Geology in Michigan –
Field Guide to Fossil Collecting on the Stonington Peninsula in Delta County, Michigan

By Dave Adler, CPG-11377

FIGURE 1 | REGIONAL MAP

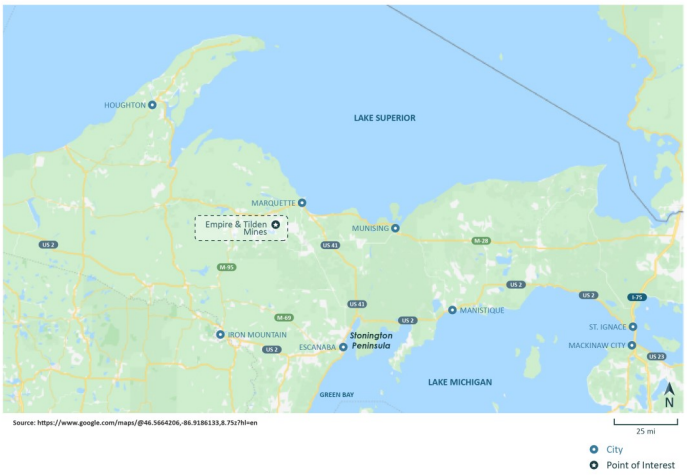
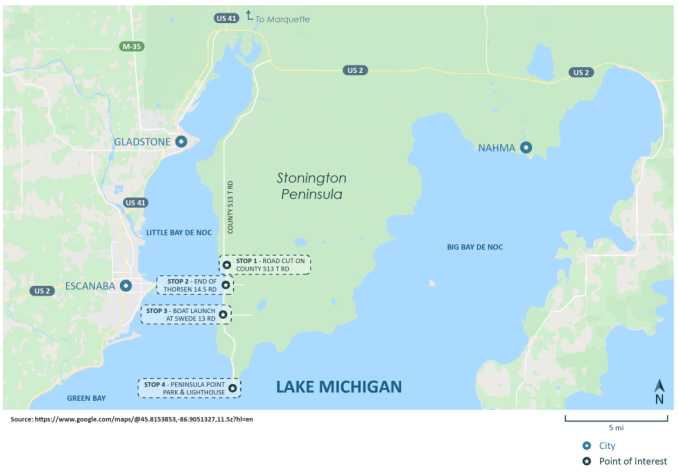


FIGURE 2 | AREA MAP



Directions

The Stonington Peninsula juts out into the north shore of Lake Michigan just south of the City of Rapid River in Delta County in the south-central portion of Michigan's Upper Peninsula (Figure 1). It is most easily accessed via US Highway 2 (US-2), the primary paved road that runs east-west along the south side of the Upper Peninsula. The four stops described in this article are accessed from County 513 T Road, the paved two-lane road that traverses the west side of the Stonington Peninsula from north to south. County 513 T Road (CO 513) can be accessed from US-2 approximately 2.5 miles east of Rapid River (Figure 2).

From Marquette, take US-41 south for approximately 50 miles to US-2 in Rapid River. Proceed east on US-2 approximately 2.5 miles to the intersection of CO 513 and US-2. Turn right (south) onto CO 513 and proceed southward along the west side of the Stonington Peninsula to the four stops described separately below.

From St. Ignace on the north side of the Mackinac Bridge, take US-2 west for approximately 125 miles to the intersection of US-2 and CO 513 (approximately 2.5 miles east of Rapid River). Turn left onto CO 513 and proceed south towards Stops 1-4. From the west, take US-2 eastward through Rapid River. Turn right (south) onto CO 513 and proceed southward toward Stops 1-4.

Introduction

The Stonington Peninsula is a quiet, lightly populated and mostly rural area of the south-central Upper Peninsula. It is surrounded on three sides by the waters of Lake Michigan - Little Bay De Noc on the west side, Big Bay de Noc on the east side, and Green Bay on the south side. CO 513 is the primary paved road allowing access along the west side of the Stonington Peninsula where there are bedrock cliffs that overlook Little Bay De Noc and the cities of Escanaba and Gladstone. The area has a rich history related to the Upper Peninsula's logging and iron mining industries. If you drive along CO 513 near dusk, you're likely to see hundreds of white tail deer in the fields on the east side of the road. If you travel all the way to the south end of CO 513 to Peninsula Point (Stop 4), you'll find a public park with a picnic grounds and a historic lighthouse. Monarch butterflies have been known to congregate here in the thousands in the fall where they rest for a short time during their migration to Mexico, a journey of nearly 2,000 miles. Over 200 bird species have been observed at Peninsula Point.

Bedrock of the Ordovician Bill's Creek Formation and

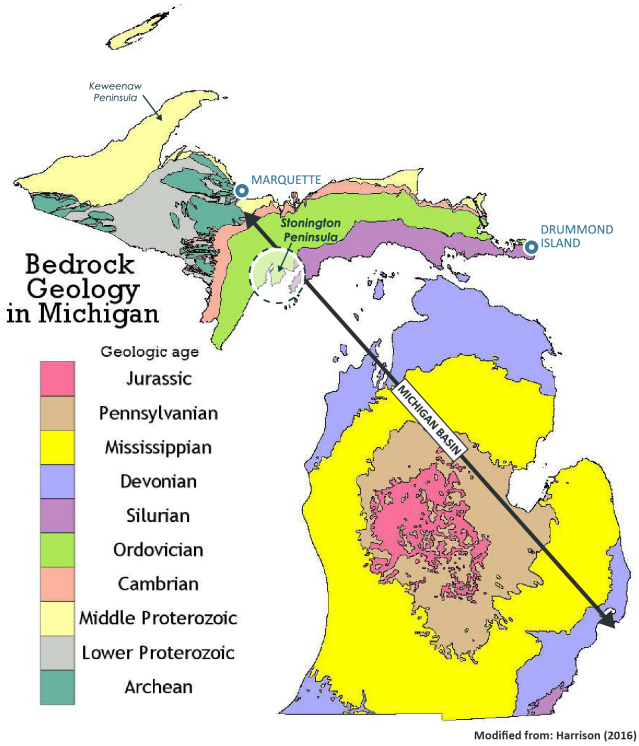
the overlying Stonington Formation is exposed at several locations on the west side of the Stonington Peninsula. The Bill's Creek Shale and the Stonington Limestone are highly fossiliferous and yield numerous Ordovician invertebrate fossils. The Bill's Creek Shale is especially rich in fossils and tends to weather easily, allowing for great fossil collecting on the beaches of Little Bay De Noc and other areas where bedrock is exposed, including the cliffs along the west side of the Stonington Peninsula.

This field guide describes four stops where the Bill's Creek Shale and the Stonington Limestone can be observed and where fossils can be readily found and collected. It's a great place to introduce children to the fascinating wonders of geology and the history of life on earth. As always, discretion, attention to safety (your personal safety and the safety of those around you), and respect for private property are encouraged. Have fun and enjoy!

Geologic Setting

The Stonington Peninsula is located on the northwest side of the Michigan Basin geomorphic province. The regional geologic setting is depicted on Figure 3. The flanking rocks to the northwest include Archean, Lower Proterozoic, and Middle Proterozoic rocks along the southern margin of the Canadian Shield. The Middle Proterozoic (Huronian/Animikian) rocks include the economically significant iron ore deposits of Michigan's three iron ranges - the Marquette Iron Range (Negaunee Iron Formation), the Menominee Iron Range (Vulcan Iron Formation) and the Gogebic Iron Range (Ironwood Iron Formation). The extensive native copper deposits of the Lake Superior Copper District (the Late Precambrian Portage Lake Lava Series and the Nonesuch Shale) are also located off the northwest flank of the Michigan Basin. From approximately 1880-1910, the Lake Superior Copper District supplied much of the country's industrial copper supply. Iron ore is still being mined on the Marquette Range.

FIGURE 3 | GEOLOGIC SETTING



Modified from: Harrison (2016)

The Michigan Basin is a bowl-shaped intracratonic crustal depression that contains several thousand feet of sedimentary rocks deposited during the Paleozoic era. These sedimentary rocks overlie older Precambrian age crystalline basement rocks. The maximum thickness of accumulated Paleozoic sedimentary rocks in the Michigan Basin is approximately 15,000 feet in the Midland area near the center of Michigan's Lower Peninsula. The Paleozoic sedimentary rocks include dolomite, limestone, shale and sandstone. Dolomites and limestones are the primary Paleozoic lithologies of the Michigan Basin.

Formation of the Michigan Basin began in the early Cambrian by erosion of ancient highlands formed during the Cambrian-Penokean Orogeny, followed by subsequent deposition. Later effects of the Appalachian orogeny may have caused the structural deformation and downward movement in what had been a relatively stable continental interior. As a result, several intracratonic structural basins developed in the central lowland areas of North America creating domes and arches. The Michigan Basin is bounded on the north by the Canadian Shield, on the west by the Wisconsin Arch and Wisconsin Dome, on the east and southeast by the Algonquin Arch and the Findlay Arch, and by the Kankakee Arch to the south in northern Illinois and Indiana (Michigan Department of Transportation, 2008).

Shallow seas covered most of the Michigan Basin during the Ordovician and Silurian. The rocks deposited during this time were mostly chemical precipitates and evaporites. During the middle and late Silurian, significant halite deposits were formed within the Silurian age Salina Formation, a relatively thick sequence of evaporite and carbonate rocks. The Salina is an important source of rock salt, especially in southeast Michigan (Detroit/ Windsor, Ontario area) and has also produced oil and gas.

As shown on Figure 3, the Ordovician rocks of the Michigan Basin occur in an east-west trending arc-shaped belt extending from the Stonington Peninsula eastward across the Upper Peninsula (UP) to Drummond Island at the eastern edge of the UP. The Ordovician rocks dip gently to the south and east towards the interior of the basin. These rocks are primarily fine-grained carbonates and shales. According to LaRowe (2000), the paleolatitude of the Great Lakes region in the Late Ordovician was approximately 20 degrees south, thereby providing environmental conditions suitable for carbonate deposition.

Late Ordovician age marine bedrock of the Richmond Group underlies the Stonington Peninsula (Dorr and Eschman, 1970). The Richmond Group includes, in ascending order (from oldest to youngest), the Bill's Creek Shale, the Stonington Formation, and the Big Hill Formation. Both the Bill's Creek and Stonington Formations are exposed at several locations along the west side of the Stonington Peninsula, and offer some excellent opportunities to observe the Ordovician lithologies and their rich assemblages of well-preserved Ordovician invertebrate fauna.

The Bills' Creek Shale has been described in the published literature as:

- Thin-bedded gray to brown soft shale with occasional

layers of hard shale. The shale becomes bluish when weathered. Thin layers of argillaceous, fine-grained limestone are interbedded with the shale. The shale and limestone grade into each other laterally. A total thickness of 245 feet has been observed in the Cleveland-Cliffs core from a location 32 miles northeast of Escanaba. (LaRowe, 2000). LaRowe (2000) goes on to state that the deposition of the Bill's Creek Shale was likely in relatively deep water, as shown by both the lithology and the fauna.

- Thin bedded brown shale with occasional layers six inches thick. The shale turns a light bluish color when weathered. Alternating interbeds of argillaceous limestone occur in the shale towards the top of the section. The alternating interbeds are especially well exposed near the top of the section in exposures on the west side of the Stonington Peninsula (Hussey, 1952).

The Stonington Formation conformably overlies the Bill's Creek Shale and consists of the Bay De Noc Member overlain by the Ogontz Member. The Bay De Noc member has been described as shaly limestone by Dorr and Eschman (1970), and as mudstone and argillaceous limestone by Lamsdell et al (2016). The Ogontz member has been described as limestone with layers of chert nodules (Lamsdell et al, 2016) and as cherty limestone by Dorr and Eschman (1970).

According to LaRowe (2000), the Bay De Noc Member of the Stonington Formation is mostly tan to grey argillaceous limestone with interbedded shale and occasional mudstone, similar to the underlying Bill's Creek beds. The type section for the Stonington Formation is in the shoreline cliffs on the west side of the Stonington Peninsula where the exposed section is approximately 25 feet thick. This location is near Stop 1 described below. The total thickness of the Stonington Formation is approximately 150 feet, as observed in the above noted Cleveland-Cliffs core (LaRowe, 2000).

According to Wicander and Playford (2008), palaeontologic-palynologic and sedimentologic evidence indicates that the Bill's Creek Shale was deposited in a near-shore, low energy marine environment. The Bay De Noc Member of the Stonington Limestone was also deposited in a low energy marine environment, although in a more offshore, somewhat deeper water setting.

Pleistocene age glacial drift sediments overlie the bedrock throughout most of the Michigan Basin. The exposed glacial features are the result of advancing and retreating continental glaciers during the Wisconsin glacial stage of the Pleistocene epoch (approximately 35,000 to 10,000 years before present). The glacial drift in Michigan's Lower Peninsula, where there are few bedrock exposures, tends to be relatively thick, on the order of several hundred feet thick in some areas. The glacial drift in the UP is generally thinner, and bedrock exposures are much more common.

The glacial drift on the Stonington Peninsula has been described by Jerome (2006) as lake plain sediments along the northern half of the west side of the peninsula, and as bedrock-controlled ground moraine deposits on most of the remainder of the peninsula. Western Michigan University (1981) describes the glacial drift as lakebed sands along the sides of the Stonington Peninsula, with rock at or near the surface on the majority of the peninsula. Apple and Reeves (2007) describe the glacial sediments in Delta County as till, outwash and lacustrine with a thickness ranging from 0-200 feet. The glacial cover on the Stonington Peninsula is generally thin (0-50 feet thick) to very thin (less than 10 feet thick), especially along the west side of the peninsula where the Bills Creek Shale and the Stonington Limestone are exposed in coastline cliffs, a roadcut along CO 513 (Stop 1), and at some of the beach areas.

The Bill's Creek Shale is prolific in Ordovician marine invertebrate fossils. Its fossil assemblage includes arthropods, ostracods, conodonts, brachiopods, trilobites, bryozoans, pelecypods, and graptolites. Kesling and Hussey (1953) describe the abundance of ostracod fossils at a location on the west side of the Stonington Peninsula as containing fifteen specimens of a particular quadrilobate species in one square inch of exposed rock surface.

Historical Note

According to Hussey (1926), the first known observations of the Ordovician rocks exposed on the west side of the Stonington Peninsula were made by Dr. Douglas Houghton in 1837. Dr. Houghton examined the rocks exposed along the east shore of Little Bay De Noc (the west side of the Stonington Peninsula) from Peninsula Point at the southern tip of the peninsula (Stop 4 described below) northward for approximately seven miles. He was the first to describe the argillaceous (Bay De Noc) member and the overlying cherty (Ogontz) Member of what would later be named as the Stonington Formation.

Douglas Houghton was a botanist, naturalist, geologist, and physician. He was elected mayor of Detroit in 1842. The diminutive Dr. Houghton (also referred to as the "Little Doctor") was the first Professor of Geology, Mineralogy, and Chemistry at the University of Michigan and the first State Geologist after Michigan achieved statehood in 1837. Dr. Houghton was a member of Henry Rowe Schoolcraft's 1831 and 1832 expeditions to the Lake Superior and upper Mississippi valley regions where they observed the native copper deposits of the Keweenaw Peninsula that would later become the object of America's first mining rush. Dr. Houghton's later geologic reconnaissance of the Keweenaw copper deposits and his subsequent reports are largely responsible for the copper rush in the western UP that began in 1843, several years before the California gold rush. Douglas Houghton drowned in a Lake Superior storm in October 1845 at the age of 36. His many accomplishments in those 36 years would suggest a much longer lifetime.

Stop 1: Roadcut on the East Side of CO 513 at the Entrance to Lakewood Cemetery

Latitude: 45°45'45"N; Longitude: 86°58'34"W

Section 23, T39N, R22W, Delta County

Directions

FIGURE 4 | STOP 1 - ROADCUT ON COUNTY 513 T RD

From the intersection of US 2 and CO 513, travel south on CO 513 for approximately 11 miles. Shortly after you pass the intersection of CO 513 and School 16 Rd./ Caps 16 Ln., you'll see a prominent roadcut to your left on the east side of CO 513 (Figure 4). Towards the south end of the roadcut you'll see a sign for Lakewood Cemetery and the cemetery access road. You'll also see a blue and white sign with the address 5991 CO 513 T Rd. (Figure 5). On some maps the cemetery access road is called Hemlock Dr., although there's no sign there bearing that name. If you come to the intersection of CO 513 and Idlewood 15.5 Ln., you've gone just a little too far south.

Figure 5: Entrance to Lakewood Cemetery on CO 513 T Road. Photo by Dave Adler.

Geology

Park on the side of the road at the entrance to the cemetery. The roadcut is about 20 feet high and extends along the east side of CO 513 for approximately 600 feet or so. See Figures 6 and 7. The gray, soft and weathered shale and argillaceous limestone layers that comprise most of the roadcut at this location are the uppermost beds of the Bill's Creek Shale. The Bill's Creek beds weather easily forming a talus slope draping some of the roadcut. These rocks are rich in invertebrate marine fossils that are easily collected by hand.

Figure 6: Roadcut Along CO 513 Looking North. Note Gray Bill's Creek Shale Overlain by Tan Stonington Limestone. The Entrance to Lakewood Cemetery is in Middle Left of Photo. Photo by Dave Adler.

Figure 7: Roadcut Along CO 513 Looking East. Note Gray Bill's Creek Shale Overlain by Tan Stonington Limestone. Photo by Dave Adler.

Figure 8: Hand Size Specimen of Fossiliferous Bill's Creek Shale. Photo by Dave Adler.

A good example of a hand size specimen with some

well-preserved fossils is shown in Figure 8. The well-formed Pelecypods that can be seen in this specimen have been identified by Hussey (1952) as Cleidophorus noquettensis. According to Hussey (1952) when referring to the uppermost beds of the Bill's Creek Shale on the west side of the Stonington Peninsula: "Great numbers of small pelecypods belonging to the genus Clidophorus occur in the limestone layers and in the shaly partings between the layers". Hand size and larger specimens that are laden with fossils can be easily found and collected here.

As you look towards the uppermost portion of the roadcut, you'll see the rock layers change color from gray to light tan and become more competent and less weathered. These tan beds are the basal portion of the Bay De Noc member of the Stonington Formation that overlies the Bill's Creek Shale.

Stop 2: Fossil Beach at CO 513 and the End of Thorsen 14.5 Road

Latitude: 45°44'42"N; Longitude: 86°58'28"W

Section 25, T39N, R22W, Delta County

FIGURE 9 | STOP 2 - FOSSIL BEACH AT END OF THORSEN 14.5 RD

Directions

Figure 10: Landmark at the End of Thorsen 14.5 Rd. (Intersection of CO 513 and Thorsen 14.5 Rd.). View West towards Escanaba with Little Bay De Noc in the Background. Photo by Dave Adler.

From Stop 1 on CO 513, continue south on CO 513 for approximately 1.3 miles to the intersection of CO 513 and Thorsen 14.5 Rd. You'll see a green road sign that says "CO RD 513T Rd" on one side and "Thorsen 14.5 Rd (CRK-17)" on the other side. There will be a short dirt road extension of Thorsen 14.5 Rd. leading into a field to your right, to the west towards Little Bay De Noc (see Figures 9 and 10). Pull in to this dirt road. You can park in the field and continue walking down the short dirt road to a beach on Little Bay De Noc. It's a short and relatively easy walk down the dirt road to the beach. Alternatively, you may be able to drive down to the beach and park there, depending on local conditions at the time of your visit. Four-wheel drive is recommended if you drive down to the beach.

Geology

Figure 11: Fossil Beach Looking South Towards Stop 3. Note the Rock Cliffs Rising Above Little Bay De Noc in the Background. Photo by Dave Adler.

The beach along Little Bay De Noc in this area is a fossil hunter's paradise. The combined forces of gravity, erosion, and wave action have broken down the Bill's Creek Shale into gravel, cobble and small boulder sized pieces (see Figure 11). Wave action has partially polished many of the fossiliferous beach rocks, thereby en-

Figure 12: Brachiopods and Rugose Corrals Collected at Stop 2. Photo by Dave Adler.

hancing their appearance. Many cobble and small boulder sized pieces suitable for cutting, slabbing, and making bookends or similar aesthetically pleasing objects can be found here. Individual fossil specimens from the Bill's Creek Shale can also be found here. Whole brachiopods and rugose corals that have been released from the shale and polished by wave action are especially abundant at Stop 2 and make nice collector's items (see Figure 12).

As you stand on the beach looking out to the west into Little Bay De Noc, turn to your left and look south down the coastline of the Stonington Peninsula. You'll see cliffs rising along the coastline to the south towards Stop 3. As shown on Figure 13, these cliffs offer excellent exposures of the gray Bill's Creek Shale and the overlying tan Stonington Limestone (Bay De Noc Member). You may be able to access the cliffs by walking south along the beach from Stop 2, depending on beach conditions and water levels in Little Bay De Noc at the time of your visit. Keep

Figure 13: Beach Cliffs along Little Bay De Noc South of Stop 2. Note Gray Bill's Creek Shale and Talus Piles Overlain by Overhanging Tan Stonington Limestone. View South Towards Stop 3. Photo by Dave Adler.

an eye out for fossils as you walk the beach. The cliffs can also be accessed by watercraft. It's an easy paddle from the beach at Stop 2 when wave and wind conditions are appropriate.

Stop 3: Public Boat Launch at Co 513 and Swede 13 Road

FIGURE 14 | STOP 3 - PUBLIC BOAT LAUNCH AT END OF SWEDE 13 RD

Latitude: 45°43'25"N; Longitude: 86°58'50"W

Section 35, T39N, R22W, Delta County

Directions

Stop 3 is a public boat launch at the intersection of CO 513 and Swede 13 Rd. There is a beach with outcrops and more great fossil hunting at this location. This is also an excellent place to observe the shoreline cliffs along the east side of Little Bay De Noc. From Stop 2, proceed south on CO 513 for approximately 1.6 miles to the inter-

Figure 15: View south of the Low-Lying Outcrops of the Gray Bay De Noc Member of the Stonington Limestone and the Cobble Beach at the Stop 3 Public Boat Launch. Photo by Dave Adler.

section of CO 513 and Swede 13 Rd. (see Figure 14). Turn right (west) into the boat launch area where there's free parking and a free public boat launch. You will see a circular drive area. Walk along the circular drive to a cobble beach on Little Bay De Noc where there are low lying outcrops of gray limestone (see Figure 15).

Geology

The gray limestone here is much harder, less weathered, and more massively bedded than the rocks exposed at Stop 2. Hussey (1926) attributed these gray limestone beds to the Bay De Noc Member of the Stonington beds of the Richmond Formation (equivalent to what is now considered the Bay De Noc Member of the Stonington Formation). He described the rock as gray, very fine-grained argillaceous limestone, non-crystalline and moderately hard that yields numerous fossilized specimens of the Ordovician pelecypods Whiteavesia (Pholadimorpha) pholadiformis and Modiolopsis vailda. Hussey (1926) gives a total thickness of the abundantly fossil bearing Bay De Noc Member in this area of about 28 feet.

The cobble beach just below the above noted low lying gray limestone outcrops is relatively small in area but yields what seems like an endless supply of cobble and boulder size specimens of hard, gray to tan limestone that has abundant and very well-defined fossilized bryozoan colonies, a striking example of which is shown on Figure 16. This is a great place for collecting fossils. The access is easy, you can park your vehicle nearby on the circular

Figure 16: Tan Limestone Cobble with Bryozoans at the Stop 3 Cobble Beach. Photo by Dave Adler.

drive, and you don't have to carry your specimens very far.

If you walk clockwise around the circular drive from the cobble beach towards the boat launch and a wooden pier that sticks out into the water, look along the coastline to the north (back towards Stop 2). This is one of the best vantage points to observe the bedrock cliffs along the west side of the Stonington Peninsula. The cliffs in this area show some of the best exposures of the gray Bill's Creek Shale in the lower half of the cliff face, overlain by the tan beds of the Stonington Limestone in the upper half of the cliff face (see Figure 17). The Bill's Creek

Figure 17: The Bedrock Cliffs Along the West Side of the Stonington Peninsula. View North from Stop 3. Photo by Dave Adler.

Shale is noticeably more weathered, softer, and more friable than the overlying Stonington Limestone. It's only a short walk along the shoreline from the boat launch to the cliffs, but you may have to traverse private property. The cliffs can also be accessed by watercraft, again depending on local wind and wave conditions at the time of your visit.

An often-observed feature of cliff faces and high angle rock cuts where softer, more friable rocks underlie harder, more competent rocks is slope instability caused by undercutting of the overlying rocks leading to collapse. This type of rock slope failure was observed in the bedrock cliffs near the area shown on Figure 17 from the vantage point at Stop 3. As shown on Figure 18, the overhanging tan Stonington Limestone beds in the upper portion of the cliff face have collapsed due to undercutting caused by weathering and wave erosion of the underlying softer shale beds. The resulting slope instability, though localized, is rather striking and dramatic in appearance.

Figure 18: Bedrock Cliff Collapse where the Bill's Creek Shale has undercut the Overhanging Stonington Limestone North of Stop 3. Photo by Dave Adler.

Stop 4: Peninsula Point Lighthouse and Picnic Grounds

Latitude: 45°40'07"N; Longitude: 86°58'00"W

Section 24, T38N, R22W, Delta County

Directions

Stop 4 is the Peninsula Point Lighthouse and Picnic Grounds, also known as Peninsula Point Park, located at the southern tip of the Stonington Peninsula. The park is operated by the US Forest Service and offers opportunities for fishing, picnicking, beachcombing and hiking along the shoreline, observing rock outcrops, and collect-

Figure 19: Aerial View of Peninsula Point Lighthouse and Picnic Grounds. Photo by Bing.com.

ing rocks and fossils. There are picnic tables, outdoor grills, drinking water, outhouse style restroom facilities, and a historic lighthouse tower (see Figure 19). You can climb the 40-foot high lighthouse tower and view the surrounding countryside and the horizon as it extends over Green Bay, Little Bay De Noc, and Lake Michigan from the deck at the top of the tower. Peninsula Point is also a well-known place to observe a multitude of migrating bird species as well as monarch butterflies. It's a very nice venue for a gathering of friends or a family reunion.

When you exit the public boat launch at Stop 3, turn right onto CO 513 and proceed south for approximately four miles. CO 513 ends at Peninsula Point Park. The last mile or so is a somewhat narrow dirt road through the woods that necessitates slowing down a bit, but four-wheel drive isn't needed to get to Peninsula Point. However, the dirt portion of the road is not considered suitable for recreational vehicles or trailers greater than 16 feet long or eight feet high.

Geology

The glacial cover at Peninsula Point is very thin. As shown on Figure 20, bedrock occurs directly underneath the surficial topsoil and vegetation. The bedrock is well exposed along the shoreline at Peninsula Point. It has been identified by Hussey (1926) as belonging to the Ogontz Member of the Stonington beds (Stonington Formation). According to Hussey (1926), the Ogontz member is comprised mostly of cherty limestone that conformably overlies the Bay De Noc Member of the Stonington Formation. The Ogontz consists of 3-20 feet of light gray to yellowish-brown to dark brown massive and irregularly bedded limestone varying from soft and argillaceous to hard and cherty, with fossiliferous cherty beds being predominant. The base of the Ogontz is typically argillaceous. The fossils in the cherty layers, including gastropods and trilobites, are often well preserved, but the cherty nature of the rock matrix makes good specimens hard to obtain.

As shown on Figure 20, the bedrock observed at the coastal exposure at Peninsula Point is light gray, relatively flat lying limestone with fairly well-defined bedding. It does not appear to be particularly cherty. The exposed beds of the Ogontz here are fossiliferous, although fossils are not as abundant as in the Bill's Creek Shale. If you look closely at Figure 20, you can see the limestone beds extending under the water and out into Green Bay, giving one a feel for the reefs that are known to occur nearby that have historically been a hazard to shipping.

Figure 20: Coastline Outcrops of the Ogontz Member of the Stonington Limestone at Peninsula Point. Photo by Dave Adler.

Peninsula Point Lighthouse

During the 1860s, the town of Escanaba and other nearby ports were teeming with sailing ships hauling iron ore, lumber, fish and other commercial goods. When iron ore docks were constructed in Escanaba in 1864, Congress appropriated $15,000 for a lighthouse at the tip of the Stonington Peninsula at Peninsula Point (Stop 4) to assist ships in navigating around shoals and reefs in the local waters of Lake Michigan/Green Bay. The Peninsula Point Lighthouse was completed in 1865 with a square, 40-foot tall brick tower attached to a 1.5 story brick light keeper's dwelling. The lighthouse was equipped with an oil-fired fourth order Fresnel lens inside the decagonal shaped lantern room atop the lighthouse tower. A photo of the lighthouse and keeper's dwelling circa 1914 is shown in Figure 21.

In 1922, the fuel for the light was changed from oil to acetylene gas, allowing the lighthouse to be automated and unattended. The acetylene fueled light produced a white flash every ten seconds. In 1936, a new lighthouse was constructed at Minneapolis Shoal located approximately seven miles southwest of Peninsula Point. As

Figure 21: Peninsula Point Lighthouse Circa 1914 Showing the Keeper's Dwelling and Associated Outbuildings. Photo source: https://www.lighthousefriends.com/PeninsulaPoint1_1914_cg.jpg.

most shipping in the area now passed to the south of Minneapolis Shoal, the lighthouse at Peninsula Point was no longer needed and was decommissioned. Ownership of the Peninsula Point lighthouse and surrounding 47 acres was transferred to the U.S. Forest Service in November of 1936. The Civilian Conservation Corps was granted custodianship in 1937 and subsequently repaired the lighthouse buildings and created a campground and picnic area on the grounds.

The light keeper's quarters burned in 1959 and the remains of the building were removed. Today, only the 40 -foot tall lighthouse tower remains, surrounded by a day use picnic area with picnic tables, outdoor grills, and primitive restroom facilities. There is an interpretive trail along the coastline where outcrops of the exposed fossiliferous Ordovician carbonate rocks can be observed. The lighthouse tower is listed on the National Register of Historic Places. Visitors can climb the lighthouse tower for spectacular panorama views of Lake Michigan and the surrounding coastline. The tower also serves as an elevated vantage point for watching migrating birds and butterflies.

Closing

The west side of the Stonington Peninsula offers a number of excellent opportunities to observe and examine the Ordovician rocks of the Michigan Basin and collect specimens of the abundant fossil assemblages found in these rocks. It's also a secluded place of quiet solitude where one can breathe fresh clean air, enjoy the wildlife, comb the beaches, fish, and paddle the blue waters of Lake Michigan. It's a place that has much of the appeal that Michigan's Upper Peninsula is known for.

This field guide is intended to assist those who may be interested in fossil collecting and experiencing some of the geology of Michigan in an up close and personal way. The fossils of the Ordovician rocks on the west side of the Stonington Peninsula have been presented in this field guide in a general manner. Those wishing to take a deeper dive into the paleontology of this area are encouraged to consult the references below, where additional and considerably more detailed information can be obtained.

Acknowledgments

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