4.3. Wetland Hydrology Indicators

Read the paragraphs starting the section titled “Wetland Hydrology Indicators,” leading up to the Table listing all the indicators in your Supplement.

Question	Answer
How does the Corps group Wetland Hydrology indicators?	The field indicators are grouped into four major categories in each region. A. Observation of surface water or saturated soils B. Evidence of recent inundation C. Evidence of current or recent soil saturation D. Evidence from other site conditions or data

Question	Answer
What is the difference between primary and secondary indicators?	Only one primary indicator is sufficient to meet the requirements for Wetland Hydrology on the data sheet, but two secondary indicators are necessary to reach the conclusion that wetland hydrology is present on a site.
Discussion	
Note that you can reach false conclusions even with primary indicators if they don’t reflect Normal Environmental Conditions or Normal Circumstances. Before you do your delineation, do your homework. Determine whether hydrologic inputs~~rainfall~~ ha~~ves~~ been either more or less than normal, both recently and in the longer term. In the field, walk the entire site before collecting data, and check for evidence of disturbance or unusually wet or dry rainfall conditions. One of the biggest mistakes delineators make is to jump right into the delineation without understanding the water flows, water budget components, and current site conditions throughout the whole site and catchment basin. Walk the site first, and then collect data.	

Instructions for Individual Indicators

The Wetland Hydrology Indicators are discussed below. Read those indicators and the Cautions and User Notes for the indicators used in your Regional Supplement. Answer the questions and read the discussions. Skip indicators that don’t apply in your region.

Table 2 lists all of the Wetland Hydrology Indicators used in the Corps Supplements, along with which regions they are used in and how many of the supplements use the indicator as primary or secondary.

Table 2. Wetland Hydrology Indicators for use with Regional Supplements				
Indicator Code	Indicator Name	Region Used In	No. of Supplements Indicator Occurs As	
			Primary	Secondary
Group A: Observations of Surface Water or Saturated Soils				
A1	Surface Water	All	10	0
A2	High water table	All	10	0
A3	Saturation	All	10	0
Group B: Evidence of Recent Inundation				
B1	Water marks	All	10	1-partial
B2	Sediment deposits	All	10	1-partial
B3	Drift deposits	All	10	1-partial
B4	Algal mat or crust	All *but* Arid West	9	0
B5	Iron deposits	All *but* Arid West	9	0
B6	Surface soil cracks	All	3	7
B7	Inundation visible on aerial imagery	All	10	0
B8	Sparsely vegetated concave surface	All *but* Arid West	4	5
B9	Water-stained leaves	All	8	2
B10	Drainage patterns	All	0	10
B11	Salt Crust	Arid West, Great Plains, Western Mountains	3	0
B12	Biotic Crust	Arid West	1	0
B13	Aquatic invertebrates	All *but* Alaska	9	0
B14	True aquatic plants	Eastern. Mountains & Piedmont, Midwest	2	0
B15	Marl deposits	Alaska, Atlantic Gulf Coast, Caribbean, NC-NE	3	1
B16	Moss trim lines	Atlantic Gulf Coast, Eastern Mountains, NC-NE	0	3
B17	Tilapia nests	Pacific Isles	1	0
Group C: Evidence of Current of Recent Soil Saturation				
C1	Hydrogen sulfide odor	All	10	0
C2	Dry-season water table	All	2	8
C3	Oxidized rhizospheres along living roots	All	9	1
C4	Presence of reduced iron	All	9	1
C5	Salt deposits	Alaska, Pacific Islands	0	2
C6	Recent iron reduction in tilled soils	All *but* Alaska & Great Plains	8	0
C7	Thin muck surface	All *but* Alaska & Western Mountains	8	0
C8	Crayfish burrows	All *but* Alaska, Caribbean& Pac. Isles, Western. Mtns	0	6
C9	Saturation visible on aerial imagery	All *but* Alaska & Pacific Isles	0	8
C10	Fiddler crab burrows	Caribbean Isles & Pacific Isles	2	0
Group D: Evidence from Other Site Conditions or Data				
D1	Stunted or stressed plants	All *but* Arid West, At. Gulf, Carib Isles, Great Plains	1	5
D2	Geomorphic position	All *but* Arid West	0	9
D3	Shallow aquitard	All *but* Great Plains & Midwest	0	8
D4	Microtopographic relief	Alaska, Eastern Mountains, NC-NE	0	8
D5	FAC-Neutral test	All	0	10
D6	Raised ant mounds	Western Mountains	0	1
D7	Frost-heave hummocks	Great Plains, Western Mountains	0	2
D9	Gauge or well data	Midwest	1	0
Hydrology Tools for Wetland Determinations				
	Engineering Field Handbook Chapter 19, part 650		All NRCS	

Group A. Observation of Surface Water or Saturated Soils

Why is this important to me? The three Group A indicators are used in all Supplements. These are direct observations of hydrology and serve to document the definition of FSA wetlands. Read all three indicators.

A1. Surface water

Read Indicator A1, Surface water

Question	Answer
Give an example of when this indicator may give a false positive decision for NC and for NEC.	Blocked culverts for non-Normal Circumstances; unusual flooding for non-Normal Environmental Conditions.

Question	Answer
You are on a site at the beginning of the wet season and growing season and observe indicator A1: Surface water (inundation) onsite, Does the extent of inundation indicate the wetland boundary?	It depends on the landform and upon recent weather history. You are seeing the site at one instant in time.
Discussion	
Inundation usually is found well inside the wetland boundary, and soil saturation usually extends further upslope beyond the zone of ponding. However, sometimes wetlands have abrupt boundaries and inundation is very close to the outside edge. Recent weather may have been wetter or drier than normal and that must be considered. Note carefully the landform and ask why the site is inundated. Are there outlets? Is the site within a floodplain? Some sites stay inundated much longer than others. Another cause of standing water is shallow compaction. Water standing in wheel ruts in a farm lane may not be accompanied by saturated conditions in the adjacent meadow.	

A2. High water table

Read Indicator A2, High water table

Question	Answer
What is a restrictive layer?	A shallow aquitard, or soil layer that prevents water from flowing downward.

Question	Answer
What flow paths would supply shallow water tables but not surface water?	Shallow throughflow on top of a restrictive layer; groundwater discharge onto a slightly sloping area or an area with a

	drainage outlet, such as seeps.
Discussion	
Shallow water tables are more common than inundation because many wetlands have surface outlets that drain excess water off the land surface as fast as it discharges out of the ground. The source of saturation is usually either shallow or deep groundwater. Precipitation will saturate the soil down to a restrictive layer and a perched water table can form. In most wetlands with high water tables the water table exists very near the soil surface at some time during the wet season, but then drops as ET begins to balance inputs.	

A3. Saturation

Read Indicator A3, Saturation

Question	Answer
Should you record the depth of the water table when you document Indicator A3?	Yes
Discussion	
The supplements state that “This indicator must be associated with an existing water table located immediately below the saturated zone.” Such a saturated zone would be either the **capillary fringe** above the top of the aquifer (the water table) or part of that aquifer where water has not had time to fill the soil pit yet.	

Question	Answer
Which of these (any or all) are accepted methods to determine glistening? 1. Break open a soil ped. 2. Squeeze a soil ped. 3. Gently shake a soil ped.	Only # 1
Discussion	
Breaking soil peds retains the pore structure and pore size distribution within the ped. Glistening shows fully saturated pore spaces in the broken ped. Squeezing compresses the pore matrix, so expressed water reflects conditions with a smaller total pore volume. Shaking causes water to break free from light absorption to the soil pore matrix; if the ped glistens only after shaking, then the entire pore space was not fully saturated.	
Question	Answer
How far above the water table do you expect to find glistening?	A few inches, not many inches except perhaps in organic soils.
Discussion	
The capillary fringe is pretty thin in natural soils. Half a foot would be the maximum,	

even in silts with high organic matter content. Organic soils, however, can be saturated several inches above the free water surface in an unlined borehole.

Question	Answer
Why does the User Note mention recent rainfall events?	Rainfall infiltration can be mistaken for saturation.

Discussion

During and after storms rain water enters the soil and percolates through the pore space downward until it can go no further because of a water table or a restrictive layer. The movement of rainwater into a dry soil is called the wetting front. The slug of infiltration water behind the wetting front can be saturated, but it is not caused by shallow water tables and wetland hydrology unless it has reached the water table.

The concept of saturated soil conditions raises a contradiction in the glossary. Note in the glossary that the 1987 Manual defines saturation as water at atmospheric pressure, that is, at or below the water table in an unlined borehole. The Regional Supplement, on the other hand, defines saturation to include the zone within the capillary fringe above the water table. This indicator (glistening) captures the capillary fringe and it also captures soils with very slow permeability where soil water seeps out of the side of the soil into the bore hole more slowly than the investigator is able to wait around for.

Group B. Evidence of Recent Inundation

Why is this important to me? Read these seven indicators thoroughly as they are frequently used: B1, B2, B3, B7, B8, B9, and B10. Do others as appropriate to your region and as time allows.

B1. Water marks

Read Indicator B1, Water marks

Question	Answer
What are the biggest problems with this indicator?	You do not know if the inundation event occurred during the growing season. Nor if such events occur in 5 out of 10 years.

Discussion

Several of the Group B indicators provide strong evidence that high water stood on the ground surface at some time in the past, but you rarely know when or how frequently these events occurred. This is why we have a three parameter system. If the site has both hydric soils and hydrophytic vegetation, then this evidence of standing water is a pretty good indicator of how the plants and soils were stressed to become wetland indicators. On the other hand, Water Marks, Sediment Deposits, Drift Deposits, etc., without hydric soils or hydrophytic vegetation, only show that there was a high water event sometime in the past and that it may occur only rarely.

B2. Sediment deposits

Read Indicator B2, Sediment deposits

Question	Answer
Which indicator might be more reliable, B1 or B2?	Probably B2.
Discussion	
Sediment deposits are a fairly reliable indication of flooding earlier in this growing season, especially if they are found on this year's leaves. Alluvial silt is much more likely to be washed away by subsequent rainstorms than are water marks. Note also that sediment deposits are less obvious than water marks and are often overlooked by novice delineators.	

B3. Drift deposits

Read Indicator B3, Drift deposits

Question	Answer
What are common forms in which drift deposits may be observed?	Drift deposits may be a pile of debris accumulated against a fixed feature such as a rock or tree. They may also form a circle or polygon on the perimeter of an area where water stood for a period of time. A drift deposit may appear as a line, for example where waves have deposited debris from a body of water.
Discussion	
Drift lines or drift deposits usually indicate short duration ponding or flooding. They are usually formed where either water carried floating debris, or the wind blew in debris on waves in open water (lakes, for example). In vegetated settings drifted debris is often laid down as piles of twigs or stems oriented parallel to each other. In a pothole setting, the stems of vegetation will float to the perimeter of the pond and remain there when the water infiltrates or evaporates. The debris may be remnants of vegetation (e.g., branches, stems, leaves), man-made litter, or other waterborne materials.	

B4. Algal mat or crust

Read Indicator B4, Algal mat or crust

Question	Answer
Are algal mats usually found near the wetland boundary or further into the	Further towards the interior where prolonged wet conditions occur.

wetland interior?	

Discussion
The user notes point out that algal mats indicate prolonged wet conditions sufficient for algal growth and development. The wetland boundary will often be upslope of the indicator. If you see algal mats during the dry season, they are strong evidence that the wetland is at least as extensive as algal mats and probably more so. This indicator is not used in the Arid West Supplement. It is a new indicator for the Corps, introduced with the Regional Supplements.

B5. Iron deposits

Read Indicator B5, Iron deposits

Question	Answer
Why should iron films observed in bottoms of ditches not be recorded for this indicator?	Ditch bottoms are usually lower than the depths required for wetland hydrology.

Discussion
Iron discharge films on the bottoms but not the sides of ditches only indicate that iron-enriched waters discharged to the depth of the bottom of the ditch. This indicator is most useful if found on the dry ground surface, as in the photograph in the Regional Supplement. Iron deposits show that large amounts of reduced iron (Fe^{++}) have been discharged onto the surface from some source where much iron was reduced, such as reduced groundwater in a discharge position in the landscape The Fe^{++} oxidizes when it is exposed to air and becomes reddish Fe^{+++}. A similar process causes **ocher** to form in drainage lines and in hillside seeps. This indicator is not used in the Arid West Supplement. It is a new indicator for the Corps, introduced with the Regional Supplements.

B6. Surface soil cracks

Read Indicator B6, Surface soil cracks (In some Supplements this indicator is not used, and in others it is a secondary indicator and described after the primary indicators within Group B.)

Question	Answer
In what kind of materials is this indicator usually found?	Recently deposited fine sediments and surficial soil material in concave landscape positions

Discussion
This is a secondary indicator in most of the country but is primary in Alaska, the Arid

West, and the Western Mountains. In dry regions with unvegetated lake beds the surface soil cracks form in materials much different from the surrounding landscape. In the rest of the nation they are a more ambiguous formation with a tenuous interpretation. They can also be found in mud deposits in parking lots and need to be interpreted in the context of the entire habitat of plants, soils, and water flow paths.

B7. Inundation on aerial imagery

Read Indicator B7, Inundation on aerial imagery

Question	Answer
Does *any* occurrence of standing water in aerial imagery cause indicator B7 to be met?	No

Discussion

Inundation in a very wet period is not conclusive evidence. Such an observation must be coupled with precipitation data from the period when the aerial imagery was taken. Inundation on aerial imagery is most conclusive if a pattern of wetness emerges that correlates with wet, normal, and dry periods in the precipitation record.

B8. Sparsely vegetated concave surface

Read Indicator B8, Sparsely vegetated concave surface

Question	Answer
What kind of hydro-regime is necessary to stress vegetation so much that there is almost no vegetation growing there?	Probably alternating very wet and very dry

Discussion

These areas must stress both wetland and non-wetland plants, by alternating between very wet and very dry conditions. They are often very shady, too, under forest canopy. The conditions seem to prevent survival of young woody species. On dry season inspections there is little to go on in these flats. If vegetation is missing, it is also difficult to document the Hydrophytic Vegetation indicator, except for the trees around the edge of the sparsely vegetated concave area.

B9. Water-stained leaves

***Read** Indicator B9, Water-stained leaves*

Question	Answer
How do you distinguish water-stained leaves from darkly colored, decomposing leaves in non-wetlands.	They should contrast strongly with fallen leaves in nearby non-wetland landscape positions.

Discussion
Water stained leaves has always been a controversial indicator because of uncertainty about whether leaves are dark because of inundation or simply because of natural decomposition processes in non-wetland settings. The best teacher is experience comparing fallen leaf morphology on transects in and out of depressions. You will often find water stained leaves on sparsely vegetated concave surfaces. Water-stained leaves is a primary indicator in all supplements except Alaska and parts of the Western Mountains.

B10. Drainage patterns

Read Indicator B10, Drainage patterns

Question	Answer
Could a lack of leaf litter provide evidence that indicator B10 is met?	Yes
Discussion	
This indicator consists of flow patterns that are visible on the soil surface or eroded into the soil, low vegetation bent over in the direction of flow, absence of leaf litter or small woody debris due to flowing water, and similar evidence that water flowed across the ground surface. Indicator B10 is met when a site that previously had leaf litter scattered over it now has leaves removed from an area where water probably flowed.	

B11. Salt crust

Read Indicator B11, Salt crust

Question	Answer
How do you distinguish between evaporative salt crusts (B11) and the fluffy salt deposits mentioned in the User Notes?	B11 salt crusts usually are horizontal whereas capillary fringe salt crusts often precipitate on the sides of silt mounds that form around the bases of plants and can have hollow cavities within the ‘fluffy’ crenulations.
Discussion	
Salt crusts in depressions or lake bed fringes usually form on hard surfaces that are difficult to penetrate with a shovel or auger. Around the edge of the depression there may be concentric rings of different kinds of salts that precipitate out at different solution concentrations as the pool evaporates. Salt crusts that form from capillary rise often form up the sides of undulating surfaces, especially mounds around phreatophytic plants. They are puffy and strongly three-dimensional whereas the B11 salt crusts are	

flatter and more planar.

Contact your local experts to learn where salt crusts are important in your region, how to identify them, what similar features they can be confused with, and what pitfalls are associated with using this indicator in the field.

B12. Biotic crust (Arid West Supplement only)

Read Indicator B12, Biotic crust, including the accompanying 7 figures

Question	Answer
Which of the figures are examples of what biotic crusts are *NOT* B12 Wetland Hydrology indicators?	The last two, Figures 31 and 32

Discussion

Contact your local experts to learn whether biotic crusts are important in your region, how to identify them, what similar features they can be confused with, and what pitfalls are associated with using this indicator in the field.

B13. Aquatic fauna

Read Indicator B13, Aquatic fauna

Discussion

The remains of aquatic fauna are occasionally the best evidence still present on closed depressional sites that dry out seasonally due to water table draw-down and ET.

Contact your local experts to learn your local aquatic fauna, what non-aquatic fauna should not be used as a primary indicator of wetland hydrology, and what pitfalls are associated with using this indicator in the field. Consult with your local experts about the quantity of aquatic fauna considered to be sufficient to indicate whether indicator B13 is met.

B14. True aquatic plants

Read Indicator B14, True aquatic plants

Question	Answer
Where would you find a list of true aquatic plant species for your region or state?	The Corps Plants website. Technical Floras note if species are aquatic.

Discussion
This indicator complements Indicator A1, Surface water. It is useful for inspections conducted during drought or extreme dry season draw down when aquatic plant remains are the major source of your information about wetland hydrology. The Corps Plants website is: https://rsgis.crrel.usace.army.mil/apex/f?p=703:1:158550515867352, o Go to All Botanical Searches. o Select your geographic area o Select Aquatic Plants in the drop down box by Habitat o Click on the red Accept Query button Contact your local experts to learn which plants are true aquatic plants, what non-aquatic plants should not be used as a primary indicator of wetland hydrology, and what pitfalls are associated with using this indicator in the field.

B15. Marl deposits (included in only 4 regional supplements)

Read Indicator B15, Marl deposits

Question	Answer
A soil has 8 inches of soft, black muck overlying 60 inches of marl. Does this soil have Indicator B15?	No

Discussion
Indicator B15 is for active deposition of marl under current wetland hydrologic regimes. It appears as a thin film on top of the soil or on top of horizontal debris on the ground surface. Its primary use is for areas that would have indicators A1 or A2 during the wet period of a normal growing season, but your site visit is during the dry season or during a drought, when water levels have dropped severely. Contact your local experts to learn whether Marl deposits are important in your region, how to identify them, what similar features they can be confused with, and what pitfalls are associated with using this indicator in the field.

B16. Moss trim lines (included in only 3 regional supplements)

Read Indicator B16, Moss trim lines

Question	Answer
What other indicators can this be confused with?	B1 and B2.
Discussion	

This is a variant of the Water Marks and Sediment Deposits indicators, which are primary indicators in all of the country. Moss trim lines are formed when water-intolerant mosses growing on tree trunks and other upright objects are killed by prolonged inundation, forming an abrupt lower edge to the moss community at the high-water level.

Contact your local experts to learn whether moss trim lines are important in your region, how to identify them, what similar features they can be confused with, and what pitfalls are associated with using this indicator in the field.

B17. Tilapia nests (included in only the Pacific Isles supplement)

Read Indicator 18, Tilapia nests

Discussion
Contact your local experts to learn whether Tilapia nests are important in your region, how to identify them, what similar features they can be confused with, and what pitfalls are associated with using this indicator in the field.

Group C. Evidence of Current or Recent Soil Saturation

Why is this important to me? Read these four indicators carefully as they are frequently used: C2, C3, C6, and C7. Do others as appropriate to your region and as time allows.

C1. Hydrogen sulfide odor

Read Indicator C1, Hydrogen sulfide odor

Question	Answer
Can you have Indicator C1 without Indicators A1, A2, or A3?	Probably not

Discussion

Hydrogen sulfide is present only under very reducing conditions. For this indicator to be present, the soil has to be thoroughly anaerobic, which only occurs when the soil is saturated. The indicator's utility is that it dispenses with any doubt that wetland hydrology conditions may be an artifact of unusually wet weather.

In order for hydrogen sulfide to produce an odor in a soil pit there must be a fair amount of free sulfur in the soil and water. This indicator is usually found in coastal situations. Sulfurous odors in inland settings can sometimes be associated with volatile petroleum products.

C2. Dry-season water table

Read Indicator C2, Dry-season water table

Question	Answer
What is an easy way to document that you are in the normal dry season when you want to use the indicator?	Use the local soil survey Water Features Table data or climatological data available for the area being evaluated.

Discussion

This indicator should be used only where hydric soils have distinct seasonal differences in water table depth. This information can be found easily by consulting Customer Service Toolkit with Soil Data Viewer, eFOTG, Soil Data Mart, or Web Soil Survey for the soil you are inspecting or hydric soils associated with landscapes and landforms you are working in. All programs have print options for inclusion in the file.

Note also that the User Notes recommend documenting that precipitation levels have been drier than normal if the indicator is used in the wet season. Information may be available from your state climatological office. Procedures for nationally available climate data are found in section 3.3.2.

C3. Oxidized rhizospheres along living roots

Read Indicator C3, Oxidized rhizospheres along living roots.

Question	Answer
Do the iron deposits have to be on the roots or may they be on the walls of the root channel?	Orange or red Fe^{+++} deposits may be found either on the root or on the walls of its root channel.

Discussion

The General Description is explicit that the iron coatings can be either on the root or on the walls of the channel. The important thing is that they be associated with living roots. Compare the two photographs of this feature in the Supplement. The first photograph is of a black or very dark gray soil where the iron deposits are visible on living, white, root surfaces. The second photograph is of a soil that has many (more than 20 percent by volume) oxidized rhizospheres, mostly impregnating channels enough to be seen at this coarse magnification.

Take a hand lens in the field with you if oxidized rhizospheres are common in your area.

C4. Presence of reduced iron

Read Indicator C4, Presence of reduced iron

Question	Answer
Which other indicator from Group C is similar to this indicator (Presence of reduced iron)?	C1, Hydrogen sulfide odor

Discussion

Both C1 and C4 require soil saturation at the moment of observation, so Indicator A3 and probably A2 will also be present. These indicators just confirm that this hydroperiod is long term and not a temporary consequence of unusually wet conditions.

See the Soils Module for use of alpha, alpha dipyridyl. The reagent is relatively unstable. It probably is more appropriate to soils studies than for routine wetland hydrology determinations.

It is fairly common to observe soil color change from dull gray to light brown on exposure to air. This, too, meets Indicator C4.

C5. Salt deposits

Read C5, Salt deposits

Discussion

Contact your local experts to learn where Salt deposits are important in your region, how to identify them, what similar features they can be confused with, and what pitfalls are associated with using this indicator in the field.

C6. Recent iron reduction in tilled soils

Read Indicator C6, Recent iron reduction in tilled soils

Question	Answer
What is likely to be the most common error committed when using this indicator?	Confusing redox concentrations with brownish B-horizon material pulled up into the Ap horizon.
Discussion	
People who are not soil scientists frequently are unsure whether orange bodies within the A horizon are redox concentrations or B-horizon contamination from below brought up by tillage. A hand lens will help here. Hunt for spatial patterns where soft masses are associated with natural features within the soil ped or clod, color changes are gradual rather than abrupt, and orientation can be explained by natural differences in the pedologic micro-environment. In contrast, hand lens inspection will show that subsoil material brought up by tillage equipment will have a different amount of visual graininess, different amounts of organic matter distributed through the soil matrix, and will be a distinct body with arbitrary orientation in the Ap matrix. If in doubt, use the hand lens to compare the orange body in the topsoil with some subsoil material; it should be obvious if they are similar or different material.	

C7. Thin muck surface

Read *Indicator C7, Thin muck surface*

Question	Answer
What is the minimum thickness for this indicator?	No minimum thickness is stated.
Discussion	
This is an unusual indicator in that less is *better*. The problem is that in agricultural regions most of the organic soils have been drained. Thick layers of muck remain at the land surface, but that muck only indicates an earlier hydrologic regime, not the current one. Currently active wetlands frequently accumulate organic matter on the soil surface. They may accumulate an inch or two of mucky mineral material at the uppermost mineral layer and/or a thin layer of muck on top. This layer of muck will not persist if the soil dries out for a couple seasons, but it does persist if the soil is saturated to the surface or ponded regularly.	

C8. Crayfish burrows

Read Indicator C8, Crayfish burrows

Question	Answer
Why is this a secondary indicator and B13 (aquatic fauna) is a primary indicator?	B13 requires observation of the aquatic fauna themselves in their normal habitat. C8 relies on inference from a very mobile animal that can live feet below the ground surface.
Discussion	
Personal experience shows that crayfish burrows are usually located in wetlands but sometimes are found in somewhat poorly drained soils outside of wetlands. The depth that they can dig to in order to follow falling water tables makes them only a secondary indicator of wetland hydrology.	

C9. Saturation visible on aerial imagery

Read *Indicator C9, Saturation visible on aerial imagery*

Question	Answer
If a color tone difference is seen in an aerial image, is this sufficient to be labeled as Saturation visible on aerial imagery?	No. A color tone difference may or may not indicate saturation.
Discussion	
Saturation in a very wet period is not conclusive evidence. Such an observation must be coupled with precipitation data from the period when the aerial imagery was taken. Saturation on aerial imagery is most conclusive if a pattern of wetness emerges that coincides with dry, normal, and wet periods in the precipitation record. Saturated soil signatures must correspond to field-verified hydric soils, depressions or drainage patterns, differential crop management, or other evidence of a seasonal high water table.	

C10. Fiddler crab burrows (only in Caribbean Isles and Pacific Isles supplements)

Read Indicator C10, Fiddler crab burrows

Discussion
Contact your local experts to learn where Fiddler crab burrows are important in your region, how to identify them, what similar features they can be confused with, and what pitfalls are associated with using this indicator in the field.

Group D. Evidence of Other Site Conditions or Data

Why is this important to me? Read these four indicators carefully as they are frequently used: D2, D3, D4, and D5. Do others as appropriate to your region and as time allows.

D1. Stunted or stressed plants

Read Indicator D1, Stunted or stressed plants

Question	Answer
Would this indicator be used if this is seen in aerial imagery?	No

Discussion

These indicators from the regional supplements are field indicators, not for off-site methods. If stunted or stressed crops were seen repeatedly in aerial imagery, this may be able to be used to support the presence of wetland hydrology as an application of the Remote Sensing Tool (Part 650.1903) in Engineering Field Handbook Chapter 19.

This indicator is related to the vegetation that is experiencing the stunting or stress. Crops such as corn and soybeans are sensitive to anaerobic conditions and will begin to be affected in as little as 48-72 hours. Typically this is not long enough for hydrophytic vegetation to change from recessive to dominant. Profitable crops of corn are grown on wetlands. Exercise caution when applying this indicator. The wetland hydrology criterion does not include firm numbers on frequency and duration of the wetness, so knowledge of the vegetation must temper application of this indicator.

D2. Geomorphic position

Read Indicator D2, Geomorphic position

Question	Answer
Is this indicator applicable in an area with a functioning drainage system?	Maybe

Discussion

Some supplements specifically indicate that the D2 indicator does not apply where a functioning drainage system exists in a site in a water-receptive geomorphic position; others do not. If the drainage system elevation is higher than the bottom of the basin, this indicator may still apply. The user may be required to evaluate the drainage system and determine its impact on the site's capacity for runoff retention.

Other problems can also cloud the application of indicator D2. This indicator is an excellent guideline for identifying potential wetland sites but professional judgment should be used before making the final call.

D3. Shallow aquitard

Read Indicator D3, Shallow aquitard	
Question	Answer
Where would you go to document that local aquitards are restrictive enough to support wetland hydrology?	Local Soil Survey information.
Discussion	
The definition of an aquitard is relative rather than quantitative. Several pedologic restrictive layers can be discontinuous and therefore allow leakage. Furthermore, slope position and percentage can change the hydrologic functioning of aquitards and restrictive layers, as can position within a catchment basin. Check local Soil Survey tables to determine and document that restrictive layers in your area function to perch water sufficiently for hydric soils to be present. Use this secondary indicator only in conjunction with strong evidence of hydrophytic vegetation and hydric soils.	

D4. Microtopographic relief

Read Indicator D4, Microtopographic relief
Discussion
Contact your local experts to learn where Microtopographic relief is important in your region, how to identify it, what similar features it can be confused with, and what pitfalls are associated with using this indicator in the field.

D5. FAC-neutral test

Read Indicator D5, FAC-neutral test	
Question	Answer
On a site, four dominant plant species across all strata are identified. Two are FACW and two are FACU. Does this site meet the FAC-neutral test?	No
Discussion	
The FAC-neutral test is met if more than 50% of the dominant species are FACW and/or OBL. In this example, the FACW species are exactly 50%. This is not MORE THAN 50%. The test is not met.	

D6. Raised ant mounds (only Western Mountains regional supplement)

Read Indicator D6, Raised ant mounds

Discussion
Contact your local experts to learn where Raised ant mounds are important in your region, how to identify them, what similar features they can be confused with, and what pitfalls are associated with using this indicator in the field.

D7. Frost-heave hummocks (only Western Mountains and Great Plains regional supplements)

Read Indicator D7, Frost-heave hummocks

Discussion
Contact your local experts to learn where Frost heave hummocks are important in your region, how to identify them, what similar features they can be confused with, and what pitfalls are associated with using this indicator in the field.

D8. Not used in any Supplement

D9. Gauge or well data

Read Indicator D9, Gauge or well data

Question	Answer
Which NRCS tools are to be used to evaluate any gauge or well data available for a site?	Hydrology Tools for Wetland Determination, Engineering Field Handbook Chapter 19, Use of Stream and Lake Gages 650.1901 and Observation Wells 650.1907
Discussion	
Quantitative hydrologic investigations are acceptable and strong evidence for determining presence or absence of wetland hydrology if conducted with acceptable methods and overseen by qualified personnel. NRCS Hydrology Tools for Wetland Determination provide those safeguards.	