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Limetstone and Dolomite Resources of Kentucky

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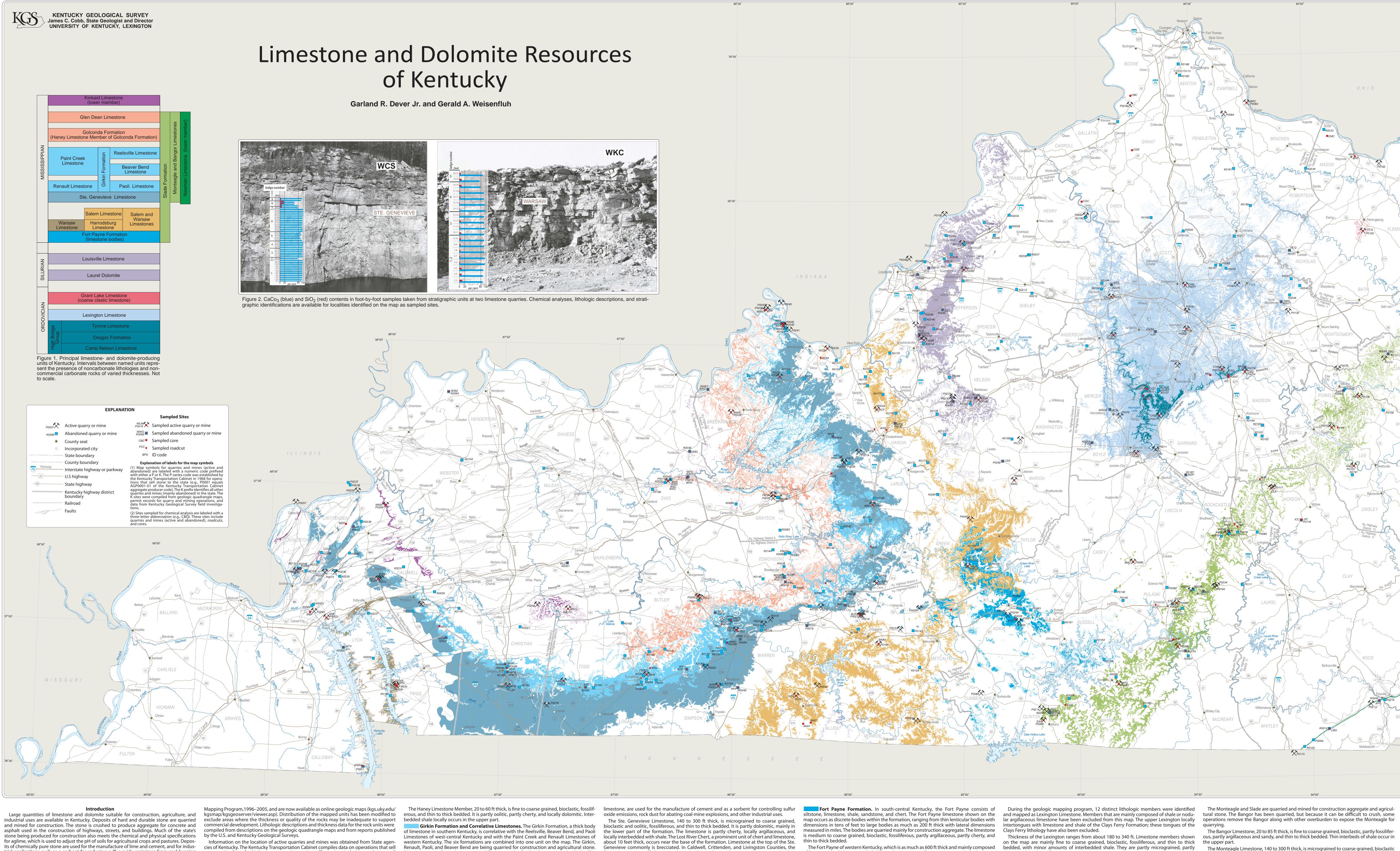
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trial applications such as a sorbent for reducing sulfur oxide emissions from coal-burning stone to the State for highway-construction projects. These sites include most but not all Dimension stone formerly was quarried from intervals of oolitic limestone in the Girkin. The formation consists of three members, in descending order: Levias Limestone Amber of limestone and chert, is excluded from the map. Its surface occurrences along the lower cherty, and partly argillaceous. power plants, rock dust for explosion abatement in underground coal mines, and as fillers. active operations in the state. The Division of Mine Reclamation and Enforcement in underground coal mines, and as fillers. active operations in the upper part. Dimension stone has been quarried from several of the limestone and dolomite units. In 2008, the latest year for which industry statistics are available from the U.S. Geological lates their operation. The location of abandoned operations was compiled from the geologic industrial uses. Survey, production by the stone industry of Kentucky ranked 12th in the nation (U.S. quadrangle maps and the records of field investigations by the Kentucky and the correlative Salem and Warsaw Limestone and dolomite units. The erosion has resulted in Geological Survey, 2008). Ninety-five operations produced 51 million metric tons of sosils. It is used for construction aggregate, skid-resistant aggregate, skid-resistant aggregate, skid-resistant aggregate, railroad outcome of south-central Kentucky and the chemical composition of lime- of south-central Kentucky and the chemical composition of lime- of south-central Kentucky and the chemical composition of lime- outcome of south-central Kentucky and the chemical composition of lime- outcome of south-central Kentucky and the chemical composition of lime- outcome of south-central Kentucky and the chemical composition of lime- outcome of south-central Kentucky and extensive of s valued at \$411 million. At least 60 percent of the production was construction aggregate. stones and chert are Limestones and their potential for industrial uses. Samples generally ous, partly micrograined, partly sandy, and locally argillaceous. Quartz rosettes and chert are Limestones and the upper part of the Salem Limestone are being quarried for construction ballast, riprap, and filter stone. Kentucky led the nation in the production of stone from underground mines in 2008 and it were taken at 1-ft intervals from vertical sections in active and abandoned quarries and common in the lower part. Several thin zones of shale and sandstone occur in the formation. and agricultural stone. The Harrodsburg Limestone was quarried in the past. ranked third in lime production. A western Kentucky quarry was the largest producing mines, cores, and roadcuts. The samples were analyzed at the University of Kentucky from Marion tions were exhausted on the properties, the mines sloped down into the underlying Camp stone unit on the map. They crop out in west-central and northern Kentucky, rocks correlative with these two the samples were analyzed at the University of Kentucky by the the samples were analyzed at the University of Kentucky from Marion to the underlying Camp stone unit on the map. They crop out in west-central and northern Kentucky, rocks correlative with these two the samples were analyzed at the University of Kentucky by the the samples were analyzed at the University of Kentucky by the the samples were analyzed at the University of Kentucky from Marion to the underlying Camp stone underlying Camp stone underlain by a dolomite. The samples were analyzed at the University of Kentucky from Marion to the underlying Camp stone underlain by a dolomite. The samples were analyzed at the University of Kentucky from Marion to the map. They crop out in west-central and northern Kentucky from Marion to the underlying Camp stone underlain by a dolomite. The samples were analyzed at the University of Kentucky from Marion to the underlying Camp stone underlain by a dolomite. The samples were analyzed at the University of Kentucky from Marion to the underlying Camp stone underlain by a dolomite. The samples were analyzed at the University of Kentucky from Marion to the underlying Camp stone underlain by a dolomite. The samples were analyzed at the University of Kentucky from Marion to the underlying Camp stone underlain by a dolomite. The samples were analyzed at the University of Kentucky from Marion to the underlying Camp stone underlain by a dolomite. The samples were analyzed at the University of Kentucky from Marion to the underlying Camp stone underlain by a dolomite. The samples were analyzed at the underlying Camp stone underlain by a dolomite. The operation in the United States for several years.

Map of Stone Resources The map shows the surface distribution of limestone and dolomite units that are sources iron oxide (Fe₂O₃), sulfur (S), and phosphorus (P). of commercial stone in Kentucky and the principal highways and rail lines of the state's transportation network. Active stone-producing guarries and mines and abandoned operations are located on the map. Sites sampled for chemical analysis are indicated by red symbols; Kinkaid Limestone. The Kinkaid consists of three members. The lower member, these include active and abandoned quarries and mines, cores, and roadcuts. The geologic composed of limestone, is mined and quarried in western Kentucky, mainly for construction formations on the map range in age from Ordovician to Mississippian (Fig. 1) and are aggregate. The limestone, which averages about 30 ft in thickness, is very fine to medium described below.

Stone is produced from the surface deposits by open-pit quarries. The surface deposits and contains distinctive algal balls. The upper part of the lower member is more argillaceous, extend into the subsurface where stone resources are developed by drift and slope mines. partly dolomitic, and thinner bedded with interbedded shale. Middle and upper members of Multiple factors influence the siting of a stone-producing operation, including the geologic the Kinkaid are excluded from the map. They are composed of shale, sandstone, and limecharacteristics of a limestone or dolomite deposit, proximity to markets and the transporta- stone, and commonly are partly to completely absent across the region because of tion network, planning and zoning laws, competing land uses, and public perception of such pre-Pennsylvanian erosion. operations.

commodity from the producing mine or guarry to its market. Transportation of stone within construction stone. They are combined into one unit on the map, which shows their outcrop Kentucky is mainly by truck. Rail has been used for some projects. Operations along the Ohio, extending from Meade County southward across the Rough Creek Fault System into Logan Tennessee, and Cumberland Rivers ship stone by barge to both out-of-state markets and County. Outcrops of these units west of Logan County are excluded from the map because in-state sites.

The geologic units shown on the map were compiled from 1:24,000-scale geologic quadrangle maps produced by the U.S. Geological Survey–Kentucky Geological Survey cooperative areal geologic mapping program from 1960–1978. These maps have been digitized into a seamless spatial database with funds provided by the National Cooperative Geologic

Kentucky Department for Natural Resources issues permits for quarries and mines, and regu-calcium limestone (95 percent or more CaCO₃), which is potentially suitable for various Member (170–260 ft thick). Mining Engineering Laboratory of the College of Engineering, the Center for Applied Energy of sandstone and shale. As the intervening sandstone and shale thin and pinch out south- limestone is fine to coarse grained, bioclastic, pelletal, fossiliferous, and thin to thick bedded. **Rock Unit Descriptions**

grained, slightly argillaceous, locally cherty, and medium to thick bedded. It is fossiliferous Glen Dean and Haney Limestones. The Glen Dean Limestone and Haney Lime-A major factor in determining the price of stone is the cost of transporting this bulk stone Member of the Golconda Formation are guarried in western Kentucky, mainly for

of increased amounts of shale and sandstone, and the thinning of limestones. The Glen Dean Limestone, 30 to 100 ft thick, consists of limestone and shale. The limestone is fine to coarse grained, bioclastic, commonly very fossiliferous, and thin to thick bedded. It is locally oolitic and partly cherty. Shale is common to abundant in the upper part of the formation and occurs interbedded with limestone in the lower part.

10 to 35 ft thick, both are fine to coarse grained, bioclastic, partly fossiliferous, partly oolitic, crystalline, calcareous, argillaceous, and locally geodiferous. stone, 20 to 50 ft thick, is micrograined to medium grained, bioclastic, fossiliferous, partly oolitic, locally cherty, and thin to thick bedded. It is sandy and shaly at the base, with interbedded shale near the middle. In the area where the Beaver Bend and Paoli have merged, their combined thickness reaches as much as 95 ft. The Paint Creek and Renault Limestones of western Kentucky also are separated by a formation composed of sandstone and shale. As it thins and pinches out eastward, the Paint

120 ft thick, is fine to coarse grained, bioclastic and oolitic, fossiliferous, locally cherty, locally argillaceous, sparsely dolomitic, and thin to thick bedded. Shale is common in the middle and upper parts. The formation is excluded from the map in the area northwest of Caldwell County, where the Paint Creek is mainly shale and sandstone. The Renault Limestone, 50 to 125 ft thick, is micrograined to coarse grained, bioclastic, fossiliferous, partly oolitic, partly argillaceous, locally cherty, and thin to thick bedded. Shale and argillaceous limestone occur in the middle and at the top of the formation in parts of the area.

Ste. Genevieve Limestone. The Ste. Genevieve of western Kentucky crops out in a semicircular belt extending from Meade County southward into Warren County and westward toward Livingston County. In Caldwell, Crittenden, and Livingston Counties, outcrops occur mainly in isolated fault blocks. Faulting also controls surface distribution of the formation in Grayson and Ohio Counties. Ste. Genevieve limestone is guarried and mined for construction, agriculture, and industrial uses. Intervals of high-calcium stone, mainly oolitic The Ste. Genevieve Limestone, 140 to 300 ft thick, is micrograined to coarse grained, map occurs as discrete bodies within the formation, ranging from thin lenticular bodies with lar argillaceous limestone have been excluded from this map. The upper Lexington locally operations remove the Bangor along with other overburden to expose the Monteagle for

Research, and the KGS laboratory during the various programs. Analyzed constituents were ward from the Ohio River, the three limestones and areal extent of the two formations have been affected (95 percent or more CaCO₃ + MgCO₃) and high-calcium stone in the Camp Nelson. Dimencalcium carbonate (CaCO₃), magnesium carbonate (MgCO₃), silica (SiO₂), alumina (Al₂O₃), Gravson Counties. The Reelsville Limestone, 5 to 50 ft thick, and the Beaver Bend Limestone, 5 to 50 ft thick, and the Beaver Bend Limestone, 5 to 50 ft thick, mainly occurs in the lower part of the formation. Dolomite is finely by pre-Middle Devonian erosion. The Laurel is quarried and mined for construction aggre- sion stone formerly was quarried from the Tyrone and Oregon. and thin to thick bedded. Interbedded shale occurs in the two formations. The Paoli Lime- The Harrodsburg Limestone, 10 to 60 ft thick, is medium to coarse grained, bioclastic, fossiliferous, and thin to thick bedded. It is partly dolomitic and locally cherty.

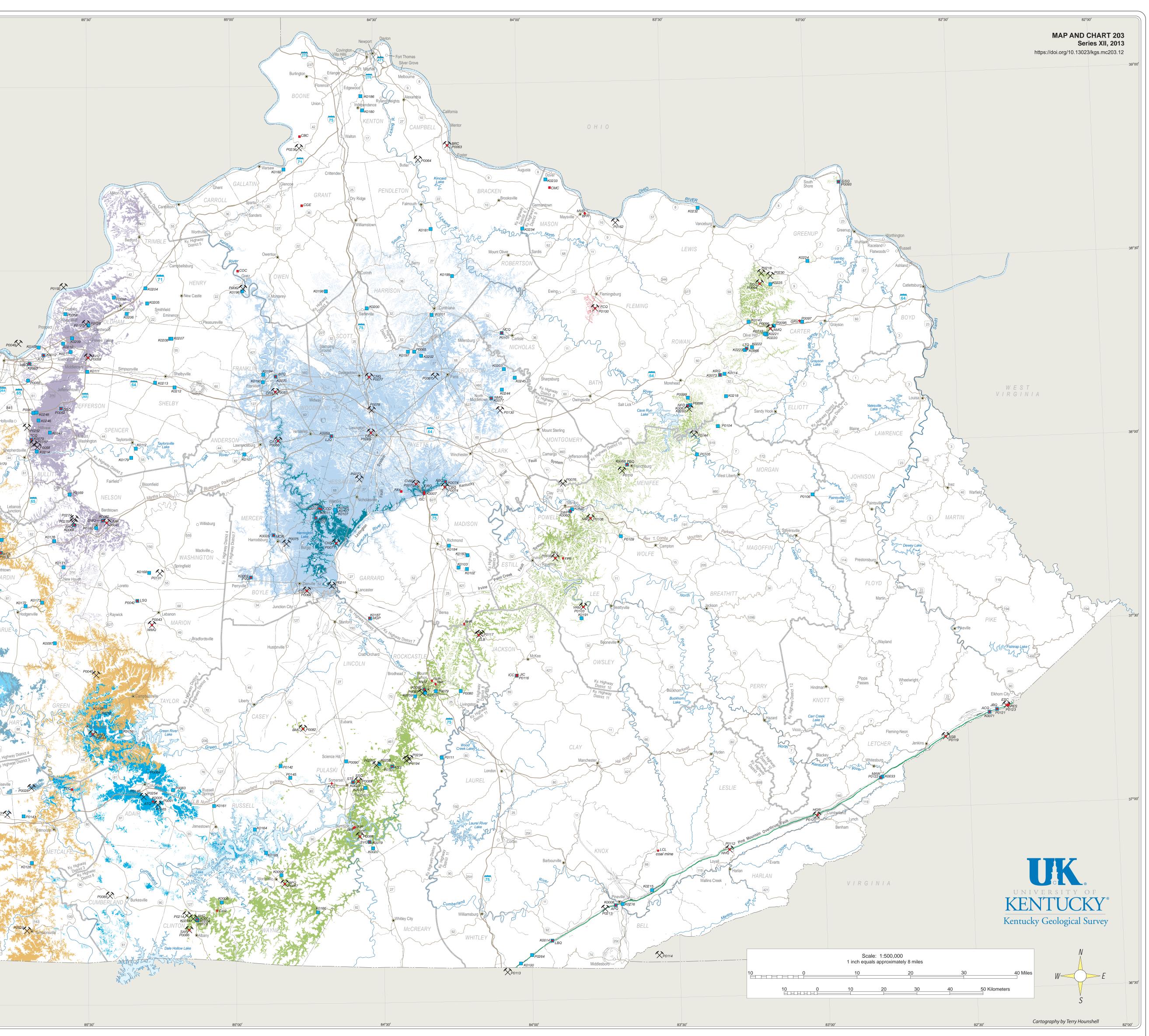
The Salem and Warsaw Limestones, 60 to 170 ft thick, consists of limestone, siltstone, shale, and sandstone. The limestone is fine to coarse grained, bioclastic, fossiliferous, and thin to thick bedded. It is partly argillaceous, silty, sandy, and locally cherty. Geodiferous siltstone and shale are interbedded with the limestone and commonly form the dominant lithologies in the lower part of the formation. Sandstone occurs locally. Outcrops of the Salem and Warsaw Limestones in the area east of western Cumberland and Adair Counties of dolomite with minor amounts of interbedded shale. Dolomite is finely to moderately generally about 30 ft thick. are excluded from the map because of increased amounts of siltstone and shale. Warsaw Limestone of Western Kentucky. The Warsaw crops out discontinuously

treatment plants, and scrubber stone for flue-gas desulfurization. Thickness of the Warsaw ranges from 170 to 300 ft, and averages about 200 ft. Fine to

coarse bryozoan and crinoid fragments in a chalk-like matrix is a characteristic lithology of he formation and forms intervals of high-calcium stone. Micrograined to fine-grained, argilaceous, silty, and cherty limestone occurs interbedded with the fossil-fragmental limestone. mainly consists of limestone with lesser amounts of shale. It is being quarried and mined for in a belt across east-central and northeastern Kentucky, are combined into one unit on this the unit. The basal 15 to 45 ft of the formation commonly consists of interbedded limestone and construction aggregate and agricultural limestone.

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ormations formerly were sources of dimension stone. It consists of dolomitic limestone and calcareous dolomite, which are thin to thick bedded, thick, are exposed at the surface. crystalline and sparsely fossiliferous. crystalline, fossiliferous, partly vuggy, sparsely cherty, and thin to thick bedded.



bioclastic, fossiliferous, partly cherty, and partly argillaceous. Calcareous dolomite is finely

grained, fossiliferous, irregularly bedded, and partly argillaceous, with local thin interbeds of

on the map are mainly fine to coarse grained, bioclastic, fossiliferous, and thin to thick the upper part.

chert residuum and, locally, tripolitic clay. In southern Livingston County, the Fort Payne is order, the Tyrone Limestone, Oregon Formation, and Camp Nelson Limestone. The forma-Salem, Warsaw, and Harrodsburg Limestones. The Salem Limestone and Harrods-quarried at a site where it was protected by a thick cap of Warsaw Limestone. The Fort Payne tions crop belt because of intra-Mississippian and pre-Pennsylvanian periods of erosion and agriculture, and industrial uses is mainly from subsurface deposits. Many mines in central removal of the formation in parts of northeastern Kentucky. The Slade is correlative with the Louisville Limestone and Laurel Dolomite. The Louisville and Laurel are combined Kentucky initially produced stone from the lower Tyrone and Oregon; when these forma- Monteagle and Bangor except for two units in the basal part of the formation, a cherty lime-County northward into Trimble County, and along the Kentucky-Tennessee state line in Allen Nelson. In northern Kentucky, lime is manufactured from intervals of high-carbonate stone units underlie the Monteagle.

> gate and agricultural stone. In the past, the Louisville was quarried for these purposes. Both Total thickness of the High Bridge ranges from about 430 to 570 ft. The Tyrone and Oregon, partly sandy, and thin to thick bedded. The basal dolomite is finely crystalline, argillaceous, which locally intertongue, commonly have a combined thickness of 120 feet. The Oregon and locally cherty and geodiferous. Shale mainly occurs as thin interbeds, but a widespread The Louisville averages about 60 to 70 ft in thickness, with a maximum thickness of 95 ft. pinches out laterally. Only the upper 320 ft of the Camp Nelson, which is as much as 440 ft shale, commonly 5 to 15 ft thick, is present in the upper part of the formation.

> sparsely cherty, and thin to thick bedded. It contains several thin beds of bentonite. Argilla- the Pine Mountain Overthrust Fault. The linear mountain, 125 mi in length, extends northceous limestone and shale occur in upper and middle parts of the formation. Consequently, eastward from near Jellico, Tenn., to Elkhorn City in southeastern Pike County, Ky. Rocks The Laurel averages about 50 ft in thickness, with a maximum thickness of 65 ft. It consists mining for construction aggregate is restricted to an interval in the lower part of the Tyrone, along the northwest face dip steeply southeastward, commonly at angles of 20 to 35°. The Oregon is mainly composed of finely to moderately crystalline, calcareous dolomite,

Grant Lake Limestone. The Grant Lake crops in east-central and west-central which is partly interbedded with micrograined limestone. It commonly is thick bedded. along the lower valleys of the Cumberland River (Lake Barkley) and Tennessee River Kentucky and mainly consists of rubbly weathering, fossiliferous, argillaceous limestone, The Camp Nelson characteristically consists of micrograined limestone mottled with stone, and sandstone. The upper member is excluded from this map. The lower member is Kentucky Lake) in western Kentucky. Extensive faulting in the area partly controls its surface which generally will not meet the physical specifications for construction aggregate. It formerly was mined at one site distribution. The Warsaw is being guarried for construction and agricultural stone. It also has However, in Fleming County, a distinct limestone unit occurring locally at the top of the furnished riprap and boulders for erosion control along waterways, filter stone for sewage-furnished riprap and boulders for erosion control along waterways, filter stone for sewage-furnished riprap and boulders for erosion control along waterways, filter stone for sewage-furnished riprap and boulders for erosion control along waterways, filter stone for sewage-furnished riprap and boulders for erosion control along waterways, filter stone for sewage-furnished riprap and boulders for erosion control along waterways, filter stone for sewage-furnished riprap and boulders for erosion control along waterways, filter stone for sewage-furnished riprap and boulders for erosion control along waterways, filter stone for sewage-furnished riprap and boulders for erosion control along waterways, filter stone for sewage-furnished riprap and boulders for erosion control along waterways, filter stone for sewage-furnished riprap and boulders for erosion control along waterways, filter stone for sewage-furnished riprap and boulders for erosion control along waterways, filter stone for sewage-furnished riprap and boulders for erosion control along waterways, filter stone for sewage-furnished riprap and boulders for erosion control along waterways, filter stone for sewage-function for erosion control along waterways, filter stone for sewage-function for erosion control along waterways, filter stone for sewage-function for erosion control along waterways, filter stone for sewage-function for erosion control along waterways, filter stone for sewage-function for erosion control along waterways, filter stone for sewage-function for erosion control along waterways, filter stone for sewage-function for erosion control along waterways, filter stone for sewage-function for erosion control along waterways, filter stone for erosion for erosion control along waterways, filter stone for erosion control along waterways, filter stone for erosion control along waterways, filter stone for erosion control along waterways, fil stone beds on the geologic quadrangle maps. The limestone, as much as 30 ft thick, is coarse persistent zone, 5 to 10 ft thick, of argillaceous, dolomitic limestone and shale occurs near an apparent increase in thickness, resulting from folding or faulting of the rocks. Limestone the top of the Camp Nelson.

> Monteagle Limestones of south-central Kentucky and the Slade Formation, which crops out commonly argillaceous. Shale content of the lower member generally increases upward in map. The change in geologic nomenclature from Bangor-Monteagle to Slade occurs in northeastern Pulaski County. The Bangor is separated from the underlying Monteagle by a unit of shale and sandstone, 1 to 40 ft thick.

The Bangor Limestone, 20 to 85 ft thick, is fine to coarse grained, bioclastic, partly fossilifer-

and oolitic, fossiliferous, partly cherty, partly sandy, and thin to thick bedded. Thin beds of The Slade mainly consists of limestone, with minor amounts of dolomite and shale. The limestone is micrograined to coarse grained, bioclastic and oolitic, fossiliferous, partly cherty,

Newman Limestone. The Newman crops out in southeastern Kentucky along the with minor amounts of interbedded shale. The dolomitic limestone is fine to coarse grained, The Tyrone mainly consists of micrograined limestone, which is partly fossiliferous, northwest face of Pine Mountain where the limestone has been brought to the surface by The Newman was divided into two members on the geologic quadrangle maps: (1) a lower member mainly composed of limestone, with lesser amounts of dolomite and shale and (2) an upper member composed of shale interbedded with varied amounts of siltstone, lime-

> is micrograined to coarse grained, bioclastic, partly oolitic, partly argillaceous and silty, partly Bangor and Monteagle Limestones and Slade Formation. The Bangor and cherty, partly fossiliferous, and thin to thick bedded. Dolomite is finely crystalline and

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Acknowledgments The authors wish to acknowledge the Kentucky Transportation Cabinet Materials Branch and the Kentucky Division of Mine Reclamation and Enforcement Non-Coal Review Branch for supplying data and suggestions for the map. Helpful reviews were provided by David Harris, Warren Anderson, and William Andrews of the Kentucky Geological Survey.