NA Not available. XX Not applicable.

¹Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

²Data are rounded to no more than three significant digits; may not add to totals shown.

³Excludes certain stones; kind and value included with "Combined values" data.

⁴Value excluded to avoid disclosing company proprietary data.

TABLE 2
NORTH CAROLINA: CRUSHED STONE SOLD OR USED, BY KIND¹

Kind	2005			2006		
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Number of quarries	Quantity (thousand metric tons)	Value (thousands)
Limestone	11	6,790	\$66,900 ^r	12	8,480	\$90,200
Dolomite	1	369	3,630	1	436	4,970
Granite	74	53,900	526,000 ^r	79	57,400	632,000
Traprock	7	7,690	64,100 ^r	7	7,900	91,000
Quartzite	2	W	W	--	--	--
Slate	2	1,350	13,300 ^r	2	1,440	15,100
Miscellaneous stone	4	3,460	34,400 ^r	3	1,840	18,700
Total	XX	73,600 ^r	708,000 ^r	XX	77,500	852,000

^rRevised. W Withheld to avoid disclosing company proprietary data. XX Not applicable. -- Zero.

¹Data are rounded to no more than three significant digits; may not add to totals shown.

TABLE 3
NORTH CAROLINA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2006, BY USE¹

(Thousand metric tons and thousand dollars)

Use	Quantity	Value
Construction:		
Coarse aggregate (+1½ inch):		
Riprap and jetty stone	287	3,860
Filter stone	293	4,120
Other coarse aggregate	647	9,950
Total	1,230	17,900
Coarse aggregate, graded:		
Concrete aggregate, coarse	2,360	27,300
Bituminous aggregate, coarse	522	5,780
Bituminous surface-treatment aggregate	W	W
Railroad ballast	1,480	11,600
Other graded coarse aggregate	7,860	106,000
Total	12,200	151,000
Fine aggregate (-¾ inch):		
Stone sand, concrete	97	1,290
Stone sand, bituminous mix or seal	(2)	(2)
Screening, undesignated	849	9,440
Other fine aggregate	2,910	28,300
Total	3,850	39,000
Coarse and fine aggregates:		
Graded road base or subbase	2,900	31,700
Unpaved road surfacing	(3)	(3)
Terrazzo and exposed aggregate	(3)	(3)
Crusher run or fill or waste	1,450	13,800
Other coarse and fine aggregates	9,390	95,900
Total	13,900	144,000
Agricultural, other	(4)	(4)
Special, Whiting or whiting substitute	(4)	(4)
Unspecified:⁵		
Reported	39,400	421,000
Estimated	6,900	78,000
Total	46,300	500,000
Grand total	77,500	852,000

W Withheld to avoid disclosing company proprietary data; included with "Other graded coarse aggregates."

¹Data are rounded to no more than three significant digits; may not add to totals shown.

²Withheld to avoid disclosing company proprietary data; included with "Other fine aggregate."

³Withheld to avoid disclosing company proprietary data; included in "Total."

⁴Withheld to avoid disclosing company proprietary data; included in "Grand total."

⁵Reported and estimated production without a breakdown by end use.

TABLE 4
NORTH CAROLINA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2006, BY USE AND DISTRICT¹

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Construction:						
Coarse aggregate (+1½ inch) ²	W	W	W	W	W	W
Coarse aggregate, graded ³	W	W	W	W	W	W
Fine aggregate (-¾ inch) ⁴	W	W	W	W	W	W
Coarse and fine aggregate ⁵	W	W	W	W	W	W
Agricultural ⁶	--	--	--	--	W	W
Special ⁷	W	W	--	--	--	--
Unspecified: ⁸						
Reported	1,140	12,100	20,100	213,000	18,100	196,000
Estimated	4,100	46,000	1,500	17,000	1,300	15,000
Total	14,000	159,000	38,200	413,000	25,300	280,000

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

¹Data are rounded to no more than three significant digits; may not add to totals shown.

²Includes filter stone, riprap and jetty stone, and other coarse aggregate.

³Includes bituminous aggregate (coarse), bituminous surface-treatment aggregate, concrete aggregate (coarse), railroad ballast, and other graded coarse aggregate.

⁴Includes screening (undesignated), stone sand (bituminous mix or seal), stone sand (concrete), and other fine aggregate.

⁵Includes crusher run or fill or waste, graded road base or subbase, terrazzo and exposed aggregate, unpaved road surfacing, and other coarse and fine aggregates.

⁶Includes other agricultural uses.

⁷Includes whitening or whitening substitute.

⁸Reported and estimated production without a breakdown by end use.

TABLE 5
NORTH CAROLINA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2006,
BY MAJOR USE CATEGORY¹

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	5,280	\$29,800	\$5.65
Plaster and gunite sands	189	969	5.13
Concrete products (blocks, bricks, pipe, decorative, etc.)	374	2,930	7.83
Asphaltic concrete aggregates and other bituminous mixtures	408	2,690	6.60
Road base and coverings ²	790	4,320	5.47
Fill	2,060	6,650	3.23
Snow and ice control	51	590	11.57
Other miscellaneous uses ³	334	2,930	8.78
Unspecified: ⁴			
Reported	1,080	6,720	6.25
Estimated	2,340	12,300	5.28
Total or average	12,900	70,000	5.42

¹Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

²Includes road and other stabilization (lime).

³Includes filtration.

⁴Reported and estimated production without a breakdown by end use.

TABLE 6
NORTH CAROLINA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2006,
BY USE AND DISTRICT^{1,2}

(Thousand metric tons and thousand dollars)

Use	Districts 1 and 2		District 3		Unspecified districts	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregates and concrete products ³	2,290	14,400	3,530	19,100	25	258
Asphaltic concrete aggregates and road base materials ⁴	570	4,910	629	2,100	--	--
Fill	39	166	1,900	5,830	121	649
Other miscellaneous uses ⁵	97	1,020	288	2,510	--	--
Unspecified: ⁶						
Reported	463	3,440	613	3,280	--	--
Estimated	558	3,010	1,780	9,320	--	--
Total	4,020	26,900	8,740	42,100	146	907

-- Zero.

¹Data are rounded to no more than three significant digits; may not add to totals shown.

²Districts 1 and 2 are combined to avoid disclosing company proprietary data.

³Includes plaster and guniting sands.

⁴Includes road and other stabilization (lime).

⁵Includes filtration and snow and ice control.

⁶Reported and estimated production without a breakdown by end use.