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	SYSTEM	SUB- SYSTEM		SERIES	STAGE	GROUP	FORMATION	MEMBER (Bed)	GRAPHIC COLUMN	THICKNESS (Feet)	TINIT
	JATERNARY		HOLOCENE	PLEISTOCENE			undifferentiated alluvial and lacustrine deposits			0–150	Δ
	E ar		MIOCENE-	PLEISTO.			Mounds/Grover Gravel			0–50	E
	TERTIARY PALEOGEN		EOCENE				Wilcox		0 0 ° 0 0	0–260	С
	CRETACEOUS		LATE		MAAST- RICHTIAN		McNairy	Commerce/Diswood		0–160	C
					CAMP- ANIAN		Post Creek			0–40	E
	CARBONIFEROUS	MISSISSIPPIAN	AN	MERAMEAN			Ullin Ls			150–400	F
			'ALMEYER	AN			Fort Payne	Hartline Chert		80–200	G
			~	OSAGE.			Springville Shale	State Pond		25–90	F
			KIND.				Chouteau Ls			0–2	I
			LATE				New Albany Shale			0–100	J
			Ц	J	GIVETIAN		St. Laurent	Rendleman Oolite Bed Misenheimer Shale		50–150	k
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A Quaternary undifferentiated includes the Henry Formation, Equality Formation and the Cahokia Alluvium. The Henry Formation is a glacial outwash of silt, sand and gravel. It occurs in large drainages and the Mississippi River bottoms. The Equality Formation is composed of lacustrine silt and gray clay. It occurs as slackwater lakes in tributaries to the Mississippi and Cache Rivers. The Cahokia Alluvium consisting of colluvial loess, silt, clay, sand and gravel. Most of the gravel is eroded from Paleozoic rocks exposed in the county.

B Mounds/Grover Gravel is composed of a tan varnish over chert. The chert gravel is rounded to sub angular and in places is cemented with iron. Where the formation is iron cemented, mica is commonly associated, but most of the formation is not lithified. Grover Gravel can contain red hematitic chert, purple quartzite, and agates.

C Wilcox Formation is localized in a graben in Black Powder Hollow. The sand is red, purple, yellow, and brown, coarse grained, quartz that can be cross bedded but non-lithified. The gravel is rounded, light gray to black polished chert or guartz and jasper pebbles. Locally, it is iron cemented and can contain mica. It is unconformable with the overlying gravel.

D McNairy Formation sand is the main constituent of this white, orange to red, iron stained, highly micaceous formation. The sand is unlithified, very fine to fine grained, well sorted quartz sand. Bedding ranges from cross laminations to horizontal lamination with clay drapes. Rounded gravel can occur sporadically throughout the lower part of this unit. White kaolinitic clay also sporadically occurs in the formation. The trace fossil ophiomorpha, a shrimp domicile, as well as other tabular horizontal traces, occur in this unit. The middle part of the formation contains a clay with peat and rooted horizon (Levings Member). The upper part is unconformable with the sand above.

E Post Creek Formation is comprised of gravel, silcrete, and "quartzite". This unit is bounded by unconformities below and above. The base is composed of a poorly sorted sand and rounded gravel. It ranges from unlithified to an iron cemented gravel in places. The clasts are composed of dark gray to black chert and opaque white to translucent quartz. Above the gravel is a one to ten foot thick rooted silcrete that has been found at the 400 foot elevation near the Mississippi River to 600 foot elevation capping ridges. The silcrete is brecciated in places and contains silica cemented, medium grained, well sorted quartz sand grains. In places lateral to the silcrete, a silica cemented sandstone has been found. It has been called a "quartzite" (Commerce) but has not been metamorphosed. Like the silicified soil horizon, i.e., silcrete, the sandstone has also been silicified. It is a medium grained, well sorted quartz arenite that does not have mica. The unit above and below is unconformable with this

I Chouteau Limestone is a greenish gray to blueish gray lime mudstone with an orange stain. It contains phosphatic and calcareous nodules. Fossils include crinoids, brachiopods and rare proetid trilobites. It is a thin unit in Alexander County only attaining one to two and a half feet thick. The lower contact is wavy and sharp.

J New Albany Shale is a black, fissile shale that is thinner in Alexander County than eastward. It has a petroliferous odor and contains pyrite and phosphate nodules in the upper three feet of the formation. It is also highly jointed and has orange staining. Fossils are rare but conodonts and the spore *Tasmanites* are common. Farther into the basin the New Albany gains Group status but because the section is condensed down to 80 feet it is not divided. The lower contact is gradational with the Middle Devonian St. Laurent Formation.

K St. Laurent Formation is an argillaceous lime mudstone with cherty limestone, shale to silty shale and dolostone. The upper part of the formation is a dark gray cherty lime mudstone that is silty in places. This grades into a dolomitic to calcareous shale. The chert is abundant as alternating beds or nodules of white, gray, and black. Fossils of the brachiopods, *Devonochonetes*, and *Mucrospirifer mucronatus* occur in this unit. The index fossil, *Polygnathus cristata*, a conodont, indicates that the St. Laurent is Middle Devonian. The upper middle part of the formation is a cherty, silty, glauconitic, spore-bearing lime mudstone that contains numerous fossils. The fossils include crinoids, rugose corals, strophominid brachiopods, sporangites and the trilobite *Dipleura* sp. The **Rendlman Oolite Bed** occurs below these beds and is composed of a white, thin oolitic grainstone. The **Misenheimer Shale Member** occurs below the oolite bed. It is a tan to brownish gray calcareous shale that contains spores and rare phyllocarid fossils. The basal part of this formation is a dense, brownish gray lime mudstone that contains an abundant fauna. Fragments of brownish bones and However, the most important index fossil is the "button coral" *Microcyclus discus* which occurs near the bottom of the St. Laurent Formation. The basal contact is gradational to sharp but conformable in Alexander County.

L Grand Tower Formation is composed of limestone and calcareous cemented quartz sandstone. The upper part of the Grand Tower is a thin, wavy bedded, brownish gray, lime mudstone with numerous brachiopods and tempestite beds containing abundant chonetid brachiopods and the bivalve Paracyclas sp. Other fossils include straight nautiloid cephalopods and solitary rugose corals, the colonial rugose, *Hexagonaria* and the encrusting, calcareous algae Asphaltinoides grandtowerensis. The middle portion of this formation is an abrupt surface that yields a white crinoidal grainstone that is cross bedded. This grades into a sandy zone that shows quartz sand grains "floating" in the limestone

sile, thin bedded and has abundant *Zoophycus* trace fossils and occasional trilobite fragments. The Lithium Member is a purple and green mottled marl that contains the epiboly *Scyphocrinites elegans*, a large floating crinoid typical of the upper Silurian. Below the Lithium is the **Sheppards Point Member** which is a green marl that has thin black bands containing graptolites. The graptolite Sae*tograptus incepiens* is the main graptolite occurring in all of the thin dark layers in this unit. The basal member in the Moccasin is the **Greens Ferry Member** which is a brick red to mottled red and gray green, argillaceous limestone with numerous fossils of brachiopods, straight nautiloid cephalopods and trilobites. The trilobites are mainly calymenids. The lower contact with the unit below is gradational.

R St. Clair Limestone is a red and gray lime mudstone. It is dense, weathers blocky and is somewhat argillaceous in the upper parts. This unit also displays a "cloudy" texture. Fossils are mainly disarticulated crinoids and calymenid trilobites. The lower part is a gray and red to pink sublithographic limestone. Stylolites common in the lower dense units. The lower contact is sharp.

S Seventy-Six Shale is a red clayey soft shale. It is a thin unit (2') with red and green calcareous shale that contains glauconite and red hematitic "buttons" probable algal oncolites. This unit is important for correlation as it provides a highly resistive "kick" on electric logs. Conodonts are common in this shale. The lower contact is sharp and disconformable with the underlying unit.

T Sexton Creek Limestone is a brownish gray lime mudstone. It is sublithographic limestone that yields conchoidal fracture and has abundant chert as nodules or crude wavy beds. Bedding is wavy; chert can be tan, gray or translucent tan. Chert yields vertical fractures perpendicular to bedding. Fossils commonly found in the Sexton Creek are large colonial favositid "biscuits", some of which can be silicified. The lower contact is unconformable.

U Leemon Limestone contains complex facies relationships that are typically missing from the section in all but one location on the east bank of the Mississippi River. At the base a cross bedded oolitic bed occurs with rounded boulders of a lithographic limestone (Girardeau). The overlying bed is a bluish gray shale with lenses of a wackestone having cephalons and pydidia of the large dalamenitid trilobite *Muchronaspis danai* and the brachiopod *Schukertella*. The uppermost bed is an oolite that has a small rare lichid trilobite. An unconformity lies between this unit and the overlying limestone.

V Girardeau Limestone is a dense lime mudstone. It is gray, weathers light gray, sublithographic limestone that displays conchoidal fracture. The bedding is wavy and thin with dark gray chert nodules. The wavy beds of lime mudstone also laterally accretes. Tan shaly partings occur between the limestone beds. Fossils are only found between the limestone beds in the thin shales. Fossils include trilobites, sea stars (starfish), numerous crinoids, tentaculitids, corals, gastropods, bryozoans, brachiopods and conodonts. The crinoid occurrence is diverse which includes: *Ptychocrinus splendens*, P. fimbriatus, Compsocrinus nodosus, Alisocronus, tetrarmatus, Dendrocrinus casei, Prototaxocrinus girardeau and Clidochirus ser*rulatus.* The lower contact is sharp.



F Ullin Limestone is a light gray to white grainstone. It is composed of disarticulated crinoidal debris in a fenestrate bryozoan matrix, mainly seen as cross bedded shoals. The disarticulated crinoid columnals have a brownish gray speckled texture included into the chalky white background or matrix of the fenestrate bryozoans, giving the Ullin a unique appearance that is not seen in any other formation in the Illinois Basin. The lower part of this unit becomes siliceous and has chert nodules. The lower contact is gradational.

G Fort Payne Formation is mainly a cherty limestone. The chert is gray to orange and commonly dense or novaculitic beds are thick. The limestone is dark gray, composed of lime mudstones and fossil wackestones. Some of the lime mudstones are dolomitic, glauconitic and siliceous. Some beds can be locally brecciated. A basal unit called the **Hartline Chert Bed** occurs in the County. It is solid chert, thick bedded and novaculitic. It has a sharp contact with the

H Springville Shale is a mint green silty shale. This unit ranges from weakly fissile to fissile and weathers in platelets. It can coarsen upward and contains horizontal tubular burrows but no body fossils. It is a soft glauconitic greenish gray to brownish gray clayey shale. A bed of soft glauconitic shale at the base called the **State Pond Member** contains dark phosphate nodules. This basal bed is also silty and distinctly darker green than the overlying Springville Shale. The basal contact is sharp.



matrix. The **Dutch Creek Sandstone Member** is the basal member of the formation. It is composed of a white, well rounded, well sorted, frosted, medium grained, (St. Peter-like) quartz arenite. Fossils include large rugose corals, the tabulate coral Pleurodictyum problematicum, trilobites Odontocephalus ageri, *Eldredgops cristata*, and the brachiopods *Amphigenia curta* and *Eodevonaria.* The lower contact interfingers with the Clear Creek Chert below and is gradational in this area.

M Clear Creek Chert is a cherty, siliceous, finely crystalline, lime mudstone. This unit is a white to light gray with orange staining dominated by chert either bedded or nodular. Bedding varies from thin to thick bedded. Brecciated beds also occur as well as white chalky, tripolitic beds that are extremely friable. The upper part of the formation contains brachiopod fossils similar to the Dutch Creek Amphigenia curta and Eodevonaria acurata. There are also rare "hair-net" like graptolites in the upper part. Trilobites common to the Clear Creek are Odontocephalus ageri, Odontochile (Dalmanites) pratteni, Acidaspis tuberculata, Coronuda sp. and Paciphacops sp. Brachiopods are strophominids and spiriferids. The area around Wolf Lake is highly silicified where little or no limestone can be observed. Other areas east and south contain more carbonate rock. The basal contact is conformable.

N Backbone Limestone is a pure white to light gray crystalline limestone. This formation contains some chert nodules but the silica content is reduced considerably. Fossils are mainly the brachiopods Acrospirifer murchisoni, Costispirifer arenosus and Rensselaeria *ovoidies,* but also gastropods, bivalves, crinoids, trilobites and the bryozoan *Lichenalia* are abundant in the upper part. Bedding is mainly thin to medium. Chert nodules are white to light gray. It is typically a crystalline lime mudstone that grades into the Grassy Knob Chert below.

O Grassy Knob Chert is composed of a white to yellowish orange chert. Fossils are exceedingly rare in this unit and bedding can be thick, tabular, massive and brecciated. Bioturbation in the form of horizontal burrows are common. Glauconite has been observed along with microscopic chitinozoans and siliceous sponge spicules. The chert is hard and novaculitic although porous tripolitic zones do occur. The contact with the unit below appears to be gradational.

P Bailey Limestone is greenish near the base and has green to gray chert nodules with shaley interbeds. Bedding is wavy and thin and contains dalaminitid trilobites and a large species of an odontochilid trilobite in the lower part. This limestone is dolomitic in places and becomes deeper gray up section. The chert nodules resemble infilled burrows and also become dark to medium gray farther up section. The abundance of chert increases in the upper part of this unit. *Zoophycus* is observed in numerous intervals within this formation. Other fossils include abundant siliceous sponge spicules, rare conularids, and the rare trilobite Hutontonia sp. In various stratigraphic horizons, either by weathering or hydrothermal alteration along faults, the limestone layers of this unit were altered to microcrystalline silica. This observation was noted at numerous locations in the quadrangle. The limestone is altered to a white, chalky, porous, fine siliceous material called Tripoli. The chert nodules within the limestone were either unaltered where weathered, or in the case of possible hydrothermal activity, the chert nodules became translucent. The top part of this formation grades into the overlying chert.

Q Moccasin Springs Formation is composed of limestone,

W Maquoketa Shale is composed of shale, siltstone, sandstone and limestone. It is a bluish green, gray shale or claystone, nonfissile, thin bedded that has limestone lenses and intercalated beds. The upper part is composed of the **Orchard Creek Member** of the Maquoketa Shale. This unit is a lime mudstone that is bluish brown and contains thin soft shales between the limestone beds. Bedding is undulatory. Fossils in this member include anataphrid trilobites, crinoids, edrioasteroides which are encrusting on a hardground in the lime mudstone, rare conularids and brachiopods. The graptolite *Climacograptus putillus* indicates an upper Ordovician age. The middle member is Thebes Sandstone Member of the Maquoketa Shale. The Thebes is a very fine grained, well sorted quartz sandstone. It is a medium to dark brown quartz arenite that is thinly to medium bedded. It is cross bedded in places but typically thin bedded to laminated in the upper part. Also radial feeding (fodininchia) burrowing occurs in the upper half of the member. The trilobite Ampyxina bellatula is rare but occurs in the Thebes Sandstone. The lowest member is the Cape La Croix composed of gray to dark gray shale with thin lime mudstone to wackestone beds. It has bands of small black spheres possibly composed of phosphatic nodules and silt. Fossil fragments include trilobites, brachiopods and disarticulated graptolites. It is calcareous in places. The contact with the overlying sandstone is gradational.

X Cape Limestone is a brown, crinoidal, pelloidal packstone to grainstone. Minor grain constituents include fragments of trilobites, ostracodes and brachiopods. This unit is medium bedded, vuggy with "dead oil," and has a petroliferous odor. The presence of some lime mudstone makes this unit darker than the Kimmswick Limestone below. It contains black splintery chert nodules and is disconformable with the shale above.

Y Kimmswick Limestone is a white to light gray, coarsely crystalline grainstone. The large calcite crystals are due to coarse pelmatozoan grains. Bedding ranges from medium to thick, hummocky and cross bedded. Diagnostic fossils include: the green coralline algae Fisherites oweni (Receptaculites), trilobites Illaenus sp., Amphilichas sp., and Isotelus gigas brachiopods Rafinesquina sp. and Strophomena sp., bryozoans ramose and Trepostome sp. Chert nodules range from gray to black and are 3 to 4 inches in diameter. Stylolites are common. Zones of rose to pink occur lower in the unit. The overlying contact is vuggy with microkarsts and clay filled fissures a few feet deep and is disconformable with the unit above.









Horizontal scale: 1 inch = 2,000 feet Vertical scale: 1 inch = 500 feet Vertical exaggeration: $4 \times$

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