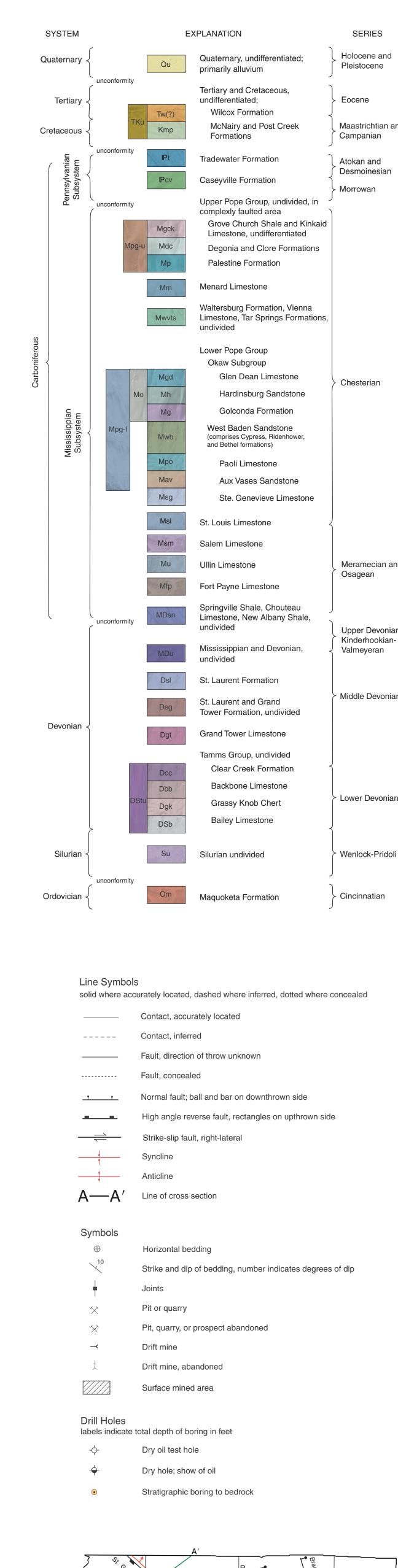
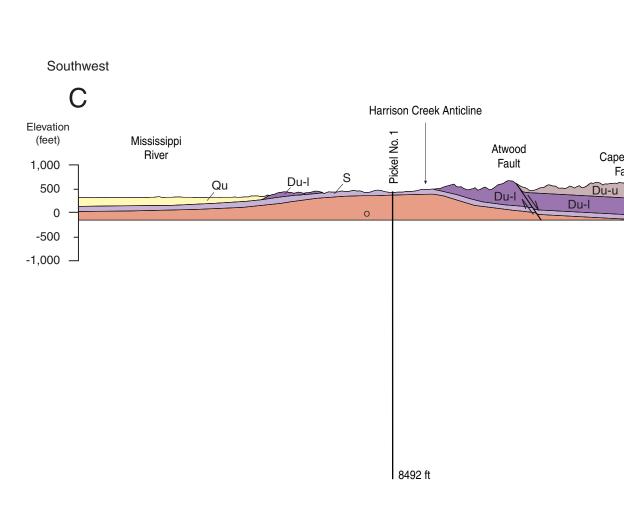


STATEMAP Union County-BG Sheet 1 of 2

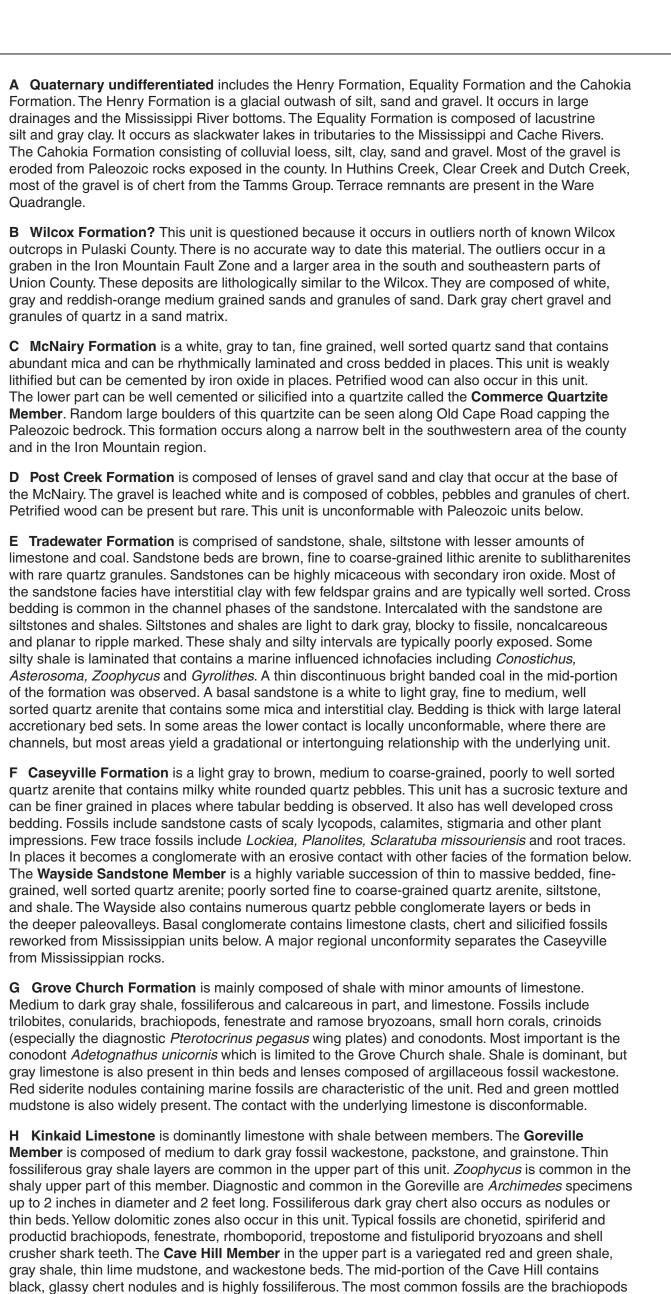
\sim	Wolf Lake	Cobden	Makanda	Lick Creek
	J. A. Devera 1993	J. A. Devera 1995	R. J. Jacobson and C. P. Weibel 1993	C. P. Weibel and W. J. Nelson 1993
	Ware	Jonesboro	Anna	Mt. Pleasant
	W. J. Nelson and J. A. Devera 1994	W. J. Nelson and J. A. Devera 1994	J. A. Devera 1995	W. J. Nelson and J. A. Devera 2007
	McClure	Mill Creek	Dongola	Cypress
	J. A. Devera, W. J. Nelson, and J. M. Masters 1994	J. A. Devera, W. J. Nelson, and J. M. Masters 1994	W. J. Nelson, L. R. Follmer, and J. M. Masters 1999	J. A. Devera and W. J. Nelson 2009
l				



SYSTEM	SUB- SYSTEM	SERIES	STAGE	GROUP/ SUB-GROUP	FORMATION	MEMBER (Bed)	GRAPHIC COLUMN	THICKNESS (Feet)	UNIT
QUATER- NARY		HOLOCENE AND PLEISTOCENE			undifferentiated			0–130	А
TERTIARY/ PALEOGENE		EOCENE			Wilcox?		0,000	0–80	В
CRETACEOUS		MAAST- RICHTIAN			McNairy	Commerce		0–200	С
CRE		CAM- PANIAN			Post Creek	Quartzite		0–15	D
	VANIAN	ATOKAN		I CREEK	Tradewater			0–300	E
	PENNSYLVANIAN	MORROWAN		RACCOON CREEK	Caseyville			150–400	F
					Grove Church	Goreville Ls		0–25	G
						Cave Hill		40–180	H
		MISSISSIPPIAN CHESTERIAN			Kinkaid Ls	Negli Creek			•
					Degonia Ss	Ls Marine Zone		60–120	I
			AN		Clore	Ford Station Tygett Ss Cora		40–80	J
SU			ELVIRAN		Palestine Ss			30–80	ĸ
CARBONIFEROUS			CHESTERIAN HOMBERGIAN		Menard	Allard Scottsburg		80–120	L
0	MISSISSIPPIAN			POPE	Walterbug Ss	Walche		0–30	N
					Vienna Ls Tar Springs Ss			0–15 70–120	N C
					Glen Dean Ls			0–60	F
				Okaw	Hardinsburg Ss	Haney Ls		0–40	C
					Golconda	Fraileys Shale Beech Creek Ls		70–120	F
			GASPERIAN	ten Ss	Cypress Ss	Deeur Oreek LS		60–120 512-	S
				West Baden Ss	Ridenhower			912–901 45–80	Т
					Bethel Ss Paoli			0–15 90–120	V
			N,		Aux Vases Ss			20–40	v
			GENEVIEVIAN		Ste. Genevieve Ls			200–250	х



STATEMAP Union County-BG Sheet 2 of 2



Quadrangle.

Anthracospirifer increbescens, Composita subguadrata, and Diaphragmus sp. The basal part of this member is a greenish gray calcareous shale that yields wing plates of the index fossil *Pterotocrinus* tridecibrachiatus. The Negli Creek Limestone Member is dark gray lime mudstone that has fossil wackestone and packstone facies. Wavy beds are marked by thin shale partings. The presence of the oncoid, *Girvanella* and the calcareous demosponge, *Chaetetella* is basin-wide and diagnostic along with abundant large bellerophontid gastropods. The contact at the base is sharp but conformable with the unit below. **I** Degonia Sandstone is dominantly sandstone with some siltstone, clay and shale. The sandstone is a white to tan, or stained yellow, very fine to fine grained, well sorted, quartz arenite. It can contain small amounts of mica and dark to black mineral grains. In Union County, the Degonia is mainly composed of cross bedded channel sands and is much thicker than farther east in Johnson and Pope Counties. Thicker beds occur in the lower part, whereas the upper part is thinner bedded and finer grained. The upper part can also contain rare marine invertebrates such as brachiopods, bryozoans and mollusks. Primary sedimentary structures include current ripples, and interference ripples, load casts and tool marks. Trace fossils are simple horizontal tubes and crawling traces (repichnia). Occasional stigmaria roots and lycopod impressions occur in the upper part. Variegated red and green shale occurs near the top of this formation. The red and green shale is typically poorly exposed but was observed in the study area and is a widespread marker throughout southern Illinois. The basal contact is disconformable locally where channels cut into the Clore Formation below.

J Clore Formation is composed dominantly of shale, limestone and sandstone. The Ford Station **Member** is dark gray, argillaceous lime mudstone, fossiliferous wackestone, packstone and oölitic grainstone interlayered with dark gray shale. Limestone beds display hour-glass weathering. A yellow dolostone bed is widespread. The most common fossils are the brachiopods Anthacospirifer increbescens, Composita subquadrata, Cliothyridina sp., Orthotetes kaskaskiensis and Diaphragmus nivosus and large blastoids of Pentremites sp. The Tygett Sandstone Member comprises one or two units of sandstone, separated by shale and thin limestone. The sandstone is mostly thin-bedded and ripple-laminated, but locally fills channels and exhibits large-scale crossbedding. Upright tree stumps, stigmarian root casts, and the U-shaped trace fossil *Rhizocorallium* commonly occur near the top of the Tygett. The **Cora Member** is dominantly dark gray shale, with interbeds of limestone less than 1 foot to about 5 feet thick. The limestone is olive-gray to dark gray, argillaceous lime mudstone and wackestone that contain abundant brachiopods and bryozoans. The Clore-Palestine contact appears to be gradational. **K** Palestine Sandstone The upper Palestine is mostly carbonaceous shale and claystone

containing local pyritic coal. Rooted mudstone underlies the coal. Sandstone dominates the middle and upper parts of the unit. It typically coarsens upward from shale to siltstone to sandstone. It is a white to light gray, weathers brown, fine to medium grained quartz arenite that can contain small amounts of mica. Bedding is tabular to ripple laminated and cross bedded. The lower contact varies from gradational to erosional. **L** Menard Limestone is mainly limestone with shale dividing the three members. Shale of the

uppermost Menard is dark gray to greenish gray, fissile, calcareous, and fossiliferous. Thin interbeds and lenses of limestone are present. The **Allard Limestone Member** is mostly dark brownish gray to greenish gray lime mudstone. Crinoidal and oölitic grainstone occurs sporadically in the upper part. Fossiliferous wackestone and packstone facies are also present. Beds of yellow dolostone are found. Dark crinoid bearing chert nodules are numerous in some beds. Brachiopods are the typical Elviran fauna as found in the Clore Formation and Kinkaid Limestone. The **middle shale** is mostly dark gray with thin fossiliferous limestone beds, but includes green mudstone that is slickensided and can have red mottling. The Scottsburg Limestone Member is largely dark gray sublithographic lime mudstone, with fossil and pelletal wackestone facies. Common to this member is the bivalve Sulcatopinna missouriensis. Some beds contain chert and yellow dolostone beds. A diagnostic facies is a rhythmic laminated limestone and polygonal lime mudstone with desiccation cracks. Brachiopods are the most common fossils; bryozoans, rugose corals, echinoderm debris, bivalves and gastropods also are present. The lower shale is medium to dark gray, platy, and calcareous, with thin fossiliferous layers. *Pterotocrinus menardensis* wing plates are common. The **Walche Limestone** Member is dark gray lime mudstone and wackestone. The lower contact is gradational to sharp. M Waltersburg Sandstone is thin in Union County and mainly composed of shale. However,

siltstone and a thin quartz arenite does occur in the study area. The siltstone is greenish-gray and ripple laminated. The shale can be calcareous in parts and varies from olive gray to gray. The quartz arenite weathers to a rusty brown. The lower contact is gradational with the unit below. **N** Vienna Limestone is a thin lime mudstone to wackestone that is dark gray to brownish gray. A dark gray shale is also present. Crinoids and bryozoans occur in the wackestone facies along with a dark gray nodular chert. Some of the chert nodules weathers a chocolate brown and commonly contain crinoids. Fossils that occur in the unit are the bivalve *Sulcatopinna missouriensis* and the bryozoan *Prismopora serrulata*. The lower contact is conformable. **O** Tar Springs Sandstone is composed of sandstone, siltstone and shale. The lower part is a

white to light gray, fine grained quartz arenite that occurs as massive thick beds that form large sand waves (antidunes) in the Alto Pass area. Above the thick bedded part of the unit are rhythmically alternating thick and thin couplets of channel forms. Clay drapes occur between rhythmic couplets. No coal was observed in the study area which is seen east of Union County. Shale is dark to medium gray with some organic debris or carbonaceous material. Siltstone is gray to olive gray. The basal contact is sharp and locally disconformable but typically interbedded and gradational. **P** Glen Dean Limestone contains shale between limestone beds. The unit is a light gray to medium gray, oölitic and cherty in part and typically has grainstone to packstone and wackestone facies. Dark

gray to greenish gray, fossiliferous shale separates the limestone beds. The shale is calcareous and can contain brachiopods, crinoids and blastoids. *Pterotocrinus bifurcatus* wing plates, *Pentremites*, and the bryozoan *Prismopora serrulata* are all indicative of this unit. The lower contact is sharp to gradational. **Q** Hardinsburg Sandstone is dominated by thin quartz-rich sandstone beds and shale. The sandstone is white to light gray, very fine to fine grained quartz arenites that contain shale rip-up

clasts. The shale is dark gray to greenish gray, laminated and silty. This unit can laterally pinch out to a shaly limestone. The basal contact is conformable. **R** Golcanda Formation is composed of limestone, calcareous shale with limestone lenses and an important basal limestone member. The **Haney Limestone Member** is the upper limestone member with shale interbeds. Crinoid-bryozoan wackestone and packstone are the prevalent facies, but the Haney also includes crinoidal and oölitic grainstone facies and yellow-weathering dolomitic lime mudstone. Shale is gray and greenish gray, calcareous, and rich in fossils. This unit has a diverse crinoid fauna, including Phanocrinus, Zeacrinites, Pterotocrinus, Onychocrinus, Talarocrinus, Decadocrinus and Agassizocrinus. Blastoids include several species of Pentremites. Other fauna include rugose coral, proetid trilobites, ramose and fenestrate bryozoans and numerous brachiopods The **Fraileys Shale Member** is shale with limestone interbeds that occurs below the Haney Limestone member. At the top is greenish gray, calcareous shale that exhibits thin fossil-strewn pavement layers containing the index fossil *Pterotocrinus capitalis*. Beneath the fossiliferous shale is blocky, variegated red and green mudstone that is a paleosol. The middle Fraileys consists of interbedded limestone and shale; a wide range of limestone textures are present. The lower Fraileys

is dark gray fissile shale that is calcareous and contains siderite nodules. The basal contact is sharp and locally erosional. The **Beech Creek Limestone Member** (called "Barlow Lime" in the oil & gas industry) is lenticular in the study area. It is mostly dark brownish gray, dolomitic lime mudstone to crinoid-bryozoan wackestone, but includes packstone and grainstone facies. Quartz sand is common. It is widely correlated in the Illinois Basin. The lower contact is sharp but conformable. **S** Cypress Sandstone is composed of sandstone, siltstone and shale. The upper Cypress is mostly interbedded shale, siltstone, and very fine, thinly layered sandstone. Red and green blocky mudstone is present in places. Below this is laminated siltstone to fine-grained guartz arenite that

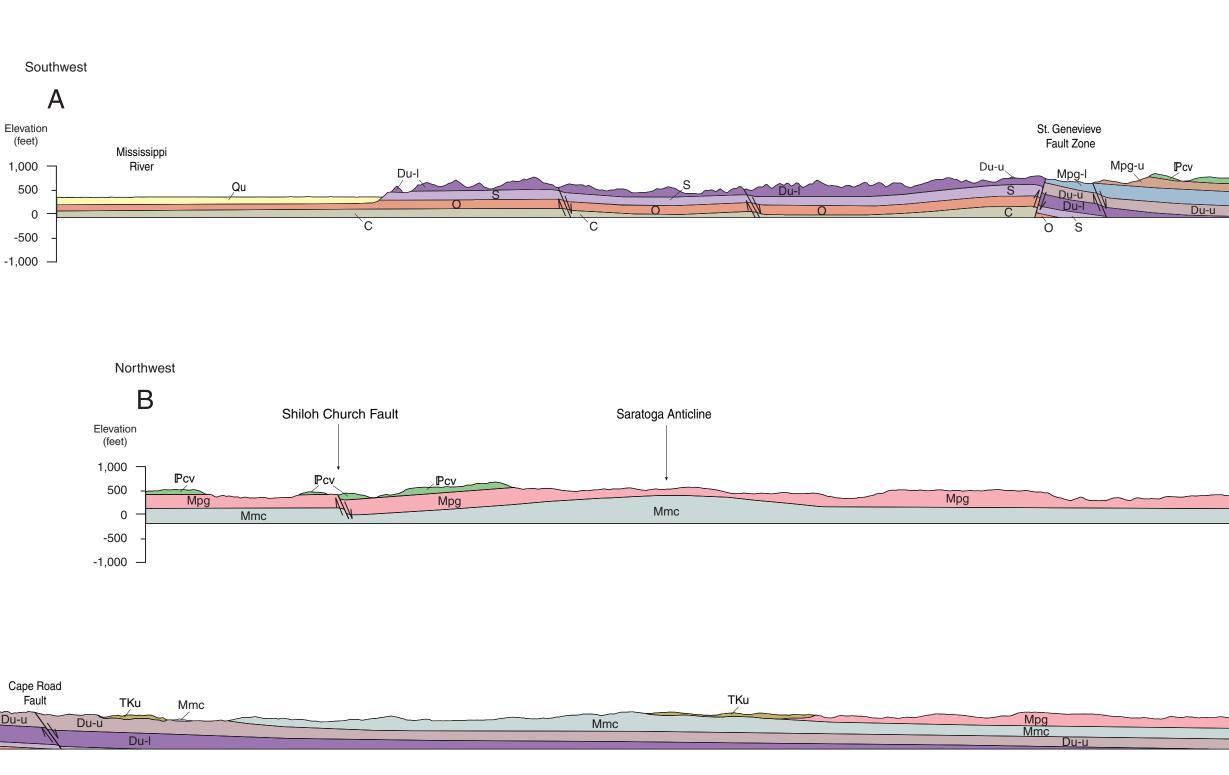
has gray to greenish gray thin shale interbeds. Rippled stacked bedding contains trace fossils. The lower more massive sandstone is white to light gray (weathering yellow), fine- to medium-grained, well sorted quartz arenite that displays medium to thick bedding and large scale cross bedding. The contact with the unit below varies from gradational to sharp to erosive. **Ridenhower Formation** is dominated by shale, siltstone and sandstone with thin limestone interbeds. At the top is laminated calcareous, fine-grained sandstone that contains brachiopods and echinoderms. Below is dark gray, fissile, silty shale that has siderite concretions. Limestone of the

Ridenhower is sandy, dark gray fossil wackestone that contains echinoderms, bryozoans, rugose corals, brachiopods and goniatite cephalopods. The lower contact is gradational. **U** Bethel Sandstone is mainly a light gray sandstone with shale. The Bethel is typically medium grained and can contain quartz granules which makes this one of the coarsest sandstones of the Chesterian Series. Thin lenses of greenish gray shale or claystone as well as dark greenish gray shale that contain carbonaceous debris and mica flakes. This unit only occurs in the subsurface in northeastern Union County. It is eroded in the southwestern half of the county. The basal contact is erosive.

V Paoli Formation is composed of interbedded limestone and shale. The Paoli limestone is mainly a light gray, cross bedded crinoidal to oölitic grainstone. Also present are fossiliferous packstones containing rip-up clasts of red and green shale or pink to red stained pelmatozoan grains. Fossils include Lyropora and fenestrate bryozoans, spirferid brachiopods, Pentremites blastoids, and the index crinoid *Talarocrinus*. Some of the crinoid columnals include the oval *Platycrinites* crinoid debris. Shale occurs in the middle of the formation; it is greenish, calcareous and fossiliferous. The basal limestone beds are oölitic grainstones. The lower contact is sharp to gradational.

W Aux Vases Sandstone is a sandstone that contains shale, claystone and limestone. In the upper parts of the unit the sandstone can be thinly laminated and rhythmically deposited fine grained, well sorted, quartz arenite. These tidally deposited beds do not occur farther east in other counties. Typically the sandstone is light gray to tan but can contain greenish gray and purplish red zones. In the lower part this unit is shaly. The shale is greenish gray, platy, fissile, and calcareous in places. Limestone is a purplish red grainstone that is cross bedded and can be channel form within a red and green shale. Thin lenses of limestone and a mixture of pale green, silty shale that contain profuse trace fossils mixed with disarticulated fossils and occasional *Conostichus* (domicile trace of burrowing sea anemones) are present in the lower part. The lower contact varies from gradational to erosional locally.

X Ste. Genevieve Limestone is a light gray oblitic grainstone is characteristic, but crinoidal, oölitic packstone, dark gray fossil wackestone, dark gray cherty lime mudstone, and dolostone are intercalated. Lenses and interbeds of greenish gray shale or claystone occur locally near the upper part of the formation. Large-scale crossbedding of oölites and bioclasts are well developed in the upper Ste. Genevieve. The **Spar Mountain Sandstone Member** is a thin unit of calcareous sandstone or sandy limestone in the middle upper part of the formation. The characteristic fossils found in this formation include the crinoid *Platycrinites penicllus*, and the brachiopod *Pugnoides* ottumwa. The lower contact is gradational and intertonguing through an interval of 20 to 40 feet thick. The contact was mapped at the lowest occurrence of oölitic limestone.



NM 44 NM 44 <td< th=""><th>UNIT</th><th>THICKNESS (Feet)</th><th>GRAPHIC COLUMN</th><th>MEMBER (Bed)</th><th>FORMATION</th><th>GROUP</th><th>STAGE</th><th>SERIES</th><th>SUB- SYSTEM</th><th>SYSTEM</th></td<>	UNIT	THICKNESS (Feet)	GRAPHIC COLUMN	MEMBER (Bed)	FORMATION	GROUP	STAGE	SERIES	SUB- SYSTEM	SYSTEM
NUMBER Number<	Y	275–350			St. Louis Ls					
Harding Signed with a second secon	Z	285–430			Salem Ls			AN IERAMEAN	Z	SU
NOVA Hartine Chert A A A A A A A A A A A A A A A A A A A	AA	250–450			Ullin Ls			VALMEYER/ N	MISSISSIPPIA	CARBONIFERO
New Albany State Pond O-2 Had OU New Albany State Pond 0-2 Had OU New Albany State Pond 0-80 New Albany State 0-80 St. Laurent Pendleman Oolite Bed Misenheimer Shale 120-200 New Albany St. Laurent St. Laurent Pendleman Oolite Bed Misenheimer Shale 120-200 New Albany Clear Creek Chert 0-80 120-200 Backbone Ls 0-80 0-80 Backbone Ls 0-80 00-350 A A A A A A A A 0 Bailey 0-80 Bailey 0-80 Bailey 0-80	BB	10–110		Hartline Chert	Fort Payne			AN		
New Albany Shale 0-80 U New Albany Shale 0-80 U New Albany Shale 0-80 U New Albany Shale 120-200 New Albany Shale St. Laurent Rendleman Oolite Bed Misenhamer Shale 120-200 New Albany Shale St. Laurent Rendleman Oolite Bed Misenhamer Shale 120-200 New Albany Shale Grand Tower Image: St. Laurent Dutch Creek Olite Bed Misenhamer Shale Image: St. Laurent Dutch Creek Image: St. Laurent Dutch Creek Image: St. Laurent Image: St. Laurent Image: St. Laurent Image: St. Laurent Image: St. Laurent Image: St. Laurent Image: St. Laurent Image: St. Laurent Image: St. Laurent Image: St. Laurent Image: St. Laurent Image: St. Laurent Image: St. Laurent Image: St. Laurent Image: St. Laurent Image: St. Laurent Image: St. Laurent	сс	20–85		State Pond				OSAGE		
NYNOAG Image: state of the	DD	0–2			Chouteau Ls					
NUMAR NUMAR St. Laurent Rendieman Oxide Bed Misenheimer Shale 120-200 NUMAR NUMAR Grand Tower Is -160 Dutch Creek Is -160 Is -160 Backbone Is -160 Is -160 Backbone Is -160 Is -160 Balley Is -160 Is -160	EE	0–80						UPPER		
NYNO Image: Second state	FF	120–200		Oolite Bed Misenheimer	St. Laurent		GIVETIAN	AIDDLE		
NUMONA SMM Clear Creek Chert Clear Creek Chert Clear Creek Chert A	GG	15 -160		Dutch Creek	Grand Tower		EIFELIAN	2		
Human Ls A A 100 Grassy Knob A A A A A Grassy Knob A A A A A A A A A A A Bailey A A A A A Randol Shale	НН	300–350				TAMMS				DEVONIAN
Grassy Knob Grassy Knob A A A A A A 200 A A A A A A A A A A A A A A A A A A A A A 200 Bailey Bailey A A A A A A A A A A A A A A A A A A A A </td <td>II</td> <td>100</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>VER</td> <td></td> <td></td>	II	100						VER		
Bailey Ba	JJ	200			Grassy Knob Chert			LOV		
Randol Shale	KK	300–350			Bailey					
	LL	120		Lithium Sheppard Point	Moccasin Springs	BAINBRIDGE				SILURIAN
Image: State of the state o	MM	37		Greens Ferry	St. Clair Ls	3AINE				SILL
$\frac{\text{Seventy Six}}{\text{Seventy Crock}} = \frac{2}{2}$	NN	2+			Seventy Six					
Ls 40	00				Ls					
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NECOLOGIO Naquoketa Naquoketa Thebes Ss	QQ	140–200		Shale	Maquoketa					ORDOVICI

Y St. Louis Limestone is a medium to light gray, sublithographic, cherty lime mudstone. This is the most typical rock type, but the upper St. Louis contains beds of dolostone and nodules. In the Anna Quarry the chert nodules display purple fluorite within the chert banding. An important epiboly in the lower part of this unit is the pervasive occurrence of found throughout. The lower contact is gradational. **Z** Salem Limestone is dominantly medium gray and thick bedded in the upper half of the formation. It is a fine to coarse grained skeletal packstone that contains scattered oölites. Chert is uncommon in the upper part. The lower half is a darker gray, cherty lime mudstone, and skeletal packstone alternating with light gray, fine to coarse grained skeletal and oölitic packstone and grainstone facies. Fossils include rugose corals, brachiopods, fenestrate

AA Ullin Limestone is a light gray to white grainstone. It is composed of disarticulated 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 unit becomes siliceous and has chert nodules. The lower contact is gradational. **BB** Fort Payne Formation is mainly a cherty limestone. The chert is gray to orange and

Bed occurs in the County. It is solid chert, thick bedded and novaculitic. It has a sharp contact with the underlying unit. fissile and weathers in platelets. It can coarsen upward and contains horizontal tubular

overlying Springville Shale. The basal contact is sharp. **DD** Chouteau Limestone is a greenish gray to blueish gray lime mudstone with an orange feet thick. The lower contact is wavy and sharp. **EE** New Albany Shale is a black, fissile shale that is thinner in Union County than

The lower contact is gradational with the Middle Devonian St. Laurent Formation. FF 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 chert is abundant as alternating beds or nodules of white, gray and black. Fossils of the

that contains numerous fossils. The fossils include crinoids, rugose corals, strophominid brachiopods, sporangites and the trilobite *Dipleura* sp. The **Rendiman Oölite Bed** occurs below these beds and is composed of a white, thin oölitic grainstone. The **Misenheimer** Shale Member occurs below the oölite bed. It is a tan to brownish gray calcareous shale occurs near the bottom of the St. Laurent Formation. The basal contact is gradational to sharp but conformable in Union County.

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 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. Peterlike) 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.

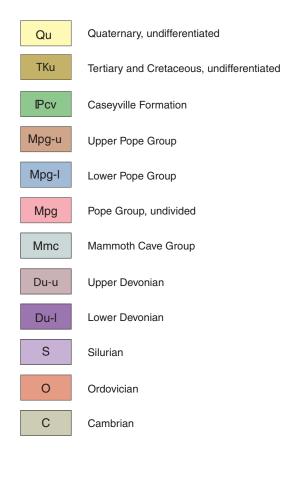
HH Clear Creek Chert is a cherty, siliceous, finely crystalline, lime mudstone. This unit is a white to light gray with orange staining dominated by chert either bedded or nodular. rare "hair-net" like graptolites in the upper part. Trilobites common to the Clear Creek are sp. and *Paciphacops* sp. Brachiopods are strophominids and spiriferids. The area around

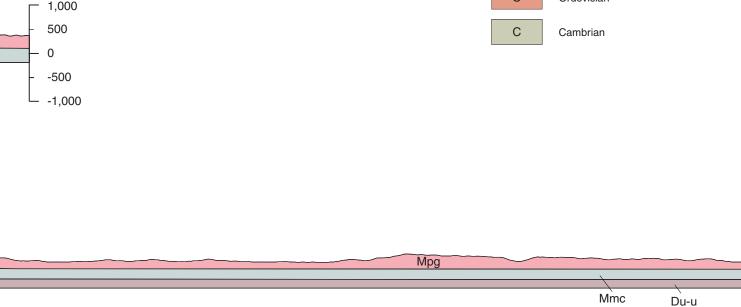
and south contain more carbonate rock. The basal contact is conformable. **II** Backbone Limestone is a pure white to light gray crystalline limestone. This formation contains some chert nodules but the silica content is reduced considerably. Fossils are mainly the brachiopods Acrospirifer murchisoni, 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

JJ 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.

*KINDERHOOKIAN

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





fossil wackestones with rare scattered oölites. Chert occurs as thick layers and oval banded the rugose coral *Acrocyathus proliferum*. Crinoidal wackestones and packstone are locally

bryozoans, and the index fossil *Globoendothyra baileyi*. The lower contact is gradational. crinoidal debris in a fenestrate bryozoan matrix, mainly seen as cross bedded shoals. The

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

CC Springville Shale is a mint green silty shale. This unit ranges from weakly fissile to 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

stain. It contains phosphatic and calcareous nodules. Fossils include crinoids, brachiopods and rare proetid trilobites. It is a thin unit in Union County only attaining one to two and a half

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.

lime mudstone that is silty in places. This grades into a dolomitic to calcareous shale. The brachiopods, *Devonochonetes*, and *Mucrospirifer mucronatus* occur in this unit. The index fossil, a conodont, *Polygnathus cristata* yields 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 spores and rare phyllocarid fossils. The basal part of this formation is a dense, and However, the most important index fossil is the "button coral" *Microcyclus discus* which

GG Grand Tower Formation is composed of limestone and calcareous cemented quartz

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 Odontocephalus ageri, Odontochile (Dalmanites) pratteni, Acidaspis tuberculata, Coronuda Wolf Lake is highly silicified where little or no limestone can be observed. Other areas east

KK Bailey Limestone is a light gray cherty, lime mudstone. It is a wavy, thin bedded lime mudstone that has small chert nodules. The chert is commonly light gray to medium gray in the middle to upper parts and green gray to mint green in the lower part. Thin clay or argillaceous layers occur between the wavy beds. Fossils are rare in the upper parts. Only *Zoophycus* trace fossil layers have been found along with glassy sponge spicules, radiolaria and chitinozoa. In the lower part some body fossils have been found; the trilobites present. This unit also can display solution breccia beds; thin layers of greenish shale can be *Hutontonia*, *Odontochile*, phacopids, and other fossils include conularids, straight nautiloid cephalopods and crinoids. The fossils occur very near the base of the formation. The lower part of the Bailey interfingers with the Moccasin Springs below.

LL Moccasin Springs Formation is composed of limestone, marl, and shale. The Randol **Shale Member** is the upper unit of the Moccasin Springs. It is a greenish calcareous shale that is nonfissile, 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 *Saetograptus 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. appearance that is not seen in any other formation in the Illinois Basin. The lower part of this The trilobites are mainly calymenids. The lower contact with the unit below is gradational. **MM** St. Clair Limestone is a red and gray lime mudstone. It is dense, weathers blocky and 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.

> **NN** 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.

OO 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. A fossils, common to the Sexton Creek are large colonial favositid "biscuits" some of which can be silicified. The lower contact is unconformable. **PP** 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 serrulatus.* The lower contact is sharp.

QQ 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 Maguoketa 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 lower part of the formation is the **Thebes Sandstone Member** of the Maguoketa Shale. The Thebes is a very fine grained, well sorted guartz 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 brownish gray lime mudstone that contains an abundant fauna. Fragments of brownish bones radial feeding (fodininchia) burrowing occurs in the upper half of the member. The trilobite Ampyxina bellatula is rare but occurs in the Thebes Sandstone.

Symbology		
Limestone	\sim	Ripple Marks
Sandstone	~/ ▲	Chert
Shale	-	Coal
Carbonaceous Shale		
Conglomeritic Sandstone		
Silty Shale		
Dolomite		
 Argillaceous Limestone		
Oolitic Limestone		
Cherty Limestone		
Dolomitic Limestone		
Sandy Limestone		