DELTA COUNTY
ENVIRONMENTAL HEALTH

Policy & Recommendations for Sodic Soils
Delta County EHPR22-03.1.1

Revised: May 11, 2022
Approved: Greg Rajnowski, EH Director

Summary
This policy, along with best practice recommendations, ensures sustainability in On-Site Wastewater Treatment Systems (OWTS) in Delta County when designed in salt-rich (sodic) soils above weathered Mancos shale. The recommendations are based on soil research done in and outside Delta County and is for engineers and inspectors, and in some cases installers.

Policy

- Delta County Environmental Health (DCEH) shall educate the community, specifically OWTS engineers, installers and inspectors, of the research and history regarding sodic soils in Delta County.
- DCEH will share with the public collected data and Information on known failures of OWTS' that are due to sodic soil conditions. This information will be mapped and searchable by address.
- DCEH will support local research regarding OWTS and sodic soils and will consult with National Resource Conservation Service (NRCS) and Colorado Department of of Public Health and Environment (CDPHE) Water Quality Control Division (WQCD) staff in cases when deemed necessary by the DCEH.

Policy Background

- It is well documented[1] that sodic soils with a high sodium absorption ratio (SAR), high PH, and high exchangeable sodium percentage (ESP) lead to soil chemistry challenges for OWTS and a greater likelihood of failure when these factors are not considered in the design.
- Sandy soils have large pores which allow water to move rapidly as compared to clayey soils which have smaller pores causing a reduction in water movement. Because more time is required to move effluent through the profile of clay soils, a larger soil treatment area must be provided. In addition, research demonstrates that soils with high clay content, high pH, and a high exchangeable sodium percentage (>6%) typically have structural stability problems causing a reduction in permeability within the soil profile. Soil dispersion (or swelling) is caused by soils that are repeatedly wetted and dried forcing clay particles to plug soil pores, resulting in the reduced soil permeability. It then reforms and solidifies into an almost cement-like soil with little to no structure.
- Several plant species can be useful in identifying areas of the county where calcareous clay soils may be detrimental to effective wastewater management. Delta is home to a rare endangered plant called "Clay-loving Wild Buckwheat", or *Eriogonum pelinophilum,* that prefers a particular soil microhabitat (whitish calcareous clay soils derived from

[1] *Reference: van de Graaff, R and Patterson, R.A. (2001) Explaining the Mysteries of Salinity, Sodicity, SAR and ESP in On-site Practice in Proceedings of On-site '01 Conference: Advancing On-site Wastewater Systems by R.A. Patterson & M.J. Jones (Eds). Published by Lanfax Laboratories, Armidale ISBN 0-9579438-0-6, p 361 - 368*

Mancos Shale), occurring with *shadscale/spiny saltbush*, *mat saltbush*, and *black sagebrush*.[2]

- Soil structure can also be destroyed due to excavation and compaction during OWTS installation. Once the structure is destroyed, it takes decades for it to re-form in the soil. There is little that can be done to artificially recreate good structure. Therefore, a careless installation can render a good site into an unsuitable one simply by destroying the soil structure[3].

Recommendations

- For Professional Engineers and Installers:
    - Soils are considered sodic when the ESP is greater than 6. A recommendation put forward in the October 2021 issue of *Onsite Installer* referencing sodic soil states: "Where water ponds on the surface, they are milky colored. Water infiltrates very slowly into the surface. Accomplishing this will require *a pressure distribution system where the goal is to spread effluent out evenly across the area over time*. These are elevated sewage treatment mounds and at-grade systems using multiple doses throughout the day."[4]
    - For systems that have sufficient drop in the effluent lines, proprietary technologies above a sand bed provides additional treatment, reduces swelling in the soils and can be done in a shallow bed to encourage evaporation and oxygenation. This improves infiltration while decreasing the expansion of the sodic soil substrate.
    - A general reference to septic suitability is available through the NRCS. The NRCS Soil Survey classification ranks soils based on their rating for *Septic Tank Absorption Fields*. The ratings are shown as decimal fractions ranging from 0.01 to 1.00. They indicate gradations between the point at which a soil feature has the least impact on the use (0.00) and the point at which the soil feature greatly limits use (1.00):
        - **"Not limited"(0.00)** indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected. These are Green in the map.
        - **"Somewhat limited"(<1.00)** indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected.These are Yellow in the map.
        - **"Very limited" (1.00)** indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be

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[2] *CLAY-LOVING WILD BUCKWHEAT. Eriogonum pelinophilum Reveal, Contributed by: USDA NRCS Colorado Plant Materials Program, https://www.nrcs.usda.gov/Internet/FSE_PLANTMATERIALS/publications/copmspg10710.pdf*

[3] *The Impact of Soil Structure on System Installation: An in-depth look at grade, size and type and how the classification affects onsite wastewater treatment, Onsite Installer Magazine: July 19, 2021, By Sara Heger, Ph.D.*

[4] *Follow These Strategies to Adapt Treatment Solutions for Dispersive Soils, By Jim Anderson and Dave Gustafson, Onsite Installer magazine; October 2021*

overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.These are Red in the map.

- For soils where it is impractical to mound the system due to site characteristics, other options should be considered including:
  - Shallow, yet oversized, evaporative trench systems that disturb less of the native soil (thereby resulting in less leaching of salts from the lower layers) with sufficient gravel (¾ inch to ½ inch) as additional treatment medium.
  - Add gravel and sand medium to chambered systems to reduce the likelihood that the chambers will settle into the expanding clay of native soils.
  - Consider adding Non-Pressurized Drip Dispersal System (NDDS) technology, on or above grade whenever possible.
- There is added risk when OWTS include discharges from water softeners; this will contribute to increased salinity of wastewater effluent and therefore negatively impact septic systems.[5] As a general rule, water softeners should not be discharged into these systems. Doing so increases the salt content of the effluent and further impairs the system.

- Several methods can be used to determine factors impairing an EXISTING system:
  - A trained inspector can be contracted to conduct and determine the operational testing capacity of the current system, as installed. NAWT licensed inspectors are on our website, however, county regulations also allow professional engineers to inspect the system for proper design and operation.
  - A visual inspection (via camera) of the lateral segments can be done to identify whether any infiltration through soil is taking place within the chambers. In the case of trenches probing the soil for saturated sections and pitting is helpful.
  - Contact NRCS soils scientists to determine the soil characteristics and soil chemistry (salinity, pH, SAR) unique to the property. They can assess the system for factors limiting the current system and identify whether a higher level treatment system is appropriate. A list of local contacts is available on the NRCS website.

Resources

- Sodic Soils Research: ((Can you please forward me a copy of this document?))
  - van de Graaff, R and Patterson, R.A. (2001) *Explaining the Mysteries of Salinity, Sodicity, SAR and ESP in On-site Practice* in Proceedings of On-site '01 Conference: Advancing On-site Wastewater Systems by R.A. Patterson & M.J. Jones (Eds). Published by Lanfax Laboratories, Armidale ISBN 0-9579438-0-6, p 361-368
  - NRCS website: https://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx
  - CDPHE Mounded Design Guidelines: https://drive.google.com/file/d/0B0tmPQ67k3NVMXdnYTQwM0NlLVE/view?resourcekey=0-eH2Tp87HcAMEhWApKSzvnQ

[5] *Do Water Softeners and Septic Systems Mesh? By Doug Day, Onsite Installer May 2014.*