Geologic Resources of Iowa Final Project

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Site Identification

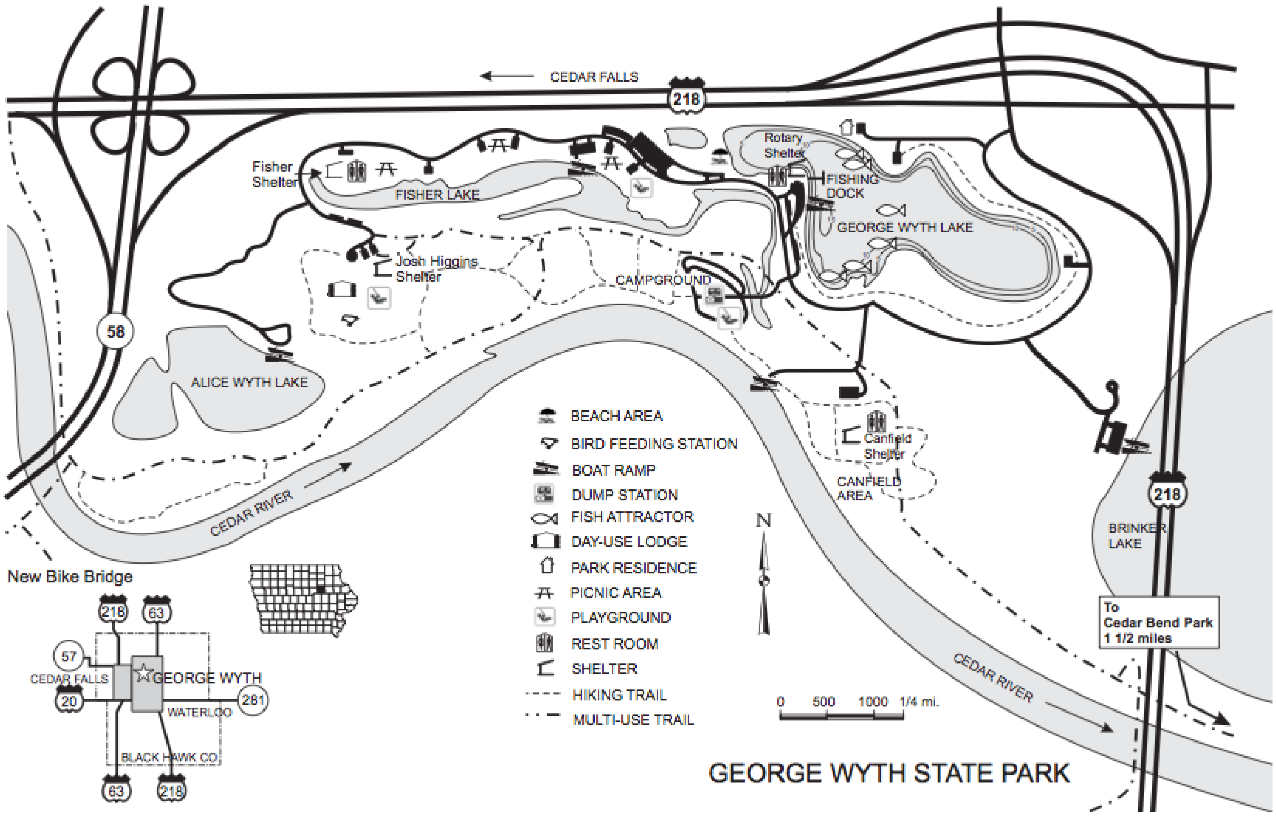
George Wyth Memorial State Park, formerly known as Josh Higgins Parkway, is located between Waterloo and Cedar Falls, Iowa off of Highway 218.

- 42°32′7″N 92°24′4″W
- Cedar Falls Quadrangle, Iowa-Black Hawk Co., 7.5 minute series (topo)
    - T.89N, R.13W, Sec.8, SW¼ N½
    - T.89N, R.13W, Sec.7, SE¼ NE¼

Historical Record

The area that is today George Wyth Memorial State Park was first settled by William and Nancy Fisher, who came from Virginia in 1853 (CedarNet, 2004) shortly after the first families were arriving in what is modern-day Waterloo. The areas surrounding the Cedar River saw a population increase in the years to follow as people flooded into the area, growing and developing the cities of Cedar Falls and Waterloo.

In 1940, 145 acres that included the Fisher's land (and Fisher Lake) was acquired for public recreation and called Josh Higgins Parkway (CedarNet, 2004). Later, in 1956, the park was re-named to honor J. George Wyth, former president of a local company called Viking Pump and important figure in the establishment of the first two city parks in Cedar Falls (Kinney, n.d.). It was because of his work with the latter that prompted the Iowa State Conservation Commission to preserve the park in his namesake.



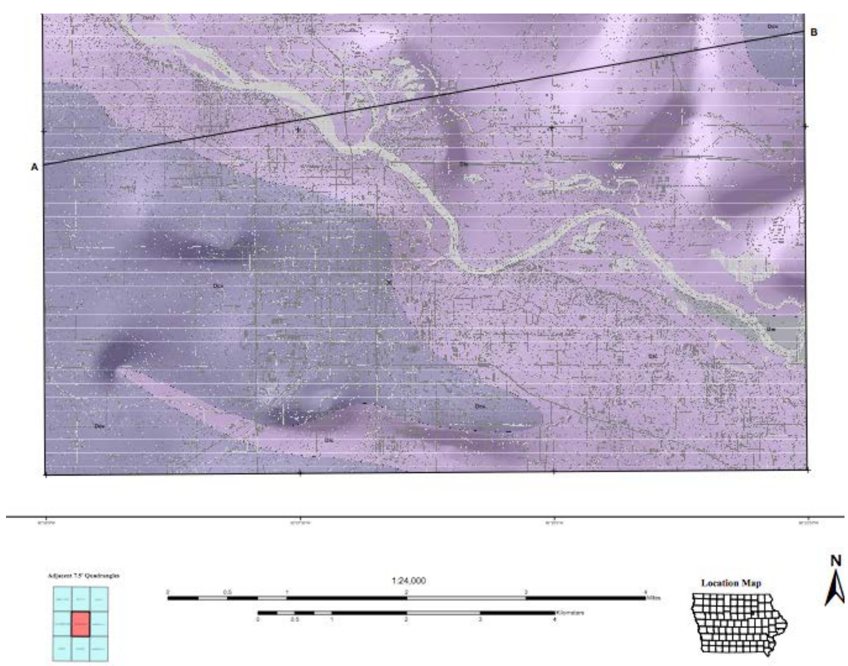
Currently George Wyth spans 419 acres and serves the public as a recreation area available for fishing, boating, biking, camping, swimming, and bird watching, among a multitude of other activities (ParkDetails, n.d.). The Cedar River borders the park on the South side, and there are presently four lakes which include Fisher Lake, George Wyth Lake, Alice Wyth Lake, and Brinker Lake, formerly known as East Lake (Cedar Falls Parks Directory, 2013). Fisher Lake being the exception, the lakes in George Wyth were created when sand dredging operations were closed, and there are more that will be opened to the public when current mining operations cease production, likely in 2016 (Jamison, 2014) (Kinney, 2002).

Most of the current and former quarries and sand pits were leased by BMC Aggregates, a company that produces crushed stone, sand, gravel, and other specialty products for road and building construction, landscaping, and playgrounds (BMC

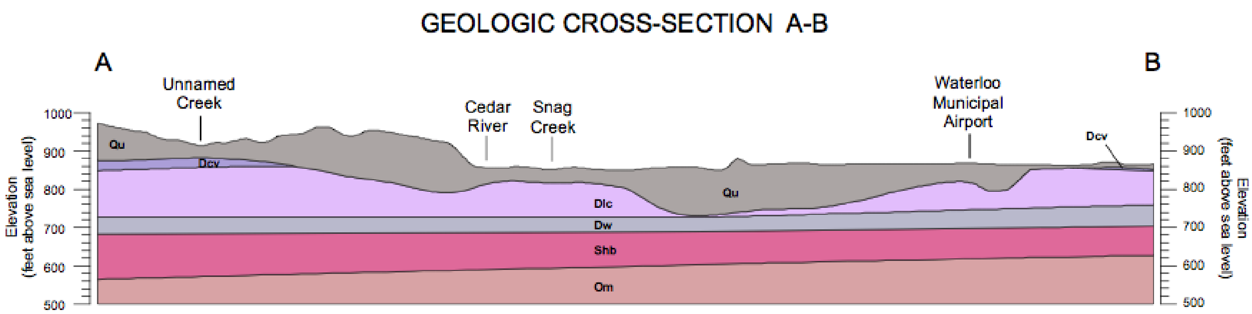
Aggregates, n.d.). When quarries and dredging operations are through with production (i.e. run out of useful material), they could be filled back in to restore them to natural landscape, but many times are either left as-is and allowed to fill with water or turned into recreation areas/preserves, which is the case of George Wyth (What happens…,2012). Lakes like these typically fill in naturally via the water table, water that also has to be continually pumped out during mining.

Bedrock Geology

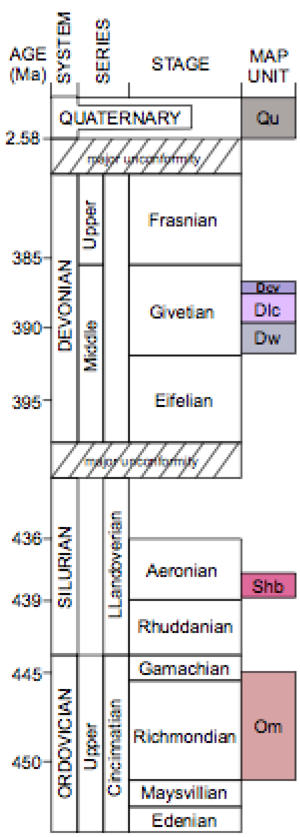
The rich dolomite and limestone deposits now mined in this area were deposited approximately 388 m.a during the Middle Devonian period, and are a result of the transgression/regression of shallow, coastal seas (Anderson, 1998).



Bedrock Formations of George Wyth



Correlation of Map Units



Little Cedar Formation (390-387 m.a.)

The Little Cedar Formation was deposited under a large Devonian sea that cycled through several T-R cycles throughout the period. Because most of the rock in this area is dolomitic, it is my assumption that George Wyth overlies the Gizzard Creek Member. The Gizzard Creek Member is characterized by dolomite and clay deposits with only a few fossil species that include mainly brachiopods, especially in the lower portion (OFM-12-03).

Wapsipinicon Group (392-390 m.a.)

Beneath the Little Cedar Formation lies the Wapsipinicon Group, formed earlier in the Devonian through deposition in a salty, shallow marine mudflat (Anderson, 1998). Gypsum and anhydrite can be found in this layer, along with shaley, laminated dolomite and limestone, but there are very few fossils. Though fossilized fish can be found, the limited marine life is likely due to the concentration of evaporites in a restricted marine seaway (Anderson, 1998).

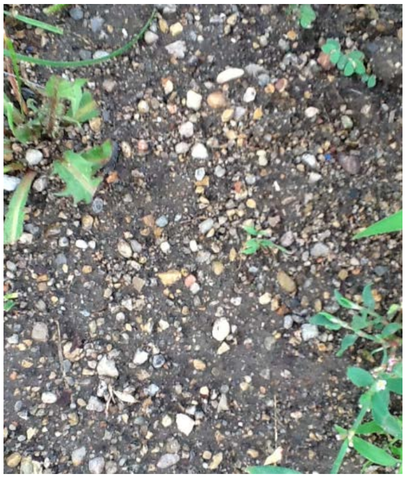
Hopkinton and Blanding Formations (439-437 m.a)

______During the first half of the Silurian, the Hopkinton and Blanding formations were deposited in a well-oxygenated marine shelf-environment (Anderson, 1998). This vuggy dolomite is typically quite cherty (up to 30%), especially in the Blanding formation, and are typically quite fossiliferous, including such organisms as corals, brachiopods, and stromatoporoids (OFM-12-03).

Maquoketa Formation (452-445 m.a.)

Rock from the Maquoketa Formation was deposited during the Late Ordovician in shallow, sometimes anoxic seas (Anderson, 1998). Typically abundant in invertebrates like brachiopods and graptolites, this dolomitic shale is typically brown to brown-grey in color toward the bottom, but transitions to interbedded layers of green-grey near the top (OFM-12-03).

Photo Samples From George Wyth



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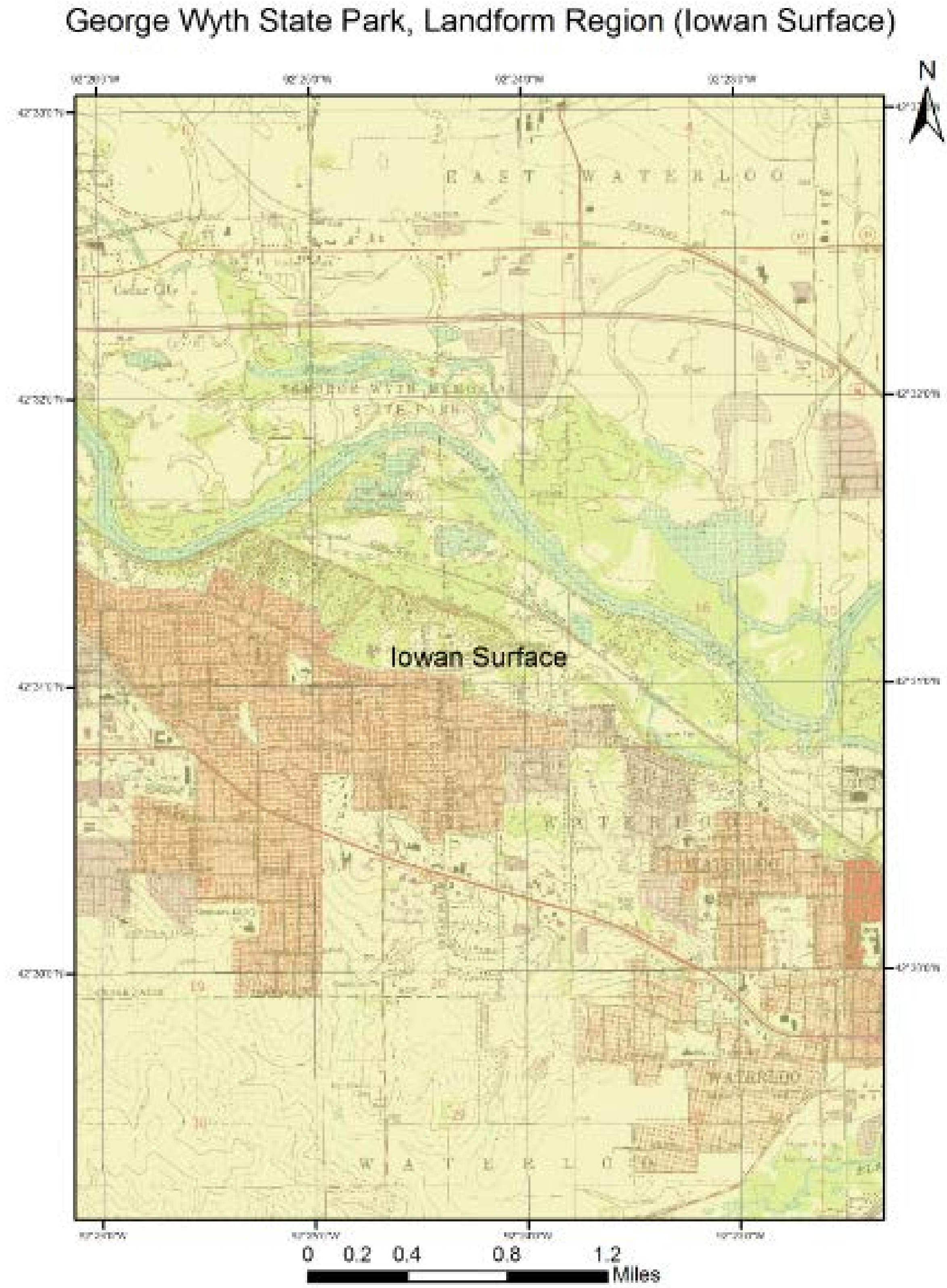
Soil and Rock photos from the park. Sandy soil is indicative of the park, and the main types of rock found in the park are dolomite and dolomitic limestone (brought in when constructing the lakes).

(Fisher Lake; The only natural lake in the park, formed from an oxbow of the Cedar River)

(Brinker Lake; Lake soon to be expanded by nearly 60 acres when current dredging operations cease, around 2016)

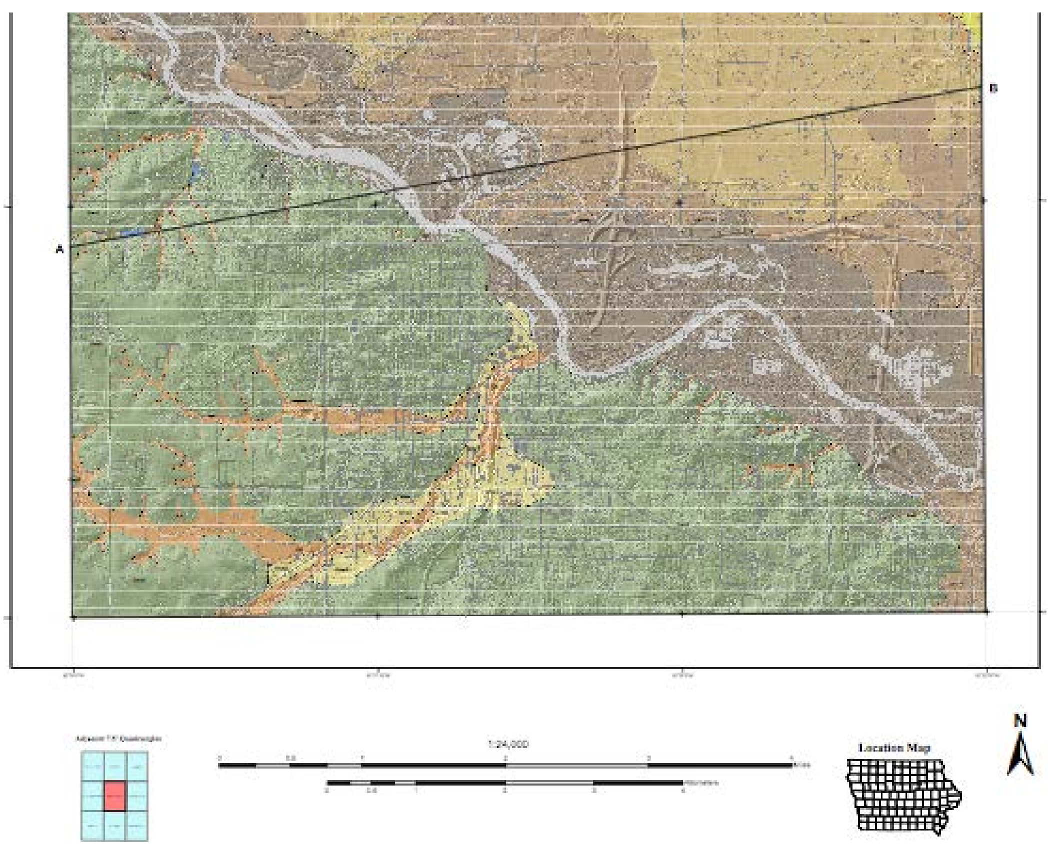
Quaternary Geology and Topography



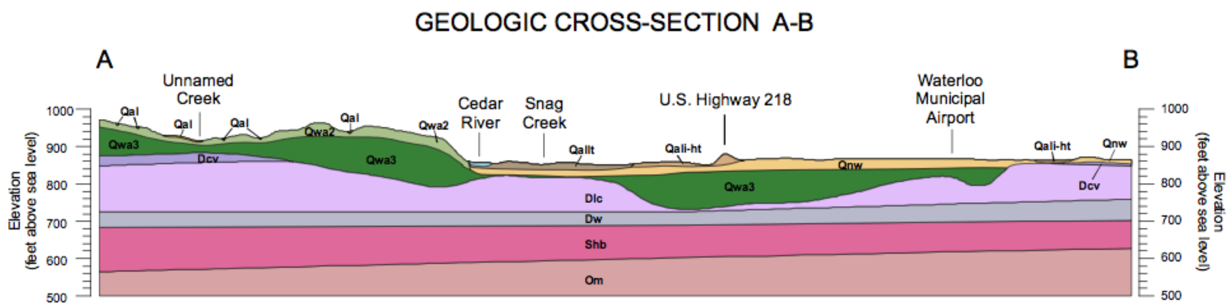
The Iowan Surface was formed between 16,500 and 21,000 years before present, and is characterized by rolling hills set within well-developed (low-gradient) drainage networks, wetlands, pahas in the south, and spotty karst topography to the north (Heinzel, 2015). This area is comprised of mostly thin layers of loamy soils or loess over glacial, Pre-Illinoian till of variable thickness (Heinzel, 2015).

The surficial geology of the area was shaped by multiple periods of glaciation, in addition to periods of periglacial environments which eroded the bedrock and deposited sediment on the Iowan Surface (OFM-12-04). Approximately 2.2-0.5 m.a., this region experienced its last glacial episode through at least seven different glacial advances/retreats (OFM-12-04), which scoured the surface, eroding overlying layers of bedrock. Over the next half-million years or so, Iowa was exposed to extreme cold, wind, solifluction, and typical freeze/thaw action that is indicative of periglacial environments (OFM-12-04). With time, strong winds eroded much of the Pre-Illinoian surface, forming a visible stone line and depositing sediment downwind in the south to form paha (OFM-12-04). In addition to wind, well-developed stream channels formed by glaciers helped carry and deposit fluvial sediment in the area.

George Wyth is set within the well-developed drainage network of the Iowan surface and is currently associated with the modern channel of the Cedar River (OFM-12-04). Surficial alluvial and outwash deposits in the park were formed in the Holocene, and are typically dark gray to brown silty clay loam, loam, or clay loam (OFM-12-04). Because of the Cedar River, soils in the area are very sandy (see photo above), and display a wide variety of rocks and minerals that were transported here from other areas. Because this is a State Park, and no exposed faces were present, I did not want to disturb an area for deeper soil analysis, but according to several well logs from the park, this sand (and sandy clay) represent the first 35-45 feet under the surface (Well Record 18306, 1960) (Well Record 22186, 1968). Beneath that it was slightly different in each well, even though both sites were in the SouthWest quadrant of the park. Data from Well Record 18306 described blue clay for the next 65 feet, followed by about 110 feet of light shale, while data from Well Record 22186 identifies about 30 feet of gray drift over about 40 feet of limestone. This might possibly be explained by the meandering path of the Cedar River. This area is all part of the Cedar River Basin, and as the river changed course over time, it likely eroded and deposited sediment in various areas within the basin.

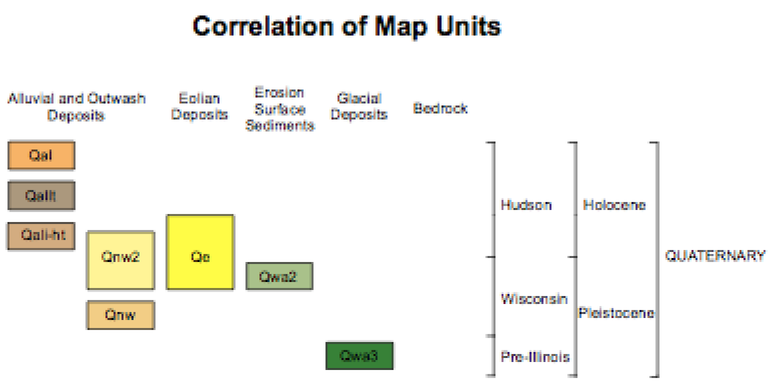


Quaternary Formations of George Wyth



Hudson Episode - Holocene

Deforest Formation-Camp Creek Member and Roberts Creek Member – Characterized by very dark gray to brown silty clay loam, loam, or clay loam. With a depth of 1-5 m, it overlies the Noah Creek Formation (OFM-12-04).



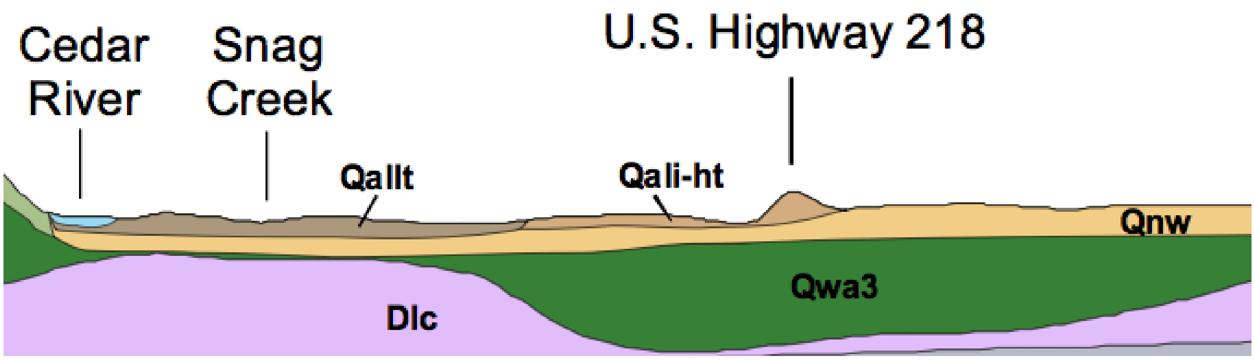
Early Wisconsin Episode – Pleistocene

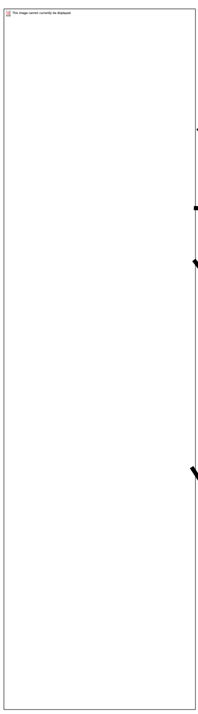
Noah Creek Formation – Characterized by a thin layer (2-8 m) of yellowish brown to gray feldsparic quartz sand, pebbly sand, and gravel, with some silty clay layers that intervene (OFM-12-04). A wide range of sediment is present from silty, colluvial deposits, in some places where wind has reworked colluvial deposits, to well-sorted, well-stratified layers are present (OFM-12-04).

Pre-illinoian Episode – Pleistocene

Wolf Creek or Alburnett Formation – Characterized by dense, fractured, loamy glacial till that may be buried by other surface sediment, loess, or alluvium that is typically 3-45 m thick (OFM-12-04).

Geologic Evolution Through History





Holocene (Hudson Episode; 12,600 y.b.p.) Periglacial environment with continued erosion and deposition via wind and well-developed stream channels	Dark gray/brown silty clay loam, and loam
Pleistocene (Early Wisconsin; 115,000 y.b.p.) Periglacial, or near glacial environment that included permafrost, solifluction, freeze/thaw action, along with fluvial and eolian processes. Deposits include sand, pebbly sand, and gravel with silty clay layers)	Composed of yellowish-brown/gray feldsparic quartz sand
Pleistocene (Pre-Illinoian; 2.5 - 0.5 m.a.) The first ice sheet moved into the area during the Pleistocene and covered much of Iowa. Glaciers eroded bedrock down up to 200 ft. in some places, accounting for the missing Coralville Formation in the area, and depositing sediment in others. Drainage channels were also developing, carrying sediment from farther up north	Composed of dense, fractured, loamy glacial till
Middle Devonian Bedrock (390-387 m.a.) Large marine sea that cycled through T-R cycles to form dolomitic limestone atop layers of gypsum, anhydrite, and shaley limestone, formed earlier in the Devonian when seas were shallow and salty	Fossils include: corals, brachiopods, and stromatoporoids

Student Project/Lesson Plan

Objective	Implementation Design	Daily Lesson Plans
• Students will collect data about waste water treatment plants, garbage disposal, and clean water delivery as they prepare for their group presentations. • Students will collaborate, create, and present a group PowerPoint presentation as they summarize and analyze data collected from field trip. • Students will explain and defend their water treatment solution as they write an argumentative letter. • Students will create an individual PowerPoint presentation as they plan action steps for a specific location.	• Students will be divided into groups, and will set up their Science Notebooks for data collection and reflection prior to field trip. • Classes will discuss procedure and safety guidelines prior to field trip. • Students will participate in field trip to a water treatment facility (CFU, Evansdale, Hudson, and Waterloo) in addition to conducting their own water sampling tests at George Wyth State Park, and visiting a sand dredging operation, like the ones that made the lakes. • Students will collect data using Science Notebooks and iPads. • After returning from the field trip, students will begin to collaborate and design a	• Day 1 - Divide students into groups and assign roles for the group project. Describe the flow of the field trip/how the day will go tomorrow. Outline expectations, and distribute directions to students • Day 2 - Field Trip (George Wyth and one of 3 waste water treatment facilities in the area) • Day 3 - Re-cap field trip and discuss data. Distribute group project rubric, and discuss each 'role'. Begin working on project in class (laptops/Chrome Books) - students collaborate via Google Drive. • Day 4 - Work time on group project • Day 5 - Work time on group project • Day 6 - Work time on group project/begin prepping for presentation (outline expectations for

Students will communicate data as they present their PowerPoint on their water treatment solution to peers.	PowerPoint presentation that summarizes what they saw at their water treatment facility (students will have gone to different sites, so this will serve as a field trip 'jigsaw', if you will). - Students will present PowerPoint as a group to the class. - Students will take notes during other's presentations to use later in their individual projects. - Students will articulate their reasoning for picking their particular place in the world and justify the water treatment solution for that place. - In their letter they will defend their idea of the best water treatment solution for that place. The will also give background information about their place to explain/defend why they think that place	presentation as a class) - Day 7 - Last day to work on group project and prep for presentation - Day 8 - Begin group presentations - Day 9 - Group presentations - Day 10 - Group presentations - Day 11 - Finish group presentations and introduce individual project - Day 12 - Time to work on individual project - Day 13 - Time to work on individual project - Day 14 - Time to work on individual project - Day 15 - Time to work on individual project/begin to prep for presentation - Day 16 - Last day to work on individual project/prep for presentation - Day 17 - Begin individual presentations - Day 18 - Individual presentations - Day 19 - Individual presentations - Day 20 - Finish individual presentations

	is in need of a water treatment solution. ● Students will take their information they gathered from the group presentations to think of a place in the world and create a water treatment solution for that place. ● Students will design a presentation to share with the class about the city they chose, and their advised water treatment plan after research	

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