

Vermont Rapid Condition Assessment Method

User's Manual and Scoring Form



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1.0 VERMONT WETLANDS

1.1 General

The wetlands of the State of Vermont are valuable natural resources. It is estimated that Vermont's existing wetlands comprise less than 5 percent of Vermont's surface area. In addition to being Vermont's most productive ecosystem, wetlands serve a wide variety of functions beneficial to the health, safety and welfare of Vermont's people, its infrastructure, and its flora and fauna including:

- retaining stormwater runoff, reducing flood peaks, delaying flood crests and thereby reducing flooding;
- improving surface water quality by storing organic materials, chemically breaking down or removing pollutants, and by filtering eroded sediments and organic matter from the surface runoff; protecting the quality and quantity of ground water, and contributing to streamwater flow
- stabilizing soil and dissipating wave and current energy;
- providing spawning & breeding, feeding and general habitat for fish and amphibians;
- providing a wide diversity of habitat for wildlife, including waterfowl, birds, mammals, furbearers, amphibians and reptiles;
- providing habitats which are critical for the survival of rare, threatened and endangered species of plants and animals;
- providing both representative and rare examples of plant communities which make up the state's natural wetland heritage;
- providing valuable resources for education and research in natural sciences;
- providing a diversity of recreational and economic benefits;
- Contributing to the open space character and overall beauty of the landscape.

A substantial portion of Vermont's wetlands have already been destroyed or severely impaired by draining, dredging, filling, excavation, pollution and other activities. It is estimated that Vermont, to date, has fewer than 50% of its wetlands and is continuing to lose additional wetland resources annually.

The legislature adopted an act in 1986 (10 V.S.A. Chapter 37, Section 905(a)(7-9)) that established the first statutory framework for identifying and protecting Vermont's wetlands in accordance with the Vermont Wetland Rules (VWR) adopted by the Water Resources Board (Board). In 2010 the Vermont Wetland Rules were changed significantly by the VT Legislature, giving the Secretary of the Agency of Natural Resources the legal authority to identify and regulate wetlands determined as Class One and Class Two, as they occur in their natural environment, and not rely strictly on the Vermont Wetland Inventory Map for the legal authority to regulate wetlands in Vermont. The updated rules apply to those wetlands which are determined to be "so significant that they merit protection." The determination of whether a wetland merits protection under these rules is based on an evaluation of the extent to which it serves one or more of the functions listed in Section 5, pages 12 – 18) of the rules. The Vermont Rapid Assessment Method is not meant to be used as a substitute for the evaluation of the functions of a particular wetland. Rather, VRCAM should be used in conjunction with the function and value checklist to determine the ecological significance and level of condition within the wetland.

The Rules establish three classes of wetlands that are used to determine the level of protection under these Rules. Class One and Two wetlands are "significant wetlands" and therefore are protected under these rules. Class One wetlands, are wetlands which the Water Resources Panel or the Natural Resources Board determines to be exceptional or irreplaceable in their contribution to Vermont's natural heritage and merit the highest level of protection under these rules. Class Three wetlands are not protected under these Rules, however, they may be protected by other state, federal, or local regulations.

1.2 Scope and use of the Vermont Rapid Assessment Method

Regulatory Application: The VRCAM will be used in conjunction with the function and value assessment to determine whether a wetland is so significant it merits protection. The scoring system will help to clarify the

determination of wetland class where the assessment of function and value is inconclusive, and otherwise to support these assessments.

The VRCAM scoring system may also play a role in deciding which wetlands would qualify for General or Individual Wetland Permits. . A very high scoring wetland will require a higher level of review and scrutiny than a wetland that has a marginal score in order to retain its current condition, and important functions and values. The Vermont Wetland Program will weigh the proposed activity against the quality of the wetland, and the use of VRCAM will provide a means of measuring that quality.

The VRCAM scoring system may also be used to compare a wetland before and after proposed impacts to determine if a project as proposed will result in undue, adverse impacts.

Bioassessment Field Application:

QUANTITATIVE RATING

Metric 1: Wetland Size

Wetland size including other contiguous wetland types

Metric 1 asks the rater to identify the size of the wetland being assessed. The rater can estimate the size based on personal visual reference or satellite imagery maps. Wetlands that are large (generally over 1 acre) are presumed significant due to their size. Larger wetlands are, for scoring purposes, presumed to be more resilient to minimal disturbances. Therefore, scoring is scaled from low to high points relative to size. Note: wetlands under one acre, such as bogs, fens, vernal pools, and seeps will be rated in the field, where they can be determined significant (or not), and receive a score of 3 – 5 pts. based on current condition, and size appropriate functions and values for their specific wetland type.

Select one size class and assign score

>10 ha (>25 acres) (5 pts)

1 to10 ha (2.5 to < 25 acres) (5 pts)

0.20 to <1 ha (.5 to < 2.5 acres) (3 pts)

> 0.20 ha (< 0.5 acres) (3 pt)

*Exception - Vernal Pool or Fen Community relative to size (3 – 5 pts)

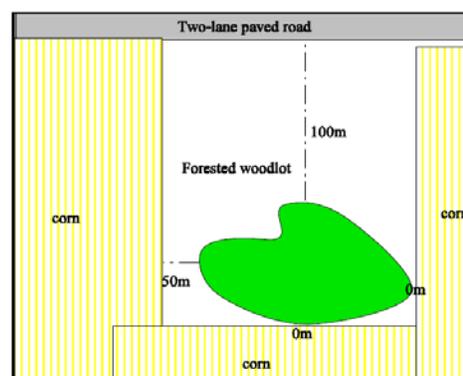
Metric 2: Upland Buffers and Surrounding Land Use.

Wetlands are ecological communities that are located in areas between upland and aquatic environments (like streams, rivers, ponds, and lakes), and isolated upland environments (generally patches within forested matrixes). Like all natural systems, they are sensitive to human disturbances, both direct and indirect. Nutrient enrichment or eutrophication from stormwater inputs, urban runoff, or agricultural runoff can degrade wetlands just as these disturbances can degrade streams, ponds, rivers, and lakes.

The questions in Metric 2 reflect the fact that wetlands with “buffer” zones between the wetland and human land uses are often less disturbed than wetlands without such buffers. Conversely, wetlands that are located in places where human land use is more intensive are often subject to greater degrees of disturbance. However, it is important to stress that merely because a wetland is located in an area with intensive human land uses does not mean that it is or will become degraded.

Question 2a: Average Buffer Width

For the purposes of this question, “buffer” means non-anthropogenic landscape features which have the capability of protecting the biological, physical, and/or chemical integrity of the wetland from effects of human activity. Typically, a buffer could be forested or shrubby margin, prairie, streams or lakes, old fields, and in certain instances more managed landscapes like meadows or hay fields. Intensive human land uses should not be counted as buffers. These include active agricultural row cropping, fenced or unfenced pastures, paved areas, housing developments, and golf courses, mowed or



highly managed parkland, mining or construction sites, etc. A comprehensive list is not proposed in this manual. The key concept is whether the buffer area, whatever it is, *functions* to protect the wetland from degradation.

In order to calculate the Average Buffer Width (ABW), estimate the width of buffer on each side of the wetland to a maximum of 300m and divide by the number of sides, e.g. the average buffer width of a wetland with buffers of 100m, 50m, 0m and 0m would be calculated as follows: $ABW = (50 + 50 + 0 + 0)/4 = 25$ (see Fig. 1). The wetland would score 2 points for Question 2a. A wetland with buffers greater than 300m on all sides would have an $ABW \geq 300m$ and would score 10 points. This procedure works well with small to midsize wetlands. For very large wetlands or wetlands with unusual shapes there may be multiple "sides" and it may be difficult to measure, determine, or obtain access to all of the sides of the wetland. In this situation, the Rater may consider this question to provide a buffer continuum from very narrow to wide and assign the points associated with the most appropriate category, and use GIS as a scoring tool where indicated.

Question 2b: Intensity of Predominant Surrounding Land Use(s)

In order to answer this question, the Rater should evaluate the intensity of the predominant land uses in the areas outside the wetland and beyond the wetland's buffer zone, i.e. more than 50m (164 ft) if the wetland has buffers greater than 50m on all sides. The questions form a continuum from most intensive to least intensive land uses. In many instances, the Rater will need to "double check" and average the score. This question asks the Rater to generally characterize the type of land uses that are most common in the immediate vicinity of the wetland. Several examples are offered to aid in answering this question.

Example 1. Wetland is a deep (90cm), largely unvegetated (except for the canopy trees above it) vernal pool, located entirely within a large, contiguous patch of second growth forest. Upland forest extends from 100 to 300m on all sides of the wetland. Outside of the forest, the land use is agricultural row cropping. Score: the wetland is entirely surrounded by second growth forest and should receive a score of 10.

Example 2. The wetland is deep, largely unvegetated (except for the canopy trees above it) vernal pool, located *at the edge of* a large, contiguous patch of second growth forest. Outside of the forest, the land use is agricultural row cropping. The boundary of hydric soils extends from the current wetland edge into the agricultural field. Score: the Rater should double check "Low" intensity (10) and "high" intensity (0), and average the scores, $(10+0)/2=5$.

Example 3. The wetland is a vegetatively diverse emergent marsh located in the floodplain of a State Scenic River. A mature forested, riparian corridor is adjacent to one side of the wetland; on the other side is a fenced pasture (Note: both sides of the river have a forested, riparian corridor). Score: the Rater should double check "Low" and "moderately high", and average the scores, $(10+3)/2=6.5$.

Example 4. The wetland is an isolated cattail marsh. On one side, the wetland has no buffer and is immediately adjacent to active row cropping. On the other three sides, the wetland is surrounded by a new fallow field. Score: the Rater should double check "moderately high" (3) and "high" (0), and average the scores, $(3+0)/2=1.5$.

Example 5. The wetland is a buttonbush swamp with forested margins. The wetland is bisected by a small, dirt township road. The wetland has mature to young second growth forest on one side, a "shrubby" old field (probably >10 years old) on 2 sides, and is hydrologically connected to another buttonbush swamp on the fourth side but is separated from this other wetland by a 20 to 50 meter wide upland forested area. Score: the Rater should double check "Low" and "Moderate" and average the scores, $(10+5)/2=7.5$.

Metric 3: Hydrology

"Hydrology is probably the single most important determinant for the establishment and maintenance of specific types of wetlands and wetland processes." (Mitsch and Gosselink, 1996, p.55, italics in the original). Thus, 25% of the total points possible in the VRCAM Quantitative Rating are awarded in Metric 3. This metric asks the Rater to evaluate the wetland's water budget, hydroperiod, the hydrologic connectivity of the wetland to other surface waters, and finally, the degree to which the wetland's hydrology has been altered by human disturbances. The functions and values of a particular wetland's hydrology and position in the landscape are addressed both implicitly and explicitly in these questions. The Rater will need to be familiar with the definitions, criteria, and methods of the Corps of Engineers Wetlands Delineation Manual (U.S. ACOE 1987, hereafter the 1987 Manual) for determining whether a particular area has wetland hydrology. In addition, the Rater's answers to Questions 3a, 3b, 3c and 3d can be based on the information and indicators of wetland hydrology discussed in the 1987 Manual.

A wetland could potentially receive more than 25 points for Metric 3 of the VRCAM. If this occurs, the Rater is directed to enter a score of 25 points total for Metric 3.

Question 3a.Sources of Water: Groundwater

This question relates to a wetland's water budget. It also reflects that wetlands with certain types of water sources, or multiple water sources, e.g. low pH groundwater or perennial surface water connections, can be very high quality wetlands or can have high functions and values. This question asks the Rater to check all of the following water sources that are part of the wetland's hydrologic budget:

- Low pH groundwater (5 points)
- Groundwater (3 points)
- Precipitation (1 point)
- Seasonal/Intermittent surface water (2 points)
- Perennial surface water (lake or stream) (3 points)

The applicability of each of these options is discussed in detail below.

Low pH Groundwater is usually associated with poor fens, bogs, red maple-black gum swamps, black spruce swamps, hemlock acidic basin swamps, spruce fir-tamarack swamps, and acidic headwater seeps. However, low pH groundwater can be present in smaller quantities resulting in a wetland with moderate pH plants or substrates characteristic of intermediate fens, and some seeps. In low pH situations the Rater may observe a fewer graminoids (sedge and grass species) and a well developed herbaceous layer including sphagnum mosses (*Sphagnum spp.*), sundew species (*Drosera spp.*), leatherleaf (*Chamaedaphne calyculata*), black spruce (*Picea mariana*), balsam fir (*Abies balsamea*), and other characteristic peatland species. If groundwater discharges are observable but are not confirmed as low pH the wetland should be scored as mesic pH or high pH accordingly, unless calciphiles are present to help determine high pH.

. Low pH groundwater can also be present and combine with high to moderate pH waters such that an intermediate fen occurs. In other situations, groundwater may express at breaks in a slope above a river, stream, or brook and a seep will develop with low or high pH species under forested, shrub, or open canopy conditions.

Groundwater pH is to be measured using a calibrated pH meter in the field, or as determined by a qualified lab when samples are properly transported by the Rater.

Although many wetlands may receive inputs from the water table as part of their annual water budget, this question should not be scored unless the Rater can observe seeps or other signs that groundwater is a source of water. It is because of this, the Rater should be aware that wetlands can be underscored if groundwater inputs are not readily observable at a time of year when the wetland is a net exporter or recipient of groundwater. If the Rater suspects, but does not have evidence to support scoring the wetland for groundwater, this should be noted on the scoring sheets or comments section and revisited if the loss of these points affects a categorization decision.

As with high or low pH groundwater, any groundwater source can be inferred by observing seeps or rivulets flowing into the wetland or by observing plant species associated with groundwater, e.g. golden saxifrage (*Chrysosplenium americanum*), false foamflower (*Tiarella cordifolia*), species typically associated with fens, various Cyperaceae species, etc. Other circumstantial factors which can be used to infer whether "other groundwater" is present are whether what otherwise appears to be an isolated wetland remains inundated or saturated through late summer and fall, and the clarity or oxygen content of the water.

Precipitation

At a minimum, every wetland evaluated under the VRCAM receives at least 1 point since all wetlands receive precipitation as a hydrologic input.

Many wetlands receive a substantial portion of their annual hydrologic input from seasonal or intermittent flooding from nearby streams, rivers, or lakes. Wetlands located in the headwater area of a watershed and wetlands that have their own small watersheds often receive intermittent surface water inputs via definable stream channels that flow into the wetland after rain events. In order to award points for "Seasonal/Intermittent" surface water, the Rater should observe a definable channel, tributary, stream, etc. whereby surface water flows into the wetland. Seasonal surface water, e.g. from spring flooding of a lake, pond, river or stream, can be inferred using the indicators of hydrology outlined in the 1987 Manual, e.g. recorded data, drift lines, sediment deposits, etc. The Rater does not need to actually observe surface water flowing into the wetland at the time the rating is being performed.

Perennial Surface Water (Lake or Stream)

A wetland has a “perennial surface water” connection to a lake or stream if there is a permanent surface water connection between the wetland and the lake or stream such that the wetland’s hydrology is completely or significantly dominated by water from the stream or lake. The qualifier “significantly” is used since some wetlands can have other water sources, in addition to the connection to the stream or lake that also are important. For example, a wetland that forms on the margins of a kettle lake can have a perennial surface water connection to the lake, and can also receive high pH ground water. Both water sources are significant to the wetland’s overall hydrology.

Groundwater

Although many wetlands may receive inputs from the water table as part of their annual water budget, this question should be scored when the Rater can observe seeps or other signs that groundwater is a source of water for the wetland and when the Rater has more detailed water budget data available that confirms a net input of groundwater to and/or from the wetland.

Question 3b: Hydrologic Connectivity

Question 3b awards points for a wetland’s position in the landscape. This question awards additional points if a wetland is located in a flood plain, is located between a stream or lake and a human land use, is part of a riparian or upland corridor, or is part of a wetland or upland (e.g. forest or prairie) complex. Fennessy et al. (1998b) found strong positive correlations between a wetland’s proximity to other wetlands and the wetland’s “quality.” Wetlands that are located in flood plains or that are in a position to intercept contaminated water before it reaches a stream or lake have functions that are valued by human society. Wetlands located in riparian or upland corridors, or that are part of larger natural systems, e.g. large, contiguous patches of forest are important components of watersheds and regional ecosystems.

Flood plain.

"Flood plain forests and wetland types" are defined in (Wetland, Woodland, Wildland, Thompson and Sorenson 2005). Where available, the Rater can use flood insurance rate maps (FIRMs) and flood boundary and floodway maps published by the Federal Emergency Management Agency (FEMA) to identify flood prone areas.

Wetland is part of a wetland or upland complex

Both this and the next question ask whether the wetland is in physical proximity to, or a part of other nearby wetland or upland natural areas. The difference is whether the area the wetland is connected to is “long and narrow”, like a river, or a polygon that is contiguous to another wetland type or forest or woodlot. If the latter is the case, this question applies; if the former, the next question applies. In some instances, both may apply where a wetland is located in a riparian corridor but is adjacent to a large wetland or upland complex. In this case, the wetland should be scored for both.

Wetland is part of a riparian/upland corridor

The term “corridor” has its common meaning and should be understood differently from the term “complex” used in the preceding question. Riparian corridors are typically areas within the flood plain of rivers or streams that are often forested, however, a mix of natural and human land uses is possible. The key concept for deciding to score this and the preceding question is whether the wetland is connected to other natural areas such that organisms can move between or through the systems. Upland corridors can be as narrow as a vegetated fence row along a farm field that eventually connects to a woodlot, forest, or riparian corridor.

Wetland is hydrologically isolated

The term “Isolated hydrology--bog or fen with no obvious hydrologic input or output” is for wetlands that are unique in that there is no obvious water source contributing to the wetland, and possibly no water exiting the wetland either. If water is discharging from the fen or bog this score is still applied so long as there are no obvious water input sources visible (except precipitation).

Question 3c: Maximum Water Depth.

Depth of water often correlates well with permanence of inundation and also relates to other habitat features of the wetland, e.g. use of the wetland as breeding pools by salamanders and other amphibians. There is some redundancy between this question and Question 3d (duration). However, it is generally easier to determine depth, even when the

wetland is dry, than duration, especially when the wetland may only be visited once or during one season. This question asks the Rater to determine the maximum water depth of the wetland being rated as follows:

- 25 cm (10 in) (5)
- >13 cm to < 25 cm (5 < 10 in) (3)
- <12 cm (2)

The Rater does not need to actually observe the wetland when its water depth is greatest in order to award the maximum points for this question. For all wetlands that have peat substrate, hummocks and pools, or pit and mound topography, the deepest pools within the wetland determine the score for the maximum water depth

We note this in the field form, but don't attach points to it due to redundancy—also this is in 3a.

Question 3d: Anthropogenic Modifications to Natural Hydrologic Regime

Score one or double check and average.

None or none apparent (10)

Recovering – use for restoration or abandoned uses in wetlands (5)

Recent or no recovery (0)

This question asks the Rater to evaluate the “intactness” of, or lack of disturbance to the wetland community that is being evaluated. Given that anthropogenic modifications to wetlands being one of the fundamental detractors from wetland function, and disturbances to hydrology one of the main sources of degradation to wetlands, this question represents 10% of the total possible points awardable under the Quantitative Rating.

Question 3e: Hydrologic Stressors

This question does not discriminate between wetlands with different types of hydrologic regimes, e.g. between a forested seep wetland located on a flood plain with seasonal inundation and a bog with precipitation and minor amounts of surface run-off from a small watershed.

Rather, it asks the rater to evaluate the “Stressors” of the hydrologic regime attributable to a specific type or types of impacts, altering the wetland's natural hydrologic regime. The forested seep wetland and the leatherleaf bog can score a loss of many points (-5 for each stressor identified) if there are apparent modifications to the wetland's natural hydrologic regime.

In order to properly answer this question, the Rater should list all possible disturbances to the wetland's hydrology that are observed by the Rater. The following is a list of disturbances noted on the form:

- Ditching or dredging (- 5)
- Tiled (- 5)
- Dike (-5)
- Weir or Dam (-5)
- Stormwater input (- 5)
- Point source pollution (- 5)
- Filling and/or grading (- 5)
- Road bed or railroad track (-5)
- Sedimentation – from an anthropogenic source (-5)
- Other _____

All available information, field visits, aerial photos, maps, etc. can be used to identify a possible ongoing or past hydrologic disturbance.

Once the Rater has listed all evident ongoing and recent disturbances, the Rater must subtract 5 points for each of the observed disturbances causing more than slight and naturally recoverable alterations to the natural hydrologic regime.

It is very important to stress that the Rater may check one or several of these possible disturbances, yet still determine that disturbances did not alter the natural hydrologic regime. If the Rater does not observe any alterations, or determines that the alterations have made trivial changes to the natural hydrology, then the maximum points should be assigned. If the alterations have caused more than trivial changes, a score of 1, 3 or 7, or an intermediate score of 2 or 5 (if 1 and 3 or 3 and 7 are double-checked) should be assigned. If the Rater is unsure whether the

alterations were more than trivial or did not occur so far in the past that the current conditions are "natural," 7 and 12 should be double-checked and a score of 9.5 assigned.

Example 1. The wetland is a complex of marshes, aquatic beds, fens and forested seep wetlands located around the perimeter of a natural kettle lake. In the 1930s, portions of the wetland were filled and dredged to develop a private beach/picnic/campground area. A dike with a weir was installed to deepen the lake by several feet. The private beach is still in use throughout the growing season. Approximately, 15 hectares (37 acres) of high quality wetlands remain. *Score:* the past disturbances did not seriously impact this groundwater-driven wetland system, although a considerable amount of wetland was probably flooded when the lake level was raised but the system appears to have recovered from this disturbance. "Recovered" should be checked and the wetland receives a score of 7.

Example 2. The wetland is a 4 hectare (10 acres) buttonbush swamp with areas of forested wetland with closed canopy on one side. No significant outflows are observed although a small, shallow ditch from an abandoned farm field is observed. A small, asphalt-paved township road cuts off the forested wetland from the buttonbush swamp. A small culvert connects the two wetlands. The road was installed more than 25 years ago. *Score:* double check Filling and/or grading and other (enter culverts here) since it is clear the disturbances altered the natural hydrologic regime.

Example 3. The wetland is a 2.5 hectare (6 acre) predominately emergent marsh with a strong shrub/sapling component. Small amounts of fill were placed 15 meters from the wetland's edge to construct a pole barn. *Score:* no score is entered since the filling activity wasn't in the wetland and did not clearly affect the wetland's natural hydrology.

Example 4. The wetland is forested with shallow (<20cm deep) pools located in an isolated woodlot. Surrounding farm fields have been ditched and tilled and are actively farmed and the county soil map shows large areas of hydric soils extending through portions of the woodlot into the surrounding farm fields. The remaining wetland areas appear to be at the topographic low point on the property. A feeder ditch passes along one side of the woodlot. The herbaceous layer appears degraded and over-run by poison ivy (*Toxicodendron radicans*). *Score:* double check Tiled and Ditching or dredging since the ditching and tiling diverts water from this remnant wetland (-5 + -5 = -10).

Example 5. Wetland is a seasonally-flooded, flood plain forested wetland, on an order 3 brook or river. The wetland abuts a wooded ridge and is located at the side of a former pasture. The understory is regularly mowed and woody debris removed by the owner. Some selective cutting has also occurred. *Score:* -5 since the disturbances presently affect the wetland's natural hydrology and likely contribute to sediment entering the watershed as well—however if sediment isn't readily observed exiting (or existing in) the wetland do not score for sedimentation as well.

Example 6. Wetland is a remnant forested wetland that was avoided during development of a large commercial, residential development, but is now completely landlocked by streets, stores and apartment housing. The wetland has old field vegetation around its margins but has a diverse canopy and herbaceous vegetation within its boundaries. It is suspected that the surrounding development has increased the surface flows into the wetland, although no stormsewers directly discharge into the wetland. *Score:* since it is unclear whether the development has actually affected the wetland's natural hydrologic regime, although it seems likely that there has been some type of disturbance, the Rater decides to view the scores as points on a hydrologic disturbance continuum and double checks "none or none apparent" and "recovered" and assigns a score of "9.5."

Example 6. Wetland is a remnant forested wetland avoided during construction of a large commercial and residential development, but is now completely landlocked by streets, stores and apartment housing. The wetland has old field vegetation around its margins but has a diverse canopy and herbaceous vegetation within its boundaries. It is suspected that the surrounding development has increased the surface flows into the wetland, although no stormsewers directly discharge into the wetland. *Score:* if it isn't clear the development has affected the wetland's natural hydrologic regime, do not score for Stormwater input. However, if it obvious that stormwater enters the wetland in rivulets or sheet flow, or through ditching, the Rater will score -5 for Stormwater input.

Example 7. The wetland is a 2 hectare (5 acre) shrub wetland located in a mature forest of 10 hectares (24 acres). The wetland has a diverse sedge flora. The forest is located on a large 40 hectare (98 acre) plot of undeveloped land located within a heavily urbanized suburb. *Score:* the Rater should not check any stressors on the list since the natural hydrologic regime has not been disturbed.

Metric 4: Habitat Alteration and Development

While hydrology may be the single most important determinant for the establishment and maintenance of specific types of wetlands and wetland processes, there is a range of other factors and activities which affect wetland quality and cause disturbances to wetlands that are unrelated to hydrology. This metric attempts to evaluate these things under the rubric “habitat alteration.”

In many instances, items checked as possible hydrologic disturbances in Question 3e will be instead alterations to a wetland’s habitat or disruptions in its development (successional state). In other instances, a disturbance may be appropriately considered under both Metric 3 and Metric 4. In any case, the Rater should carefully consider the actual, proximate (direct) cause of the disturbance to the wetland.

Question 4a: Habitat Development.

This question asks the Rater to assign an overall qualitative rating of how well-developed the wetland is in comparison to other ecologically or hydrogeomorphically similar wetlands. More than most questions, this question requires the Rater to have a good knowledge of the types of wetland communities and the range in quality of those wetlands typical of the region, watershed, or state. Again, a scoring continuum is presented from poor to excellent. Uncertainties in assigning a wetland to a particular category should be resolved by double checking the two most appropriate categories and averaging the score.

- Excellent (5 points). Wetland appears to represent the best of its type or class.
- Very good (4 points). Wetland appears to be a very good example of its type or class but is lacking in characteristics which would make it excellent.
- Good (3 points). Wetland appears to be a good example of its type or class but because of past or present disturbances, successional state, etc. is not excellent.
- Fair (2 points). Wetland appears to be a fair to good example of its type or class.
- Poor to Fair (1 points). Wetland appears to be a poor to fair example of its type or class.

Question 4b: Substrate/Soil Disturbance.

This question asks the Rater to evaluate physical disturbances to the soil and surface substrates of the wetland.

- none or none apparent (5 points). There are no disturbances apparent to the Rater.
- recovering (3 points). The wetland shows evidence of recovering from past disturbances.
- Alteration present - no recovery (1 point). The disturbance(s) has occurred recently or historically, and no recovery from past disturbance is evident-- the disturbance can be ongoing (note on the VRCAM if this is the case).

The Rater should score the most appropriate category to describe the present state of the wetland. In instances where the Rater believes that a wetland falls between two categories, or where the Rater is uncertain as to which category is appropriate, it is expected and highly appropriate to “double check” and average the score. Note also that the labels on the scoring categories are intended to be descriptive but not controlling.

Examples of substrate/soil disturbance include filling and grading, plowing, grazing (hooves), vehicle use (motorbikes, off-road vehicles, and construction vehicles), sedimentation, dredging, and other mechanical disturbances to the surface substrates or soils.

Question 4c: Vegetation Alteration or Removal (Subtract 5 points for each impact)

This question may seem to have a correlation to Question 3e, except that this question specifically asks the Rater to evaluate the disturbance to the natural wetland community that is being evaluated. Again, it is very important to stress that this question does not discriminate between wetlands with different types of habitat, e.g. between a forested vernal pool and a flood plain forested wetland. This question asks the rater to evaluate the intactness of the habitat attributable to that type of wetland, so either a vernal pool or flood plain forest can lose points (-5 for each impact) if there are apparent modifications or destruction of the native vegetation.

In order to properly answer this question, the Rater should list all evident alterations to the wetland’s vegetation/habitat that are observed using the list of possible disturbances on the rating sheet below.

- Mowing (-5 to -10)
- Grazing (-5 to -10)
- Clear-cutting (-5 to -10)
- Selective cutting (-5 to -10)

- Woody debris and/ or shrub or sapling removal (-5 to -10)
- Kill zone from toxic substances (-10)
- Herbaceous or aquatic bed removal (-5 to -10)
- Farming – cropland (-5 to -10)
- Nutrient enrichment (eutrophication) (-5 to -10)
- Sedimentation (-5 to -10)
- Recreational vehicle use: 4-wheelers, trucks, etc., (-5 to -10)
- Other (-5 to -10)

Available information from field visits, aerial photos, maps, etc. can be used to identify possible ongoing or past habitat alterations. It is important to stress that this is a list of possible alterations to the wetland's habitat. The Rater must then evaluate whether the activity actually disturbed the habitat (see disturbance list above) is to a degree that warrants a higher subtraction within the range of scoring from -5 to -10. A simple way to think about this question is by asking oneself "what percentage of the wetland being scored has the vegetative disturbance described above? If 50% of any wetland is mowed, no matter the wetland's surface area, that alteration would receive a subtraction score of -10. However, if mowing is present in less than .1% of a 15 hectare wetland, that impact would likely receive a subtraction score of -5. So, the percentage of alteration in comparison to the wetland's size is relative for scoring purposes in this category.

Example 1. The wetland is a large 100 hectare (247 acre) fen, marsh, wet prairie, located between end moraines and receiving artesian ground water as its predominate source of hydrology. The wetland is a relic of a much larger wetland complex that existed presettlement. In the 1950s, peat mining occurred throughout the wetland. Adjacent wetland areas were ditched and tilled and are now actively farmed. The wetland is now largely vegetated with narrow-leaved cattail (*Typha angustifolia*), although small areas of fen vegetation are maintained by removing cattails through cutting or spraying. *Score:* the peat mining was a substantial disturbance to the natural vegetation from which the wetland hasn't recovered. The Rater assigns a score of -10.

Example 2. The wetland is a 1.5 hectare (3.7 acre) formerly forested/buttonbush swamp in which most of the trees were removed to incorporate the wetland into a golf course as a water hazard. The wetland also received large amounts of sediment during golf course construction, which has turned into a shoreline of sand in the now ponded wetland. *Score:* Sedimentation -10 and Clearcutting -10 for a total of -20 for this scenario due to the total destruction of the wetland in favor of a golf course pond with little intact habitat.

Example 3. The wetland is a 3.0 hectare (7.4 acre) forested wetland which was heavily grazed by cattle no more than 5 years ago. The wetland is near a large (400 hectare, 988 acre) mature second growth forest with other forested wetlands that were fenced off from the pasture. The wetland has few tree seedlings or saplings and no shrubs, although a relatively diverse herbaceous (sedges and grasses) community is now present. *Score:* the wetland appears to be recovering from the heavy grazing. The Rater assigns a score of "3" to this wetland.

Example 4. The wetland is a 2 hectare (5 acre) depression forested wetland located in a mature forest of 10ha. The wetland has a diverse sedge flora. The forest is located on a large 40 hectare (98 acre) plot of undeveloped land located within a heavily urbanized suburb. Surrounding the forest are other wetlands, some of which have been clear cut, mowed, or partially filled. *Score:* the Rater should check none or none apparent (9 points) since the forested wetland does not appear to be disturbed even though the surrounding area is heavily urbanized.

Example 5. Wetland is an emergent marsh dominated by river bulrush (*Scirpus fluviatilis*) and reed canary grass (*Phalaris arundinacea*) surrounding a kettle lake. Much of the wetland and surrounding upland areas was farmed until 15 years ago, when the groundwater fed kettle lake was allowed to revert to a natural state. The surrounding hillsides can be characterized as young "old-field." Carp, bullheads and green sunfish are abundant in the lake itself. *Score:* the Rater considers double-checking "recovering" and "recent or no recovery", but ultimately decides that the system as a whole is in the process of recovering from these past disturbances. A score of "3" is assigned.

Example 6. Wetland is a forested, depression wetland with a rich herbaceous community with several rare or endangered plant species. As recently as 15 years ago, the wetland and adjacent upland forests were selectively cut. The canopy of the forest has largely reestablished itself. *Score:* the wetland has "recovered" from this disturbance and a score of "6" is assigned.

Metric 5: Special Wetland Communities.

This metric assigns or deducts up to 5 additional points to the types of wetlands and circumstances addressed in the Narrative Rating Questions. *No wetland can ever receive more than 5 points for this metric* even if multiple categories are applicable, e.g. the wetland is one of the following types: Bog, Fen, Calcareous Red Maple-Tamarac Swamp, Vernal Pool, Northern White Cedar Swamp, Old Growth Forested Wetland, Calcareous or Acidic Riverside Seep, Red or Silver Maple-Green Ash Swamp, Sugar Maple-Ostrich Fern Riverine FP Forest, Alpine Peatland, Hemlock Swamp, Buttonbush Swamp, Deep Bulrush Marsh, Black Spruce Swamp, Red Maple-Black Gum Swamp, wetland has State/Federal threatened or endangered species, wetland is a Major migratory songbird/water fowl habitat or usage.

Metric 6: Plant Communities, Interspersion, and Microtopography.

Vascular plants are an easily observable component of most wetland communities. Increases and decreases in the diversity, horizontal and vertical complexity, and abundance of plant species are well correlated with disturbances to wetlands. *See* Fennessy et al. 1998a and 1998b; Mack et al. 2000. Also included in this metric are physical habitat attributes like standing dead trees, hummocks, and coarse woody debris since these are ultimately plant-produced attributes. Note: low species diversity due to natural vegetative cover, such as occurs in closed canopy Cedar Swamps, or Black Spruce Bog communities, should be noted and explained in the site report for that wetland.

Question 6a: Wetland Vegetation Condition, within the Community, for Each Strata Present.

This question asks the Rater to identify all of the plant communities present within the wetland being evaluated. Five communities are identified: Aquatic bed, Emergent, Shrub, Forested, and Open water (with open water being notable for its overall lack of vegetation). A vegetation community scoring 5, in the scoring range from 0 to 5, must cover a minimum contiguous area set at 0.1 hectares or (1000m²) aka 0.25 acres).

Importantly, when evaluating the presence or absence of a plant community, the Rater must consider simultaneously its horizontal and vertical distribution. For example, a typical Vermont marsh will often have horizontally dispersed zones of vegetation: emergent to aquatic bed to open water. However, vegetation communities can also be vertically stratified: a forested wetland may have a “forest community” composed of trees, with buttonbush (a shrub class) and a rich sedge herbaceous layer (an emergent class).

All wetland vegetation classes should be scored using the cover scale on page 12.

Aquatic Bed Class (floating plants and vegetated carpets).

The “aquatic bed” vegetation community includes wetlands or areas of wetlands dominated by plants that grow principally on or below the surface of the water for most of the growing season in most years. The most common types of plants found in Aquatic bed habitats in Vermont are pondweed (*Potamogeton* spp.), *Najas* spp., water milfoil (*Myriophyllum* spp.), waterweed (*Elodea* spp.), coontail (*Ceratophyllum* spp.), water lilies (*Nymphaea* spp.), spatterdock (*Nuphar* spp.), water-cup (*Ranunculus flabellaris* and *R. longirostris*), mermaid weed (*Proserpinaca palustris*) and bladderwort (*Utricularia* spp.). Floating aquatic species like duckweed (*Lemna* spp., *Spirodela* spp.), watermeal (*Wolffia* spp.), and common duckmeat (*Spirodela polyrrhiza*) are also common. Occasionally floating mats of sphagnum and other mosses with enough substrate to accommodate floating mats of *Myrica gale* (Sweet gale) or similar low strata shrub species and or herbaceous species have developed in a wetland. Based on the rater’s best judgment, these floating mats should be scored in either the Aquatic Bed Class or the Shrub Class, but not both.

In most instances, aquatic beds will occur as a distinct zone or between hummocks in the wetland; however, occasionally aquatic beds can occur as an understory in forested wetlands below shrubs or trees. For example, watercup (*Ranunculus flabellaris*) often grows in rich beds in inundated pools of forested wetlands and buttonbush swamps. In this situation, the Rater should consider the aquatic bed community to be present even though it occurs under a “canopy” of shrubs or trees.

Emergent Class.

The “emergent” vegetation community includes wetlands or areas of wetlands dominated by erect, rooted, herbaceous hydrophytes, and may occasionally exclude mosses and lichens. This vegetation is present for most or all of the growing season in most years. Emergent wetlands are usually dominated by plants with a strata less than 1.5 meters in height.

Emergent wetlands can maintain the same appearance in areas with relatively stable hydrology or can change appearance if water levels fluctuate strongly or in drought or high precipitation years. Common emergent community types in Vermont include shallow emergent marshes, wet meadows, cattail marshes, seeps, and sedge meadows.

In Vermont, most emergent communities are classified via Cowardin as “palustrine” emergent wetlands. Cowardin et al. (1979) distinguishes between persistent and nonpersistent emergent communities but this distinction is not critical for the purposes of the VRCAM. The most common types of plants found in emergent wetlands include cattails (*Typha spp.*), sedge family plants (*Carex spp.*, *Scirpus spp.*, *Eleocharis spp.*, *Cyperus spp.* etc.), bur-reeds (*Sparganium spp.*) rushes (*Juncus spp.*), grass family plants (*Glyceria spp.*, *Phalaris arundinacea*, *Phragmites australis*, *Leersia spp.*, *Poa palustris*, *Calamagrostis canadensis*, etc.), and many broadleaved persistent and nonpersistent dicots (e.g. *Lythrum spp.*, *Lysimachia spp.*, *Polygonum spp.*, *Peltandra virginica*, *Pontederia cordata*, *Sagittaria spp.*, *Alisma subcordatum*, *Lycopus spp.*, *Bidens spp.*, *Impatiens spp.*, *Iris spp.*, *Verbena hastata*, and *Asclepias incarnata*).

In most instances, emergent communities will occur as a distinct community or patch communities within the wetland; however, an emergent community can also be found as an “understory” below shrubs or trees. For example, some forested & shrub wetlands in Vermont can have inclusions of diverse herbaceous communities also. In this situation, the Rater should consider the emergent community to be present even though it occurs within a forested or shrub wetland..

Shrub Class.

The shrub vegetation community includes wetlands or areas of wetlands dominated by woody vegetation less than 6m (20 ft) tall. The plant species include true shrubs, young trees, or trees or shrubs that are small or stunted because of environmental conditions. Environmental conditions effecting vegetative growth in any wetland, which were created through anthropogenic means, must be noted on the VRCAM and scored accordingly.

Shrub wetlands may represent a successional stage leading to forested wetland or they may be stable plant communities (Anderson 1982). Outside of shrub dominated bogs, peatlands, and fens, the most common shrub communities in Vermont are Alluvial Shrub Swamps and Alder Swamps (dominated by any of the following: *Alnus incana*, *Spiraea alba var. latifolia*, *Salix spp.*, *Nemopanthus mucronatus*, *Vaccinium corymbosum*). Other less common wetlands include Sweet gale shoreline swamps, and Buttonbush swamps (dominated by *Cephalanthus occidentalis*, or *Myrica gale* respectively). Dogwood (*Swida spp.*) dominated wetlands, chokeberry (*Aronia spp.*), spicebush (*Lindera benzoin*), maleberry (*Lyonia ligustrina*), winterberry (*Ilex verticillata*), and swamp rose (*Rosa palustris*), are also common shrub components in many Vermont wetlands. Common shrub species found in bogs and fens include leatherleaf (*Chamaedaphne calyculata*), blueberries and small cranberry (*Vaccinium spp.*), bog rosemary (*Andromeda glaucophylla*), black chokecherry (*Aronia melanocarpa*), *Kalmia spp.*, Labrador tea (*Ledum groenlandicum*), bog birch (*Betula pumila*), and shrubby cinquefoil (*Dasiphora floribunda*).

Forested Class.

The forest vegetation community includes wetlands or areas of wetlands characterized by woody vegetation greater than 6m (20ft) or taller. Forested wetlands have an overstory of trees with varying canopy closure, which may or may not allow for the development of an understory of young trees, shrubs, an herbaceous layer, or all of the aforementioned. In Vermont, forested wetlands are a common type of wetland located on flood plains, mountain slopes at all elevations, in basins, adjacent to lakes and ponds, and in riparian areas.

Note: vernal pools and seeps fall under the forested wetland classification due to their small community type being located within a forested matrix.

The most commonly observed canopy trees in Vermont forested wetlands are red maple (*Acer rubrum*), northern white cedar (*Thuja occidentalis*), silver maple (*Acer saccharinum*), black spruce (*Picea mariana*), balsam fir (*Abies balsamea*), American elm (*Ulmus americana*), and green and black ash (*Fraxinus pennsylvanica and nigra*). Other Vermont wetland tree species include Tamarack (*Larix laricina*), swamp white oak (*Quercus bicolor*), black willow (*Salix nigra*), yellow birch (*Betula allegheniensis*), black gum (*Nyssa sylvatica*), and hemlock (*Tsuga canadensis*).

Open Water Class.

The open water class is equivalent to the “open water - unknown bottom” class in Cowardin et al. (1979) and also small, shallower pooled areas within wetlands that naturally occur in some of Vermont’s wetlands. Open water can occur in both open canopy and forested wetlands, and includes areas of wetlands that are inundated and unvegetated (no emergent or aquatic bed vegetation present), with pooled areas under canopy vegetation present—most often in Cedar Swamps, Red Maple-Black Ash-Seepage Swamps, Black Gum Swamps, Hemlock-Sphagnum Acidic Basin Swamps, and all Fen communities. Occasionally Shallow Emergent Marshes, Cattail Swamps, Alder and Alluvial Swamps, beaver influenced wetlands, and Buttonbush Swamps will have pooled understory areas too.

Other

Although it is expected that the classes described above will be sufficient to characterize most if not all Vermont wetlands, the Rater may be faced with a wetland or portion of a wetland that does not fit within one of these communities. In this situation, it is recommended that the classification outlined in Cowardin et al. (1979), Classification of Wetlands and Deepwater Habitats of the United States, or Anderson (1982), be used to determine an appropriate classification of the wetland. The Rater should clearly document the reasons for using the new class. The class should then be scored using the cover scale (see below).

Question 6a. Tables of Narrative description for vegetative communities, quality, and open water

The scale of 0 to 5, from very low to high quality vegetation communities presume the Rater has knowledge of the types and range in quality of the vegetation identified in specific wetland communities in different biophysical regions, and differences in vegetation based on wetland condition, such that the Rater can place a particular community on a relative scale of quality.

The scales below for wetland vegetation communities require the Rater to have knowledge of the types and range in quality of the vegetation identified in specific wetland communities, in different biophysical regions, and wetland conditions, along a scale scoring 0 to 5. Table 1 is to assist with scoring the vegetative cover—along with Table 2, which is designed to assist the Rater with the quality of the cover within the wetland, and Table 3, was created to help with open water classes for a range of score from 0 to 5.

Table 1. Qualitative scale for vegetative communities; at least a <0.04ha (0.10 acre) coverage in the wetland

Cover Scale	Description of Vegetative Condition
0	Absent of native vegetation—or if present, native (disturbance tolerant) vegetation in the strata being scored is overrun by non-native invasive plants which comprise a significant portion of the vegetation strata
1	Native vegetation, primarily disturbance tolerant, is present in low to moderate amounts and is of low quality, interspersed by non-native vegetation throughout the vegetation strata
2	Native vegetation is present in moderate amounts and is of low to moderate quality, and non-native species are present over 5 percent, along with disturbance tolerant native species. Where vegetation is moderate quality, few plants of high fidelity to a specific wetland community are present.
3	Native vegetation comprises a significant portion of the flora community, and is of moderate quality with few disturbance tolerant species, where less than 5 percent non-native species are present. Plants are mostly representative of their wetland community type
4	Native vegetation comprises all of the floral community in the strata being scored, and is of moderate to high quality with less than 10% disturbance tolerant species present. Plants represent the expected strata within their wetland community type.
5	Native vegetation comprises all of the floral community in the strata being scored, and is of high, reference quality with high fidelity plants present, and the wetland vegetation expresses exemplary wetland species composition.

The following guidelines are presented for scoring the 5 vegetation strata:

*The Rater is asked to compare the relative contribution of the vegetation strata by comparing it to a Vermont wetland community type that would have the same predictable strata (within reason, since communities don’t all

have the same inclusions of low to moderate species presence for specific plants. If the wetland's vegetation doesn't easily correlate to any specific community type, then 1 is appropriately assigned to this community.

Assigning a 0 score.

All classification schemes are artificial to greater or lesser extent and impose arbitrary thresholds. Thus, it is likely that a wetland could have some elements of more than one vegetation condition described in Table 1. Emergent marshes often have a wooded or shrubby fringe that is located on hydric soils and within the jurisdictional boundary of the wetland. Forested wetlands often have small amounts of shrubs growing under small openings in the canopy, or have small amounts of emergent wetland vegetation or mesic woodland herbs growing on the substrate, on logs, or on the bases of trees. However, for the purposes of this method, in order for a vegetation community to be considered present in the wetland, the community must cover a minimum contiguous area of 0.04 hectares aka 0.10 acres, unless the wetland itself is less than 0.25 hectares or ½ acre in size, in which case the Rater will select the single most characteristic class.

With regard to the herbaceous vegetation that comprises emergent and aquatic bed communities, the community may have areas of bare ground, small areas of open water, or somewhat sparse stem or tussock density. Some forested wetlands have diverse herbaceous emergent communities that are characterized by scattered tussocks growing throughout the wetland or in wide or narrow zones around the shallower perimeter areas of the wetland. The Rater should sum up the existing small portions of wetland strata within a larger wetland community to determine if there is enough of a strata to score above a 0 (zero). The parts of this entire community, including open areas between tussocks or stems, should be used when determining whether a strata of the vegetation meets the minimum size for scoring in Table 1.

If forested vegetation is no more than a thin band of 1 or 2 trees around some or all of the perimeter, a score of 0 should be assigned. Conversely, many emergent marshes and buttonbush swamps grade into a clearly forested community with a closed canopy and a rather abrupt change occurs in understory vegetation, either in a zone around the perimeter or on one or several sides, especially when upland forest is nearby. In this situation a forested community should be considered to be present and an appropriate score assigned for the forest canopy strata.

The open water class includes vernal pool communities. While difficult to express the quality of the open water after the pool has dried in late summer, it is up to the rater to use best residual evidence from the pooled area of the wetland, and professional judgment to determine the quality of the open water or emergent vegetation, and score it accordingly.

Assigning a 1 score.

In assigning a score of "1" to a vegetation community that is determined to be present, the Rater must find one of the following:

1. The natural vegetation community comprises only a *small* part of the wetland's vegetation strata being examined due to invasive species present, and is of low quality, and/or
2. The vegetation strata is primarily disturbance tolerant species and there is also non-native invasive species present totaling over 25% of the wetland vegetation present.

If neither the 0 nor 1 choice applies, the Rater should assign a 2 or higher score for the strata in question.

Example 1. The wetland is a 4 hectare (9.88 acre) high quality emergent marsh. Areas of buttonbush and swamp loosestrife are present with surface area of 0.5 to 1.0 hectares (1.2 to 2.5 acres). The south edge of the wetland abuts a young second growth forest and a forested wetland community of 0.2 hectares (0.5 acres) has developed at this margin. *Score:* The forested wetland community receives a score of "1" since it only comprises a small part of the wetland's entire vegetation. Conversely, the emergent marsh will receive a score of "2" or higher.

Example 2. Portions of a forested flood plain wetland have been clearcut and partially filled. Sedimentation from a nearby construction site has resulted in an emergent community dominated by narrow-leaved cattail and *Phragmites australis*. The emergent community is approximately 30% of the area of mapped hydric soils. *Score:* The emergent community receives a score of "1" since it comprises a significant part of the wetland's present vegetation; however, it is of low quality (Note: the remaining forested component will likely receive a score of 2 or more).

Assigning a 2 score.

In assigning a score of 2 to a vegetation community that is determined to be present, the Rater must find one of the following:

1. The vegetation community comprises a *significant* part of the wetland's vegetation and is of *moderate quality*, or
2. The vegetation community comprises a *small* part of the wetland's vegetation but is of *high quality*.

"Significance" is understood as whether the community is ecologically significant part of the entire wetland. In some instances, however, just considering the physical size of a community may go a long way to deciding what the ecological significance of the community is. For example, if 6.5ha of a 7.0ha marsh is an "emergent" vegetation community, and 0.5ha is relatively narrow (20-40m wide), moderate quality, forested wetland community in one corner, the forested component probably does not comprise a significant part of the of the wetland' s vegetation (and the Rater should reconsider assigning a "1" to the forested community).

If neither the 0 nor 1 choice applies, the Rater should assign a 2 or higher score for the strata in question.

Example of scoring 1: The wetland is a 7 hectare (17 acre) wetland located in the flood plain of a low-gradient river that floods one to several times yearly. Approximately 3 hectares (7.4 acres) is buttonbush, 1 hectare (2.5 acres) is open water, and 3 hectares (7.4 acres) is second-growth forested with silver maple and green ash. The forested portions of the wetland lie around the central area of buttonbush and open water. A diverse, sedge-dominated herbaceous community (*Carex lurida*, *C. vessicaria*, *C. lacustris*, *C. lupulina*, *C. typhina*) is present under portions of the forested wetland; annual and perennial emergent species (*Impatiens capensis*, *P. hydropiperoides*, and *Iris versicolor*) and a tiny amount of a floating aquatic herb (*Ludwigia palustris*) is present in the margins of the buttonbush/open water area. *Score:* four strata are present in this wetland: forest, open water, emergent, and shrub (The aquatic bed species is not present over a sufficient area to count as a separate strata). The forest strata is of moderate quality given the moderate species diversity, and the presence of an invasive tree (*Acer platanoides*), and should receive a score of 2 points. The emergent strata is high quality with no invasive species, and few generalist/disturbance tolerant species, and should receive either a 4 or 5 score. The buttonbush (scrub-shrub) community appears to be high quality and would receive a score of 3 due to a recent clearing which removed a portion of the shrub community to create a driveway.. Referring to Table 2, the open water is determined to be low quality based on the one disturbance tolerant plant, occurring in a very tiny amount, within the only open portion of the wetland, and receives a 1 point.

Example of scoring 2: Wetland is a 1.5 hectare (3.7 acre), low quality floating-leaved marsh surrounded by a high quality 7 hectare (17 acre) buttonbush/swamp rose shrub swamp located on the flood plain of a low-gradient stream. Areas of young second growth swamp forest (<2 hectares or 5 acres) exist at the margins of the wetland. Water chestnut (*Trapa natans*) is present in the marsh. The aquatic bed community receives a score of "1" due to the invasive Water chestnut; The swamp scrub shrub and forest communities receive a score of "3" due to their high quality.

Assigning a 3 score.

In assigning a score of 3 to the vegetation strata present, the Rater must find that the vegetation strata...

1. Is of moderate quality, where there are less than 5% non-native species present and/or few disturbance tolerant species present, and...
2. The wetland strata include species representative and expected of its natural community type.

Example 1. The wetland is an intact 2.5 hectare (6.2 acre) relict Intermediate fen that is part of a 15 hectare (37 acre) Red maple forest. The wetland is dominated by Bluejoint grass (*Calamagrostis canadensis*), Fringed sedge (*Carex crinita*), and Star sedge (*Carex echinata*) and has a diverse assemblage of ferns. The wetland also has small areas (0.3 hectares or 0.75 acres) of open water dominated by mermaid weed (*Proserpinaca palustris*) and water primrose (*Ludwigia palustris*). A portion of the emergent community is of high quality, but recent 4-wheeler activity has destroyed a large area of vegetation and caused ruts that are draining it. The unaffected area of the emergent wetland is in very good condition and thus the emergent community scores a 3. The aquatic bed community is of moderate quality, and while it is only a small part of the wetland's vegetation (0.10 acre) it still scores a 3.

Example 2. Wetland is a 1.5 hectare (3.7 acre), low quality floating-leaved marsh surrounded by a good quality 7 hectare (17 acre) buttonbush/swamp rose shrub swamp located on the flood plain of a low-gradient stream. Areas of young second growth swamp forest (<2 hectares or 5 acres) exist at the margins of the wetland. Water chestnut (*Trapa natans*) is present in the marsh. The aquatic bed community receives a score of 0 due to the invasive Water chestnut; the scrub shrub swamp scores a 5 due to the exceptional condition of the shrub strata; and the forested wetland community receives a score of 3 due to its young succession, but intact status.

Assigning a 4 score.

When assigning a score of 4 to the vegetation strata, the Rater must insure that the vegetation strata...

1. Is comprised of all native species, with few (>10%) disturbance tolerant species present, and
2. The species in the strata being scored are a good representation of their wetland community type, and show no evidence of recent human activity.

Assigning a 5 Score.

Assigning a score of 5 explicitly implies that the wetland vegetation in the strata being scored is of exceptionally high quality with all native species, few to no disturbance tolerant species (except those considered an expected community component of the strata being sampled), and that the strata being sampled is the of the very best condition for its wetland community type. As well, a score of 5 is a determination by the Rater that a wetland strata is of reference condition for its wetland community type.

Question 6b: Horizontal (elevation view) interspersions & vegetation patches (areas of distinct floral communities) within the wetland matrix

This question is regarding vegetation patches and horizontal interspersions--where different plant species often create elevation changes, and patches within the wetland community, useful to many species of wildlife. To accomplish scoring for this question, the Rater must evaluate the wetland from an area of the wetland, or areas of the entire wetland complex—if more than one wetland community is present, where it is possible to view and interpret interspersions objectively. The Rater can then select from the following categories of interspersions:

- High (5 points) Wetland has a high degree of patch and elevation interspersions.
- Moderately high (4 points) Wetland has a moderately high degree of interspersions.
- Moderate (3 points) Wetland has a moderate degree of interspersions.
- Moderately low (2 points) Wetland has a moderately low degree of interspersions.
- Low (1 point) Wetland has a low degree of plan view interspersions.

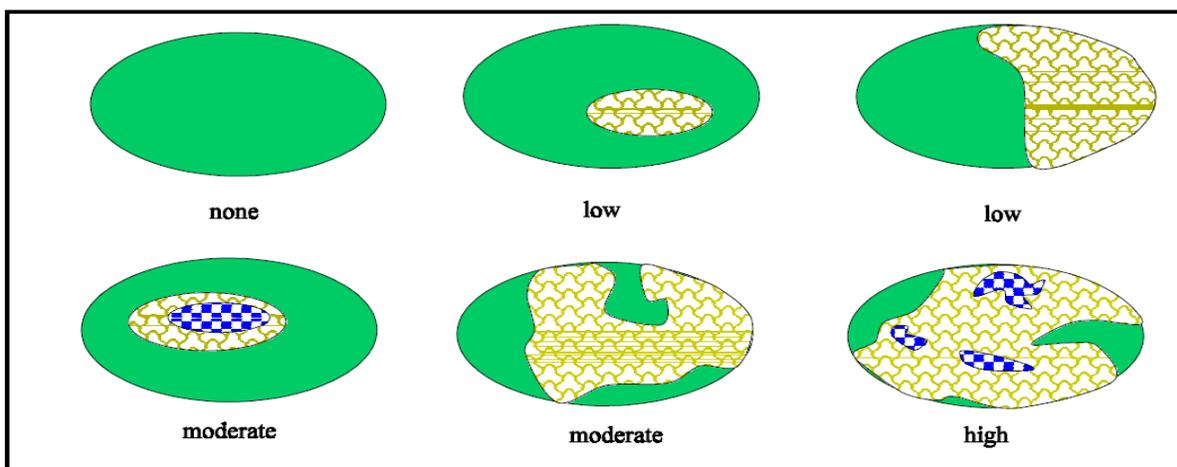


Figure 2. Hypothetical wetlands for estimating degree of patch interspersions.

Question 6c: Microtopography within the Wetland Community

This question asks the Rater to evaluate various plant-derived microtopographic habitat features often present in wetlands and whether the wetland provides breeding pools for amphibians, particularly native species of salamanders and frogs. A 0 to 3 point cover scale similar to that used in Question 6a is used to rate both the quantity and quality of habitat features present in the wetland.

Scoring for question 6c:

The Rater, after a physical evaluation of the wetlands microtopographic attributes, will score the features outlined below, that are present in the wetland by assigning a cover score of 0, 1, 2, or 3, based on the following...

- Vegetated hummocks/tussocks
- Coarse woody debris >10cm (6in)
- Standing dead trees >25cm(10in)
- Amphibian breeding pools

Assigning a 0 Score.

The feature being scored isn't present.

Assigning a 1 Score.

The feature being scored is of poor condition and is present in very low quantities. For example: a tussock sedge swamp with many impacts that removed most of the hummocks/tussocks, or a small cedar swamp with pools filled by road building or dumping activities. There may be small amounts of the habitat feature present, but it is of little use due to low quantity or poor condition.

Assigning a 2 Score.

The feature being scored is present in moderate amounts, is likely to or clearly has, a habitat function of a moderate degree, and is in moderate condition.

Assigning a 3 Score.

The feature being scored is of very good to excellent quality, is present in moderately high to high amounts, and clearly can perform or does perform a habitat function visible to the Rater.

Question 6d: Coverage of Invasive Plant Species

This question asks the Rater to look at the coverage of invasive plants in the wetland, by estimating invasive plant cover using a plan view approach, and then scoring the coverage approximately using a subtraction score of -1, -3, or -5. For wetlands with no invasive plant species present a +5 score will be added.

Table 2. Vermont Class B Noxious Weeds

Scientific Name	Common Name
<i>Aegopodium podagraria</i> L.	goutweed
<i>Ailanthus altissima</i>	tree-of-heaven
<i>Alliaria petiolata</i> (A. <i>officinalis</i>)	garlic mustard
<i>Butomus umbellatus</i>	flowering rush
<i>Celastrus orbiculatus</i> Thunb.	Oriental bittersweet
<i>Fallopia japonica</i>	Japanese knotweed
<i>Hydrocharis morsus-ranae</i> L.	frogbit
<i>Lonicera x bella</i>	Bell honeysuckle
<i>Lonicera japonica</i>	Japanese honeysuckle
<i>Lonicera maackii</i>	Amur honeysuckle
<i>Lonicera morrowii</i>	Morrow honeysuckle
<i>Lonicera tatarica</i>	Tartarian honeysuckle
<i>Lythrum salicaria</i>	purple loosestrife
<i>Myriophyllum spicatum</i>	Eurasian watermilfoil
<i>Nymphoides peltata</i> (Gmel.)	yellow floating heart
<i>Phragmites australis</i>	common reed
<i>Potamogeton crispus</i> L.	curly leaf pondweed
<i>Rhamnus cathartica</i>	common buckthorn
<i>Rhamnus frangula</i>	glossy buckthorn
<i>Trapa natans</i> L.	water chestnut
<i>Vincetoxicum nigrum</i> L.	black swallow-wort

Table 3. List of invasive watch species in Vermont.

Scientific Name	Common Name
<i>Acer ginnala</i> Maxim.	Amur maple
<i>Acer platanoides</i> L.	Norway maple
<i>Alnus glutinosa</i> (L.) Gaertner	European black alder
<i>Amorpha fruticosa</i> L.	False indigo
<i>Ampelopsis brevipedunculata</i> (Maxim.) Trautv.	Porcelainberry
<i>Anthriscus sylvestris</i> (L.) Hoffm.	Wild chervil
<i>Berberis thunbergii</i> DC.	Japanese barberry
<i>Berberis vulgaris</i> L.	Common barberry
<i>Callitriche stagnalis</i> Scop.	Pond water-starwort
<i>Cardamine impatiens</i> L.	Narrowleaf bittercress
<i>Centaurea maculosa</i> L. Syn.: <i>Centaurea biebersteinii</i> DC	Spotted knapweed
<i>Elaeagnus angustifolia</i> L.	Russian olive
<i>Elaeagnus umbellata</i> Thunb.	Autumn olive
<i>Euonymus alata</i> (Thunb.) Sieb.	Winged euonymus
<i>Euphorbia cyparissias</i> L.	Cypress spurge
<i>Glyceria maxima</i> (Hartman) Holmberg	Reed mannagrass
<i>Hesperis matronalis</i> L.	Dame's rocket
<i>Iris pseudacorus</i> L.	Yellow iris
<i>Ligustrum obtusifolium</i> Sieb. & Zucc.	Border privet
<i>Lonicera xylosteum</i> L.	Dwarf honeysuckle
<i>Lysimachia vulgaris</i> L.	Garden Loosestrife
<i>Marsilea quadrifolia</i> L.	European waterclover
<i>Microstegium vimineum</i> (Trin.) A. Camus	Japanese stilt grass
<i>Najas minor</i> Allioni	Brittle waternymph
<i>Paulownia tomentosa</i> (Thunb.) Sieb & Zucc. Ex Ste.	Princess tree
<i>Phalaris arundinacea</i> L.	Reed canary grass
<i>Polygonum perfoliatum</i> L.	Mile-a-minute vine
<i>Polygonum sachalinense</i> F. Schmidt ex Maxim. Syn: <i>Fallopia sachalinensis</i> (F. Schmidt ex Maxim.) Dcne.	Giant knotweed
<i>Populus alba</i> L.	White poplar
<i>Robinia pseudoacacia</i> L.	Black locust
<i>Rorripa nasturtium-aquaticum</i> (L.) Hayek Syn: <i>Nasturtium officinale</i> Ait. f.	Watercress
<i>Rosa multiflora</i> Thunb. ex Murr.	Multiflora rose

3.0 SCORING

VRCAM Scoring Method

The ORAM lists category 3 wetlands as their highest quality wetlands, whereas Vermont high quality wetlands are listed transversely as class 1 wetlands. See Table 6.

Vermont scoring will be adjusted accordingly to best represent an accurate wetland class rating.

Table 4. Scoring paradigm for Vermont wetlands using VRCAM

Very Poor	1 - 20
This category is for wetlands presenting severe signs of current degradation from multiple impacts, and in obvious ecological decline from the reference wetland community type they should represent	
Poor	21 - 40
This category is for wetlands showing moderate signs of current degradation, with present declines to the ecological integrity, that are not so severely damaged as to not represent their community type	
Moderate	41 - 60
This category is for wetlands that are generally representative of their community type, and are currently degraded in some way and show present impacts to their ecological integrity	
Good	61 - 80
This category is for wetlands that are representative of their community type, and show few impacts to their ecological integrity, yet still have a small measure of current degradation	
Very Good	81 - 100
This category is for wetlands that are ecologically intact, and have little to no current impacts--they can be considered reference wetlands if scoring warrants	
Excellent	100 +
This category is only for wetlands of reference condition, that are so significant that they can be categorized as a intact outstanding example of their specific wetland community type	

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