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Salt

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The United States was the world's leading salt-producing nation until 2005, when China surpassed the United States to become the world leader. Total U.S. salt production in 2014 increased by 13% to 45.3 million metric tons (Mt) compared with the revised production of 2013 (table 1), making the United States the second-leading salt-producing nation. Global salt production in 2014 was 272 Mt with 70 Mt produced in China.

Salt, also known as sodium chloride, consists of the elements sodium and chlorine. Sodium is a silver-colored metal that is so unstable that it reacts violently in the presence of water, and chlorine is a greenish-colored gas that is dangerous and may be lethal; yet combined, these two elements form sodium chloride, which is a white-colored compound essential to life itself. Virtually every person in the world has some direct or indirect contact with salt daily. People routinely add salt to their food as a flavor enhancer or apply rock salt to walkways to remove ice in the winter. Salt is used as feedstock for chlorine and caustic soda manufacture. These two inorganic chemicals are used to make many consumer-related end-use products, such as polyvinyl chloride (PVC), a plastic made from chlorine, and paper-pulping chemicals manufactured from sodium hydroxide (caustic soda).

Production

U.S. production and sales data for salt were developed by the U.S. Geological Survey (USGS) from an annual voluntary survey of U.S. salt-producing sites and company operations (table 2). Production refers to the quantity of salt mined or manufactured that is available for sale. Salt sold or used is the quantity of salt that was sold directly to customers or used by the salt producer, which usually is a chloralkali (chlorine and sodium hydroxide) manufacturer. The data in table 2 are rated capacities for mines and refineries as of December 31, 2014. Rated capacity is defined as the maximum quantity of product that can be produced in a period of time on a normally sustainable long-term operating rate, based on the physical equipment of the plant, and given acceptable routine operating procedures involving energy, labor, maintenance, and materials.

According to survey respondents, 28 companies operated 63 salt-producing plants in 16 States in 2014. Of these, 9 companies and 14 plants produced more than 1 Mt each and accounted for 90% and 67%, respectively, of total U.S. production and for 89% and 45%, respectively, of total value. Several companies and plants produced more than one type of salt. In 2014, 6 companies (17 operations) produced vacuum pan salt; 11 companies (15 operations), solar-evaporated salt; 10 companies (14 operations), rock salt; and 13 companies (27 operations), salt brine.

Five of the seven leading producing States were, in descending order of total salt sold or used, Louisiana with 32%; Texas, 17%; New York, 17%; Kansas, 6%; and Utah, 5%. Ohio and Michigan were among the top seven salt-producing States in total quantity of salt sold or used, but their rankings were withheld to protect proprietary data (table 5). The distribution of domestic and imported evaporated and rock salt to each State and the District of Columbia in 2014 is reported in table 7.

Of the 28 companies to which a canvass form was sent in 2013, 18 responded, representing 80% of the totals shown in this report. Data for the nonrespondents were estimated based on their responses to previous annual surveys, the 2014 production estimate survey, or brine production capabilities for chloralkali manufacture based upon published chlorine production capacities; that is, 1.75 metric tons (t) of salt required per ton of chlorine capacity. For rock salt producers, data from the Mine Safety and Health Administration also were used in estimating production.

The structure of the U.S. salt industry has changed throughout the years. In 1970, 50 companies operated 95 salt-producing plants in the United States. Market competition, increased energy and labor costs, less expensive imports, fluctuations in currency exchange rates, and an excess of production capacity (resulting in the downsizing of the industry through mergers and acquisitions) reduced the number of operations in the industry to 28 companies and 63 plants by 2014. The USGS does not survey small-scale producers of culinary "sea salt" at several locations in the United States. These boutique operations, in total, are thought to annually produce less than 100 t of sea salt.

The four types of salt that are surveyed were classified according to the method of recovery as follows: vacuum pan salt, from mechanical evaporation of a purified brine feedstock; solar salt, from solar evaporation of seawater, landlocked bodies of saline water, or primary or byproduct brines; rock salt, from surface or underground mining of halite deposits; and salt brine, from solution mining of underground halite deposits. Data for brine production and consumption represent anhydrous salt content only and not the weight of the water (tables 3 and 4).

Vacuum Pan Salt.—Vacuum pan salt production was 4.14 Mt in 2014, essentially unchanged compared with the revised 2013 total of 4.13 Mt. Mechanical evaporation of salt by the vacuum pan process is dependent on the number and size of the vacuum crystallizers operating in series. Rated capacities in table 2 are established by using proven design performance of the equipment.

Although rock salt, solar salt, and salt brine may be used to make vacuum pan salt, virtually all domestic vacuum pan salt is obtained from solution mining of underground salt formations. Vacuum pan salt is obtained by dehydrating brine using heat alone or in combination with a vacuum. The grainer or open-pan process uses open, rectangular pans with steam-heated immersion coils to evaporate the water in the brine. The final

product is usually flake shaped rather than the typical cubic form. Flake salt is preferred for the production of baked goods, butter, and cheese.

In late July, Cargill, Inc. purchased the Hersey, MI, salts operation of The Mosaic Company. The Hersey plant was formerly part of Cargill's crop nutrition division before it was sold to Mosaic in 2004. Mosaic primarily was removing the potash salts, but sodium chloride is also present, which will be the focus of Cargill at the Hersey plant. Cargill expected to produce salt blocks and other agricultural products at this site (Ramstad, 2014).

Solar Salt.—Solar salt production was 3.9 Mt in 2014, a 9% increase from the revised 2013 total of 3.58 Mt. Increased demand for snow and ice control caused the majority of the production increase.

Because evaporation rates must exceed precipitation rates, the climatic conditions and geographic locations of solar evaporation facilities are critical to the successful production and harvesting of solar salt. Therefore, rated capacities in table 2 generally are based on the historical evaporation patterns within a region and vary depending on the location and the surface acres of the evaporation ponds. Only unpredictable seasonal precipitation and market conditions usually affect the production rates of the facilities.

Rock Salt.— In 2014, rock salt production was nearly 20 Mt, a 35% increase compared with the revised 2013 total of 14.8 Mt. Rock salt is mined by the room-and-pillar method, which is similar to that used in coal and trona mining.

Because most rock salt is used for deicing, the operating rate of rock salt facilities fluctuates with the demand for deicing salt, which is dependent on the severity of winter weather conditions. During periods of strong demand, production levels often achieve, or exceed in certain situations, the rated capacities. Full mine capacity generally is a function of the hoisting capabilities of the mine. Assuming that the work week is 5 days (250 workdays per year), two working shifts and one maintenance shift per day, and at least one short-term planned turnaround for the mine and mill per year, table 2 lists the production capacities for domestic rock salt operations.

Rock salt producers operated at high rates in 2014 because increased demand required mining companies to extend hours to increase output. In January, American Rock Salt Co. was running its western New York plant around the clock to supply road salt that was in great demand throughout its market region. The company anticipated strong demand for the entire year (Tumulty, 2014). Hutchinson Salt Co. in Kansas maintained high production throughout the year and continued to ship 2,000 to 3,000 tons of road salt per day late in the year (Smith, Mitch, 2014).

In New York, litigation involving the 1994 collapse of the Retsof underground salt mine near Geneseo reached a partial conclusion in December when the county accepted a $20 million settlement from AkzoNobel N.V. (Amsterdam, Netherlands), the company that operated the mine at the time of the collapse. The money was targeted to be used for water infrastructure or water supply protection in the area affected by the mine collapse. With the agreement, AkzoNobel was released from any past, present, or future claims related to damage caused by the mine collapse (Orr, 2014).

Salt Brine.—U.S. salt brine production in 2014 was 17.3 Mt, a slight decrease compared with the 2013 total of 17.4 Mt. Brine production capacities are difficult to derive because they are based on the variabilities of the injection rate of the solvent and the dissolution rates of the underground salt bodies, both of which determine the quantity of brine produced. In turn, these production levels are usually dependent on the demand for the products that the brine is being used to manufacture.

Solution mining is used to obtain a sodium chloride feedstock for vacuum pan salt production and for chlorine, caustic soda, and synthetic soda ash (excluding the United States) manufacture. The quantity of underground salt dissolved and recovered as brine to make vacuum pan salt usually is not reported as primary salt production; only the quantity of vacuum pan salt manufactured is reported. The quantity of brine used to make chloralkali chemicals is reported as either the amount of captive brine used or brine sold. The chemical industry is the leading consumer of salt brine worldwide.

In April, legislation that would increase regulation for mining salt domes passed in the Louisiana Senate. These regulations were in response to sinkhole issues dating back to at least 1980 (Beal, 2014). The solution mining of salt domes is believed to be at least partially responsible for the development of sinkholes adjacent to the domes (Miller, 2014).

Consumption

Direct and indirect uses of salt number about 14,000, according to industry sources. The USGS annually surveys eight major categories comprising 29 end uses. The 2014 reported consumption (sales or use as reported by the salt companies, including their exports and imports) was 55 Mt, and the distribution of salt by major end use was ice control, 44.4%; chemicals, 36.0%; distributors (grocery and other wholesalers and retailers and so forth), 8.1%; food processing, 3.2%; agricultural, 2.9%; other uses combined with exports, 2.5%; general industrial, 1.8%; and primary water treatment, 1.1% (table 6).

In 2014, apparent consumption (salt sold or used plus imports minus exports) was 65.2 Mt. Reported consumption statistics are those reported only by domestic salt-producing companies. Apparent consumption normally is greater than reported consumption because apparent consumption includes additional quantities of salt imported and exported by nonsalt-producing companies, such as some chloralkali operations and salt distributors, especially importers along the east coast of the United States, primarily for snow and ice control.

Distributors represented a substantial share of salt sales by the salt industry; all of this salt was ultimately resold to a variety of end users. For a more complete analysis of end-use markets, specific sectors of distribution listed in table 6 can be combined, such as agricultural and water treatment quantities reported by salt producers and those supplied by distributors. Aside from the various types of salt, there are distinctions in packaging and applications of salt. Salt for human consumption is packaged in various sized containers for several specialized purposes.

Ice Control and Road Stabilization.—In 2014, U.S. consumption of salt for this application was 24.5 Mt, which was about 20% more than that of 2013. After relatively low consumption for this use in 2011 and 2012, consumption in 2013 and 2014 increased significantly. It was likely that salt stockpiles were depleted in most locales by the end of the winter of 2014–15.

The use of salt brine for road deicing has been increasing for the past several years. Regular rock salt can be dissolved to create a salt brine solution. Salt brine is used as pretreatment prior to ice or snow accumulation.

Salt is an inexpensive, widely available, and effective ice control agent. It does, however, become less effective as temperatures decrease below about -9.5 °C to -6.5 °C (15 °F to 20 °F). At lower temperatures, more salt must be applied to maintain higher brine concentrations to provide the same degree of melting. Most winter snowstorms and ice storms happen when temperatures are between -4 °C and 0 °C (25 °F and 32 °F), the range in which salt is most effective.

In highway deicing, salt has been associated with corrosion of bridge decks, motor vehicles, reinforcement bar and wire, and unprotected steel structures used in road construction. Surface runoff, vehicle spraying, and windblown actions also affect soil, roadside vegetation, and local surface water and groundwater supplies. Although evidence of environmental loading of salt has been found during peak usage, spring rains and thaws usually dilute the concentrations of sodium chloride in the area where salt was applied. However, when the salt leaches from the immediate environment adjacent to roads, it sometimes collects in lakes and other inland freshwater bodies, potentially changing water chemistry and affecting ecosystems and communities that use this water.

Road salt can affect automobiles, lakes, streams, pets, plants, and structures around the United States. In the Adirondack Mountains region of New York, the potential detrimental effects of road salt were a growing concern. The effect of salt on Lake George is the subject of the Jefferson Project, a high-tech data-intensive project designed to model how the lake works and how humans are affecting it (Dybas, 2014).

USGS scientists contributed to an article that showed that chloride concentrations in the northern United States increased substantially over time with average concentrations approximately doubling from 1990 to 2011, outpacing the rate of urbanization in the region. The influence of chloride on aquatic life increased with time; 29% of sites studied exceeded the concentration for the U.S. Environmental Protection Agency's chronic water quality criteria of 230 milligrams per liter by an average of more than 100 individual days per year during 2006–11. The rapid rate of chloride concentration increase in these streams is likely owing to a combination of increased road salt application rates, increased baseline concentrations, and greater snowfall in the midwestern United States during the latter portion of the study period (Corsi and others, 2014).

The U.S. Department of Transportation established the Center for Environmentally Sustainable Transportation in Cold Climates in conjunction with several universities in the United States. The Center's mandate was to study the movement of road salt onto and effect on vegetation and groundwater. Issues to be studied include determining the "effective temperature" of various deicing products and their effect on vehicles, roadways, and the environment (Kostigen, 2014).

The quantity of salt consumed for road deicing each year is directly related to the severity of the winter weather conditions. Long-range forecasting of salt consumption in this application is extremely difficult because of the complexities in long-range forecasting of the weather.

Severe winter weather in many parts of the United States in late 2013 depleted salt reserves and road crews began using supplies intended for 2014. In January 2014, many salt stockpiles ran low although the extreme cold in some areas led to the use of alternatives to traditional road salt to meet the lower temperature requirements. Salt reserves ran low in Illinois, Indiana, Kentucky, Missouri, Ohio, Pennsylvania, and Wisconsin and were depleted in some areas by the end of the month. Severe and dangerous winter weather was even reported in the Deep South in Louisiana and in Mobile, AL, where salt is almost never stockpiled for winter use, and some northern parts of the State had very little salt available (Bayatpour, 2014; Daily Chronicle, 2014; Orlando, 2014; Sain, 2014; Sharp, 2014; Smith, Rebecca, 2014; Wieland, 2014).

In February 2014, more States began to experience salt shortages including Connecticut, Iowa, Michigan, New Jersey, and New York. The conditions were so worrisome that states of emergency were declared in New Jersey and New York amid a serious shortage of salt and impending storms. February was characterized by increased salt prices amid a severe lack of supply, often because salt shipments were unable to reach the places where they were needed because of poor road conditions and a lack of haul vehicles. By month's end, salt deliveries increased throughout the affected region (CBS New York, 2014; Fisher, 2014; Kim, 2014).

Road salt users in March 2014 continued to struggle with salt shortages and costs. Governmental agencies responsible for keeping roads clear and safe were less confident that they would be able to meet their obligations and funds where shifted from other priorities to purchase salt from wherever it could be found. Sand and other alternative materials were increasingly used although as little as possible because of the effectiveness, costs, and other associated concerns. As spring weather ensued and roads cleared, road salt consumers began the sometimes difficult process of reaching agreements with salt suppliers for the next deicing season (Conner, 2014; Corley, 2014; Lavien, 2014; Taylor, 2014).

Throughout the summer and fall, as communities purchased salt for the next winter, quoted prices were uniformly higher, by as much as three times those of the previous year. Some communities filed complaints with State regulators, and others refused offers made through State buying programs. For some buyers, no bids were received from salt suppliers, and they were forced to scramble to find salt. Severe winter weather was very limited in late 2014, improving the chances that road salt deliveries would arrive before they were needed (Forgave, 2014; Geiselman, 2014; Pelham, 2014; Rittmeyer, 2014; Seitz, 2014; Vindy.com, 2014; WICS, 2014).

In addition to use on highways during winter weather, salt can be added to soil to stabilize it and to provide firmness to the foundation upon which highways are built. The salt also acts to minimize the effects of changes in humidity and traffic load, which can cause shifting in the subsurface.

Chemical.—Since 1941, when the U.S. Bureau of Mines began collecting end-use data for salt, the leading consumer of salt, primarily as salt brine, has been the chemical industry, except for 2011, 2013, and 2014 when salt for road deicing led. Salt brine is extracted from natural underground saline sources or solution-mined halite deposits (salt beds or salt domes) or produced through the dissolution of solar salt. Within this industry, the chloralkali sector remains the major consumer of salt for manufacturing chlorine, coproduct sodium hydroxide (caustic soda), and synthetic soda ash. Since 1986, when the last domestic synthetic soda ash plant was closed because of high production costs and its inability to compete with less expensive natural soda ash, no synthetic soda ash has been manufactured in the United States; many countries, however, still produce synthetic soda ash and use vast quantities of salt brine as feedstock. Total salt sold or used by the chemical industry was 19.8 Mt in 2014 (table 6).

Salt is used as the primary raw material in chlorine manufacture because it is an inexpensive and widely available source of chlorine ions. For sodium hydroxide production, salt is the main source of sodium ions. Chlorine and caustic soda are classified as the first generation of products made from salt. These two chemicals are used to manufacture other materials such as household cleaners, plastics, and solvents for dry cleaning, which are classified as the second generation of products made from salt. Although most salt brine is produced by the same companies that use it, many chloralkali manufacturers now purchase brine from independent brine supply companies. In certain cases, brine is produced by a chemical company that uses some of it and sells the excess to neighboring competitors. According to industry sources, about 48% of the salt used to manufacture chlorine was captive (produced by the chloralkali companies), and 31% was purchased brine; domestically purchased solar salt and rock salt made up 12% of the supply, and imported rock, solar, and vacuum pan salt combined, 9%.

The industry average ratio of 1.75 t of salt is required to produce 1.0 t of chlorine and 1.1 t of joint product sodium hydroxide. Reported consumption of total domestic and imported salt for chlorine manufacture was 17.6 Mt (table 6); however, the data do not include salt imported directly by the chlorine producers or captive brine produced by them.

Salt is also used as a feedstock in chemical plants that make sodium chlorate, metallic sodium, and other downstream chemical products. In powdered soaps and detergents, salt is used as a bulking agent and a coagulant for colloidal dispersion after saponification. In pharmaceuticals, salt is a chemical reagent and is used as the electrolyte in saline solutions. It is used with sulfuric acid to produce sodium sulfate and hydrochloric acid. The "Other chemical" subsector is relatively small, representing about 11% of domestic salt sales for the entire chemical sector and only 4% of total domestic salt consumption. However, the amount of salt consumed in this category increased by 67% in 2014 compared with that of 2013. The 2.2 Mt consumed for "Other chemicals" represents the highest level seen in several decades, about the same as in 1996.

The consumption of salt for metallic sodium has declined during the past several years. E.I. du Pont de Nemours and Co. was the sole manufacturer of metallic sodium in the United States in 2014. The domestic market for metallic sodium decreased because sodium metal was no longer needed for the production of leaded gasolines. The leading use of sodium metal was for sodium borohydride production, the feedstock for sodium dithionite, which was used as a reductive bleaching agent by the pulp and paper industry. Sodium metal also is used to manufacture sodium azide, which is used in automotive air bags, and as a power reducing agent in the alternative polysilicon manufacturing processes. Other potential uses of sodium metal are in the remediation of chemical weapons, chlorofluorocarbons, pesticides, and polychlorinated biphenyls.

Distributors.—A large quantity of salt is marketed through various distributors, some of which specialize in agricultural and water treatment services—two sectors in which the salt companies also have direct sales (table 6). Distributor sales also include grocery wholesalers and (or) retailers, institutional wholesalers, U.S. Government resale, and other wholesalers and retailers. Total salt sold to distributors was 4.5 Mt in 2014.

Food Processing.—Nearly every person uses some quantity of salt in food. Aside from table salt, sodium is found in many processed foods. Salt is added to food by the food processor or by the consumer as a flavor enhancer, preservative, binder, fermentation-control additive, texture-control agent, and color developer. Table salt may contain 0.01% potassium iodide as an additive to provide a source of iodine, which is essential to the oxidation processes in the body. Kosher salt, sea salt, condiment salt, and salt tablets are special varieties of salt.

The food processing category is subdivided, in descending order of salt consumption, into other food processing, meat packers, canning, dairy, baking, and grain mill products. Total salt sold for food processing was 1.76 Mt in 2014, slightly lower than that of 2013 (table 6).

In meat packing, salt is added to processed meats to promote color development in bacon, ham, and other processed meat products. As a preservative, salt inhibits the growth of bacteria, which leads to spoilage of the product. Salt in sausages forms a binding gel made up of meat, fat, and moisture. Salt also acts as a flavor enhancer and as a tenderizer.

In canning, salt is primarily added as a flavor enhancer and preservative. It also is used as a carrier for other ingredients, dehydrating agent, enzyme inhibitor, and tenderizer.

In the dairy industry, salt is added to cheese as a color-, fermentation-, and texture-control agent. The dairy subsector includes companies that manufacture creamery butter, condensed and evaporated milk, frozen dairy desserts, ice cream, natural and processed cheese, and specialty dairy products.

In baking, salt is added to control the rate of fermentation in bread dough. It also is used to strengthen the gluten (the elastic protein-water complex in certain doughs) and as a flavor enhancer, such as a topping on baked goods.

The food-processing category also contains grain mill products. These products consist of milling flour and

rice, manufactured cereal breakfast food, and blended or prepared flour.

In the "Other food processing" category, salt is used mainly as a seasoning agent. This category includes miscellaneous establishments that make food for human consumption (such as potato chips and pretzels) and for domestic pet consumption (such as cat and dog food).

Concerns about human consumption of salt continued in 2014 as many educators and Government agencies worked to inform people about salt in their diets. The Pan American Health Organization/World Health Organization (PAHO/WHO) held its annual World Salt Awareness Week in March and asked people to "Stop, look, choose…the lower salt option." WHO said that excess salt consumption leads to increased chances of heart attack, stroke, and kidney failure (Jamaica Observer, 2014). A study released in 2014 concluded that salt was bad for teens, especially those who are overweight. The study concluded that salt caused these teens' cells to age prematurely, which could increase risk for heart disease and other serious problems (Mandel, 2014).

The U.S. Food and Drug Administration (FDA) was preparing voluntary guidelines for the food industry with the goal of lowering salt content in foods. Health advocacy groups lobbied for mandatory guidelines, but the FDA prefers the voluntary and gradual route to salt reduction in foods (Associated Press, 2014).

Other studies questioned some of the guidelines issued by Government agencies. Researchers publishing in the American Journal of Hypertension concluded that most Americans' intake of salt is actually within an optimal range. This range was higher than the 2,300 milligrams or less salt intake recommended level from the Centers for Disease Control and Prevention (Salt Institute, 2014; Winslow, 2014).

Agricultural.—Barnyard and grazing livestock need supplementary salt rations to maintain proper nutrition. In 2014, 1.6 Mt of salt was sold to the agricultural industry (table 6). Animal feed and water conditioning salt are made into 22.7-kilogram (50-pound) pressed blocks. Iodine, sulfur, trace elements, and vitamins are occasionally added to salt blocks to provide nutrients not found naturally in the diet of certain livestock. Salt is also compressed into pellets that are used for water conditioning.

General Industrial.—The industrial uses of salt are diverse. They include, in descending order of quantity consumed, oil and gas exploration, other industrial applications, pulp and paper, metal processing, tanning and leather treatment, textiles and dyeing, and rubber manufacture. Total salt sold to these sectors was 986,000 t in 2014.

In oil and gas exploration, salt is an important component of drilling fluids used in well drilling. It is used to flocculate and increase the density of the drilling fluid to overcome high downwell gas pressures. When a drill hits a salt formation, salt is added to the drilling fluid to saturate the solution and to minimize the dissolution within the salt stratum. Salt is also used to increase the set rate of concrete in cemented casings.

In the pulp and paper industry, salt is used to bleach wood pulp. It also is used to make sodium chlorate, which is added along with sulfuric acid and water to manufacture chlorine dioxide, an excellent oxygen-based bleaching chemical. The chlorine dioxide process, which originated in Germany after World War I, has become more popular because of efforts to reduce or eliminate other bleaching compounds containing chlorine.

In metal processing, salt is used in concentrating uranium ore into uranium oxide (yellow cake). It also is used in processing aluminum, beryllium, copper, steel, and vanadium.

In tanning and leather treatment, salt is added to animal hides to inhibit microbial activity on the underside of the hides and to attract moisture back into the hides. In rubber manufacture, salt is used to make buna, neoprene, and white type rubbers. Salt brine and sulfuric acid are used to coagulate an emulsified latex made from chlorinated butadiene.

In textiles and dyeing, salt is used as a brine rinse to separate organic contaminants, to promote "salting out" of dyestuff precipitates, and to blend with concentrated dyes to standardize them. One of its main roles is to provide the positive ion charge to promote the absorption of negatively charged ions of dyes.

Water Treatment.—Many areas of the United States have hard water, which contains excessive calcium and magnesium ions that contribute to the buildup of a scale or film of alkaline mineral deposits in household and industrial equipment and pipes. Commercial and residential water-softening units use salt to remove the ions that cause the hardness. The sodium ions captured on a resin bed are exchanged for the calcium and magnesium ions. Periodically, the water-softening units must be recharged because the sodium ions become depleted. Salt is added and dissolved, and brine replenishes the lost sodium ions. In 2014, 603,000 t of salt was sold for primary water treatment and an additional 504,000 t was sold for water conditioning by distributors (table 6).

Transportation

Because the locations of the salt supplies are not often near consumers, transportation costs significantly add to the price of salt. In some cases, shipping costs are higher than the actual value of the salt. Pumping salt brine through pipelines is an economic means of transportation but cannot be used for dry salt. Large bulk shipments of dry salt in ocean freighters or river barges are low in cost but are restricted in points of origin and consumption. River and lake movement of salt in winter is often severely curtailed because of frozen waterways.

Transoceanic imports of salt have been increasing in some areas of the United States because they are cost competitive with purchasing salt from domestic suppliers and transporting it using barge, rail, or truck. One important factor that often determines the quantity of salt that can be imported is the depth of the channels and the ports; many ports are not deep enough to accommodate larger ships. As salt is packaged, handled, and shipped in smaller units, the costs increase and are reflected in higher selling prices.

American Rock Salt (Livingston County, NY) received permission from the U.S. Army Corps of Engineers to extend a rail line by 460 meters. The rail spur expansion will allow American Rock Salt to increase its daily output by 40% and create 30 new jobs (Leader, 2014; TWC News, 2014).

Prices

The four types of salt that are produced have unique production, processing, and packaging factors that determine the selling prices. Generally, salt sold in bulk is less expensive than salt that has been packaged, pelletized, or pressed into blocks. Salt in brine is the least expensive salt sold because mining and processing costs are less. Vacuum pan salt is the most expensive because of its purity and the higher energy costs involved in processing.

Price quotations are not synonymous with average unit values reported to the USGS. The quotations do not necessarily represent prices at which transactions actually took place, or bid and asked prices. The annual average unit values, as collected by the USGS and listed in table 8, represent a national average unit value for each of the types of salt and the various product forms.

Foreign Trade

Under Harmonized Tariff Schedule of the United States (HTS) nomenclature, imports are aggregated under one category named "Salt (including table and denatured salt) and pure sodium chloride, whether or not in aqueous solution, seawater." The same classification also applies to exports. The HTS code for salt is 2501.00.0000. Although several other HTS codes pertain to various salt classifications, the United States aggregates shipments under one code because the sums of individual subclassifications fail to meet the minimum dollar requirements necessary for individual listings.

Based on U.S. Census Bureau data for 2014, the United States exported 940,000 t of salt; this was a 79% increase compared with that of 2013 (table 9). In 2014, most exports (86%) were to Canada. Salt was shipped to 101 countries through 35 customs districts; the Cleveland, OH, district exported the most and represented 42% of the U.S. total, and 16% went through Detroit, MI (table 10). Large percentage increases in exports and imports are normally in response to increased demand for rock salt for deicing related to the frequency and severity of winter storms in Canada and the United States, respectively.

The United States imported 20.1 Mt of salt from 60 countries in 2014, which was 69% more than was imported during 2013 (table 11). Chile was the leading source of imports, supplying about 39% of total imports, followed by Canada (29%). Table 12 lists the imports of salt by customs district. Of the 39 customs districts that imported salt in 2014, the New York, NY, customs district was the largest in terms of tonnage, accounting for about 16% of the total, followed by Boston, MA, and New Orleans, LA (11% each); Philadelphia, PA (10%); Baltimore, MD, and Detroit, MI (9% each); and Milwaukee, WI (7%).

The quantity of salt imports was about 21 times that of exports. Net salt imports also represented about 29% of U.S. apparent consumption, indicating the magnitude of the U.S. reliance on salt imports. Most imported salt was brought into the country by foreign subsidiaries of major U.S. salt producers. Generally, imported salt can be purchased and delivered to many U.S. customers at prices lower than the comparable domestic product because production costs are lower abroad, currency exchange rates may cause the price of imported salt to be lower than the price of domestic salt, and ocean freight rates are less expensive than overland rail or truck rates.

Michigan Salt, LLC, a salt distributor, imported at least 50,000 t of salt from Cyprus to the Port of Detroit. Michigan Salt stored the salt temporarily in a facility owned by Detroit Steel Co. until the salt was hauled by truck to customers (Sword, 2014).

Morton Salt, Inc. signed 1-year agreement with the Port of New Hampshire with options for four more 1-year contracts. Morton Salt has been importing salt through Portsmouth, NH, since 2001 (McMenemy, 2014).

Midwest Salt Co. (Fort Wayne, IN) imported salt from Morocco into the Port of Toledo, OH. The Ohio Department of Transportation arranged to have Midwest Salt import 172,000 t for the State's needs in October. Many communities throughout the State had been unable to secure salt for the coming winter necessitating the arrangement with Midwest Salt (Patch, 2014).

World Review

Table 13 lists world salt production statistics for 93 countries based on reported and estimated information. In 2014, the total estimated world production increased slightly to about 272 Mt. The United States remained the second-leading salt-producing country, representing 17% of total world output. China has rapidly increased its production over the past decade from 37 Mt in 2004 to 70 Mt in 2014, making it the leading salt producer in the world.

Most countries possess some form of salt production capability, with production levels set to meet their own domestic requirements and with additional quantities available for export to other countries. Many developing nations tend to develop their agricultural resources to feed their population first. Utilization of easily extractable mineral resources follows, and salt is one of the first mineral commodities to be mined. Some countries, such as the United States, import a substantial amount of salt to meet total demand requirements because of economic factors, as previously discussed.

Brazil.—In Brazil, the production of caustic soda, one of the primary chemicals derived from salt, may be limited by high electricity costs. Costs for electricity were projected to rise by 25% to 35% owing to a drought that affected hydroelectricity production. This could increase imports of caustic soda from the United States where production costs would be lower (Coifman, 2014).

Canada.—Red Moon Potash, Inc. started additional drilling on its Captain Cook salt/potash deposit in western Newfoundland in July. This followed drilling done in 2013, which encountered a layer of salt 150 meters thick. The new drilling program was expected to add substantial tonnage to the delineated salt deposit (TC Media, 2014).

China.—The Government of China dissolved its salt monopoly in November. The monopoly had been in place since the 7th century B.C. and was run by the China National Salt Industry Group (CNSIG). In the past, salt producers were required to sell their salt through the CNSIG but now would be able to sell directly to customers. New licenses were to be issued beginning in 2017 (Hornby, 2014).

India.—Salt mining in the State of Gujarat, India, was affected by licensing delays from the Environment Ministry for eight salt factories in the Jamnagar district. The permitting process was delayed by the Ministry's Forest Advisory Board, which was referring these cases to the National Board of Wildlife to determine if the operations would have a negative effect on animals or plants (Jha, 2014).

However, even with these permitting delays, salt prices were falling in India as a delayed monsoon season allowed the salt mines to increase output after a slow start earlier in the year when intermittent rains delayed the season. Salt production in Gujarat, which normally produces about 70% of India's salt, was running about 35% below average earlier in the year but was only about 15% below average by midsummer (Murali, 2014; Umarji, 2014). The Indian Salt Service, under the Ministry of Commerce and Industry, projected that salt production in India would rise to 40 Mt by 2020. Approximately 10 Mt of this production would be for export and 20 Mt would be for domestic industrial purposes. More than one-quarter of salt production in India is by small-scale producers (Times of India, The, 2014).

Indonesia.—The Government of Indonesia expected salt imports would double in 2014 to more than 2.5 Mt. Local salt farmers were not expected to be able to meet the growing industrial demand in Indonesia, especially because the harvesting techniques were antiquated and dependent on weather for success. Some salt producers looked to the Government to provide better education and technology to help the salt producers meet growing domestic demand (Jakarta Post, The, 2014).

Nicaragua.—The Inter-American Investment Corp. (IIC) signed a loan agreement with Sales de Nicaragua, S.A. that will help the Nicaraguan salt producer meet growing demand. The loan was part of a program for financing small- and medium-sized enterprises. The IIC, headquartered in Washington, DC, promotes private-sector development in Latin America and the Caribbean (Inter-American Investment Corp., 2014).

Outlook

The United States continued to be one of the leaders in salt production, consumption, and world trade. Solar salt and vacuum pan salt production and consumption have been constant and are expected to remain stable. U.S. salt production is expected to be between 43 and 48 Mt through 2016. Rock salt production and consumption are heavily dependent on the severity of winter weather. Severe winter weather in many parts of the United States during the 2014–15 winter season will likely increase salt demand and production in 2015. Although the severity of the weather is virtually impossible to accurately forecast far in advance, the supplies of salt, from either domestic or imported sources, are likely adequate to meet any anticipated increase in demand. Despite the closing and idling of some chlorine plants since 2007, the remaining chlorine facilities are able to run at higher capacity utilization rates if necessary to meet increased market demand. Because the chloralkali industry is energy intensive, lower energy prices may allow increased production of chlorine at competitive prices in the world markets and increasing consumption of salt brine as well.

Because salt is a relatively low-value commodity, the shipping cost for oceanic, rail, or truck transportation can be an important determining factor when attempting to secure supply sources from either domestic or foreign locations. As energy prices change, one mode of transportation may be more cost effective than others. Excluding deicing salt, domestic salt consumption may fluctuate but is likely to continue to increase with population growth. U.S. total salt production is expected to be an estimated 48 Mt in 2015.

International Mining (2014) projected salt demand to grow by about 2.7% per year through 2018, with the highest growth rate in Asia. China and the United States are both net importers of salt, and the leading exporters of salt are Australia, Chile, India, and Mexico. Most growth is projected to come from the chemicals sector with world growth in chloralkali consuming an additional 30 Mt of salt through 2018.

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TABLE 1
SALIENT SALT STATISTICS[1]

(Thousand metric tons and thousand dollars)

	2010	2011	2012	2013	2014
United States:					
Production:[2]					
Vacuum and open pans	4,100	4,080	4,240	4,130 r	4,140
Solar	3,120	3,230	2,760	3,580 r	3,900
Rock	17,600	18,500	13,300	14,800 r	20,000
Brine	18,500	19,200	16,900	17,400	17,300
Total	43,300	45,000	37,200	39,900 r	45,300
Sold or used by producers:					
Quantity	43,500	45,500	34,900	43,100 r	46,000
Value	1,690,000	1,770,000	1,460,000	1,980,000 r	2,220,000
Exports:					
Quantity	595	846	809	525	940
Value	69,300	87,500	90,300	88,800	139,000
Imports for consumption:					
Quantity	12,900	13,800	9,880	11,900	20,100
Value	322,000	367,000	292,000	348,000	588,000
Consumption:					
Apparent[3]	55,800	58,500	44,000	54,500 r	65,200
Reported	48,600	48,000	36,900	47,600	55,000
World, production	269,000 r	272,000 r	259,000 r	273,000 r	272,000

rRevised.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Excludes Puerto Rico.
[3]Sold or used plus imports minus exports.

TABLE 2
U.S. SALT COMPANIES BY PRODUCTION CAPACITY, LOCATION, AND TYPE IN 2014[1]

(Thousand short tons)

Company	Vacuum and open pans	Solar	Rock	Brine
American Rock Salt Co., Hampton Corners, NY	--	--	4,500	--
Axiall Corp.:				
Lake Charles, LA	--	--	--	(2)
New Martinsville, WV	--	--	--	(2)
California Supreme Salt, LLC, Twentynine Palms, CA	--	15	--	--
Cargill, Inc.:				
Akron, OH	350	--	--	(2)
Avery Island, LA	--	--	2,700	(2)
Breaux Bridge, LA	200	--	--	--
Cleveland, OH	--	--	4,000	--
Freedom, OK	--	300	--	--
Hersey, MI[3]	300	--	--	--
Lake Point, UT	--	800	--	--
Lansing, NY	--	--	2,400	--
Hutchinson, KS	450	--	--	--
Newark, CA	150	750	--	(2)
St. Clair, MI	425	--	--	--
Watkins Glen, NY	450	--	--	--
Corpus Christi Brine Services, Inc., Benavides, TX	--	--	--	(2)
Detroit Salt Co. LLC, Detroit, MI	--	--	1,500	--
Dow Chemical Co., The:				
Freeport, TX	--	--	--	(2)
Plaquemine, LA	--	--	--	(2)
E.I. du Pont de Nemours and Co., New Johnsonville, TN	230	--	--	--
Huck Salt Co., Fallon, NV	--	--	20	--
Hutchinson Salt Co., Hutchinson, KS	--	--	750	--
Independent Salt Co., Kanopolis, KS	--	--	750	--
Key Energy Services, LLC, Hobbs, NM	--	--	--	(2)
Lyons Salt Co., Lyons, KS	--	--	600	--
Moab Salt, Inc., Moab, UT	--	250	--	--
Morton International, Inc.:				
Fairport, OH	--	--	2,000	--
Glendale, AZ	--	150	--	--
Grand Saline, TX	150	--	400	--
Grantsville, UT	--	500	--	--
Manistee, MI	360	--	--	--
Rittman, OH	600	--	--	--
Silver Springs, NY	375	--	--	(2)
South Hutchinson, KS	350	--	--	--
Weeks Island, LA	--	--	1,800	(2)
New Mexico Salt and Mineral Corp., Loving, NM	--	100	--	--
North American Salt Co.:[4]				
Cote Blanche, LA	--	--	3,500	--
Lyons, KS	425	--	--	--
Ogden, UT[5]	--	1,500	--	--
Occidental Chemical Corp., Wichita, KS	--	--	--	(2)
Olin Corp., McIntosh, AL	--	--	--	(2)
PB Energy Storage, Inc.:[6]				
Dale, NY	--	--	--	(2)
Napoleonville, LA	--	--	--	(2)
Redmond Clay & Salt Co., Inc., Redmond, UT	--	--	150	--
Searles Valley Minerals, Inc., Trona, CA	--	200	--	--
South Bay Salt Works, Chula Vista, CA	--	125	--	--
Tetra Technologies, Inc., Amboy, CA	--	75	--	--

See footnotes at end of table.

TABLE 2—Continued
U.S. SALT COMPANIES BY PRODUCTION CAPACITY, LOCATION, AND TYPE IN 2014[1]

(Thousand short tons)

Company	Vacuum and open pans	Solar	Rock	Brine
Texas Brine Corp.:				
Beaumont, TX	--	--	--	(2)
Chacahoula, LA	--	--	--	(2)
Clemville, TX	--	--	--	(2)
Corpus Christi, TX	--	--	--	(2)
Houston, TX	--	--	--	(2)
LaPorte, TX	--	--	--	(2)
Wyoming, NY	--	--	--	(2)
US Salt L.L.C., Watkins Glen, NY	335	--	--	(2)
Union Texas Products Corp., Plaquemine, LA	--	--	--	(2)
United Salt Corp.:				
Baytown, TX	400	--	--	(2)
Carlsbad, NM	--	400	--	--
Hockley, TX	--	--	150	--
Saltville, VA	200	--	--	--
Total production capacity	5,750	5,170	25,200	17,300

-- Zero.

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

[2]Includes brine for sale and for captive use. Individual brine capacity is assumed to be equal to the quantity of annual brine production, and therefore, considered company proprietary data. Brine producers include those chloralkali producers that produce captive brine and companies that supply brine for chloralkali manufacture, oilfield chemicals, and so forth. Total brine production capacity is the quantity of brine produced for the year.

[3]Cargill, Inc. purchased in 2014.

[4]Owned by Compass Minerals, Inc.

[5]Owned by Compass Minerals; operated by Great Salt Lake Minerals Corp.

[6]Associated with Texas Brine Corp.

Source: U.S. Geological Survey.

TABLE 3
SALT PRODUCED IN THE UNITED STATES, BY TYPE AND PRODUCT FORM[1]

(Thousand metric tons)

Product form	Vacuum and open pans	Solar	Rock	Brine	Total
2013:					
Bulk	1,010 r	2,700 r	14,600	17,400	35,700 r
Compressed pellets	1,190	351	XX	XX	1,550
Packaged	1,810	455	231 r	XX	2,500
Pressed blocks	123	73 r	52	XX	247 r
Total	4,130 r	3,580 r	14,800 r	17,400	39,900 r
2014:					
Bulk	827	2,900	19,600	17,300	40,600
Compressed pellets	1,200	354	XX	XX	1,550
Packaged	2,000	566	310	XX	2,880
Pressed blocks	115	76	43	XX	234
Total	4,140	3,900	20,000	17,300	45,300

rRevised. XX Not applicable.

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

TABLE 4
SALT SOLD OR USED IN THE UNITED STATES, BY TYPE AND PRODUCT FORM[1, 2]

(Thousand metric tons and thousand dollars)

Product form	Vacuum and open pans		Solar		Rock		Brine		Total	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
2013:										
Bulk	772 r	82,000 r	2,120 r	100,000 r	17,900 r	820,000 r	17,400	148,000	38,200 r	1,150,000 r
Compressed pellets	1,220	202,000	418	64,500	XX	XX	XX	XX	1,640	267,000
Packaged:										
Less-than-5-pound units	238	NA	15	NA	146 r	NA	XX	XX	399 r	XX
More-than-5-pound units	1,730 r	NA	666	NA	169 r	NA	XX	XX	2,570 r	XX
Total	1,970 r	398,000 r	681	86,200 r	315 r	41,700 r	XX	XX	2,970 r	526,000 r
Pressed blocks:										
For livestock	83 r	NA	53	NA	35	NA	XX	XX	171 r	XX
For water treatment	43 r	NA	61 r	NA	19	NA	XX	XX	123 r	XX
Total	126 r	17,000 r	114 r	16,700 r	54	7,310	XX	XX	294 r	40,900 r
Grand total	4,090 r	699,000 r	3,330 r	268,000 r	18,300	869,000 r	17,400	148,000	43,100 r	1,980,000 r
2014:										
Bulk	811	97,900	2,370	126,000	20,300	949,000	17,500	159,000	41,000	1,330,000
Compressed pellets	1,250	221,000	423	67,300	XX	XX	XX	XX	1,670	289,000
Packaged:										
Less-than-5-pound units	226	NA	16	NA	1	NA	XX	XX	242	XX
More-than-5-pound units	1,680	NA	766	NA	430	NA	XX	XX	2,880	XX
Total	1,910	398,000	781	107,000	431	50,100	XX	XX	3,120	555,000
Pressed blocks:										
For livestock	75	NA	57	NA	16	NA	XX	XX	148	XX
For water treatment	34	NA	61	NA	21	NA	XX	XX	116	XX
Total	109	15,700	117	16,600	37	10,000	XX	XX	264	42,300
Grand total	4,080	733,000	3,700	317,000	20,800	1,010,000	17,500	159,000	46,000	2,220,000

rRevised. NA Not available. XX Not applicable.

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

[2]As reported at salt production locations, the term "sold or used" indicates that some salt, usually salt brine, is not sold but is used for captive purposes by the plant or company. Because data do not include salt imported, purchased, and (or) sold from inventory from regional distribution centers, salt sold or used by type may differ from totals shown in tables 5 and 6, which are derived from company totals.

TABLE 5
SALT SOLD OR USED BY PRODUCERS IN THE UNITED STATES, BY STATE[1, 2]

(Thousand metric tons and thousand dollars)

State	2013		2014	
	Quantity	Value	Quantity	Value
Kansas	2,650	174,000	2,930	194,000
Louisiana	14,300	318,000	14,800	344,000
New York	7,120 r	502,000 r	7,740	577,000
Texas	7,770	166,000	8,010	182,000
Utah	2,040	157,000 r	2,360	194,000
Other Eastern States[3]	7,720	516,000	8,610	565,000
Other Western States[4]	1,550	151,000	1,600	161,000
Total	43,100 r	1,980,000 r	46,000	2,220,000
Puerto Rico[e]	45	1,500	45	1,720

eEstimated. rRevised.

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

[2]The term "sold or used" indicates that some salt, usually salt brine, is not sold but is used for captive purposes by the plant or company.

[3]Includes Alabama, Michigan, Ohio, Tennessee, Virginia, and West Virginia.

[4]Includes Arizona, California, Nevada, New Mexico, and Oklahoma.

TABLE 6

DISTRIBUTION OF DOMESTIC AND IMPORTED SALT BY PRODUCERS IN THE UNITED STATES, BY END USE AND TYPE[1, 2]

(Thousand metric tons)

End use	Vacuum and open pans		Solar		Rock		Brine		Total[3]	
	2013	2014	2013	2014	2013	2014	2013	2014	2013	2014
Chemical:										
Chloralkali producers	49	46	303	346	608	554	15,700	16,700	16,700	17,600
Other chemical	318	323	195	156	712	1,000	69	678	1,290 r	2,160
Total	368	369	498	502	1,320	1,560	15,800	17,400	18,000	19,800
Food-processing industry:										
Meat packers	194	183	36	40	28	17	--	--	258 r	240
Dairy	150	145	14	14	6	4	--	--	170 r	163
Canning	157	152	19	15	3	4	--	--	179	171
Baking	147	143	5	6	10	9	--	--	162	158
Grain mill products	99	101	10	11	10	8	--	--	119	120
Other food processing	649	628	119	147	110	131	4	1	882	907
Total	1,400	1,350	203	233	167	174	4	1	1,770	1,760
General industrial:										
Textiles and dyeing	17	14	20	21	2	3	--	--	39 r	38
Metal processing	4	4	13	12	25	40	(4)	--	42	56
Rubber	2	2	(4)	1	3	3	(4)	(4)	5 r	6
Oil and gas	85	96	214	214	67	70	43	20	409	400
Pulp and paper	7	7	35	40	24	24	--	--	66	71
Tanning and (or) leather	2	1	10	14	26	24	--	--	38	39
Other industrial	71	97	59	55	273	209	7	13	410	374
Total	188	222	351	356	421	374	50	34	1,010	986
Agricultural:										
Feed retailers and (or) dealers mixers	254	251	207	185	452	503	--	--	913 r	939
Feed manufacturers	106	86	126	121	284	307	--	--	516	514
Direct-buying end user	5	26	6	18	58	91	--	--	69	135
Total	365	364	339	324	794	901	--	--	1,500	1,590
Water treatment:										
Government (Federal, State, local)	78	81	124	123	72	155	1	1	274 r	360
Commercial or other	39	40	93	83	65	118	1	2	198	243
Total	117	121	217	206	137	273	2	3	473	603
Ice control and (or) stabilization:										
Government (Federal, State, local)	3	3	476 r	1,330	14,500	15,400	-- r	--	14,900	16,800
Commercial or other	62	56	183	330	5,200	7,310	--	--	5,440	7,690
Total	65	59	659	1,660	19,700	22,700	-- r	--	20,400	24,500
Distributors:										
Agricultural	89	86	136	147	126	156	--	--	351	389
Grocery wholesalers and (or) retailers	401	409	171	170	93	129	(4)	(4)	665	708
Institutional wholesalers and end users	146	154	68	72	97	85	(4)	(4)	311	311
Water-conditioning	175	176	314	318	137	9	1	1	627 r	504
U.S. Government resale	(4)	(4)	(4)	(4)	(4)	(4)	--	--	-- r	(4)
Other wholesalers and (or) retailers	966 r	1,090	895 r	991	131	472	(4)	1	1,990 r	2,550
Total	1,780 r	1,910	1,580 r	1,700	584	851	2	2	3,950 r	4,460
Other[5]	122	121	214	192	4	1,000	183	64	523 r	1,380
Grand total	4,400 r	4,520	4,070	5,170	23,100	27,900	16,000	17,500	47,500 r	55,000

rRevised. -- Zero.

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

[2]The quantity of imports included in the total for each type of salt is the amount reported by the U.S. salt industry, not the quantity reported by the U.S. Census Bureau that appears in tables 1, 9, 10, 11, and 12.

[3]Because data include salt imported, produced, and (or) sold from inventory from regional distribution centers, data for salt sold or used by type may differ from totals shown in tables 1, 3, and 4, which are derived from plant reports at salt production locations. Data from these tables may differ from totals shown in table 6 because of changes in inventory and (or) incomplete reporting.

[4]Less than ½ unit.

[5]Includes exports.

TABLE 7
DISTRIBUTION OF DOMESTIC AND IMPORTED EVAPORATED AND ROCK SALT IN THE UNITED STATES, BY DESTINATION[1, 2]

(Thousand metric tons)

	2013				2014			
	Evaporated				Evaporated			
Destination	Vacuum and open pans	Solar	Rock	Total	Vacuum and open pans	Solar	Rock	Total
Alabama	48	10	53	111	48	12	51	111
Alaska	2	2	(3)	4	1	3	(3)	4
Arizona	43	73	1	117	48	72	1	121
Arkansas	48	5	50	103	46	7	89	142
California	261	713	2	976	256	681	67	1,000
Colorado	23	71	34	128	25	96	37	158
Connecticut	17	12	101	130	16	74	201	291
Delaware	7	7	2	16	7	11	8	26
District of Columbia	(3)	6	--	6	(3)	13	7	20
Florida	134	147	47	328	129	160	86	375
Georgia	121	83	49	253	124	92	109	325
Hawaii	1	2	--	3	1	2	--	3
Idaho	25	95	12	132	26	104	2	132
Illinois	297	148	2,220	2,670	358	125	2,950	3,430
Indiana	242	110	774	1,130	243	117	929	1,290
Iowa	124	101	454	679	125	105	551	781
Kansas	78	46	827	951	76	42	970	1,090
Kentucky	72	5	833	910	74	5	1,130	1,210
Louisiana	89	7	171	267	99	7	173	279
Maine	15	3	93	111	19	55	102	176
Maryland	71	131	98	300	72	293	256	621
Massachusetts	35	10	337	382	40	16	389	445
Michigan	264	33	2,330	2,630	258	57	2,690	3,010
Minnesota	107	191	970	1,270	111	177	868	1,160
Mississippi	19	16	122	157	18	17	146	181
Missouri	105	82	439	626	107	92	638	837
Montana	2	45	(3)	47	2	44	(3)	46
Nebraska	53	44	27	124	56	46	27	129
Nevada	11	215	28	254	12	204	29	245
New Hampshire	13	7	96	116	11	7	155	173
New Jersey	92	33	161	286	90	146	216	452
New Mexico	24	198	(3)	222	22	235	(3)	257
New York	156	29	3,200	3,380	174	36	3,590	3,800
North Carolina	138	65	93	296	127	125	110	362
North Dakota	11	18	7	36	8	16	7	31
Ohio	419	45	2,790	3,260	443	57	3,480	3,980
Oklahoma	28	24	75	127	26	26	106	158
Oregon	31	40	1	72	28	50	1	79
Pennsylvania	200	136	2,260	2,600	207	212	2,520	2,940
Rhode Island	3	1	1	5	3	1	47	51
South Carolina	45	13	2	60	44	14	35	93
South Dakota	26	48	17	91	26	48	6	80
Tennessee	87	5	272	364	109	6	584	699
Texas	345	168	142	655	328	183	150	661
Utah	35	267	125	427	29	161	53	243
Vermont	4	1	319	324	3	1	374	378
Virginia	82	25	188	295	98	96	351	545
Washington	43	89	(3)	132	34	223	(3)	257
West Virginia	22	5	266	293	33	6	373	412
Wisconsin	202	201	2,270	2,680	204	177	2,110	2,490
Wyoming	10	20	1	31	9	21	1	31
Other[4]	67 r	216 r	710	993 r	65	592	1,110	1,760
Total[5]	4,400 r	4,070 r	23,100	31,500 r	4,520	5,170	27,900	37,600

See footnotes at end of table.

TABLE 7—Continued
DISTRIBUTION OF DOMESTIC AND IMPORTED EVAPORATED AND ROCK SALT IN THE UNITED STATES, BY DESTINATION[1, 2]

[r]Revised. -- Zero.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Each type of salt includes domestic and imported quantities. Brine is excluded because it is not shipped out of State.
[3]Less than ½ unit.
[4]Includes exports and shipments to overseas areas administered by the United States, Puerto Rico, and unspecified destinations.
[5]Because data include salt imported, purchased, and (or) sold from inventory from regional distribution centers, data for evaporated and rock salt distributed by State may differ from totals shown in tables 1 and 3, which are derived from plant reports at salt production locations. Data may differ from totals shown in table 5 because of changes in inventory and (or) incomplete reporting.

TABLE 8
AVERAGE VALUE OF SALT, BY PRODUCT FORM AND TYPE[1]

(Dollars per metric ton)

Product form	Vacuum and open pans	Solar	Rock	Brine
2013:				
Bulk	106.22 [r]	47.33 [r]	45.72 [r]	8.49
Compressed pellets	165.57 [r]	154.34 [r]	XX	XX
Packaged	202.06 [r]	126.59 [r]	132.24 [r]	XX
Average[2]	172.09 [r]	78.04 [r]	47.22 [r]	8.49
Pressed blocks	134.60 [r]	146.07 [r]	135.33 [r]	XX
2014:				
Bulk	120.75	53.09	46.67	9.08
Compressed pellets	177.10	159.12	XX	XX
Packaged	208.44	136.82	116.21	XX
Average[2]	180.61	83.90	48.11	9.08
Pressed blocks	142.68	140.92	270.13	XX

[r]Revised. XX Not applicable.
[1]Net selling value, free on board plant, excluding container costs.
[2]Salt value data reported prior to 1984 were an aggregate value per metric ton of bulk, compressed pellets, and packaged salt. For time series continuity, an average of these three types of product forms is presented that is based on the aggregated values and quantities of the product form for each type of salt listed in table 3.

TABLE 9
U.S. EXPORTS OF SALT, BY COUNTRY[1]

(Thousand metric tons and thousand dollars)

Country	2013		2014	
	Quantity	Value[2]	Quantity	Value[2]
Australia	1	558	1	871
Bahamas, The	1	506	1	495
Bahrain	1	384	1	338
Brazil	5	1,810	6	4,020
Canada	434	52,900	809	62,400
China	2	1,000	31	16,300
Colombia	2	549	1	599
Costa Rica	2	520	2	542
Dominican Republic	1	319	1	326
El Salvador	1	147	1	117
Germany	2	1,060	1	747
Honduras	1	243	1	155
Hong Kong	3	439	(3)	547
Ireland	1	522	1	1,030
Japan	2	3,110	2	4,410
Korea, Republic of	1	442	1	667
Kuwait	1	254	(3)	114
Mexico	35	9,920	44	14,800
Netherlands	1	651	1	875
Panama	1	197	1	233
Saudi Arabia	6	2,140	7	3,110
Singapore	3	966	3	4,230
Taiwan	1	1,180	(3)	1,090
United Arab Emirates	2 r	774 r	2	782
United Kingdom	2	784	2	862
Other	13 r	7,480 r	20	19,100
Total	525	88,800	940	139,000

rRevised.

[1]Data are rounded to no more than three significant digits; may not add to totals shown. (The Harmonized Tariff Schedule of the United States code for salt is 2501.00.0000.)

[2]Free alongside ship value at U.S. ports.

[3]Less than ½ unit.

Source: U.S. Census Bureau.

TABLE 10
U.S. EXPORTS OF SALT, BY CUSTOMS DISTRICT[1]

(Thousand metric tons and thousand dollars)

District	2013		2014	
	Quantity	Value[2]	Quantity	Value[2]
Anchorage, AK	3	1,090	3	948
Baltimore, MD	1	387	(3)	258
Buffalo, NY	97	11,400	35	7,540
Charleston, SC	(3)	251	(3)	606
Chicago, IL	1	479	1	354
Cleveland, OH	113	12,100	395	18,300
Detroit, MI	47	9,100	149	13,300
El Paso, TX	2	374	2	384
Great Falls, MT	3	845	5	1,430
Houston, TX	13	4,480	15	5,720
Laredo, TX	27	7,690	25	9,150
Los Angeles, CA	7	5,910	35	25,000
Miami, FL	4	2,270	4	2,170
New Orleans, LA	2	547	12	3,180
New York, NY	14	5,360	17	16,600
Nogales, AZ	4	846	4	1,560
Norfolk, VA	2	1,760	3	4,380
Ogdensburg, NY	20	3,690	19	3,580
Pembina, ND	8	1,700	10	1,400
Philadelphia, PA	1	680	1	436
San Diego, CA	3	1,010	2	1,060
San Francisco, CA	6	1,220	4	2,310
Savannah, GA	1	404	1	755
Seattle, WA	12	3,070	8	2,750
St. Albans, VT	5	806	6	869
Other[4]	129	11,300	184	14,700
Total	525	88,800	940	139,000

[1]Data are rounded to no more than three significant digits; may not add to totals shown. (The Harmonized Tariff Schedule of the United States code for salt is 2501.00.0000.)

[2]Free alongside ship value at U.S. ports.

[3]Less than ½ unit.

[4]Unknown but assumed to be rail and (or) truck shipments to Canada through various points of departure. Also includes minor shipments through 19 other customs districts.

Source: U.S. Census Bureau.

TABLE 11
U.S. IMPORTS FOR CONSUMPTION OF SALT, BY COUNTRY[1]

(Thousand metric tons and thousand dollars)

	2013		2014	
Country	Quantity	Value[2]	Quantity	Value[2]
Australia	44	1,990	127	4,640
Bahamas, The	630	24,900	1,010	33,500
Belgium	4	1,330	5	1,410
Brazil	(3)	165	268	7,840
Canada	4,960	157,000	5,800	191,000
Chile	3,900	69,300	7,890	167,000
China	20	2,770	21	2,570
Colombia	3	925	26	964
Cyprus	(3)	175	1	935
Egypt	89	1,840	560	18,000
France	10	6,300	13	6,090
Germany	7	1,380	111	5,730
India	(3)	553	(3)	215
Israel	14	6,280	66	10,100
Italy	43	3,260	158	7,030
Japan	1	61	(3)	76
Korea, Republic of	22	2,340	43	2,270
Mexico	1,530	39,000	2,390	71,000
Netherlands	248	7,380	257	7,770
New Zealand	19	136	1	159
Pakistan	31	3,070	56	4,390
Peru	244	3,720	722	11,300
South Africa	21	1,810	5	1,320
Spain	7	2,140	176	8,890
Switzerland	(3)	12	(3)	7
United Kingdom	1	1,870	2	2,130
Vietnam	3	646	52	577
Other	49	8,030	381	21,400
Total	11,900	348,000	20,100	588,000

[1]Data are rounded to no more than three significant digits; may not add to totals shown. (The Harmonized Tariff Schedule of the United States code for salt is 2501.00.0000.)

[2]Customs value only.

[3]Less than ½ unit.

Source: U.S. Census Bureau.

TABLE 12
U.S. IMPORTS OF SALT, BY CUSTOMS DISTRICT[1]

(Thousand metric tons and thousand dollars)

District	2013		2014	
	Quantity	Value[2]	Quantity	Value[2]
Anchorage, AK	18	749	18	687
Baltimore, MD	820	22,100	1,800	45,300
Boston, MA	1,500	25,400	2,120	42,300
Buffalo, NY	178	4,120	91	3,950
Charleston, SC	101	2,290	151	2,830
Chicago, IL	603	17,500	1,130	31,200
Cleveland, OH	328	9,090	370	13,900
Columbia-Snake, OR	191	6,330	136	4,890
Dallas-Fort Worth, TX	(3)	48	(3)	154
Detroit, MI	1,170	25,900	1,830	49,200
Duluth, MN	40	3,840	134	12,900
Great Falls, MT	3	536	(3)	87
Houston-Galveston, TX	10	1,490	6	1,970
Laredo, TX	242	3,650	297	3,320
Los Angeles, CA	169	7,540	195	6,340
Miami, FL	1	525	2	750
Milwaukee, WI	1,600	36,900	1,420	31,400
Minneapolis, MN	425	9,220	334	6,740
Mobile, AL	4	3,870	9	5,600
New Orleans, LA	1	203	2,140	69,900
New York, NY	1,700	44,500	3,230	80,000
Nogales, AZ	157	2,000	72	1,200
Norfolk, VA	137	8,890	236	10,700
Ogdensburg, NY	141	42,600	96	40,900
Pembina, ND	22	2,030	83	5,670
Philadelphia, PA	794	20,700	2,070	51,000
Portland, ME	638	13,400	1,090	22,400
Providence, RI	223	6,120	257	6,730
San Diego, CA	112	2,060	57	2,510
San Francisco, CA	115	3,140	97	3,180
San Juan, PR	5	1,100	27	1,110
Savannah, GA	52	2,860	52	3,210
Seattle, WA	92	4,420	85	4,560
St. Albans, VT	37	449	41	2,570
St. Louis, MO	(3)	66	2	27
Tampa, FL	240	11,300	314	13,000
Wilmington, NC	23	1,310	147	6,020
Other[4]	8	34	(3)	82
Total	11,900	348,000	20,100	588,000

[1]Data are rounded to no more than three significant digits; may not add to totals shown. (The Harmonized Tariff Schedule of the United States code for salt is 2501.00.0000.)

[2]Customs value only.

[3]Less than ½ unit.

[4]Includes imports through six other customs districts.

Source: U.S. Census Bureau.

TABLE 13
SALT: WORLD PRODUCTION, BY COUNTRY[1, 2]

(Thousand metric tons)

Country[3]	2010	2011	2012	2013	2014
Afghanistan, rock	186	186 r, e	147 r	124 r	35
Algeria, brine and sea	107	238	178 r	173 r	193
Angola[e]	50	40	40	40	40
Argentina	1,532	1,889	1,844	1,652 r	1,500 e
Armenia	29	36	38	31 r	30
Australia	11,540 r	12,250 r	12,500 r	12,900 r	13,000
Austria, mine output	1,083	1,143	958	1,115 r	1,154
Azerbaijan, marketable	4	5 r	5	5 r	5
Bangladesh, sea[4]	1,409	1,430 r	1,439 r	1,439 r	1,461
Belarus	2,412	2,576	2,177	2,625 r	2,510 e
Bolivia, rock	1	2	2	2	2
Bosnia and Herzegovina	663	834	862	857 r	921
Botswana[5]	365	447	389 r	521 r	515
Brazil:					
Rock	1,415	1,335	1,403	1,349 r	1,300 e
Sea	5,615	4,829	6,079	5,926 r	6,000 e
Total	7,030	6,164	7,482	7,275 r	7,300 e
Bulgaria	1,900	2,200	2,100	2,100	2,200 e
Burma, brine[e]	97 [6]	100	100	100	100
Canada	10,537	12,625	10,845	12,210	13,876
Chile	7,695	9,966	8,057	6,577	10,533
China	70,380	67,420	69,120	73,676 r	70,497
Colombia:					
Rock	289	306	229	319 r	340
Sea	140	152	78	113 r	106
Total	428	458	307	432 r	446
Croatia	67 r	56 r	46 r	43 r	33
Cuba	272	281	216 r	222 r	243
Denmark[e]	601 [6]	600	600	600	600
Djibouti[e]	12	8	4	1 r	1
Egypt	2,460	2,809 r	2,802 r	2,194 r	2,200 e
Eritrea, sea[e]	120 r	180	240	290	290
Ethiopia, rock[e, 4]	330 [6]	388 [6]	440	470 r	450
France	5,867	5,430 e	5,457	5,893 r	5,809
Georgia[e]	30	28	29	30 r	28
Germany:					
Evaporated, includes sea	322	329	301 r	297 r	274
Industrial brines	8,752	8,066	7,515 r	8,073 r	7,709
Rock and other brines	10,602	9,048	6,840 r	9,026 r	5,355
Total	19,676	17,443	14,656 r	17,396 r	13,338
Ghana[e]	85 [6]	250 r	250 r	250 r	250
Greece	164 r	175	192	190	146
Guatemala[e]	50	50	50	50	50
India:[e]					
Rock	1	2	2	2	3
Other	17,000	16,000	17,000	18,000 r	17,000
Total	17,000	16,000	17,000	18,000 r	17,000
Indonesia	600	650	700	720	720
Iran[7]	3,354 r	2,776 r	2,962 r	2,079 r	2,100 e
Iraq	102	136	143	182 r	180 e
Israel, marketed	421	410	415	442 r	460
Italy[8]	4,006	2,912	3,098	2,879 r	1,501
Japan	1,138 r	1,153 r	1,077 r	1,052 r	1,000 e

See footnotes at end of table.

TABLE 13
SALT: WORLD PRODUCTION, BY COUNTRY[1, 2]—Continued

(Thousand metric tons)

Country[3]	2010	2011	2012	2013	2014
Jordan:					
Brine	33	32	32	32	32
Dead Sea[9]	1	1	1	1	1
Total	34	33	33	33	33
Kazakhstan	276	364	464	531 r	597
Kenya, refined	242 r	254 r	231 r	207 r	223
Korea, North	500	500	500	500	500
Korea, Republic of	223	372	309	421 r	304
Kuwait[e]	14	15	15	15	14
Kyrgyzstan[e]	1	1	1	1	1
Laos, rock	13	23	12	6 r	9
Lebanon[e]	20	20	20	15 r	15
Libya[e]	40	20	30	30	30
Madagascar[e]	78	85	85	85	85
Malta, solar[e]	1 r	1 r	1 r	1 r	1
Mauritania	(10)	1	1	1 e	1 e
Mauritius, sea[e]	1 [6]	4	4	4	4
Mexico	8,430	8,812	8,730 r	9,461 r	10,251
Mongolia, mine output	2	2	2	2 r	2
Montenegro, sea water evaporate	11	10	16	10 r	--
Morocco:					
Rock	503	721	730	489 r	439
Sea	20	25	25	20 r	20
Total	523	746	755	509 r	459
Mozambique, sea[e]	145 r	150 r	150 r	150 r	160
Namibia, sea	771	738	810 r	827 r	797
New Zealand[e]	95	95	95 r	100	100
Niger[e]	30	30	30	30	30
Oman[e]	12	12	13	12 r	13
Pakistan:[5]					
Rock	1,941 r	2,173 r	2,091 r	2,263 r	2,241
Sea	190	315	292 r	297 r	300
Total	2,131 r	2,488 r	2,383 r	2,560 r	2,541
Panama, sea	28	61 r	37 r	61 r	57
Peru	1,570 e	1,565	1,200	2,263 r	2,241
Philippines, sea	558	720	775 r	993 r	1,016
Poland:					
Evaporated	411	415	658 r	686 r	642
Recovered from brine	2,464	2,633	2,891 r	2,735 r	2,800
Rock	1,236 r	1,234	793 r	1,320 r	775
Total	4,111 r	4,282	4,342 r	4,741 r	4,217
Portugal, rock	619	631	520	474 r	400 e
Romania:[e]					
Rock	40	40	40	40	40
Other	2,400	2,500	2,200	2,200	2,200
Total	2,440	2,540	2,240	2,240	2,240
Russia[e]	1,800	1,800	1,850	1,900 r	1,900
Saudi Arabia	1,800	1,890 r	1,611 r	1,900 r	1,990
Senegal	232	258	237	243 r	245
Serbia	31	23	17	14 r	13
Slovakia	-- r	--	--	--	--
Slovenia	1	4	6	3 r	--
South Africa	394	381	399	479 r	494

See footnotes at end of table.

TABLE 13—Continued
SALT: WORLD PRODUCTION, BY COUNTRY[1, 2]

(Thousand metric tons)

Country[3]	2010	2011	2012	2013	2014
Spain:					
Rock	3,116	3,096 r	2,786 r	2,902 r	2,900 e
Sea and evaporated	1,334	1,407 r	1,323 r	1,376 r	1,400 e
Total	4,450	4,503 r	4,109 r	4,278 r	4,300 e
Sri Lanka	74 r	62 r	64 r	37 r	102
Sudan	142	11	26	21 r	37
Switzerland	679 r	501	528	652 r	390
Syria[e]	81 [6]	71 [6]	34 [6]	30 r	30
Tajikistan[e]	52	27	28 [6]	32 r, [6]	32 [6]
Tanzania	34	32	34	34	75
Tunisia, sea	1,804	1,181	1,132	1,146 r	32
Turkey	4,044	6,546	5,255	5,565 r	5,932
Turkmenistan[e]	215	215	220	225 r	230
Uganda[e]	15	15	15	15	15
Ukraine	4,908	5,938	6,189	5,796 r	4,800 e
United Kingdom[11]	6,666	6,060 r	6,152 r	6,601 r	6,600 e
United States, including Puerto Rico:					
United States:					
Brine	18,500	19,200	16,900	17,400	17,300
Rock	17,600	18,500	13,300	14,800 r	20,000
Solar	3,120	3,230	2,760	3,580 r	3,900
Vacuum and open pan	4,100	4,080	4,240	4,130 r	4,140
Total	43,300	45,000	37,200	39,900 r	45,300
Puerto Rico[e]	45	45	45	45	45
Total, United States and Puerto Rico[e]	43,300	45,000	37,200	40,000 r	45,300
Vietnam	975	862	1,178	719 r	766
Yemen[e]	75	75	75	75	75
Grand total	269,000 r	272,000	259,000 r	273,000 r	272,000

[e]Estimated. [r]Revised. -- Zero.

[1]Grand totals, U.S. data, and estimated data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes data available through June 24, 2016.

[3]Salt is produced in Guinea, Iceland, Mali, and Venezuela, but available information is inadequate to make reliable estimates of output levels. Some salt brine production data for manufacture of chlorine, caustic soda, and soda ash are not reported because of incomplete reporting by many countries.

[4]Year ending June 30 of that stated.

[5]From natural soda ash production.

[6]Reported figure.

[7]Year beginning March 21 of that stated.

[8]Does not include production from Sardinia and Sicily, which is estimated to be 200,000 metric tons per year.

[9]Extracted from Dead Sea for therapeutic usage; contains bromide, calcium, chloride, magnesium, and potassium salts.

[10]Less than ½ unit.

[11]Year ending July 15 of that stated.