

**SITES IN THE VIRGINIA-WASHINGTON, D.C.-MARYLAND METRO
AREA TO OBSERVE OR COLLECT BACTERIA THAT PRECIPITATE
IRON AND MANGANESE OXIDES¹**

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This publication is intended to be used along with U.S. Geological Survey EarthFax (1-800-USA-MAPS) What's the Red in the Water? What's the Black on the Rocks? What's the Oil on the Surface? and <<http://pubs.usgs.gov/publications/text/Norriemicrobes.html>>

SITES IN THE VIRGINIA-WASHINGTON, D.C.-MARYLAND METRO AREA TO OBSERVE OR COLLECT BACTERIA THAT PRECIPITATE IRON AND MANGANESE OXIDES

VIRGINIA

VA Site 1A. Fairfax County, Huntley Meadows Park: From the Beltway (495), go south on US 1. Turn right onto Lockheed Blvd.; travel to end of Lockheed Blvd., and then turn CAREFULLY into the Park at the sign. Park in parking lot, walk along the wetland path to the beginning of the boardwalk. Look to the right (north) and see red patches in the water where ground water is discharging. This ground water is anoxic and carries reduced iron. The iron bacteria here (predominantly Leptothrix ochracea) oxidize the iron and turn it into a red flocculate. If you move the flocculate aside, you can see the underlying black color formed where the reducing bacteria reduce the iron to its black state in the zone of reduction in the mud. As you walk along the boardwalk, you will see much evidence of the iron bacterium, Leptothrix discophora, that forms glassy-looking patches that appear, at first glance, to be an oil-film,

VA Site 1B. Fairfax County, Huntley Meadows Park, back entrance: BOOTS ARE USEFUL HERE. This is at the intersection of South Kings Highway with Telegraph Rd. Park in parking lot at the Park's back entrance (across from the 7-11). Walk down hill (south) along the sidewalk to the Telegraph Rd. bridge across Dogue Creek. Look out from the bridge and see if you can see where ground water seeps into Dogue Creek; these are seen as red flocculate. Scramble down the bank, and walk upstream (opposite the direction the water flows). As you walk upstream, there are many springs and seep sites which you can recognize by the red color of the loose flocculate made by Leptothrix ochracea and the precipitates made by Gallionella ferruginea. Where leaves are coated by Siderocapsa sp., they are red. Films of Leptothrix discophora also show where anoxic ground water discharges into Dogue Creek. As you walk upstream, note the black color of the rocks in the riffles. These are evidence of manganese oxide deposition by the bacterium Leptothrix discophora. COVER YOUR EYES FROM FLYING ROCKS and break open some of the pebbles to see that the black oxidized manganese is only on the outside surfaces. If the rocks look brown rather than black, they are probably covered by siliceous algae called diatoms. Wipe the diatoms off to see the underlying black color from the manganese oxide coats.

VA Site 2. Fairfax County, South Kings Highway retaining wall: This site is between The Parkway and Vantage Lane just down the hill from St. Marks Church. You may park on Vantage Lane and walk along the north shoulder. Look in the weep holes at the red precipitates (formed by an unusually skinny strain of Leptothrix ochracea). When retaining walls are built perpendicular to the direction of water transport, engineers leave weep holes so the water pressure doesn't build up behind the wall and knock it over. Behind the wall, the ground water here is anoxic and carries reduced iron. The ground water also carries hydrogen sulfide because the reducing bacteria reduce the sulfate in the concrete. Because of the presence of a small amount of sulfide, very rarely you can also find white filaments on the red precipitates in the weep holes. These white filaments are bacteria that oxidize the sulfide to elemental sulfur (Beggiatoa sp.).

VA Site 3. Fairfax County, Reston, Vernon J. Walker Nature trail: Between Lawyers Rd. and Glade Dr. on Soapstone Dr. Park at the lowest point in the road where the creek known as "The Glade" crosses Soapstone Dr. As you walk the creek, note numerous seeps where flocculate and precipitates of iron bacteria such as Gallionella ferruginea, Leptothrix ochracea, and Siderocapsa sp. turn the water red.

VA Site 4. Alexandria, Taylor Run. This site is located off of Duke Street, just west of Telegraph Road. Turn north onto Taylor Run Parkway West and right immediately onto Hilton St. Turn left at first driveway (down a steep bridge). Walk down the bank into the creek. Taylor Run has ground water seeps with red flocculates of iron bacteria and black manganese oxide-coated rocks. The black on the rocks is from the manganese oxide precipitated primarily by Leptothrix discophora. Note that the black manganese oxide is also precipitating on the concrete of the culvert.

VA Site 5. Loudoun County, Northern Virginia Regional Park at Seneca Road: From Route 7, go north (towards the Potomac R.) on Seneca Rd. Park outside the gate (the gate may be open when you arrive, but if someone locks it later, you will be stuck inside). Walk down the hill on the path and look in the ditches and creeks as you walk towards the Potomac River. You'll note many red patches in the water from flocculate of the iron bacteria, including Leptothrix ochracea. Also note oil-like biofilms from Leptothrix discophora and the play of colors that intensify when biofilms cross.

WASHINGTON, DC

DC Site 1. McGogney Elementary School seep. This site is located along Wheeler Rd, between Alabama Ave. and Mississippi Ave. Park just down the hill from McGogney Elementary School on the same side of the street as the school. See where the sidewalk is wet. This spring discharges anoxic ground water that carries reduced iron. The iron bacteria Gallionella ferruginea, Leptothrix cholodnii, Siderocapsa sp., Leptothrix ochracea, and Toxothrix trichogenes oxidize it to red iron oxide. Oil-like biofilms of Leptothrix discophora can also be spotted between the clumps of grass. If you move the red iron oxide aside, you can see the underlying black color formed where the reducing bacteria reduce the iron to its black iron state in the zone of reduction.

DC Site 2. Oxon Run Parkway. The creek runs between Mississippi Ave. and Valley Ave. **BOOTS ARE USEFUL HERE.** Park on either street and walk east until you are past the concrete culvert that contains the creek. Once you leave the concrete, the property belongs to the National Park Service but it's not a park. Many ground water seeps occur along Oxon Run. The dominant iron bacterium here is Leptothrix ochracea. Leptothrix cholodnii, Siderocapsa, and Siderocystis sp. are also present, along with the oil-like biofilms of Leptothrix discophora.

DC Site 3. Kenilworth Aquatic Garden. This is a National Park--NO COLLECTING. The Park is located off 295, south of Rt. 50. Walk the path that goes past the Capitol Green House and see many red ground water seeps. The main iron bacterium on the vegetation is Siderocapsa sp. Forming loose flocculate in the water are the iron bacteria Leptothrix ochracea and Leptothrix cholodnii. Oil-like biofilms made by Leptothrix discophora are commonly present. This same bacterium also colonizes the undersides of water lilies here.

DC Site 4. Chesapeake and Ohio Canal. This is a National Park--NO COLLECTING. The Park is located off Canal Rd. under Chain Bridge. If you walk down toward the Potomac River, you can spot many red ground water seeps. There are also numerous seeps under and near the bridge. The seeps get their red color from the entire suite of iron bacteria including Siderocapsa sp., Leptothrix ochracea, Leptothrix discophora, and Leptothrix cholodnii, Toxothrix trichogenes, Siderocystis sp., and Gallionella ferruginea.

DC Site 5. Rock Creek Park. This is a National Park--NO COLLECTING. Follow Beach Drive north and make a right at the light on Blagden Ave., which is the next street that turns off to the right after Piney Branch Rd. Park as soon as you see the small bridge on the right. Ground water comes out of the culvert and the iron bacteria, Leptothrix ochracea, Siderocystis sp., Gallionella ferruginea, and Siderocystis turn the creek into a surrealistic landscape of reds and oranges. If you follow the tributary down towards Rock Creek, you'll see lots of pebbles and cobbles coated black with manganese oxide by the iron bacterium, Leptothrix discophora.

DC Site 6. Fort Dupont Park. This is a National Park--NO COLLECTING. The Park is off Minnesota Ave., near Randle Circle. Park and walk down the hill to the bridge across the tributary. The creek is red from the iron bacterium Leptothrix ochracea. The redox boundary is easy to spot as you walk along the creek because the red oxidized iron overlies the black reduced iron. Sometimes the redox boundary is in the water column and sometimes it is in the sediments.

MARYLAND

MD Site 1A. Montgomery County, Paint Branch: This creek crosses Briggs Chaney Rd. between Farside Dr. and Highway 29. Park at Paint Branch Park and walk down the hillside to the creek to see where red seeps feed along the creekside and are made of the flocculate of the iron bacteria Leptothrix ochracea and Siderocystis sp. Holdfasts that the bacterium, Leptothrix discophora, uses to attach to hard surfaces are plentiful on quartz sand grains.

MD Site 1B. Montgomery County, Gum Springs tributary of the Paint Branch: Turn south off Briggs Chaney Rd. onto Farside Dr. and park at dead end. Look over into the culvert and follow the stream downstream to see the iron bacteria in Sienna wetland. Gallionella ferruginea is the most abundant iron bacterium here and Leptothrix discophora makes the oil-like biofilm.

MD Site 2. Prince Georges County, Louise P. Cosca Park: The Park is located between Piscataway Road and Brandywine Road on Thrift Rd. From Piscataway Rd., turn right on Tippet Rd and then follow road onto Thrift Rd. From Brandywine Rd, turn west on Thrift Rd and follow sign into Park. Butler Creek is bright red from the flocculate and precipitates of the iron bacteria Gallionella ferruginea, Leptothrix cholodnii, Siderocapsa sp., and Toxothrix tricogenes. Also see oil-like biofilms of Leptothrix discophora.

MD Site 3. Charles County, Mill Swamp: Travel south on 210, north/west on Bryans Rd. (in the direction of the Potomac River). Drive down the hill and see the red flocculates of iron bacteria in the swamp. These include Leptothrix cholodnii, Siderocapsa sp., Siderocystis, and Leptothrix ochracea, along with oil-like biofilms of Leptothrix discophora.

MD Site 4. Ann Arundel County, Muddy Branch: At SE edge of Baltimore Washington International Airport, Muddy Branch crosses Hammond Ferry Rd. and I97. The oil-like biofilms of Leptothrix discophora are intense under the bridges where the films cannot be disturbed by rainfall. The red flocculate is from the iron bacteria Leptothrix cholodnii, Siderocapsa sp., and Leptothrix ochracea, along with the oil-like biofilms of Leptothrix discophora.

ADDITIONAL INFORMATION:

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