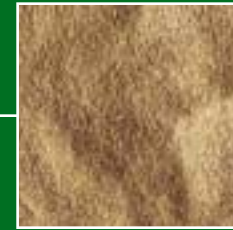


15,000 BC

10,000 BC



50 Fascinating Facts about Stone, Sand & Gravel

FUNDAMENTAL RESOURCES FOR MORE THAN 5000 YEARS

440 1725 3000 BC 1988
1420
1839 1105 775 562 35
1565

Since the Dawn of Recorded History...

■ FOR CENTURIES, CONSTRUCTION AGGREGATES—OR CRUSHED STONE, SAND AND GRAVEL—HAVE BEEN SOLD COMMERCIALY FOR RESIDENTIAL AND COMMERCIAL BUILDING CONSTRUCTION. THESE MATERIALS HAVE FUNDAMENTALLY IMPROVED MANKIND'S SECURITY, SAFETY AND MOBILITY AND ENHANCED THE QUALITY OF LIFE.

■ Many forms of water clocks were used in Ancient Egypt, but were later replaced by the amazingly accurate sand hourglass. The advantages of sand over water were obvious. Sand did not evaporate or spill over, and never needed refilling. And, unlike sundials, it did not depend on sunlight for operation. The sand hourglass is known today as the symbol of Father Time.

■ During the Greek and Roman periods, sand, gravel and volcanic rock and dust were used to make concrete-like material for use in building. Some of these structures remain standing.

■ In ancient times, a form of concrete was made from a conglomerate of gravel and broken stone with sand and lava.

■ Vitruvius, a Roman architect and engineer, and Pliny, a Roman scholar, designed cisterns from this material for storing large amounts of water.

■ It was not unusual for Roman roads to be made of broken stone, and some of those roads still carry traffic today.

■ In medieval Europe, castles and cathedrals were built by stonemasons of various types of stone. Sometimes when construction was completed, the structure was painted or whitewashed so that it would be one color.

■ America's first paved road, between Philadelphia and Lancaster, Pa., was completed in 1795.

■ Hourglasses and other timing devices using sand were depended upon for approximate time keeping by the British Navy as late as 1839. Standard shipboard equipment included an hourglass, a half-hour glass and an eight-minute glass. Timing devices using sand are still in common use today for cooking eggs and in children's board games.



2000 BC

300 BC

100 AD

300 AD

600 AD

1800 AD

...Aggregates are the Foundation of Our World...

■ **AGGREGATES CONSIST OF SAND, GRAVEL OR ROCK FRAGMENTS THAT ARE USED IN THEIR NATURAL STATE OR AFTER MECHANICAL PROCESSING. QUARRIED STONE IS CRUSHED AND PROCESSED TO PRODUCE CRUSHED STONE AND MANUFACTURED SAND.**

- In the 1850's and 60's, railroads were substantial users of aggregates. This material was used for roadbed construction and ballast to support the ties.
- The development of the automobile in the early 1900's created an immediate demand for paved roadways, and aggregates production increased tremendously for use in materials such as asphalt and concrete road pavements.
- Around the turn of the 20th century, independent operators began turning what had largely been homegrown aggregate production into a full-fledged industry by digging gravel for use on streets and roads. Spring thaws turned dirt roads into quagmires, whereas roads made of stone had both strength and drainage capability.

- The cost of transporting aggregates increases in direct ratio to the number of miles the material must be hauled.
- Efficient transportation of aggregates to the user is an important factor in providing reasonable costs in construction projects.
- Throughout World War II, airfields in China were constructed by hand by thousands of Chinese workers who chipped and fitted stone to create surfaces suitable for takeoffs and landings.

- Between 1970 and 2001, sand, gravel and crushed stone use in the United States averaged 1.84 billion tons per year, reaching a high of 2.75 billion tons in 2001.
- In 2001, 1,400 companies operating 3,700 active quarries in 49 states produced crushed stone valued at \$9 billion. Leading states in order of production were Texas, Pennsylvania, Florida, Ohio, Illinois, Georgia, Missouri, Virginia, North Carolina, and California, which together accounted for about 53% of the total.

- 6,200 operations of 3,900 companies in 50 states produced construction sand and gravel valued at \$5.5 billion during 2001. Leading states in order of volume were California, Texas, Michigan, Ohio, Arizona, Washington and Colorado. If taken together, they accounted for about 46% of the total.
- In the 21st century, the restoration of an aging transportation infrastructure (roads, highway, bridges, airport runways, railway beds, public transit) will require the production of substantial amounts of aggregates.



1850 AD



1940 AD



1970 AD



2000 AD

2005 AD

...and Environmental Solutions for the Future.

■ AGGREGATES CAN BE MINED AND MINED LAND CAN BE RECLAIMED CONCURRENTLY. THE PRIMARY GOAL OF RECLAMATION IS TO RETURN THE LAND TO BENEFICIAL USE.

- Potential sources of crushed stone and sand and gravel may be widespread, but specific land use considerations, socioeconomic reasons or the physical and chemical properties of the materials may limit their utility.
- Although nature dictates the location of aggregates, sources can be lost if houses or other developments are constructed above these sites.
- The aggregates industry has reclaimed mined-out pits and quarries. These sites have been transformed into nature centers, parks, lakes, schools, shopping centers, industrial parks, housing sites, wildlife areas, wetlands and many other beneficial uses.



2020 AD

- Aggregates are used in nearly all residential, commercial and industrial building construction and in most public works projects, such as: roads, highways and bridges; railroad beds; dams; airports; water and sewage treatment plants and systems; and tunnels.
- Aggregates are used to construct both water and sewage treatment plants, and also to filter water as part of the purification process.
- Leaders in the aggregates industry are continuously demonstrating their willingness and desire to act and operate responsibly in serving the construction needs of the country by respecting and observing the well-being and the environmental setting of the communities of which they are an important part.



2200 AD

- Crushed limestone is used for agricultural lime and by utility power plants in the reduction of sulfur dioxide, which produces acid rain.
- Crushed rock, large gravel and cobbles are an ideal fill for gabions— compartmentalized rectangular containers made of galvanized steel hexagonal wire mesh that protect river embankments from erosion. Aggregate-filled gabions are also used for channel linings, retaining walls, bridge abutments and wingwalls and shore and beach protection.
- Byproduct fines from aggregates processing are potential sources for remineralizing soils in agriculture and forests by providing the needed trace elements and minerals for healthy soil and abundant growth.



3000 AD



3500 AD

- Sand is used for beach replenishment. It is also an excellent material for landscaping and it provides traction on snow without causing adverse effects.
- Riprap and armor stone are two types of large stone material used to prevent erosion along rivers and shorelines. Often, blankets of smaller aggregates are placed under the larger stone to increase its effectiveness and longevity.
- Though sources of potential aggregates are widely distributed throughout the United States in a variety of geologic environments, they are not evenly distributed geographically.



5000 AD

Stone, Sand & Gravel: By the Numbers

■ DEPOSITS OF SAND, GRAVEL AND STONE AROUND THE WORLD ARE HUGE. HOWEVER, BECAUSE OF THEIR GEOGRAPHICAL DISTRIBUTION AND ENVIRONMENTAL RESTRICTIONS, NOT ALL OF IT IS AVAILABLE FOR MINING.

- Aggregates production accounts for more than half of the non-fuel mining volume in the United States.
- It is estimated that 38,000 tons of aggregates are necessary to construct one lane-mile of a four-lane interstate highway.
- Ground and pounded aggregates are used in the manufacture of such varied household items as paper, paint, cosmetics, pharmaceuticals, toothpaste, chewing gum and cleansers.
- The Denver International Airport in Colorado required 5 million tons of aggregates in its construction. The Grand Coulee Dam in Washington required 17 million tons.
- Construction of an average modern home requires 400 tons of aggregates.
- 15,000 tons of aggregates are required for the construction of an average size school or hospital.
- Crushed stone, sand and gravel are used by water and sewer facilities for filtration in water purification and sewage treatment.
- Aggregates make up more than 94% of asphalt and 80% of concrete pavements.
- About 1% or less of the construction aggregates used annually in the United States is imported.
- Of the crushed stone imported into the United States, 54% comes from Canada, 31% from Mexico, 8% from the Bahamas and 7% from other nations.
- 71% of imported sand and gravel comes from Canada, 11% from the Bahamas, 8% from Mexico and the remaining 10% from other countries.
- Individual crushed stone quarries range in size from operations producing less than 50,000 tons annually to those with production of more than 10 million tons.
- During the past 60 years, the production of aggregates has more than quadrupled. In addition, per capita consumption has increased from 3.5 tons per year to 10 tons annually.
- Individual sand and gravel operations range in size from those reporting production of less than 25,000 tons annually, to those which produce more than 2.5 million tons.
- California leads the United States in the production of sand and gravel. Texas leads the nation in the production of crushed stone. Delaware is the only state in the nation that does not produce crushed stone.
- Aggregates are most commonly used within 50 miles of their place of extraction.
- The production of crushed stone, sand and gravel in the United States went from about 200 million tons in 1940 to approximately 2.74 billion tons in 2001.



Highlights from NSSGA's History

THE NATIONAL STONE, SAND AND GRAVEL ASSOCIATION, AN INTERNATIONAL TRADE ASSOCIATION WITH A MEMBERSHIP OF MORE THAN 850 COMPANIES FROM THE UNITED STATES, CANADA, MEXICO AND THROUGHOUT THE WORLD, REPRESENTS PRODUCERS OF CONSTRUCTION AGGREGATES—SAND, GRAVEL AND CRUSHED STONE. IT IS, BY PRODUCT VOLUME, THE LARGEST MINING TRADE ASSOCIATION IN THE WORLD. NSSGA PROVIDES ITS MEMBERS WITH EDUCATION, TRAINING, RESEARCH, TECHNOLOGY AND REPRESENTATION BEFORE CONGRESS AND FEDERAL REGULATORY BODIES WITH THE MISSION OF INCREASING THE GROWTH AND ENHANCING THE QUALITY OF THE AGGREGATES INDUSTRY.

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|------|---|------|--|
| 1903 | National Quarry Owners' Association (NQOA) founded. | 1984 | NLI and NCSA merge to become the National Stone Association (NSA). |
| 1911 | National Sand and Gravel Producers Association (NSGPA) founded. | 1987 | National Sand and Gravel Association becomes the National Aggregates Association (NAA). |
| 1916 | NSGPA becomes National Sand and Gravel Association. | 1990 | NAA and NSA play a central role in establishing the Aggregates Foundation for Technology, Research and Education and the creation of the Center for Aggregates Research at the University of Texas and Texas A&M University. |
| 1918 | NQOA becomes National Crushed Stone Association (NCSA). | 2000 | The National Aggregates Association and National Stone Association merge to form NSSGA. |
| 1945 | National Limestone Institute (NLI) founded. | | |

The information contained herein was specifically prepared for the use of writers, educators, students, and anyone who may have the occasion to engage in research in the industry. The information was gathered by the National Stone, Sand and Gravel Association and is considered by the association to be accurate and reliable.

NATIONAL STONE, SAND & GRAVEL ASSOCIATION



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