ILLINOIS NATURAL AREAS INVENTORY UPDATE GRADING HANDBOOK

Fourth edition

Appendices

Tables

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Natural Quality and Grades

Natural Quality is defined as measure of the effects of degrading disturbance to a Natural Community. * A system of five letter grades (A, B, C, D. and E) expresses degrees of Natural Quality. The Illinois Department of Natural Resources' definitions and descriptions of Natural Quality Grades are in Appendix 1. NOTE 1 †

Regimes, Factors, and Indicators

Information about the attributes of a Natural Community that are useful for determining the community's Natural Quality are organized with a three-level system:

Disturbance Regime
Disturbance Factor
Quality Indicator

Disturbance Regimes

Disturbances that can have a significant effect on Natural Quality are grouped into 25 broad categories, or *Disturbance Regimes*:

Clearing
Cultivation
Deer Overabundance
Drainage
Earthmoving
Farming
Faunal Exploitation and Disturbance
Fire
Fire Suppression
Flooding
Grazing
Insects and Pathogens
Intrusions
Invasive Species
Logging
Mowing
Soil Movement, Erosion, and Deposition
Water Impoundment
Water Pollution
Weather and Climatic Extremes
Other Natural Biotic Processes
Other Natural Abiotic Processes
Other Artificial Disturbances
Artificial Disturbances in General
Natural Disturbances in General

* A term is italicized or bolded when it is defined in this handbook. Terms that are formally defined specifically for the Illinois Natural Areas Inventory Update are capitalized.

† Notes begin on page 30.

In addition to the 25 Disturbance Regimes, two more categories are necessary to cover all of the possibilities that are encountered when evaluating Survey Sites:

Unknown disturbance
No evident disturbance

The 25 Disturbance Regimes and two additional categories are defined in Appendix 2.

Disturbance Factors

A *Disturbance Factor* is an *intrusion*, an *activity*, or a *condition* of a Natural Community that affects or may affect the Natural Quality of the community. The factor may or may not be directly observable in the field, and it can be either an *explanation for* or a *consequence of* a Quality Indicator.

Disturbance Factors are listed in Appendix 3.

Quality Indicators

A *Quality Indicator* is a feature that (a) usually can be observed in the field, [*] and (b) can be interpreted as an *indication* of some kind of disturbance or lack of disturbance to a Natural Community. The indicator may be (a) a kind of *intrusion* (a physical thing), (b) evidence of an *activity*, or (c) a *condition* of a Natural Community. A Quality Indicator is *evidence* of either a disturbance or the lack of disturbance in a community.

In other words, a Quality Indicator is an *expression* of the Natural Quality of a community; a Disturbance Factor is a *reason* for the quality of a community. A Quality Indicator is "what you see." A Disturbance Factor is "what caused what you see."

Appendix 4 consists of an ever-expanding list of Quality Indicators. When grading a Natural Community, the Surveyor identifies Quality Indicators and then documents and analyzes them in terms of Disturbance Factors on a Grading Form.

Relationship between Disturbance Regimes, Disturbance Factors, and Quality Indicators

The hierarchical relationship between a Disturbance Regime, Disturbance Factor, and Quality Indicator is roughly equivalent to the taxonomic relationship between a biological *family*, *genus*, and *species*. A Disturbance Regime is a *family* grouping of Disturbance Factors. A Disturbance Factor is stated in *generic* terms, and it may be indicated

[*] Most Quality Indicators are found during the Final Field Survey or Initial Ground Survey, but they can also be identified during the Map & Aerial Photo Stage, Aerial Survey Stage, or Existing Information Stage.

by a number of Quality Indicators. A Quality Indicator is a *specific* expression of either a disturbance or the lack of disturbance. Each Quality Indicator is expressed individually and differently whenever it occurs in a Survey Site.

The list of Quality Indicators in Appendix 4 is dynamic: it continually changes as indicators are refined or newly recognized during field investigations, consultations with natural area specialists, and literature review. On the other hand, the list of Disturbance Regimes and Disturbance Factors in Appendix 3 has been designed and developed to provide a more stable, inclusive classification structure. The system for classifying Disturbance Regimes, Factors, and Indicators is ad hoc in the sense that it consists of groupings that serve the practical purposes of grading even though some elements of the classification are defined with different criteria than others ("mixing apples and oranges").

Artificial Disturbances versus Natural Disturbances

An *artificial disturbance* is one that results directly from human actions. A *natural disturbance* is one that is not directly caused by people. This simple dichotomy of "artificial" versus "natural" is not always unambiguous and incontrovertible because many ostensibly natural disturbances are initiated or fostered by human actions. For instance the great majority of fires that shaped the natural vegetation of Illinois probably were set by humans, but there is no direct evidence from the distant past that people set fire to the vegetation. Another example: Dutch elm disease is caused by a fungus that is spread by a beetle; both of these organisms were brought to America by international commerce — so, is mortality from Dutch elm disease a natural disturbance or an artificial one? According to the above definition, it is not an artificial disturbance because the elms are not killed by direct human actions. [NOTE 2] Grazing by livestock is classified as an artificial disturbance even though it can be argued that human actions are not directly responsible for the disturbing impacts of the domestic stock.

As a rule, artificial disturbances are deleterious to a Natural Community. To a large degree, natural disturbances are benign or beneficial. Artificial disturbances often damage or destroy a Natural Community; natural disturbances often maintain or rejuvenate a community.

Intrusions versus Cultural Communities

An *intrusion* is a relatively small, manmade physical feature or a localized site of intensive human disturbance. The activity that created the feature may have occurred in the distant past. Examples:

Old, abandoned wagon road	Fence
Small trash dump	Shack
Small gravel pit	Ditch

An intrusion is a disturbance feature within a Natural Community; it is not a separate community. If the disturbance is more extensive, then it is not treated as an intrusion: instead it is classified and mapped as a Community Type in the Cultural Community Class.

The *Cultural Community Class* is defined by the Illinois Natural Areas Inventory to include communities that were created by human disturbance, such as Cropland and Developed Land.

An old intrusion can often be viewed as a scar or an injury that has not completely healed. An intrusion may or may not have a substantial effect on the Natural Community that it occupies, and its effect may or may not extend far beyond the limited area that it occupies. For instance an old, long-abandoned excavation in a Gravel Prairie may be little more than a scar that has no apparent effect on the adjacent prairie. On the other hand, a ditch is likely to have a wide-ranging effect if it cuts through a wetland. The presence of an intrusion does not lower the Natural Quality of the surrounding community if the community is not significantly affected by it.

A single campsite that does not break the canopy of a forest is an intrusion, but a large group campground with cleared vegetation and buildings is Developed Land (a different Natural Community) — not an intrusion in the surrounding forested Natural Community. A single campsite in a forest would not normally affect the grade of the forest because its disturbing impact is so limited. A group campground in a forest is a separate Natural Community, and it does not necessarily lower the grade of the adjacent forest unless the impacts of the campsites and campers are significant and extend into the forest. [*]

Disturbance Features

During the Initial Ground Survey or Final Field Survey, if a disturbed area is marked and labeled on a site map, the disturbed area is treated as a *Disturbance Feature*. [†] Disturbances are classified in this manner so that they can be handled in the project's information system in the same way as the other elements of a Survey Site that are recorded, classified, and mapped as *features*: *i.e.* Significant Features, Exceptional Features, and Notable Features.

A Disturbance Feature is classified as either an Artificial Disturbance Feature or a Natural Disturbance Feature.

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[*] Offsite impacts from the campground might include light pollution, free-roaming pets, trampling by people, littering, firewood removal, and polluted runoff and groundwater.

[†] A Disturbance Feature may be mapped as a point, a line, or a polygon.

Artificial Disturbance Features

An *Artificial Disturbance Feature* is an *intrusion*: that is, it is a relatively small, man-made physical feature or a localized site of intensive human disturbance — as discussed above and in the definition of Intrusions in Appendix 2.

Natural Disturbance Features

A *Natural Disturbance Feature* is a place that has been disturbed by a natural agent. Examples:

Part of a forest that was blown down by a storm
Area that was burned
Stand of trees that were killed by a disease
Area that was scoured by a flooding stream

A Natural Disturbance Feature is a *feature* of a Natural Community rather than a distinct community. It may be any size — even as extensive as the community or group of communities where it occurs.

A natural disturbance is usually not considered when grading a community unless the disturbance is so severe that it mimics the effects of a significant artificial disturbance (for instance, a blowdown that looks like a clearcut, or a meandering stream that is removing a seepage community as effectively as a dragline).

Grading Form

During field surveys, the Natural Quality of a Survey Site is documented on a Grading Form, which provides a means for recording *observations* (descriptions of a community and its components), *analyses* (evaluations of quality), and a *decision* (a Natural Quality Grade). The form and instructions for completing it are in Appendix 10.

Grading Patches

Although an entire Survey Site is graded during the Final Field Survey, the grades are assigned to subdivisions of the site, termed Grading Patches. If a site is simple and uniform in terms of its Natural Communities and Natural Quality, it might consist of a single Grading Patch, but usually there are more than one patch in a Survey Site.

Definition

A *Grading Patch* is defined as having two main characteristics: (1) the patch consists of Natural Communities that are in the same Community Class, and (2) the patch must appear to be relatively uniform in Natural Quality (*i.e.* all of the patch will be assigned

to a single Natural Quality Grade). Each of these characteristics is discussed in more detail under the next two numbered headings.

(1) ***A Grading Patch consists of Natural Communities that are in the same Community Class.***

A Grading Patch can consist of several *related* Natural Communities (*i.e.* communities that are in the same Community Class). [*] It is often efficient to combine adjacent communities and evaluate them at the Community Class (or Subclass) level. However, it is not always necessary (and not even always desirable) to combine all of the adjacent, related Natural Communities into a single grading patch — even if they appear to have the same grade. If the characteristics that affect the assignment of a grade vary significantly from one community to another, then it is better to delineate separate patches and complete a series of Grading Forms for individual Natural Communities instead of treating them as one patch and combining them on one form; by using several Grading Forms in this situation, each community can be clearly described, analyzed, and documented.

(2) ***A Grading Patch must be relatively uniform in Natural Quality.***

A Grading Form cannot be used to document more than one Natural Quality Grade. At the beginning of the grading process, the boundaries of the patch that is being graded are likely to be tentative, unknown, or only partially decided. If the Surveyor determines during the grading process that part of the patch should be assigned a different grade, then the patch must be subdivided and another Grading Form must be started.

A Grading Patch is rarely entirely uniform in quality. A patch is likely to have parts that would be given a higher or lower grade if those parts were larger and separated from their surroundings by sharp boundaries. [†] To help address the inherent variability of the natural landscape, it is allowable for as much as one-quarter of a Grading Patch to consist of parts that would be assigned a different grade if those parts were larger

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[*] A woodlot that consists, for example, of both Dry-mesic Upland Forest and Mesic Upland Forest would often be evaluated as a single Grading Patch on a single Grading Form. But a Swamp and its surrounding Wet-mesic Floodplain Forest must be treated as separate patches and documented with separate forms because the forested wetland (swamp) and the floodplain forest are in different Community Classes.

[†] An example to illustrate this point: A Grade B patch may have small parts within it that are more degraded and that would be assigned Grade C if those parts were bigger and separated from the surrounding area by sharp boundaries. A more common situation is for a Grade B patch to vary continuously — with some parts in better condition than others, but with continuous variation instead of clear boundaries or abrupt transitions between the parts. A series of "cookie cutter" samples of such a patch might appear to represent different Natural Quality Grades, but when the area is viewed as a whole, there are no internal patches — only a complex mosaic of gradual transitions.

and clearly distinct (*i.e.*, sharply bounded instead of part of a complex mosaic or gradual transition).

In a complex situation, one part of a Natural Community at a site could be a certain grade because of a certain set of factors, and another part of the same community at the same site might be the same grade because of a different set of factors. In this situation, it may be necessary to delineate two adjacent Grading Patches and use two Grading Forms to sort out and clearly record the decision-making and grading process for the two parts of the community.

Acreage Guidelines

To deal in a practical manner with the heterogeneous nature of Natural Communities, a set of acreage guidelines is defined for recognizing and delineating Grading Patches. The acreage standard for a Grading Patch varies according to the kind of community. As a general rule, a Grading Patch of a forest community should be 5 acres or larger; it is usually not necessary — and not necessarily even desirable — to distinguish smaller areas when grading. A Grading Patch of a prairie should be at least one-quarter acre. As a general rule, the size of a Grading Patch for other communities should be at least one-quarter of the minimum acreage that has been defined for a Significant Feature of that community, but not less than 0.25 acre. [*] For instance the minimum acreage for the Significant Feature of a Marsh is 20 acres, so a Grading Patch in a Marsh should generally be at least 5 acres.

These are guidelines, not hard-and-fast rules: a smaller area may be (and often should be) be graded separately if it is clearly distinct. For instance if a 30-acre, old-growth, Grade B woods is bordered by a 0.5-acre strip of 20-year-old trees that have grown up in an old clearing, this area of young regrowth (Grade D) should be delineated and graded separately because it is clearly distinct from the rest of the forest.

Entitation

A Grading Patch does not have an identity and boundaries until a Surveyor carves it out of the landscape. The process of *entitation* ("making an entity") consists of recognizing a Grading Patch and delineating its boundaries. The Surveyor recognizes a Grading Patch by applying the definition on page 5, which calls for all of the patch to be in a single Community Class, and for the patch to be relatively uniform in its Natural Quality.

[*] Minimum acreage standards for the various Natural Communities are stated in the *Illinois Natural Areas Inventory Standards and Guidelines* by Illinois Department of Natural Resources (2006).

It is a fairly straightforward exercise to delineate an area that is all in the same Community Class, but it is often more difficult to draw a line around an area that is more-or-less uniform in quality. The quality of a community is assessed by analyzing and rating the four Grading Components that are spelled out beginning on page 12: species composition, vegetation structure, ecological processes, and physical environment (or Composition, Structure, Processes, and Environment for short). Sometimes those components are expressed hand-in-hand: for instance the Structure of a community is often a reflection of its Composition, and disturbances (or Processes) often determine both Composition and Structure. It is easiest to draw a line around a Grading Patch wherever the boundaries of different components coincide (for instance where the extent of an area that is rated Medium in Composition coincides with an area that is rated Low in Structure). Otherwise it may be necessary to draw the boundary line as a series of interpolations, extrapolations, compromises, and surmises.

Degree of Documentation

During the Final Field Survey of a site, the entire area is graded. Natural Quality Grades are assigned to one or more Grading Patches within the boundaries of the site. Although every Grading Patch must be documented with a Grading Form, it is not always necessary to describe the quality of each patch in detail. If a Grading Patch is low quality (Grade D or E), it can usually be documented by recording one or a few severe, overriding Disturbance Factors — without needing to mention any lesser disturbances. At the other extreme, if a patch is Grade A or Grade B, it must be thoroughly described and analyzed with a Grading Form.

A Grade C area may or may not call for detailed and thorough records on the Grading Form. If a patch is clearly Grade C, the assessment may often be documented sufficiently with very few photos and entries in the blanks on the form. But if the Grade C determination cannot be reached without an in-depth evaluation, then the Grading Form needs to be filled out in detail. The "B/C split" is critical: if an area appears to be on the border between a "low Grade B" and a "high Grade C," then the observations and analysis that led to the grading decision need to be thoroughly and carefully recorded.

A Grading Patch that is a Category I Significant Feature or a Category I Exceptional Feature must be documented in detail. This includes not only Grade A and Grade B areas — but also any Grade C area that appears to be a good candidate for recognition as either a Best-of-Kind Site or a Local Natural Area.

Identifying and Documenting Quality Indicators

A Surveyor identifies a Quality Indicator by looking for any feature of a Natural Community that is an indication of the community's history of disturbance, recovery from disturbance, or lack of disturbance. As defined on page 2, a Quality Indicator may be a physical thing, or evidence of an activity, or a condition of a Natural Community. Guidelines for identifying Quality Indicators are in Appendix 5.

A Quality Indicator is documented by recording it on page 1 of the Grading Form and by photographing it. Photos serve several purposes. They show what the Surveyor observed and analyzed when assigning a Natural Quality Grade to a community. They are a permanent record, and they can be distributed to people who have not been to the site.

The process of photographing a Quality Indicator helps ensure that the Surveyor's impression of the indicator is accurate: the indicator might not be as well developed and expressed as the Surveyor first thought. An attempt to document a Quality Indicator with photography is sometimes frustrating and disappointing. For instance, it may be difficult or impossible to capture the structure of an old-growth forest with a camera. Or, a woods may turn out to have fewer stumps than it first seemed to have — because it proves impossible to photograph many stumps at once even though they seemed to be "all over the place" during the initial reconnaissance. If one cannot convincingly document a Quality Indicator with a camera, one may need to rethink whether the indicator well enough developed to be significant.

Interpreting Quality Indicators and Identifying Disturbance Factors

After a Quality Indicator is identified, the corresponding Disturbance Factor or Factors need to be identified. Ideally both the Quality Indicator and Disturbance Factor are listed in Table 7. If they are not in Table 7, the table needs to be revised — or perhaps the Surveyor has misinterpreted the evidence from the field. When a Disturbance Factor is identified, it is recorded on page 1 of the Grading Form beside its Quality Indicator. Guidelines for interpreting Quality Indicators and identifying Disturbance Factors are in Appendix 5.

Documenting the Impact of a Disturbance Factor

The *Impact* of a Disturbance Factor is assessed by observing and documenting three attributes: the factor's *Extent*, *Level*, and *Trend*. These attributes are recorded for each Disturbance Factor on page 1 of the Grading Form.

Extent

The *Extent* of a Disturbance Factor is an estimate of the proportion of a Grading Patch that is occupied or affected by the factor. The Grading Form provides four choices for recording a Disturbance Factor's Extent:

Not seen: The factor or its effect is not found in the Grading Patch. [*]

[*] A Disturbance Factor is not normally recorded on a Grading Form unless it is identified in a Grading Patch, so the "Not seen" option is rarely if ever applicable. But "Not seen" could be the default entry in the electronic version of the Grading Form if a default is needed.

Low (localized): The factor occupies or affects less than about one-tenth of the Grading Patch, often in several scattered spots.

Medium (moderate): The factor occupies or affects roughly one-tenth to one-half of the Grading Patch.

High (widespread): The factor occupies or affects more than half of the Grading Patch.

Guidelines for documenting the Extent.—The Extent of a Disturbance Factor is estimated on the basis of visual inspection during field reconnaissance. It is not ordinarily determined by any kind of measurement.

Level

The *Level* of a Disturbance Factor is the degree of development of the factor and its effects. There are four choices:

None or N/A: If a Disturbance Factor is present in a Grading Patch but it is having no apparent, active effect on the community, then the *Level* is None. Or if the *Extent* of the Disturbance Factor is recorded as Not seen, then the *Level* must be N/A (not applicable).

Low: In the parts of a Grading Patch that the Disturbance Factor occupies or affects, it is poorly developed and has a minor effect on the community.

Medium: The level of development is judged to be between Low and High.

High: In the parts of a Grading Patch that the Disturbance Factor occupies or affects, it is well developed and has a major effect on the community. (Note that the Level of a Disturbance Factor may be High even though its Extent is Low or Medium.)

Guidelines for documenting the Level.—The Level of a Disturbance Factor may vary in different parts of a Grading Patch — for instance High in one part and Low (or absent) in other parts. In such a case, the Surveyor should choose the level that best represents the patch as a whole, and explain the choice with notes on the Grading Form. For instance if the level is High in a few small spots but mostly Low, one should choose Low and explain the situation; do not "average" the level and call it Medium. However, if most of the Disturbance Factor is judged to be Low but an area of high-level development is especially significant, then the level should be recorded as High to give a better assessment of the situation. In this case too, the complex situation needs to be documented with notes.

Trend

The *Trend* describes whether the *Extent* or *Level* of a Disturbance Factor appears to be increasing or decreasing. Four options:

> **Unknown or N/A**: If a trend cannot be determined, it is Unknown. If the *Extent* of a disturbance is recorded as Not seen or if the *Level* is None or N/A, then the Trend must be N/A (not applicable).
>
> **Low (decreasing)**: The Disturbance Factor is judged to be declining, either by shrinking in area or dropping toward a lower level of development.
>
> **Medium (stable)**: The factor appears to be in a steady state, neither increasing nor decreasing overall — although it may be increasing or decreasing locally within the Grading Patch.
>
> **High (increasing)**: The factor is judged to be increasing, either in its extent or its level of development, or both.

Guidelines for documenting the Trend.—The Trend of a Disturbance Factor may be obvious, or it may be difficult or impossible to judge on the basis of the available information. Often the growth or decline of vegetation is a good indicator of a trend. Are flood-damaged plants resprouting? Is a patch of weeds obviously dying back?

Interpreting the Effect of a Disturbance Factor

When grading a Natural Community, a Disturbance Factor is assessed according to its *Effect* on the Natural Quality of the community. Most Disturbance Factors have the potential for lowering the Natural Quality. Some factors have a positive effect on quality. Others may have a positive, negative, approximately neutral, variable, uncertain, or unknown effect — depending on the community and sometimes on the individual circumstances of the community. The duration of the effect of a disturbance may range from ephemeral to permanent.

Although most disturbances may lower the quality of a community, many disturbances have an effect that is often considered positive — such as enhancement of native biodiversity, maintenance of early seral stages, stimulation of plant growth and reproduction, and reduction of interspecific competition. [*] Periodic disturbances are even

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[*] An example of a disturbance that has mixed impacts on a community is grazing on a dry, rocky prairie, which prevents woody encroachment and fosters some disturbance-dependent prairie forbs, but which eliminates conservative species and encourages weedy species (including exotics). Three Disturbance Factors with a positive Effect can be identified in this situation, based on Table 5: 11.01 (Enhancement of snap diversity), 11.02 (Maintenance of habitat for native species that require bare soil and sparse vegetation), and 11.03 (Reduction or control of woody growth in

necessary for the long-term persistence of some communities (*e.g.* to maintain a prairie that would otherwise succeed to forest).

The Effect of each Disturbance Factor is recorded on page 1 of the Grading Form. The combined impacts of all the various disturbances on a Natural Community have a major bearing on the community's species composition, vegetation structure, ecological processes, and physical environment. The condition of those four components, in turn, determines the quality of a community.

Guidelines to keep in mind when identifying Quality Indicators and Disturbance Factors and when thinking about what they mean are spelled out in Appendix 5. The basic procedures for grading a Natural Community on the basis of Quality Indicators and Disturbance Factors are outlined on the following pages.

Grading Components and Sub-components

For the purposes of grading Natural Quality, a Natural Community is described and analyzed in terms of four *Grading Components*:

Species composition
Vegetation structure
Ecological processes
Physical environment

Briefly termed:

Composition
Structure
Processes
Environment

Each Grading Component can be broken down into a number of *Sub-components*, which are elements of a Grading Component that can be observed and evaluated, and that have a major bearing on the condition of the Grading Component.

The four Grading Components and important Sub-components are defined and discussed under the next several headings.

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a formerly fire-maintained community). Two Disturbance Factors with a negative Effect can also be identified: 11.05 (Decrease in favored forage species; reduction in the diversity and abundance of conservative native species), and 11.06 (Increase or persistence of unpalatable or grazing-adapted species).

Composition

Definition

The *composition* of a community refers to the species that are present in the community, plus three attributes of each species: its *nativity*, *abundance*, and *autecology*.

A species' *nativity* may be simply denoted as either *native* or *exotic*. A detailed and comprehensive terminology for describing nativity is in Appendix 6.

Terms for annotating the *abundance* of a species are in Appendix 7.

Autecology refers to the ecology of an individual species, as opposed to the *synecology* of a community. Aspects of autecology include phenology (spring ephemeral, fall-blooming, etc.), length of the reproductive cycle (annual, biennial, perennial), reproductive strategy (r/K selection), photosynthetic pathway (C3 vs. C4), tolerance to environmental extremes, tolerance to disturbances, competitive ability (allelopathy, shade tolerance), and palatability to herbivores.

Sub-components

Many aspects of the species composition of a Natural Community lend themselves to analysis when grading Natural Quality. The following Sub-components are listed on the Grading Form because they are considered to be the primary ones that indicate the condition of the Grading Component:

> **Richness**: The number of species in a given area. This number may be derived from vegetation plot sampling, or it may be simply estimated by looking at the Grading Patch, ideally while making a plant species list.
>
> **Conservatives**: Native plant species that do not tolerate most disturbances, and that usually do not occur in degraded habitats.
>
> **Decreasers**: Native plant species that tend to decrease in number or vigor when their habitat is lightly to moderately disturbed. [*]
>
> **Increasers**: Native or non-native plant species that tend to increase in number or vigor when their habitat is lightly to moderately disturbed.

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[*] This concept of *increasers* and *decreasers* originated with range scientists and managers who were assessing the response of plant species to grazing by domestic livestock. Here in the *Grading Handbook*, the terms are employed in reference to any kind of disturbance, not just grazing.

Ruderals: Native or non-native plant species that grow in highly disturbed areas, often becoming established on bare soil; often annuals that do not persist unless the site is repeatedly disturbed or unless the substrate is unnatural (*e.g.* a cindery railroad embankment).

Exotics: Species that are not native to an area.

Additional Sub-components may be added to the Grading Form on a patch-by-patch basis to characterize other relevant aspects of a Grading Patch's species composition.

Structure

Definition

Structure has three aspects:

(a) the physiognomy or physical form and appearance of the vegetation as a whole,

(b) the pattern of distribution of species or groups of species within a community, and

(c) the growth form and morphology of individual species and even single plants in a community.

In other words, structure relates to:

(a) the vertical arrangement and character of vegetation layers (including the size and density of trees),

(b) the horizontal distribution of individual species or groups of species in a community (*e.g.* zones related to environmental gradients, or patches that develop in response to disturbance history and succession, or apparently random or patternless distribution), and

(c) a species' growth form (graminoid, forb, shrub, tree) and the appearance of individual plants (vigor; disfigurement from herbivory, pathogens, and environmental stressors).

Sub-components

During the grading process, the Structure component is evaluated according to the Natural Community's vertical vegetation layers. A community may have as many as four possible vegetation layers:

Ground layer: Herbaceous plants and woody plants up to 1 meter tall.

Shrub layer: Shrubs, saplings, and small trees.

Subcanopy layer: Small trees that form a canopy directly beneath the overstory canopy.

Overstory layer: Trees that form the uppermost canopy in a community.

In addition, as an alternative, the shrub layer and subcanopy layer may be referred to collectively as the **understory layer** when it is efficient to do so, and when it is possible to clearly record observations or analyses about both layers at once.

Any of the vertical layers that are present in a community may be characterized and evaluated during the grading process. In addition, it is sometimes useful to document the vegetation structure in terms of another Sub-component:

Horizontal pattern: The horizontal distribution of individual species or groups of species in a community, including the size and shape of vegetation patches, the relationship between patches and environmental gradients and disturbances, and the character of boundaries between patches.

The above Sub-components are listed on the Grading Form. Other aspects of vegetation structure may be identified and added to the form as additional Sub-components if they do not fit well into any of the above Sub-components.

Processes

Definition

Ecological *processes* consist of the biological and physical actions that shape and control an ecosystem and cause it to function.

Here is a sampling of ecological processes and their effects on an ecosystem: (a) formation of soil by chemical weathering and decomposition of organic matter; (b) changes in vegetation structure, microclimate, soil, and species composition through ecological succession; (c) control of animal populations by predators, diseases, and parasites, and (d) changes in natural communities that result from disturbances such as fires and floods.

When evaluating a Survey Site, one must recognize and accept that ecological processes are significantly different now than they were two centuries ago. Farming has fundamentally transformed the hydrology of streams. Wildfires no longer sweep the plains, so a remnant prairie may no longer experience the fires that it requires for its continued existence. Large predators have been eradicated, so the population dynamics of ani-

mals as well as plants have changed dramatically. There are no free-ranging bison and no passenger pigeons. [NOTE 3] The natural landscape is so fragmented that local dispersal as well as long-distance migration are severely curtailed for many species. Acid rain, atmospheric deposition of nitrogen, and global warming add new dimensions of change. Regardless of such major alterations of ecosystem processes, evaluation standards need to be applied in a manner that allows the Processes component of some Grading Patches in some Survey Sites to be rated as High.

Sub-components

Biological and physical processes are myriad and they operate at every scale, from intracellular to cosmic. An ecological process that is evidenced by a Quality Indicator may originate or extend beyond the limits of a Grading Patch and far from a Survey Site. Most processes operate well beyond the control and outside the capacity of natural area managers. The grading procedure should focus primarily on processes that function at the approximate scale of a Survey Site or a Natural Community — not at a much higher or lower level.

Two kinds of ecological processes are most important to examine when grading a community: (a) those that are most significant in determining the species composition and structure of the community, and (b) those that have been modified so much that the basic character of the local ecosystem has changed.

The Grading Form has blanks for rating the following four Sub-components of the Processes component:

> **Reproduction and Growth**: Addition of new plants (genets) through sexual reproduction, and addition of new stems (ramets) via asexual reproduction; also, increase in the size of plants.
>
> **Succession**: The process in which communities of plants and animals in a particular area are replaced over time by a series of different communities.
>
> **Fire**: Actions of fire on a community, primarily by consuming organic matter and killing or injuring plants and animals.
>
> **Hydrology**: Actions of running or standing water on a community: scouring soil and vegetation, inundating and drowning living things, moving nutrients, etc.

As needed, any number of other Sub-components may be recognized and evaluated to assess the condition of the Processes component.

Environment

Definition

The physical *environment* is the abiotic component of an ecosystem, including the substrate or medium in which plants and animals live.

Sub-components

Three main parts of the physical environment for a community are the *microclimate*, *soil*, and *water*. The microclimate (or "climate near the ground") is a basic element of the environment, but it does not usually figure into the grading equation. Even though soil and water are so full of life that it is impossible to separate the living from the non-living environment, they are classified here as abiotic or physical features of an ecosystem.

Three elements of the Environment component are preprinted on the Grading Form because they are most likely to come into play when evaluating an area:

> **Soil**: The surface of the earth, extending downward to include the upper part of the parent material.
>
> **Water**: Streams, diffuse surface runoff, standing surface water, soil water, and groundwater.
>
> **Intrusions**: Relatively small, manmade physical features (such as a structure) or localized sites of intensive human disturbance (such as a trail).

Other environmental Sub-components may be added to the Grading Form and analyzed on an ad hoc basis (that is, to describe the unique situation of an individual Grading Patch).

Rating the Condition of Grading Components and Sub-components

When evaluating a Grading Patch, the overall condition of each of the four Grading Components and its Sub-components is estimated with a Condition Rating, which is a simple, qualitative, relative scale: Low, Medium, and High. The Medium rating has the widest latitude:

Low	**Medium**	**High**
Lower quarter	Middle half	Upper quarter

A Grading Component or Sub-component is rated High if it is judged to have more than 75% of the characteristics that it would have if it were in a theoretical, pristine natural area (*i.e.* without any degradation). A component or sub-component is rated Low if it is judged on the same basis to be in the bottom quarter. Any case in-between is Medium.

To rate the condition of a Grading Component in a Grading Patch, the Surveyor must do the following:

(1) Examine the Grading Patch to identify Quality Indicators.

(2) Document each Quality Indicator with a written description and photography.

(3) Determine which Disturbance Factor or Factors are indicated by each Quality Indicator.

(4) Decide whether the Effect of each Disturbance Factor on the community is clearly positive, clearly negative, variable or approximately neutral, or uncertain or unknown.

(5) Determine the Impact (Extent, Level, and Trend) of each Disturbance Factor.

(6) Evaluate the Grading Component by examining relevant Sub-components and rating their condition as High, Medium, or Low. Base this rating on (a) the observed characteristics of the Sub-component and (b) the impact of Disturbance Factors on the Sub-component.

(7) Summarize the condition of the Grading Component with a rating (High, Medium, or Low) and a descriptive narrative. Base the rating on the condition of the Sub-components as well as other characteristics of the Grading Component that were not formally classified as Sub-components.

Condition Ratings for Grading Components and Sub-components are based on experienced, professional judgment and comparative knowledge of many different sites. A rating is not derived from any sort of multifactorial, numerical scoring system.

Tables 1 to 4 characterize Condition Ratings (High, Medium, and Low) for each of the Grading Components.

Table 1. Condition Ratings for Composition.	
Description	**Examples**
HIGH The species composition reflects conditions that develop under a long-term lack of degrading disturbances. The Grading Patch may or may not have native species that require early seral conditions that are created and maintained by natural disturbances.	Wet-mesic Floodplain Forest dominated by Acer saccharinum, Populus deltoides, Quercus macrocarpa, and Q. bicolor, with scattered Carya illinoensis and C. laciniosa; understory of Fraxinus lanceolata; ground layer a mix of flood-tolerant native herbs.
Species diversity is natural, usually indicated by relatively high native species richness. Conservative species are present, except in Natural Communities that do not normally have such species (*i.e.* highly dynamic, naturally disturbed communities with open habitats).	Mesic Prairie dominated by Andropogon gerardii and Sporobolus heterolepis, with 80 native plant species per acre, including conservative forbs such as Dalea and Baptisia; no heavy invasion by exotics (but Poa pratensis grows in a suppressed condition throughout).
Less conservative species are present, but they are not as abundant as in lower quality occurrences of the community. Exotic species may be present, but they do not have a significant impact on the community's composition, structure, or processes.	Sedge meadow covered by clumps of Carex stricta, with a wide variety of native herbs in the interstices.
MEDIUM Conservative plants are reduced in the number of species and individuals, compared to what they would be in a high quality community.	Wet-mesic Floodplain Forest that has a natural woody species composition except for scattered exotic understory trees and shrubs (Maclura, Morus, Lonicera). Alliaria is invading the ground layer but has not significantly suppressed the native herbs.
Less conservative species (increasers) are common to abundant. Exotic species may have a significant impact on the community's composition, structure, or processes.	Mesic Prairie that lacks some of the expected conservative species (Dalea, Eryngium) but has an abundance of less conservative natives (Oligoneuron rigidum, Ratibida). Exotics such as Daucus and Pastinaca are conspicuous.
	Sedge Meadow dominated by Carex stricta but with an abundance of less conservative natives (Asclepias incarnata, Eupatoriadelphus maculatus).
LOW Species composition is substantially altered from natural conditions. A few disturbance-tolerant species may dominate. Native species diversity is depleted, often replaced by exotics or weedy natives.	Wet-mesic Floodplain Forest where Alliaria has largely taken over the ground layer.
	Mesic Prairie dominated by Bromus inermis, with 20 native species per acre.
	Sedge Meadow overwhelmed by Lythrum salicaria.

Table 2. Condition Ratings for Structure.	
Description	**Examples**
HIGH The structure of the community has all of the vertical layers and horizontal patterns that a natural example of the community is expected to have. For the Forest Community Class, a significant part of the overstory canopy is composed of old trees.	Wet-mesic Floodplain Forest with an overstory dominated by old trees, and understory and ground layers that are well developed except in areas that are too wet or have recently been scoured by floodwater.
	Mesic Prairie that has an intact sod and little or no shrub invasion.
	Sedge Meadow that has an intact array of sedge tussocks and little or no shrub invasion.
MEDIUM The structure of the community is significantly altered: woody layers may be partially disrupted, but they are not largely or completely missing. For the Forest Community Class, the overstory canopy may lack old trees. Less conservative species often predominate in patches.	Wet-mesic Floodplain Forest with an overstory of young to mature trees because the old trees have been removed by logging.
	Mesic Prairie with patches of clonal weedy natives (Helianthus and Solidago).
	Sedge Meadow with sedge tussocks that are shorn by grazing cattle, and with the mucky interstices trampled and enlarged.
LOW The structure if the community is substantially damaged. Woody layers or size classes may be missing. Horizontal patterns are arrayed in response to unnatural disturbances instead of natural processes and the physical environment.	Wet-mesic Floodplain Forest with most of the overstory trees killed by a prolonged flood.
	Mesic Prairie with heavy invasion by Rhamnus cathartica thickets and Cornus racemosa clones, which are dense enough to shade out most of the herbaceous plants.
	Sedge Meadow that is well along in the process of succeeding to a shrubland because of the growth of Frangula alnus and Salix.

Table 3. Condition Ratings for Processes.	
Description	**Examples**
HIGH Processes that are necessary for the continuance of the community are intact and functioning.	Wet-mesic Floodplain Forest with no evident problems with ecological processes, particularly hydrological processes.
	Mesic Prairie that is well managed with prescribed burns.
	Sedge Meadow with natural hydrologic and fire regimes, and no history of grazing by domestic livestock.
MEDIUM Processes are disrupted to the point that the functioning of the ecosystem is significantly altered, and the health of the community will not be maintained without active management.	Wet-mesic Floodplain Forest that has been damaged by excessive flood scouring, which was caused by farming upstream in the watershed.
	Mesic Prairie that has not burned in decades.
	Sedge Meadow that is being damaged by excessive runoff of polluted water from an adjacent residential subdivision.
LOW Processes are substantially disrupted, to the pont that the original community has been replaced or cannot persist in the long term.	Wet-mesic Floodplain Forest that has been drained by stream entrenchment.
	Mesic Prairie that is so overwhelmed by shrubs that it no longer has the fine fuels (grassy duff) needed to carry a fire.
	Sedge Meadow where the controlling processes are grazing by cattle and wallowing by hogs.

Table 4. Condition Ratings for Environment.	
Description	**Examples**
HIGH The environment is substantially unaltered from natural conditions.	Wet-mesic Floodplain Forest with no evidence of unnatural disturbance to the soil and water, and no significant artificial intrusions.
	Mesic Prairie that shows no evidence of disturbance to its soil or other abiotic features.
	Sedge Meadow that has a natural substrate and unpolluted water.
MEDIUM The environment has suffered significant damage or alteration, but not enough to transform the community or to prevent it from returning to natural conditions.	Wet-mesic Floodplain Forest that received excessive siltation from the Great Flood of 1993 (damaging its vegetation), but that is now recovering.
	Mesic Prairie that lost about half of its topsoil long ago during construction of an adjacent railroad line.
	Sedge Meadow with a ditch that has lowered its water table, but not so much as to immediately destroy it.
LOW The environment is dominated by unnatural conditions, and it will not revert to natural conditions without major rehabilitation (if ever).	Wet-mesic Floodplain Forest with an entrenched, gullying stream channel that has drained wet depressions that formerly held water.
	Mesic Prairie that has reestablished in an abandoned industrial site where all of the topsoil was scraped away.
	Sedge Meadow that has been diked and partially excavated to create and maintain permanent areas of open water.

Grading Model

Grading Components and Condition Ratings

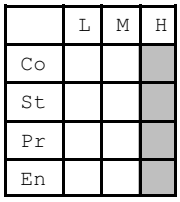
The process for evaluating Natural Quality is organized around a matrix of four variables, each of which has three possible values. The variables are the four Grading Components: Composition, Structure, Processes, and Environment (designated as Co, St, Pr, and En). The three values are the Condition Ratings that are defined on page 17: Low, Medium, and High (L, M, H).

Grading Components:

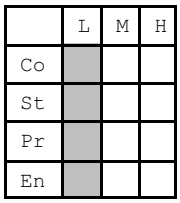
Co = Composition
St = Structure
Pr = Processes
En = Environment

Condition Ratings:

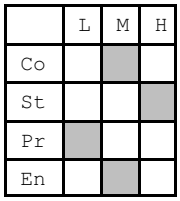
L = Low
M = Medium
H = High



In the highest possible quality example of a Natural Community, all four Grading Components are rated High, designated as Co = H, St = H, Pr = H, and En = H, or HHHH. This is illustrated by the top matrix in the right margin. A High rating for each of the four Grading Components does not indicate a "perfect score." A Grading Component does not have to be scored as 100% to be rated as High: it only needs to be estimated to fall in the upper 25%.



The opposite extreme is LLLL (*i.e.* all four of the Grading Components are rated Low).



An intermediate case is MHLM: Composition = Medium, Structure = High, Processes = Low, and Environment = Medium.

Here are all 81 possible arrangements of the ratings:

LLLL	LMLH	LHML	MLMM	MMMH	MHHL	HLHM	HMHH
LLLM	LMML	LHMM	MLMH	MMHL	MHHM	HLHH	HHLL
LLLH	LMMM	LHMH	MLHL	MMHM	MHHH	HMLL	HHLM
LLML	LMMH	LHHL	MLHM	MMHH	HLLL	HMLM	HHLH
LLMM	LMHL	LHHM	MLHH	MHLL	HLLM	HMLH	HHML
LLMH	LMHM	LHHH	MMLL	MHLM	HLLH	HMML	HHMM
LLHL	LMHH	MLLL	MMLM	MHLH	HLML	HMMM	HHMH
LLHM	LHLL	MLLM	MMLH	MHML	HLMM	HMMH	HHHL
LLHH	LHLM	MLLH	MMML	MHMM	HLMH	HMHL	HHHM
LMLL	LHLH	MLML	MMMM	MHMH	HLHL	HMHM	HHHH
LMLM							

These combinations are displayed in Appendix 9. * Many of them are unlikely to occur in nature. For instance if Environment is in Low condition, it is not likely to support Composition and Structure in High condition: a natural glade flora will not colonize an abandoned asphalt parking lot, and a natural sedge meadow will not become established on an alluvial fan that is forming at the head of a flood-control reservoir.

If an unlikely combination of Condition Ratings actually does occur in a Survey Site, it is probably an unstable condition. For instance a community that is rated High in Composition and Low in Process is likely to be a temporary circumstance because the species composition probably cannot remain in very good condition (High) in the long term if the ecological processes that control the community are in poor condition (Low).

Relative Importance of the Grading Components

Composition is the single most important indication of the quality of a Natural Community. The species that occur in a community are an integrated expression of the condition of the community's Structure, Processes, and Environment.

Structure is the second most important indicator of the quality of a community. This is not to say that a community's structure is more important than a community's ecological processes. But Structure is a more important Grading Component than Processes because Structure is more readily observable, and it is a good indicator of the history of disturbance, recovery, and development of a community. In part, Structure is determined by Composition, but it is also controlled by Processes, especially disturbances.

Processes are key to the long-term condition and viability of a community. If ecological processes are disrupted, the community will change in response.

Environment is a basic component of an ecosystem, but in terms of evaluating Natural Quality, it usually is decidedly less important than the other three components. If the condition of Environment is not High, the environmental degradation can usually be seen in the Composition and Structure, which are often easier to assess.

Long-term Interactions among Components

Pr < Co or St. If the condition of Processes is lower than the condition of Composition or Structure, the condition of Composition or Structure is likely to decline in the long term.

---

* These 81 possible arrangements are not *combinations* in the mathematical sense. Nor are they *permutations*.

Pr > Co or St. If the condition of Processes is higher than the condition of Composition or Structure, the condition of Composition or Structure may improve in the long term.

En < Co or St. If the condition of Environment is rated lower than the condition of Composition or Structure, the future of the community may be difficult or impossible to ascertain or predict. The Composition and Structure may or may not have already adjusted and adapted to the degraded Environment. As a general rule, Environment is not likely to improve quickly without some sort of effort to rehabilitate it.

If the condition of Composition or Structure is Low, this is often a consequence of Processes or Environment that are in Low condition.

Co or St > Pr or En. If the Composition or Structure are rated higher than Processes or Environment, either of two circumstances is likely. (1) The condition of the Composition or Structure may be mistakenly overrated. (2) Or the condition of Processes or Environment may have declined recently, and the Composition and Structure have not yet adjusted to the changed conditions.

To guard against the first circumstance (*i.e.* mistakenly overrating a Grading Component), the Surveyor needs to review the analysis of the Grading Components to determine whether one of them has been mis-evaluated. But if Processes and Environment are truly in lower condition than Composition and Structure, the long-term implications for the community should be examined, and the Natural Quality Grade should be assigned accordingly.

Grading Rules

The above discussion suggests that Composition and Structure can be employed as the principal basis for determining the grade of a community. The following Grading Rules are prescribed:

(1) Composition is the primary component for determining a grade:

   (a) If Composition is Low, the grade is D.

   (b) If Composition is Medium, the grade is C.

   (c) If Composition is High, the grade is either A or B, depending on (a) how much the community's composition has been altered from natural conditions, and (b) the community's Structure.

(2) Structure is the primary consideration for separating Grade A and Grade B, after the Composition has been considered:

(a) If Composition and Structure are both High, the grade may be either A or B.

(b) If Composition is High but the Structure is Medium or Low, the grade is B.

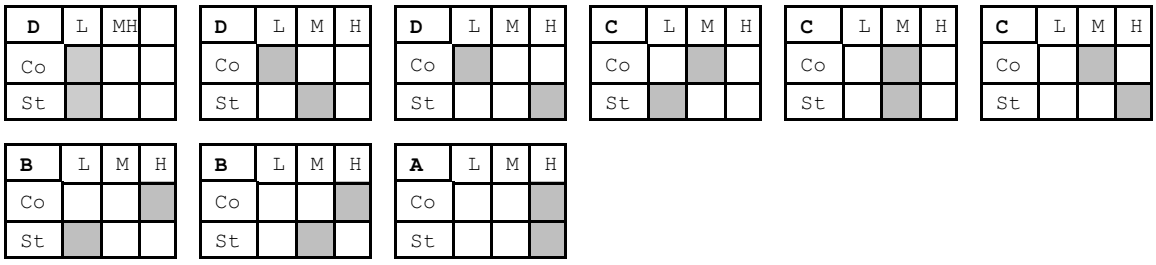
(3) If Composition or Structure is rated High, and Processes or Environment is rated Low:

(a) Reexamine the analysis and rating of Composition or Structure to determine whether that component should be rated Medium instead of High.

(b) If the rating of Composition or Structure remains High, consider whether the grade should be lowered from Grade A or B to Grade C.

(4) If the results of applying the above rules do not make sense, then do something else, document the departure from the rules on the Grading Form, and consult with the Field Survey Director or Survey Instructor. The current draft rules may prove to be oversimplified or otherwise inadequate.

When only Composition and Structure are considered, there are nine possible Grading Models, shown here with the grades that are derived from applying the Rules 1 and 2:



Appendix 9 shows all possible combinations of the four Grading Components and their three Condition Ratings. In that appendix, Natural Quality Grades are assigned to each of these 81 Grading Models, based on the above set of rules. Most of the assigned grades are obvious choices, but some are tentative. Using the Grading Models will show how well they work and which ones need to be modified or applied cautiously.

NOTE FOR THE FOURTH EDITION: Further field testing of the Grading Rules and Grading Models since the third edition of the *Grading Handbook* has indicated that the rules and models may need to be modified by splitting the High rating for Composition into two levels: Moderately High (MH) and Very High (VH) to help distinguish Grade B patches and Grade A patches (*i.e.* MH corresponds to a potentially Grade B patch, and VH corresponds to a potentially Grade A patch). Rules 1 and 2 (above) have been

reworded to suggest this change, but the Grading Models have not been revised to reflect any such change, pending further testing and analysis.

The Illinois Natural Areas Inventory's grading system has five grades (A, B, C, D, and E), but Grade E is not included in the Grading Model because it can be recognized without any in-depth analysis. Grade E communities are in the Cultural Community Class, such as Developed Land and Cropland. A community is Grade E if the rating of one or more of its Grading Components would be effectively "No" instead of High, Medium, or Low. That is, a Grade E area can be considered as having no (or essentially no) natural species composition, natural vegetation structure, natural expressions of ecological processes operating at the community level, or natural physical environment.

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Notes

1. In the Supplemental Materials for the *Survey Standards and Guidelines* is an essay titled *Recognizing Disturbances within Natural Communities* by Max Hutchison (1993). This is the single best short piece of writing that analyzes the role of disturbances in Illinois' natural areas.

   See also the *Conceptual Foundation and Philosophical Framework for the Illinois Natural Areas Inventory* by John White (2008), particularly the section about the Presettlement Paradigm and the appendix, "Mission and Goals for an Ecological Reserve Program for Illinois."

2. The role of humans in wild areas and natural systems is the subject of much debate and philosophical discussion. See "Natural Disturbances in General" in the *Survey Standards and Guidelines* (White 2009) for an entry into the literature on this topic.

3. The formerly immense population of passenger pigeons must have had a big impact on the ecology of eastern North America; see Ellsworth and McComb (2003 for an introduction to the topic. However, it has been suggested that the estimated billions of passenger pigeons were a relatively recent, unnatural consequence of ecological disruptions that attended the arrival of European colonists on the continent (see Neumann 1985).

4. This quotation is from Short (1845).

5. See "Why Natural Areas Exist" in the INAI *Technical Report* (White 1978). See also the Survey Standards and Guidelines titled "Small or Isolated Piece of Idle Property" in White (2009).

6. For a detailed, local analysis of the phenomenon of snaps growing in a woods, see "Distribution Patterns of Prairie Plant Species in a Closed-canopy Forest Situation" by McCarty and Hassien (1986).

Appendix 1
Natural Quality Grades

This appendix consists of the "Natural Community Grading" section of the Illinois Department of Natural Resources' *Standards and Guidelines* (2006):

Natural Quality and Community Grading

Natural quality is defined as a measure of the effects of disturbance and/or degradation to a natural community. These disturbances may or may not be natural, but are typically anthropogenic in origin.

For the purposes of the INAI, natural quality is expressed by a system of grades which are affected by the amount of artificial or natural disturbance. Several environmental indicators are used to evaluate and subsequently rate natural community quality. These include species lists, presence of conservative or indicator species, community structure, observations of community function, and evidence of degradation (*e.g.* grazing, logging).

Grades used by the INAI are summarized below:

Grade A — Very high quality natural community

A Grade A natural community exhibits native species composition, structure, and function with no or very minimal signs of degradation. Sites experiencing minimal degradation will show near complete recovery — the composition, structure, and functional integrity are intact. Generally, Grade A communities need minimal or no restoration though may require management to maintain their present condition (*e.g.* periodic fire).

Examples of Grade A Natural Communities: old-growth, ungrazed forest, prairie with undisturbed soil and natural plant species composition, wetlands with unpolluted waters, unaltered hydrology, and natural vegetation.

Grade B — High quality natural community

A Grade B natural community is a former Grade A community that has (1) experienced some degradation, but whose composition and structural integrity is intact, or (2) historically experienced moderate to heavy degradation, but has recovered significantly to where it possesses the structure of a complete and functional community. A Grade B community can be restored to Grade A or maintained at its present condition with management.

Examples of Grade B Natural Communities: old-growth forest selectively logged 5 years ago, old second-growth forest recovered from moderate past grazing, prairie with some weedy species due to soil grading 15 years ago, wetlands where original hydrology has been altered which may have changed species composition locally, but not the structure and diversity of the community as whole.

Grade C — Medium quality natural community

A Grade C community either (1) has experienced moderate to heavy degradation and may or may not be in the process of recovering its composition, structure, and function, but possesses restoration potential appropriate for a complete and functional community of that type, or (2) has experienced severe degradation and has recovered the structure and function of the community. Degradation of Grade C communities can be so great that its species composition, structure, and function have been significantly altered, but it possesses restoration potential for improvement or maintenance at this grade. A Grade C community may be restored to a Grade B community with intensive, specifically prescribed management and/or a significant interval of time. A Grade C community can be maintained in its present condition with routine management.

Examples of Grade C Natural Communities: heavily grazed old-growth forest, young to mature second-growth forest, grazed prairie where many native species have been replaced by weedy species, wetland with artificial water levels that has changed the structure and composition of the vegetation.

Grade D — Low quality natural community

A Grade D community (1) has experienced severe degradation and has not recovered the species composition and structure characteristic for a natural community of that type, or (2) has experienced very severe degradation, but has just begun to recover the structure appropriate for a such a community. A Grade D community has been so severely degraded that its structure and function have been significantly altered. The community may be undergoing rapid succession, or if the disturbance is unnatural and constant (*e.g.* continual grazing), the community may be held in a constant degraded state. A Grade D community typically can only be rehabilitated through replacing and supplementing species composition and structure and significant management efforts.

Examples of Grade D Natural Communities: recently cut forest, severely grazed, mature second growth forest, prairie with graded soil and dominated by weedy species with many native species missing, wetland that has been artificially flooded or drained, greatly changing the vegetation.

Grade E — Very severely disturbed natural community

In Grade E communities, the original community has been destroyed or removed. Grade E communities experienced such a severe level of degradation that the functional

community has been removed and there are few or no higher plants or animal species of a functional community. The land surface is often physically altered. Either (1) the site is going through the first stages of secondary succession, or (2) the natural biota is nearly or completely gone. A Grade E community can only be reclaimed through total reconstruction of a community starting from scratch.

Examples of Grade E Communities: newly cleared land, cropland, improved pasture, residential/commercial development, parking lot, road or railroad embankments and rights of way.

Appendix 2
Definitions of Disturbance Regimes

Clearing is defined as removal of vegetation, usually with substantial disturbance of the soil surface. Clearing usually transforms a "natural" Natural Community to another Natural Community in the Cultural Community Class (*e.g.* from Mesic Upland Forest to Pastureland, or from Mesic Savanna to Developed Land). Clearing is a severe disturbance — so when evaluating a vegetated area, clearing is usually considered in the context of *recovery* from past clearing. A Successional Field community is an old clearing or cultivated area that is reverting to wild conditions. Removal of vegetation that is carried out as part of natural area management usually is not classified as clearing because not all of the plants are removed, and the soil usually is not severely disturbed.

Cultivation is defined as plowing and other tilling of the soil to prepare a seedbed, kill weeds, and raise a crop. As with *clearing*, cultivation is such a severely disturbing activity that a Natural Community is usually evaluated in the context of *recovery* after past cultivation. If an area is currently cultivated, it is Grade E (Cropland). If the cultivated field has been abandoned and wild vegetation is recovering in the area, then the Natural Community is graded according to the degree to which it has reverted after cultivation has ceased.

Deer Overabundance is defined as the effects of foraging and other activities by white-tailed deer that are serious enough to significantly alter the ecology of a Natural Community. Although the effects of overly abundant deer can be similar to pasturage by domestic stock, Deer Overabundance is treated as a Disturbance Regime separate from Grazing.

Drainage is artificial removal of surface water, soil water, and shallow groundwater by ditching, stream channelization, underdraining (*i.e.* subsurface drainage tile lines), and drawdown from wells. Levees and pumping stations may also be employed as part of an artificial drainage system.

Earthmoving consists of major soil disturbances other than cultivation. Example: bulldozing to scrape and re-deposit soil in order to re-contour the land surface, commonly along a grass waterway or on a road right-of-way. A small area where earth has been moved (such as to make a single-car pull-off parking spot in the edge of a woods) may be treated as an *intrusion* instead of being classified and evaluated as an occurrence of the Earthmoving Disturbance Regime. If the earthmoving is more extensive, it usually results in the conversion of an area to Developed Land (Grade E) — rather than lowering the grade of the community that was disturbed. As with cultivation and clearing, an area that has been affected by earthmoving may have recovered to the point that it is at least Grade D (not Grade E, or bare earth).

Faunal Exploitation and Disturbance is defined as killing or otherwise interfering with the life of wild animals: hunting, fishing, trapping, roadkills, harassment by humans and human environs, etc. Destruction or disturbance of animal habitats is not addressed here; instead it is covered by other Disturbance Regimes.

Fire is wildland fire in any form and from any origin (either a prescribed burn or a wildfire).

Fire Suppression is defined as the effects of fire being reduced in frequency or completely excluded from a Natural Community whose character was naturally maintained by periodic burning.

Flooding is disturbance by water either flowing over or standing on land that usually is not covered by water.

Grazing is pasturage by domestic livestock. Although this Disturbance Regime is traditionally termed Grazing, it might be more aptly called *pasturage*, for two reasons. (1) Strictly speaking, according to some definitions, *grazing* refers to eating *herbaceous* vegetation, and *browsing* refers to eating *woody* plants. (2) The impact of domestic livestock in a pastured Natural Community extends beyond the vegetation to the soil, water, and fauna.

Insects and Pathogens include insect pests and diseases that have a significant impact on a community's composition and structure.

Intrusions are either manmade objects (such as a structure), or focal points of very localized, intense disturbance (an ORV trail or a household dump, for instance). An intrusion does not just *damage* a Natural Community: it actually *replaces* the community in the limited area that it occupies. If an intrusive feature is large enough, it is not treated as an intrusion within a Natural Community; instead it is mapped and classified as a separate Natural Community (*i.e.* as some kind of Developed Land). Intrusions are further discussed on page 3.

Invasive Species are highly competitive, non-indigenous plants and animals that have the proven potential to become so abundant in a Natural Community that they significantly change the character of the community. This Disturbance Regime does not include fire-sensitive, native plants that encroach into formerly fire-maintained communities.

Logging is the act of cutting trees. Logging usually carries the connotation of large-scale or commercial tree-cutting, but this Disturbance Regime is defined broadly so that it also includes lesser disturbances such as removing a dead tree for firewood.

Mowing is cutting of herbaceous vegetation or small woody plants. This Disturbance Regime includes haying, which involves removal of the cut herbage.

Soil Movement, Erosion, and Deposition is defined as the natural removal, transport, and deposition of soil, including water-caused erosion and sedimentation, wind erosion and deposition (sand blowouts and dune formation), mass wasting (downslope movement via gravity), and bioturbation (primarily mixing or sorting of soil by burrowing animals).

Water Impoundment is the artificial retention of surface water by means of a dam (across a stream channel or between valley walls) or a dike (across a broad lowland).

Water Pollution is defined as an unnatural increase in dissolved or suspended solids (organic materials as well as inorganic fertilizers, biocides, and other industrial chemicals) from sewage, farm runoff, and other sources. Both surface water and groundwater are included in this Disturbance Regime. Sedimentation (siltation) in a body of water is not classified as water pollution; it is included in the Soil Movement, Erosion, and Deposition regime.

Weather and Climatic Extremes include storms (wind, rain, snow, ice, lightning), drought, and temperature extremes that injure or kill plants and animals or significantly alter their habitats.

Other Hydrological Disruptions include unnatural changes in the frequency, duration, and impact of moving surface or subsurface waters (other than artificial drainage and water impoundment, which are addressed with their own Disturbance Regimes). Example: increased flooding as a result of removal of vegetation farther upstream in a watershed.

Other Natural Biotic Processes are other activities by organisms that shift the condition of a community from the norm — such as strong interspecific competition and dominance, hemiparasitism, and unusually heavy herbivory (other than foraging by deer and domestic livestock). The activity of a beaver colony (damming and cutting) is an obvious example of this kind of disturbance.

Other Natural Abiotic Processes include disturbances by non-living natural agents that do not fit into another Disturbance Regime.

Other Artificial Disturbances are ones that do not fit into any other category. Examples: littering, soil contamination.

Artificial Disturbances in General: This category is applied where the Natural Community has been disturbed by an unnatural agent, but the Disturbance Regime either cannot be identified or is not being specified for some reason (*e.g.* the community appears to have possibly been affected by several different artificial disturbances, but the disturbances cannot be sorted out and named).

Natural Disturbances in General: This category is applied where the Natural Community has been disturbed by a natural agent, but the Disturbance Regime either cannot be identified or is not being specified for some reason (*e.g.* the community appears to have possibly been affected by several different natural disturbances, but the disturbances cannot be sorted out and named).

Two additional categories are not actually Disturbance Regimes, but they are needed to cover all of the possibilities that arise when a Quality Indicator is interpreted and translated to a corresponding Disturbance Factor:

Unknown disturbance: A Quality Indicator is annotated with "Unknown disturbance" if the Quality Indicator shows that the community evidently is disturbed, but the kind of Disturbance Factor cannot be identified. That is, the disturbance cannot even be categorized with *Artificial Disturbances in General*, or *Natural Disturbances in General*, or with one of the "other other" Disturbance Factors in Table 5 (*i.e.* numbers 21.99, 22.99, or 23.99).

No evident disturbance: The Quality Indicator does not show any evidence of disturbance. In addition, the Quality Indicator may or may not clearly indicate that the area is undisturbed.

After a 400-mile, late summer and early autumn sojourn across central Illinois in the early 1840s, Dr. Charles W. Short wrote,

The Flora of the prairies — the theme of so much admiration to those who view them with an ordinary eye, — does not, when closely examined by the Botanist, present that deep interest and attraction which he has been led to expect. Its leading feature is rather the unbounded profusion with which a few species occur in certain localities, than the mixed variety of many different species occurring any where. Thus from some elevated position in a large prairie the eye takes in at one glance thousands of acres, literally empurpled with the flowering spikes of several species of Liatris. . . . In other situations, where a depressed or flattened surface and clayey soil favor the continuance of moisture, a few species of yellow-flowered Coreopsis occur in such profuse abundance as to tinge the entire surface with a golden burnish. . . . This peculiarity of an aggregation of individuals of one or more species, to something like an exclusive monopoly of certain localities, obtains even in regard to those plants which are the rarest and least frequently met with; for whenever one specimen was found there generally occurred many more in the same immediate neighborhood. [NOTE 4]

Appendix 3
Disturbance Regimes and Disturbance Factors

Disturbance Regimes

A **Disturbance Factor** is an *intrusion* (a physical thing), an *activity*, or a *condition* of a Natural Community that affects or may affect the Natural Quality of the community.

A **Disturbance Regime** is a group of related Disturbance Factors. [*]

[*] In this context, a Disturbance Regime is defined differently than it is traditionally defined in ecology. Ecologists use the term *disturbance regime* to refer to a characteristic set of behaviors by a natural phenomenon, such as a *flooding regime* or a *fire regime* (*i.e.* fire season, intensity, rate of spread, distribution pattern, etc.).

In Table 5, about a hundred Disturbance Factors are arranged according to the above-listed Disturbance Regimes. The regimes are numbered with whole numbers, and the factors have numbers with decimals. Nos. 26 and 27 are not actually Disturbance Regimes but are needed to cover all of the possibilities that are encountered when evaluating a site.

Table 5. Disturbance Regimes and Disturbance Factors.

1. Clearing

1.01. Recent or active clearing
1.02. Former clearing
1.99. Other clearing effect

2. Cultivation

2.01. Plowing or other tilling
2.99. Other cultivation effect

3. Deer Overabundance

3.01. Damage to the native herbaceous flora and woody vegetation (including prevention of recruitment)
3.02. Encouragement of weedy and unpalatable plants
3.03. Damage to the soil (trampling, erosion)
3.99. Other effect of deer

4. Drainage

4.01. Ditching for surface drainage (including stream channelization)
4.02. Subsurface drainage tile line
4.03. Groundwater drawdown from wells (including irrigation systems)
4.04. Depletion of soil water by trees encroaching on a herbaceous wetland
4.05. Change in vegetation composition or structure in response to drainage
4.99. Other drainage effect

5. Earthmoving

5.01. Excavation (digging a hole)
5.02. Filling (raising a mound or filling a low area)
5.03. Re-contouring the land surface (scraping and redepositing soil)
5.99. Other earthmoving effect

6. Farming

6.01. Deposition of soil at the edge of a field
6.02. Herbicide application and herbicide drift

Table 5. Disturbance Regimes and Disturbance Factors, *continued*.

6.03. Planting
6.99. Other farming effect

7. Faunal Exploitation and Disturbance

7.01. Hunting, trapping, fishing
7.02. Disturbance by human visitation
7.03. Disturbance by urbanized and residential environs (roadkill, noise, lights, pets)
7.99. Other disturbance to animals

8. Fire

8.01. Reduction of invasive species (not including native woody encroachment)
8.02. Reduction of encroachment by fire-sensitive native species
8.03. Stimulation of fire-adapted native species
8.04. Thinning of the structure of a fire-adapted woody community that has grown up because of fire suppression
8.05. Accelerated soil erosion
8.06. Stimulation of invasive vegetation
8.07. Consumption of leaf litter and woody debris
8.08. Death or injury to woody plants (including resprouting and coppice growth)
8.99. Other fire effect

9. Fire Suppression

9.01. Exotic cool-season grasses and other exotics fostered by a lack of fire
9.02. Fire-adapted, native species declining or not reproducing
9.03. Fire-sensitive, native species spreading into formerly fire-maintained habitat
9.04. Increase in the density and canopy closure of woody vegetation
9.05. Shade-pruning of major lateral crown limbs on overstory trees
9.06. Suppression of vegetative growth, flowering, and fruiting
9.99. Other fire suppression effect

10. Flooding

10.01. Death of vegetation caused by unusually prolonged inundation
10.02. Decrease in flooding (volume, velocity, duration, impact)
10.03. Increase in flooding (volume, velocity, duration, impact)
10.04. Mechanical injury of floodplain vegetation and scouring of the soil surface, promoting early successional vegetation
10.05. Seasonal water level fluctuation
10.99. Other flooding effect

11. Grazing

11.01. Enhancement of snap diversity

Table 5. Disturbance Regimes and Disturbance Factors, *continued*.

11.02. Maintenance of habitat for native species that require bare soil and sparse vegetation
11.03. Reduction or control of woody growth in a formerly fire-maintained community
11.04. Browsing and hedging of woody plants; creation of a browse line; suppression of woody reproduction; coppice growth
11.05. Decrease in favored forage species; reduction in the diversity and abundance of conservative native species
11.06. Increase or persistence of unpalatable or grazing-adapted species
11.07. Soil erosion and compaction (trails, terracettes), root damage and injury or death of trees
11.99. Other grazing effect

12. Insects and Pathogens

12.01. Disease damage
12.02. Insect damage
12.99. Other insect or pathogen effect

13. Intrusions

13.01. Building or group of buildings (homesite, farmstead), abandoned
13.02. Building or group of buildings (homesite, farmstead), active
13.03. Road, active
13.04. Road, abandoned
13.05. Footpath or horse trail
13.06. Fence
13.07. Utility line, aboveground
13.08. Utility line, belowground
13.09. Other building, structure, or other intrusion
13.10. Dump, active
13.11. Dump, inactive
13.12. Cemetery
13.99. Other intrusion

14. Invasive Species

14.01. Exotic invasive species
14.02. Native invasive species
14.99. Other invasive species effect

15. Logging

15.01. Selective timber harvest
15.02. Clearcutting
15.03. Other tree-cutting (removal of firewood or hazardous trees)
15.99. Other tree-cutting effect

Table 5. Disturbance Regimes and Disturbance Factors, *continued*.

16. Mowing

16.01. Mowing of herbaceous vegetation (other than haying)
16.02. Mowing of woody vegetation, not maintaining desirable native vegetation
16.03. Infrequent cutting of native vegetation (*e.g.* under a powerline) inadvertently maintaining desirable native vegetation
16.04. Haying
16.99. Other mowing effect

17. Soil Movement, Erosion, and Deposition

17.01. Sheet, rill, or gully erosion and deposition
17.02. Mass wasting (soil creep, slumping, rockfall)
17.03. Stream entrenchment
17.04. Stream meandering
17.05. Floodplain scouring or sedimentation
17.06. Wind erosion and deposition
17.07. Bioturbation
17.99. Other soil movement, erosion, or deposition effect

18. Water Impoundment

18.01. Dam or dike
18.02. Inhibition of migration by aquatic life
18.03. Raising and stabilization of wetland water level (reduction or elimination of seasonal water-level fluctuations)
18.99. Other water impoundment effect

19. Water Pollution

19.01. Oil or other chemical spill
19.02. Nutrient enrichment from cropland runoff and sewage effluent (including livestock containment operations and septic tanks)
19.03. Sedimentation
19.99. Other water pollution effect

20. Weather and Climatic Extremes

20.01. Storm damage (windthrow, broken limbs)
20.02. Drought
20.03. Temperature extremes (heat, cold)
20.99. Other effect from weather or extreme climate

Table 5. Disturbance Regimes and Disturbance Factors, *continued*.

21. Other Natural Biotic Processes

21.01. Interspecific competition
21.02. Succession
21.03. Beaver disturbance
21.99. Other effect of a natural biotic process

22. Other Natural Abiotic Processes

22.99. Other effect of a natural abiotic process

23. Other Artificial Disturbances

23.01. Herb gathering (root digging), flower-picking, mushroom hunting, plant poaching (orchids)
23.02. Seed gathering for off-site restoration
23.03. Damage from road salt runoff and spray
23.04. Soil contamination (petroleum or other chemicals other than road salt)
23.05. Mine subsidence
23.06. Damage to vegetation and soil by recreational visitors
23.07. Vegetation restoration and management (planting, killing plants)
23.99. Other artificial disturbance

24. Artificial Disturbances in General

25. Natural Disturbances in General

26. Unknown disturbance

27. No evident disturbance

Appendix 4

Quality Indicators and Disturbance Factors

This appendix has a set of tables with Quality Indicators and Disturbance Factors for the following Survey Features:

Organization of Table 7

Table 7 consists of a series of smaller tables for individual Survey Features, as listed above. Information in each of the smaller tables is organized according to the four Grading Components:

Composition
Structure
Processes
Environment

The Grading Components are broken into a number of Sub-components, such as *Structure: Overstory Layer* and *Structure: Understory Layer*. The four Grading Components and their Sub-components are defined beginning on page 13.

For each Component and Sub-component, the table provides a list of Quality Indicators and the Disturbance Factors that are indicated by each Quality Indicator, plus brief notes about how to interpret the Quality Indicators and Disturbance Factors.

Quality Indicators

A *Quality Indicator* is a feature that (a) can be observed in the field (or can be identified from some source other than fieldwork), and (b) can be interpreted as an *indication* of some kind of disturbance or lack of disturbance to a Natural Community. The indicator may be (a) a kind of *intrusion* (a physical thing), (b) evidence of an *activity*, or (c) a *condition* of a Natural Community. A Quality Indicator is *evidence* of either a disturbance or the lack of disturbance in a community.

Within each section of a table (that is, beneath a particular heading), Quality Indicators in the first column are generally arranged alphabetically. Or in some parts of the tables, Quality Indicators that have positive (+) Disturbance Factors are listed ahead of Quality Indicators that have more-or-less neutral (±) or negative (–) Disturbance Factors. However, it is not possible or even desirable to arrange all entries alphabetically or in a strict order from positive to negative.

Wherever a group of plant species is listed for a Quality Indicator, the list is usually intended to be illustrative and not exhaustive. Many of the Quality Indicators refer to the *presence of*, *abundance of*, or *lack of* certain plants. In this context, the term "presence" has no indication of the number of plants. An "abundance of" a species is defined as "being substantially more common than usual, especially relative to other species." The "lack of" a species means "reduced below the usual or expected level" — not necessarily the complete absence of a species.

Disturbances and their effects on a community are expressed to various degrees, denoted as Low, Medium, or High (see page 17). Most Quality Indicators are listed on the chart in negative terms: an "Abundance of weeds" and a "Lack of conservative species." If a Quality Indicator were instead stated in the opposite terms (a "Lack of weeds" or an "Abundance of conservative species"), then the ratings Low and High would have opposite meanings.

Disturbance Factors

A Disturbance Factor is an *intrusion*, an *activity*, or a *condition* of a Natural Community that affects or may affect the Natural Quality of the community. The factor may or may not be directly observable in the field, and it can be either an *explanation for* or a *consequence of* a Quality Indicator.

The second and third columns of Table 7 list Disturbance Factors for each Quality Indicator. Entries in the third column are often descriptive and detailed, and they are not standardized according to a formal set of terminology. The numbers in the second column are part of a formally defined list of Disturbance Factors that is in Appendix 3, "Disturbance Regimes and Disturbance Factors." Appendix 3 provides a hierarchical framework and standard terminology for Disturbance Factors.

In the third column, each Disturbance Factor is preceded by a symbol that indicates its probable or potential Effect on the Survey Feature:

- – Negative effect
- \+ Positive effect
- ± Positive, negative, approximately neutral, or variable effect — depending on the community or individual circumstances
- ? Uncertain or unknown effect

Notes

The fourth column provides further information, especially cautions about how to interpret information in the other columns (*i.e.* important "exceptions to the rule").

The ecological impacts of disturbances are often complex, variable, and cryptic. A Quality Indicator is only an *indicator*, and a Disturbance Factor is only a *factor* — not necessarily "the answer." It would be impossible to spell out all of the mitigating circumstances and situations in which a statement in the table is not applicable. To make a statement always true, it would often be necessary to water it down with qualifiers such as *probably*, *generally*, and *usually* to the point that the statement would be almost meaningless.

Which Subdivisions of Table 7 to Consult

Table 7 consists of 14 subdivisions (smaller tables), each of which treats a different Survey Feature, as listed here:

7.1. Floodplain Forest
7.2. Forest
7.3. Herbaceous Communities in General
7.4. Prairie
7.5. Sand Prairie
7.6. Sand Savanna
7.7. Savanna
7.8. Seep
7.9. Standing Water
7.10. Stream
7.11. Vegetated Communities in General
7.12. Wet Prairie
7.13. Wetland
7.14. Wooded Communities in General

Table 6 shows which parts of Table 7 pertain to various units of the Natural Community Classification System. For instance, Table 6 shows that Floodplain Forest is treated by Tables 7.1, 7.2, 7.11, and 7.14. Floodplain Forest is a Community Subclass; when evaluating any of the Community Types that are in the Floodplain Forest Subclass, those four tables need to be consulted.

Table 6. Natural Communities treated by Table 7.

Community Class, Subclass, or Type	Subdivision of Table 7													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Floodplain Forest	X	X									X			X
Forest		X									X			X
Open Water *									X					
Prairie			X	X							X			
Sand Prairie			X	X	X						X			
Sand Savanna			X	X	X	X	X				X			X
Savanna			X	X			X				X			X
Seep			X					X			X		X	X
Stream									X					
Wet Prairie			X	X							X	X		
Wetland			X								X		X	X

* The *Open Water* Community Class is defined by the Illinois Department of Natural Resources to include the two Subclasses: *Lake* and *Pond*. Streams are placed in their own Community Class even though they are also open-water communities.

Table 7.1. Quality Indicators and Disturbance Factors for Floodplain Forest.

Floodplain Forest (a Community Subclass) is also covered by the following other tables:

Forest
Vegetated Communities in General
Wooded Communities in General

Quality Indicators	Disturbance Factors		Notes
STRUCTURE: GROUND LAYER			
Lack of stumps or other evidence of logging	26	± Possibly a long-term absence of logging	Tree stumps rot away much faster in floodplain forests than in upland forests because biological decomposition is more rapid in moist conditions, and because "softwoods" such as Acer saccharinum decay faster than upland oaks. Flood scouring may obliterate or obscure logging trails and other damage from tree-cutting, so the evidence of logging does not last as long on floodplains as on uplands.

Table 7.2. Quality Indicators and Disturbance Factors for Forest.

Forest (a Community Class) is also covered by the following other tables:

Vegetated Communities in General
Wooded Communities in General

Quality Indicators	Disturbance Factors		Notes
COMPOSITION: INDIVIDUAL SPECIES			
Abundance of Asimina triloba	11.06	– Grazing	Pawpaw may have a competitive advantage over other understory plants because it is not eaten by livestock or deer, but may be abundant in areas that are not browsed heavily, simply because it spread well by root suckers.
	3.01	– Deer overabundance	
	21.01	± Highly competitive, clonal growth	
STRUCTURE: OVERSTORY LAYER			
Oldest trees with a tall trunk, major lateral crown limbs that are ascending to spreading, a lack of large, shade-pruned, lateral limbs and limb stubs on the middle and lower trunk.	27	Old-growth conditions	Several characteristics of old trees and old-growth forests need to be added to the table.
Oldest trees with large, shade-pruned, lateral limbs and limb stubs on the middle and lower trunk.	9.05	± Fire suppression and shade pruning	This growth form indicates that the stand was formerly more open (usually because of a history of recurrent fire or prolonged grazing). The community may have once been an open woodland that has developed into a closed-canopy forest.
	27	+ Protection and recovery from a long period of disturbance in the past	
Small gaps in the tree canopy	15.01	– Selective logging	
	11.07 11.04	– Grazing	Pasturage over a period of many years may kill some overstory trees. Continual grazing by livestock will help maintain any canopy gaps that develop because young trees are eaten and prevented from growing up.
	8.08	± Fire	Fire can have the same effect as grazing: killing overstory trees and preventing new trees from growing up and into the canopy gaps. When immigrant farmers first occupied the land in the 1800s, grazing replaced fires as the mechanism that kept the woods relatively open.
	21, 22	± Death of single trees from any of a number of other natural causes	

Quality Indicators	Disturbance Factors		Notes
	27	± Extreme environment inhibiting the growth of trees that would otherwise close the canopy gaps	Canopy gaps may persist for a long time (often for several decades or longer) on wet sites or dry sites.
STRUCTURE: UNDERSTORY LAYER			
Euonymus atropurpureus not browsed very much	27	+ Deer not abundant	Wahoo is highly favored by deer, and it is likely to escape browsing only where it is inaccessible (*e.g.* on a steep bank).
Aesculus glabra severely hedged	3.01	– Deer overabundance	In a forest that is overpopulated by deer, young buckeyes have only stubs for branches.
Lindera benzoin browsed	3.01	– Deer overabundance	Apparently deer like to eat spicebush, but they seem to be selective, favoring new growth. Consequently deer may repeatedly browse on tender, young shoots that are produced by a bush that has recently been browsed — while the deer ignore nearby bushes that have hardened shoots because they were not browsed earlier in the season.
ENVIRONMENT: GEOMORPHOLOGY			
Pit-and-mound microtopography	20.01	± Windthrow	
	27	+ Big, old trees	
	27	+ Lack of cultivation	Clearing and farming obliterates pit-and-mound microtopography.

Table 7.3. Quality Indicators and Disturbance Factors for Herbaceous Communities in General.			
Quality Indicators	**Disturbance Factors**		**Notes**
COMPOSITION: GROUPS OF SPECIES			
Abundance of annual and biennial species	2.01	– Cultivation	
	5	– Earthmoving	
	10.04 10.05	± Flooding (soil scouring and deposition; inundation followed by drawdown)	
	6.02	– Herbiciding	
	24, 25	– Other disturbances that remove vegetation and creates bare soil	
Abundance of rhizomatous, clone-forming composites: Aster, Solidago, Euthamia, Eupatorium, Helianthus	2.01	– Cultivation	
	11.06	– Grazing	
	16	– Mowing	
	5	– Earthmoving	
	6.01 6.02	– Other disturbances, especially edge effects next to farm fields (herbicide drift, sedimentation)	
Lack of broadleaf herbs	6.02	– Application of broadleaf herbicide	Herbiciding to get rid of broadleafs (cemetery prairies, perhaps some prairies that were managed as haymeadows or pastureland (get rid of thistles)).
STRUCTURE: HORIZONTAL PATTERN			
Distinctly patchy vegetation pattern, not obviously related to environmental patchiness	2.01 5, 24, 25	– Usually soil disturbance, but possibly also other kinds of disturbances	A recently abandoned field that is colonized by annuals and biennials may exhibit a patchy vegetation pattern because of the way in which various species seeded into different parts of the field. Once a field is colonized by rhizomatous perennials, a patchy pattern may develop and persist for decades as clones expand. Over the long term, the patches will break up and become less distinct as clones senesce and as adjacent clones merge and pass through each other.
Patches of shrubs and young trees growing up in a matrix of herbaceous vegetation	21.02	± Vegetation succession	Woody vegetation naturally succeeds herbaceous vegetation in most situations. Exclusion of disturbances usually speeds up the process of succession.

Table 7.3. Herbaceous Communities in General.

Quality Indicators	Disturbance Factors		Notes
	9.01 9.03	± Fire suppression	Woody growth in prairies is usually blamed on fire suppression, but the dramatic present-day increase of woody invasion may be due (in part) to the fact that "the woodies never got there before" — but now seed sources, dispersers, and disturbances are so ubiquitous and close-by that the prairie vegetation is being overwhelmed by a floodtide of trees and shrubs.
	11.06	– Grazing	Grazing generally retards woody growth, but grazing may actually foster the establishment of woody plants by creating a seed bed of bare soil and by reducing competition from herbaceous vegetation. This situation is especially true if heavy grazing is followed by a period without grazing — which allows the newly established woody plants to grow up above the herbaceous plants.
	4	– Drainage	Drainage may foster the spread of woody plants into an area that was too wet for most trees and shrubs before it was drained.
Streaked appearance of the vegetation (certain plants growing in more or less faint or discontinuous rows)	2.01	– Cultivation	Streaks appear because some species are concentrated in the traces of moist furrows.
	16	– Mowing	Ruts and gouges from the mowing machine cause weedy streaks.
	6.03 23.07	– Planting	If grasses or other plants are seeded (drilled) into a matrix of wild vegetation, the pattern of planting rows may persist for years.
STRUCTURE: GROUND LAYER			
Exceptionally vigorous growth, flowering, or fruiting of fire-adapted species	8.03	± Fire, especially since the previous growing season	The Disturbance Factor has a ± value instead of a + value because the vigorous growth and flowering is a short-term response, and it is not (in itself) a true reflection of higher Natural Quality.
Lack of vigor in the growth, flowering, or fruiting of fire-adapted species	9.06	– Long-term fire suppression	

Table 7.4. Quality Indicators and Disturbance Factors for Prairie.

Prairie (a Community Class) is also treated by the following other tables:

Herbaceous Communities in General
Vegetated Communities in General

Quality Indicators	Disturbance Factors		Notes
COMPOSITION: GROUPS OF SPECIES			
Presence of heavy-seeded, deep-rooted legumes: Dalea, Baptisia, Amorpha	27	+ Lack of soil disturbance	Dalea purpurea may spread onto a roadcut if there is an immediately adjacent seed source. This species also appears to recover well in grazed hill prairies after the livestock are removed for many years.
	27	+ Lack of grazing	
Presence of shrubby snaps: Ceanothus, Amorpha, Salix humilis	27	+ Lack of cultivation	Rosa carolina is a woody snap, but it is much less conservative than Ceanothus, Amorpha, or Salix humilis.
Species that are most typical of dry or dry-mesic prairie, growing in mesic prairie: Stipa spartea, Echinacea pallida, Dalea candida	16.01 16.02	± Mowing	These species are likely to decline and even die out in mesic prairie unless some kind of periodic light disturbance (other than fire) reduces competition from typical mesic prairie species.
	11.01	± Grazing	
Abundance of weedier or less conservative snaps on eroded earth ("thin, poor" soil): Oligoneuron rigidum, Sporobolus asper, Ratibida pinnata, Aster ericoides, Silphium terebinthinaceum, Schizachyrium	11.07 2.01 5.01 5.03 17.01 17.02 17.04	± Soil erosion (often initiated by overgrazing or cultivation); or slumping above an active stream meander; or earthmoving that has exposed unweathered, calcareous glacial drift	A number of the weedier snaps are calciphilic and thrive on exposures of raw, unleached glacial drift where even the common exotic grasses and weeds do not thrive.
Concentration of a single species that is not strongly rhizomatous (also, the high density does not appear to be related to a localized edaphic condition or an obvious disturbance history). Representative snaps: Parthenium, Liatris, Eryngium, Ratibida, Tephrosia	24	± Some sort of long-ago or undetectable physical disturbance (light disturbance to the soil is the usual suspect)	
	27	± No evident reason	
	21.01	± Competitive exclusion of other species, especially via allelopathy in some species	
Abundance of snaps with large, deep taproots: Silphium terebinthinaceum, S. laciniatum, Eryngium	5.03	– Earthmoving (scraping and removal of the soil surface), typically along a road or railroad	Scraping of the soil surface does not kill forbs that have deep taproots, and the bare soil may be an ideal seedbed for these species.

Table 7.4. Prairie.

Quality Indicators	Disturbance Factors		Notes
Lack of especially palatable and favored forage species: legumes, Silphium, showy and nectar-laden flowers	11.05	– Grazing	
	3.01	– Deer overabundance	
Lack of early spring-blooming flora: Phlox, Lithospermum	6.02	– Early-season application of broadleaf herbicide	
Lack of midsummer-flowering forbs	16.04	– Haying	A long history of removing hay will deplete species that flower and set seed during the haying season.
Lack of broadleaf herbs	6.02	– Application of broadleaf herbicide	
Gentiana puberulenta in a Poa pratensis sod	11.06	– Grazing	Downy gentian can be naturally common in Grade A prairie. It may also be common in prairie that has been grazed so heavily that it is a bluegrass turf.
Helianthus mollis in a dense patch, with relatively little else growing with it	21.01	± Allelopathy	
Pedicularis and Comandra growing among sparse, stunted grasses; small perennials such as Hypoxis, Gentiana, and Sisyrinchium may be conspicuous	21.01	± Hemiparasitism	Pedicularis and Comandra are hemiparasites that reduce the vigor of grasses, improving the habitat for diminutive species. The smaller plants may or may not be more abundant, but they are more visible where the vegetation is sparser and lower.
Abundance or dominance of exotic cool-season grasses: Poa pratensis, P. compressa, Festuca elatior, F. pratensis, Bromus inermis, Phalaris arundinacea, Dactylis, Phleum	11.06	– Grazing	Phalaris arundinacea and Bromus inermis may strongly dominate a prairie that has not been significantly disturbed other than by fire suppression and perhaps long-ago grazing.
	2.01	– Cultivation (followed by long-term abandonment and often grazing)	
	9.01	– Fire suppression	
	14.01	– Invasive species	
	6.03	– Seeding of cool-season grasses	
COMPOSITION: INDIVIDUAL SPECIES			
Corylus americana thriving	8.03	+ Fire	Hazel may increase in a prairie that is burned, creating a patch of Shrub Prairie.

Table 7.4. Prairie.

Quality Indicators	Disturbance Factors		Notes
Poa pratensis in suppressed condition	14.01	± Invasive species	Kentucky bluegrass is nearly ubiquitous in well drained prairies. It has insinuated itself into the fabric of prairie communities to the extent that it has been characterized as "acting like a native" in situations where it does not dominate. The species may even be found in half or more of the vegetation sampling plots in many Grade A and Grade B prairies, but in such situations, it grows as a low grass beneath and among other species. For this Quality Indicator, the Disturbance Factor is annotated as ± even though the species is an invasive exotic because it can be considered almost innocuous in this condition.
Poa pratensis not in a suppressed condition	14.01	– Invasive species	
	11.06	– Grazing	Pasturage causes Kentucky bluegrass to increase dramatically and form a sod. After livestock are removed, this grass can persist as a dense turf for many years.
	9.01	– Fire suppression	A sward of Poa pratensis will stop the spread of a fire.
	24	– Other disturbance	
Sporobolus heterolepis	27	+ Lack of cultivation	Dominance by prairie dropseed is a hallmark indicator of virgin mesic prairie. This grass may also withstand considerable grazing pressure, and it may spread onto roadcuts.

Table 7.4. Prairie.

Quality Indicators	Disturbance Factors		Notes
STRUCTURE: GROUND LAYER			
Vigorous vegetative growth and abundant flowering of grasses and forbs	8.03	± Recent fire	In the first growing season after a prairie has burned, herbaceous plants may grow about 50% to 100% taller than they grew before the fire. Flowering of snaps (including woody snaps) after a burn is likely to be spectacular in contrast to a flowering in a prairie that has not been burned in more than a few years. If half of a Grade A prairie is viewed in the first growing season after a fire and it is compared with half of the prairie that has not burned for more than a year or two, the superficial appearance of the vegetation may give the first impression that the unburned part must be Grade B. Closer inspection (especially vegetation sampling) will reveal that the species richness on both sides of the fire line is approximately the same, but the plants in the unburned part are smaller, flowering less, and flowering later. Snaps respond positively to fire, and fire is necessary for the long-term maintenance of a prairie, but in this case, the Disturbance Factor has a ± value instead of a + value because the vigorous growth and flowering is a short-term response, and it is not (in itself) a true reflection of higher Natural Quality.
Prairie grass growing short (perhaps even seeming dwarfed), not flowering well	27, 21	+ Long-term stability and lack of disturbance, resulting in strong competition between individual plants for below-ground resources	Sporobolus heterolepis never grows tall.
Prairie grass growing especially tall and robust, flowering well	8.03	+ Fire	
	21.99 22.99 23.99	± Light soil disturbance that reduces competition from other plants but does not cause long-term damage to the prairie grass	
	23.07	± Prairie restoration	Prairie grasses often grow more vigorously in a restoration than in a natural prairie.0

Table 7.4. Prairie.

Quality Indicators	Disturbance Factors		Notes
Presence of the following low shrubs, which rarely grow taller than the ground layer: Amorpha canescens, Ceanothus americanus, C. herbaceus, Salix humilis	27	+ Lack of disturbance	The presence of shrubs is generally considered to be a negative characteristic (or at least a "red flag") in prairie communities, but these particular low, prairie-adapted species are indicators of high quality.
STRUCTURE: SHRUB LAYER			
Presence of Corylus americana	—	See the entry for Corylus americana above, under the heading *Composition: Individual Species*.	
Presence of the shrubs other than Amorpha, Ceanothus, Corylus, Rosa carolina, and Salix humilis	9.01 9.03	– Fire suppression	
	21.02	– Vegetation succession	
ENVIRONMENT: SOIL			
Terracettes	11.07	– Grazing	Terracettes are best developed in Loess Hill Prairies. But if grazing is heavy enough, terracettes may develop on a steep slope of any kind of parent material.

Table 7.5. Quality Indicators and Disturbance Factors for Sand Prairie.

Sand Prairie (a Community Subclass) is also treated by the following other tables:

Herbaceous Communities in General
Prairie
Vegetated Communities in General

Quality Indicators	Disturbance Factors		Notes
COMPOSITION: GROUPS OF SPECIES			
Lack of shallow-rooted perennial species such as Viola pedata	17.06	± Blowing sand	
COMPOSITION: INDIVIDUAL SPECIES			
Abundance of Opuntia	11.06	– Grazing	
STRUCTURE: GROUND LAYER			
Bare soil between clumps of perennial bunch grasses	27	+ Long-term stability and lack of disturbance	

Table 7.6. Quality Indicators and Disturbance Factors for Sand Savanna.

Sand Savanna (a Community Subclass) is also treated by the following other tables:

Herbaceous Communities in General
Prairie
Sand Prairie
Savanna
Vegetated Communities in General
Wooded Communities in General

Quality Indicators	Disturbance Factors		Notes
COMPOSITION: GROUPS OF SPECIES			
Presence of earth star mushrooms (Geaster) and British soldier lichens (Cladonia)	27	+ Lack of soil disturbance (trampling)	

Table 7.7. Quality Indicators and Disturbance Factors for Savanna.

Savanna (a Community Class) is also treated by the following other tables:

Herbaceous Communities in General
Prairie
Vegetated Communities in General
Wooded Communities in General

Quality Indicators	Disturbance Factors		Notes

Table 7.8. Quality Indicators and Disturbance Factors for Seep.

Seep (a Community Subclass) is also treated by the following other tables:

Herbaceous Communities in General
Vegetated Communities in General
Wetland
Wooded Communities in General

Quality Indicators	Disturbance Factors		Notes
ENVIRONMENT: WATER			
Oily (opaque, iridescent) film on the surface of the water	27	± Natural conditions, not polluted water	Water that collects in shallow pools in seepage areas often has an oily surface sheen. This is a natural condition (the product of bacterial action?), not unnatural pollution.

Table 7.9. Quality Indicators and Disturbance Factors for Standing Water.			
Quality Indicators	**Disturbance Factors**		**Notes**
COMPOSITION: GROUPS OF SPECIES			
Algal bloom	19.01	– Fertilizer runoff, sewage effluent	
ENVIRONMENT: WATER			
Standing water that is clear (neither turbid nor with an algal bloom) but that has a blue or green tint	19.01	– Chemical dye (Aquashade or Aquashadow)	These dyes prevent the growth of aquatic plants. They are most commonly used in ponds that are landscaping features near residences.
	5.01	– Excavation into glacial drift	Water may have a turquoise cast because of dissolved calcium; this is most common in roadside borrow pits that are excavated into calcareous glacial drift

Table 7.10. Quality Indicators and Disturbance Factors for Stream.			
Quality Indicators	**Disturbance Factors**		**Notes**
PROCESSES			
Decrease in the frequency and duration of over-bank flooding	17.03	– Stream entrenchment	
Sudden drainage of a wetland adjacent to a stream channel	17.04	± Stream meandering	
	17.03	– Stream entrenchment	
Trees being undermined and uprooted, toppling into a stream channel	17.04	± Stream meandering	The rate at which a stream channel is widening or moving laterally can be judged in part by determining the age of trees that are falling into the channel.
	17.03	– Stream entrenchment	
ENVIRONMENT: WATER			
Algal bloom	19.02	– Fertilizer runoff, sewage effluent	
ENVIRONMENT: GEOMORPHOLOGY			
Ancient, long-buried geologic material freshly exposed in a streambank	17.03	– Stream entrenchment	
	17.04	± Stream meandering	
Gullies newly branching from a stream channel	17.03	– Stream entrenchment	
Rapid lowering of the streambed, evidenced by a “nickpoint”	17.03	– Stream entrenchment	A nickpoint marks the upstream limit of entrenchment, where the streambed drops abruptly.
Natural levees being destroyed instead of maintained by floodwaters	17.03	– Stream entrenchment	
“Perched” tributaries	17.03	– Stream entrenchment	A perched tributary has a bed that is abruptly higher than the bed of the stream that it joins, at the point where the two streams come together.
Soil pipes draining into a stream channel	17.03	– Stream entrenchment	
Soil pipes collapsing to form small sinkholes and open gullies on the surface adjacent to a stream channel	17.03	– Stream entrenchment	
Stream channel and an incipient new floodplain newly forming within the widened and deepened cross-section of the old channel	17.03	– Stream entrenchment	

Table 7.10. Stream.

Quality Indicators	Disturbance Factors		Notes
Streambanks failing and sloughing into the channel, making the channel wider	17.03	– Stream entrenchment	Channel *widening* must be distinguished from channel *meandering*. When a channel meanders, the streambank erodes away on one side of the channel while it accretes on the opposite side. When a channel widens, both banks retreat at the same time.
Surface water diverted into a new void that has developed beneath the streambed (in the very upper reaches of a stream channel)	17.03	– Stream entrenchment	
V-shaped cross-section in a stream channel	17.03	– Stream entrenchment	
ENVIRONMENT: INTRUSIONS			
Dam	18.01	– Impoundment	
	18.02	– Interference with upstream and downstream movements by aquatic life	

Table 7.11. Quality Indicators and Disturbance Factors for Vegetated Communities in General.			
Quality Indicators	**Disturbance Factors**		**Notes**
COMPOSITION: GROUPS OF SPECIES			
Presence of conservative species in general	27	+ Absence of degrading disturbances	This is the single most important indicator of the Natural Quality and history of development, disturbance, and recovery of a Natural Community. Conservative species may sometimes occur in anomalous degraded habitats, though.
	21.99 22.99	+ Occurrence of beneficial disturbances	
Depauperate native species diversity (with fewer species than normal)	2.01	– Cultivation and earthmoving	Some Community Types have a higher species diversity than others. Different occurrences of a Community Type can naturally be noticeably more or less diverse than others.
	11.05	– Grazing	
	14.01 14.02	– Native or non-native invasive species out-competing the indigenous flora	
Dominance by one or a few plant species	15	– Logging	If a forest is clearcut, a few early successional tree species such as Liriodendron may dominate the patch that was cut.
	1.02	– Clearing	Old clearings of formerly cultivated patches may be colonized and dominated by a few weedy colonizers.
	2.01	– Cultivation	
	16.01	– Mowing	Mowing and grazing can foster the dominance of a few grasses such as Poa pratensis.
	11.06	– Grazing	
	14.01 14.02	– Invasive species	Bromus inermis, Phragmites australis, and Phalaris arundinacea are so strongly competitive and such successful invaders because they are rhizomatous or stoloniferous and allelopathic.
	21.01	± Allelopathy	
	27	+ Natural conditions	Local dominance by one or a few species may be a natural occurrence, especially in extreme environments (*e.g.* a tupelo swamp).
Weedy herbaceous plants (native and non-native)	2.01	– Cultivation	In this context, weedy herbs are annuals and early successional species.
	11.02 11.06	– Grazing	
	3.02	– Overabundant deer	

Table 7.11. Vegetated Communities in General.

Quality Indicators	Disturbance Factors		Notes
	24, 25	± Other disturbances, most notably natural flooding	
Exotic species	2.01	– Cultivation	
	11.06	– Grazing	
	16.01 16.04	– Mowing	
	9.01	– Fire suppression	
	14.01	– Invasive species	
	24, 25, 27	± Any of a number of other disturbances, or no disturbance in particular	The majority of exotic species inhabit disturbed areas, and they do not appear to have a significant impact when they occur in low numbers in native vegetation.
Abundance of woody plants that are thorny or otherwise unpalatable: Rosa, Rubus, Ribes, Crataegus, Maclura, Gleditsia, Zanthoxylum, Symphoricarpos	11.06	– Grazing	Unpalatable woody plants can be locally common to abundant even in the absence of any history of grazing.
	3.02	– Deer overabundance	
Presence of old shade trees (notably sugar maples on hilltops) and specimen trees (*e.g.* conifers) growing untended	13.01	– Old homesite	
	13.04	– Abandoned driveway	
Abundance of invasive, exotic shrubs that were commonly planted for wildlife food and cover: Lonicera maackii (and other bush honeysuckles), Rosa multiflora, Elaeagnus umbellatus	14.01	– Invasive species	These species are well naturalized, but some of the heaviest infestations are still in and around the sites where they were first introduced for conservation purposes.
	23.02	– Proximity to long-established plantings in State Parks, conservation areas, Interstate highway rights-of-way	

Table 7.11. Vegetated Communities in General.

Quality Indicators	Disturbance Factors		Notes
Abundance and wide variety of invasive, exotic shrubs and trees that are commonly planted as hedges, landscape ornamentals, and shade trees: Berberis, Euonymus, Ligustrum, Malus, Pyrus calleryana, Crataegus, Ulmus pumila, Acer platanoides	14.01	– Invasive species	Some of these species are well naturalized, but the greatest diversity is found in wildlands close to residential areas, office parks, and similar areas that have plenty of landscape plantings that serve as seed sources.
	23.02	– Proximity to Developed Land, especially a residential area	
Presence of a wide variety of horticultural herbs (garden vegetables and flowers): Lycopersicum, Citrullus, Ajuga, Papaver, Petunia, Cleome	23.02	– Proximity to a residential area	These plants are not invasives because they rarely become naturalized — even locally. Such species usually do not spread from where they were initially established in the wild, and they tend to die out rather than reproducing. A cultivated population (most often upstream or upslope) must act as a source for continual reestablishment if such a species is to persist in the wild.
Presence of rare, unusual, especially showy, peripheral, or disjunct North American wildflowers: Asclepias tuberosa, Coreopsis lanceolata, Penstemon grandiflorus, Salvia azurea var. grandiflora, Echinacea purpurea, Gaillardia pulchella, Ratibida columnifera, Cosmos bipinnatus, Eschscholzia californica	27	+ A natural occurrence, not the result of human manipulation	Some showy American wildflowers that are not indigenous to the local area are spreading from restorations and other plantings, making it more difficult to evaluate native remnants. Restorations may be enhanced with rare species. Adequately detailed and complete records of restoration efforts are likely to be impossible to obtain, sometimes making it impossible to determine whether a species was artificially introduced to a site.
	23.07	– Enhancement of the indigenous flora during restoration activities	
	23.07	– Inclusion of showy non-native wildflowers in seed mixes	
	6.03	– Wildlife food plot (legumes seeded to attract and nourish trophy bucks)	
Presence of non-invasive horticultural species growing untended: Syringa, Narcissus, fruit trees, Yucca	13.01	– Former homesite	
	13.12	– Abandoned cemetery	
Abundance of annual warm-season grasses: Setaria, Bromus, Hordeum jubatum, H. pusillum, Sporobolus, Digitaria, Echinochloa, Panicum	20.15	– Soil disturbance (cultivation, earthmoving)	A number of annual warm-season grasses are a natural component of sand prairies and streambanks.
	11.07	– Overgrazing (trampling)	
	6.02	– Herbiciding	

Table 7.11. Vegetated Communities in General.

Quality Indicators	Disturbance Factors		Notes
	23.04	– Road salt	
	16.01	– Mowing (close enough to scalp the soil)	
	10.05	± Ponding of water in a ditch or shallow basin, followed by drawdown and exposure of a mudflat	
Abundance of herbaceous plants that are spiny, prickly, extra hairy, poisonous, or otherwise unpalatable: Verbascum thapsus, Hieracium, Cirsium, Vernonia, Eupatorium, Asclepias, resinous composites other than Silphium	11.06	– Grazing	Many unpalatable herbs are naturally common on dry sites, particularly sand deposits.
Abundance of native "hitchhiker" herbs with stickery fruits: Circaea, Bidens, Hackelia, Agrimonia, Desmodium, Geum, Galium, umbellifers	11.06	– Grazing	This Quality Indicator is found more often in shaded habitats and somewhat more often in lowland areas.
	3.02	– Deer overabundance	
	10.99 23.06 24, 25	± Disturbed conditions in general, particularly flooding as well as visitation by animals, hikers, hunters, and equestrians	
Assemblage of nitrogen-loving exotic species: Nepeta, Arctium, and Leonurus are the Big Three	13.01	– Old homesite or farmyard	Food waste, manure, and urine from people, pets, and farm animals elevate the nitrogen levels in dooryards and farmyards.
	23.04	– Nitrogen enrichment	
COMPOSITION: INDIVIDUAL SPECIES			
Ambrosia trifida	24 , 25	– Disturbances that create bare soil	Giant ragweed is an annual, but it is allelopathic, and a dense stand can persist for many years after it becomes established from a single disturbance event.
Equisetum arvense Equisetum hyemale	5.1	– Artificial deposit of sand, gravel, or cinders mixed in the soil	
	27	± Naturally sandy soil	Horsetails also grow in loamy soil, but a large, dense colony of Equisetum often indicates a sand deposit.

Table 7.11. Vegetated Communities in General.

Quality Indicators	Disturbance Factors		Notes
Juniperus virginiana growing anywhere except on or near a bedrock outcrop or other natural firebreak	2.01	– Cultivation	Red cedars commonly colonize old fields.
	11.06	– Grazing	Grazing can stimulate the invasion of cedars into a prairie.
	9.03	– Fire suppression	Red cedars are highly vulnerable to fire.
	13.12	– Cemetery	Cedars and other conifers are commonly planted in graveyards. A single old cedar in a woods may mark a gravesite.
STRUCTURE: HORIZONTAL PATTERN			
Boundary between communities or vegetation types that is extra sharp or rectilinear	1.02	– Clearing	
	15	– Logging	
	11	– Grazing (if attended by fencing)	
	16	– Mowing	
	2.01	– Cultivation	
	24	– Other human activities	
STRUCTURE: GROUND LAYER			
Lack of a buildup of leaf litter and duff	8.07	± Fire	Consumption of leaf litter and duff by fire is accompanied by a dramatic increase in vegetative growth and flowering in most herbaceous communities.
	11.02	± Grazing	
	16.01 16.04	– Mowing	
	21.01	± High rate of biological decomposition	Moist and flood-prone habitats are most likely to exhibit rapid rotting of dead plants. The fallen leaves of oaks last much longer than those of elms, ashes, and maples because oak leaves have a lower mineral content and higher concentrations of tannins, thus inhibiting microbial action and feeding by detritivores.

Table 7.11. Vegetated Communities in General.

Quality Indicators	Disturbance Factors		Notes
Plants and plant parts broken off or dug up, evidently by people instead of animals	23.01	– Herb gathering, flower-picking, mushroom hunting, plant poaching	
STRUCTURE: UNDERSTORY LAYER			
Young trees growing in a dense stand	15, 21	– Logging, followed by release of advance regeneration and growth of new trees	
	1.02 21.02	– Recovery after clearing	
	12.01 12.02 20.01 21.03 21.02	± Recovery after disease, insect, storm, or beaver damage	
	10.04 21.02	± Recovery after flood damage	
	9.03 21.02	± Afforestation because of fire suppression	
	4.05 21.02	– Afforestation after drainage of a wetland	
	17.04 17.05 21.02	± Afforestation on newly exposed or newly created land in a floodplain	
STRUCTURE IN GENERAL			
Deformed, discolored, chlorotic, tattered, skeletonized, or otherwise damaged or dying leaves or entire plants	6.02	– Herbicide damage	
	12.02	± Insect damage	
	12.01	± Disease damage	

Table 7.11. Vegetated Communities in General.

Quality Indicators	Disturbance Factors		Notes
	23.99	– Death ray from flying saucer	
PROCESSES			
Flowers blooming later in the season than normal	16.01 16.04	– Mowing	
ENVIRONMENT: SOIL			
A horizon increased (deeper than expected)	2.01	– Cultivation (lowering the adjacent soil surface, creating the illusion that the deeper A horizon has been thickened)	
	5.02	– Earthmoving	
	10.04	±Sedimentation	Sedimentation and wind deposition are annotated as ± because they are commonly natural occurrences.
	17.06	±Wind deposition	
A horizon truncated (less depth than expected)	2.01	– Cultivation	
	17.01 11.07	– Sheet erosion on an uncultivated slope, often caused by grazing	
	5.03	– Earthmoving (reshaping a ditch)	
	17.06	±Wind erosion	
Gullies	2.01	– Cultivation	
	11.07	– Grazing	
	17.03	– Stream entrenchment	
	23.06	– Driving ORVs, and other activities that destroy vegetation	

Table 7.11. Vegetated Communities in General.

Quality Indicators	Disturbance Factors		Notes
Light-colored soil mixed with or on top of darker soil at the surface	17.01	– Soil erosion stripping away the topsoil	
	5.01	– Excavation and refilling of a trench for a tile line or buried utility line, bringing subsoil and regolith to the surface	
	17.07	+ Bioturbation (mammal burrows, treefalls)	Pocket gopher mounds in sand prairies are conspicuous displays of this disturbance as a result of bioturbation.
Plow sole	2.01	– Cultivation	A soil probe or soil pit is necessary to detect a plow sole (unless it is exposed by rill erosion), and it should not be confused with a natural hardpan.
Ridged and furrowed surface (plow lines and deadfurrows)	2.01	– Cultivation	
Rock piles (glacial erratics or fragments of local bedrock)	2.01	– Cultivation of the adjacent land	Loose rocks are gathered and piled in fencerows, in field corners, and beneath shade trees.
Rutted surface	2.01	– Cultivation (tractors turning around in uncultivated idle land next to a field)	
	16	– Mowing on moist ground	Ruts from mowing in a wet meadow might be mistaken for plow lines.
	23.02	– Other off-road traffic (fire engine or utility maintenance truck stuck in a prairie)	

Table 7.11. Vegetated Communities in General.

Quality Indicators	Disturbance Factors		Notes
Soil horizons intermixed with layers of cinders etc. (railroad ballast, road asphalt)	5.03	– Earthmoving (road and railroad maintenance)	
Subtle terrace (bench-like in profile) running across a slope (just one terrace, not a series of terracettes)	17.01	– Sheet erosion depositing soil on the upslope side of an old fenceline (or unfenced field border) and stripping away soil on the downslope side of the line	
Terracettes	11.07	– Grazing	
ENVIRONMENT: INTRUSIONS			
Abandoned buildings or farmsteads (including old foundations, basements, cellars, cisterns, wells, chimneys, silos, driveways, farm equipment, scattered bricks and other artifacts)	13.01	– Formerly intense local human activity, usually including a concentration of domestic livestock (especially before World War II), often including the introduction of persistent or invasive non-native plants	
Clearing and maintenance of open conditions along a utility corridor or other right-of-way by infrequent mowing (brushing)	1.01	– Clearing	Powerline and pipeline rights-of-way that cut through wooded hill country provide some of the best refuges for savanna and woodland snaps. Herbicide can wreck these refuges, though.
	16.02	– Removal of woody growth, not maintaining desirable native vegetation	
	16.03	+ Suppression of undesired woody growth and promotion of desired native vegetation	
Ditches	4.01	– Surface drainage	
	4.02	– Subsurface drainage tile line (a ditch often serves as an outlet for drainage tiles)	
	10.03 17.05	– Increased flooding, flood scouring, erosion, and sedimentation (caused by a straighter channel, steeper gradient, and faster runoff from upstream)	

Table 7.11. Vegetated Communities in General.

Quality Indicators	Disturbance Factors		Notes
Drainage tiles or tile fragments on the surface or exposed in a hole	4.02	– Drainage tile line	
Fences	11	± Grazing	One or both or neither side of a fence may have been grazed at one time or another. The makeup of a fence may indicate the kind of animals that it was built to contain. Grazing is not always bad. See the discussion under the heading *Is grazing harmful to prairies? Or is it beneficial?* in the Grazing in Grassland SS&G and *Not all grazing is not always all bad. Not!* in the Prairie SS&G.
Hay bales and residual patches of uneaten hay ("hay dots" on aerial photography)	11	– Supplemental feeding of grazing animals	Supplemental feeding may indicate heavy grazing pressure or dormant-season pasturage.
Linear (especially rectilinear) features, boundaries, and patterns	6	– Farming	Lines that are long, straight, sharp, parallel, or at right angles are usually the expression of artificial disturbances.
	4.01 13.99	– Stream channelization, levee, dike, spoil bank	
	13.08	– Buried utility line (pipe or cable)	
	4.02	– Drainage tile line (sometimes visible from traces on the surface)	
	24	– Many other human activities, land uses, and intrusions (mowing, earthmoving)	
Livestock	11	± Grazing	The kind of livestock can be inferred by examining the kind of fencing, feeding and watering equipment, hoofprints, droppings, and hair caught on barbed wire. Grazing is not always bad. See the discussion under the heading *Is grazing harmful to prairies? Or is it beneficial?* in the Grazing in Grassland SS&G and *Not all grazing is not always all bad. Not!* in the Prairie SS&G.
Livestock shelters; feeding, watering, and handling facilities, etc. (barns, sheds, feed bunks, watering tanks, ponds, corrals)			
Livestock trails, trampled areas, dung			

Table 7.11. Vegetated Communities in General.

Quality Indicators	Disturbance Factors		Notes
Surface depressions, large (a closed basin — that is, a low spot with a center that is lower than its lowest side)	23.05	– Subsidence of an underground mine	Closed depressions (except for stream oxbows) are rarely created by surface erosion. They are usually the result of human activities. Karst sinkholes are a major exception.
	23.05	– Collapsed and partially filled entrance of a mine shaft	
	23.02	– Open-pit mine (gravel pit)	
	13.01	– Old basement	
	23.02	– Other artificial excavation	
	8.99 20.02 4	– Burned-out peat deposit (fire during a drought or after artificial drainage)	
	17.02	+ Collapse or subsidence above a cave system	
Surface depressions, small (a closed basin — that is, a low spot with a center that is lower than its lowest side)	13.01	– Abandoned well, cellar, or cistern	Surface erosion does not commonly create small closed depressions.
	4.02	– Break in a drainage tile line ("tile hole" or "blowout")	
	23.02	– Collapsed or looted grave (most Indian mounds have been dug into)	
	15.01	– Cutting of valuable walnut or pecan below ground level	
	23.01	– Digging and removal of a plant	
	23.02	– Other artificial excavation	
	21.99 20.01 17.07	+ Tree stump or snag that has rotted away ("stump hole"), treefall pit, animal burrow	

Table 7.12. Quality Indicators and Disturbance Factors for Wet Prairie.

Wet Prairie (a Community Type) is also treated by the following other tables:

Herbaceous Communities in General
Prairie
Vegetated Communities in General

Quality Indicators	Disturbance Factors		Notes
COMPOSITION			
Lower plant species diversity than in the adjacent wet-mesic and mesic prairie (often substantially lower)	26, 27	? Unknown	Most Wet Prairies exhibit significantly lower diversity than better drained prairie communities on the same site. Is this a natural condition, or is it a reflection of the fact that Wet Prairies have been almost universally degraded by unnatural hydrologic disturbances? Unless there is strong off-site evidence or direct on-site indication that the lower diversity is a consequence of unnatural disturbance, the Disturbance Factor should not be valued as negative, and the Natural Quality should not be downgraded on the basis of relative low species diversity. Even though a Wet Prairie may have lower species diversity, a high quality example should have some relatively conservative plants.

Table 7.13. Quality Indicators and Disturbance Factors for Wetland.

Wetland (a Community Class) is also covered by the following other tables:

Herbaceous Communities in General
Vegetated Communities in General
Wooded Communities in General

Quality Indicators	Disturbance Factors		Notes
COMPOSITION: GROUPS OF SPECIES			
Wetland species growing on well-drained soil	4	– Drainage	Wetland species can sometimes persist for several years after their habitat has been drained.
	27	+ A natural condition: The soil only appears to be well drained.	A hardpan or bedrock near the surface can cause a shallow, perched water table and wet soil early in the growing season. The site may dry out during the summer and appear to be mesic, dry-mesic, or even dry.
STRUCTURE: HORIZONTAL PATTERN			
Wet spot in a lowland or along a shallow drainageway	4.02	– Subsurface drainage system that is failing (water is forced to the surface where a tile line has broken and clogged)	
ENVIRONMENT: INTRUSIONS			
Tile outlet discharging into a stream channel	4.02	– Drainage tile line	The tile outlet indicates that the font of water probably is artificial, not a natural spring. However, a naturally springy area may have a tile outlet.

Table 7.14. Quality Indicators and Disturbance Factors for Wooded Communities in General.			
Quality Indicators	**Disturbance Factors**		**Notes**
COMPOSITION: GROUPS OF SPECIES			
Presence of relatively conservative understory trees and shrubs: Cercis, Cornus florida, Amelanchier, Viburnum, Carpinus, Ostrya, Staphylea	27	+ Lack of degrading disturbances (grazing in particular)	
Abundance of non-conservative (but not weedy) spring ephemerals: Podophyllum, Claytonia	11.06	± Grazing	Spring ephemerals can thrive in a pastured woods if they complete their active life cycle before the woods is pastured each year. Grazing can abet some species by spreading propagules and reducing competition.
Lack of especially palatable and favored forage species: Geum, Anemone, and showy and nectar-laden flowers (Lilium, Campanula americana)	11.05	– Grazing	
	3.01	– Deer overabundance	
Floodplain trees growing in abundance on an upland: Ulmus americana, Celtis, Fraxinus lanceolata, Acer negundo, A. saccharinum, Populus deltoides	1.02	– Old clearing, grown back up in trees	
	9.03	– Fire suppression	
COMPOSITION: INDIVIDUAL SPECIES			
Corylus americana thriving	8.03	± Fire	
Erechtites hieracifolia	8.03	± Fire	
Mertensia virginica	10.04	± Floodplain scouring	Bluebells thrive in forests that receive a lot of flood scouring. They are also surprisingly good dispersers and colonizers of young forest in former clearings.
	1.02	– Reforested clearing	
Phytolacca americana	8.03	± Fire	Pokeweeds are common in canopy gaps and on tree tip-up mounds (root wads). They may increase dramatically for several years after a fire.
	20.01	± Treefall	

Table 7.14. Wooded Communities in General.

Quality Indicators	Disturbance Factors		Notes
STRUCTURE: HORIZONTAL PATTERN			
Opening in a wooded tract	1	– Clearing	Many other artificial disturbances can create an opening (especially a small one) in a wooded tract. Many openings are a natural consequence of an environmental extreme (wetness or dryness), but they are maintained in part (and in the long term) by fire or some other, unarguably artificial disturbance.
	11.03 11.04	± Grazing (maintaining or creating an opening)	
	25	+ Natural disturbances	
STRUCTURE: GROUND LAYER			
Dead trees, downed	20.01	± Windthrow	
	27	+ Long-term stability and lack of disturbance	
Lack of leaf litter and duff	8.02	± Fire	Consumption of leaf litter and duff by fire may be attended by a dramatic increase in the growth and flowering of herbaceous plants.
	21.01	± High rate of biological decomposition	Moist and flood-prone habitats are most likely to exhibit rapid rotting of fallen leaves. Replacement of oaks and hickories by maples, ashes, and elms greatly increases the rate of litter decomposition. Non-native earthworms can substantially speed up litter cycling.
STRUCTURE: UNDERSTORY LAYER			
Browse line	11.04	– Grazing	
	3.01	– Deer overabundance	
Dead Juniperus virginiana trees standing beneath the overstory layer	1.02 21.02	– Clearing, followed by long-term abandonment	A red cedar must start out life in a sunny, open area. A cedar standing dead or nearly dead beneath a tree canopy is testimony to formerly open conditions.

Table 7.14. Wooded Communities in General.

Quality Indicators	Disturbance Factors		Notes
	9.04	– Loss of a hill prairie, glade, or open woodland because of plant succession, usually from fire suppression or cessation of grazing	
Hedging (twigs bitten off, resulting in clusters of short shoots and sometimes dwarfed leaves)	11.04	– Grazing	
	3.01	– Deer overabundance	
Lack of understory	11.04	– Grazing	
	23.02	– Clearing of understory	
	8.08	± Fire	
	21.01	± Overstory trees creating such dense shade that trees cannot grow well beneath them	A dense tree canopy may result in a very thin shrub layer, especially on wet or wet-mesic soil.
	27	± Wet or wet-mesic soil	
STRUCTURE: OVERSTORY LAYER			
Big, old trees with relatively few, large-diameter limbs	27	+ Old age of trees	A crown that has its wood concentrated into relatively few, large-diameter limbs is an indicator of an old tree.
Cull trees	15.01	– "High-grade" logging	In the strict sense, a "cull" can be defined as a defective, non-merchantable tree that was left uncut when a stand was logged. Fires and floods can damage trees and make them defective. Xeric environments also foster gnarled trees. (*Xeric* is used here in the sense that it is defined by the Illinois Natural Areas Inventory: excessively drained and extremely dry, not simply dry.)
	8.08	± Fire	
	10.04	± Flood damage	
	27	± Xeric environment	

Table 7.14. Wooded Communities in General.

Quality Indicators	Disturbance Factors		Notes
Dead trees, standing (termed a "deadening" if the dead trees are concentrated in a patch)	21.03	± Girdling by beaver	The bivalent ± symbol indicates that the Disturbance Factor may be considered positive (or at least neutral) if it is the result of a natural agent, or negative if it is judged to be a consequence of unnatural conditions.
	12.01	± Mortality from disease	
	12.02	± Mortality from insects	
	8.08	± Fire	
	27	+ Old age of trees (natural mortality)	
	10.01 18.03	± Prolonged inundation by an extra-ordinary flood or by impounded water	
	17.05	± Sedimentation (smothering roots)	
	21.01	± Shading of shade-intolerant species by trees that overtop them	
	11.07	– Grazing damage to roots	
Lack of old trees in a mature stand of trees	15	– Logging	
	20.01	± Windthrow	
	27	+ Trees that have died of old age	An old-growth forest may have very few old trees if they have died out and have not yet been replaced.
Lack of large, well-formed, high-value hard-woods: Juglans nigra, Quercus alba, Carya illinoiensis	15.01	– Logging	Veneer-quality hardwoods are quite valuable. White oaks were once heavily cut to make staves for whisky barrels.
STRUCTURE IN GENERAL			
Coppice growth (plants top-killed and re-sprouted)	15.01	– Logging	Tilias naturally form large basal sprouts that are not caused by injury. Gleditsias sprout from their roots and commonly fork near the ground, but they do not usually have a true coppice growth form unless they have been severely injured.
	8.08	± Fire	
	16	– Mowing	
	23.02	– Clearing of understory	

Table 7.14. Wooded Communities in General.

Quality Indicators	Disturbance Factors		Notes
	11.04	– Grazing	
	23.07	+ Natural area vegetation management	
Fire scars	8.08	± Fire	
Charred tree trunks and charred woody debris			
Gap in tree size classes	11.04	– Grazing	
	8.04 8.08	± Fire	
	23.02	– Clearing of understory	
	3.01	– Overabundant deer	
Open, discontinuous tree canopy and subcanopy	8.04 8.08	± Fire	
	11.04	± Grazing	
	24, 25	± Other disturbances	Any disturbances that kill trees can result in an open, discontinuous tree canopy and subcanopy, especially if the disturbance is continuous or intermittent and continual.
Strip of trees with trunks that are all growing at a slant in the same direction	1.02	– Edge of an old clearing or roadway	Young trees lean outward as they grow toward the center of a road or clearing.
Trees broken (limbs broken), scraped, knocked down, or partially pushed over	15.01	– Logging	
	20.01	± Storm damage (wind, ice, snow, lightning)	
	10.04	± Flood damage	
ENVIRONMENT: INTRUSIONS			
Logging skid trails, haul roads, yarding areas, discarded cables	15	– Logging	

Table 7.14. Wooded Communities in General.

Quality Indicators	Disturbance Factors		Notes
Tree-cutting stumps, tops, logs	15	– Commercial timber harvest	
	15.03	– Firewood removal	
	23.07	± Natural area vegetation management	
	15.03	– Hazard reduction along a trail	
	23.07	– Removal of a “chimney” tree at a prescribed burn	
	15.03	– Cutting other trees (bee trees, coon trees)	

Appendix 5
Guidelines for Assessing Natural Quality

This appendix consists of advice and instructions about how to look at and think about an area when determining its Natural Quality. The guidelines under the first heading address Quality Indicators and Disturbance Factors in general terms. The second set of guidelines consists of tips that are good to keep in mind when conducting fieldwork and filling out the Grading Form.

Interpreting Quality Indicators and Evaluating Disturbance Factors

Different kinds of disturbances can have the same apparent effect on the quality of a Natural Community. For instance, consider the Quality Indicator that is termed *Abundance of rhizomatous, clone-forming composites* (commonly exemplified by dense Canada goldenrod with a scattering of asters and other goldenrods). In a prairie, this condition may be the result of at least four major Disturbance Regimes: Cultivation, Grazing, Mowing, and Earthmoving. The same weedy character may also be the consequence of other disturbances, perhaps especially herbicide drift, chemical-laden runoff, and sedimentation from adjacent farmland.

It is often impossible to determine what Disturbance Factor was the cause of a community's condition. You may be able to infer the kind of disturbance by examining the vegetation and its context, and by knowing or surmising the land use history. In the case of part of a prairie that is overrun by Canada goldenrod, you might presume that it was caused by long-ago farming — but later learn that the goldenrods dominate where a baseball diamond was once graded and mowed.

The character of a patch of a Natural Community is often the condition that has developed during a significant period of recovery or other change long after a disturbance event. Consider the case of a prairie that is overrun by Canada goldenrod: plowing, heavy grazing, prolonged mowing, or bulldozing may have created the conditions that initiated the establishment of the goldenrod clones, but the area did not have a dense stand of goldenrod while it was being plowed, grazed, mowed, or bulldozed. The disturbance may have ceased two or three decades ago, and the clones may have spread well beyond the area of disturbance that fostered their establishment and initial growth.

Some Disturbance Factors are stated in terms of severe disturbance, but the condition of a community is often the result of partial* recovery *from the disturbance. For instance if *cultivation* is listed for a Grading Patch, it usually does not mean that the patch is being cultivated — but that the patch is recovering from cultivation in the distant past.

A certain condition may indicate degradation and lower Natural Quality in one community — but not in another community, and sometimes not even in a different part of the same community. For instance the Quality Indicator *Abundance of rhizomatous, clone-forming composites* does not have the same relevance throughout a savanna community because this suite of plants commonly occupies shady spots in savannas that have obviously high quality vegetation in the adjacent sunny spots. Presumably all of the savanna has suffered the same disturbances, and all is the same Natural Quality — even though shaded parts appear to be weedier than sunny parts.

The occurrence of a disturbance in a community is not a significant consideration in grading the community if it does not have a significant effect on the community. If a disturbance is a small *intrusion* (*i.e.* an artificial feature or a very localized site of intense activity), it might significantly affect a community only within the space that the intrusion actually occupies; or, it might have a widely pervasive effect. A big patch of a community is likely to have more Quality Indicators and Disturbance Factors than a small patch — simply because it is bigger. In such a circumstance, a greater number of disturbances does not necessarily translate into a lower Natural Quality Grade. In fact, a larger example of a community is more likely to be higher quality simply because it can better resist or absorb the impacts of a number of degrading disturbances.

A characteristic of a community that is tentatively judged to be a negative condition may simply be natural variation. Unusual conditions may exist because of random processes and for no apparent reason. For example, it may be natural for a prairie remnant to have a large clone of Canada goldenrod or gray dogwood. But aggressive native plants and large-scale natural disturbances such as storm damage can overwhelm a small natural area, making the disturbances "negative" even though they are "natural."

A high quality example of a Natural Community might not fit a predetermined model. Nature is complex and diverse, and we don't know everything. Illustrative examples and word-pictures of "representative," "ideal," or "high quality" conditions cannot adequately portray the full scope of natural variation. An area should not necessarily be downgraded or rejected because it does not match a preconceived idea of what it would look like if it were high quality.

The Quality Indicators and Disturbance Factors in Table 7 do not cover all of the possibilities, and cannot always be used to tell the whole story of a site's disturbance, recovery, and protection from disturbance. Table 7 will be expanded as more Quality Indicators and Disturbance Factors are identified during all of the Survey Stages.

Many Quality Indicators are stated as extremes or anomalies. They are conditions that are well above or below average, or features that "catch your eye." In contrast, most natural areas have plenty of more-or-less average characteristics that are not as clearly expressed in nature as they are stated in Table 7. Consequently Grading Patches are often difficult to evaluate.

Pointers for Evaluating Natural Quality in the Field

It is safe to assume that almost any area has been severely disturbed at some time in the past two centuries. If all of the disturbances that have affected Illinois in the past two centuries were telescoped into an instant, there would be few trees and wisps of herbage standing above a landscape almost completely denuded by logging, farming, and grazing "down to the nub." The scattered areas with vegetation still standing in this scene might comprise the majority of our present-day natural areas, which have survived on sites that escaped logging, farming, and overgrazing for some reason. [NOTE 5]

If the quality of a community is unclear, consider its context. Consider this example: Community 1 occurs inside or adjacent to Community 2; the quality of Community 1 is unclear, but the grade of Community 2 is known. If both of the communities appear to have had the same history of land use and disturbance, then they will often have the same Natural Quality. However, this guideline must be applied with caution because different Natural Communities respond to and recover from disturbances in different ways, especially if the communities are in different Community Classes or Subclasses.

Make comparisons. Observe differences between patches, and consider why the patches differ. For instance, if part of a community looks more disturbed that the rest (*e.g.* more weeds or smaller trees) figure out why.

Land use and the history of disturbances often change at a property line. Look particularly for differences in Natural Quality on either side of a fence or road.

Don't combine a lack of knowledge with certitude. If some aspect of the quality of a community is uncertain, discuss the uncertainty. Make frank conjectures instead of unsupported assumptions. For instance, say that the flooding regime *may* be unnatural or *presumably* has changed — rather then assuming and stating that the flooding regime has changed — unless you have some evidence to support your hypothesis. Sometimes the right thing to write is, "I don't know. . . ."

***Ask the question,* "What's wrong with this area?"** If the answer is, "I don't see anything wrong," then maybe the area is high quality. But if you cannot also say why the area is high quality, then the best evaluation may be Grade C.

***If the quality of a small part of an area is unclear, ask,* "What if all of the area looked like this?** Answering this question will sometimes clear up the uncertainty.

Do not focus only on the negative indicators of a community's quality. Observe, document, and analyze what is good or average about a Grading Patch too. Be sure to photograph the average condition and representative areas, not just disturbances.

It is not necessary (and usually is not desirable) to record every possible Quality Indicator that can be identified in an area. Many disturbances have a very limited

extent or level of development, and they do not have a role in determining an area's quality. For instance, a cluster of groundhog burrows or scattered windthrown or beaver-gnawed trees are local disturbances that have no effect on the grade of a community. Minor human disturbances may be common: littering, vandalism, trampling, old structures, etc. When an area is examined closely, the effects of many disturbing natural processes and artificial intrusions may be identified, but they do not need to be documented and evaluated unless they are important considerations when grading the community.

Page 1 of the Grading Form is a tool, not an end in itself. Usually at least a few Quality Indicators and Disturbance Factors are recorded on page 1 of the Grading Form. However, not all such observations need to be formally recorded on page 1. Observations can be incorporated into the discussion of Grading Components on page 2 without being entered on page 1 if this approach is efficient and the "bottom line" is the same: the *observations* and *analysis* are well stated, and the *decision* (*i.e.* the Natural Quality Grade) is clearly supported and explained.

If a Grading Patch is highly disturbed, it may not need to be documented in detail. It may suffice to list and discuss only one or two overriding disturbances without recording others. For instance if a patch of woods is clearcut, there is no need to list other Disturbance Factors such as intrusions and past grazing.

Quality Indicators and Disturbance Factors can be identified from a variety of sources. Most of them are found during the on-site inspection, but they can also be identified during the Map & Aerial Photo Stage, Existing Information Stage, and even Aerial Survey. One of the most useful tools to have at hand when investigating a site is an old aerial photo of the area. Much information about a site's history of disturbance may be gained by talking with a landowner, tenant, site manager, neighbor, former resident, or whoever has used the site. Written documentation and old on-the-ground photography may be available, especially for public lands and nature preserves. Ideally all of this sort of information will be gathered and available for use during the Final Field Survey

Help add to and improve the guidelines in this appendix as well as the information and instructions in the rest of the Grading Handbook. Routinely contribute to Table 7 and use the latest updated version. Issues that still need to be worked out better include: (1) how to grade naturally disturbed areas (such as an old-growth forest that has been blown down by a storm), (2) how to treat early successional communities that become established on naturally disturbed land (such as young riparian forest), and (3) how to grade cliff communities (where a lack of disturbance is the common condition).

Appendix 6
Terminology for Describing Nativity

The following definitions are from *Suggestions for a standardized terminology for alien plants* in an article by Pyšek *et al*. (2004).

Native plants
Synonym: indigenous plants.
Definition: Taxa that have originated in a given area without human involvement or that have arrived there without intentional or unintentional intervention of humans from an area in which they are native.

Alien plants [*]
Synonyms: exotic plants; introduced plants; non-native plants; non-indigenous plants.
Definition: Plant taxa in a given area whose presence there is due to intentional or unintentional human involvement, or which have arrived there without the help of people from an area in which they are alien.

Casual alien plants
Synonyms: Given the difficulties associated with definitions of casual plants, there are no consistently used synonyms in the literature. [†]
Definition: Alien plants that may flourish and even reproduce occasionally outside cultivation in an area, but that eventually die out because they do not form self-replacing populations, and rely on introductions for their persistence.

Naturalized plants
Synonym: established plants.
Definition: Alien plants that sustain self-replacing populations for at least 10 years without direct intervention by people (or in spite of human intervention) by recruitment from seed or ramets (tillers, tubers, bulbs, fragments, etc.) capable of independent growth.

Invasive plants
Definition: Invasive plants are a subset of naturalized plants that produce reproductive offspring, often in very large numbers, at considerable distances from the parent plants, and thus have the potential to spread over a large area.

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[*] EDITOR'S NOTE: In keeping with the majority of natural area workers in the state, the Illinois Natural Areas Inventory uses the term *exotic* instead of *alien*.

[†] EDITOR'S NOTE: The full article by Pyšek *et al*. includes a brief review of other terms that have been defined and used more or less in the same way that *casual alien plants* is defined here. These other terms include *subspontaneous taxa*, *waifs*, *occasional escapes*, *ephemeral taxa*, and *adventives*.

Transformers
Synonym: Transformers are essentially equivalent with edificators, a term used in European, especially Russian literature. Edificators are defined as "environment forming plants."
Definition: A subset of invasive plants (not necessarily alien) that change the character, condition, form, or nature of ecosystems over a substantial area. (Substantial means relative to the extent of that ecosystem.)

Weeds
Synonym: pests; harmful species; problem plants; noxious plants. The last term is often used, particularly in U.S.A., for a subset of weedy taxa, whose control or eradication is mandatory.
Definition: Plants (not necessarily alien) that grow in sites where they are not wanted and which have detectable economic or environmental impact or both.

Appendix 7
Terminology for Rating Relative Abundance

Definitions

A five-level Relative Abundance scale provides an estimate of how common a plant species is within a given area. The estimate is based primarily on the amount of effort that must be spent to find a species:

> **1. Rare**.—A plant is rated as *rare* if it is known to have very few (say, up to three of four) individuals or small populations in an area. If the area is extensive, a rare species is likely to be found only with luck, or after prolonged diligent searching, or by returning to a previously known location for the species.
>
> **2. Occasional**.—An *occasional* species is common enough that it is apt to be located before an area is thoroughly searched, but the plant is widely scattered or is not so frequent that it is likely to be discovered immediately unless the area is quite small.
>
> **3. Common**.—A species is *common* if it can be located with essentially no effort. It is found throughout most or all of the area, but it does not generally dominate the area.
>
> **4. Very common**.—A *very common* species occurs in large numbers throughout most or all of an area, but it does not generally dominate the area.
>
> **5. Abundant**.—An *abundant* species is dominant and ubiquitous in an area. Or, if it dominates only part of the area, it is annotated as "locally abundant."

If a species is present in an area but its abundance is not estimated, it can be simply annotated as *present*:

> **P. Present**

Application and Interpretation of the Relative Abundance Scale

The abundance rating provides a subjective, relative estimate of the number of plants of a certain species in an area. Only five classes (*rare* through *abundant*) characterize the entire range of possible population levels for all species, so each of the five classes must embrace a broad range of numbers. Despite the wide latitude of each class, it can difficult to confidently estimate the abundance of a species.

Ideally different Regional Ecologists examining the same area will assign the same abundance rating to a particular species. But in practice, different people are quite likely to assign different ratings to the same species. It will be satisfactory if the ratings differ by only one abundance class: for instance a species is rated 3 by one person but is rated 4 by another person.

The species that a Surveyor finds within the first few minutes in an area are likely to be rated as 3, 4, or 5. However, a rare species might be encountered immediately by chance.

Relative Abundance ratings can be assigned to species growing in any given area, but the ratings are usually used to estimate how common a species is within a Grading Patch or a specific Natural Community (instead of in an entire Survey Site, for instance).

The Relative Abundance scale must be adjusted to accommodate all growth forms of plants (*i.e.* trees, shrubs, and herbs). An acre of forest can support hundreds of thousands of herbs but only a few hundred trees. Consequently a herbaceous species can be a few orders of magnitude more numerous than a tree species but still be assigned to the same abundance class as the tree.

Many plant species have a spotty and patchy distribution, even within habitat that appears to be well suited for its growth. This uneven distribution can make it difficult to assign an overall abundance rating. In such instances, the Relative Abundance can be qualified by adding an L (for "locally"). For instance 3L means *locally common*. [*]

[*] The annotation needs to be recorded as 3L instead of L3 to meet the format requirements of the information system.

Appendix 8: Snaps

Introduction

A *snap* is loosely defined as a native, sun-loving, relatively conservative, non-aquatic plant that has traditionally been called a "prairie plant." Most snaps are perennial, although relatively few are annuals or biennials. All are herbaceous except for a few low shrubs that are morphologically and ecologically so well adapted to the prairie environment that they are sometimes mistaken for herbs — especially when they have recently re-sprouted after being top-killed by a fire.

The purpose of introducing a new term to substitute for "prairie plant" is to address two facts: (1) so-called prairie plant species are elements of many natural communities other than prairies, and (2) continuing to refer to those species as "prairie plants" has substantial, negative impacts on the identification, protection, and management of a wide range of non-prairie communities.

Background

Many Midwesterners who care for natural areas tend to focus on prairies to the neglect and detriment of other natural communities. A prairie enthusiast who finds an assemblage of sun-loving flora growing in a house-sized opening (or even a room-sized opening) in a woods is apt to call it a prairie even though this sunny, open area is actually the last remaining gap in the canopy of a savanna that has not yet completely closed over. Such a bias for prairies is ironic and unfortunate because natural remnants of savannas are even rarer than prairies.

Fixation on prairies has resulted in some tragic incidents of savannas and woodlands being managed to their detriment — to "restore the prairie vegetation." See the discussion in the section titled *Classification, entitation, and identification of savannas* in the Savanna Survey Standards and Guidelines (in White 2009), including the footnote in that discussion..

For lack of a better term, we have all spoken of "prairie plants in the woods." Words matter: when we say "prairie plant," we're apt to think *prairie*. But those native, sun-loving, relatively conservative, herbaceous plants belong in woodlands, savannas, glades, and fens too. Community classification matters: see "Why Savanna Classification Matters: The Implications for Land Management Planning, Review and Implementation" by Heidorn (1984).

A new word for "prairie plant" is needed for two reasons. (1) They're not just prairie plants. (2) Because they are called prairie plants, the communities in which they occur are sometimes treated as if they are (or should be) prairies even though they are not prairies.

At the Hill Prairie Conference at Principia College in October 2006, I vowed, "There is no such thing as a prairie plant," and I introduced a term: *

nasunnonaquaperherb

Short for: **na**tive, **sun**-loving, **non-aqua**tic, **per**ennial **herb**

I constructed this concatenation to make a point — but not as a serious attempt to coin a term that would gain acceptance by ecologists and natural area workers.

Early in the series of training sessions for the INAI Update's Regional Ecologists in 2008, I used the term *nasunnonaquaperherb* as a serious-minded but tongue-in-cheek way to assert that we truly do need to abandon the "prairie plant" paradigm. I asserted that it is not right to say that an open woodland or savanna is characterized by the presence of prairie plants. The Regional Ecologists took me seriously and rearranged and further abridged the adjectives to make a "snappier" term:

sun-loving, **na**tive, non-aquatic, **p**erennial **herb**

Subsequent brainstorming and debate among the INAI Update staff focused on the appropriate form for the term: snap-herb, snap herb, or snapherb?

Eventually I realized that "perennial herb" can be shortened to "perennial," particularly in the sense used by horticulturists. Consequently I dropped "herb" and settled on *snap*.

Definition

A *snap* is defined as: a member of a group of sun-loving, native, non-aquatic plant species that are (a) principally perennial and usually herbaceous and (b) adapted to the ecological conditions exhibited by herbaceous vegetation that develops in a stable, little-disturbed natural community.

In this definition, a *sun-loving* plant is a species with two characteristics: (a) it is well adapted to the physical environment of full exposure to high light intensities, and (b) it can compete successfully in the dense ground-layer vegetation that typically develops in undisturbed sunny situations. *Non-aquatic* means not inhabiting the *hydric* soil moisture class as defined by the Illinois Natural Areas inventory. Although the definition states that snaps are principally perennial and usually herbaceous, a few snaps are annuals, biennials, or low shrubs that commonly associate with sun-loving, native, non-aquatic, perennial, herbaceous plants.

* This appendix is written in the first person of John White.

Interpretation

One might suppose that there are "degrees of snap," but the term *snap* is intended for species that are truly adapted to exposure to full sun. Some snaps, though, can also grow in semi-shade. For instance Aster oolentangiensis (sky-blue aster) is a denizen of both open woods and prairies. Parthenium integrifolium (feverfew) is a snap even though it can also persist for many years in a suppressed condition in a woodland that has developed a closed canopy. [NOTE 6]

A species that thrives in semi-shaded habitats with snaps is not a snap if it does not normally also grow in full sun. For instance, Lespedeza capitata (prairie bush clover) is a snap; but its congener L. virginica (slender bush clover) is not, because L. virginica can thrive only in the thinner vegetation that develops in partial shade and on poor soils. Helianthus mollis (downy sunflower) is a snap; but H. divaricatus (woodland sunflower) is not, because H. divaricatus is rarely found in open areas far from shady borders. Asclepias sullivantii (Sullivant's milkweed) is a snap; but A. purpurascens (purple milkweed) is not, because A. purpurascens usually grows beneath a tree canopy and is rarely found far out in a prairie.

Appendix 9
Grading Models

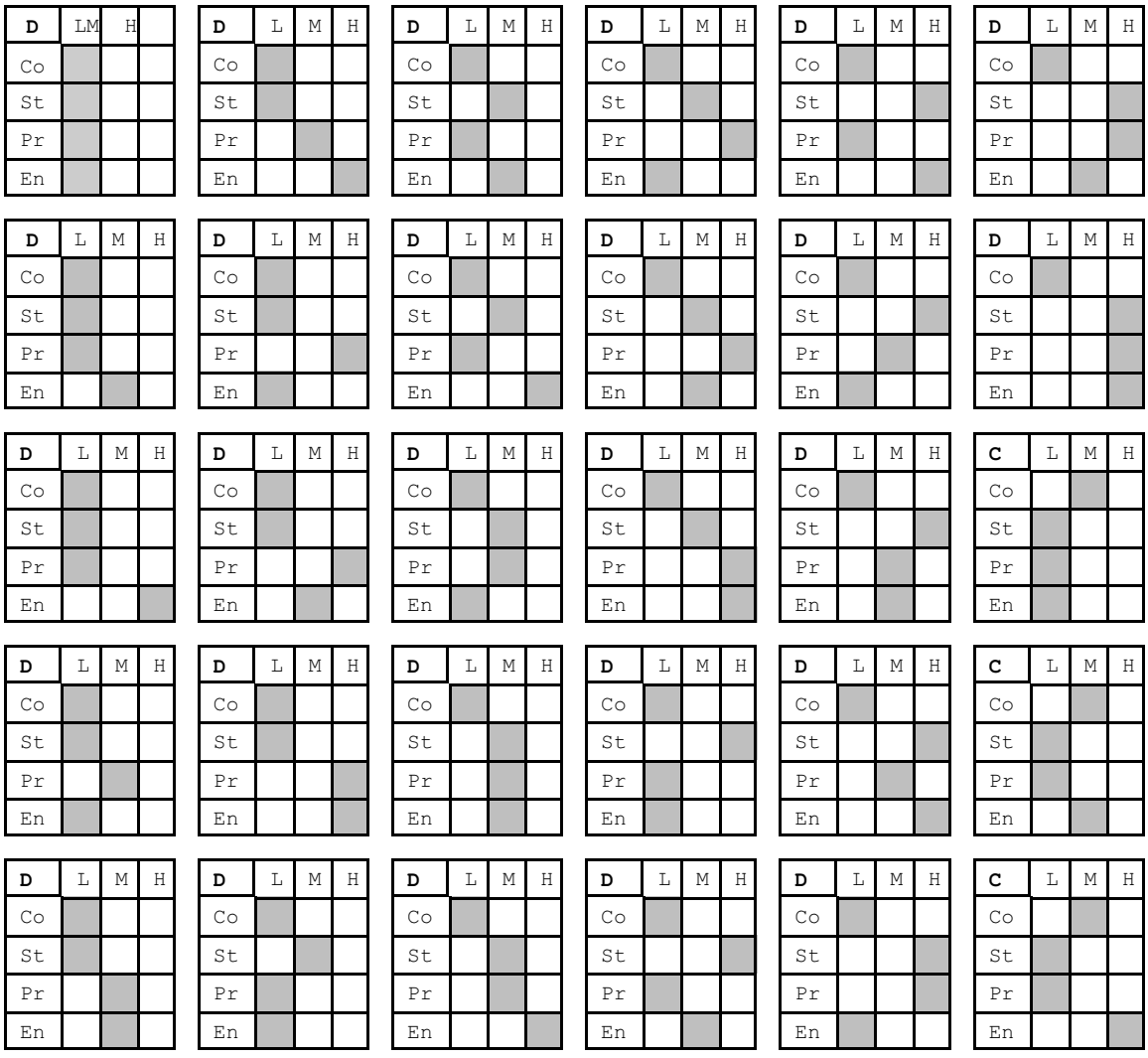
This appendix displays the 81 possible combinations of Grading Components and Condition Ratings, as discussed on page 23. The upper left cell of each matrix shows the Natural Quality Grade that is indicated by the ratings of the Grading Components. This is a provisional set of Grading Models; they need to be applied and tested to see whether the grades in the models correctly indicate the quality of a community.

Grading Components:

Co = Composition
St = Structure
Pr = Processes
En = Environment

Condition Ratings:

L = Low
M = Medium
H = High



C	L	M	H
Co		■	
St	■		
Pr		■	
En	■		

C	L	M	H
Co		■	
St		■	
Pr	■		
En			■

C	L	M	H
Co		■	
St			■
Pr	■		
En		■	

C?	L	M	H
Co			■
St	■		
Pr	■		
En	■		

C?	L	M	H
Co			■
St	■		
Pr			■
En			■

B	L	M	H
Co			■
St		■	
Pr			■
En		■	

C	L	M	H
Co		■	
St	■		
Pr		■	
En		■	

C	L	M	H
Co		■	
St		■	
Pr		■	
En	■		

C	L	M	H
Co		■	
St			■
Pr	■		
En			■

C?	L	M	H
Co			■
St	■		
Pr	■		
En		■	

B	L	M	H
Co			■
St		■	
Pr	■		
En	■		

B	L	M	H
Co			■
St		■	
Pr			■
En			■

C	L	M	H
Co		■	
St	■		
Pr		■	
En			■

C	L	M	H
Co		■	
St		■	
Pr		■	
En		■	

C	L	M	H
Co		■	
St			■
Pr		■	
En	■		

C?	L	M	H
Co			■
St	■		
Pr	■		
En			■

B	L	M	H
Co			■
St		■	
Pr	■		
En		■	

A?	L	M	H
Co			■
St			■
Pr	■		
En	■		

C	L	M	H
Co		■	
St	■		
Pr			■
En	■		

C	L	M	H
Co		■	
St		■	
Pr		■	
En			■

C	L	M	H
Co		■	
St			■
Pr		■	
En		■	

C?	L	M	H
Co			■
St	■		
Pr		■	
En	■		

B	L	M	H
Co			■
St		■	
Pr	■		
En			■

A?	L	M	H
Co			■
St			■
Pr	■		
En		■	

C	L	M	H
Co		■	
St	■		
Pr			■
En		■	

C	L	M	H
Co		■	
St		■	
Pr			■
En	■		

C	L	M	H
Co		■	
St			■
Pr		■	
En			■

C?	L	M	H
Co			■
St	■		
Pr		■	
En		■	

B	L	M	H
Co			■
St		■	
Pr		■	
En	■		

A?	L	M	H
Co			■
St			■
Pr	■		
En			■

C	L	M	H
Co		■	
St	■		
Pr			■
En			■

C	L	M	H
Co		■	
St		■	
Pr			■
En		■	

C	L	M	H
Co		■	
St			■
Pr			■
En	■		

C?	L	M	H
Co			■
St	■		
Pr		■	
En			■

B	L	M	H
Co			■
St		■	
Pr		■	
En		■	

A?	L	M	H
Co			■
St			■
Pr		■	
En	■		

C	L	M	H
Co		■	
St		■	
Pr	■		
En	■		

C	L	M	H
Co		■	
St		■	
Pr			■
En			■

C	L	M	H
Co		■	
St			■
Pr			■
En		■	

C?	L	M	H
Co			■
St	■		
Pr			■
En	■		

B	L	M	H
Co			■
St		■	
Pr		■	
En			■

A	L	M	H
Co			■
St			■
Pr		■	
En		■	

C	L	M	H
Co		■	
St		■	
Pr	■		
En		■	

C	L	M	H
Co		■	
St			■
Pr	■		
En	■		

C	L	M	H
Co		■	
St			■
Pr			■
En			■

C?	L	M	H
Co			■
St	■		
Pr			■
En		■	

B	L	M	H
Co			■
St		■	
Pr			■
En	■		

A	L	M	H
Co			■
St			■
Pr		■	
En			■

A?	L	M	H
Co			
St			
Pr			
En			

A	L	M	H
Co			
St			
Pr			
En			

A	L	M	H
Co			
St			
Pr			
En			

Appendix 10
Grading Form and Instructions

A Grading Form is used to document the Natural Quality of a Grading Patch and to determine its grade.

Page 1

The first page is for recording basic information about the Grading Patch, and to document Quality Indicators and Disturbance Features.

Site Code.—Enter the Site Code from the Survey Site Record.

Site Name.—Enter the Site Name from the Survey Site Record.

Surveyor.—Enter the name of the Regional Ecologist or other person who is evaluating the area and filling out the Grading Form.

Date.—Record the date when the area is graded.

NC/NQ polygon.—A Grading Patch can have only one grade, but it may have more than one Natural Community. A mapped area that consists of a single Natural Community (NC) and that has a single Natural Quality (NQ) grade is termed an NC/NQ polygon. If a Grading Patch has more than one Natural Community, it must have more than one NC/NQ polygon.

Enter the location code for the NC/NQ polygon or polygons that comprise the Grading Patch. These codes are the same as the codes in the Location (Loc) column of the Natural Quality table of the Survey Site Record.

Natural Community.—Record the name of every Community Type in the Grading Patch.

Grade.—Record the Natural Quality Grade of the Grading Patch here. This grade is tentative until page 2 is completed.

Notes.—Record any general information or comments about the Grading Patch that do not belong elsewhere on the form. For instance, if someone other than the Surveyor assisted with completing the form, record that person's name here. If there is not enough room in this blank, assign a number to the notes, turn to page 2 or 3, write the number in the No. column, and write the notes in the Notes column.

Description of Quality Indicators.—Describe each Quality Indicator in specific terms. That is, spell out how the Quality Indicator is actually expressed in the Grading Patch — which is not necessarily exactly the same way as it is characterized in Table 7 of the Grading Handbook. For instance, one of the Quality Indicators in Table 7 is stated as *Dominance by one or a few plant species*; in an actual Grading Patch, the specific expression of this indicator might be *Dominance by only two tree species: Quercus stellata and Q. marilandica*.

If you identify and use a Quality Indicator that is not listed in Table 7, record it on the Grading Form and email it to the other Regional Ecologists, Field Survey Director, and Survey Instructor. The Survey Instructor will add the newly identified Quality Indicator to the master list that is continually updated and re-distributed.

Photo.—Photograph the Quality Indicator (QI), and record an identifying code for the photo. More than one QI may be illustrated with a single photo; if so, record the same identifying code for each QI. More than one photo may show the same QI; if so, record only the photo or photos that best illustrate the QI (*e.g.* the photos that were taken specifically to document the QI).

Disturbance Factor (DF).—Identify the Disturbance Factor that is indicated by the Quality Indicator (consult Tables 5 and 7). Record the number of the Disturbance Factor from Table 5. It is all right to record the number of a Disturbance Regime instead of a Disturbance Factor if a specific Disturbance Factor cannot be identified, or if several Disturbance Factors in the same regime are associated with the Quality Indicator.

If there is more than one Disturbance Factor for a particular Quality Indicator, list each Disturbance Factor on its own line, and use ditto marks to show that the Quality Indicator is repeated for more than one Disturbance Factor.

If you identify a Disturbance Factor that is not listed in Table 5, select and record the number of one of the "other" categories that is listed for each of Disturbance Regimes 1 through 23. If you determine that a new Disturbance Factor should be added to Table 5, consult with the Field Survey Director or Survey Instructor.

Effect.—Decide whether the Disturbance Factor has a positive or negative effect on the quality of the Natural Community or communities in the Grading Patch. Write one of the following symbols in the column:

- \- Negative effect
- \+ Positive effect
- ± Approximately neutral or variable effect
- ? Uncertain or unknown effect

Consult Table 7 to see how the Effect of the Disturbance Factor has been evaluated (*i.e.* positive, negative, etc.) for the Quality Indicator. If you determine that the Effect of the Disturbance Factor is different from how it was annotated for the Quality Indicator in Table 7, report this to the Field Survey Director or Survey Instructor.

Extent.—The *Extent* of a Disturbance Factor is an estimate of the proportion of a Grading Patch that is occupied or affected by the factor. Enter a code that best describes the Extent:

– Not seen: The factor or its effect is not found in the Grading Patch. *

L Low (Localized): The factor is localized, and it occupies or affects less than about one-tenth of the Grading Patch, often in several scattered spots.

M Medium (Moderate): The factor occupies or affects roughly one-tenth to one-half of the Grading Patch.

H High (Widespread): The factor occupies or affects more than half of the Grading Patch.

Level.—The *Level* of a Disturbance Factor is the degree of development of the factor and its effects. Enter a number that best describes this level:

– None or N/A: If a Disturbance Factor is present in a Grading Patch but it is having no apparent, active effect on the community, then the *Level* is None. Or if the *Extent* of the Disturbance Factor is recorded as Not seen, then the *Level* must be N/A (not applicable).

L Low: In the parts of a Grading Patch that the Disturbance Factor occupies or effects, it is poorly developed and has a minor effect on the community.

M Medium: The level of development is judged to be between Low and High.

H High: In the parts of a Grading Patch that the Disturbance Factor occupies or effects, it is well developed and has a major effect on the community.

Trend.—The *Trend* describes whether the *Extent* or *Level* of a Disturbance Factor appears to be increasing or decreasing. Enter a number that best describes the Trend:

* A Disturbance Feature is not usually recorded on the Grading Form unless it occurs in a Grading Patch, so the "Not seen" option is rarely applicable.

– Unknown or N/A: If a trend cannot be determined, it is Unknown. If the *Extent* of a disturbance is recorded as Not seen or if the *Level* is None or N/A, then the Trend is N/A (not applicable).

L Low (Decreasing): The Disturbance Factor is judged to be declining, either by shrinking in area or dropping toward a lower level of development.

M Medium (Stable): The factor appears to be in a steady state, neither increasing nor decreasing overall — although it may be increasing or decreasing locally within the Grading Patch.

H High (Increasing): The factor is judged to be increasing, either in its extent or its level of development, or both.

Notes.—As appropriate, record more observations or analysis about each Quality Indicator or Disturbance Factor. *Copious notes are encouraged*. In the Notes column on page 1, assign a number (1, 2, 3 . . .) to each set of notes. This number is used as a key to the notes, which are written on page 2 or 3.

Page 2

Page 2 addresses the four Grading Components and their Sub-components. The Natural Quality Grade is derived from an analysis of the Condition Ratings of these components and sub-components.

Site Code.—Copy the Site Code from page 1. This duplication is a precaution in case the different pages of the form become separated from each other.

NC/NQ polygon.—Copy the NC/NQ polygon code or codes from page 1.

The next section of the form has blanks for evaluating each of the Grading Components:

Composition
Structure
Processes
Environment

For each Grading Component, the names of a number of the most important Sub-components serve as headings on the form. Each of these Sub-components is defined in the Grading Handbook beginning on page 13. There are blanks for entering other Sub-components, as needed.

There are two boxes to the right of each heading. The first box is for recording a Condition Rating. The second box is for entering a number that keys to notes that are recorded elsewhere on the form.

Condition Rating.—For each Grading Component and for each relevant Sub-component, record a Condition Rating in the first box to the right of the heading:

L = Low
M = Medium
H = High

Guidelines for determining a Condition Rating are under the heading *Rating the Condition of Grading Components and Sub-components* on page 17. A Grading Component should not be rated until its Sub-components are considered. However, it is usually not necessary to formally rate, analyze, and discuss each Sub-component.

A Grading Component or Sub-component is rated High if it is judged to have more than 75% of the characteristics that it would have if it were in a theoretical, pristine natural area (*i.e.* without any degradation). A component or sub-component is rated Low if it is judged on the same basis to be in the bottom quartile. Any case in the middle half is Medium.

It may prove problematic to distinguish a potential Grade A patch from a potential Grade B patch if the Composition of the patch is rated simply as High. To address this issue, a modification of the "High" rating for Composition is provisionally introduced:

MH = Moderately High
VH = Very High

Sub-components are worded and defined so that a High rating indicates high Natural Quality. For instance, if a Grading Patch has many conservative species, then the Conservatives sub-component is rated High. But if there are many ruderal species, the Ruderals sub-component is rated Low because the Ruderals Sub-component is stated as "Lack of ruderals."

Notes.—As appropriate, for each component and sub-component, write notes that support the Condition Rating. *Copious note-taking is encouraged.* Record a number for each set of notes. This number is used as a key to the notes, which are written farther down on page 2 or on page 3.

Grade.—Consult the Grading Model (pages 23 and 95) and follow the Grading Rules (page 25) to assign a Natural Quality Grade (A, B, C, D, or E) for the Grading Patch. Write the letter grade in the box. Do not use plus or minus signs (*e.g.* B+ and C–); the grading system is not so precise, and the information system cannot accommodate pluses and minuses.

Discussion.—Enter a note number in the second box and write more notes to support the grade assignment if the documentation is not covered sufficiently in the notes for Quality Indicators, Disturbance Factors, Grading Components, and Sub-components.

In particular, it may be useful to summarize the reasons why a higher or lower grade was not assigned to the Grading Patch. This summary may be in the form of a *comparative statement*, briefly spelling out the salient differences between this Grading Patch and an adjacent patch that has a higher or lower grade.

Boundaries.—Enter a note number in the box and write an explanation if you used a certain feature or set of features to draw the line between this Grading Patch and another, and if this information would be especially edifying.

Inclusions.—Enter a note number in the box and write an explanation if a significant part of the Grading Patch consists of areas that would be graded higher or lower if those areas were larger and more distinct (as discussed on page 6 of the Grading Handbook.

No. and **Notes**.—Use this section of the form to record notes from page 1 or the top of page 2. Repeat the note number that was written earlier on the form, then write the notes.

Page 3

Site Code.—Copy the Site Code from page 1.

NC/NQ polygon.—Copy the NC/NQ polygon code or codes from page 1.

No. and **Notes**.—Use this section of the form to continue to record notes that do not fit on page 2.

If additional pages are needed, use another blank page 3 and change the number of the page.

Site Code:	Page 1
Site Name:	
Surveyor:	Date:
NC/NQ polygon:	
Natural Community:	Grade:
Notes:	

Description of Quality Indicators	Photo	DF	Effect	Extent	Level	Trend	Notes

GRADING FORM												Page 2
Site Code:												
NC/NQ polygon:												
Composition			Richness			Conservatives			Increasers			
			Lack of ruderals			Lack of exotics						
Structure			Ground layer			Shrub layer			Subcanopy			
			Overstory			Horiz. pattern						
Processes			Repr. & Growth			Succession			Fire			
			Hydrology									
Environment			Soil			Water			Lack of intrusions			
Grade			**Discussion**			**Boundaries**			**Inclusions**			

No.	Notes

GRADING FORM	Page 3
Site Code:	
NC/NQ polygon:	

No.	Notes