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UMD Soil Judging Teams Dominate Regional Contest Heading to OH for Nationals in Spring 2020

The University of Maryland Soil Judging Team excelled at the regional contest held in the vicinity of Easton, MD. Pictured left to right: Front Row – Mia Godbey (11th Place Individual), Rory Skirzenski, Cathy Wang (1st Place Individual), Jennifer Statter, Antonio Vega (10th Place Individual), Mary Gumerov; Back Row – Isabella Bruno, Yunxuan Pei (3rd Place Individual), Wade Williams, Jonathan Moy (2nd Place Individual), Barret Wessel (Asst. Coach), Dr. Brian Needelman (Coach), Jacob Mast, Dr. Martin Rabenhorst (Contest Organizer). Story on page 3.

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In this issue

Editors' comments

Editor Fanning thanks Assistant Editor Wessel for putting together this issue and thanks the several MAPSS members and UM students and others for their articles and pictures for this issue, the second and last for Volume 30 and 2019. I commented in comments in the previous issue on my health-heart issues. Now, as of about the 4th of July, I have a new heart valve, part cow, part swine, moo-oink and it has been determined that I don't need a pacemaker. Thank God and Medicare Insurance for huge support. Now I need to find support to get to the 9th IASSC in Adelaide in November 2020, but don't know where I will find it. One of my prayers was favorably answered in 2019 – The Washington Nationals won the World Series. Maybe MAPSS needs to have an outing to a Nats/O's game in 2020. Go Nats! Go O's! Go Flying Dog lager beer, but stay sober. And continue everyone to be great soil judgers. Congrats to the UM and UDE and other teams for your great efforts and success in 19, keep going in 20.

Calendar of some coming events

- Jan. 8-9 2020. Mid-Atlantic Hydric Soils Committee Meeting, hosted by John Galbraith of VT in the vicinity of Blacksburg, VA. Contact Bruce Vasilas (bvasilas@udel.edu) for additional details.
- Nov. 7-11, 2020. Soil Science Society of America Annual Meeting, Phoenix, AZ.
- Nov. 15-20, 2020. 9th International Acid Sulfate Soils Conference, University of Adelaide, Adelaide, Australia. Note that this will be in late spring in Australia, a good time to get away from late fall and oncoming winter in the northern hemisphere. https://biological.adelaide.edu.au/acid-sulfate-soil/iassc/

Future articles etc. *Pedologue* needs articles, pictures, poems, cartoons, letters to the editor or other things soil scientists and/or other readers may be inspired to submit. Please submit such items to the editors (preferably DelvinDel@aol.com , alternatively dsf@umd.edu, and bwessel@umd.edu). Be an author, support your newsletter! It's a way to promote your work, our community, and things we all need to know about soils and the environment.

Maryland Wins Regional Contest
Both UMD and U Del Heading to Ohio for Nationals

Martin Rabenhorst

The UMD team takes a break in one of the contest practice pits at the Wye Research and Education Center.

The University of Maryland Soil Judging Team took first place at the 2019 Northeast Regional Soil Judging contest. The team swept the medal stand with Cathy Wang in 1st, Jonathan Moy in 2nd, and Yunxuan Pei in 3rd. This impressive victory adds to the team's recent run of success with three national championships in the past seven years (over the 60 year history of the event, UMD has had 5 National Championships and 25 Regional Contest Victories). The team had two other finishers in the top 15: Antonio Vega in 10th and Mia Godbey in 11th. Also on the team were Isabella Bruno, Mary Gumerov, Jacob Mast, Rory Skirzenski, Jeniffer Statter, and Wade Williams. The team was coached by Dr. Brian Needelman and PhD candidate Barret Wessel from the Department of Environmental Science and Technology.

Brand new to the competition this year was a team from the Univ. of Delaware, coached by MAPSS members Jenwei Tsai and Jocelyn Wardrup (Grad Student at U. Del.) The members of the Delaware team were Katie Mina, Luke Mulcahy, Christopher Swift, Morgan "Duke" Williams. These new kids on the block had a fantastic showing with Katie Mina finishing in 15th place, the team finishing in 5th place in the group judging which landed them a 5th place showing overall, and the opportunity to participate in the National Soil Judging Contest next Spring that will be hosted by Ohio State University. (Way to go Blue Hens!)

This year a total of 10 universities participated in the contest (the largest number ever), which included 3 newcomers. In addition to the Univ. of Delaware, for the first time ever, one coach and eight students from the Univ. of Pittsburgh (Johnstown) joined with one coach and two students from SUNY Fredonia to field the "Pitt" team. Also for the first time, the University of Vermont was among the crowd gathered for the NE Regional contest (coached by former UMD soil judger (2000-2002) Ben Waterman.)

Schools that have also become regulars at the NE regional contest include Stockton Univ. (NJ) which began participation in 2013, Bloomsburg Univ. (currently coached by former UMD soil judger (2003-2006) Rebecca Bourgault) which joined the NE regional ranks in 2015, and Brooklyn College which participated both last year (2018) and this year.

This year the contest was hosted by the University of Maryland, led by Dr. Martin Rabenhorst and grad student Evan Park from the Department of Environmental Science and Technology, who were strongly supported by our USDA-NRCS Colleagues (especially Phil King, Jim Brewer and Annie Rossi). A great many other MAPSS members stepped up to help with the contest (Thank you, thank you, thank you!) Dr. Rabenhorst kept contest information Top Secret so that UMD students and coaches didn't have insider information. The

contestants examined practice sites October 9-10 across Queen Annes (Wye Island and Wye REC), Caroline (Phil Snow's Farm) and Kent counties (Thank you Tommy Wilbanks) which included mostly Ultisols, Alfisols and Entisols derived from Teriary sediments and Late Pleistocene aeolian deposits. The contest itself was held on October 11 at Remington Farms near Chestertown, Maryland.

Among a field of 16 teams from 10 Universities, and behind Maryland in 1st place, the Univ. of Rhode Island finished 2nd, Delaware Valley Univ. 3rd, Penn State Univ. 4th and first time participant Univ. of Delaware placed 5th. These five will be representing the NE region at the National contest in Ohio next Spring.

Fifth place University of Delaware Soil Judging Team. Left to right: Coaches Jocelyn Wardrup and Jenwei Tsai, students Luke Mulcahy, Morgan "Duke" Williams, Katie Mina, Christopher Swift, and contest organizer Martin Rabenhorst.

MAPSS MEMBERS MARTIN RABENHORST AND GARY JELLICK DEMONSTRATE INDICATORS FOR PROBLEMATIC HYDRIC SOILS TO SOCIETY OF WETLAND SCIENTISTS AT MEETING IN MD.

By Gary Jellick, Partner, Advanced IRIS Oxides, LLC, gary@irisoxides.com

The annual meeting of the Society of Wetland Scientists (SWS) was held in Baltimore this past spring, and MAPSS was asked to provide logistical support in conducting a workshop on using Field Indicators of Hydric Soils in difficult and/or problematic situations. Dr. Martin Rabenhorst and Gary Jellick stepped up to assist the workshop organizers by locating and instrumenting field sites in Carroll County, Maryland that illustrate two situations in the region (MRLA 148) where the common indicator of a hydric soil (depleted matrix with chroma 2 or less) often does not exist.

To prepare for the SWS Workshop, Fe and Mn coated IRIS films were installed at the two field sites for a period of 30 days. Here Dr. Rabenhorst is holding a Mn IRIS film that has essentially been stripped of all Mn below a depth of about 5 cm at the Piedmont Flood Plain site. The five Fe films on the ground also demonstrated significant removal of Fe, and document that the soil at this site met the Hydric Soil Technical Standard for reducing conditions. (Photo Credit: Sara Mack)

These situations include soils derived from Triassic Red Parent Material and soils that formed in recent sediments deposited on Piedmont Flood Plains, described by Field Indicators F21 and F19, respectively[1]. In the case of Piedmont Flood Plain soils, recently deposited sediments may not have had sufficient time to produce a depleted matrix under saturated conditions. In contrast, hydric soils derived from Triassic Red Parent Material are often problematic to identify because they resist color change under anaerobic, reducing conditions. As discussed in her thesis, UMD graduate Sara Mack determined that the reason these soils resist color change appears to be related to the larger crystallite sizes of hematite in problematic red parent materials, such as those found in the Triassic Basin[2].

In addition to the field examination of problematic hydric soils, the organizers of the SWS Workshop also wanted to demonstrate the use of IRIS technology for documenting reducing conditions in soils. IRIS stands for "Indicator of Reduction in Soils" and has been used over the last decade with PVC tubes coated with Fe oxide paint. Recent research by Dr. Rabenhorst has expanded IRIS technology to include the use of Mn coatings that are more readily reduced than Fe coatings, and the use of PVC films that overcome many limitations associated with PVC tubes. Fe coated IRIS films can be used to meet the Hydric Soil Technical Standard for reducing conditions. The use of Mn coated IRIS films have not yet been approved for this purpose. Additional photos on following page.

[1] Mack, S.C., Berkowitz, J.F., Rabenhorst, M.C., 2018. Improving Hydric Soil Identification in Areas Containing Problematic Red Parent Materials: a Nationwide Collaborative Mapping Approach. Wetlands.

[2] Mack, Sara C., Martin C. Rabenhorst, and Jacob F. Berkowitz. "Understanding the Inhibition of Color Change in Problematic Red Parent Material Hydric Soils." Soil Science Society of America Journal 83, no. 3 (2019): 838–47.

Above – Hydric soil that formed in Problematic Red Parent Material. A low chroma, depleted matrix often does not occur in such soils.

Below – Close examination of these soils is necessary to see redoximorphic features. Here there are more than 10 percent redox concentrations within 25 cm of the surface, which satisfies Field Indicator F21. (Photo Credits: Mallory Gilbert).

MAPSS Summer Field Day – July 25, 2019

Annie Rossi

On July 25th, MAPSS members met for a summer field day to learn more about the Maryland hops and craft beer industry. The day began at the Western Maryland Research and Education Center (WMREC) in Keedysville, MD. In order to support the growing craft beer industry in Maryland, the University of Maryland Extension has established an experimental hop yard. Bryan Butler, Principle Agent in Agriculture and Natural Resources, gave an energetic and enthusiastic tour of the hop yard and discussed many of the lessons learned through the Hops Project. Researchers are working to identify varieties of hops that are suitable for production in Maryland and develop best management practices for growers. As part of the project, UMD has partnered with Flying Dog Brewery to identify the varieties that are not only agriculturally productive, but also provide the aromas and flavors desired by brewers.

Gary Jellick points out an unusual interpretation of the MAPSS acronym as members arrive for the brewery tour.

Twenty-four varieties of hops were planted in the 0.5 acre hop yard in 2016. This plot included two heirloom varieties that have been grown on local farms since Prohibition. A new hop yard was established in 2019 with some of the most promising varieties. The vast majority of commercial hops used by local breweries are produced in the Pacific Northwest. The warmer, more humid climate of Maryland presents many challenges including increased insect and disease pressure. Bryan talked about many of these challenges and the intensive management practices they've adopted. We learned about some of the different hop varieties included in the trials and how they vary in terms of growth, yield, and resulting aroma and flavor profiles. Bryan also talked about how the hops are harvested and processed, and the analytical tests used to evaluate the hops.

Below: Members listen at the hop yard as Bryan Butler explains cultivation issues.

On our way back from the hop yard, we stopped for a brief look at a Hagerstown soil pit located on the farm. MAPSS member Carl Robinette gave a brief presentation on the Hagerstown and Funkstown soil series that are mapped throughout the area. These soils have morphologies that are challenging to interpret. Carl shared some of the water table data that he has collected and some insights and interpretations.

After a very quick lunch and a short drive, we regrouped at the Flying Dog Brewery in Frederick, MD. Justin Tarnow of Flying Dog Brewery gave us a tour of the brewery facility. The tour included the brewing, quality assurance, and bottling processes. We also learned about Flying Dog's history and the craft beer industry. After the tour, we were able to reflect on the day over some cold beverages. Thank you to our hosts, WMREC and Flying Dog Brewery, for a fun and educational event!

One explanation offered for this upside-down spodosol was *profile inversion*, where an event like a tree throw can upend horizons and allow them to flip as the tree trunk rots away. What do you think?

The Northeast Pedology Field Tour in Massachusetts: A Student's Perspective

Emily Keener, UMD MS Student

This year, I attended the North East Regional Pedology Field Trip, hosted in Amherst, MA. The tour consisted of visits to multiple soil pits in various landscapes throughout western Massachusetts. Alongside other graduate students and soil-judging undergrads, I enjoyed exploring the beautiful landscapes the area had to offer, seeing the soils they helped to shape, and discussing the intertwined histories of Western Massachusetts and its soils with experienced pedologists.

I came into the soil science community with a background in environmental science as an undergraduate, a more surface-level understanding of soils, and an interest in urban ecology and urban soils as I began graduate school- which is why I was so excited to hear multiple mentions of emerging soil classifications for anthropogenic soils amongst discussions on the trip. Despite having a more introductory knowledge of the field of pedology, the professors and students I interacted with created an environment in which I felt comfortable asking questions and contributing thoughts, especially as the discussion extended to soil classification related to land use. I was particularly impressed with the way that pedologists can use the characteristics of the soil profile to connect the soil with the area's geologic, hydrologic, and ecological past and present. In almost every soil pit we visited, I gained new insights to the processes of pedogenesis and soil classification with important implications for my own work and for ecology and environmental science in general.

What I gleaned from this three-day tour was consistent with what I have gleaned from diving deeper into soil science as I have progressed as a graduate student: understanding soil is crucial to understanding an area's ecological history and predicting and managing for its future. As the major hydro-bio-geo-chemical nexus of terrestrial ecosystems, the fate of an ecosystem above-ground is intertwined with that of the soil below. Any strategy to manage for the ecological health of a landscape cannot fail to consider the conservation of the soil on which those ecosystems depend. The message I heard from the pedology community is clear- the past and the future can be seen in the soil. As human land uses create extremely novel contexts for the beginnings of pedogenesis, pedological knowledge is crucial to understanding, predicting, and managing for the future of human-impacted landscapes.

Though it looks as though humans have mixed subsoil into topsoil, the red areas of this soil are actually weathered limestone "ghosts," angular rock fragments weathered in place, peppering the matrix with zones of different properties.

Muck-Raking at the NTCHS-MAHSC Joint Summer Meeting

C. Evan Park, UMD MS Student

The joint meeting of the National Technical Committee for Hydric Soils and the Mid-Atlantic Hydric Soils committee recently took place in Elkins, W. Va. Hosts Jared Beard, West Virginia state soil scientist, and Jason Teets, NRCS MLRA soil survey regional office 6, led a field tour of sites that satisfied hydric soil field indicator A10, but did not exhibit other characteristics of a hydric soil. The hosts proposed that the indicator status be changed from "for use" to "for testing" in MLRA 127 and 125. This led to discussion of the integrity of the indicator and the information and training necessary to properly apply the indicator in the field.

A shallow, cobbly soil profile with several centimeters of organic material stimulated discussion.

Hydric soil field indicator A10 states that a soil can be identified as hydric if it has a 2 cm layer of muck starting ≤15 cm from the soil surface. Muck is sapric organic material decomposed to the extent that, after rubbing, less than 1/6th of the material is distinguishable fiber. The field tour presented five sites ranging from uplands to toe slopes, all of which displayed the morphology necessary to satisfy this indicator. IRIS films deployed at each of the five sites did not meet the minimum standard of 30% paint removal, indicating the sites were not reducing. In addition, water table data from the five sites showed little or no saturation in the upper 30 cm (the maximum depth of the installed wells). These data indicated that the sites were relatively dry, yet there was accumulation of organic matter at the soil surface. Field tour participants largely agreed that the organic material was sapric, but data from KSSL indicated it was hemic in at least two sites. The hosts argued that the misdiagnosis of the organic material meant that the indicator status should be changed in the region, because the indicators are meant to be proof-positive field tests that do not require lab data, and which should not falsely indicate the presence of a hydric soil that is not there. False positives are errors that undermine the purpose of field indicators in general, and identifying and correcting such errors is one of the tasks of the Hydric Soils Committees. Some participants remarked that the issue was not the integrity of the field indicators, but the ability of field scientists to accurately assess soil materials. The discussion of training field scientists and calibrating to lab data was short-lived, as the focus returned to the role of the National Technical Committee in deciding the indicator status of A10 in MLRA 127 and 125. Committee members stated they did not have enough data to determine if the sites met the technical standard for hydric soils, and therefore the

Greg Hammer (foreground, left) and Jason Teets (foreground, right) share thoughts on the nature of the organic material.

committee could not make a decision about the indicator in the region. It was recommended that the organic horizons be resampled and carefully sifted to remove live roots before sending them back to KSSL for re-testing. It was also recommended that water table data and IRIS film data be collected year-round in order to provide sufficient data about the environmental conditions at these sites.

The tour concluded without a verdict for the issue raised by the hosts, but it emphasized to all participants the importance of collecting reliable, thorough data to draw conclusions, calibrate field skills, and provide clarity when field methods yield equivocal results. Many thanks to hosts Jared Beard and Jason Teets for an enjoyable, edifying meeting.

Days Gone By…

Bob Darmody at his desk in the back of what is now Dr. Brian Needelman's lab, was then Dr. John Foss's lab., but it became Dr. Marty Rabenhorst's lab., which we also referred to as soil survey lab. Picture taken in 1973, when Bob was working on his M.S. degree, when he was our first student to study tidal marsh soils. He claims that this was his desk for 7 years as he worked for his M.S. and Ph.D. degrees and also was for a time the instructor of the Intro Soils Course before it was taught by Dr. Rabenhorst after Dr. Foss became Department Chair at North Dakota State U. Intro soils was briefly taught by Dr. Rabenhorst after Dr. Foss's departure, before it was taken over by Dr. Ray Weil as a new faculty member. Bob (by then Dr. Darmody) became a pedologist at the University of Illinois, from which position he is now retired, now serving as Executive Secretary of the Society for Mining and Reclamation. He and Marty were fellow undergraduate students and close friends, both students of Dr. Foss as graduate students. Bob, who supplied the pictures for days gone by for the last issue of Pedologue also supplied this picture from back when of himself.

Sulfidization in a Tidal Marsh – Poem

By Del Fanning, Pedologue Editor, Emeritus Professor, UM Department of Environmental Science and Technology. DelvinDel@aol.com or dsf@umd.edu

Comment: Del has been working on this poem for some time and first sang it publically during a guest lecture on acid sulfate soils and sulfidization and sulfuricization for Dr. Brian Needelman's UMD ENST 414 Soil Morphology, Genesis and Classification class on Nov. 15, 2019. He hopes to present it again at the MAPSS membership meeting in 2020 and maybe also at the 9th IASSC in Adelaide, Australia in November, 2020.

To be sung to the tune for Ebb Tide

Only bold, and not red, print is sung by presenter, a hand-out written version of this is recommended for audience referral when it is orally presented, sung, to enhance understanding, first verse from the web

First the tide rushes in
Plants a kiss on the shore
Then rolls out to sea
And the sea is very still once more.

A Chesapeake Bay tidal marsh in which sulfidization occurs. The man presumably detects the odor of hydrogen sulfide emanating from the marsh.

But with the tide that comes in
Sea water sulfate comes along
It meets some dead OM (pronounce Oh M)
And by *Desulfuvibrio desulfuricans* living there
Getting energy from the reaction
The sulfate S is reduced to sulfide as the OM gets oxidized.

$SO_4^{2-} + 2CH_2O \rightarrow H_2S + 2HCO_3^-$

The tiny S plus-six cation of sulfate
Gains 8 electrons and greatly expands to become an S two minus sulfide anion
That shares two electrons with H pluses
To become stinky hydrogen sulfide.

O Relative size of S^{6+} **cation,** **O** **Relative size of S^{2-} anion**

The carbon of the OM with its lost electrons
Becomes C plus four
And combines with three oxides and an H plus
And sloshes out to sea as bicarbonate.

Much of the hydrogen sulfide
Rises up to the air
To give a stinky aroma
To the marsh

But some H two S meets goethitic iron oxyhydroxide
Eroded to the marsh in soil from the upland
The S re-oxidizes a little as it chemically reduces
The ferric to **the ferrous form of Fe** (pronounce as eff E)

$2FeOOH + 3H_2S \rightarrow FeS_2 + FeS + 4H_2O$

But one of three sulfide ions doesn't oxidize at all
It meets an already formed ferrous Fe
And precipitates
To make black Fe monosulfide.

FeS, Iron Monosulfide, may be the mineral mackinawite. Black as ace of spades, evolves H_2S with HCl.
$FeS + 2HCl \rightarrow H_2S + Fe^{2+} + 2Cl^-$

But pairs of partially oxidized S's, that reduced the ferric Fe's,
Come together to form S two (pronounce as S two), **two minus, disulfide,**
That precipitates with the ferrous Fe
To form pyrite, some even in framboidal form.

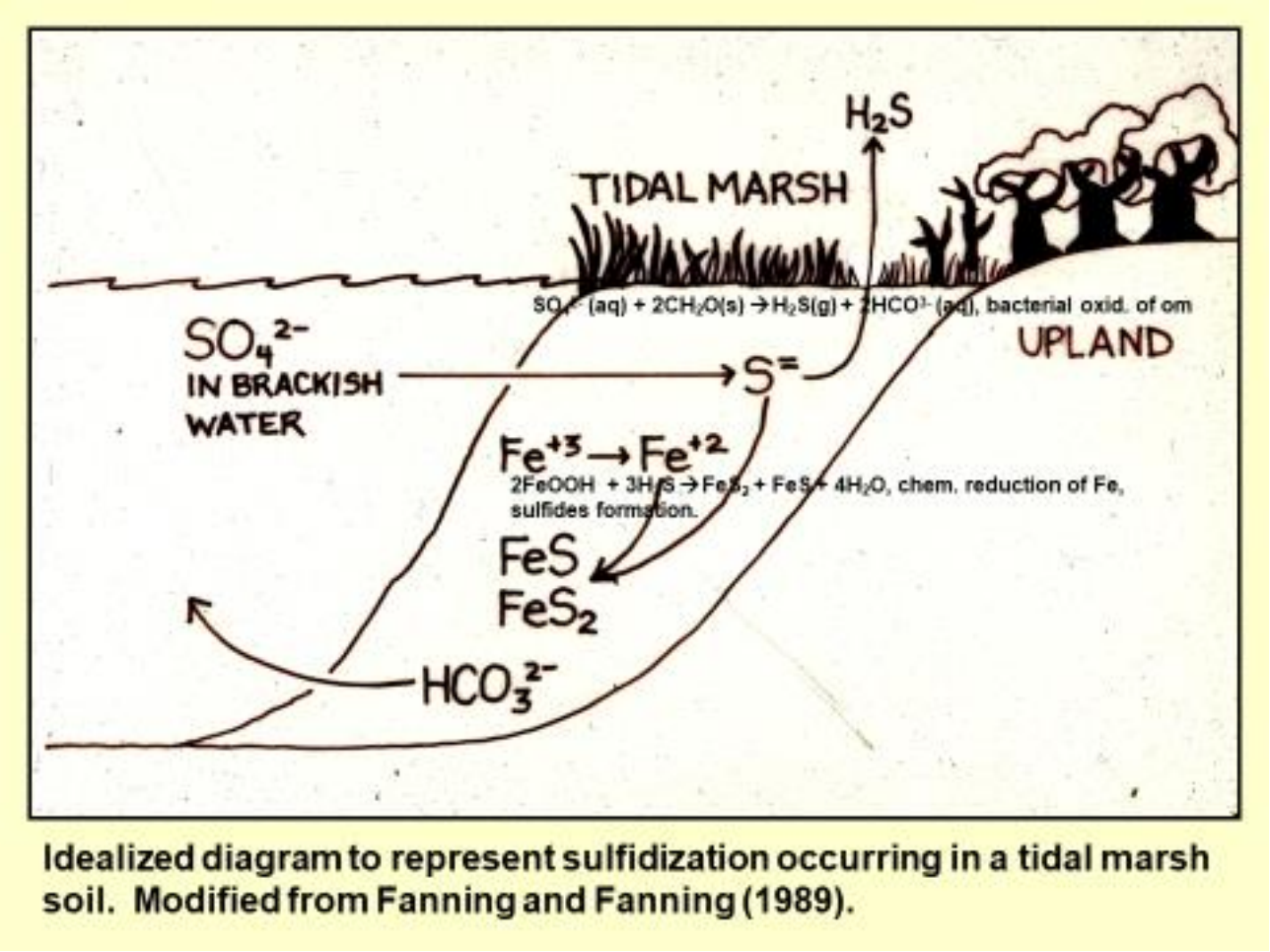
S_2^{2-} Disulfide formula, S two, two minus.
FeS_2 Iron disulfide, the formula for pyrite.

As these processes continue on
Tidal cycle after tidal cycle, as the moon circles the earth, or as earth spins under its moon?

With the bicarbonate washed away to the sea
A *sulfidic material*, as defined by *Soil Taxonomy*, is formed,

This is my sulfidization story in poetic form (the last sentence may be spoken, not sung, followed by a bow, by the reciter of the poem – ideally me). The colored slide at top may be projected to be on screen or played up on computer screen during sung presentation, alternative on next page or below.

An alternative slide (below) to present or maybe be played back and forth with the one at the top during oral presentation.



Idealized diagram to represent sulfidization occurring in a tidal marsh soil. Modified from Fanning and Fanning (1989).

This last slide, picture, is reproduced from a Power Point presentation and appears in print in Fanning et al. (2017).

References:

Fanning, D. S. and M. C. B. Fanning. 1989. Soil: Morphology, Genesis and Classification. John Wiley and Sons. New York. The gross soil forming processes of sulfidization and sulfuricization are presented in Chapter 10.

Fanning, D. S., M. C. Rabenhorst and R.W. Fitzpatrick. 2017. Historical developments in the understanding of acid sulfate soils. Geoderma 308: 191-206.