Iowa Fen Rapid Assessment Method for Wetlands v. 1 Quantitative Rating

User's Manual and Scoring Form

Iowa DNR, Watershed Monitoring and Assessment Section

Iowa DNR, Water Quality Monitoring and Assessment Section

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Introduction

Fens are found throughout Iowa with the highest density of fen wetlands occurring throughout the Iowan Surface landform region. Fens are also relatively abundant in Northwest Iowa and along the moraines of the Des Moines Lobe landform. Fens also occur elsewhere, but are generally much more uncommon. In general fens occur on slopes. In rare circumstances, fens can occur in oxbows where the river once cut through a shallow aquifer. Most of the water supply to fens comes from groundwater fed by shallow aquifers. This differentiates them from other wetland types that occur in valleys or on slopes that simply receive surface runoff. Most of the remaining fens exist because they either had too much groundwater flowing from them to adequately drain for cultivation, or they occurred on steep hillslopes. In many cases fen areas are simply used as pasture. Most wet prairies were easier to drain and therefore most were converted to row crop. In general, areas that could not be cultivated were used for grazing and in some cases, have suffered from invasion of reed canary grass and smooth brome grass. Because of this, wetlands still exist that have characteristics of both fens and wet prairie.

The dominate substrate in fens is peat-like, partially decayed plant material, typically a Palms or Houghton Muck soil type. The groundwater inhibits or slows down the breakdown of the plant material which typically causes a mounding of peat to build up around the source of water. Throughout much of the state, fen recharge areas contain calcareous, mineral-rich soils that influence the groundwater chemistry. This is most pronounced in northwest Iowa where carbonates precipitate and form white marl coatings on the soil. In general, the concentration of carbonates decreases towards southwest Iowa. Likewise, the presence of cold, mineral rich water with minimal ponding provides a unique substrate that supports unique plant and animal communities, including some endangered and threatened hydrophyte and calciophilic species. Also, within each fen there is a gradient of available water from very wet or ponded to dry. This condition often provides a continuum of hydrophyte plant species to dryer prairie communities within in a very short distance.

Disturbed fens have historically been considered “unrestorable” because disturbances to the hydrology of a fen can cause damage that lasts for decades if not permanently. These changes, coupled with occasional or frequent cultivation or grazing allows weedy or invasive plants such as reed canary grass to establish. Recently, a few people have begun to restore fens with mixed success by recreating the historic hydrology patterns. This may involve filling ditches, removing tile or creating berms to keep water in the fen’s soils. This emphasizes the importance of documenting even rather degraded sites, because they now have potential restoration value. These wetlands should be recognized for their ability to support unique biological diversity in Iowa as well as their aesthetic and recreational benefits to humans and also for their importance in the natural hydrologic cycle. In many cases fens are the source for small headwater streams. Protecting fens helps to protect streams.

Although most of Iowa’s fens have been destroyed, historically there was a continuous gradient of very rich fens with large peat mounds to wet prairie (AKA sedge meadows, wet meadows, etc.) dominated by aquatic macrophytes. This has historically caused a great deal of difficulty in having a uniform naming convention for fens. For example, the fens of the Iowan Surface were once considered “hanging bogs” and not fens at all. Later the concensus changed and they were considered fens. Likewise, many people still consider seeps to be different from fens. In order to avoid the difficulty of a naming convention in this document, this assessment method may be used for any wetland with characteristics of a fen, such as little ponded water or very shallow water, and/or those occurring on a slope. However, careful notes must be taken when assessing a site that doesn’t have “classic” fen

characteristics (e.g. bouncy peat mounds, marl, "fen" macrophytes, hillside location, etc.). Thorough notes should be taken at all sites, and the user should always note any characteristics that are unique to that wetland site. Review of aerial photography has historically been used to locate potential fen sites. Upon visiting the site it may become apparent that it isn't a fen, but a sedge meadow or wet prairie instead. Because it may take a great deal of time to gain access to a site, one should gather as much information as possible. It's possible that no information regarding that site has ever been (and may never again be) collected. Wet prairies and sedge meadows share a great deal of disturbances that fens do. Information related to these wetlands is also important and is often in short supply, therefore it's worth recording as much information as possible about the site even if it's not a true fen.

The Iowa FenRAM

The Iowa Rapid Assessment Method of Fen Wetlands (IA FenRAM) was developed using the Ohio EPA's Rapid Assessment Method for Wetlands (ORAM) as a model for the layout and style of assessment (Ohio EAP Technical Report WET/2001-1). Although the state of Iowa now has an updated GIS coverage of all known fen locations, information regarding each fen's quality, impairments, and other important information have not been uniformly recorded. In most cases the notes were brief because the surveyors had numerous sites to visit. Assessment of overall condition was subjectively based on size, hydrology and plant community. Impairments were recorded in some cases, but in others there was no information. Additionally, many of these sites have not been visited by natural resource personnel since the early 1990s. Several sites, however, have been subjects of studies and papers and therefore have a great deal of data about them. Numerous other fens exist that have not been visited because access was not granted, or they were simply not known to exist. Most fens remain in private ownership and sites are continually lost and encroached upon by agriculture or development. Recently skyrocketing grain prices have likely given farmers more incentive to drain fens. Fortunately, recent advances in GIS technology have given us a greater ability to identify areas that likely contain fens not identified during previous surveys.

A renewed effort to visit these fens, record important information, and meet with landowners to discuss the value of preserving fens and available conservation options is needed. This rapid assessment method will provide a useful tool to identify important positive attributes and impairments at sites, but also the impetus for a renewed effort to visit the state's fens. A standardized rapid assessment method is an excellent tool for recording important information quickly. Likewise, the individual metric scores, when used in a database, can provide a great deal of information about a large number of sites. The data from these assessments will provide a useful tool to measure the status and trends of wetland quantity and quality while simultaneously collecting information that will be useful for conservation and restoration prioritization. The scores from individual metrics or sub-metrics allows for comparisons among all of the assessed fens by individual metric (this is particularly easy from a database standpoint) and may assist in identifying an individual fen site's restoration potential.

Rapid assessment methods are valuable tools for collecting information about the quality and status of natural systems. However, they are not a substitute for detailed surveys of those systems. Users of this method should consider that the method may under-score or over-score the site that's assessed, especially when the site is not a typical fen (i.e. a sedge meadow could score lower than fens, but in-fact be a relatively high quality sedge meadow). This assessment can be used throughout most of the spring, summer and fall period, however the ideal "index period" would be from late May through early October when native plant communities, as well as invasive species, are most apparent.

How to use the IA FenRAM and this Manual

IA FenRAM is designed to be adaptable to the skills of the user and the condition of the fen assessed. Persons with a basic understanding of wetland ecology and the biology and geomorphology of fens should be able to accurately use this method. It is also recommended that the user be familiar with the common plant species that inhabit fens, especially invasive plants of Iowa, threatened or endangered species, wetland obligate species and calciophilic plants.

The quantitative portion of the Iowa FenRam consists of six important categories or 'metrics' for measuring the quality of a fen site. A final index score for a site is obtained when all metric scores are totaled. The scale is 1 – 100, with a lower index score indicating a poor quality site and a higher number indicating a high quality site. Basic information to assist the user on using each of these metrics is found in the following sections of this manual. Skills in the identification of saturated soils and plant community changes are also important for the user in determining the boundary of the fen (or area to be assessed).

The time needed to complete the assessment will vary depending on the skills of the user, the size of the fen and the complexity of the vegetation, land use, and habitat alteration and development. For small degraded fens, scoring can be completed in a few minutes. For larger fens or fen complexes that are scored together it may take a couple of hours to complete the assessment. Maps of the site (made in advance), aerial photos, prior surveys or assessments and local historical knowledge may assist the user in completing the assessment and decrease the amount of time needed in the field. Speaking with the landowners and/or land managers will also yield a great deal of information about the site. Whenever possible, compile thorough notes and attach these to the assessment.

While performing the assessment, users are also encouraged to take several photographs. Such information is extremely helpful for later evaluations and allows others to understand the dynamics of individual fens.

Please note that the instructions "double check and average" appear in sub-metrics 3c, 3d, 4a, and 4c. These metrics can prove difficult to differentiate between the metric's categories or exhibit characteristics of both conditions. IA FenRAM attempts to eliminate under or over-estimation of these submetrics by allowing the user to select both conditions and obtain an average score. In the field, the user can select two categories that are listed within the metric or submetric, indicating that the fen exhibits an "in-between" condition of those listed.

Quantitative Rating

Metric 1: Fen Area (Size)

Metric 1 considers the area of the fen in acres. The larger the fen is, the more points IA FenRAM assigns. Larger fens or fen complexes are less likely to be altered because such areas were too difficult to drain effectively and/or were part of a large pasture with larger uplands that likely minimized the effects of grazing. Larger fen areas often contain greater plant species diversity and richness due to the larger size, potentially greater moisture gradients and more areas of micro-habitats that provider greater species diversity. Therefore, such fens often represent the highest quality fens remaining in Iowa. However, this is not always the case; examples exist where small fens (< 1.0 ac) host a great variety of plant and animal species. Such fens may be under-represented by Metric 1, therefore these details should be carefully noted on the score sheet. These sites will likely score well in the other metrics. These small, isolated fens may have been too wet to farm and too small to graze. Such fens may be very high quality despite their small size.

The first step to completing the IA FenRAM is to determine what area is to be assessed as part of the fen. Fen community boundaries can often be delineated by locating areas of saturated ground and changes in plant species from common fen and wetland plants to facultative upland plant species. For the IA FenRAM assessment, only the discharge area of the fen is included. Upland areas around the fen are not included in the assessment beyond noting the width of the buffer and the fen's connection to upland or wetland complexes. Ease of delineation of fen margins varies greatly from fen to fen. In a very wet fen the boundaries can be quite apparent. Dryer, disturbed fens (i.e. subsurface tiled or surface drained fens) can be difficult to determine precise perimeter boundaries. In these cases it is important to note any difficulties on the score sheet. Artificial boundaries such as property lines, state or county lines, or roads should not be used to the assessment boundaries unless 1) they determine areas where standing water or saturated soil changes to more drained soils or 2) permission to access the property is denied. In either case, it is important to provide as much information as possible regarding the part of the fen outside of the assessment area. It is unlikely that the historic discharge area of the fen coincided with property boundaries, therefore dramatic changes in vegetation patterns are likely an indication of disturbance. If possible, note the extent of these changes on aerial photography maps.

The area of the fen's discharge zone can be calculated with relative ease using a GPS for best accuracy, or by using GIS to estimate the area (less accurate) or by visual estimation (least accurate). Users should note the method of area estimation on the score sheet. In the field, delineations for the development and testing of this assessment method were performed by walking around the perimeter of each fen's discharge zone with a Garmin eTrex handheld GPS unit. This unit is capable of recording "tracks" which can then be used to estimate the area of the completed loop. It is important to note that heavy rainfall prior to the assessment may make determination of the discharge area boundary difficult. In many cases it is possible to note the fen's boundary based on the interface of wetland and upland plants. However, it's advised that walking the fen's perimeter is done at a later date when upland soils are drier if possible. If not, the user should include notes related to these difficulties.

Isolated fen boundaries can be relatively easy to determine especially when land use dramatically changes from typical fen habitat to agricultural land uses. Fens that are part of a larger fen complex can be more difficult to delineate since saturated soils and fen plant communities may connect the fens in a way that makes it difficult to determine where one fen ends and another starts. In these cases fen complexes can and should be assessed with one score sheet if the fens are of similar plant

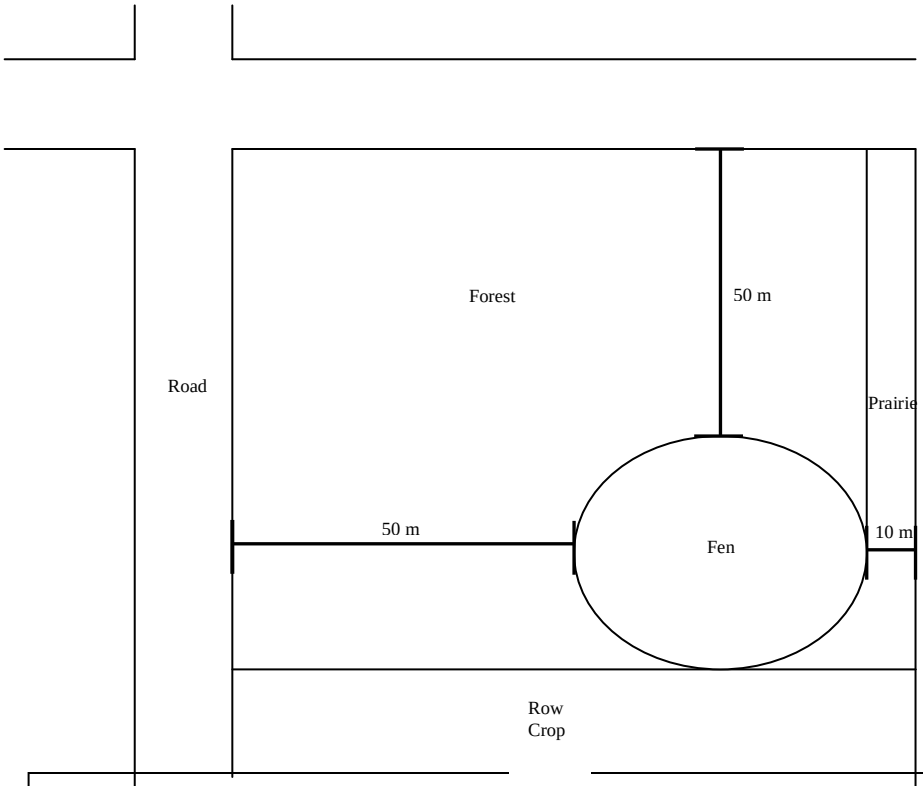
communities, habitat features, hydrology and disturbance. However, if the individual fens are separated by upland plant communities, they should be assessed on individual score sheets, especially if the plant communities or disturbance varies greatly among them. Users should take detailed notes of how the sites within a complex were delineated on the score sheet(s) and indicated on maps from aerial photography. Whenever possible, each fen should be delineated with the GPS method above.

Metric 2: Upland buffers and surrounding land use

Buffer zones between fens and areas of human land use protect the fen from disturbance, especially surface runoff. Larger buffers provide better protection of the fen. The intensity of land use is also an important factor in determining the level of disturbance to the fen. The maximum score for this metric is 14.

Sub-Metric 2a: Average buffer width.

In this method, "buffer" refers to the natural (i.e. relatively low human impact) landscape features which are capable of protecting the biological, physical and chemical quality of the fen from the effects of human land uses. These buffers can be natural systems such as forested areas, prairies, streams or lakes, etc. Areas of human land use include row crops, intensively grazed pasture lands, paved or urban areas, mowed or managed fields or lawns, etc. should not be used in the calculation of average buffer width.



Example: A circular fen's discharge area is surrounded by 50 m of forested buffer on two sides, a 10 m strip of prairie on one side, and row crop on the other. To calculate the average buffer width: 50 m+50 m+10 m+0 m = 110 m; 110 m/4 = 27.5 m. 27.5 m is the average buffer width. *Score:* "Medium" (4).

To calculate the average buffer width one should envision four "sides" to each fen. The user must then estimate the buffer width of each "side" of the fen, add the widths together and divide the total by the number of "sides". This method works best in small fens. Large fens or fens of odd shapes may have multiple (i.e. more than four) "sides" and will be more difficult to calculate. In this situation the user should look more at whether the buffer provides an overall wide band of protection or a narrow band leaving the fen more susceptible to disturbance and assign a score accordingly. It may be helpful to envision more than one "side" in this situation. Careful notes about buffers and land-use on score sheets can be helpful later as well as handwritten notes on printed aerial photos. It may be helpful to use GIS to measure these distances following the field assessment, especially if the discharge zone was delineated with a GPS and converted to a shapefile.

It is important to note narrow buffers uphill from the fen or field "water-ways" leading to a fen, as these may shunt sediment into the discharge area. Also, notes regarding the composition of the buffer, especially on aerial photography maps are extremely helpful in later site evaluations.

Sub-Metric 2b: Intensity of surrounding land use
Note: This Sub-Metric can be "Double Checked and Averaged"

The land use adjacent to the fen can greatly affect the ecological health of the fen. Fens that are located in areas where human land use is more intense may be subjected to a greater degree of disturbance than fens that are located in more natural settings.

To score this attribute the users should determine the intensity of the surrounding land use by characterizing the land uses present beyond the fen buffer zone. The land uses listed on the score sheet range from very low intensity to high intensity. Often users may need to double check and average to determine the attribute score.

> *Example:* An isolated fen is surrounded by 200 m of prairie area on all four sides. Beyond the prairie area is row cropping.
> *Score:* The fen is entirely surrounded by prairie area; "Very Low" (7).
>
> *Example:* An isolated fen is surrounded by 200 m of prairie area on two sides. The other two sides are surrounded by corn fields.
> *Score:* The user should double check "Very Low" (7) and "High" (1) and average the scores; (7+1)/2=4.
>
> *Example:* A fen is part of a fen complex and is surrounded by 200 m of prairie area on two sides. Another side is adjacent to an old field and the final side is connected to the upland of the fen complex.
> *Score:* The user should double check "Very Low" (7) and "Low" (5) and average the scores; (7+5)2=6.

Metric 3: Hydrology
Hydrology is one of the most important characteristics of a fen. Water source, volume of flow, saturation and rate of water loss often determine what plants and animals live in a fen. This metric looks at water sources, hydrologic connectivity to other fens or aquatic habitats, the amount of saturation, and modifications made to the hydrology of the fen. The maximum score for this metric is 30. However, when adding sub-metric scores there is a possibility of obtaining a score up to 35 because multiple categories from metrics 3a, 3b, and 3c can be checked and added together. In this instance the user should assign a maximum score of 30 only.

Sub-Metric 3a: Sources of Water
When assessing this attribute the user should look at potential sources of water to the fen. All fens receive some water from precipitation and therefore automatically receive a score of at least 1 for this attribute. Nearly all fens in Iowa are formed due to surface discharge of alkaline groundwater. One notable exception is Dead Man's Lake in Pilot Knob State park. This fen is not only formed in a basin, the parent rock material in its recharge area is igneous resulting in nutrient and calcium poor water. Because of this, Dead Man's Lake (and possibly one or two private fens throughout the state) has characteristics that are more like a bog. As most shallow aquifers in Iowa come in contact with

limestone, most have a neutral to high pH. A simple handheld pH probe will allow the user to determine the pH of the water in the fen. Likewise, use of litmus paper is acceptable, but less accurate and should be avoided if possible. If litmus is used, please note this on the score sheet.

Sub-Metric 3b: Connectivity

Fens that are part of a fen, wetland, riparian, or upland complex are usually of higher quality than isolated fens. A fen is considered part of a fen complex when it is apparent that nearby fens share the same aquifer. Although fens several miles away may share the same source of water, they would not be classified as a fen complex. Examples include Fen Valley WMA, and the Excelsior Fen complex where each of these complexes are located within one contiguous grassland area. A fen is part of a wetland complex when it is hydrologically connected to other wetlands such as pothole or riverine wetlands. Upland complexes are large blocks of upland areas, typically prairie or woodland/savannah, whereas upland corridors are long and narrow sections of uplands adjacent to the fen. Fens are often positioned along stream terraces. Such fens would be considered part of the riparian corridor.

A fen can be part of a wetland complex and an upland complex but will only receive a maximum score of 3 once. The same is true when a fen is part of both a riparian corridor and an upland corridor (receives a score of 1). Conversely a fen can be part of either a wetland complex (or upland complex) OR a fen complex and a riparian corridor (or upland corridor) and will receive a score for both (i.e. a score of 3 for the wetland complex or upland complex OR a score of 5 for a fen complex and 1 for the riparian corridor).

> *Example:* A fen is part of a fen complex and is part of a riparian corridor.
> *Score:* 5+1=6.
>
> *Example:* A fen is part of an upland complex and is part of a riparian corridor.
> *Score:* 3+1=4.
>
> *Example:* A fen is part of a wetland complex and an upland complex.
> *Score:* 3.

Sub-Metric 3c: Duration inundation/saturation.

Note: This Sub-Metric can be "Double Checked and Averaged"

The amount of time standing water or saturated soil is present is a good indicator of the quality of habitat for amphibian reproduction and conditions suitable for common fen plant species. This attribute will be difficult for the user to assess if the fen is visited during in the late fall or winter. A fen with horizontal bands of open, shallow water oriented perpendicular to the slope of the fen are called flarks would receive a score of 5 for this attribute. Often peat becomes saturated with water and creates a spongy or bouncy mound; fens exhibiting this feature would receive a score of 4 for this attribute. Fens that exhibit in-between conditions of inundation and saturation can be double checked and averaged to score. Often degraded fens (e.g. fens that have been heavily tiled) have little standing water or saturation. Muck soils tend to "deflate" when dry, especially after cultivation. Mounding may not be visible and the fen may appear much like the surrounding upland. Such fens will receive a score of 1.

> *Example:* Standing water is located throughout the fen boundaries.
> *Score:* 5.
>
> *Example:* A very small area of standing water is present but the fen is soggy when walked on.

Score: The user should double check "Standing water easily visible" (5) and "Soggy when walked on" (4) and average the scores; (5+4)/2=4.5.

Sub-Metric 3d: Modifications to the Natural Hydrologic Regime.
Note: This Sub-Metric can be "Double Checked and Averaged"

This attribute measures the amount and extent that human activities have modified the hydrology of the fen. Disturbances to hydrology are one of the main sources of wetland degradation; therefore this attribute makes up a larger portion of the total metric score (up to 50%) than the other three attributes compromising Metric 3. When assessing this attribute users are to determine if water sources are intercepted before reaching the fen (cutting it off from water source) and/or water in the fen is being diverted out of the fen (such as tiling, ditching, dredging, pond digging) and/or water is being diverted in or held in the fen unnaturally (such as ditching, damming for ponds,) and/ or water is prevented from following its natural flow through the fen (roads, railroad tracks, filling, etc.).

Users are urged to take careful notes and photographs of changes to hydrology. Detailed descriptions on the score sheet as well as drawings on maps or diagrams are extremely useful in documentation. For the purposes of this assessment method, all potential modifications in the hydrology of a particular fen site may not be readily apparent without intensive study and time. For this metric, the user should simply use their best professional judgment to look for clues of hydrological modification by conducting a visual assessment of the area during the walk-around of the perimeter. If additional information is obtained from the landowner or land manager (described further below) that affects this sub-metric it can be used in scoring the site, but should be noted thoroughly with additional notes or maps.

The first step to assessing this sub-metric is to list all the *possible* disturbances observed by the user to the hydrology of the fen. The user is then to determine if the disturbances are in fact modifying the hydrology of the fen and where they fit in the following categories below. It is important to note that a user may observe many possible disturbances and still determine that the fen hydrology is not modified and score assign a score of 15. The following are disturbances listed on the IA FenRAM scoring form:

None or none apparent (15 points): There are no disturbances observed that modify the fen hydrology that the user can observe.

Recovered (10 points): The disturbances observed occurred so far in the past that the fen hydrology does not seem altered by them any longer or has fully recovered from any past modification.

Recovering (5 points): The disturbances observed have modified the fen's hydrology, but the fen is in the processes of recovering from the disturbances (for example, ditches no longer maintained and are filling)

Recent or no recovery (1 point): The disturbances observed are recent and are modifying the hydrology and/or the fen's hydrology has not recovered from past disturbances and/or the disturbances are ongoing or are being constructed and are modifying the hydrology of the fen.

Fens that exhibit conditions of hydrologic recovery between two scores receive an averaged score. In addition to actual field visits other information available to the user may be useful when assessing this attribute. Information can come from aerial photos, maps, historical photos, landowner/manager knowledge, etc. It is important to note that there may be unseen impairments affecting fens, such as

corrugated tile drainage. If the user feels that such alterations are occurring it is useful to note both the reason for suspicion as well as the suspected alteration on the score sheet. Follow-up discussions with the landowner may help to understand the site's alterations better.

> *Example:* A road runs through the middle of a fen. However there is no overland flow from one part of the fen to another.
> *Score:* The fen water source (i.e. groundwater) is not modified, therefore the metric is scored as "none or none apparent"; 15.

> *Example:* A fen located on an old homestead has been used as a repository for construction waste; another area of the fen was dug up to remove peat.
> *Score:* The user should double check "None or none apparent" (15) for the dump site, and "present, but no recovery" (1) and average the scores; (15+1)/2=8.

> *Example:* A landowner has attempted to farm a fen by installing drain tile throughout the fen; the fen is significantly drier than the un-tiled fens in the area.
> *Score:* The user should check "Recent or No Recovery" (score of 1) because the fen is still being drained by the tile.

Metric 4. Fen Habitat Alteration and Development

This metric measures the degree of disturbance to the fen's soils and subsequent changes to the plant communities. Drainage, cultivation, and heavy grazing are common factors contributing to the disturbance of the substrate. Drainage and/or prior cultivation typically result in compaction and/or breakdown of the soils. This results in a level, uniform appearance of soil in comparison to naturally mounded or lumpy substrate. These fens may appear much less like a fen and more like a wet prairie or sedge meadow because they no longer have bouncy soils. Heavy grazing can exaggerate hummocks resulting in tall, columnar hummocks, or short hummocks covered mostly with low grass. Sedimentation, invasive or weedy species, and other less common problems, may occasionally contribute to severe disturbance to individual fen's substrate. It is important to look carefully for anything that appears unusual and take careful notes and photographs.

Sub-Metric 4a: Substrate disturbances.
Note: This Sub-Metric can be "Double Checked and Averaged"

This sub-metric estimates the degree of disturbance to the substrate in general, without regard for the specific cause of disturbance. In many cases the cause may be unclear but, as always, record careful notes, take photographs and include information regarding either known or suspected causes.

> *Example:* The fen does not appear to have bouncy substrate and the soil no longer has much apparent plant material. Speaking with the landowner revealed the fen was cultivated for much of the 1980's.
> *Score:* The user should select (recent or no recovery, score 0) because the substrate no longer receives sufficient water and the soil has begun to decompose and "deflate".

> *Example:* The fen is located in a pasture and appears to have numerous hummocks around the edge, but it appears the cattle do not enter the center of the fen. This area appears to be unaffected by grazing.
> *Score:* The User should select both "None or None Apparent" because the center is unaffected, *and* "Recent or No Recovery" because the edges are or were recently being trampled.

Example: The landowner noted that the fen was cultivated several years ago. There is some reed canary grass and brome around the edges, but much of the inner part of the fen appears to have some plants indicative of fens and is wet and "bouncy".
Score: The user should select "Recovering" (score 2).

Sub-Metric 4b: 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 hydro-geomorphically similar wetlands. More than most questions, this question presumes the user has a good sense of the types of wetlands and the range in quality of those wetlands typical of the region, watershed, or state. A scoring continuum is presented from poor to excellent.

Example: The fen covers an area of a connected wetland/lake and upland complex. It has a diversity of plant species and vegetation types, humus and organic soils are present and sufficient water sources are present. There is also evidence of active habitat restoration/ management present. There are no alterations such as grazing, draining or dredging present
Score: The user should select (Excellent, 3) because this description indicates a high quality habitat in relation to fens currently in Iowa.

Example: The fen covers a small area that is located with little or no other natural habitats. Invasive plants or a low diversity of plants are present. Habitat alterations are present.
Score: The user should select (Poor, 1) because this description indicates a low quality habitat in relation to fens currently in Iowa.

Sub-Metric 4c: Habitat Alteration.
Note: This Sub-Metric can be "Double Checked and Averaged"

This question asks the Rater to assign an overall qualitative rating of the presence or extent of habitat alteration. Land-use practices that can cause habitat alteration to fens are grazing, draining, vegetation removal, chemical application or tilling. Other activities may also alter the habitat of a fen.

Example: There are no alterations such as grazing, draining or dredging present
Score: The user should select (none or none apparent, 4).

Example: There is evidence of grazing such as reduced vegetation or compaction of the substrate but animals are not present.
Score: The user can double check (Recent or no recovery, 1) since the vegetation is reduced and the substrate is compacted and (Recovering, 2) since the animals are no longer present (score 1.5).

Example: The fen is actively being grazed.
Score: The user should select (Recent or no recovery, 1).

Metric 5. Special Fens
This metric gives points to fens that are of particular interest. A fen can receive up to 10 points in this metric even if two or more conditions listed exist. The three special fen conditions are:

Significant insect/amphibian habitat or usage. This condition is looking at the availability of Baltimore Checkerspot butterfly habitat. These butterflies use the Turtlehead plant exclusively to lay their eggs. The plant is then food for the butterflies' caterpillars. This metric can also be used for other species such as amphibians or other insects as more information becomes available. For example, many amphibians need standing water that is free of predatory fish. Fens that have significant standing water may provide this habitat at certain sites but should only be awarded these points where direct observations are made for a particular species.

The site has a known occurrence of state/federal threatened or endangered plant species. This condition is taking into consideration the importance that fen provides to rare plant populations. Fens are home to approximately 24 species of plants that are considered endangered, threatened, or of special concern, 12 of which are restricted to fen habitats only. These endangered, threatened, or of special concern species are listed below:

Angelica	*Angelica atropurpurea*
Water parsnip	*Berula erecta incisum*
Swamp birch	*Betula pumila glandulifera*
Fen star sedge	*Carex sterilis*
Swamp thistle	*Cirsium muticum*
Small white lady's-slipper orchid	*Cypripedium candidum*
Jeweled shooting star	*Dodecatheon amethystinum*
Sundew	*Drosera rotundifolia*
Ovoid spike rush	*Eleocharis ovata*
Woodland horsetail	*Equisetum sylvaticum*
Tall cotton-grass	*Eriophorum angustifolium*
Slender cotton-grass	*Eriophorum gracile*
Bog bedstraw	*Galium labradoricum*
Bog Buckbean	*Menyanthes trifoliata*
Yellow monkey flower	*Mimulus glabratus fremontii*
Northern adder's-tongue	*Ophioglossum pusillum*
Northern adder's-tongue	*Ophioglossum pusillum*
Orchid species	*Platanthera sp.*
Beaked rush	*Rhynchospora capillacea*
Sage willow, hoary willow	*Salix candida*
Bog willow	*Salix pedicellaris*
Lady's Tresses Orchids	*Spiranthes sp.*
Common arrow-grass	*Triglochin maritima*
Valerian	*Valeriana edulis ciliata*

It is possible that others occur in fens, or that the associated upland prairie may have rare or threatened and endangered plant or animal species. If you encounter an unknown or unusual species take a number of photographs, record careful notes, and if possible record the location with a GPS and put this in your notes.

The fen site is within boundaries of a state preserve, special easement (WRP) due to its' quality. This condition gives points to fens that are protected because of their high quality.

Metric 6: Vegetation

The diversity, amount of fen indicator species, and extent of invasive plants directly relates to the overall quality of a fen. Plants are easily observed during the growing season.

Sub-Metric 6a: Fen indicator species.

IA FenRAM users are asked to identify the number of fen indicator species observed in the assessed fen. It may be difficult to identify every species present at the time of the site visit. Therefore, if the user is unable to identify a particular species while at the site, it would be best to take a picture of the plant for later identification rather than collecting it. It is the number of fen indicator species that is important. Species that are common indicators of a fen site are listed below:

Agalinis paupercula	Fen False foxglove
Angelica atropurpurea	Angelica
Aster puniceus	Swamp aster
Betula pumila glandulifera	Bog birch
Carex prairea	Fen panicled sedge
Carex stricta	Common tussock sedge
Chelone glabra	White turtlehead
Cirsium muticum	Swamp thistle
Cypripedium candidum	Small white lady's-slipper orchid
Epilobium ciliatum	Northern willow herb
Epilobium coloratum	Cinnamon willowherb
Epilobium leptophyllum	Bog willowherb
Epilobium strictum	Downy willow herb
Eriophorumpolystachion	Tall cotton-grass
Eupatorium perfoliatum	Boneset
Gentiana andrewsii	Bottle gentian, closed gentian
Gentianopsis crinita	Fringed gentian
Gentianopsis procera	Small fringed gentian
Liparis loeselii	Bog twayblade
Lobelia kalmii	Kalm's lobelia
Lycopus americanus	Water horehound
Lythrum alatum	Winged loosestrife
Menyanthes trifoliata	Buckbean
Muhlenbergia glomerata	Fen wild Timothy
Onoclea sensibilis	Sensitive fern
Parnassia glauca	Grass of Parnassus
Pedicularis lanceolata	Swamp lousewort, Fen betony
Polygonum sagittatum	Tearthumb
Pycnanthemum virginianum	Common mountain mint
Rhynchospora capillacea	Beaked rush
Salix candida	Sage willow, hoary willow
Salix pedicellaris	Bog willow
Solidago riddellii	Riddell's goldenrod
Spiranthes cernua	Nodding ladies'-tresses
Thelypteris palustris pubescens	Marsh fern
Valeriana edulis ciliata	Valerian
Viola nephrophylla	Bog violet

Sub-Metric 6b: Native Vegetation quality

This sub-metric looks at the quality of the plant community present in the fen. The diversity, dominance of native species, dominance of disturbance non-tolerant species, and presence of rare, threatened or endangered species are all conditions assessed. IA FenRAM users are to categorize the fen into one of the following vegetation quality conditions:

"Low" (0 points): Diversity low; Dominance of nonnative and/or disturbance tolerant native species is high. Rare species or plants indicative of fens are typically absent or in low numbers.

"Moderate" (3 points): Diversity moderate to moderately high. Generally, without the presence of rare, threatened or endangered species; but relatively common native species predominate. Non-native and/or disturbance tolerant native species may also be present, but do not dominate.

"High" (5 points): Diversity high; Rare, threatened or endangered species may be present and the community is composed of native species and species indicative of fens are common. Non-native and/or disturbance tolerant native species represent an insignificant proportion of total diversity.

Sub-Metric 6c: Coverage of invasive plants.

Invasive plants can establish themselves in a fen and displace the native vegetation. This sub-metric scores the amount of invasive plants in the assessed fen. Common invasive plants include *Lythrum salicaria* (purple loosestrife), *Phalaris arundinacea* (reed canary grass), *Phragmites australis* (Phragmities) and *Typha angustifolia* (narrow-leaved cattail). Also, fire suppression allows woody native and non-native species to invade fens and shade out desirable species. Tree growth in or very near the fen can typically be considered a disturbance to the fen with the exception of "fen indicative" species such as bog birch or sage willow. This sub-metric is the only one in the IA FenRAM that can deduct points from the total score. When scoring this metric consider the extent of coverage of both herbaceous and woody invasives.

Interpreting the Results of the IA FenRAM

Quantitative Scoring

Scores for the IA FenRAM range from 0 to 100, which allows for a wide range of possible scores. In addition to the total score having a maximum value, each metric in the method also has an individual maximum score. Table 1 shows the maximum score possible for each metric and sub-metric as well as the percentage of the total score each metric represents.

Problematic situations

In some situations the use of the IA FenRAM will result in an over or under estimation of the fen quality or status of the fen. In some fens, alterations may have occurred, but the fen still has plant communities and hydrology characteristics of a less degraded fen. Therefore, the quality of the assessed fen may be under-estimated (by "over-weighting" a disturbance). The opposite is also possible, in other words, a seemingly minor impact, or a less visible impact such as pattern tile, could highly impact a site. When vegetation characteristics do not seem appropriate given the known disturbances, users should carefully record notes about this on the score sheet. In such cases users must recognize that scores from certain metrics may skew the total score by over- or under-representing the overall quality of the site.

Index period

When interpreting the IA FenRAM, users should take into consideration the time of year a rapid assessment is performed and the possible effect weather and climate may have on attributes of the metrics, as well as the total score. This assessment is designed to be performed during the growing season (i.e. index period from May to October). For individuals with extensive knowledge of fens, it may be possible to perform an assessment outside of this index period by assessing standing-dead vegetation. However, this is not recommended and should be clearly noted on the score sheet if it is done. Snowfall can cover the wetland boundaries, important substrate characteristics, and plant communities. This may lower the accuracy of IA FenRAM scores. Assessment made during dry periods or drought years may also lead to the inaccurate assessment of metric 3 (Hydrology) and to a lesser degree metric 4. Likewise, heavy rainfall may skew metric 3c (Duration of inundation/ saturation). Any uncertainty of metric scores should be noted on the score sheet at the time of assessment. A re-assessment at another time may be necessary to obtain a more accurate total score.

References

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Mitsch, William J. and James G. Gosselink. 1986. Wetlands, 2nd Edition. Van Nostrand Reinhold Company, New York, New York.

Pearson, J.A. and M.A. Leoschke. 1992. Floristic Composition and Conservation Status of Fens in Iowa. Jour. Iowa Acad. Sci. 99(2-3): 41-52.

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Iowa Fen RAM v. 1.0 Scoring Form Quantitative Rating

Site:	Rater(s):	Date:

Metric 1. Fen Area (size).

max. 16 pts. subtotal

Select one size class and assign score.

- [ ] >2.0 acres (16 pts)
- [ ] 1.0 to 2.0 acres (12 pts)
- [ ] 0.5 to 1.0 acres (9 pts)
- [ ] 0.1 to 0.5 acres (5 pts)
- [ ] <0.1 (1 pt)

Metric 2. Upland buffers and surrounding land use.

max. 14 pts subtotal

2a. Calculate average buffer width. Select only one and assign score.

- [ ] WIDE. Buffers average 50m or more around fen perimeter (7)
- [ ] MEDIUM. Buffers average 25m to <50m around fen perimeter (4)
- [ ] NARROW. Buffers average 10m to <25m around fen perimeter (1)
- [ ] VERY NARROW. Buffers average <10m around fen perimeter (0)

2b. Intensity of surrounding land use. Select one or double check and average.

- [ ] VERY LOW. 2nd growth or older forest, prairie, savannah, wildlife area... (7)
- [ ] LOW. Old field (>10 years), shrubland, young second growth forest (5)
- [ ] MODERATELY HIGH. Residential, fenced pasture, park, conservation tillage (3)
- [ ] HIGH. Urban, industrial, open pasture, row crop, mining, construction (1)

Metric 3. Hydrology.

max 30 pts. subtotal

3a. Sources of Water. Score all that apply.

- [ ] High pH (>5.5) groundwater (fen) (5)
- [ ] Low pH (<5.5) groundwater (bog) (5)
- [ ] Precipitation (1)

3b. Connectivity. Score all that apply.

- [ ] Part of a larger fen complex (5)
- [ ] Part of wetland and/or upland complex (3)
- [ ] Part of riparian and/or upland corridor (1)

3c. Duration inundation/saturation. Score one or dbl check and average.

- [ ] Standing water easily visible (5)
- [ ] Soggy when walked upon (4)
- [ ] Only small area saturated (2)
- [ ] Very little moisture detectable (1)

3d. Modifications to natural hydrologic regime. Score one or dbl check and average.

- [ ] None or none apparent (15)
- [ ] Recovered (10)
- [ ] Recovering (5)
- [ ] Present, but no recovery (1)

Check all disturbances observed

- [ ] ditch
- [ ] tile
- [ ] dike
- [ ] road
- [ ] point source
- [ ] filling/grading
- [ ] RR track
- [ ] dredging/pond
- [ ] other_____

Metric 4. Fen Habitat Alteration and Development.

max 10 pts. subtotal

4a. Substrate disturbances. Score one or dbl check and average.

- [ ] None or none apparent (3)
- [ ] Recovered (2)
- [ ] Recovering (1)
- [ ] Recent or no recovery (0)

4b. Habitat development. How developed is it compared to other Iowa fens. Select only one and assign score.

- [ ] Excellent (3)
- [ ] Good (2)
- [ ] Poor (1)

4c. Habitat alteration. Score one or dbl check and average.

- [ ] None or none apparent (4)
- [ ] Recovered (3)
- [ ] Recovering (2)
- [ ] Recent or no recovery (1)

Check all disturbances observed

- [ ] mowing
- [ ] grazing
- [ ] pesticides/ herbicides
- [ ] shrub/sapling removal
- [ ] dredging
- [ ] farming
- [ ] nutrient enrichment

max 10 pts. subtotal

Metric 5. Special Fens.

Select all that apply.

	Significant insect/amphibian (Baltimore Checkerspot) habitat or usage (10)
	Known occurrence state/federal threatened or endangered species (10)
	Fen is within boundaries of state preserve, special easement (WRP) due to its' quality (10)

max 20 pts. subtotal

Metric 6. Vegetation.

6a. Fen obligate species. Select only one and assign score.

	> 10 species present (15)
	5-10 species present (10)
	1-5 species present (5)
	<1 species present (0)

6b. Native Vegetation Quality

Select only one and assign score.

	low (0)	Diversity low; Dominance of nonnative and/or disturbance tolerant native species
	mod (3)	Diversity moderate to moderately high; Generally without the presence of rare, threatened or endangered species; Dominance of native species, nonnative and/or disturbance tolerant native species may also be present.
	high (5)	Diversity high; Rare, threatened or endangered species may also be present; Dominance of native species, nonnative and/or disturbance tolerant native species absent or in very small quantities.

6c. Coverage of invasive plants. Select only one and add or deduct points for coverage.

	Extensive >75% cover (-5)
	Moderate 25-75% cover (-3)
	Sparse 5-25% cover (-1)
	Nearly absent <5% cover (0)
	Absent (1)

	GRAND TOTAL (max 100 pts)