

Formation	Member	Stratigraphic relations		Thickness of member		Limestone			Claystone and mudstone			Siltstone and Sandstone			Coal bed	Lithofacies	Fossils	Distinctive features
		General lithologic sequence and prominent strata, from top to bottom	Persistence of strata	Range and thickness and area where thickest (by quadrangle)	Direction of thinning	Range in thickness and area where thickest (by quadrangle)	Bedding and sedimentary structures	Insoluble residue	Range in thickness and area where thickest (by quadrangle)	Bedding and sedimentary structures	Minerals other than quartz and mica	Thickness, shape, and trend of units, area where thickest (by quadrangle)	Bedding and sedimentary structures	Minerals other than quartz and muscovite	General nature and persistence, range in thickness, and area where thickest (by quadrangle)	Number and type		
Washington	Upper limestone	Limestone; 8-12 beds separated by thin claystone. Sandstone, mudstone, or claystone separates the limestone into two sets of beds locally.	Uppermost beds persistent. Sandstone, mudstone, and claystone restricted to southern and west-central parts. Lowermost beds absent from extreme southwestern part.	12-49 ft. NW ¼ Amity.	Southwestward and northeastward.	Magnesium content of limestone in Washington Formation <5 percent. 12-25 ft.; individual beds, 4 in.-2 ft.; Washington East and Amity. Even bedded; medium to thick bedded. Fine laminations suggesting algal structure common. Local vertical structures and breccia. Quartz grains Microscopic particles of chert? Illite Chlorite Mixed-layer montmorillonite chlorite. Pyrite			2 in. -13 ± ft. W ½ Amity.	Claystone: irregular, laminated to structureless. Mudstone: laminated	Not analyzed.	Siltstone: 0-10 ft.; lenticular and intertonguing. Sandstone: 0-14 ft.; lenticular. SW ¼ Washington West.	Siltstone: even bedded; laminated to medium bedded. Sandstone: even bedded; generally thin to medium bedded; locally laminated.	Not analyzed; probably similar to sandstone in other members.	Member has no coal bed.	Five. Limestone, silty limestone, clayey limestone, calcareous mudstone, silty limestone-mudstone.	Limestone: fresh-water ostracodes, locally in profusion; fish remains; teeth, spines, scales, occasional bone fragment; <i>Spirorbis</i> locally; small high-spired gastropods rare. Ostracodes and fish remains generally in top 1 in. of a bed.	Generally high CaCO <sub>3</sub> content (85 percent or more) of uppermost limestone beds; uppermost beds dark gray, almost black; weathered surface of uppermost beds almost white.
	Middle	Mudstone and siltstone. Sandstone and siltstone. Carbonaceous shaly mudstone with thin impure coal locally at base. Mudstone, siltstone, and sandstone. Coal, impure, thin, and carbonaceous; shaly mudstone. Limestone, generally in two or more series of beds separated by mudstone, siltstone, and occasionally sandstone. Sandstone, siltstone, and mudstone. Coal and carbonaceous shaly mudstone.	Persistent. Sandstone bed persistent. Persistent. Individual strata not persistent. Persistent. Uppermost two series of limestone beds persistent; several beds in uppermost series persistent. Sandstone generally persistent. Persistent.	100-156 ft. SW ¼ Amity.	Northwestward	5-28 ft.; individual beds 5 in.-2 ½ ft. NW ¼ Washington West. Generally even bedded; basal beds in a set; commonly nodular. Many beds are finely laminated, suggesting algal structures. Many beds are breccia-conglomerate, either wholly or in part, some beds have filled solution and desiccation cracks. Quartz grains Illite Kaolinite Chlorite Montmorillonite? Pyrite	2 in. -15 ft.; Amity.	Claystone: irregular, laminated to structureless; generally in thin sheets between limestone beds and beneath coal beds. Mudstone: lenticular and intertonguing units; even bedded; laminated; ironstone and limestone nodules locally. Above the limestone: Illite Chlorite Mixed-layer clay Montmorillonite? Below the limestone: Illite Kaolinite Chlorite	Siltstone: 1 in. -20 ft.; lenticular and intertongued. Sandstone: 0-50 ft.; sheetlike; thicker parts elongate, sinuous, anastomosing; N-N.E. SW ¼ Washington West.	Siltstone: generally even bedded and laminated. Sandstone: variable from even to irregular; tabular (forest) and festoon crossbedding; ripple laminations locally; crude low-angle forest bedding in thick sandstone units in western part of Washington West quadrangle; scour bottoms beneath units with festoon crossbedding.	Potassium feldspar (orthoclase?) Plagioclase (sodic and calcic varieties) Illite Kaolinite Chlorite Pyrite Calcite Heavy minerals are leucocene, ilmenite, magnetite, brown tourmaline, garnet, rutile, apatite, biotite, and zircon. The siltstones contain fewer heavy minerals and more calcite.	A carbonaceous laminated mudstone coal bed; 2 in. - 12 ft.; Amity; persistent. (Jollytown coal bed of Stevenson, 1876.) Generally thin impure coal and carbonaceous shaly mudstone above the uppermost series of limestone beds are generally persistent; thickest in the Washington West quadrangle.	Five. Limestone-sandstone, calcareous sandy siltstone, calcareous siltstone, silty limestone-mudstone, mudstone.	Limestone: fresh-water ostracodes; small high-spired gastropods locally in third bed from top of uppermost limestone set; <i>Spirorbis</i> locally; fish remains locally; small pelecypods rare. Mudstone: carbonized plant debris locally above coal beds.	Impure limestone beds near the middle of the member; breccia-conglomeratic character and yellowish orange of the third bed from top of uppermost limestone set; carbonaceous shaly mudstone in upper part.			
	Lower limestone	Generally 8-12 limestone beds separated by claystone and mudstone that vary in thickness; in west-central Washington West quadrangle all but uppermost bed is siltstone; near east-central edge of Washington East quadrangle the member is siltstone and sandstone. Coal bed.	Carbonaceous shaly limestone bed at top of member and thick ledge-forming bed near top of member persistent; mudstone-claystone layer near middle generally persistent.	15-42 ft. S ½ Prosperity.	No regional pattern.	0-15 ft.; E ½ Washington West. Individual beds 2 in.-2 ft. Bedding variable, from even in uppermost beds to irregular in lower beds; lower bed nodular. Some beds laminated, suggesting algal structures; some beds have breccia-conglomerate either wholly or in part; other beds have filled desiccation cracks. Quartz grains Microscopic particles of chert? Illite Kaolinite Chlorite Pyrite	2 in. -20 ft.; Washington East and easternmost part of SE ¼ Amity. SE ¼ Amity.	Claystone: irregular, laminated to structureless; sheetlike to lenticular; carbonaceous laminations common. Mudstone: lenticular and intertonguing; carbonaceous laminae, ironstone nodules, and limy nodules common. Feldspar Illite Kaolinite Chlorite Mixed-layer montmorillonite-chlorite in one sample from claystone parting in Washington coal bed.	Siltstone: a few inches to about 20 ft.; lenticular and intertonguing. Sandstone: 0-10 ft.; lenticular. W ½ Washington West.	Siltstone: generally even bedded and laminated. Sandstone: irregular; crossbedded locally. Similar to sandstone in other members.	Washington; 0-100 in.; thickest in Washington West quadrangle; absent in S ½ Washington East, N ½ Amity; high claystone-mudstone content.	Nine. Clayey limestone, calcareous mudstone, silty limestone-mudstone, calcareous sandy siltstone, calcareous siltstone, silty sandstone.	Limestone: fresh-water ostracodes; fish remains, <i>Spirorbis</i> ; small high-spired gastropods common in lowermost bed, not found in other beds. Fossils generally in upper 2 in. of a bed; uppermost carbonaceous bed commonly contains much fossil debris.	Relatively thick ledge-forming limestone near top; relatively thick claystone bed near middle of member.				
Waynesburg	Upper	Interbedded laminated mudstone and siltstone; sandstone beds locally. Coal bed.	Individual beds lenticular. Persistent.	3-23 ft.	No regional pattern.	3-17 ft.; E ½ Washington West; SE ¼ Amity.	Even bedded; laminated throughout. Abundant carbonaceous particles. Illite Kaolinite Chlorite	Siltstone: <6 in.; sheetlike and intertonguing. Sandstone: 0-16 ft.; sheetlike; thicker parts are elongate.	Siltstone: even bedded; laminated. Sandstone: crossbedded; ripple laminations locally. Similar to sandstone in other members.	Little Washington; 3-31 in.; E ½ Washington East and SE ¼ Amity; impure, represented by carbonaceous laminated mudstone locally.	Four. Sandstone, silty sandstone, siltstone, mudstone.	Abundant fine carbonized plant debris along bedding planes.	Relative thinness, abundant carbonaceous laminae, and high mica content.					
	Middle	Claystone and mudstone. Siltstone and sandstone. Thin coal bed. Limestone. Claystone, mudstone, siltstone, and sandstone. Limestone and mudstone. Coal bed.	Persistent; rock types lenticular. Persistent. Limestone persistent N ½ Washington area. Persistent. Persistent.	38-90 ft.; S ½ Prosperity.	Northwestward	6 in. -16 ft.; E ½ Washington West, SE ¼ Washington East, N ½ Amity. Individual beds 3 in.-2 ft. Irregular to even bedded; nodular locally. Fine laminations suggesting algal structure common. Most beds wholly or in part breccia-conglomerate; some beds have filled solution cavities. Quartz grains Illite Kaolinite Chlorite Pyrite	1-63 ft.; Prosperity; Amity.	Claystone: irregular, laminated to structureless. Mudstone: laminated. Units are lenticular and intertonguing; ironstone and limy nodules common. Feldspar Illite Kaolinite Chlorite Pyrite	Siltstone: 1-30 ft.; lenticular and intertonguing. Sandstone: 0-29 ft.; sheetlike; thicker parts elongate and distributary. N-N.E. Typically thin bedded.	Siltstone: even bedded; laminated to medium bedded; ripple laminations locally. Sandstone: even bedded; irregular locally; tabular (forest) and festoon crossbedding, ripple laminations locally; scour bottoms beneath bodies with festoon crossbedding. Similar to sandstone in other members.	Waynesburg "A"; 0-60 in.; Prosperity; impure, represented by carbonaceous laminated mudstone locally.	Six. Calcareous mudstone, silty limestone, mudstone, calcareous siltstone, calcareous siltstone, silty sandstone.	Limestone: fresh-water ostracodes; <i>Spirorbis</i> ; fish remains, and small high-spired gastropods locally. Claystone: fish remains, <i>Spirorbis</i> , and small high-spired gastropods locally between limestone beds and beneath Waynesburg "A" coal bed. Sandstone: macerated plant debris locally.	Persistent limestone beds above the Waynesburg "A" coal bed; breccia-conglomeratic limestone beds; persistent thin coal bed (Waynesburg "B") in upper part.				
	Lower	Claystone. Limestone. Mudstone, siltstone and limestone. Sandstone, siltstone, mudstone, and limestone. Coal bed.	Persistent. Sandstone persistent. Persistent.	38-82 ft. SE ¼ Amity.	Westward	0-8 ft.; SW ¼ Prosperity. Even bedded to nodular. Quartz grains Pyrite Illite Kaolinite Chlorite	4-55 ft.; East-central Amity; SW ¼ Prosperity.	Claystone: irregular, laminated to structureless. Mudstone: laminated. Units are lenticular and intertonguing; ironstone and limy nodules locally. Feldspar Illite Kaolinite Chlorite Pyrite Siderite	Siltstone: 0-20 ft.; lenticular and intertonguing. Sandstone: 0-55 ft.; sheetlike; thicker parts elongate, sinuous and anastomosing. NW and NE.	Siltstone: even bedded; laminated; ripple laminations locally. Sandstone: even bedded to irregular and massive; festoon crossbedding prominent in E ½ Amity. Similar to sandstone in other members.	Waynesburg; 0-100± in.; absent only in small area in SW ¼ Prosperity; thickest in Amity; has characteristic thick clay parting; second only to Pittsburgh bed in prominence.	Seven. Sandstone silty sandstone, calcareous sandstone, siltstone, calcareous sandy siltstone, silty limestone-mudstone, mudstone.	Carbonized plant fragments abundant locally in laminated mudstone just above the Waynesburg bed. Log casts abundant in base of the cross-bedded massive stone.	Prominent Waynesburg coal bed; massive crossbedded sandstone.				