

# THE STANDARDS AND GUIDELINES FOR THE ILLINOIS NATURAL AREAS INVENTORY



Goose Lake Prairie INAI #1067 – Mesic Prairie  
Photo Credit: Dan Kirk

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Natural Areas Evaluation Committee*



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## In Memoriam:

The original version of the Standards and Guidelines for the Illinois Natural Areas Inventory was compiled and edited in 2002, primarily by Patti (Malmborg) Reilly during her time as the Natural Areas Project Manager. She condensed thirteen years of Natural Areas Evaluation Committee decisions with technical natural areas evaluation guidance initially published in 1978. Although Patti would place the credit on the contributors mentioned below, she is recognized as leading this document's creation. In 2013, we lost Patti too early. She is remembered as a curious biologist, an exceptional artist, and a kind friend to all who knew her. The staff of the Division of Natural Heritage, the Illinois Nature Preserves Commission, the Illinois Endangered Species Protection Board and, indeed, all citizens of the State of Illinois are indebted to Patti for her effort in condensing the methods for identifying, evaluating, nominating, and designating a natural area for inclusion on the Illinois Natural Areas Inventory.

## Contributors:

A work such as this would not be possible without input from those dedicated people who have been studying, researching, and managing our native landscape out of a love of nature and for the preservation of our State's natural heritage. Past and current staff of the Division of Natural Heritage, the Illinois Nature Preserves Commission, and the Illinois Endangered Species Protection Board, with academic researchers and conservation partners have provided valuable contributions to this document. Prior versions have listed individuals, but this version recognizes that no list of contributors can ever be complete for these ever-evolving methods and their practices. However, Illinois' natural areas effort would not have progressed to this point without the early and continued commitment of John Schwegman, who developed The Natural Divisions of Illinois and oversaw the complex Illinois Natural Areas Inventory (INAI) project, and John White, who served as the INAI project's lead.

It is the IDNR's intent to present this 2022 version as the updated, current, and relevant version to guide INAI efforts. Best conservation practices dictate that research and dialogue continue to ensure improvement in our methods for evaluating, documenting, and managing Illinois' natural communities. Changes will be performed accordingly. Per INAI Standards and Guidelines, changes approved by the Natural Areas Evaluation Committee will be documented in meeting minutes with administrative changes noted in future revisions of the Standards and Guidelines. Recommended improvements may be submitted to [DNR.NaturalAreas@illinois.gov](mailto:DNR.NaturalAreas@illinois.gov).

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# Executive Summary

The Standards and Guidelines for the Illinois Natural Areas Inventory (INAI) provide practitioners with a framework for evaluating landscape features and species habitats, the standards by which these features and habitats can be compared to others, and guidelines for evaluating and seeking recognition of these sites as significant to the preservation of Illinois' natural history. This designation as an INAI acknowledges a site's quality, increases the potential for perpetual protection with the Illinois Nature Preserves Commission or other conservation easement entities, supports inclusion in State-sanctioned impact review processes that are based in law, prioritizes stewardship procurement funding, and promotes increased attention when threatened by potential adverse impacts. The Standards and Guidelines provide a summary of the historical origin and necessity for identifying Illinois' remnant natural community types and rare species habitats before it is too late. Moreover, this guidance summarizes the natural community classification system used by the State to characterize some common landscape attributes, such as geology, hydrology, soils, aspect, slope, and floral and/or faunal species assemblages. These INAI sites are separated into Categories based on particular features – Category I is reserved for the highest quality natural communities, Category II includes those sites harboring suitable habitat for Illinois' endangered and threatened species, Category III sites are those recognized by the INPC as natural areas under their authority granted by the Illinois Natural Areas Preservation Act, Category IV is held for outstanding geological features, and Category VI recognizes unusual concentrations of flora and fauna that warrant recognition but otherwise may not have an applicable INAI category. The Standards and Guidelines is a manual based on decades of natural areas evaluation, coordinative meetings, targeted comparative research, and continual adaptive progress. Herein is a summary of the methods undertaken past and present. The integrity of the process and this document depends on recurrent improvements based on site assessments and updates to our methods coupled with the recognition of a changing environment.

# Background

The Illinois Natural Areas Inventory (INAI, Inventory) is administered by the Natural Areas Program of the Illinois Department of Natural Resources' (IDNR, Department) Office of Resource Conservation in the Division of Natural Heritage. Together with the Illinois Nature Preserves Commission (INPC, Commission) and the Illinois Endangered Species Protection Board (IESPB), our responsibilities include inventory, stewardship, protection, and defense of natural areas, rare species, and their habitats. The Natural Areas Program works closely with the Natural Heritage Database Program, the Endangered Species Program, the Heritage Field Section, and staff of the INPC to track, manage, and defend Illinois' remnant natural communities and listed species habitats, focusing on the rarest aspects of our State's biodiversity. All of this is done in collaboration with Illinois' academic, government, conservation, land management, and land trust partners.

The biological composition of natural communities is organized geographically in response to geologic, topographic, hydrologic, and climatic gradients and glacial history. Landscape Regions, or spatial units with relatively homogenous biological composition, assist evaluation of natural communities by serving as a utile scale from which to delineate expectations of biological composition. The Landscape Regions used by the INAI include Natural Divisions and Sections for evaluating terrestrial plant communities (Schwegman 1973) and Ecological Drainage Units for evaluation of stream communities (Hinz, Jr. et al. 2017).

The Illinois Natural Areas Preservation Act (525 ILCS 30/)(Act) memorialized the urgency to identify and protect the unique places representative of our Landscape Regions by stating, "It is therefore the public policy of the State of Illinois to secure for the people of present and future generations the benefits of an enduring resource of natural areas, including the elements of natural diversity present in the State, by establishing a system of nature preserves...and assisting in the preservation of natural areas and features." In 1963, the Illinois Nature Preserves Commission was established for the purpose of bestowing legal protection on natural areas. In Section 6, the Act further provides that the INPC has the duty to compile and maintain a statewide inventory of natural areas that will assist in the preservation of Illinois' significant natural features. The Illinois Department of Natural Resources (then Illinois Department of Conservation) cooperates with the INPC and the IESPB to compile and maintain the inventory and to create and support a statewide Nature Preserves System composed of protected natural areas of statewide significance.

The goal of INPC is to legally protect representative examples of the varied natural features that occurred throughout the State. Administrative Rules were developed for the Commission to facilitate this work, but a "list" of Illinois' significant natural features was needed to guide their protection efforts. Due to the foresight of a few key individuals, the idea of a statewide natural areas inventory was conceptualized. From 1975-1978, the State of Illinois completed a project that set a national precedent. This project would assist Illinois in the competent management of our landscape by creating the INAI, a statewide inventory of our remaining highest quality natural landscape features and rare species' habitats. The project was funded as a contract among the IDNR, the University of Illinois, and the Natural Land Institute. Carried out under the direction of John White and incorporating the work of many staff and volunteers, this inventory of Illinois' natural areas was the first step in creating a systematic way to find, evaluate, describe, and classify Illinois' natural heritage for future generations (White 1978).

Through this project, an invaluable legacy was created. Three major accomplishments of the INAI project have become important tools used by many states to create natural area programs of their own. These were: 1) developing a natural community classification system, 2) developing a system for grading the quality of natural communities, and 3) compiling a list of Illinois' remaining natural areas and their attributes in a database. A total of 1,089 sites covering 25,723 acres were identified as significant constituting the first INAI list. The list was accompanied by the INAI Technical Report (White 1978). This 476-page report has served as a roadmap to our inventory methods. Yet, over time, numerous administrative updates and field discoveries accrued requiring a more accessible manual, hence the initiation of the first INAI Standards and Guidelines in 2002. Still, there is no replacement for the in-depth understanding provided by the INAI Technical Report which continues to be cited by natural areas programs in neighboring states as a guiding publication.

## The Illinois Natural Areas Inventory

The INAI identifies natural areas of statewide significance on public and private land. Site significance is dependent upon the presence of ecological features and their quality based on the extent of degradation. Since 1978, the INAI has served as the primary tool used by the IDNR and many other agencies and organizations to determine the occurrence and status of natural areas in Illinois. The INAI is used far beyond its original purpose and today guides land acquisition, affects federal permitting requirements, influences grant funding, initiates environmental coordination, prioritizes management initiatives, and is a component of the Illinois Wildlife Action

Plan. Identification of representative examples of every community type, terrestrial and aquatic, naturally occurring within each Landscape Region is a goal of the INAI (Figures 1 and 2). As we continue to adapt the INAI to current landscape conditions and new scientific knowledge, we ensure that data collected will be used to efficiently track and improve the condition of Illinois' natural areas.

A vast amount of data has been collected since the INAI's inception. Combined with abundant field survey efforts, information storage and retrieval was always understood to be one of the hallmarks of the project. The Natural Heritage Database was developed to support the endeavor. It contains the current list of sites included on the INAI and their associated attributes, as well as information on sites that have been deleted and those combined with other sites. Through the Department's partnership with NatureServe, data collected since the beginning of the INAI through the present are stored in a Biotics 5 geodatabase maintained at the IDNR Headquarters in Springfield. The Natural Areas Program also maintains a Microsoft Access database, known as the Natural Areas Tracking System or NATS, which compiles streamlined INAI information as sites are designated, changed, or removed. By using information contained in the Biotics and NATS databases we can quickly surmise a site's location, the reason for its designation, and the changes to its designation over time.

It is important to continually evaluate the existing Illinois landscape and status of natural areas generally. The field effort is carried out by IDNR and INPC staff with other qualified biologists who are responsible for new site nomination, data collection, stewardship, monitoring, and surveillance. Biotics contains fields for describing a site's current condition, management history, and state of degradation. However, this data is better served utilizing modern real-time interactive georeferenced tools, such as a Geographic Information System (GIS). Transitioning documentation of natural area boundaries, as well as applied management practices, to today's standard of interactive mapping platforms is a high priority for the Natural Areas Program.

To be a competent manager of any resource, one must know a minimum of five things: 1) the resources you are responsible for, 2) the specific characteristics of each resource, 3) the goals to be accomplished, 4) the methods to be used to accomplish the goals, and 5) through assessment, whether the methods met the goals or require adaptation. Land managers are no exception. To preserve and manage our natural landscape, we determine features that are significant, decide which characteristics are important about those features, determine what actions should improve or maintain the quality of the features, decide the best methods to be used for the enhancement or maintenance, and determine whether adaptation is necessary. With time and experience have come new perspectives and discoveries. We have learned that some natural communities are disturbance-dependent and will disappear without it. We have learned much about natural processes such as the role of fire in particular natural community development and maintenance. We have also learned that "successional stages" are much more complex and interconnected than were once thought. In the years since the original INAI, restoration techniques have evolved. These techniques allow resource managers to simulate natural processes that can restore significant natural features to some lands that did not possess qualities that would have qualified them for the original Inventory. The Act compels us to secure the benefits of our enduring resource of natural areas as representative examples of the elements of natural diversity present in the State by restoring healthy ecological function and preserving native species and their habitats.

The INAI is a dynamic list that is updated as changes occur on the landscape and as our knowledge of conservation science improves. Additions, changes, and deletions of natural areas from the INAI are performed only with the approval of The Natural Areas Evaluation Committee (NAEC). This internal committee is comprised of representatives from the IDNR, INPC, and IESPB. The deliberations of the Committee remain internal due to discussions involving private property and listed species locations. Some proposed actions require a majority vote and others, like removal, require unanimous consent.

## **The INAI Update and Recheck**

An innovative follow-up project to the INAI provided Illinois a milestone moment in our natural areas efforts. In 2007, IDNR embarked on an **INAI Update Project** led by partners in search of yet unknown Category I high-quality natural areas, taking advantage of new technologies such as satellite imagery and modern ecological concepts. The focus was on discovering, assessing, and mapping potentially undiscovered qualifying natural communities missed by the original Inventory. The development of consistent methodology for determining natural areas quality using current scientific practices was a driving motivation of this project.

Between 2007 and 2011, contractual ecologists for the project identified natural community features via maps and aerial photos, aerial reconnaissance surveys, and on-the-ground surveys. Once a significant site or feature was identified by the INAI Update Project staff, the site was considered a Final Candidate Site and a nomination was developed. From there, the nominations needed to be reviewed and approved by the respective IDNR Natural Heritage Biologist and INPC Natural Areas Preservation Specialist. If approved, the site or feature addition could be brought to the Natural Areas Evaluation Committee. Over 2,000 potential natural areas were evaluated, but most of these ultimately did not qualify. As of 2022, nearly 100 new INAI sites or features have been successfully nominated to



the Inventory as a result of this part of the INAI Update Project. Field biologists continue to study and assess these potentially significant natural communities for eventual nomination.

Another part of the project was known as the **INAI Recheck**. Due to the efforts occurring nearly simultaneously, this endeavor is sometimes overshadowed. The objective, however, was not the same. This was a three-year effort conducted by contractual ecologists to remap, re-grade, and conduct quantitative vegetative analysis of existing Category I INAI natural communities. True, new natural community types were sometimes identified within existing INAI sites. Primarily, this was a reevaluation of the 664 known Category I INAI sites. After accounting for data limitations and property access denials, a total of 527 existing Category I sites, or 79% of all Category I sites designated at the time of the project, were reevaluated as part of the INAI Recheck Project (INHS 2012).

There were three key findings from this re-evaluation of INAI sites (INHS 2012):

1. Natural areas management is essential to the continued existence of these sites. Natural areas that received moderate to intensive management maintained or improved their natural quality over time. Natural areas that did not receive consistent management usually have degraded or vanished.
2. Small, fragmented and/or isolated natural communities (e.g., Hill Prairies) and those subject to significant degradation from off-site factors (e.g., Marshes, Sedge Meadows) are especially at risk of disappearing statewide.
3. Prescribed fire at remedial and maintenance regimes is critical to the long-term viability of most natural communities in Illinois. Fire not only helps achieve more resilient and biodiverse conditions on the sites, but also reduces degradation by invasive species – the foremost management threat to natural areas generally. (2022 - Current natural areas management practitioners are quick to note that many natural communities also require structural modification practices, such as canopy thinning, coupled with prescribed fire for community maintenance or enhancement.)

At the 55<sup>th</sup> Meeting (April 27, 2010), the NAEC adopted the methods of the INAI Update Project at least in part. Since the project's conclusion in 2011, INAI management or lack thereof has continued to present some incongruities between the datasets. Therefore, in 2022, a GIS Application was developed that overlays original Category I natural community boundaries with those recorded by the INAI Recheck Project. Field biologists and landowner partners are currently comparing the changes and correcting discrepancies through on-the-ground mapping with a goal of refining the INAI data to reflect in real-time the status of Illinois' highest quality natural communities.

## **The INAI in 2022**

Since 1978, INAI sites have been added, boundaries have been adjusted, and sites have been removed due to degradation or conversion. Illinois currently recognizes 1,519 INAIs on 497,759 acres. Seven hundred and forty five (745) of those INAI sites are recognized as harboring the highest-quality natural communities known from the State. Within these Category I INAI sites, there are 224,074 acres of qualifying natural communities or 0.6% of Illinois' approximately 37 million acres. When itemizing the number and acreage of the other Categories, an error of duplication quickly emerges due to the regularity with which Category I sites are also Category II (containing listed species habitat), Category III (protection by INPC), Category IV (or containing outstanding geology), and/or Category VI (containing unusual concentrations for flora and/or fauna).

In 2022, 321 of the 1,519 INAIs are on land owned by the IDNR (21% of all INAIs). Of those, 209 or 65% are protected in perpetuity by the INPC.

## **Regulatory Authority**

The Inventory was originally created to be an "in house" biologically-based accounting system for the IDNR and INPC. It still has no regulatory authority of its own. However, the Inventory is now directly referenced as a regulatory tool under at least two State of Illinois statutes. Consultation between the IDNR and agencies of State and local governments of Illinois is triggered by potential adverse impacts to INAI sites resulting from actions authorized, funded, or carried out by those agencies. Consultation on these actions is authorized under the Illinois Natural Areas Preservation Act (525 ILCS 30/17). If an INAI site is present, impact avoidance is prioritized, followed by minimization. The INAI also affects the implementation of the Interagency Wetland Policy Act of 1989 (20 ILCS 830/), where applicable, and prompts the initiation of IDNR Consultation review. Inventory sites are classified as critical resource waters and require the maximum wetland replacement value of 5.5 to 1 if impacts to an INAI wetland site occur.

# HOW TO IDENTIFY AN ILLINOIS NATURAL AREA

## Structure of the Inventory

Illinois Natural Areas Inventory sites are distinguished by the significant natural feature(s) present at the site. Five main feature groupings are recognized by the INAI and are denoted as Categories. The Categories of the Illinois Natural Areas Inventory (INAI) separate specific types of natural areas and features and describe significant features that are important in preserving the natural heritage of Illinois. The features that make a site eligible for the INAI are evaluated for their quality and statewide significance. Categories use specific criteria to evaluate site eligibility. A site may qualify under more than one Category. The five Categories of the INAI are:

- Category I. High-quality natural communities (including qualifying restorations and reconstructions)
- Category II. Specific suitable habitat occupied by endangered and threatened species (including species translocation/reintroductions)
- Category III. Illinois Nature Preserves, Land & Water Reserves, Natural Heritage Landmarks
- Category IV. Outstanding geological features
- Category V. (Currently unused)
- Category VI. Unusual concentrations of flora and/or fauna

Eligibility criteria are driven by statewide significance and are derived from examining the rarity of a feature, its position on the landscape, its present condition, its protection status, and its restoration potential. Once a significant feature is identified, assessed, and included under a Category of the Inventory, the feature is then known as the qualifying feature. The qualifying feature's condition and attributes are tracked for as long as it continues to qualify according to the specific criteria.

## Modification to Categories over Time

Category I, II, and IV have remained unchanged.

Categories III, V, VI, and VII have been modified from the original designations used in the past resulting from experience gained. (NAEC Meeting #40, 4-4-06)

Category III has been changed from sites supporting relict species to sites dedicated as Illinois Nature Preserves, registered as Land & Water Reserves, or enrolled as Natural Heritage Landmarks. A statewide list of relict species (i.e., a species found far from its current contiguous geographic range formerly having a wider distribution as with 'relicts' of a past climatic period) is problematic due to the large expanse of the state, especially north to south. A relict species in the Shawnee Hills Natural Division may not be a relict species in the Northeastern Morainal Natural Division. Relict species assemblages now qualify under Category VI as Unusual Concentrations of Flora and/or Fauna based on specific local flora and fauna.

Category V had been changed from Natural Study Areas to Restorations and Listed Species Translocations. However, since natural community restorations are required to be equivalent to a high-quality natural community (grade A or B), these sites are now tracked within Category I. Also, since endangered and threatened species translocations are required to demonstrate long term persistence and document source and donor populations, they are functionally equivalent to Category II sites and are now tracked as such. Category V is currently an unused category.

Category VI, previously Unique Natural Features, is now titled Unusual Concentrations of Flora and/or Fauna to provide a more specific description of sites in this category. Most of the sites in this Category qualified because of unusual concentrations of flora or fauna (e.g., sites with relict species), hence the change.

Category VII, previously High-Quality Streams, is currently unused. All sites previously tracked in Category VII were considered high-quality streams based on the Index of Biotic Integrity or Biological Stream Characterization. Former Category VII sites and other aquatic natural areas are considered for inclusion under other Categories I, II, and VI based on their features. In 2022, a Category I natural community grading system has also now been developed for Stream communities.

# INAI Natural Community Classification System

The INAI Natural Community Classification System (Appendix A) is based on the underlying principles of Landscape Regions, specifically the Natural Divisions and Sections of Illinois (Schwegman 1973; Figure 1) and, for streams, the Ecological Drainage Units of Illinois (Hinz, Jr., et al 2017)(EDU, Figure 2) that recognize regions of the State based on **topography, glacial history, bedrock, soils, and distribution of native plants and animals**. These classification systems can be used to characterize all landscape conditions – high-quality to degraded.

The Natural Divisions and Sections of Illinois include 14 Natural Divisions divided into 34 subregions, known as Sections (Figure 1). Each Natural Division and Section has its own distinct set of physical and environmental characteristics that have influenced the development and evolution of surficial natural communities. An important attribute of each INAI site is its location relative to its Natural Division. The State has broad geographic variation from north to south and east to west that is categorized as Natural Divisions and Sections. A site's Natural Division and Section determines many of its ecological traits, including its species assemblages, as these traits vary from section to section. Consequently, the species assemblages that represent natural community types in one Natural Division and Section may differ from the species assemblages in other like community types with the same name in a different Natural Division and Section.

The Ecological Drainage Units of Illinois were derived using drainages and HUC8s (Hydrologic Unit Code) with relatively similar fish and mussel species assemblages (Figure 2). These units distinguish 11 watersheds that share a common zoogeographic history, physiographic and climatic characteristics, and therefore likely have a distinct set of freshwater assemblages and habitats (USGS 2022).

Natural communities are defined as ecological assemblages of co-existing, interacting species, considered together with their physical environment, and associated ecological processes, which reoccur on the landscape where similar conditions are present. Each Natural Division and Ecological Drainage Unit represents a diverse set of ecological conditions to which plants and animals have adapted over time and have evolved into distinct biotic communities that reoccur under a set of specific physical conditions within characteristic locations on the landscape.

Dominant natural features are used to identify, describe, and name community types. Natural communities, aquatic and terrestrial, are identified and named using physical characteristics and processes. In many terrestrial natural communities, a large proportion of these features either refers to, or are based on, plant resources. Although vegetation is frequently used to name and describe community types, the Inventory does not consider a plant community to be equivalent to a community type. Though the plant community is only one feature of a community type, this approach to naming communities is practical for the INAI because plant communities are influenced directly by substrate, climatic conditions, other ecological processes, and are highly observable. Plants are typically the most visible and reliably occurring inhabitants of terrestrial natural communities.

Animals are difficult to use in classifying most terrestrial natural communities (Whittaker 1977, Wilhelm 1978). Animal species, especially vertebrates, are more widely distributed and mobile than plants. Faunal communities that use these well-adapted plant communities or other landscape features to fulfill life history requirements may not be tied to a specific community type. Many invertebrates, however, may be restricted to certain habitats or associated with specific host plants or animals and may be listed as key indicator species for some natural communities. This is particularly true for aquatic systems where animals (e.g., macroinvertebrates, fish, and mussels) serve as the most meaningful indicator of natural community quality.

Figure 1. A map of Illinois' Natural Divisions and Sections.

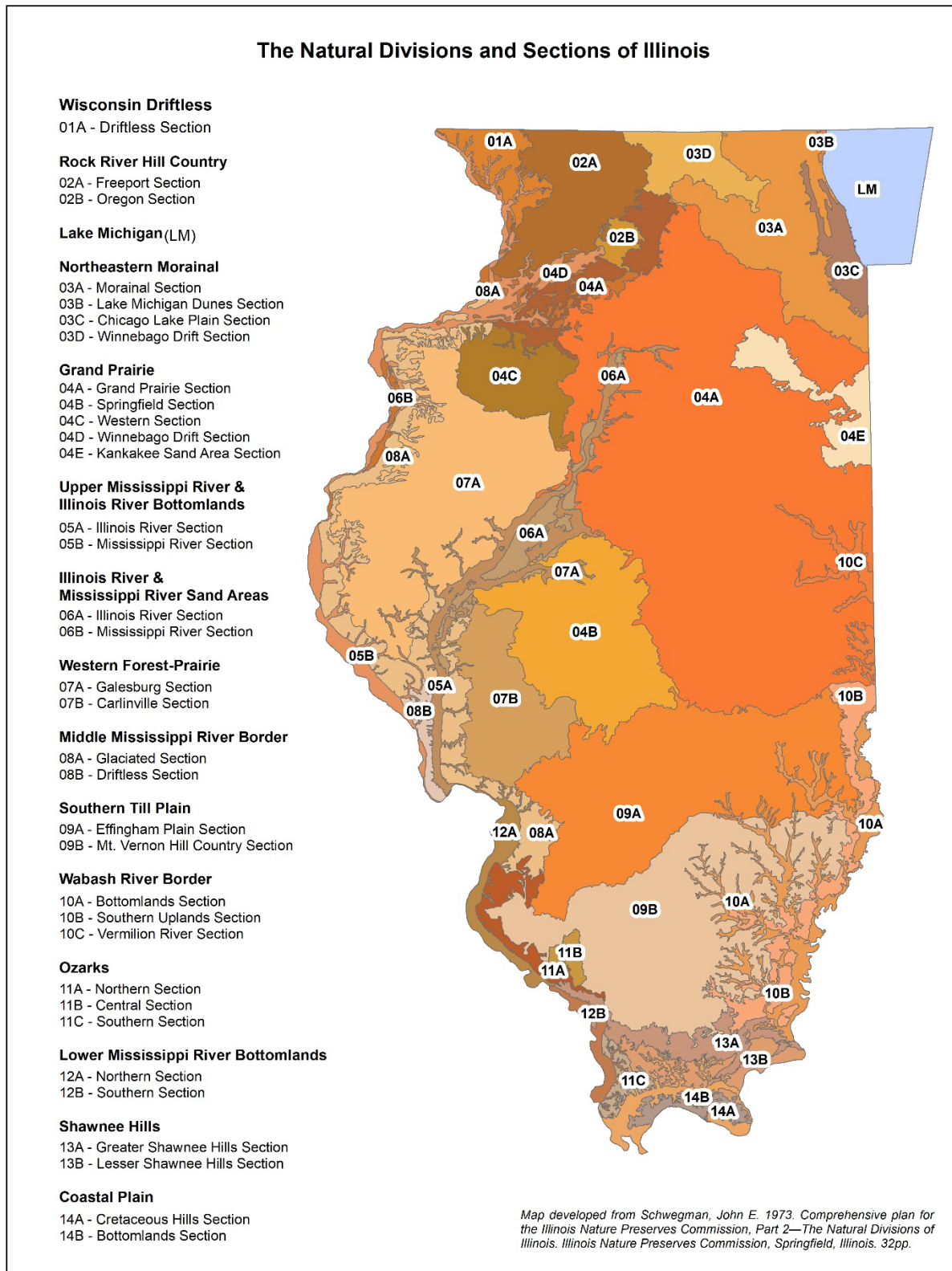
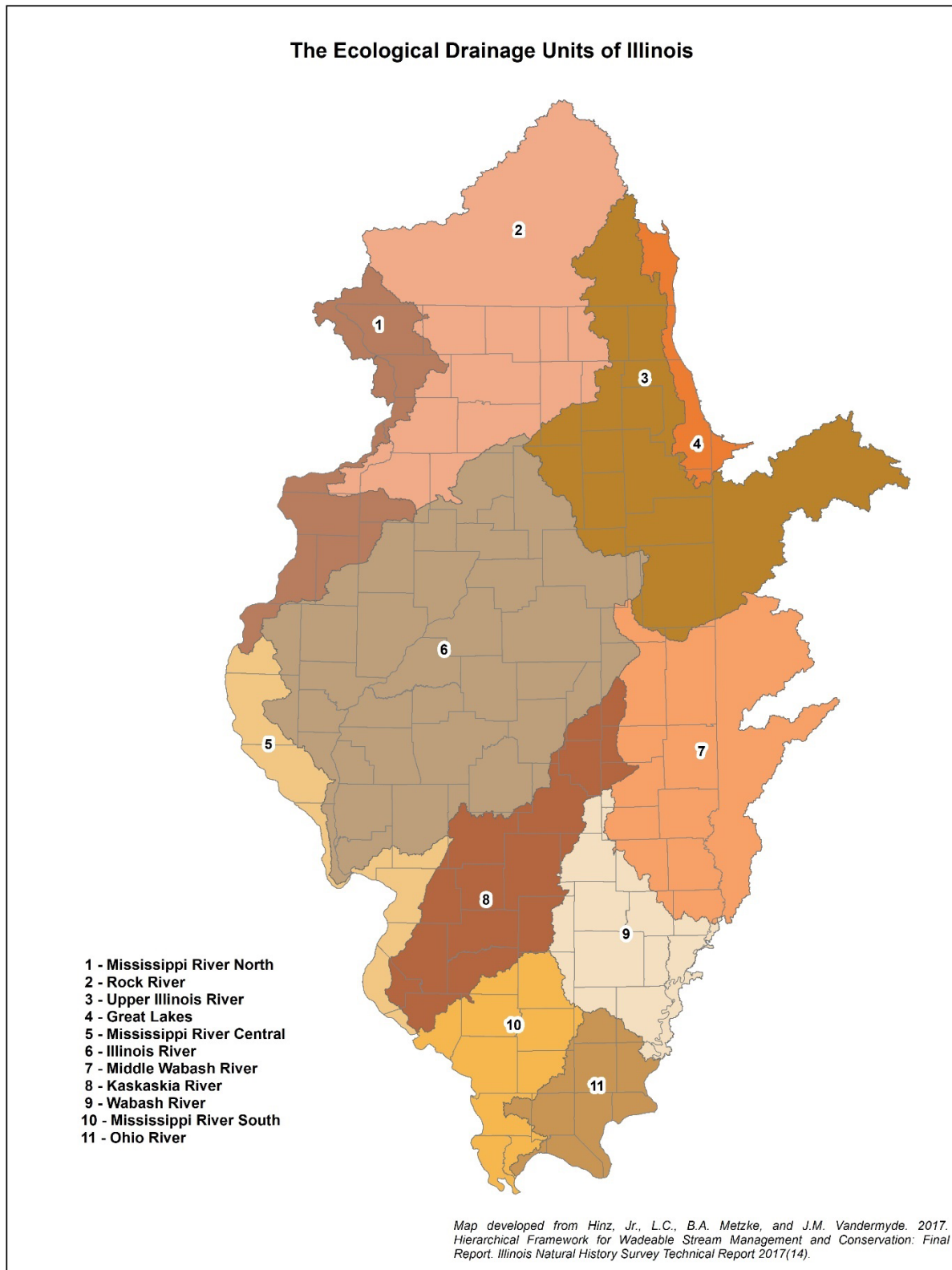


Figure 2. Ecological Drainage Units of Illinois.



The natural community classification system used in the INAI Standards and Guidelines is a modification of the Classification of Natural Communities in Illinois by White and Madany (1978). Their community hierarchy represented natural features and geological and hydrological processes which occurred on the landscape.

The INAI Natural Community Classification System follows a hierarchical structure to identify and describe Illinois' natural communities; community class - community subclass - community type (Table 1).

Modified from: Classification of Natural Communities in Illinois, by John White and Michael H. Madany (1978).

A meaningful landscape inventory is dependent on the ability to classify natural communities into an organized framework that communicates important information. An important step in classification is to define the fundamental "unit" of organization. These discrete units or sets of characteristics are then arranged in a hierarchical fashion to describe the ways living things interrelate with each other and the landscape. The goal of this community classification system is to provide the organized comprehensive framework necessary to efficiently inventory and track natural communities in a repeatable and consistent manner.

Individual landscape characteristics are grouped to compose a set of discrete units or community types that are recognized by the INAI. For purposes of the INAI, we translate a complex continuum of biotic composition into manageable units. Consequently, community classification cannot be absolutely objective (Gleason, 1926; Shimwell, 1972; Kuchler, 1967; Mueller-Dombois and Ellenberg, 1974; Pielou, 1977; and Whittaker, 1962, 1973, and 1975).

## **Community Class**

A community class is the broadest category used by the INAI to classify natural communities. A community class describes the predominant features of a community. General physiognomic characteristics such as physical structure, the presence of certain hydrologic regimes, vegetation type, and disturbance factors (e.g., prescribed fire, flooding, etc.) separate the classes. Ten community classes are recognized by the Inventory:

1. Forest
2. Savanna & Woodland
3. Prairie
4. Wetland
5. Open Water
6. Stream
7. Bedrock
8. Shore
9. Cave
10. Cultural

## **Community Subclass**

Community classes are broken down into subclasses. A community subclass describes in greater detail the interactions of features such as topographic position, parent material, size, and hydrology within the community class.

## **Community Type**

A community type occurs where relatively homogeneous physical conditions result in a distinct community of species with similar environmental requirements. This represents the smallest unit of the classification system that is meaningful to the INAI on a landscape scale. Community types are distinguished by such features as soil types, depth and moisture content, and slope, which are reflected in the biota supported. Soil moisture classes can be found in Appendix A.1.

The INAI Natural Community Classification System, a list of the natural community classes, subclasses, and types, is presented in Table 1. Descriptions of each of the community types are provided in Appendix A.2.

A matrix of community types by Natural Division and Section can be found in Appendix A.3., Table 5.

Table 1. Illinois Natural Areas Inventory Natural Community Classification – List of natural community types.

<b>Class</b>	<b>Subclass</b>	<b>Type</b>
FOREST	Upland Forest	Dry Upland Forest Dry-mesic Upland Forest Mesic Upland Forest Wet-mesic Upland Forest
	Floodplain Forest	Mesic Floodplain Forest Wet-mesic Floodplain Forest Wet Floodplain Forest
	Sand Forest	Dry Sand Forest Dry-mesic Sand Forest Mesic Sand Forest
SAVANNA & WOODLAND	Savanna (glacial till/loess)	Dry-mesic Savanna Mesic Savanna
	Sand Savanna	Dry Sand Savanna Dry-mesic Sand Savanna
	Woodland	Dry Woodland Dry-mesic Woodland Mesic Woodland
	Sand Woodland	Dry Sand Woodland Dry-mesic Sand Woodland
	Flatwoods	Southern Flatwoods Sand Flatwoods Northern Flatwoods
	Barrens	Xeric Barrens Dry Barrens Dry-mesic Barrens Mesic Barrens
PRAIRIE	Prairie	Dry Prairie Dry-mesic Prairie Mesic Prairie Wet- mesic Prairie Wet Prairie
	Sand Prairie	Dry Sand Prairie Dry-mesic Sand Prairie Mesic Sand Prairie Wet-mesic Sand Prairie Wet Sand Prairie
	Gravel Prairie	Dry Gravel Prairie Dry-mesic Gravel Prairie Mesic Gravel Prairie
	Dolomite Prairie	Dry Dolomite Prairie Dry-mesic Dolomite Prairie Mesic Dolomite Prairie Wet-mesic Dolomite Prairie Wet Dolomite Prairie

<b>Class</b>	<b>Subclass</b>	<b>Type</b>
	Hill Prairie	Dolomite Hill Prairie Loess Hill Prairie Glacial Drift Hill Prairie Gravel Hill Prairie Sand Hill Prairie
	Shrub Prairie	Shrub Prairie
WETLAND	Marsh	Freshwater Marsh Brackish Marsh
	Swamp	Swamp Shrub Swamp
	Sedge Meadow	Sedge Meadow
	Fen	Forested Fen Shrub Fen Graminoid Fen Calcareous Floating Mat
	Bog	Forested Bog Tall Shrub Bog Low Shrub Bog Graminoid Bog
	Seep and Springs	Seep Acid Gravel Seep Calcareous Seep Sand Seep Spring
	Panne	Panne
OPEN WATER	Pond	Pond
	Lake	Lake Great Lake
STREAM	Ephemeral Stream	Ephemeral Stream
	Small Stream	High Gradient Small Stream Low Gradient Small Stream
	Medium Stream	High Gradient Medium Stream Low Gradient Medium Stream
	Large Stream	High Gradient Large Stream Low Gradient Large Stream
	Major River	High Gradient River Low Gradient River
BEDROCK	Glade	Sandstone Glade Limestone Glade Shale Glade



<b>Class</b>	<b>Subclass</b>	<b>Type</b>
	Cliff	Dry Sandstone Cliff Mesic Sandstone Cliff Dry Limestone Cliff Mesic Limestone Cliff Dry Dolomite Cliff Mesic Dolomite Cliff Sandstone Overhang Eroding Bluff Algific Talus Slope
SHORE	Shore	Beach Foredune
CAVE	Cave	Terrestrial Cave Aquatic Cave
CULTURAL	Cultural	Developed Land Artificial Impoundment Agricultural Land Managed Grasslands Old Field Habitat Reconstructions

# HOW TO GRADE THE QUALITY OF AN ILLINOIS NATURAL AREA

## INAI Terrestrial and Aquatic Natural Community Grading

Natural quality is defined as a measure of the effects of disturbance and/or degradation on 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 that 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, channelization). All natural communities in all Categories, from high quality to degraded, can be graded using this system.

### Grading:

- requires repeated experience in varying qualities of a particular natural community type to establish a point of reference.
- is required for every Category.
- is required for every community within a Category.
  - Each site, regardless of Category, should be mapped and graded to natural community type level.
  - Large Category II and Category VI sites may be mapped to natural community class or subclass (without grades) if not possible to map and grade to natural community type.
- does **NOT** require Vegetation Sampling.
  - Only Category I terrestrial communities being nominated as qualifying feature(s) require a Grading Form and Qualitative Plant list (see Qualitative Vegetation Sampling, (Appendix C.1.) All other community grades are recorded on a community map.
  - Quantitative Vegetation sampling is only required for the highest quality natural community type within each community class for Category I terrestrial sites. (see Quantitative Vegetation Sampling, (Appendix C.1.).
- Category I Streams require an INAI Stream Grading Form.

Further guidance on applying grades to natural community types is found in Appendix B. See Appendix B.1. for more on terrestrial grading. See Appendix B.2. for more on stream grading.

Grades used by the INAI are summarized below (White 1978, White 2009):

### Grade A - Very high-quality terrestrial or aquatic natural community

Grade A natural communities exhibit a native species composition, vegetation structure, and ecological function with no or very minimal signs of degradation. Sites experiencing minimal degradation will show near complete recovery - the compositional, structural, and functional integrity are intact. Generally, Grade A communities need minimal or no restoration, though they may require management to maintain their present conditions (e.g., periodic fire, removal of exotic invasive species).

Examples of Grade A natural communities: old-growth, ungrazed Forest; Prairie with undisturbed soil and native plant species composition; Wetlands with unpolluted waters, unaltered hydrology, and native vegetation; Streams with coarse substrates, high spatial heterogeneity of physical features, and an intact biotic community.

### Grade B – High-quality terrestrial or aquatic natural community

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

Examples of Grade B Natural Communities: old-growth Forest selectively logged five 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; Streams with minimal deposition of sediments from anthropogenic activities sedimentation, limited eutrophication, and communities that are diverse, yet may lack species intolerant of degradation.

## **Grade C – Medium-quality terrestrial or aquatic natural community**

Grade C communities either (1) have experienced moderate to heavy degradation and may or may not be in the process of recovering its species composition, vegetation structure, and ecological function, but possesses restoration potential appropriate for complete and functional communities of that type, or (2) have experienced severe degradation and has recovered the structure and function of the community. Degradation of a Grade C community can be so great that its species composition, vegetation structure, and ecological function have been significantly altered, but it possesses restoration potential for improvement or maintenance at this grade. Grade C communities may be restored to Grade B communities with intensive, specifically prescribed management and/or a significant interval of time. Grade C communities can be maintained in their 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 have changed the structure and composition of the vegetation; Streams with altered hydrology, sedimentation from anthropogenic activities, recovering from channelization, and containing communities with few species intolerant of degradation.

## **Grade D – Low-quality natural community**

Grade D communities (1) have experienced severe degradation and have not recovered the species composition and vegetation structure of a natural community of that type, or (2) have experienced very severe degradation, but have just begun to recover the vegetation structure appropriate for such a community. Grade D communities have been so severely degraded that, while a community type can be assigned, its vegetation structure and ecological 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. Grade D natural communities typically can only be rehabilitated through replacing and supplementing species composition and vegetation structure, through significant management efforts, or through intensive physical and chemical enhancement.

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; channelized Streams with little or no intact riparian zones and exhibiting limited species diversity and containing communities with no species intolerant of degradation.

## **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 ecological function has been removed and there are few or no plants or animal species of a ecologically-functioning 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, rights of way, concrete waterways.

# THE CATEGORIES OF THE ILLINOIS NATURAL AREAS INVENTORY

## Category I – High-quality natural communities

### Qualifications for Category I Sites – High-quality natural communities

A natural area is eligible for the Inventory as a Category I site when it supports a high-quality example of one or more of the natural community types found in Illinois meeting minimum size criteria. A high-quality natural community is a collection of flora and fauna that has remained at or is currently equal to a Grade A or B rating for purposes of the INAI. High-quality communities exhibit little or no degradation by natural or unnatural causes.

Natural community types recognized and used by the INAI are listed in the Natural Community Classification System in Table 1 and described in Appendix A.2.

Once a natural community is identified, it must be evaluated for eligibility as Category I according to the standards of the INAI. This is accomplished by determining the community's quality through a grading process (White 1978, White 2009); conducting vegetation, aquatic, or cave sampling, as applicable, as well as meeting minimum qualifying community size in area (Table 2).

### Qualifying grade for Category I features

Grade A or B natural communities that meet minimum size requirements (Table 2) are eligible as INAI Category I sites. Grading is based on a framework of conditions that indicate community quality through examining present condition, degradation history, and recovery potential (Appendix B.1.). Under special conditions, a Grade C natural community may be eligible for the INAI (see below under exceptions). Grade D or Grade E communities cannot, on their current merit, qualify as Category I INAI sites, though they may be included within the boundaries of a Category I site. Remnant natural communities, defined as those that have existed since the time of glaciation, make up most of Illinois Category I sites.

### Category I Restorations and Reconstructions

Sites that have been *restored or reconstructed* to the equivalent of Grade A or B may also be eligible for INAI Category I. For the purposes of the INAI, **restoration** is defined as the application of approved management techniques to a formerly Grade C natural community which results in the improvement of the natural quality of that community. Restoration activities include, but are not limited to, native species augmentation/enrichment, removal of invasive species, restoration of natural processes (e.g., fire, hydrology), and enhancement of physical characteristics (e.g., riffle installation).

- Restorations proposed for inclusion on the INAI as Category I must meet the same minimum quality and size criteria as other Category I natural communities of that type. Plant translocations should follow the Plant Translocation Policy adopted by the Illinois Nature Preserves Commission, the Illinois Endangered Species Protection Board and IDNR (Appendix D). The sources of plants, reproductive parts, and seeds must be documented.

For the purposes of the INAI, **reconstruction** is the application of approved management techniques to Grade D and/or E natural communities which results in the improvement of the natural quality of that community. Reconstruction activities include, but are not limited to, native species establishment, reconstruction of soils, topography, substrate, gradient, and/or hydrology, and general natural community reconstruction (e.g., prairie in formerly plowed land, reconnection of river to floodplain).

- Reconstructions proposed for inclusion on the INAI as Category I must meet the following criteria:
  1. support a natural community equivalent to a Grade A or B,
  2. have been maintained at that Grade for a minimum of five years

Terrestrial reconstructions must also meet these criteria:

3. minimum of 40 acres in size for wooded natural community types and 20 acres in size for herbaceous natural community types (Table 2),

4. plant translocation according to the Plant Translocation Policy adopted by the Illinois Nature Preserves Commission, the Illinois Endangered Species Protection Board and IDNR (Appendix D). The sources of plants, reproductive parts, and seeds must be documented.

### Minimum qualifying size criteria for Category I features

The INAI recognizes that larger sites are more biologically secure than smaller sites. Still, many of Illinois' smaller remnant natural communities persist because of ownership and land use patterns. Minimum size requirements are developed through analysis of information contained in the natural areas databases and GIS regarding typical size and rarity of known examples of each natural community type. The criteria are based on the best available scientific knowledge. The goal of size requirements is to capture the diversity of natural community types ensuring the inclusion of even small yet functional natural communities and to represent significant examples of natural communities on a statewide basis. To be eligible for the INAI, the acreage of a high-quality natural community type must meet the minimum size criteria for a Community Class as outlined in Table 2.

### Exceptions to the minimum qualifying grade and size criteria for Category I sites:

It is the intent of the INAI to contain sufficient representative and /or functional replicates of every natural community type in each Natural Division and Section in which it historically occurred to protect against loss as a result of both natural and man-made events. Further, the INAI recognizes areas that are composed of a mosaic of community types that integrate with each other on the landscape. While boundaries between community types may be distinct in some areas, often they transition gradually. In community classification, we partition a complex continuum into practical units (natural community types) for identification, mapping, and management. This partitioning may preclude the recognition of significant natural features.

Therefore, the following **exceptions to the minimum quality and minimum size criteria of terrestrial** INAI Category I sites are allowed:

#### Rare Terrestrial Community Type:

- This exception applies if there are fewer than 5 qualifying examples of a natural community type within a Natural Division and Section, the natural community will be designated a Rare Community Type in that Natural Division and Section.
- This designation allows up to 5 Rare Community Types of this natural community to be added to the INAI.
- These Rare Community Types must be Grade A or B and be equal to or greater than ½ of the minimum qualifying size for that community type (Table 2).

#### Best-of-Kind Terrestrial Community Type:

- This exception applies if there are fewer than 160 acres of grade A and B examples of a natural community type within a Natural Division and Section, Grade C examples will be designated as Best-of-Kind and will be eligible for inclusion on the INAI (20<sup>th</sup> NAEC Meeting, Dec. 5-7, 2000) .
- This exception allows for the addition of up to 5 Best-of-Kind examples of the natural community type.
- Best-of-Kind sites must be Grade C in quality and must be twice as large as the minimum qualifying size for that natural community type (Table 2).
- The acreage of a Grade A or B community that is included in either a Community Mosaic exception (see below) or as an Exceptional Feature of another site is included in the 160-acre maximum by which Grade C Best-of-Kind can qualify.
- A natural community type can be represented by Rare Community Types and Best-of-Kind Community Types if the natural community qualifies under both criteria (fewer than 5 sites and fewer than 160 acres in total acreage).

#### Community Mosaic:

- This exception applies when two or more Grade A and/or B natural community types are adjacent on the landscape, but none meets the minimum qualifying size criteria individually (e.g.,).
- For Community Mosaics, total acreage for all Grade A and B natural communities are summed.
- Sites will qualify under this exception if the summed acreage exceeds the minimum qualifying size criteria for the community type that requires the greatest minimum qualifying size (Table 2).
- Vegetation sampling is required within each qualifying natural community type and the acreage will be included in the total for the Natural Division and Section.
- A Community Mosaic can be composed of grade A, B, Best-of-Kind, or any combination thereof. A Community Mosaic can have inclusions (see below).

- *Example:* An example of a Community Mosaic is an Upland Forest with a mosaic of Dry-mesic Forest on the ridgetops and Mesic Forest in ravines.

#### **Communities with Inclusions:**

- This exception applies when a qualifying Grade A, B, or Best-of-Kind natural community type contains small examples of other Grade A or B natural communities.
- Inclusions are less than 0.25 acre in size individually or less than 2% cumulatively of a site and are identifiable as a distinct natural community type(s) within the larger natural community matrix.
- Natural communities recognized as Inclusions will be mapped as polygons but not sampled and will be listed as Exceptional Features in the site description.
- *Example:* An example of a Community with Inclusion is a high-quality Dry-mesic Upland Forest which includes a small high-quality Hill Prairie, where the Hill Prairie is too small to qualify on its own.

#### **Community Complex:**

- This exception applies to sites that contain a natural community that possesses elements of two or more natural community types that are virtually indistinguishable from each other, creating an almost homogenous vegetational appearance.
- Use of this exception should be very rare. The presence of elements of more than one natural community type can be an indicator of disturbance. Careful observation and evaluation are necessary to exclude this possibility and justify this designation.
- A boundary will be drawn around the entire complex. It will be named according to the natural community type it most strongly resembles. The other community type(s) with which it shares elements would be listed as a Exceptional Features and included in the site description.
- The natural community would need to be sampled but the acreage would not be included in the total for the Natural Division and Section.
- A Community Complex can have Inclusions.
- *Example:* An example of a Community Complex is a Limestone Glade occurring within a Hill Prairie.

The following **exceptions to the minimum size and minimum quality criteria** of **aquatic** INAI Category I sites are allowed:

#### **Rare Aquatic Community Type:**

- This exception applies if there are fewer than 5 examples of an Open Water or Stream community type in a major watershed or of an Aquatic Cave in a Natural Division and Section, the natural community will be designated a Rare Community Type.
- This designation allows up to 5 Rare Community Types of this natural community to be added to the INAI as a Category I feature.
- These Rare Community Types must be Grade A or B and be equal to or greater than ½ of the minimum qualifying size for that community type (Table 2).

#### **Best-of-Kind Aquatic Community Type:**

- This exception applies if there are fewer than five confluence-to-confluence stream segments of Grade A or B Stream community types, 2.5 acres of ponds, or 25 acres of lakes present in a major watershed, or 0.5 acres of Aquatic Caves present within a Natural Division and Section, Grade C examples will be designated as Best-of-Kind and will be eligible for inclusion as Category I on the INAI.
- This exception allows for the addition of up to 5 Best-of-Kind examples of the natural community type within the major watershed or Natural Division and Section.
- Best-of-Kind sites must be Grade C in quality and must be twice as large as the minimum qualifying size for that natural community type, except for Streams (Table 2).
- A natural community type can be represented by Rare Community Types and Best-of-Kind Community Types if the natural community qualifies under both criteria.

Table 2. Illinois Natural Areas Inventory: Minimum Qualifying Size Requirements for Category I Sites

<b>COMMUNITY CLASS</b>	<b>Minimum Qualifying size</b>	<b>Other criteria</b>
<b>Forest</b>	20 acres	Grade A, B, or any combination - All Forest community types
	40 acres	Reconstructions
<b>Savanna &amp; Woodland</b>	20 acres	Grade A, B, or any combination for Southern Flatwoods, Sand Flatwoods, and Sand Savanna
	10 acres	Grade A, B, or any combination for Woodland
	5 acres	Grade A, B, or any combination for Savanna (glacial till/loess)
	1 acre	Grade A, B, or any combination for Northern Flatwoods
	0.25 acre	Grade A, B, or any combination for Barrens
	40 acres	Reconstructions
<b>Prairie</b>	0.25 acre	Grade A, B, or any combination - All Prairie community types
	20 acres	Reconstructions
<b>Wetland</b>	20 acres	Grade A, B, or any combination for Marsh and Swamp
	5 acres	Grade A, B, or any combination for Shrub Swamp
	0.25 acre	Grade A, B, or any combination for all other Wetland community types
	40 acres	Reconstructions - wooded Wetland community types
	20 acres	Reconstructions - herbaceous Wetland community types
<b>Open Water</b>	0.5 acre	Grade A, B, or any combination for Pond
	5 acres / 10' deep	Grade A, B, or any combination for Lake
<b>Streams</b>	1 confluence-to-confluence stream segment	Grade A, B, or any combination for Stream
<b>Bedrock</b>	0.25 acre	Either horizontal or vertical surface
<b>Shore</b>	0.25 acre	All Shore community types
<b>Cave</b>	1 acre or 300 feet, whichever is more	
<b>Cultural</b>		Cannot qualify for Category I on their own merit but used to describe inclusions or potential buffer

## Category II Sites - Specific suitable habitat of endangered and threatened species

### Qualifications of Category II Sites

Category II sites are Illinois lands and waters identified and documented as specific suitable habitat for animals or plants currently listed as endangered or threatened species by the Illinois Endangered Species Protection Board (IESPB) (20<sup>th</sup> NAEC Meeting, Dec. 5-7, 2000). Specific suitable habitat is defined, for the purposes of the INAI, as those physical and biological features of the landscape that a species requires to survive and reproduce.

Category II sites must be occupied in the previous ten years evidenced by a current Element Occurrence Record (EO) in the Natural Heritage Database submitted for a minimum of one State-listed endangered or threatened species to be eligible for the INAI. Each site will be evaluated on an individual basis. General guidelines for inclusion are:

1. The presence of specific suitable habitat for a listed species must be verified by an IDNR Biologist or a person approved by an IDNR Biologist.
2. The EO supporting designation of specific suitable habitat for a listed species must be current (no more than 10 years old) when the Category II site is proposed.
3. Specific suitable habitat supported by EOs more than 10 years old are not eligible for the INAI. Deletion of existing Category II sites without a current EO will be considered in consultation with IDNR Biologist.
4. Wetlands that support reproducing endangered or threatened wetland-dependent species and have an EO submitted within the past 10 years can be considered specific suitable habitat and are eligible for inclusion on the INAI because of natural hydrologic variation.
5. Ephemeral ponds that support a population of endangered or threatened species under the appropriate hydrologic and growing conditions and have a verified EO within the past 10 years can be considered specific suitable habitat and are eligible for inclusion on the INAI.

### Taxon specific guidelines:

In addition, several taxon-specific guidelines have been approved to refine INAI Category II definitions. These guidelines consider life history information and conservation needs that reflect special circumstances within species or species groups. Other guidelines may be added upon approval by the NAEC.

**Fish and Mussels:** The spatial extent of specific suitable habitat for fish and mussels shall be the valley segment (i.e., connected Stream reaches of the same natural community type; Frissell et al. 1986) within which the EO is located. Smaller extents may be accepted if ecological transitions are present (e.g., impounded reach, point source discharge). Only records of fish or mussels observed as live individuals shall qualify for Category II. Valley segments can be viewed via an online data viewer, link located in Appendix B.2.

**Birds:** The designation of specific suitable habitat for listed bird species must be supported by evidence of a breeding EO. Specific suitable habitat for a non-breeding migrant listed species is not eligible for inclusion on the INAI as a Category II site.

**Bats:** Specific suitable habitat for bats includes maternity sites, maternity colonies, and bat hibernacula or wintering habitat. This includes manmade habitat structures designed to attract bats. Nuisance locations do not qualify as Category II. Monitoring shall be performed every five years with methods prescribed by the IDNR (Kath, pers. comm.) due to potential deterioration of roosting habitat.

### Guidelines for evaluating translocations:

Category II sites may also include areas that support translocated populations of endangered or threatened species of animals or plants. Translocation methods must be consistent with the recovery and management of the listed species, be appropriate for the site, and meet all the following criteria:

1. Sites must have specific suitable habitat for an extant and reproducing population of a listed species for a minimum period of **five years** to qualify,
2. The sources of animals, eggs, plants, seeds, or other reproductive parts must be documented. Justification must be provided if sources are not local,



3. The IDNR Recovery Process must be followed with documentation of reintroduction as an approved implementation action, and management plan must exist and be followed,
4. Plant translocations must be done according to the Illinois Plant Translocation Policy adopted by the INPC, IESPB and IDNR (Appendix D.1.),
5. Animal translocations must be done in accordance with IESPB Policy on Translocation of Endangered and Threatened Animals (Appendix D.2.) and following the [IDNR's Recovery Process](#),
6. If translocation shall involve INPC-protected lands, the INPC Policy and Procedures for Translocation of Animal Species must be followed (Appendix D.3.),
7. Sites must be located within the known historic range of the species being introduced.

### **Minimum qualifying size criteria for Category II sites**

The minimum size for a terrestrial Category II site is 0.25 acre. Category II species in Open Water and Cave Community Classes will adhere to Category I size minima.

## **Category III Sites - Illinois Nature Preserves, Land and Water Reserves and Natural Heritage Landmarks**

### **Qualifications of Category III INAI sites**

Category III sites are lands and waters of the State that are identified and voluntarily protected by the landowner with the INPC as a dedicated Nature Preserve, registered Land and Water Reserve, or enrolled Natural Heritage Landmark within the Nature Preserves System, as defined by the Illinois Natural Areas Preservation Act (20<sup>th</sup> NAEC Meeting, Dec. 5-7, 2000). The Act states in Section 3.10 that a “natural area means as area of land in public or private ownership which, in the opinion of the Commission, either retains or has recovered to a substantial degree its original natural or primeval character...or has floral, faunal, ecological, geological, or archaeological features of scientific, educational, scenic, or esthetic interest.” Therefore, the INPC could protect a “natural area” that does not align with other INAI Categories besides this Category. The NAEC accepts the INPC’s approval as the criteria for inclusion on the INAI. Rules governing the management and public use of these sites will follow the Administrative Rule for Management of Nature Preserves (17 Ill. Adm. Code 4000), Regulation of Public Use of Illinois Dedicated Nature Preserves (17 Ill. Adm. Code 4015), or Register of Land and Water Reserves (17 Ill. Adm. Code 4010).

### **Minimum qualifying size criteria for Category III sites**

There are no minimum size requirements for Category III sites. The boundary of the Category III INAI site matches the boundary of the site as defined by the dedication, registration, or enrollment document, and approved by the INPC, as defined by the Illinois Natural Areas Preservation Act.

## **Category IV Sites - Outstanding geological features**

### **Qualifications of Category IV INAI Sites**

Category IV sites are outstanding representatives of Illinois' geologic diversity. A qualified staff geologist approved by the Chief of the Illinois State Geological Survey (ISGS) will determine, using geological criteria, if a site is a representative example of the state's geologic history and therefore eligible for inclusion on the INAI as a Category IV site. Geological features that are exposed by unnatural methods, such as road cuts or mining activities, are eligible for inclusion on the INAI. The ISGS is currently undergoing a review of all Category IV INAI sites to determine whether a standard of statewide significance is met (2022). While conducting the review, they will document and develop criteria for future reference.

### **Minimum qualifying size criteria for Category IV sites**

The minimum size requirement for Category IV sites is defined as one acre on either vertical or horizontal surfaces.

## **Category V Sites - Category currently unused**

## **Category VI Sites - Unusual concentration of flora and/or fauna**

Category VI sites are Illinois lands and waters that possess unusual biological features or support extraordinarily rich or diverse concentrations of flora and/or fauna of statewide significance. Concentrations may consist of a high number of species, a large number of individuals, or be an atypical association of species occurring together that are at risk from disturbance and/or are important in fulfilling a species or taxon life history requirement.

The following NAEC-approved guidelines are provided for some taxa. However, not all situations where Category VI is appropriate can be predicted. It is the responsibility of the nominator or other taxa expert to provide sufficient documentation and justification to the NAEC for a new or revised guideline. Sites will be evaluated for statewide significance and appropriately listed under this Category based on approved guidelines.

### **Flora**

Unusual concentration of vascular or non-vascular plants

Unusual assemblage of lichens on sandstone outcrops

Unusual assemblage of relict species growing and persisting together.

Unusual concentration of native aquatic plant species forming associations or large beds in Streams, Ponds, or Lakes

### **Fauna**

#### **Unusual concentration of freshwater mussels**

Native freshwater mussel assemblages/communities eligible for Category VI are those that meet or exceed the 90<sup>th</sup> percentile of species richness (Table 3) for a Stream subclass within an Ecological Drainage Unit (EDU; Higgins et al. 1998, Higgins et al. 2005). Species richness must be calculated from a 4 person-hour qualitative sample using wading collection techniques (i.e., without the aid of an underwater diving apparatus) and only species captured live shall be included in the richness total. Only samples collected within the past ten years shall be valid. The INAI site shall include the valley segment within which the focal assemblage was sampled. If multiple assemblages were sampled within the same valley segment at least half of samples shall meet the species richness criterion to be eligible. Information needed to evaluate mussel assemblages under this criterion (e.g., EDU, community subclass) can be accessed via an online data viewer found on the Illinois Natural Areas Inventory webpage.

Table 3. Minimum live mussel species richness criterion for eligibility as a Category VI unusual concentration of freshwater mussels

	Ecological Drainage Unit								
	Mississippi River North or Mississippi River Central	Rock River	Illinois River	Kaskaskia River	Mississippi River South	Ohio River	Wabash River	Middle Wabash River	Upper Illinois River or Great Lakes
<b>Stream Natural Community Subclass</b>									
<b>Small</b>	7	7	7	7	5	5	6	6	8
<b>Medium</b>	9	12	12	12	10	10	15	12	12
<b>Large and Major River</b>	12	12	12	14	14	14	15	15	15

**Essential habitat for mussel Species of Greatest Conservation Need**

The minimum length for this criterion is one Stream segment (i.e., confluence-to-confluence section).

**Unusual concentration of fish**

Coldwater Streams are those with mean daily July or August temperatures below 19° Celsius (Hinz, Jr. et al. 2011). They are characterized by a relatively high proportion of discharge attributed to groundwater inputs and representative fish species such as Southern Redbelly Dace, Fantail Darter, and Brook Stickleback. At least one mean daily July or August temperature record below 19° Celsius is required for a segment to qualify as a coldwater Stream. Temperature shall be measured continuously during the evaluation period (i.e., July or August) and is recorded as the mean of the mean daily temperature.

**Essential habitat for fish Species of Greatest Conservation Need**

This may include overwintering areas or spawning habitat. Minimum size for Streams under this criterion is a segment (i.e., confluence-to-confluence section), for Ponds and Lakes is 0.5 acres, and 0.1 acres for aquatic caves.

**Unusual concentration of cave invertebrates**

Assemblages that support 10 or more species of cave invertebrates classified as Troglotic or cave-obligate species according to the ecological classification system defined by Barr (1963, 1968) and Peck and Lewis (1978) are eligible for listing under INAI Category VI.

**Unusual concentration of reptiles and amphibians**

Sites that contain a minimum of 15 species of reptiles and amphibians occurring in the same or adjacent habitats during the breeding and/or brumation periods. Fifteen species is nearly 15% of all Illinois herptile species (104) and this value is considered a diverse community of statewide significance or unusual concentration for the purposes of the INAI Category VI. To qualify, the area should also include resources needed to sustain viable populations of these species, such as breeding sites and foraging areas.

Specific guidelines for Category VI Timber Rattlesnake habitat is found in Appendix E.

**Unusual concentration of birds**

Migration stop-over areas that provide foraging and resting habitat for shorebird concentrations of at least 10 species numbered at a minimum of 1,000 total individuals that have been documented for two consecutive years during the migration seasons (may depend on yearly hydrology).

Colonial rookery sites that contain at least 4 breeding species of heron, egret and/or cormorant and have supported breeding populations of at least 4 species for two consecutive years.

**Unusual concentration of bats**

Bat breeding and/or hibernation habitat, including man-made bat roosting structures, that contains from 50 to 100 individuals of a listed and/or non-listed species (excludes nuisance bat situations) over a period of two consecutive years. Monitoring shall be performed every five years with methods prescribed by the IDNR (Kath, pers. comm.) due to potential deterioration of roosting habitat.

**Minimum qualifying size criteria for Category VI sites**

Minimum size requirement of a Category VI, unless specified, is large enough to provide suitable habitat for that concentration of species or individuals and provide for protection and management of that concentration

# HOW TO OFFICIALLY ADD/CHANGE/REMOVE AN ILLINOIS NATURAL AREA

## Natural Areas Nomination and Documentation Procedures

### Potential Natural Areas

Identifying “potential” natural areas is important in the search for new INAI sites. A potential natural area is defined as any area that is thought to possess at least one significant natural feature which could qualify a site under any one of the five INAI Categories. Resources that can be used to search for potential INAI sites include various forms of aerial photography and imagery, topographic maps, remote sensing and satellite imagery, soils maps, digital elevation mapping, and historic vegetation surveys and mapping. Field reconnaissance efforts are also productive using aerial surveys. Ultimately, however, all sites must be ground-truthed and evaluated (i.e., graded). All potential natural areas need to have all natural community types mapped and graded for all INAI Categories to the degree possible. However, vegetation sampling is only required to be conducted at the highest quality significant community type in each community class. Following on-the-ground surveillance of a potential natural area, if considered eligible, then nomination as an INAI should proceed by developing a nomination packet for the site.

Nomination materials required for site designation under each of the five Categories are documented in the “INAI Nomination Checklist” (Appendix F). The site transitions from being a potential natural area to an INAI site once the Natural Areas Evaluation Committee determines that the area has statewide significance.

### Nomination Procedure (INAI Additions, Changes, and Deletions)

1. Any person or organization may inform the IDNR’s Natural Areas Program of a potential natural area by following the INAI Nomination Checklist and filling out an INAI Nomination and Approval Form (Appendix F). Submit forms or request information at [DNR.NaturalAreas@illinois.gov](mailto:DNR.NaturalAreas@illinois.gov) or to the local Natural Heritage Biologist (NHB).
2. The Natural Areas Program notifies the Natural Heritage Biologist (NHB) from the District where the site occurs if the NHB is not the nominator.
3. The NHB determines whether the site warrants evaluation.
4. If action is warranted, the NHB or a person approved by the NHB will evaluate the site. This process will be completed within two years from the time of nomination.
5. Complete nomination packets must be approved by the NHB for the District in which the site is located, in consultation with the INPC Natural Areas Preservation Specialist (NAPS).
6. The Natural Areas Evaluation Committee (NAEC) will consider all nomination requests with complete documentation and favorable evaluations and notify the nominator of the action taken.

### Supporting Documentation

Standardized forms (Appendix F) will be used to record and document information contained in the Inventory.

Information maintained in the INAI files should reflect baseline or historic conditions and be kept current. It is necessary to keep this information reflective of “on-the-ground” conditions related to features (qualifying or non-qualifying). This information should be updated by those most familiar with the site.

### Supporting and/or baseline information varies by Category, information that should be maintained for each site includes:

1. A natural community map containing natural community type designations (Table 1) and grades for all communities within the proposed natural area boundary,
2. Completed grading form (Appendix F) following the natural lands evaluation protocol (White 1978, White 2009)(Appendix B.1.) for each qualifying natural community type, or documentation for Stream communities following Appendix B.2.
3. Taxa species lists for the site:
  - a. plant lists should be at the natural community type level,
  - b. other taxa may be site level or any smaller subdivision of the site,

4. Quantitative Vegetation Sampling data (only required for the highest quality natural community type within each community class for Category I sites) and auxiliary information relevant to transect location, length, direction, witness tree, and plot locations for a terrestrial natural community; or aquatic community sampling data,
5. Extant element occurrence records – site report from Biotics,
6. Photos, videos, or audio recordings documenting the general site conditions and features,
7. Suitable habitat designations for species of management concern (e.g., State-listed, Illinois Wildlife Action Plan – Species in Greatest Conservation Need, watch list species, regionally rare, etc.),
8. Ownerships, easements, or other needs concerning preserve design,
9. Geological or archaeological features,
10. Unique species assemblages, management activities conducted at the site (including spatial extent), reports, brochures, legal descriptions, articles, contracts, surveillance forms, etc. relevant to the site.

## Natural Areas Evaluation Committee

The Natural Areas Evaluation Committee (NAEC; Committee) is an internal IDNR committee responsible for overseeing and updating the INAI. The NAEC is composed of six voting members or their designees:

1. Illinois Nature Preserves Commission (INPC) – one voting member,
2. Illinois Endangered Species Protection Board (IESPB) – one voting member,
3. Natural Areas Program Manager,
4. Natural Areas Project Manager,
5. Natural Heritage Biologist from the District in which the site is located or internal designee, with prior notification to the Natural Areas Program,
  - a. The Chief of the Division of Natural Heritage (or designee) will substitute for the Natural Heritage Biologist on non-site-specific policy decisions, procedural items, or as otherwise needed.
6. Natural Heritage Regional Administrator (either of the District in which the site is located, or as Regional Administrator designee representing statewide).

The Natural Areas Program Manager (or designee) will chair the meeting. A quorum, defined as a majority of the voting NAEC members (or designees), must be in attendance to transact business. Attendance by conference call is accepted.

The first meeting of the NAEC was held on July 28, 1988. The NAEC meets regularly to review nominations for actions concerning existing and potential INAI sites as well as general policy matters specific to maintaining the INAI. Actions are recorded in the minutes and resulting changes to the databases are made in a timely manner. Meeting minutes are maintained by the Natural Areas Program.

The NAEC may delegate authority to the Natural Areas Program staff, that supersedes the requirements for NAEC action, to more effectively and efficiently make changes to the INAI. Delegated authority related to additions/deletions/changes to qualifying features as a result of actions taken by the INPC and IESPB require no field concurrence. All other delegated authority for site changes requires District NHB review in consultation with the NAPS and approval. A synopsis of changes made under this authority will be provided to the Committee for review at the last meeting of a calendar year. At that time, the Committee shall reauthorize, in whole or in part, Natural Areas Program delegated authority.

Actions to be considered by the NAEC may include but are not limited to:

### 1. Addition of new INAI sites to the Inventory

A site may be added to the INAI if it is determined to contain at least one qualifying feature in any of the INAI categories. Sites are approved for addition to the INAI by a **majority vote** of the NAEC members (or designees) in attendance, except for those delegated authorities below.

*Delegated Authority:*

- Addition of sites with qualifying Category III features as a result of public actions taken by the INPC (i.e., Nature Preserve dedication or Land and Water Reserve registration or Natural Heritage Landmark designation).

## 2. Deletion of existing INAI Sites

A site will be removed from the Inventory when it is determined that it no longer contains at least one qualifying feature in any of the INAI categories. Sites are approved for removal from the INAI by a **unanimous vote** of the NAEC members (or designees) in attendance, except for those delegated authorities below.

Justification for removal may be due to extensive physical or mechanical damage to the site or documented degradations to the qualifying feature from natural or anthropogenic causes. Features may no longer be considered qualifying if the date of last observation for the element occurrence is over 20 years old or there has been at least two documented surveys conducted with sufficient sampling efficiency and spatial scale where the element of interest was not found. If there is a reasonable potential for restoration, as determined by the NAEC (with the exception of Category III sites), the site may remain on the INAI for a period determined by the NAEC to allow appropriate stewardship to be applied and the site reevaluated. After the period previously determined by the committee has expired, the deletion must be considered at the next scheduled NAEC meeting without further extensions.

*Delegated Authority:*

- Deletions of sites with no qualifying Category II feature as a result of public actions taken by the IESPB (i.e., Species Delisting) if the site contains no other qualifying feature(s).
- Deletions of sites with no qualifying Category III features as a result of public actions taken by the INPC (i.e., Nature Preserve dedication, Land and Water Reserve registration, or Natural Heritage Landmark designation) if the site contains no other qualifying feature(s).

## 3. Updating Category Designations for existing INAI Sites

The NAEC approves the addition or deletion of a Category to an existing INAI site based on the identification of new qualifying features or degradation and/or loss of an existing qualifying feature. Existing INAI sites are approved for Category change(s) (addition or deletion) by a **majority vote** of the NAEC members (or designees) in attendance, except for those delegated authorities below.

Acceptable modifications for a Category change may include but not be limited to the following circumstances: identification of a new feature that qualifies for a Category not previously designated for the site; management or restoration activities on a natural community that restores the quality to a higher qualifying grade; the assigned Category is no longer valid due to disturbance, degradation, and/or low restoration potential of the qualifying significant feature; the assigned Category is no longer valid due to absence of the significant feature; other modifications as determined by the NAEC. Complete documentation and written justification must be submitted to the Natural Areas Program. Vegetation sampling is required for adding a natural community type as a qualifying feature (i.e., adding a new Category I feature) only if it is in a community class not currently represented at the site.

*Delegated Authority:*

- Addition of, or changes to any non-qualifying feature that does not result in the addition of a new qualifying feature(s) to an existing site.
- Addition of, changes to, or deletions of a qualifying Category III feature at an existing INAI site as a result of Natural Heritage Landmark enrollment with the INPC,
- Deletions of features with an Element Occurrence Record (EO) greater than 20-years-old [only if the site contains other qualifying feature(s)].
- Modifications to any qualifying feature that does not result in:
  - deletion of sites,
  - addition or deletion of Categories to sites,
  - addition of new qualifying features within a Category,
  - deletion of an entire qualifying feature type within a Category,
- Name changes to an existing INAI site.

#### 4. INAI Site Boundaries

The NAEC approves boundary expansions to an existing INAI site if the modification is justified. Existing INAI boundary expansions are approved by a **majority vote** of the NAEC members (or designees) in attendance, except for those delegated authorities below.

Acceptable modifications for boundary expansions are:

1. inclusions of additional restored areas or additional qualifying or exceptional features,
2. establishing buffer areas to protect existing significant features, and/or
3. the combining of existing adjacent sites.

Boundaries for INAI sites should be deliberate and conservative and should reflect the minimum area needed to include the significant feature(s) at the site and additional natural lands to adequately represent the diversity of the area and support protection and effective management. Boundary adjustments may be necessary over time as conditions at the site change.

*Delegated Authority:*

- Boundary changes resulting from public actions taken by the INPC (e.g., Nature Preserve dedication, Land and Water Reserve registration, or Natural Heritage Landmark designation),
- Corrections of historical inaccuracies resulting from previous mapping procedures,
- Boundary reductions resulting from portions of a site no longer qualifying due to disturbance, degradation, destruction or delisting of species, and/or low restoration potential.

#### 5. Approval of Actions

The NAEC may act on other actions including policy or procedural revisions, changes to IDNR INAI Standards and Guidelines, or other issues that are not specific to an individual site. The NAEC will review all documentation and justification for the proposed action and vote accordingly. Such actions are approved by a **majority vote** of the NAEC members (or designees) in attendance, except for those delegated authorities below.

*Delegated Authority:*

- Editorial changes to the IDNR INAI Standards & Guidelines that bring the document into compliance with existing laws, policies, and procedures; modifications to data forms, measurements, and other data collection protocols that do not affect the type, format, and summarization of vegetation data; editorial corrections to the INAI Standards & Guidelines; and similar edits.

### Maintaining the Integrity of the INAI

The NAEC bases decisions primarily on the biologists' expert opinion, as well as supporting material housed and maintained at the IDNR within various hardcopy and digital files, GIS datasets, database management systems, NatureServe Biotics 5, and NATS. As conditions at sites change over time, it is desirable to periodically update these supporting materials to provide accurate information to guide site planning, protection needs, management activities, and defense issues. The information can also be summarized to track the status of Illinois' natural community types and to set and evaluate Natural Areas Program goals. Considering the quasi-regulatory usage of the INAI, maintaining accurate supporting information helps preserve the integrity of the INAI.

The qualifying feature(s) at INAI sites are tracked for as long as the site remains on the Inventory. This information is important to the Department's conservation planning, including prioritization of land acquisition. Regular monitoring of species, populations, or natural communities is desirable but optional. Required monitoring, for the purposes of the INAI, consists of the completion and submission of surveillance forms to the Natural Heritage Database (Appendix F). With the exception of Category IV sites, INAI sites should be **inspected** by the NHB or a designated person, with permission of the landowner, **once every three years**. Category IV sites should be inspected once every 10 years. Valuable surveillance information includes on-the-ground observations, qualifying feature status and changes, management practices and response, important ongoing research, and concerning threats. Quantitative vegetation sampling is not a required part of surveillance, however consistent updates to qualitative plant lists for each INAI are prized, particularly when specific to a natural community type. The Act requires that the condition of INAI sites protected by INPC are reported

on annually, therefore site surveillance is integral to contemporary reporting. **Complete documentation is submitted to the Natural Heritage Database Manager by December 31 of the year in which surveillance was performed.**

Upon review of surveillance forms, INAI sites that have undergone significant changes will, at the request of the NAEC, receive a full reassessment within two years of the surveillance by the NHB from the District in which the natural area is located or by Department-approved personnel. If significant resource degradation has occurred, the area may warrant a change of grade, Category, boundary, or even deletion from the Inventory. The reassessment should include any management activities undertaken on the site, the estimated effects of management on the site, and current and future management needs. When a site is degraded beyond restoration or destroyed, it should be proposed for removal from the INAI. Complete documentation and maps are required and should be submitted to the Natural Areas Program Manager by December 31 of the calendar year during which the reassessment was performed to initiate potential action by the NAEC.

Biotics 5 and NATS contain historic and current data related to Illinois' natural areas. Changes involving any INAI site will be entered into Biotics and NATS, typically within 30 days after NAEC action. Site files are maintained for each INAI, including quantitative and qualitative data sheets. Geographic Information Systems (GIS) shapefiles have been developed of all INAI site boundaries. Natural community mapping with grades should be performed for the entire INAI site, regardless of Category, for tracking change across time. The development of GIS applications to support documentation of management practices and frequency is anticipated in the near future. The Natural Areas Program is actively digitizing past plant data sheets to improve the efficiency of analysis among natural community types and to support ongoing community research. Data requests may be directed to the [Natural Heritage Database](#) and will require execution of a Data License Agreement with the Department.

With this 2022 refresh of the INAI Standards and Guidelines comes a renewed commitment to remember Illinois' natural areas history with an eye toward planning for environmental uncertainty. Maintaining the integrity of the INAI increasingly requires expertise in the practice of adaptive management. Terrestrial and aquatic ecologists are encouraged to contribute to the improvement of Illinois' natural community classification system through applied research. INAI landowners are urged to seek perpetual legal protection through INPC for rare natural communities. INAI defense requires vigilance against boundary encroachments, overuse, hydrologic disturbance, and other potential threats. The IDNR intends to clarify language in our internal Policy and Procedures Manual to ensure continued staff commitment to the State's highest quality natural areas. And, as our predecessors have considered in the past, Administrative Rules memorializing the importance of our INAI legacy should be promulgated under the Illinois Natural Areas Preservation Act to maintain Illinois' standing in the nation as a leader in natural areas identification, protection, stewardship, and defense. Your contributions to this process are welcomed at [DNR.NaturalAreas@Illinois.gov](mailto:DNR.NaturalAreas@Illinois.gov).



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# **Appendix A: Natural Community Classification**

A.1. Soil Moisture Classes

A.2. Natural Community Classification System and Descriptions

A.3. Natural Community Types by Natural Division and Section

## A.1. Soil Moisture Classes

From White 1978:

Soil moisture is a basic characteristic for distinguishing natural communities. Many closely related communities are separated on the basis of soil moisture alone. The following seven soil moisture classes are adopted with changes from the soil-drainage classes in the USDA Soil Survey Manual (Soil Survey Staff, 1953). The classes are based on runoff, permeability, and internal drainage characteristics.

### Xeric

- Excessively drained: Water is removed from the soil very rapidly, because sloping bedrock or gravel is at or near the surface.
- A soil profile is commonly poorly developed or absent.
- Forest soils are commonly brownish, grayish, or reddish and free of mottling.
- Prairie soils, if developed, have thin A horizons.

### Dry

- Somewhat excessively drained: Water is removed from the soil rapidly.
- Many of these soils have little horizon differentiation.
- Forest soils are free of mottling and are brown, yellow, gray, or red.
- Prairie soils usually have relatively thin A horizons, brownish, yellowish, grayish, or reddish thin B horizons, and no mottling.

### Dry-mesic

- Well drained: Water is removed from the soil readily, but not rapidly.
- Well drained soils are commonly intermediate in texture, although soils of other textural classes may also be well drained.
- Forest soils are free of mottling (except for fossil gley), and horizons may be brownish, yellowish, grayish, or reddish. They may be mottled deep in the C horizon or below depths of several feet.
- Prairie soils have thick, dark A horizons, reddish, brownish, or yellowish B horizons, and C horizons that may or may not be mottled.
- Well drained soils commonly retain optimum amounts of moisture for plant growth after rains.

### Mesic

- Moderately well drained: Water is removed from the soil somewhat slowly, so that the profile is wet for a small but significant part of the time.
- Moderately well drained soils commonly have a slowly permeable layer within or immediately beneath the solum, a relatively high water table, additions of water through seepage, or some combination of these conditions.
- Forest soils have uniform colors in the A and upper B horizons, with mottling in the lower B and in the C horizons.
- Prairie soils have thick, dark A horizons and yellowish or grayish faintly mottled B horizons.

### Wet-mesic

- Imperfectly or somewhat poorly drained: Water is removed from the soil slowly enough to keep it wet for significant periods but not a large part of the time.
- They commonly have a slowly permeable layer within the profile, a high water table, and additions through seepage, or a combination of these conditions.
- Forest soils are uniformly grayish, brownish, or yellowish in the upper A horizon and commonly have mottlings below 6 to 16 inches in the lower A and in the B and C horizons.
- Prairie soils have thick, dark A horizons, high in organic matter, and faint evidence of gleying immediately beneath the A horizon.

### Wet

- Poorly drained: Water is removed so slowly that the soil remains wet for a large part of the time.
- The water table is commonly at or near the surface during a considerable part of the year. Poorly drained conditions are due to a high water table, to a slowly permeable layer within the profile, to seepage, or to some combination of these conditions.
- Forest soils may be light gray from the surface downward, with or without mottlings.
- Prairie soils commonly have slightly thickened dark-colored surface layers.
- The large quantities of water that remain on the poorly drained soils greatly affect the diversity and structure of the plant community.

**Hydric**

- Very poorly drained: Water is removed from the soil so slowly that the water table remains at or above the surface the greater part of the time.
- Soils of this drainage class usually occupy level or depressed sites and are frequently ponded.
- Forest soils commonly have dark gray or black surface layers and are light gray, with or without mottlings, in the deeper parts of the profile.
- Non-forested soils commonly have mucky or peaty surfaces with distinct evidence of gleying.



## A.2. Natural Community Classification System and Descriptions

An important objective of the Illinois Natural Areas Inventory is to identify existing high-quality natural communities deserving of protection, preservation, and management. The INAI recognizes a list of community types (Table 1). A specific set of criteria separates one community type from another. These criteria can include a community's location (Natural Division and Section), soils, soil moisture, soil parent material, hydrology, slope, size, and plant and animal species composition. This section briefly describes each Community Class and its respective Community Types. Subclasses facilitate the transition from Community Class, the most general, to Community Type, the most specific. Community Type descriptions briefly describe dominant features, general geographic distribution, and characteristic species for each type. Community descriptions in the INAI Standards & Guidelines are not meant to refer to an actual community but are meant to more broadly define a theoretical best expression of that community.

Dominant and characteristic species help distinguish one Community Type from closely related types but need not be present in every example of a Community Type. The species listed are not meant as *indicator species* because they may not be restricted to a particular local environment. The order in which the species are listed implies no relative importance.

Natural communities exist as a continuum and may lack distinct boundaries. As the INAI classification system breaks that continuum into manageable units, there will nevertheless be ambiguity and overlap in application. Therefore, natural communities are defined at any level (Class, Subclass, or Type) by multiple characteristics which may or may not be restricted to that community, and reliable community classification is not done based upon one sole characteristic but instead upon the accumulation of several characteristics which are in agreement.

Since percent canopy cover as a community characteristic is a surrogate for measuring the available light at the ground level, the measure is presented within the INAI Standards & Guidelines only as a general guideline to assist in the description of Community Class and Subclass levels. Figure 3 presents a matrix that illustrates the conceptual relationship between canopy cover and soil depth/available water-holding capacity among a series of related and often associated Classes and Subclasses. These general characterizations are intended to provide a framework for validation of field assessments and to limit ambiguity due to overlapping community concepts and blended vegetation types. Ecotones are to be expected among these oftentimes associated Community Types, even across Class or Subclass boundaries, and remain a challenge to classification. Qualifiers, > or <, are used within the descriptions to indicate the imprecise relationship between the INAI classification system and percent canopy cover.

Some vertebrates and a few invertebrates that characteristically breed in a particular community may be listed. The use of topography, soils, water, and vegetation usually describes a community adequately - animals are listed only to present a clearer picture of the community. Few vertebrates are restricted to a single community, so the animals listed are usually ones with specialized habitats or limited distribution in Illinois. Nomenclature follows Smith (1978) for fishes, Phillips (2001) for amphibians and reptiles, Bohlen (1978) for birds, Feldhamer et al. (1979) for mammals, Mohlenbrock (2002) for vascular plants, and Conard et al. (1950) for bryophytes.

### Descriptions of Community Classes, Subclasses, and Community Types (revised and updated from White 1978)

#### CLASS FOREST

The Forest Community Class includes natural communities that are dominated by trees with a heavy multiple layered overstory and thick understory. Soil column (A and E horizons, or depth to slowly permeable horizon [e.g., fragipans or claypans]) typically, though not exclusively, deep (> 50 cm); soil texture variable; canopy cover (-)80 -100%; found generally in landscape positions protected from fire. Tree growth forms are mostly erect with relatively few low or horizontally spreading branches. Species composition of canopy stratum may include oaks (*Quercus spp.*), but other species also can also be common, particularly in subcanopy strata. Forest indicator species are common (Table 4) and Woodland indicator species are absent or occur in low frequency and few in number. Three subclasses are recognized. Upland and Floodplain forest are distinguished by their topographic position, and Sand Forests by their soils. See Figure 3 for generalized matrix comparing soil depth, moisture, and canopy cover to other classes and subclasses.

#### Subclass

Upland Forest--The Upland Forest communities are defined by soil moisture class, which ranges from dry to wet-mesic. Upland forests do not normally flood. Forests on terraces are considered Upland Forests, because (by definition) terraces do not normally flood.

## Type

Dry Upland Forest --The soils are dry, excessively drained, and poorly developed because of steep, exposed slopes or because of bedrock, gravel, or sand at or near the surface. Trees grow slowly but are not as stunted as in Xeric Barrens (formerly Xeric Upland Forest), and there is usually a well-developed understory and groundlayer. If the canopy is open and Savanna/Prairie plants are present, then the community is not a Dry Upland Forest but is a Dry Barren. In fact, many Dry Upland Forests of today were most likely maintained as Barrens by fire in the past and are found adjacent to contemporary Dry Barrens communities.

Distribution: Dry Upland Forests occur on steep ridges at the crests of river bluffs and at the edges of escarpments throughout Illinois but are most common on Bedrock outcrops along the Mississippi River and in the Shawnee Hills.

Dominant plants: Hill's oak (*Quercus ellipsoidalis*), bur oak (*Quercus macrocarpa*), blackjack oak (*Quercus marilandica*), chestnut oak (*Quercus prinus*), post oak (*Quercus stellata*), black oak (*Quercus velutina*).

Characteristic plants: pignut hickory (*Carya glabra*), black hickory (*Carya texana*),

Characteristic animals: ground skink (*Scincella laterale*), five-lined skink (*Eumeces fasciatus*), fence lizard (*Sceloporus undulatus*), summer tanager (*Piranga rubra*).

Dry-mesic Upland Forest – This community is in an intermediate position along a soil moisture gradient. Trees grow well, but the canopy is usually more open than in mesic forests.

Distribution: This is the most prevalent forest community in Illinois. It occurs on slopes throughout the state.

Dominant plants: white oak (*Quercus alba*), red oak (*Quercus rubra*), black oak (*Quercus velutina*).

Characteristic plants: shagbark hickory (*Carya ovata*), mockernut hickory (*Carya tomentosa*), flowering dogwood (*Cornus florida*), hop hornbeam (*Ostrya virginiana*), black haw (*Viburnum prunifolium*).

Characteristic animals: broad-headed skink (*Eumeces laticeps*), white-footed mouse (*Peromyscus leucopus*), eastern chipmunk (*Tamias striatus*).

Mesic Upland Forest -- Ideal soil moisture conditions result in a dense overstory and, in undisturbed stands, an understory of shade-tolerant species. Mesic forests occur on north-facing slopes, in ravines, and on level soil with moderately high available moisture.

Distribution: Mesic Upland Forest may be found throughout the state, but it is most common in hilly regions where slopes are protected from excessive evaporation and from fire.

Dominant plants: sugar maple (*Acer saccharum*), American beech (*Fagus grandifolia*), red oak (*Quercus rubra*), basswood (*Tilia americana*).

Characteristic plants: pawpaw (*Asimina triloba*), Ohio buckeye (*Aesculus glabra*), blue beech (*Carpinus caroliniana*), bitternut hickory (*Carya cordiformis*), red mulberry (*Morus rubra*), bladdernut (*Staphylea trifolia*).

Characteristic animals: spotted salamander (*Ambystoma maculatum*), wood frog (*Rana sylvatica*), wood thrush (*Hylochichla mustelina*).

Wet-mesic Upland Forest --This is an unusual community caused by poor drainage on level topography, occurring along shallow drainage ways, and in seepage areas.

Distribution: Small stands of Wet-mesic Upland Forest occur throughout the undissected upland forested regions of the state.

Characteristic plants: American elm (*Ulmus americana*), slippery elm (*Ulmus rubra*), hackberry (*Celtis occidentalis*), bur oak (*Quercus macrocarpa*).

## Subclass

Floodplain Forest -- Floodplain Forests occur within the floodplains of Streams. These dynamic communities are determined by the frequency and duration of flooding, and by the permeability of their soils. Floodplain forests are separated from Upland Forests because periodic flooding greatly affects the soil, fauna, and flora. The soil moisture classes range from mesic to wet.

## Type

Mesic Floodplain Forest – This community is located within the floodplain, but soils are moderately well drained, because of either their coarse texture or relatively high elevation.

Distribution: Mesic Floodplain Forest occurs throughout Illinois, although the stands are usually not extensive.

Dominant plants: sugar maple (*Acer saccharum*), white oak (*Quercus alba*), bur oak (*Quercus macrocarpa*), American elm (*Ulmus americana*), slippery elm (*Ulmus rubra*), basswood (*Tilia americana*).

Characteristic plants: black walnut (*Juglans nigra*), white ash (*Fraxinus americana*).

Characteristic animal: In floodplains, eastern mole (*Scalopus aquaticus*) is generally restricted to mesic soil, especially on natural levees.

Wet-mesic Floodplain Forest --This is the most common Floodplain Forest community. Species diversity is higher in the overstory, but lower in the groundlayer than in Mesic Floodplain Forest.

Distribution: This floodplain community occurs along Streams and creeks throughout the state.

Dominant plants: The forest is usually a mixture of trees, with no clear dominants.

Characteristic plants: silver maple (*Acer saccharinum*), hackberry (*Celtis occidentalis*), sweet gum (*Liquidambar styraciflua*), cherrybark oak (*Quercus pagodaefolia*), bur oak (*Quercus macrocarpa*), pin oak (*Quercus palustris*), American elm (*Ulmus americana*), spice bush (*Lindera benzoin*), kingnut hickory (*Carya laciniosa*), green ash (*Fraxinus lanceolata*).

Wet Floodplain Forest --Flooding is so frequent or prolonged in this community that the diversity of trees is lowered and the overstory is more open. The understory is often comprised of large dense stands of stinging nettle (*Laportea canadensis*).

Distribution: Wet Floodplain Forest occurs along Streams throughout the state. The most extensive tracts are on Lake plains and behind natural levees of large rivers.

Dominant plants: Any of the characteristic plant species listed below may be locally dominant.

Characteristic plants: silver maple (*Acer saccharinum*), cottonwood (*Populus deltoides*), sycamore (*Platanus occidentalis*), red maple (*Acer rubrum*), river birch (*Betula nigra*), black willow (*Salix nigra*), box-elder (*Acer negundo*), wood nettle (*Laportea canadensis*).

## Subclass

Sand Forest -- Sand Forests occur on sandy soils such as river terraces, glacial outwash deposits and sand dunes where fire suppression and increasing settlement reduced the burning frequency so that a closed forest with a multi-layered structure has developed. The species composition of these communities is similar to that of Sand Savannas but the trees are not as widely spaced. Fire suppression has increased the acreage of Sand Forest at the expense of Sand Savanna.

## Type

Dry Sand Forest --This community occurs on the tops of dunes or sand ridges with the highest percentage of sand and least humus and soil moisture. Trees are often scrubby.

Distribution: This community is limited to sand deposits. Dominant plant: black oak (*Quercus velutina*).

Characteristic plants: black hickory (*Carya texana*), blackjack oak (*Quercus marilandica*).

Dry-mesic Sand Forest --Areas with higher soil moisture levels support this community type. Tree size and diversity are correspondingly greater than in Dry Sand Forests.

Distribution: Dry-mesic Sand Forest may occur with Dry Sand Forest.

Dominant plants: white oak (*Quercus alba*), black oak (*Quercus velutina*).

Mesic Sand Forest --Ravines and slopes that face north or east may support Mesic Sand Forest.

Distribution: This is a rare community, occurring mainly on the slopes of sandy river terraces.

Dominant plants: red oak (*Quercus rubra*), white oak (*Quercus alba*), sugar maple (*Acer saccharum*).

## CLASS SAVANNA & WOODLAND

The Savanna & Woodland Community Class includes natural communities intermediate between Forest and Prairie. This Class includes wooded communities that are more open in nature than Forests as a result of either topo-edaphic conditions or ongoing disturbances such as fire. As a whole, this Class contains natural communities that were once among the most widespread and characteristic of the Illinois landscape. Fire suppression has allowed many open wooded communities to succeed to more closed Forest communities. Today, the least degraded remnants occur on sites with frequent fire and/or soil conditions such as sandy or rocky soils, dry slopes, and those soils with a hard fragipan where woody encroachment has been slowest. The Class is divided into two Woodland Subclasses and two Savanna Subclasses based upon substrate as well as Barrens and Flatwoods. Savannas and Woodlands

are similar to Barrens communities in form, but Barrens almost always occur on thin, poor, and excessively drained soils. Savannas and Woodlands can occur on poor to rich soils. Adoption of the Savanna & Woodland Community Class occurred at the 55<sup>th</sup> NAEC Meeting, Apr 27, 2010. See Figure 3 for generalized matrix comparing soil depth, moisture, and canopy cover to other classes and subclasses. See Table 4 for characteristic species comparison among related classes and subclasses.

### Subclass

Savanna – Savanna communities occur on glacial till or loess soils of till plains and lowlands and are characterized by widely spaced trees and an understory of native grasses, forbs, sedges, and shrubs that require high levels of light. Soil solum generally deep (e.g., > 50 cm.); canopy cover (-)10-50(+)%.

### Type

Dry-mesic Savanna --In this community, soil moisture levels are analogous to Dry-mesic Upland Forest. Grass height and the composition of the herbaceous vegetation may be similar to that of Dry-mesic prairie.

Distribution: This community occurred throughout the Prairie regions of Illinois.

Dominant plants: white oak (*Quercus alba*), bur oak (*Quercus macrocarpa*), post oak (*Quercus stellata*), black oak (*Quercus velutina*), little bluestem (*Schizachyrium scoparium*), Indian grass (*Sorghastrum nutans*), porcupine grass (*Stipa spartea*).

Characteristic plants: hazelnut (*Corylus americana*), American feverfew (*Parthenium integrifolium*), carrion flower (*Smilax lasioneuron*), stary campion (*Silene stellata*).

Characteristic animals: Cavity-nesting birds such as eastern bluebird (*Sialia sialis*), red-headed woodpecker (*Melanerpes erythrocephalus*), and common flicker (*Colaptes auratus*) are characteristic of Savannas.

Mesic Savanna -- The moisture level in Mesic Savannas is the same as in Mesic Prairie, and the herbaceous vegetation may be similar to Mesic Prairie. This community is found at the base of morainic ridges and (rarely) as islands in Wetland vegetation.

Dominant plants: white oak (*Quercus alba*), bur oak (*Quercus macrocarpa*), big bluestem (*Andropogon gerardii*), little bluestem (*Schizachyrium scoparium*), Indian grass (*Sorghastrum nutans*).

Characteristic plants: false sunflower (*Heliopsis helianthoides*), veiny pea (*Lathyrum venosus*), golden alexanders (*Zizia aurea*), purple milkweed (*Aclepias purpurescens*), Culver's root (*Veronicastrum virginicum*)

### Subclass

Sand Savanna -- Sand Savannas are associated with soils that are poor and very sandy, with little humus and low moisture content. Canopy cover (-)10-50(+)%.

Sand Savannas are associated with dune and swale topography, either dunes or Beach ridges. The undulating topography presumably limited the severity of fires and allowed a Savanna to develop instead of a Sand Prairie. The herbaceous vegetation of a Sand Savanna is quite similar to that of Sand Prairies. Two Sand Savanna communities are distinguished by soil moisture.

### Type

Dry Sand Savanna -- The crests of the highest dunes, along with south and westerly facing slopes, support this community. There is little or no A horizon. Grasses are shorter than 3 feet, plant diversity is low, and vegetation can be sparse with bare sandy patches.

Distribution: This community occurs in the major sand regions of Illinois.

Dominant plants: little bluestem (*Schizachyrium scoparium*), sand reed grass (*Calamovilfa longifolia*), Pennsylvania sedge (*Carex pensylvanica*), June grass (*Koeleria macrantha*), black oak (*Quercus velutina*), porcupine grass (*Stipa spartea*).

Characteristic plants: day flower (*Commelina erecta*), horsemint (*Monarda punctata*), cleft phlox (*Phlox bifida*).

Dry-mesic Sand Savanna --There is some development of an A horizon in this community, because it has a lower topographic position than the preceding community or because it occurs on north-facing or east-facing dune slopes.

Distribution: Dry-mesic Sand Savanna may occur in the same area as Dry Sand Savanna.

Dominant plants: little bluestem (*Schizachyrium scoparium*), Pennsylvania sedge (*Carex pensylvanica*), black oak (*Quercus velutina*), Indian grass (*Sorghastrum nutans*), porcupine grass (*Stipa spartea*).

**Characteristic plants:** flax-leaved aster (*Aster linariifolius*), New Jersey tea (*Ceanothus americanus*), clammy false foxglove (*Aureolaria pedicularia*), wild lupine (*Lupinus perennis*), prairie willow (*Salix humilis*), low-bush blueberry (*Vaccinium angustifolium*), white oak (*Quercus alba*).

**Characteristic animals:** Sand Prairie species also inhabit the Savannas like the eastern hognose snake (*Heterodon platirhinos*). The rare Illinois mud turtle (*Kinosternon flavescens*) lives in shallow ponds in Sand Savannas.

## Subclass

Woodland -- The Woodland community types are characterized by canopy cover ranging from (-)50-80(+)%; soil moisture class ranges from dry to dry-mesic (Figure 3). Stand structure is the result of frequent fire and/or dry environmental conditions that limit Forest development. Warm season (C4) grasses are generally uncommon; but forbs, sedges, and C3 grasses of Prairie, Savanna, and Woodland habitats are common. This subclass was likely very common and widespread but has become less common due to the absence of fire. Many examples have been degraded by excessive livestock and deer grazing as well as logging.

## Type

Dry Woodland -- Soils shallow or highly permeable and well drained. In unglaciated regions, some bedrock may be exposed (< 10%) and rock fragments may be present; in glaciated regions, loess may be eroded and glacial till exposed. Subcanopy stratum often not well developed. Open structure maintained by combination of fire and environmental conditions; without fire, stands eventually close. The Dry Woodland can intergrade with Dry-mesic Woodland and Barrens community types. Distinguished from Dry Barrens by low abundance or absence of warm-season grasses, less stunted canopy trees, and a less-developed shrub layer.

**Distribution:** Statewide on ridges and south and west-facing upper slopes; most common south and west of the Wisconsin till plain, particularly in unglaciated regions.

### **Dominant plants:**

Canopy - white oak (*Quercus alba*), black oak (*Quercus velutina*), post oak (*Quercus stellata*).  
Ground Layer - blunt-leaved oak sedge (*Carex albicans*), poverty oat grass (*Danthonia spicata*), woodland sunflower (*Helianthus divaricatus*).

### **Characteristic plants:**

Canopy – black hickory (*Carya texana*), rock chestnut oak (*Quercus montana prinus* [local in unglaciated southern counties]).  
Understory - leadplant (*Amorpha canescens*), New Jersey tea (*Ceanothus americanus*), aromatic sumac (*Rhus aromatica*).  
Ground Layer - wood angelica (*Angelica venenosa*), variegated milkweed (*Asclepias variegata*), *Aster* spp. (e.g. blue aster [*A. anomalous*]), aromatic aster [*A. Oblongifolius*], spreading aster [*A. patens*], top-shaped aster [*A. turbinellus*]), dittany (*Cunila origanoides*), round-leaved tick trefoil (*Desmodium rotundifolium*), panic grass (*Dichanthelium boscii*), broom moss (*Dicranum scoparium*), flowering spurge (*Euphorbia corollata*), rattlesnake master (*Eryngium yuccifolium*), *Hieracium* spp. (*H. longipilum*, *H. gronovii*, *H. scabrum*), *Lespedeza* spp. (e.g., *L. procumbens*, *L. repens*, *L. virginica*, *L. violacea*), pincushion moss (*Leucobryum glaucum*), horse balm (*Monarda bradburiana*), violet wood sorrel (*Oxalis violacea*), pale beardtongue (*Penstemon pallidus*), Virginia spiderwort (*Tradescantia virginiana*).

**Characteristic animals:** ground skink (*Scincella laterale*), five-lined skink (*Eumeces fasciatus*), fence lizard (*Sceloporus undulatus*), summer tanager (*Piranga rubra*).

Dry-mesic Woodland -- Soil conditions intermediate between dry and mesic; not as limiting for tree growth compared to Dry Woodland. Periodic fire is necessary for maintenance of composition and open structure. Subcanopy structure depends on recent fire history. Intergrades with Dry Woodland and Dry-mesic Upland Forest. Formerly classified, in part, as Dry-mesic Upland Forest (White and Madany 1978). Distinguished from Dry-mesic Upland Forest by spreading growth forms of the dominant overstory trees and predominance of a robust herbaceous ground layer.

**Distribution:** Statewide on ridges, level and rolling uplands, and south and west-facing upper slopes.

### **Dominant plants:**

Canopy – white oak (*Quercus alba*), black oak (*Quercus velutina*), post oak (*Quercus stellata*), bur oak (*Quercus macrocarpa*) *Carya* spp. (pignut hickory [*C. glabra*], shagbark hickory [*C. ovata*], shellbark hickory [*C. ovalis*], mockernut hickory [*C. tomentosa*]).  
Ground Layer - woodland brome (*Bromus pubescens*), rock satin grass (*Muhlenbergia sobolifera*), elm-leaved goldenrod (*Solidago ulmifolia*).

### **Characteristic plants:**

Understory – Juneberry (*Amelanchier arborea*), pasture rose (*Rosa carolina*), aromatic sumac (*Rhus aromatica*), New Jersey tea (*Ceanothus americanus*), flowering dogwood (*Cornus florida*), hazelnut (*Corylus americana*), hop hornbeam (*Ostrya virginiana*), black haw (*Viburnum prunifolium*).  
Ground Layer – hog peanut (*Amphicarpa bracteata*), tall anemone (Anemone virginiana), spreading dogbane (*Apocynum androsaemifolium*), pale Indian plantain (*Arnoglossum atriplicifolium*), purple milkweed (*Asclepias purpureascens*), whorled milkweed (*Asclepias quadrifolia*), *Aster* spp. (e.g., [*A. Drummondii*], [*A. Sagittifolius*]), woodland brome (*Bromus pubescens*), mullein foxglove (*Dasistoma macrophylla*), bare-stemmed tick trefoil (*Desmodium nudiflorum*), broad-leaved panic grass (*Dichanthelium latifolium*), bottlebrush rye (*Elymus hystrix*), American columbo (*Frasera carolinensis*), pale-leaved sunflower (*Helianthus strumosus*), tall alumroot (*Heuchera americana*), false dandelion (*Krigia biflora*), *Carex* spp. (e.g., [*C. albicans*], [*C. cephalophora*], [*C. hirsutella*], [*C. pennsylvanica*], [*C. retroflexa*]), rough blazing star (*Liatris aspera*), savanna blazing star (*Liatris scariosa* var. *Nieuwlandii*), horse balm (*Monarda bradburiana*), Wolf's bluegrass (*Poa wolfii*), Indian physic (*Porteranthus stipulaceus*), hairy mountain mint (*Pycnanthemum pilosum*), starry campion (*Silene stellata*), old field goldenrod (*Solidago nemoralis*), showy goldenrod (*Solidago speciosa*), yellow pimpernel (*Taenidia integerrima*), Virginia spiderwort (*Tradescantia virginiana*), buffalo clover (*Trifolium reflexum*), late horse gentian (*Triosteum perfoliatum*), and Culver's root (*Veronicastrum virginicum*).

Characteristic animals: broad-headed skink (*Eumeces laticeps*)

Mesic Woodland -- Soils deep and rich; periodic fire required for maintenance of Woodland structure. Examples include Mesic Savannas converted to Woodland with > 50% canopy cover as a result of fire absence or low frequency. Formerly classified, in part, as Mesic Savanna and Mesic Upland Forest (White and Madany 1978). Intergrades with Mesic Savanna; following extended fire absence, converts to Mesic Upland Forest.

Distribution: Statewide on high terraces, at the base of moraines, and other locations that are fire prone; scarce due to fire absence and conversion to Forest structure.

Dominant plants: Canopy – white oak (*Quercus alba*), bur oak (*Quercus macrocarpa*), red oak (*Q. rubra*).

Characteristic plants:

Understory – Chokecherry (*Prunus virginiana*), Viburnum spp. (e.g., *V. lentago*, *V. prunifolium*, *V. rafinesquianum*).

Ground Layer - *Asclepias exaltata*, *A. purpurascens*, woodland brome (*Bromus pubescens*), wild hyacinth (*Camassia scilloides*), *Carex* spp. (e.g., *C. jamesii*, *C. hirtifolia*, *C. radiata*), *Dichanthelium* spp. (e.g., *D. clandestinum*, *D. latifolium*), purple coneflower (*Echinacea purpurea*), purple joe-pye weed (*Eupatoriadelphus purpureus*), nodding fescue (*Festuca subverticillata*), false sunflower (*Heliopsis helianthoides*), beak grass (*Diarrhena americana*), pale milkvetch (*Lathyrus ochroleucus*), mayapple (*Podophyllum peltatum*), stary companion (*Silene stellata*).

## Subclass

Sand Woodland - Sand Woodlands occur on sandy soils such as on river terraces, glacial outwash deposits, and dunes where limited fire frequency has resulted in a Woodland structure. The species composition of these communities is similar to that of Sand Savannas and Sand Forest but tree density is intermediate between Sand Savanna and Sand Forest. Sand Woodland intergrades with Sand Savanna and Sand Forest and tends to develop into Sand Forest with extended fire absence. The distinctions are based on percent canopy cover. Sand Savannas have less than 50% canopy cover, Sand Woodland is from (-)50% to 80(+)% , and Sand Forest is greater than (-)80% canopy cover (Figure 3). Soil moisture types for Sand Woodland range from dry to mesic.

## Type

Dry Sand Woodland -- This community occurs on the tops of dunes or sand ridges with the highest percentage of sand and least humus and soil moisture. Trees are often scrubby.

Distribution: This community is limited to deep sand deposits in the northern half of the state.

Dominant plant: black oak (*Quercus velutina*)

Characteristic plants:

Canopy - *Carya texana*, *Quercus marilandica*.

Ground Layer - prickly pear cactus (*Opuntia macrorhiza*), aromatic sumac (*Rhus aromatica*), goat's rue (*Tephrosia virginiana*), bird's foot violet (*Viola pedate*), British soldier lichens (*Cladonia* spp.).

Characteristic animal: Six-lined racerunner (*Aspidoscelis sexlineatus*)

Dry-mesic Sand Woodland - Areas with higher available soil moisture levels support this community type. Tree size and diversity are correspondingly greater than in Dry Sand Woodland.

Distribution: Principal deep sand deposits in the northern half of the state.

Dominant plants: Canopy – white oak (*Quercus alba*), black oak (*Quercus velutina*).

Characteristic plants:

Ground Layer – wood anemone (*Anemone quinquefolia*), wild sarsaparilla (*Aralia nudicaulis*), sand sedge (*Carex muehlenbergii*), Pennsylvania sedge (*Carex pensylvanica*), common rockrose (*Helianthemum canadense*), hairy puccoon (*Lithospermum carolinense*), bluntnose sandwort (*Moehringia lateriflora*), cleft phlox (*Phlox bifida*), common cinquefoil (*Potentilla simplex*), bracken fern (*Pteridium aquilinum*), Culver's root (*Veronicastrum virginicum*).

## Subclass

Flatwoods -- Flatwoods occur on level or nearly level terrain in landscape position above the floodplain and are underlain by a subsurface layer that limits permeability (hardpan). Soils are low in available nutrients. Poor drainage results in a seasonally perched water table and ponding in microdepressions, especially during the late dormant season. During the summer months, due to evapotranspirational drying of the soil, the habitats can become extremely dry. Because soil moisture fluctuates widely by season,

the moisture class is not included in the classification. In Sand Flatwoods, the slowly permeable horizon (e.g., lakebed) may be below depth of classified soil horizon units. Formerly, all types were classified under Upland Forest (White and Madany 1978).

### **Type**

**Southern Flatwoods** -- This community is found on level areas often characterized by a shallow A horizon and a subsurface soil horizon of fine-textured and highly leached silt (E or albic horizon) immediately above a claypan (argillic horizon), the latter a subsoil layer characterized by a sharp increase in clay content. The silty E horizon often is difficult to penetrate with digging tools or soil probe (hardpan) while the claypan limits water movement. Soil layers primarily are developed in loess; locally, soils are developed in both loess and underlying lacustrine deposits. Stand structure is controlled to a large extent by edaphic factors related to available water-holding capacity and depth to the claypan. During extended periods of fire absence, particularly at sites with greater soil depth and soil water-holding capacity, stands can develop a closed canopy structure limiting or eliminating oak regeneration.

Distribution: Illinoian (Southern) till plain and locally in the Gulf coastal plain.

Dominant plants:

Canopy - post oak (*Quercus stellata*), blackjack oak (*Quercus marilandica*), black oak (*Quercus velutina*), shagbark hickory (*Carya ovata*).

Ground Layer - common blackberry (*Rubus allegheniensis*), dewberry (*Rubus flagellaris*), Virginia creeper (*Parthenocissus quinquefolia*), autumn bent grass (*Agrostis perennans*), *Carex albicans*, wood reed (*Cinna arundinacea*), woodland sunflower (*Helianthus divaricatus*).

Characteristic plants:

Ground Layer - *Carex* spp. (e.g., *C. albicans*, *C. caroliniana*, *C. festucacea*, *C. glaucoidea*, *C. hirsutella*), slender spike rush (*Eleocharis verrucosa*), Indian physic (*Porteranthus stipulaceus*), wild quinine (*Parthenium integrifolium*).

Characteristic animals: broad-headed skink (*Plestiodon laticeps*).

**Sand Flatwoods** -- This community develops on soils with two distinct layers: a layer of  $\geq 3'$  feet or more of acid, peaty sand over a layer of clay. Where natural firebreaks occur, Sand Flatwoods are present rather than Shrub Prairie or Wet-mesic Sand Prairie. With extended fire absence, these Prairie communities may develop into Sand Flatwoods.

Distribution: Sand Flatwoods are restricted to sandy plains in northeastern Illinois, primarily on lakebeds such as the Chicago lakeplain. Local expressions also occur along lower Kaskaskia River on former glacial slackwater lakebeds.

Dominant plants: Canopy - *Quercus velutina*, pin oak (*Quercus palustris*), *Quercus alba*, *Quercus stellata* is dominant in the local southern occurrences (lower Kaskaskia River drainage).

Ground Layer - wild sarsaparilla (*Aralia nudicaulis*), cinnamon fern (*Osmunda cinnamomea*).

Characteristic plants: Understory – black gum (*Nyssa sylvatica*), red maple (*Acer rubrum*), purple chokeberry (*Aronia prunifolia*), black huckleberry (*Gaylussacia baccata*), swamp dewberry (*Rubus hispidus*), low-bush blueberry (*Vaccinium angustifolium*), winterberry (*Ilex verticillata*).

Ground Layer – *Carex pensylvanica*, *C. swanii*, flattop aster (*Doellingeria umbellata*), Mayflower (*Maianthemum canadense*), partridge berry (*Mitchella repens*), sensitive fern (*Onoclea sensibilis*), royal fern (*Osmunda regalis*), interrupted fern (*O. claytoniana*).

**Northern Flatwoods** -- Poorly drained uplands on the Valparaiso Moraine include this community. Vernal ponds are characteristic. The abundance of Sedge Meadow and Wet Prairie species in modern remnants indicates that many Northern Flatwoods once had more open canopy structure. These communities may intergrade with Wet-mesic Upland Forest.

Distribution: Northern Flatwoods are known from glacial moraines in the Morainal Section of the Northeastern Morainal Division.

Dominant plants: Canopy - black ash (*Fraxinus nigra*), *Quercus alba*, swamp white oak (*Quercus bicolor*), American elm (*Ulmus americana*).

Characteristic plants:

Shrub and Ground Layer - winterberry (*Ilex verticillata*), sedges (*Carex* spp., *C. bromoides*, *C. lupulina*, *C. muskingumensis*), Cinna (*Cinna arundinacea*), fowl manna grass (*Glyceria striata*), sensitive fern (*Onoclea sensibilis*), purple fringed orchid (*Platanthera psycodes*), swamp saxifrage (*Saxifraga pensylvanica*).

Characteristic animals: blue-spotted salamander (*Ambystoma laterale*), tiger salamander (*Ambystoma tigrinum*), wood frog (*Rana sylvatica*), spring peeper (*Pseudacris crucifer*).

### **Subclass**

**Barrens** -- Barrens are heterogeneous Woodland openings resulting from a set of environmental conditions that limit or retard Forest development. These environmental conditions include xeric to mesic and nutrient-poor soil conditions, exposure typically on south-to-southwest slope aspects, and fire. Reduced fire frequency and fire absence have led to partial closure of many Barrens despite harsh environmental conditions. A characteristic of Barrens, including partially closed remnants, is the presence of many herbaceous species also found in tallgrass Prairie and open Woodland habitats; however, diversity tends to decline with stand closure. Barrens are distinguished from Savanna and Woodland by their shallow, droughty soils, derived primarily from a thin layer of loess and weathered

bedrock, or exposed glacial till on well-drained sites. In contrast to Savanna and other Woodland types, to address the spatially heterogeneous structural patterns of many remnants, Barrens remnants can occur with a broad range of canopy cover (-10 to 90+%). Barrens intergrade with Dry and Dry-mesic Woodland and Glades. See Figure 3 for generalized matrix comparing soil depth, moisture, and canopy cover to other classes and subclasses. See Table 4 for characteristic species comparison among related classes and subclasses.

### **Type**

Xeric Barrens -- Soil is shallow over bedrock and canopy trees are stunted; shrubs and small trees sometimes forming dense thickets. Distinguished from glades by dominance of trees and less than 50% exposed bedrock. Xeric Barrens can occur associated with glade, Dry Barrens, and Dry Woodland habitats. In contrast to other Barrens, Xeric Barrens may be less dependent on fire due to limited fuel conditions and association with glade habitats. Formerly classified as Xeric Upland Forest (White and Madany 1978).

Distribution: Found by the edges of bluffs (or where they historically occurred, such as the shoreline of constructed Lakes and reservoirs), typically where south to southwest facing, in the Shawnee Hills Natural Division. More commonly associated with sandstone in the Greater Shawnee Hills Section.

Characteristic Plants:

Woody Plants - low-bush blueberry (*Vaccinium pallidum*).  
Ground Layer - broomsedge (*Andropogon virginicus*), pussytoes (*Antennaria plantaginifolia*), poverty oak grass (*Danthonia spicata*), hairy cup mosses (*Polytrichum spp.*), bluets (*Houstonia spp.*, *H. longifolia*, *H. pusilla*, *H. nigricans*), yellow star grass (*Hypoxis hirsuta*), American agave (*Manfreda virginica*), cleft phlox (*Phlox bifida*), little bluestem (*Schizachyrium scoparium*), *Triadenum perfoliatum*, six-weeks fescue (*Vulpia octoflora*), common woodsia (*Woodsia obtusa*).

Characteristic animals: five-lined skink (*Eumeces fasciatus*), fence lizard (*Sceloporus undulatus*)

Dry Barrens -- Dry Barrens communities occur associated with thin soils over bedrock (unglaciaded regions) or on excessively drained slopes with exposed gravelly glacial till (glaciaded regions). The tree layer is stunted, and herbaceous vegetation is usually less than 1 m in height. Dry Barrens converge with Dry Woodland with increasing soil depth. Requires periodic fire to maintain open structure.

Distribution: Dry Barrens occur in southern and western portions of the state, typically on south and southwest facing aspects of dry ridges; most common in the Shawnee Hills and Cretaceous Hills Natural Divisions.

Dominant plants:

Canopy - blackjack oak (*Quercus marilandica*), post oak (*Q. stellata*), black oak (*Q. velutina*).  
Understory (Shawnee Hills but not Cretaceous Hills) - farkleberry (*Vaccinium arboreum*), winged elm (*Ulmus alata*).  
Ground Layer - *Carex albicans*, poverty oat grass (*Danthonia spicata*), panic grass (*Dichanthelium laxiflorum*), woodland sunflower (*Helianthus divaricatus*), little bluestem (*Schizachyrium scoparium*).

Characteristic plants: Canopy - black hickory (*Carya texana*).

Ground Layer - three-seeded Mercury (*Acalypha gracilens*), big bluestem (*Andropogon gerardii*), wavy-leaved aster (*Aster undulatus*), *Carex hirsutella*, sand bracted sedge (*C. muhlenbergii*), butterfly pea (*Clitoria mariana*), common spurge (*Euphorbia corollata*), rough blazing-star (*Liatris squarrosa*), *Dichanthelium spp.* (e.g., *D. boscii*, *D. depauperatum*, *D. linearifolium*, *D. sphaerocarpon* [panic grasses]), milk pea (*Galactia regularis*), hairy bedstraw (*Galium pilosum*), hairy lettuce (*Lactuca hirsuta*), western Indian physic (*Porteranthus stipulacea*), witch grass (*Panicum capillare*), common cinquefoil (*Potentilla simplex*), Indian grass (*Sorghastrum nutans*), yellow crownbeard (*Verbesina helianthoides*), common woodsia (*Woodsia obtusa*), goat's rue (*Tephrosia virginiana*).

Dry-mesic Barrens -- Compared with Dry Barrens, this community type has slightly deeper soils and available moisture level resulting in taller and sometimes more diverse tree and ground layers. Dry-mesic Barrens intergrade with Dry Barrens and Dry and Dry-mesic Woodland; these communities share many species in common.

Distribution: Dry-mesic Barrens occur statewide where soils are shallow over bedrock or where glacial till is exposed on ridges and sloping terrain, particularly with exposures to the south or southwest.

Dominant plants: Canopy – white oak (*Quercus alba*), post oak (*Q. stellata*), black oak (*Q. velutina*).  
Ground Layer – Indiangrass (*Sorghastrum nutans*).

Characteristic plants:

Canopy - shellbark hickory (*Carya ovalis*).  
Ground Layer – big bluestem (*Andropogon gerardii*), little bluestem (*Schizachyrium scoparium*), poverty oat grass (*Danthonia spicata*), wedge grass (*Sphenopholis obtusata*), Culver's root (*Veronicastrum virginicum*), green-headed coneflower (*Rudbeckia laciniata*), pussytoes (*Antennaria spp.*).

Mesic Barrens -- This is a very rare community type that may no longer occur because conditions support rapid Forest development with low fire frequency. Remnants are reliant on frequent fire to maintain open conditions. Mesic Barrens converge with Mesic Woodland and, with extended fire absence, Mesic Forest.

Distribution: The only known remnants were in the Cretaceous Hills.



Dominant plants:

Canopy – southern red oak (*Quercus falcata*).

Ground Layer – big bluestem (*Andropogon gerardii*), Indiangrass (*Sorghastrum nutans*), Dull meadow beauty (*Rhexia mariana*), Narrow-leaved sunflower (*Helianthus angustifolius*).

## CLASS PRAIRIE

The Prairie community class includes community types that are dominated by native grasses, forbs and shrubs on mineral soil. Six subclasses are recognized: Prairie, Sand Prairie, Gravel Prairie, Dolomite Prairie, Hill Prairie, and Shrub Prairie.

### Subclass

Prairie --This subclass includes the typical "black-soil" Prairies and Prairies on poorer till. Soils are deep and fine-textured, usually silt loam or clay loam derived from loess or glacial till, although the Prairies may also occur on alluvium. Prairie communities in some other subclasses (for example, Mesic Sand Prairie) may also have soils with deep, dark A horizons, so the term black soil is not applicable solely to this subclass. Soil moisture for these Prairies ranges from dry to wet.

### Type

Dry Prairie --This community occupies steep, exposed slopes that are somewhat excessively drained. Grasses are usually less than three feet tall and diversity is relatively low.

Distribution: This community is relatively rare, because the hilly topography necessary for its existence is usually forested. Dry Prairie remnants are most prevalent in the hilly Prairie regions of northern Illinois.

Dominant plants: little bluestem (*Schizachyrium scoparium*), side oats grama (*Bouteloua curtipendula*), porcupine grass (*Stipa spartea*).

Dry-mesic Prairie -- Moisture levels are intermediate between dry and mesic. Grass height approaches that of Mesic Prairie, and diversity is greater than in Dry Prairie.

Distribution: This community occurs throughout the Prairie regions.

Dominant plants: little bluestem (*Schizachyrium scoparium*), Indian grass (*Sorghastrum nutans*), porcupine grass (*Stipa spartea*).

Characteristic plants: leadplant (*Amorpha canescens*), pale coneflower (*Echinacea pallida*), rough blazing-star (*Liatris aspera*), prairie cinquefoil (*Potentilla arguta*).

Mesic Prairie -- Favorable moisture conditions allow for maximum plant species diversity and maximum grass and forb height. The grass layer may be only 3 feet tall if prairie dropseed (*Sporobolus heterolepis*) dominates, but it is sometimes 6 feet tall.

Distribution: Mesic Prairie was one of the most widespread and characteristic communities in Illinois.

Dominant plants: big bluestem (*Andropogon gerardii*), Indiangrass (*Sorghastrum nutans*), prairie dropseed (*Sporobolus heterolepis*).

Characteristic plants: cream wild indigo (*Baptisia leucophaea*), shooting-star (*Dodecatheon meadii*), rattlesnake master (*Eryngium yuccifolium*), prairie blazing-star (*Liatris pycnostachya*), hoary puccoon (*Lithospermum canescens*), white prairie clover (*Dalea candidum*), downy phlox (*Phlox pilosa*), compass plant (*Silphium laciniatum*), prairie dock (*Silphium terebinthinaceum*).

Characteristic animals: There are many characteristic Prairie vertebrates, but probably none are strictly limited to a single natural community. The following species are common in Mesic Prairie: plains garter snake (*Thamnophis radix*), prairie kingsnake (*Lampropeltis calligaster*), dickcissel (*Spiza americana*), grasshopper sparrow (*Ammodramus saviarum*), prairie vole (*Microtus ochrogaster*), and short-tailed shrew (*Blarina brevicauda*).

Wet-mesic Prairie -- Standing water pools on the surface after heavy rains because the water table is near the surface. Grass composition is a mixture of Mesic Prairie and Wet Prairie species. Wet-mesic Prairie is much more diverse than Wet Prairie and nearly as diverse as Mesic Prairie.

Distribution: Wet-mesic Prairie is best developed on level areas between Wet Prairie and Mesic Prairie.

Dominant plants: big bluestem (*Andropogon gerardii*), bluejoint grass (*Calamagrostis canadensis*), switch grass (*Panicum virgatum*), Indian grass (*Sorghastrum nutans*), cord grass (*Spartina pectinata*).

Characteristic plants: loosestrife (*Lysimachia quadriflora*), prairie sundrops (*Oenothera pilosella*), smooth phlox (*Phlox glaberrima*), northern ragwort (*Senecio pauperculus*), Culver's-root (*Veronicastrum virginicum*), golden Alexanders (*Zizia aurea*).

Characteristic animals: eastern massasauga (*Sistrurus catenatus*), bobolink (*Dolichonyx oryzivorus*).

Wet Prairie -- Standing water is present on the surface during winter and spring, and the soil is nearly always saturated. Plant species diversity is lower than in other Prairie communities.

Distribution: Wet Prairie was generally distributed throughout the Prairie regions of Illinois.

Dominant plants: bluejoint grass (*Calamagrostis canadensis*), sedges (*Carex spp.*), cord grass (*Spartina pectinata*).

Characteristic plants: prairie Indian plantain (*Cacalia tuberosa*), common boneset (*Eupatorium perfoliatum*), wild blue iris (*Irish shrevei*), winged loosestrife (*Lythrum alatum*), water parsnip (*Sium suave*).

## Subclass

Sand Prairie -- Soils in this subclass are coarse-textured: either sand, loamy sand, or sandy loam can support Sand Prairie. However, Prairies on sandy loam are considered Sand Prairies only if they are acidic enough to have characteristic plants. Sand Prairies are found on sandy outwash plains, lake plains, and valley trains. The soil moisture varies from dry to wet.

## Type

Dry Sand Prairie -- The soil lacks a dark A horizon, and grass is less than 3 feet tall. Dry Sand Prairies are rather rare because the proper topographic position for dry sand usually also reduces fire severity enough to allow a Savanna to develop.

Distribution: This community occurs on the crests of sand dunes.

Dominant plants: little bluestem (*Schizachyrium scoparium*), sand reed (*Calamovilfa longifolia*), June grass (*Koeleria macrantha*), porcupine grass (*Stipa spartea*).

Characteristic plants: stiff sandwort (*Arenaria stricta*), beach wormwood (*Artemisia campestris*), poppy mallow (*Callirhoe triangulata*), horsemint (*Monarda punctata*), prickly-pear cactus (*Opuntia humifusa*).

Dry-mesic Sand Prairie -- This community has a dark A horizon, unlike the Dry Sand Prairie community type. The average height of grass and the species diversity approach that of Mesic Sand Prairie.

Distribution: Dry-mesic Sand Prairie may occur with any other Sand Prairie communities.

Dominant plants: little bluestem (*Schizachyrium scoparium*), Indian grass (*Sorghastrum nutans*), porcupine grass (*Stipa spartea*).

Characteristic plants: flax-leaved aster (*Aster linariifolius*), rough blazing-star (*Liatris aspera*), showy goldenrod (*Solidago speciosa*), birdfoot violet (*Viola pedata*), western sunflower (*Helianthus occidentalis*).

Characteristic animals: Sand Prairies have several characteristic animals with western affinities, but probably no species is limited strictly to a single community. Characteristic animals of the Sand Prairies include Illinois chorus frog (*Pseudacris streckeri*), plains hog-nosed snake (*Heterodon nasicus*), bullsnake (*Pituophis melanoleucus*), lark sparrow (*Chondestes grammacus*), savannah sparrow (*Passerculus sandwichensis*), vesper sparrow (*Poocetes gramineus*), grasshopper sparrow (*Ammodramas savannarum*) and plains pocket gopher (*Geomys bursarius*).

Mesic Sand Prairie -- This community has a deep A horizon in acid sand. Mosses and low shrubs are common, although the shrubs are not dominant. Characteristic Mesic Prairie forbs such as pale coneflower (*Echinacea pallida*), drooping coneflower (*Ratibida pinnata*), and compass-plant (*Silphium laciniatum*) are rare or absent.

Distribution: Although this community might occur in any of the sand areas of the state, remnants are most common in northeastern Illinois.

Dominant plants: big bluestem (*Andropogon gerardii*), little bluestem (*Schizachyrium scoparium*), Indian grass (*Sorghastrum nutans*).

Characteristic plants: colic root (*Aletris farinosa*), black chokeberry (*Aronia melanocarpa*), purple chokeberry (*Aronia prunifolia*), flat-top aster (*Aster umbellatus*), grass pink orchid (*Calopogon tuberosus*), downy sunflower (*Helianthus mollis*), American feverfew (*Parthenium integrifolium*), swamp dewberry (*Rubus hispidus*), nut sedge (*Scleria triglomerata*), low-bush blueberry (*Vaccinium angustifolium*).

Wet-mesic Sand Prairie -- Standing water pools on the surface for short periods of time and a deep, acid, dark A horizon is present in this community. The mixture of grasses is transitional between Mesic Sand Prairie and Wet Sand Prairie.

Distribution: Small areas of Wet-mesic Sand Prairie are commonly associated with Mesic Sand Prairie.

Dominant plants: big bluestem (*Andropogon gerardii*), bluejoint grass (*Calamagrostis canadensis*), sedges (*Carex spp.*), Indian grass (*Sorghastrum nutans*), cord grass (*Spartina pectinata*), swamp dewberry (*Rubus hispidus*).

Characteristic plants: cinnamon fern (*Osmunda cinnamomea*), royal fern (*Osmunda regalis*), sensitive fern (*Onoclea sensibilis*), common mountain mint (*Pycnanthemum virginianum*), meadow beauty (*Rhexia virginica*), lance-leaved violet (*Viola lanceolata*), yellow-eyed grass (*Xyris torta*).

Wet Sand Prairie -- Standing water pools on the surface for as much as one-third of the year in this community. Wet Sand Prairie is floristically very similar to Wet Prairie.

Dominant plants: bluejoint grass (*Calamagrostis canadensis*), sedges (*Carex spp.*), cord grass (*Spartina pectinata*), marsh fern (*Thelypteris palustris*).

### Subclass

Gravel Prairie --This community includes Prairies on gravel or very gravelly soil. The soils are usually calcareous. Because the gravel provides rapid permeability, the soil moisture classes range from dry to mesic.

### Type

Dry gravel Prairie --These Prairies are located on steep gravel slopes with grasses averaging less than 3 feet in height.

Distribution: Dry Gravel Prairies occur on kames and eskers in the Northeastern Morainal Division and on the slopes of gravel terraces along Major Rivers. They may also have occurred on gravelly hills in extreme southern Illinois.

Dominant plants: little bluestem (*Schizachyrium scoparium*), side-oats grama (*Bouteloua curtipendula*).

Characteristic plants: pasque flower (*Anemone patens*), stiff sandwort (*Arenaria stricta*), woolly milkweed (*Asclepias lanuginosa*), wild flax (*Linum sulcatum*), yellow puccoon (*Lithospermum incisum*), prairie buttercup (*Ranunculus rhomboides*), kitten tails (*Besseya bullii*).

Dry-mesic Gravel Prairie --This community has relatively high soil moisture because it occurs on lower slopes. The grass is intermediate in height between Dry Gravel Prairie and Mesic Gravel Prairie.

Distribution: Dry-mesic Gravel Prairie is associated with Dry Gravel Prairie.

Dominant plants: little bluestem (*Schizachyrium scoparium*), Indian grass (*Sorghastrum nutans*), prairie dropseed (*Sporobolus heterolepis*), porcupine grass (*Stipa spartea*).

Characteristic plants: stiff aster (*Aster ptarmicoides*), scurf-pea (*Psoralea tenuiflora*), small skullcap (*Scutellaria parvula*).

Mesic Gravel Prairie --Soil moisture is relatively high because of the low topographic position. The height of the grass and the diversity of plant species approach that of Mesic Prairie. Calciphilic plants are common because the gravel is usually calcareous.

Distribution: The few known remnants of Mesic Gravel Prairie are on valley train deposits in the Northeastern Morainal Division.

Dominant plants: big bluestem (*Andropogon gerardii*), Indian grass (*Sorghastrum nutans*), prairie dropseed (*Sporobolus heterolepis*).

Characteristic plants: low calamint (*Satureja arkansana*), Valerian (*Valeriana ciliata*).

### Subclass

Dolomite Prairie – Dolomite Prairies occur where dolomite is less than 4.5 feet below the surface. Certain common Prairie plants are absent because of the shallow soils and high pH. Many other species are restricted to Dolomite Prairies, but some of these, such as Illinois mimosa (*Desmanthus illinoensis*), spike rush (*Eleocharis elliptica*), and low calamint (*Satureja arkansana*), are not restricted to specific natural communities. The natural communities range from dry to wet.

### Type

Dry Dolomite Prairie --The soil is extremely shallow to negligible in this community, and patches of dolomite pavement are common. The grass is usually less than 3 feet tall.

Distribution: This community occurs in the Rock River Hill Country and along the lower Des Plaines and Kankakee rivers.

Dominant plants: little bluestem (*Schizachyrium scoparium*), side-oats grama (*Bouteloua curtipendula*).

Characteristic plants: pagoda plant (*Blephilia ciliata*), false boneset (*Brickellia eupatorioides*), muhly grass (*Muhlenbergia cuspidata*), hairy beardtongue (*Penstemon hirsutus*).

Dry-mesic Dolomite Prairie --The soil is slightly deeper over bedrock, and the topographic position is lower than in Dry Dolomite Prairie. Also, grass height is taller and diversity is greater.

Dominant plants: little bluestem (*Schizachyrium scoparium*), Indian grass (*Sorghastrum nutans*), porcupine grass (*Stipa spartea*).

Mesic Dolomite Prairie – The soil depth is 6 or more inches over dolomite. As bedrock depth decreases, the natural community intergrades with Mesic Prairie, but deeply rooted forbs such as white wild indigo (*Baptisia leucantha*), cream wild indigo (*Baptisia leucophaea*), compass plant (*Silphium laciniatum*), and prairie dock (*Silphium terebinthinaceum*) are absent from Mesic Dolomite Prairie.

Distribution: These Dolomite Prairies are found along the lower Des Plaines and Kankakee river valleys, but they may also have occurred elsewhere in northern Illinois.

Dominant plants: big bluestem (*Andropogon gerardii*), Indian grass (*Sorghastrum nutans*), prairie dropseed (*Sporobolus heterolepis*).

Characteristic plants: northern bedstraw (*Galium boreale*), leafy prairie clover (*Dalea foliosa*).

Wet-mesic Dolomite Prairie --The soil depth to bedrock averages 1 foot. Standing water is present on the surface for short periods throughout the year. Fens can occur in close association with this community type when the depth to bedrock becomes deeper along with the proper amount of seepage. Although there is a considerable overlap between a Graminoid Fen and this community, some characteristic plants are restricted to Wet-mesic Dolomite Prairie.

Distribution: These Dolomite Prairies are found along the lower Des Plaines and Kankakee river valleys, but they may also have occurred elsewhere in northern Illinois.

Dominant plants: big bluestem (*Andropogon gerardii*), bluejoint grass (*Calamagrostis canadensis*), sedges (*Carex spp.*), tufted hairgrass (*Deschampsia caespitosa*), Indian grass (*Sorghastrum nutans*), cord grass (*Spartina pectinata*).

Characteristic plants: Ohio goldenrod (*Solidago ohioensis*), Riddell's goldenrod (*Solidago riddellii*).

Wet Dolomite Prairie --The soil is usually quite shallow over bedrock and is frequently saturated, or standing water is present on the surface. This is a very rare community even in extensive dolomite areas because depressions usually have a deep enough soil layer to support a Sedge Meadow at this moisture level.

Distribution: These Dolomite Prairies are found along the lower Des Plaines and Kankakee river valleys, but they may also have occurred elsewhere in northern Illinois.

Dominant plants: sedge (*Carex pellita*), tufted hairgrass (*Deschampsia caespitosa*), cord grass (*Spartina pectinata*).

Characteristic plants: prairie Indian plantain (*Arnoglossum lantagineum*).

## Subclass

Hill Prairie -- Hill Prairies typically occur on steep, exposed, south to west-facing bluffs. The kind of substrate often contributes to the existence of Hill Prairies together with a combination of factors that result in droughty, well-drained or somewhat excessively drained soil. Periodic fires have maintained many Hill Prairies. Because the soil moisture class is limited to dry or dry-mesic in Hill Prairies, the moisture class is not part of the natural community name. Instead, the substrate is the modifier: dolomite, loess, glacial drift, gravel, or sand.

### Type

Dolomite Hill Prairie - Dolomite Hill Prairies typically occupy a south to west-facing slope; however, they also occur on north to east-facing slopes where shallow soil (between 6 - 12 inches in depth) occurs over dolomite. The two soil types frequently supporting Dolomite Hill Prairies are Lacrescent and Elizabeth. The Dolomite Hill Prairies closely resemble the definition given by Curtis (1959) for cedar glade communities of Wisconsin in regard to species composition, position in the landscape, and geology.

Distribution: This community is restricted to the Wisconsin Driftless Division.

Dominant plants: little bluestem (*Schizachyrium scoparium*), northern dropseed (*Sporobolus heterolepis*).

Characteristic plants: sky-blue aster (*Aster oolentangiensis*), side-oats gramma (*Bouteloua curtipendula*), Richardson's sedge (*Carex richardsonii*), yellow puccoon (*Lithospermum incisum*), rock sandwort (*Minuartia stricta*).

Loess Hill Prairie -- This community is developed on deep loess, a windblown silt deposit. Loess Hill Prairies are the largest Hill Prairies in the state, historically frequently larger than 1 acre.

Distribution: Loess Hill Prairies are essentially limited to the Mississippi River and Illinois River bluffs.

Dominant plants: little bluestem (*Schizachyrium scoparium*), side-oats grama (*Bouteloua curtipendula*), Indian grass (*Sorghastrum nutans*).

Characteristic plants: green milkweed (*Asclepias viridiflora*), false boneset (*Brickellia eupatorioides*), wild flax (*Linum sulcatum*), yellow puccoon (*Lithospermum incisum*), scurf-pea (*Psoralea tenuiflora*), blue-eyed grass (*Sisyrinchium campestre*), Virginia bush clover (*Lespedeza virginiana*), purple prairie clover (*Dalea purpurea*), spreading aster (*Symphotrichum patens*), wild petuna (*Ruellia humilis*), rosinweed (*Silphium integrifolium*).

Characteristic animals: six-lined racerunner (*Cnemidophorus sexlineatus*), slender glass lizard (*Ophisaurus attenuates*).

Glacial Drift Hill Prairie -- These Hill Prairies occur on eroded glacial drift, especially where a river valley cuts through an end moraine and there are many deep, steep-sided tributary ravines.

Distribution: Most of the Glacial Drift Hill Prairies are along large rivers in the Grand Prairie Section and above stream valleys of the Western Forest-Prairie Natural Division.

Dominant plants: little bluestem (*Schizachyrium scoparium*), side-oats grama (*Bouteloua curtipendula*), Indian grass (*Sorghastrum nutans*).

Gravel Hill Prairie -- This community is similar to a Dry Gravel Prairie or Dry-mesic Gravel Prairie, but the Hill Prairies occur as openings in a Forest rather than as part of a continuous Prairie.

Distribution: Gravel Hill Prairies are restricted to northern Illinois and the Major River valleys.

Dominant plants: little bluestem (*Schizachyrium scoparium*), prairie dropseed (*Sporobolus heterolepis*), side-oats grama (*Bouteloua curtipendula*).

Characteristic plants: frostweed (*Helianthemum canadense*), prairie avens (*Geum triflorum*), pasque-flower (*Anemone patens*).

Sand Hill Prairie -- These Prairies are developed mostly on sand dunes atop river bluffs.

Distribution: Sand Hill Prairies may be found in sand areas of the state where bluffs rise along Stream corridors especially along the Major Rivers.

Dominant plants: little bluestem (*Schizachyrium scoparium*), side-oats grama (*Bouteloua curtipendula*), grama grass (*Bouteloua hirsuta*), June grass (*Koeleria macrantha*).

Characteristic plants: narrow-leaved goosefoot (*Chenopodium desiccatum*), hairy pinweed (*Lechea mucronata*), horsemint (*Monarda punctata*), salt-and-pepper plant (*Plantago purshii*), rock spikemoss (*Selaginella rupestris*), goat's-rue (*Tephrosia virginiana*).

## Subclass

Shrub Prairie -- This community subclass is dominated by a wide variety of shrubs and grasses, with a shrub canopy cover of 50% or greater and no tree cover. Only one natural community, on mesic to wet-mesic, sandy soil, is recognized. This community intergrades with Mesic and Wet-mesic Prairie. Another kind of Shrub Prairie, namely hazel thickets and plum thickets, existed on fine textured soils, but no natural remnants are known.

### Type

Shrub Prairie -- The only known natural remnants of Shrub Prairie are on acid, sandy soil. The community is dominated by a wide variety of shrubs and grasses, and there is a nearly continuous groundlayer of mosses. This community intergrades with Mesic Sand Prairie and Wet-mesic Sand Prairie.

Distribution: This community is most prevalent in the Kankakee Sand Area and the Chicago Lakeplain.

Dominant plants: big bluestem (*Andropogon gerardii*), little bluestem (*Schizachyrium scoparium*), black huckleberry (*Gaylussacia baccata*), hairy-cap moss (*Polytrichum commune*), swamp dewberry (*Rubus hispidus*), bristly blackberry (*Rubus schneideri*), Indian grass (*Sorghastrum nutans*), hardhack (*Spiraea tomentosa*), low-bush blueberry (*Vaccinium angustifolium*).

Characteristic plants: black chokeberry (*Aronia melanocarpa*), purple chokeberry (*Aronia prunifolia*), tubercled orchid (*Habenaria flava*), sphagnum mosses (*Sphagnum spp.*), lance-leaved violet (*Viola lanceolata*), primrose violet (*Viola lanceolata*).

## CLASS WETLAND

The Wetland community class includes natural communities that are transitions between aquatic and upland ecosystems that contain permanent standing water, seasonal standing water, or have saturated hydric soils with a vegetative cover. The sub-classes (Marsh, Swamp, Bog, Fen, Sedge Meadow, Panne, Seep and Spring) are recognized mainly by differences in the vegetation caused by soil pH, water depth, and water movement.

## Subclass

Marsh -- Tall graminoid persistent or non-persistent plants dominate Marsh communities, which have water near or above the surface for most of the year. Soils may be peat, muck, or mineral. Two Marsh communities are recognized.

### **Type**

Freshwater Marsh -- This class includes freshwater communities in glacial depressions on lakeplains and in Stream valleys. Marshes have a wide variety of plant communities. In general, deeper water supports lower the plant species diversity. Fluctuations in water levels, fire frequency, and muskrat (*Ondatra zibethicus*) population cycles are also important in determining species composition and structure.

Distribution: Once very widespread, natural Marshes are now common only in the Northeastern Morainal Division. Degraded remnants of larger Marshes exist in the Grand Prairie Division, and Marshes fringe the navigation pools on the Illinois River.

Dominant plants: sedge (*Carex lacustris*), swamp loosestrife (*Decodon verticillatus*), reed (*Phragmites communis*), water smartweed (*Polygonum amphibium*); water smartweed (*Polygonum coccineum*), bulrush (*Scirpus fluviatilis*), bulrush (*Scirpus validus*), common cat-tail (*Typha angustifolia*), narrow-leaved cat-tail (*Typha latifolia*).

Characteristic plants: water plantains (*Alisma spp.*), false aster (*Boltonia asteroides*), mermaid-weed (*Proserpinaca palustris*), common arrowleaf (*Sagittaria latifolia*), marsh scullcap (*Scutellaria epilobiifolia*).

Characteristic animals: muskrat (*Ondatra zibethicus*), red-winged blackbird (*Agelaius phoeniceus*), yellow-headed blackbird (*Xanthocephalus xanthocephalus*), sora (*Porzana carolina*), Virginia rail (*Rallus limicola*).

Brackish Marsh -- This rare natural community is restricted to salty seepage areas. (The term mixosaline is favored in some classifications to characterize inland waters with salinity originating from land-derived salts).

Distribution: Brackish Marshes occur along a short segment of floodplain adjacent to the Illinois River bluffs upstream from Starved Rock.

Dominant plant: cord grass (*Spartina pectinata*).

Characteristic plants: spear scale (*Atriplex patula*), swamp rose mallow (*Hibiscus palustris*), bulrush (*Scirpus paludosus*).

### **Subclass**

Swamp -- A Swamp is a Wetland dominated by woody plants. Two communities are recognized on the basis of vegetation structure.

### **Type**

Swamp – A Swamp is a forested, permanent or semi-permanent body of water.

Distribution: Swamps are limited to extreme southern Illinois because only southern tree species (except for *Larix laricina*) can live in permanent bodies of water.

Dominant plants: water tupelo (*Nyssa aquatica*), bald cypress (*Taxodium distichum*), buttonbush (*Cephalanthus occidentalis*).

Characteristic plants: black willow (*Salix nigra*), pumpkin ash (*Fraxinus tomentosa*), swamp rose (*Rosa palustris*), Virginia willow (*Itea virginica*), swamp cottonwood (*Populus heterophylla*), water locust (*Gleditsia aquatica*).

Characteristic animals: mole salamander (*Ambystoma talpoideum*), green treefrog (*Hyla cinerea*), bird-voiced treefrog (*Hyla avivoca*), bantam sunfish (*Lepomis symmetricus*), prothonotary warbler (*Protonotaria citrea*), wood duck (*Aix sponsa*), cottonmouth (*Agkistrodon piscivorus*).

Shrub Swamp -- A Shrub Swamp has a 50% or greater coverage by shrubs. A Shrub Swamp has less than 20% tree cover or else it is classified as a Swamp. Shrub Swamps are often associated with ponds in Wet Floodplain Forest communities. Occasionally, Shrub Swamps occur in glacial potholes, where they grade into the Tall Shrub Bog community.

Distribution: Shrub Swamps are generally distributed throughout the state.

Dominant plants: buttonbush (*Cephalanthus occidentalis*), red osier dogwood (*Cornus stolonifera*), pussy willow (*Salix discolor*), sandbar willow (*Salix interior*), speckled alder (*Alnus rugosa*).

### **Subclass**

Sedge meadow - A Sedge Meadow is a Wetland dominated by sedges (*Carex*) on peat, muck, or wet sand. The Sedge Meadow is remarkably homogenous in composition and structure. Hummocks are indicative of this community.

### **Type**

Sedge meadow-- The soil moisture level is analogous to that of Wet Prairie, and there is some degree of floristic overlap between the two communities. Sedge (*Carex stricta*) is the major dominant.

Dominant plants: bluejoint grass (*Calamagrostis canadensis*), sedges (*Carex stricta*), (*C. pallita*), (*C. lanuginosa*).

Characteristic plants: swamp aster (*Aster puniceus* var. *lucidulus*), sedges (*Carex haydenii*), (*C. lasiocarpa*), (*C. sartwellii*), white turtlehead (*Chelone glabra*), bog willow herb (*Epilobium leptophyllum*), spotted Joe-Pye weed (*Eupatorium maculatum*), cowbane (*Oxypolis rigidior*), cinnamon willowherb (*Epilobium coloratum*), marsh St. John's-wort (*Triadenum virginicum*).

Characteristic animal: Baltimore checkerspot (*Euphydryas phaeton*).

## Subclass

Fen -- Peat with calcareous groundwater seepage is necessary for all Fen communities. Most Fen communities tend to have a rather pronounced slope. They are most closely correlated with calcareous glacial till materials or limestone bedrock and occur in both Lake basins and Stream valleys. Fens are often found in association with strongly calcareous spring runs as well as such natural communities as Calcareous Seeps, Sedge Meadows, and Marshes. The four Fen communities are restricted to the northern third of Illinois, extending down the Illinois River Valley.

## Type

Graminoid Fen --Sloping peat is either at the edge of a moraine or, more rarely, is a raised island in a Marsh or Sedge Meadow. In the latter case, this has been attributed to upwelling of groundwater. Dominants are either mesophytic native grasses in the most elevated peat or sod-forming sedges (but never tussock-forming sedges). Although the peat is quite elevated, it resists decay due to the high level of calcium and magnesium carbonate.

Dominant plants: big bluestem (*Andropogon gerardii*), little bluestem (*Schizachyrium scoparium*), sedge (*Carex haydenii*), sedge (*Carex sterilis*), Indian grass (*Sorghastrum nutans*), prairie dropseed (*Sporobolus heterolepis*).

Characteristic plants: sedge (*Carex hystricina*), rough blazing-star (*Liatis spicata*), Kalm's lobelia (*Lobelia kalmii*), loosestrife (*Lysimachia quadriflora*), muhly grass (*Muhlenbergia glomerata*), grass-of-Parnassus (*Parnassia glauca*), Ohio goldenrod (*Solidago ohioensis*), pitcher-plant (*Sarracenia purpurea*).

Shrub Fen --The site is very similar to the Graminoid Fen, with one important exception: large poorly vegetated seepage areas with spring runs serve as fire breaks to permit dominance by shrubs.

Distribution: Shrub Fens occur occasionally throughout the northern part of Illinois. Shrub Fens dominated by tall shrubs appear restricted to Upper Peoria Lake.

Dominant plants: sedges (*Carex spp.*), sedge (*Carex sterilis*), shrubby cinquefoil (*Dasiphora fruticosa*), red osier dogwood (*Cornus stolonifera*), poison sumac (*Toxicodendron vernix*), pussy willow (*Salix discolor*).

Characteristic plants: showy lady's-slipper (*Cypripedium reginae*), queen-of-the-prairie (*Filipendula rubra*), spreading goldenrod (*Solidago patula*).

Forested Fen -- This community is on relatively steep slopes in peat, and the tree cover is greater than 20%. As in Shrub Fens, natural fire breaks are probably necessary for development of this community.

Dominant plants: tamarack (*Larix laricina*), white cedar (*Thuja occidentalis*).

Characteristic plants: hemlock parsley (*Conioselinum chinense*), green orchid (*Habenaria hyperborean*), skunk cabbage (*Symplocarpus foetidus*).

Calcareous Floating Mat -- This community always has a floating layer of sedge peat. This peat is quite calcareous, and sphagnum moss (*Sphagnum*) is generally absent. A moderately tall layer of sedges and grasses dominates the mat.

Distribution: The only remaining examples of this community are in the extreme northern part of the Northeastern Morainal Division.

Dominant plants: bluejoint grass (*Calamagrostis canadensis*), sedge (*Carex stricta*), sedge (*Carex lasiocarpa*), swamp loosestrife (*Decodon verticillatus*).

Characteristic plants: bitter cress (*Cardamine pratensis* var. *palustris*), bogbean (*Menyanthes trifoliata*), marsh cinquefoil (*Potentilla palustris*), hoary willow (*Salix candida*), willow (*Salix pedicellaris*), pitcher-plant (*Sarracenia purpurea*).

## Subclass

Bog -- Low-nutrient, acid (at least in the uppermost layer) peat deposits support a variety of Bog communities. Bogs in Illinois are nearly always in glacial depressions, and drainage is usually restricted. Bogs are often characterized by a "moat" along the periphery.

This zone of Open Water, Marsh, Sedge Meadow, or Fen may be caused by a combination of fire (where Sedge Meadow and Fen may occur) and calcareous seepage from the mineral-rich till. A layer of sphagnum moss (*Sphagnum*) usually associated with hairy-cap moss (*Polytrichum*), characterizes nearly all Bog communities. There are four natural communities in this community class, all restricted now to the Northeastern Morainal Division.

### **Type**

Graminoid Bog -- This community nearly always is floating. Sedges are co-dominant with sphagnum moss (*Sphagnum*), and low shrubs are uncommon. This community is closest to open water and can be viewed as first stage in Bog succession.

Dominant plants: sedge (*Carex hystricina*), (*C. lasiocarpa*), (*C. haydenii*), other sedges (*Carex spp.*), hairy-cap moss (*Polytrichum commune*), sphagnum moss (*Sphagnum recurvum*), other sphagnum mosses (*Sphagnum spp.*).

Characteristic plants: round-leaved sundew (*Drosera rotundifolia*), Bogbean (*Menyanthes trifoliata*), pitcher plant (*Sarracenia purpurea*).

Low Shrub Bog -- This community may or may not be floating. Two conspicuous strata are present: one of low shrubs and a moss layer of sphagnum moss (*Sphagnum*) and hairy-cap moss (*Polytrichum*).

Dominant plants: dwarf birch (*Betula pumila*), leatherleaf (*Chamaedaphne calyculata*), hairy-cap moss (*Polytrichum commune*), sphagnum mosses (*Sphagnum spp.*).

Characteristic plants: cotton sedge (*Eriophorum virginicum*), American cranberry (*Vaccinium macrocarpon*), Canada blueberry (*Vaccinium myrtilloides*), low-bush blueberry (*Vaccinium angustifolium*), black huckleberry (*Gaylussacia baccata*).

Tall Shrub Bog -- This community is regarded as the climax in Illinois Bog succession, and it occupies the most consolidated peat.

Dominant plants: red osier dogwood (*Cornus stolonifera*), winterberry (*Ilex verticillata*), glossy buckthorn (exotic) (*Rhamnus frangula*), poison sumac (*Toxicodendron vernix*), high-bush blueberry (*Vaccinium corymbosum*), black huckleberry (*Gaylussacia baccata*), dwarf birch (*Betula pumila*), black chokeberry (*Aronia melanocarpa*).

Forested Bog -- This community exists on fairly well consolidated peat. Hummocks (which tend to be more acid) and small, wet depressions are characteristic. Two distinct layers are present: a tree stratum and a stratum of tall shrubs. This category includes both Forested Bogs with a markedly acid upper peat horizon and those with only scattered areas of acidity. The latter have been termed "half-bogs" or Forested Fens by some ecologists.

Dominant plants: winterberry (*Ilex verticillata*), tamarack (*Larix laricina*), glossy buckthorn (exotic) (*Rhamnus frangula*), poison sumac (*Toxicodendron vernix*).

Characteristic plants: cinnamon fern (*Osmunda cinnamomea*), star-flower (*Trientalis borealis*), high-bush blueberry (*Vaccinium corymbosum*), sphagnum moss (*Sphagnum spp.*), yellow birch (*Betula lutea*), and sedges (*Carex trisperma*), (*C. brunnescens*), (*C. canescens*), (*C. disperma*).

### **Subclass**

Seep and Spring -- This community occurs where groundwater flows to the surface. A Seep is an area with saturated soil caused by water flowing to the surface in a diffuse rather than concentrated flow. Seeps may have local areas of concentrated flow, and the water usually collects in spring runs. Seeps are usually smaller than 0.1 acre and are most common along the lower slopes of glacial moraines, ravines, and terraces. A Spring, as opposed to a Seep, has a concentrated flow of groundwater from a definite orifice. The various communities in this subclass are separated on the basis of substrate and water characteristics.

### **Type**

Seep -- This is a Seep community with circumneutral (pH between 5.5 and 7.2) water. A tree cover is often present.

Distribution: Seeps occur throughout the state, although they are often small and frequently considered inclusions within broader community types.

Dominant plants: sedges (*Carex spp.*), alternate-leaved dogwood (*Cornus alternifolia*), black ash (*Fraxinus nigra*), skunk cabbage (*Symplocarpus foetidus*), fowl manna grass (*Glyceria striata*), spotted touch-me-not (*Impatiens biflora*), clearweed (*Pilea pumila*).

Characteristic plants: angelica (*Angelica atropurpurea*), marsh marigold (*Caltha palustris*), liverwort (*Conocephalus conicum*), swamp wood betony (*Pedicularis lanceolata*), white turtlehead (*Chelone glabra*), spreading goldenrod (*Solidago patula*), cinnamon willow herb (*Epilobium coloratum*).

Acid Gravel Seep -- This community has muck or peat deposits and a low pH, caused by water flowing through sandstone or acidic gravel. This community is characterized by acidic water and soil with a low pH (3.7 to 4.7), which emanates from bedrock (commonly on a north face at the base of a hill) or where the bedrock is covered by sand or gravel.



Distribution: Acid Gravel Seeps are restricted to a small area of the Cretaceous Hills Section.

Characteristic plants: Red maple (*Acer rubrum*), sensitive fern (*Onoclea sensibilis*), lady fern (*Athyrium filix-femina*), cinnamon fern (*Osmunda cinnamomea*), royal fern (*Osmunda regalis*), sphagnum mosses (*Sphagnum spp.*), screw-stem (*Bartonia paniculatea*), netted chain fern (*Woodwardia areolata*).

Calcareous Seep -- Groundwater is so highly calcareous that tufa deposits form on the surface. Marl flats may develop under these conditions. Many typical Seeps are somewhat calcareous; but the distinction is drawn when tufa is present, forest cover is absent, and peat deposits (usually) adjoin the Seep. Calcareous Seeps usually occur in close association with various Fen communities. There is some floristic overlap with Fens as well as with the Panne.

Distribution: Calcareous Seeps are nearly restricted to the Wisconsinan till plain.

Characteristic plants: twig rush (*Cladium mariscoides*), tufted hairgrass (*Deschampsia caespitosa*), spike rush (*Eleocharis rostellata*), rush (*Juncus brachycephalus*), shrubby cinquefoil (*Potentilla fruticosa*), beaked rush (*Rhynchospora capillacea*), beaked rush (*Rhynchospora alba*), bulrush (*Scirpus caespitosus*), nut rush (*Scleria verticillata*), prairie-dock (*Silphium terebinthinaceum*), false asphodel (*Tofieldia glutinosa*), arrow-grass (*Triglochin palustris*).

Characteristic animal: elfin skimmer (*Nannothemis bella*).

Sand Seep -- The usually acid seepage water flows through sand, usually at the edge of dune or Beach ridges. Some muck deposits can accumulate.

Distribution: This community is best developed in the Chicago Lake Plain and Kankakee Sand Area.

Characteristic plants: lady fern (*Athyrium filix-femina*), fowl manna grass (*Glyceria striata*), cinnamon fern (*Osmunda cinnamomea*), royal fern (*Osmunda regalis*), ninebark (*Physocarpus opulifolius*), skunk cabbage (*Symplocarpus foetidus*), spinulose woodfern (*Dryopteris carthusiana*).

Spring -- Spring communities occur where groundwater is released at the ground surface and forms spring runs that merit recognition as a distinct natural community. Water is typically cold in temperature and vascular plant communities are not well developed in this natural community.

Distribution: Large spring natural communities are essentially limited to the Ozark Hills and Shawnee Hills Division, but may occur where geology is appropriate.

Dominant plants: late alumroot (*Heurchera parviflora*), fowl manna grass (*Glyceria striata*), white grass (*Leersia virginica*), marsh purslane (*Ludwigia palustris*), spotted touch-me-not (*Impatiens capensis*).

Characteristic plants: yellow monkeyflower (*Mimulus glabratus*), chara (*Chara spp.*), water cress (exotic) (*Nasturtium officinale*). Moss species such as *Mnium punctatum*, *M. affine*, *Thuidium delicatulum*, *Atrichium undulatum*, *Hygroamblystegium irriguum*, *Cirriophyllum illecebrum*, *Sematophyllum carolinianum*, *Isoptertgium mican*, *Tetraphis pellucida*, *Fontinalis disticha*, *Amblystegium varium*, *Fissidens taxifolius*, *Leucobryum glaucum* and *Tortella humilis* are common especially at the orifice.

## Subclass

Panne -- This community type is restricted to wet and wet-mesic swales in calcareous sand or the remains of ancient Beach ridges or dune and swale topography within one mile of Lake Michigan.

### Type

Panne -- This community has considerable floristic overlap with the Graminoid Fen and the Calcareous Seep. Competition is not as intense as in Fens because a Panne's sod is not dense.

Dominant plants: bluejoint grass (*Calamagrostis canadensis*), sedges (*Carex spp.*), twig rush (*Cladium mariscoides*), rush (*Juncus balticus* var. *littoralis*), shrubby cinquefoil (*Potentilla fruticosa*).

Characteristic plants: sedge (*Carex viridula*), spike rush (*Eleocharis olivacea*), wild flax (*Linum medium* var. *texanum*), arrow-grass (*Triglochin maritima* and *T. palustris*), horned bladderwort (*Utricularia cornuta*),

Characteristic animal: hoary elfin (*Callophrys polios*).

## CLASS OPEN WATER

Open Water communities are permanent, open bodies of water 0.5 acre or larger in surface area. They are separated from Wetlands by their permanence, relatively high proportion of open water, and by their general lack of emergent woody or graminoid vegetation. There are three subclasses: Pond, Lake, and Lake Michigan.

## Subclass

Pond -- Ponds are natural bodies of water less than 5 acres in surface area and formed by glacial action, Stream / river dynamics (in the case of side channel Ponds) or are spring fed. Ponds often have an extensive littoral zone, but always have some open water areas. Ponds are not deep enough to exhibit vertical temperature stratification and may turn over during intense wind events. Only one Pond natural community is recognized. Most, if not all, Ponds in Illinois appear to be eutrophic.

### Type

Pond -- A Pond is a small (< 5 acres), still body of water, usually shallow enough to allow rooted aquatic plants across a portion of it. A Pond is given natural community status only if it is permanent or semi-permanent, not seasonal or ephemeral.

Distribution: Ponds are found throughout Illinois and often are the result of damming flowing waters, but also include many backwaters connected to Major Rivers and glacial depressions.

Characteristic plants: yellow pond lily (*Nuphar advena*), white water lily (*Nymphaea tuberosa*), pondweed (*Potamogeton spp.*), *Spirodela spp.*, duckweed (*Lemna spp.*), smartweed (*Polygonum spp.*).

Characteristic animals: Topminnows (*Fundulus spp.*).

## Subclass

Lake -- Natural bodies of water created by glacial meltwaters with a surface area of 5 acres or greater and a maximum depth of 10 feet or greater. Lakes exhibit vertical and horizontal heterogeneity in thermal conditions (i.e., vertical stratification) and sunlight penetration (i.e., littoral and limnetic zonation). Some rooted vegetation may be found in the littoral zone, but the limnetic zone is extensive.

### Type

Lake -- Natural bodies of water with a surface area of 5 acres or larger and a depth of 10 feet or greater. In Illinois many Lakes are formed by glacial action thousands of years ago. Other lakes are present within the floodplains of Large and Major Rivers.

Distribution: Glacial Lakes are found in the northeastern part of the state. Floodplain Lakes are found along many rivers, but most former floodplain lakes have been disconnected from their rivers and converted to agricultural production.

Characteristic plants: pond lily (*Nuphar spp.*), pondweeds (*Potamogeton spp.*), duckweed (*Lemna spp.*), smartweeds (*Polygonum spp.*). Characteristic animals: Bowfin (*Amia calva*), Lake Chubsucker (*Erismyzon sucetta*), Starhead Topminnow (*Fundulus dispar*).

Great Lake -- Lake Michigan is a large, deep, naturally oligotrophic body of water. Approximately one million acres of Lake Michigan are within the borders of Illinois.

## CLASS STREAM

A Stream is a body of water flowing in a channel or water course. River, creek, and brook are alternative names for Streams. Although Stream communities may intergrade, five community subclasses are recognized on the basis of water permanence or size: Ephemeral Stream, Small Stream, Medium Stream, Large Stream and Major River.

### Subclass

Ephemeral Stream – Ephemeral Streams are those that are dry for a portion of the year. Most are headwaters and many only contain surface water following rain events.

### Type

Ephemeral Streams – Ephemeral Streams have a defined channel but lack surface water during some of the year. Most are high gradient. Ephemeral Streams lack mussels and diverse fish assemblages, but often are used by amphibians.

### Subclass

Small Stream -- A Small Stream is a perennial Stream or stream segment with a watershed area of 19,768 acres (80 km<sup>2</sup>) or less. Two Small Stream community types are identified on the basis of their gradients.

### *Type*

High-gradient Small Stream -- This is a Stream with a gradient of 5.3 or more feet per mile. Riffles, pools, and sand and gravel beds are characteristic of High-gradient Small Streams. Headwater streams throughout much of Illinois are classified as High-gradient Small Streams.

Low-gradient Small Stream -- A Low-gradient Small Stream has a gradient of less than 5.3 feet per mile. The current is sluggish. There are few if any riffles and the primary bottom sediments are usually silt and organic matter. This community is characteristic of flat Prairie uplands and bottomlands along larger rivers.

### **Subclass**

Medium Stream -- A Medium Stream is defined as a perennial Stream or stream segment with a watershed area between 19,769 and 531,277 acres (81 - 2150 km<sup>2</sup>). Two small Stream communities are identified on the basis of their gradients.

### *Type*

High-gradient Medium Stream -- This is a Medium Stream with a gradient of 5.3 or more feet per mile. Characteristics include pools, riffles, and sand and gravel beds. This community type can be found in portions of the upper Apple River, Big Bureau Creek, Kickapoo Creek (Sangamon River watershed), and the upper Lusk Creek.

Low-gradient Medium Stream -- These Medium Streams have a gradient of less than 5.3 feet per mile. The current is sluggish. There are few if any riffles and the bottom sediments are primarily silt and organic matter. This community type can be found in portions of the Des Plaines River, the upper Mackinaw River, the upper Sangamon River, Shoal Creek, the Cache River, and Bay Creek.

### **Subclass**

Large Stream -- A Large Stream is defined as a Stream or Stream segment with a watershed greater than 531,277 acres (2150 km<sup>2</sup>) but not identified as a Major River. Two Large Stream communities are identified on the basis of their gradients.

### **Type**

High-gradient Large Stream -- This is a Large Stream with a gradient of 5.3 feet or more per mile. Characteristics include pools, riffles, and sand and gravel beds. In Illinois, this community type may be found in short segments of a few large Streams flowing through very hilly topography. This community type can be found in portions of the lower Vermilion River (Illinois River watershed) and the upper Fox River.

Low-gradient Large Stream -- These Streams have a gradient of less than 5.3 feet per mile. The current is sluggish. There are few if any riffles and the bottom sediments are primarily silt and organic matter. This community type can be found in portions of the Pecatonica River, the lower portion of the Kaskaskia River, Iroquois River, Embarras River, and Big Muddy River.

### **Subclass**

Major River -- Major Rivers are identified by name: Wabash River, Ohio River, Mississippi River, Illinois River, Rock River, the lower Fox River, and the Kankakee River. Two Major River community types are identified on the basis of their gradients.

### *Type*

High-gradient Large River -- This Major River community has a gradient of greater or equal to 5.3 feet per mile. Characteristics include some riffles, sand and gravel beds, and some silt deposits. The lower Fox River is the only representative of this community type.

Low-gradient Large River -- The gradient of this community is less than 5.3 feet per mile. The channel is meandering, deep, and the current is sluggish. There may be sand bars, but the sediments are mainly silt. This community type can be found in the Illinois, Mississippi, Rock, Ohio, and Wabash Rivers.

## CLASS BEDROCK

Communities that are established where (1) soil is thin or absent, and (2) the parent material is at or near the surface.

### Subclass

Glade -- A Glade is an opening in the forest, caused by bedrock at or near the surface and (usually) a steep southern or western exposure. A Glade is usually a mosaic of stunted trees, shrubs, patches of herbaceous vegetation, and open areas with little or no vegetation. The soil is thin or absent, and the site is either dry or xeric, so the soil moisture class is not part of the natural community name. Glades are defined by their rock type: sandstone, limestone, or shale.

### Type

Sandstone Glade -- This community occupies the tops of Cliffs and the steep upper slopes of south-facing escarpments. Sandstone crops out, and the soil is poorly developed. Trees are stunted and open grown, and shrubs are common. The overstory usually covers less than half of the area, and herbaceous vegetation is sparse. Sandstone glades often intergrade with a bordering zone of Dry Upland Forest.

Distribution: Sandstone Glades occur in both northern and southern Illinois on areas of thin soils over sandstone.

Dominant plants: little bluestem (*Schizachyrium scoparium*), broomsedge (*Andropogon virginicus*), red cedar (*Juniperus virginiana*), blackjack oak (*Quercus marilandica*), post oak (*Quercus stellata*), winged elm (*Ulmus alata*), farkleberry (*Vaccinium arboreum*).

Characteristic plants: hairy lip fern (*Cheilanthes lanosa*), croton (*Croton monanthogynus*), curly grass (*Danthonia spicata*), slender false foxglove (*Agalinis tenuifolia*), pineweed (*Hypericum gentianoides*), widow's-cross (*Sedum pulchellum*), poverty grass (*Sporobolus vaginiflorus*), flower-of-an-hour (*Talinum parviflorum*), prickly-pear cactus (*Opuntia humifusa*). In northern Illinois: fameflower (*Talinum rugospermum*), rock spikemoss (*Selaginella rupestris*).

Characteristic animals: fence lizard (*Sceloporus undulatus*), six-lined racerunner (*Aspidoscelis sexlineatus*).

Limestone Glade -- These Glades are found on steep south and west-facing spurs and bluffs of limestone. The soil is deeper than in a sandstone Glade, but it is rocky and usually clayey. Both the pH and nutrient levels are higher, resulting in a fairly diverse community. Limestone Glades sometimes occur with Loess Hill Prairies, and there is a strong floristic overlap with Hill Prairies. The best distinguishing features are the presence of limestone outcrops, shallow soil, and (usually) relatively many trees, shrubs, and vines.

Distribution: Limestone Glades occur in the Shawnee Hills Division and on the Mississippi River and Illinois River bluffs.

Dominant plants: little bluestem (*Schizachyrium scoparium*), side-oats grama (*Bouteloua curtipendula*), Indian grass (*Sorghastrum nutans*).

Characteristic plants: American agave (*Polianthes virginica*), spreading aster (*Aster patens*), prairie Indian-plantain (*Cacalia tuberosa*), rattlesnake master (*Eryngium yuccifolium*), red cedar (*Juniperus virginiana*), false boneset (*Brickellia eupatorioides*), hoary puccoon (*Lithospermum canescens*), false dragonhead (*Physostegia virginiana*), yellow chestnut oak (*Quercus muhlenbergii*), prairie-dock (*Silphium terebinthinaceum*), catbrier (*Smilax bona-nox*), pale coneflower (*Echinacea pallida*), grey-headed coneflower (*Ratibida pinnata*), bluetts (*Houstonia spp.*), aromatic sumac (*Rhus aromatica*).

Shale Glade -- Shale does not normally form rocky slopes; but, occasionally, a series of steep ridges is formed in thick shale outcrops where natural openings occur on exposed slopes, and these are termed Shale Glades.

Distribution: Shale Glades are essentially limited to a small part of the Southern Section of the Ozark Division.

Dominant plants: black oak (*Quercus marilandica*), post oak (*Quercus stellata*), little bluestem (*Schizachyrium scoparium*).

Characteristic plants: butterfly-weed (*Asclepias tuberosa*), although quite a generalist in southern Illinois.

### Subclass

Cliff -- Cliff communities occur on or near vertical faces of exposed bedrock or unconsolidated materials. Soils are absent or very thin, and the plant communities are determined by the substrate and exposure, the latter a function of aspect (the direction the Cliff is facing) and amount of shade. In Illinois, there are six natural Cliff communities: Sandstone Cliff, Limestone Cliff, Dolomite Cliff, Sandstone Overhang, Eroding Bluff, and Algific Talus Slope communities. Cliffs can be broken into two types: 1) Dry Cliff communities which are exposed and generally face south to west and 2) Mesic cliffs which are sheltered and generally face north to east.

### Type

Dry Sandstone Cliff -- Dry Sandstone Cliffs large enough to be recognized as distinct communities are abundant in the Shawnee Hills Natural Division and scattered throughout the rest of the state.

Characteristic plants: marginal fern (*Dryopteris marginalis*), hairy lip fern (*Cheilanthes lanosa*).

Mesic Sandstone Cliff -- Mesic Sandstone Cliff community types are common in the Shawnee Hills Natural Division and are occasional to scattered in the rest of the state.

Characteristic plants: shining clubmoss (*Lycopodium lucidulum*), interrupted fern (*Osmunda claytonia*), partridgeberry (*Mitchella repens*), late alumroot (*Heuchera parviflora*), common polypody (*Polypodium virginianum*).

Dry Limestone Cliff -- Dry Limestone Cliff communities typically show a lesser resistance to weathering and a higher pH than Sandstone Cliffs and share some characters and species with Dry Dolomite Cliffs.

Distribution: Dry Limestone Cliffs occur throughout Illinois where bedrock crops out and are most prominent along the Illinois and Mississippi Rivers.

Characteristic plants: purple cliffbrake (*Pellaea atropurpurea*), smooth cliffbrake (*Pellaea glabella*), baby lip fern (*Cheilanthes feei*), red cedar (*Juniperus virginiana*), Drummond's goldenrod (*Solidago drummondii*).

Mesic Limestone Cliff -- Mesic Limestone Cliff communities typically show a lesser resistance to weathering and a higher pH than sandstone Cliffs and share some characters and species with Mesic Dolomite Cliffs.

Distribution: Mesic Limestone Cliffs occur throughout Illinois where bedrock outcrops in sheltered areas or seepage along the Cliff face is present.

Characteristic plants: bladder fern (*Cystopteris bulbifera*), ninebark (*Physocarpus opulifolius*), (*Arabis hirsuta*), slender cliffbrake (*Cryptogramma stellerei*), gray polypody (*Polypodium polypodioides*).

Dry Dolomite Cliff -- This community occurs in river and creek valleys where south- to west-facing exposures exist. This community is similar to the Dry Limestone Cliff community type.

Distribution: This community type occurs in the bluffs that occur along the Mississippi River and associated drainages and are generally scattered in the rest of the northern half of the state.

Dominant plants: chestnut oak (*Quercus muhlenbergii*), red cedar (*Juniperus virginiana*).

Characteristic plants: sand cress (*Arabis lyrata*), bellflower (*Campanula rotundifolia*), baby lip fern (*Cheilanthes feei*), purple cliff brake (*Pellaea atropurpurea*), smooth purple cliff brake (*Pellaea glabella*), cliff goldenrod (*Solidago sciaphila*), Drummond's goldenrod (*Solidago drummondii*).

Mesic Dolomite Cliff -- This community type occurs in river and creek valleys where north- to east-facing exposures exist or Cliffs are protected from the elements by sheltering vegetation. Some species of plants found in this community are disjunct from their northern range distribution.

Distribution: Mesic dolomite cliffs are occasional to scattered in the northern half of the state.

Characteristic plants: Canada yew (*Taxus canadensis*), bladder fern (*Cystopteris bulbifera*), sullivantii (*Sullivantia renifolia*), walking fern (*Asplenium rhizophyllum*).

Sandstone Overhang -- This is a small but distinct natural community which occurs when a Sandstone Cliff forms a shelter. The soil beneath the overhang may consist of sandy residuum or unweathered loess. Light intensities are low, and soil moisture ranges from dry to wet.

Distribution: Sandstone Overhangs large enough to be considered as distinct natural communities are common in the Shawnee Hills but are rare in the rest of the state.

Characteristic plants: filmy fern (*Trichomanes boschianum*), French's shootingstar (*Dodecatheon frenchii*).

Eroding Bluff -- This community consists of vertical exposures of unconsolidated material (for example, glacial drift) or weak rock (such as shale). The steep slope is maintained by Stream or Lake erosion, and the natural community is poorly developed because of continual slumping.

Distribution: Eroding Bluffs are especially common along Major Rivers in the glaciated part of Illinois.

Characteristic plants: curly grass (*Danthonia spicata*), field goldenrod (*Solidago nemoralis*), yellow pimpernel (*Taenidia integerrima*).

Characteristic animals: kingfisher (*Megaceryle alcyon*), bank swallow (*Riparia riparia*), rough-winged swallow (*Stelgidopteryx ruticollis*).

Algific Talus Slope -- These communities are similar to talus slopes, but exhibit distinctive climatic and geologic factors that make algific slopes a unique community. Sinkholes allow water to flow down until it becomes trapped between the talus slope and bottom layer. During the winter months ice is formed behind the talus slope in the fissures and crevices and behind the talus slope. During the summer months the ice melts, causing moist cool air to flood out down the slope. This creates a cool microclimate that is favorable for plants that occur in cool climates, many of which are disjunct populations from northern United States and Canada.

Distribution: Only a few Algific Slopes are known and are confined to the base or talus of high river bluffs in the Wisconsin Driftless Natural Division.

Characteristic plants: basswood (*Tilia americana*), paper birch (*Betula papyrifera*), beaked hazelnut (*Corylus cornuta*), black ash (*Fraxinus nigra*), downy arrowwood (*Viburnum rafinesquianum*), nannyberry (*Viburnum lentago*), prickly rose (*Rosa acicularis*), round-leaved dogwood (*Cornus rugosa*), shadbush (*Amelanchier interior*), mountain clematis (*Clematis occidentalis*), honeysuckle (*Lonicera prolifera*), fowl bluegrass (*Poa palustris*), rice grass (*Oryzopsis racemosa*), sedge (*Carex albursina*), American spikenard (*Aralia racemosa*), bishop's -cap (*Mitella diphylla*), Canada violet (*Viola canadensis*), harebell (*Campanula rotundifolia*).

Characteristic animal: Iowa Pleistocene Snail (*Discus macclintocki*)

## CLASS SHORE

The communities in this class are all influenced by Lake Michigan. Lake-deposited sands form the substrate for the Beach and Fore-dune communities. These communities are maintained indefinitely at an early stage of succession by the substrate or by natural disturbance. All communities are limited to the shoreline of Lake Michigan.

### Subclass

Shore

#### Type

Beach -- Soil development is nonexistent because the sand is recently deposited. Two basic subdivisions can be distinguished: the nearly bare zone of sand nearest the Lake and the vegetated grassland farther inland.

Dominant plants: beach grass (*Ammophila breviligulata*), sand reed (*Calamovilfa longifolia*), nodding wild rye (*Elymus canadensis*).

Characteristic plants: sea rocket (*Cakile edentula*), common bugseed (*Corispermum hyssopifolium*), seaside spurge (*Chamaesyce polygonifolia*).

Characteristic animal: piping plover (*Charadrius melodus*).

Fore-dune -- This community is characterized by the beginnings of soil development. A fairly dense cover of low shrubs and grasses is present. There is some floristic overlap with Dry Sand Prairie because of the substrate present.

Dominant plants: little bluestem (*Schizachyrium scoparium*), bearberry (*Arctostaphylos uva-ursi*), trailing juniper (*Juniperus horizontalis*).

Characteristic plants: common juniper (*Juniperus communis*), purple prairie clover (*Dalea purpureum*).

## CLASS CAVE

A Cave is a naturally occurring void in earth materials that is humanly penetrable for at least 20 feet. This includes solution features, collapse features, or crevices. Solution Caves form in limestone or dolomite and there is no significant difference between Caves formed in the two kinds of rocks. Small Caves form in sandstone. The longest Cave systems are in the Northern Section of the Ozark Division (also termed the Salem Plateau), but Caves are also common in the Shawnee Hills Division and along the Mississippi River and lower Illinois River. Two Cave communities are distinguished: the Terrestrial Cave Community and Aquatic Cave Community. Within each community, there are recognized four groups of species: 1) accidental: species that does not normally inhabit Caves; 2) troglomen: Cave "visitors" that leaves the Cave to feed or reproduce; 3) troglomiles: facultative Cave dwellers that may live and reproduce in Caves; and 4) troglonites: an obligate Cave dweller that lives and reproduces only in Caves.

### Subclass

Cave

#### Type

Terrestrial Cave -- This community type occupies air-filled cavities in rock. The substrate may be bedrock, cobble, sand, mud or organic detritus.

Characteristic animals: little brown bat (*Myotis lucifugus*), big brown bat (*Eptesicus fuscus*), tricolored bat (*Perimyotis subflavus*), cave salamander (*Eurycea lucifuga*), pickerel frog (*Lithobates palustris*), cave cricket (*Rhaphidophoridae*).

Aquatic Cave -- Pools, Streams, and waterfalls within Caves make up this community type. These waters are part of the groundwater in a region, and the water may come to the surface in Springs and Seeps.

Distribution: This community occurs within terrestrial Cave communities.

Characteristic animals: There are many troglobitic (Cave-adapted) aquatic invertebrates in Illinois. The Spring cavefish (*Forbesichthys agassizii*), although mainly observed at surface level springs, may rarely inhabit Aquatic Caves.

## CLASS CULTURAL

The Cultural community class includes features present in the developed and manipulated landscape. Only very rarely can Cultural communities be significant features on their own. Most frequently they will occur as areas included within the boundaries of a natural area.

### Subclass

Cultural

#### *Type*

Developed Land -- This community class includes any land (including surface-mined lands with little to no vegetation – e.g., quarries and mines) that has been highly modified or has structures built on it. Examples of this community class are roads, buildings, air strips, parking lots, playgrounds, landfills, refineries, quarries, mines, etc.

Artificial Impoundment -- Artificial Impoundments are Lakes and Ponds, man-made bodies of water that may have characteristics of natural Lakes and Ponds.

Agricultural Land - Lands that are cultivated in an intensive manner to produce agricultural (including fruits), horticultural, or silvicultural crops, typically oriented in rows. It also includes windbreaks and nurseries as well as tree and shrub plantations.

Distribution: Cropland can be found statewide.

Characteristic plants: corn (*Zea mays*), soybeans (*Glycine max*), wheat (*Triticum aestivum*), sunflower (*Helianthus annuus*), pumpkin (*Cucurbita pepo*), watermelon, apple (*Malus*), etc.

Managed Grassland – Lands that are established to perennial, native or exotic, cool or warm season grasses and/or broad-leaf vegetation that are actively maintained as grasslands/openlands. Managed grasslands may be periodically mowed, hayed, burned, grazed or otherwise manipulated to maintain a grass and/or broadleaf-dominated plant cover. Managed Grassland may include lands with little or no actual grass cover; the category covers all types of lands which may be managed for typical grassland wildlife with little or no woody vegetation. Grassland that is not actively maintained is Old Field.

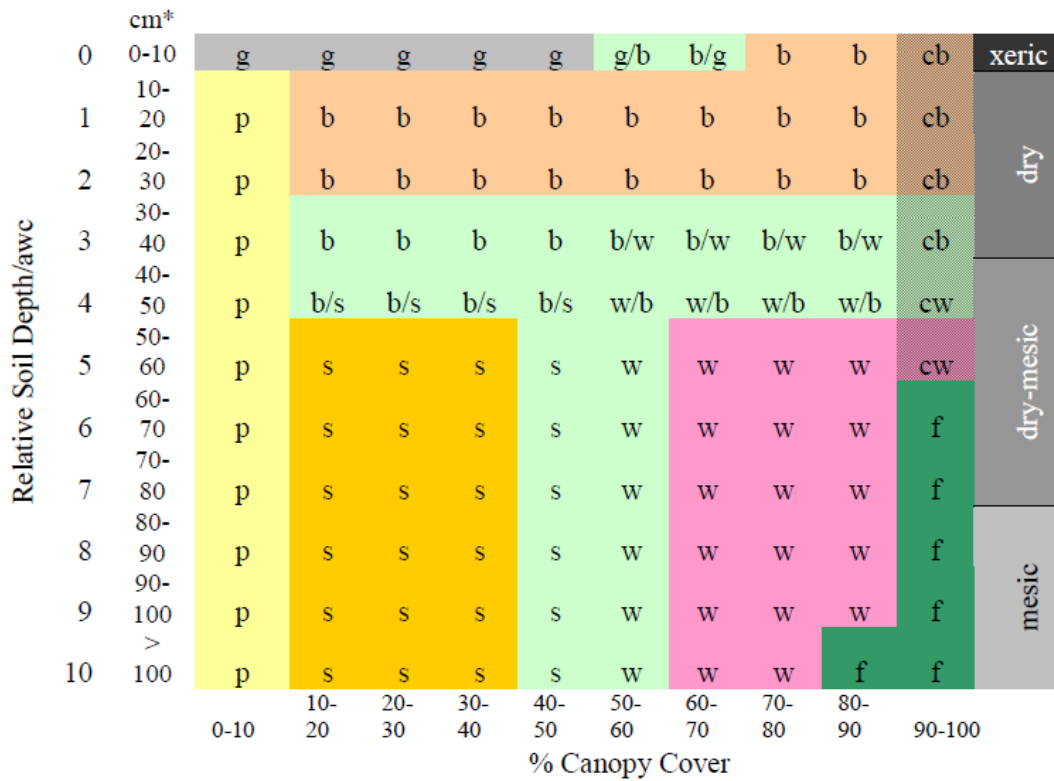
Distribution: Managed Grassland can be found statewide.

Characteristic plants: smooth brome (*Bromus inermis*), redbud (*Agrostis alba*), timothy (*Phleum pratense*), big bluestem (*Andropogon gerardii*), Indian grass (*Sorghastrum nutans*), little bluestem (*Schizachyrium scoparium*), ladino clover (*Trifolium repens*), alfalfa (*Medicago sativa*), Illinois bundleflower (*Desmanthus illinoensis*), partridge pea (*Chamaechrista fasciculata*).

Old Field -- This community type is comprised primarily of abandoned cropland and pastureland. It also can include other disturbed, formerly open land, such as vacant lots and construction sites that cannot properly be termed fields, but have been abandoned to a progression of vegetative stages. These vegetative states may or may not be representative of progression to a natural community type. Exotic species may be prevalent.

Habitat Reconstruction -- This community type includes those areas that are planted with native plant species and managed to maintain characteristics of natural communities but not necessarily to resemble in structure and composition the native vegetation of the area. Examples of this community type include reconstructions of Prairie, Forest, Wetland, and Savanna communities.

Figure 3. Generalized transition matrix comparing soil depth, moisture, and canopy cover for Woodland, Savanna, Barrens, and related habitat classes and subclasses. \*approximate depth of soil solum or to slowly permeable or impermeable layer intended as general guideline. Mesic and Dry-mesic Barrens are possible with special conditions (e.g., fire, seepage).



- b = barrens
- c = closed
- f = forest
- g = glade
- p = prairie
- s = savanna
- w = woodland
- g/b, b/g = transitional/ecotone



Table 4. Samples of Woodland, Barrens, Savanna, and Forest characteristic species. Nomenclature follows Mohlenbrock 2002.

SCIENTIFIC NAME	COMMON NAME	Woodland	Barrens	Savanna	Forest	Growth Form	Wetness	Wetness Coef.
<i>Acalypha gracilens</i>	SLENDER THREE-SEEDED MERCURY		x			A-Forb	UPL	5
<i>Acer saccharum</i>	SUGAR MAPLE				x	Tree	FACU	3
<i>Adiantum pedatum</i>	MAIDENHAIR FERN				x	Fern	FAC-	1
<i>Agrostis perennans</i>	AUTUMN BENTGRASS	x				P-Grass	FAC-	1
<i>Allium tricoccum</i>	WILD LEEK				x	P-Forb	FACU+	2
<i>Amelanchier arborea</i>	JUNEBERRY	x	x			Tree	FACU	3
<i>Amorpha canescens</i>	LEAD PLANT	x	x	x		Shrub	UPL	5
<i>Amphicarpa bracteata</i>	HOG PEANUT	x	x			H-Vine	FAC	0
<i>Andropogon gerardii</i>	BIG BLUESTEM		x	x		P-Grass	FAC-	1
<i>Anemone quinquefolia</i>	WOOD ANEMONE	x				P-Forb	FAC	0
<i>Anemone virginiana</i>	TALL ANEMONE	x		x		P-Forb	UPL	5
<i>Angelica venenosa</i>	WOOD ANGELICA		x			P-Forb	UPL	5
<i>Antennaria plantaginifolia</i>	PUSSYTOES	x	x			P-Forb	UPL	5
<i>Apocynum androsaemifolium</i>	SPREADING DOGBANE	x	x	x		P-Forb	UPL	5
<i>Aralia nudicaulis</i>	WILD SARSAPARILLA	x				P-Forb	FACU	3
<i>Arisaema dracontium</i>	GREEN DRAGON				x	P-Forb	FACW	-3
<i>Arisaema triphyllum</i>	INDIAN TURNIP				x	P-Forb	FACW-	-2
<i>Aristolochia serpentaria</i>	BIRTHWORT	x	x			P-Forb	UPL	5
<i>Arnoglossum atriplicifolium</i>	PALE INDIAN PLANTAIN	x	x			P-Forb	UPL	5
<i>Asarum canadense</i>	CANADA WILD GINGER				x	P-Forb	UPL	5
<i>Asclepias exaltata</i>	POKE MILKWEED	x				P-Forb	UPL	5
<i>Asclepias purpurascens</i>	PURPLE MILKWEED	x		x		P-Forb	FACU	3
<i>Asclepias quadrifolia</i>	WHORLED MILKWEED	x	x			P-Forb	UPL	5
<i>Asclepias variegata</i>	VARIEGATED MILKWEED	x				P-Forb	FACU-	4
<i>Asimina triloba</i>	PAPAW				x	Tree	FAC	0
<i>Aster anomalus</i>	BLUE ASTER	x	x			P-Forb	UPL	5
<i>Aster drummondii</i>	DRUMMOND'S ASTER	x				P-Forb	FACU	3

SCIENTIFIC NAME	COMMON NAME	Woodland	Barrens	Savanna	Forest	Growth Form	Wetness	Wetness Coef.
<i>Aster oblongifolius</i>	AROMATIC ASTER	x				P-Forb	UPL	5
<i>Aster patens</i>	PURPLE DAISY	x	x			P-Forb	UPL	5
<i>Aster sagittifolius</i>	ARROW-LEAVED ASTER	x				P-Forb	UPL	5
<i>Aster turbinellus</i>	TOP-SHAPED ASTER	x	x			P-Forb	UPL	5
<i>Astragalus canadensis</i>	CANADIAN MILK VETCH	x		x		P-Forb	FAC+	-1
<i>Athyrium angustum</i>	LADY FERN				x	Fern	FAC	0
<i>Aureolaria grandiflora v. pulchra</i>	YELLOW FALSE FOXGLOVE	x	x	x		P-Forb	UPL	5
<i>Besseyia bullii</i>	KITTEN TAILS	x	x			P-Forb	UPL	5
<i>Blephilia ciliata</i>	WOOD MINT	x				P-Forb	FACU-	4
<i>Brachyelytrum erectum</i>	LONG-AWNED WOOD GRASS				x	P-Grass	UPL	5
<i>Bromus pubescens</i>	WOODLAND BROME	x	x	x		P-Grass	FACU+	2
<i>Calystegia spithamea</i>	DWARF BINDWEED		x	x		P-Forb	UPL	5
<i>Camassia scilloides</i>	WILD HYACINTH	x		x		P-Forb	FAC+	-1
<i>Carex albicans</i>	BLUNT-SCALED OAK SEDGE	x	x	x		P-Sedge	UPL	5
<i>Carex albursina</i>	BLUNT-SCALED WOOD SEDGE				x	P-Sedge	UPL	5
<i>Carex blanda</i>	COMMON WOOD SEDGE				x	P-Sedge	FAC	0
<i>Carex cephalophora</i>	CAPITATE SEDGE	x				P-Sedge	FACU	3
<i>Carex glaucoidea</i>	BLUE SEDGE	x	x			P-Sedge	UPL	5
<i>Carex hirsutella</i>	HAIRY GREEN SEDGE	x	x			P-Sedge	FACU-	4
<i>Carex jamesii</i>	GRASS SEDGE				x	P-Sedge	UPL	5
<i>Carex laxiflora</i>	BEECH WOOD SEDGE				x	P-Sedge	FAC	0
<i>Carex muhlenbergii</i>	SAND BRACTED SEDGE		x	x		P-Sedge	UPL	5
<i>Carex oligocarpa</i>	FEW-FRUITED GRAY SEDGE				x	P-Sedge	UPL	5
<i>Carex pennsylvanica</i>	PENNSYLVANIA OAK SEDGE	x	x	x		P-Sedge	UPL	5
<i>Carex retroflexa</i>	BENT BRACTED SEDGE	x	x			P-Sedge	UPL	5
<i>Carya glabra</i>	PIGNUT HICKORY	x	x			Tree	FACU	3
<i>Carya texana</i>	BLACK HICKORY	x	x	x		Tree	UPL	5
<i>Caulophyllum thalictroides</i>	BLUE COHOSH				x	P-Forb	UPL	5

SCIENTIFIC NAME	COMMON NAME	Woodland	Barrens	Savanna	Forest	Growth Form	Wetness	Wetness Coef.
<i>Ceanothus americanus</i>	NEW JERSEY TEA	x	x	x		Shrub	UPL	5
<i>Chasmanthium latifolium</i>	SEA OATS				x	P-Grass	FACW	-3
<i>Cinna arundinacea</i>	WOOD REED	x				P-Grass	FACW	-3
<i>Circaea lutetiana v. canadensis</i>	ENCHANTER'S NIGHTSHADE				x	P-Forb	FACU	3
<i>Claytonia virginica</i>	SPRING BEAUTY				x	P-Forb	FACU	3
<i>Clitoria mariana</i>	BUTTERFLY PEA		x			P-Forb	UPL	5
<i>Cornus florida</i>	FLOWERING DOGWOOD	x				Tree	FACU-	4
<i>Corydalis flavula</i>	PALE CORYDALIS				x	B-Forb	FACU+	2
<i>Corylus americana</i>	AMERICAN HAZEL	x		x		Shrub	FAC	0
<i>Cryptotaenia canadensis</i>	HONEWORT				x	P-Forb	FAC	0
<i>Cunila originoides</i>	DITTANY	x	x			P-Forb	UPL	5
<i>Cystopteris protrusa</i>	HYBRID FRAGILE FERN				x	Fern	FACU	3
<i>Danthonia spicata</i>	POVERTY OAT GRASS	x	x			P-Grass	UPL	5
<i>Dasistoma macrophylla</i>	MULLEIN FOXGLOVE	x	x	x		P-Forb	FACU-	4
<i>Delphinium tricorne</i>	DWARF LARKSPUR				x	P-Forb	UPL	5
<i>Dentaria laciniata</i>	TOOTHWORT				x	P-Forb	FACU	4
<i>Desmodium cuspidatum</i>	BRACTED TICK TREFOIL	x	x			P-Forb	UPL	5
<i>Desmodium glutinosum</i>	POINTED TICK TREFOIL	x				P-Forb	UPL	5
<i>Desmodium nudiflorum</i>	BARE-STEMMED TICK TREFOIL	x	x			P-Forb	UPL	5
<i>Desmodium rotundifolium</i>	ROUND-LEAVED TICK TREFOIL	x	x			P-Forb	UPL	5
<i>Diarrhena americana</i>	BEAK GRASS	x				P-Grass	FACW	-3
<i>Dicentra cucullaria</i>	DUTCHMAN'S BREECHES				x	P-Forb	UPL	5
<i>Dichanthelium boscii</i>	LARGE-GRUITED PANIC GRASS	x	x			P-Grass	UPL	5
<i>Dichanthelium depauperatum</i>	STARVED PANIC GRASS		x	x		P-Grass	UPL	5
<i>Dichanthelium latifolium</i>	BROAD-LEAVED PANIC GRASS	x				P-Grass	FACU	3
<i>Dichanthelium laxiflorum</i>	LOOSE-FLOWERED PANIC GRASS	x	x			P-Grass	FAC-	1

SCIENTIFIC NAME	COMMON NAME	Woodland	Barrens	Savanna	Forest	Growth Form	Wetness	Wetness Coef.
<i>Dichanthelium linearifolium</i>	SLENDER-LEAVED PANIC GRASS	x	x	x		P-Grass	UPL	5
<i>Dichanthelium perlongum</i>	LONG-STALKED PANIC GRASS		x	x		P-Grass	UPL	5
<i>Dichanthelium sphaerocarpon</i>	ROUND-FRUITED PANIC GRASS		x			P-Grass	FACU	3
<i>Dodecatheon meadia</i>	SHOOTING STAR	x	x	x		P-Forb	FACU	3
<i>Echinacea purpurea</i>	BROAD-LEAVED PURPLE CONEFLOWER	x		x		P-Forb	UPL	5
<i>Elymus hystrix</i>	BOTTLEBRUSH GRASS	x				P-Grass	UPL	5
<i>Eryngium yuccifolium</i>	RATTLESNAKE MASTER		x	x		P-Forb	FAC+	-1
<i>Erythronium albidum</i>	WHITE ADDER'S TONGUE				x	P-Forb	UPL	5
<i>Eupatoriadelphus purpureus</i>	PURPLE JOE PYE WEED	x				P-Forb	FAC	0
<i>Eupatorium sessilifolium</i>	UPLAND BONESET	x				P-Forb	UPL	5
<i>Euphorbia corollata</i>	FLOWERING SPURGE	x	x	x		P-Forb	UPL	5
<i>Festuca subverticillata</i>	NODDING FESCUE	x				P-Grass	FACU+	2
<i>Frasera caroliniensis</i>	AMERICAN COLUMBO	x				B-Forb	UPL	5
<i>Galactia regularis</i>	MILK PEA		x			H-Vine	UPL	5
<i>Galium circaeazans</i>	WILD LICORICE	x	x			P-Forb	FACU-	4
<i>Galium pilosum</i>	HAIRY BEDSTRAW	x	x			P-Forb	UPL	5
<i>Geranium maculatum</i>	WILD GERANIUM				x	P-Forb	FACU	3
<i>Hedeoma pulegioides</i>	AMERICAN PENNYROYAL	x	x			A-Forb	UPL	5
<i>Hedyotis lonifolia</i>	LONG-BRACTED BLUETS		x			P-Forb	UPL	5
<i>Hedyotis nigricans</i>	NARROW-LEAVED BLUETS		x			P-Forb	UPL	5
<i>Hedyotis pusilla</i>	SMALL BLUETS		x			A-Forb	UPL	5
<i>Helianthemum bicknellii</i> - S	ROCKROSE		x	x		P-Forb	UPL	5
<i>Helianthemum canadense</i> - S	COMMON ROCKROSE		x	x		P-Forb	UPL	5
<i>Helianthus divaricatus</i>	WOODLAND SUNFLOWER	x	x	x		P-Forb	UPL	5
<i>Helianthus strumosus</i>	PALE-LEAVED SUNFLOWER	x				P-Forb	UPL	5

SCIENTIFIC NAME	COMMON NAME	Woodland	Barrens	Savanna	Forest	Growth Form	Wetness	Wetness Coef.
<i>Heliopsis helianthoides</i>	FALSE SUNFLOWER	x		x		P-Forb	UPL	5
<i>Heuchera americana v. hirsuticaulis</i>	TALL ALUMROOT	x	x			P-Forb	FACU-	4
<i>Hieracium gronovii</i>	HAIRY HAWKWEED	x				P-Forb	UPL	5
<i>Hieracium longipilum</i>	LONG-BEARDED HAWKWEED	x				P-Forb	UPL	5
<i>Hieracium scabrum</i>	ROUGH HAWKWEED	x				P-Forb	UPL	5
<i>Hybanthus concolor</i>	GREEN VIOLET				x	P-Forb	FACU+	2
<i>Hydrastis canadensis</i>	GOLDEN SEAL				x	P-Forb	UPL	5
<i>Hydrophyllum appendiculatum</i>	GREAT WATERLEAF				x	P-Forb	UPL	5
<i>Hydrophyllum virginianum</i>	VIRGINIA WATERLEAF				x	P-Forb	FACW-	-2
<i>Koeleria macrantha</i>	JUNE GRASS	x	x	x		P-Grass	UPL	5
<i>Krigia biflora</i>	FALSE DANDELOIN	x	x			P-Forb	FACU	3
<i>Lactuca hirsuta</i>	HAIRY WILD LETTUCE		x			B-Forb	UPL	5
<i>Lathyrus ochroleucus</i>	PALE VETCHLING	x		x		P-Forb	UPL	5
<i>Lechea villosa</i>	HAIRY PINWEED		x	x		P-Forb	UPL	5
<i>Lespedeza procumbens</i>	TRAILING BUSH CLOVER	x	x			P-Forb	UPL	5
<i>Lespedeza repens</i>	CREeping BUSH CLOVER	x	x			P-Forb	UPL	5
<i>Lespedeza stuevei</i>	BUSH CLOVER	x				P-Forb	UPL	5
<i>Lespedeza violacea</i>	VIOLET BUSH CLOVER	x	x			P-Forb	UPL	5
<i>Lespedeza virginica</i>	SLENDER BUSH CLOVER	x	x			P-Forb	UPL	5
<i>Liatis aspera</i>	ROUGH BLAZING STAR	x		x		P-Forb	UPL	5
<i>Liatis scabra</i>	HAIRY BLAZING STAR	x	x			P-Forb	UPL	5
<i>Liatis scariosa v. nieuwlandii</i>	SAVANNA BLAZINE STAR	x		x		P-Forb	UPL	5
<i>Liatis squarrosa</i>	ROUGH BLAZING STAR	x	x			P-Forb	UPL	5
<i>Lindera benzoin</i>	SPICEBUSH				x	Shrub	FACW-	-2
<i>Linum sulcatum</i>	GROOVED YELLOW FLAX	x				P-Forb	UPL	5
<i>Liparis liliifolia</i>	LARGE TWAYBLADE	x				P-Forb	FACU-	4
<i>Lithospermum canescens</i>	HOARY PUCCOON		x	x		P-Forb	UPL	5
<i>Lithospermum caroliniense - S</i>	HAIRY PUCCOON			x		P-Forb	UPL	5

SCIENTIFIC NAME	COMMON NAME	Woodland	Barrens	Savanna	Forest	Growth Form	Wetness	Wetness Coef.
<i>Lobelia spicata</i>	PALE SPIKED LOBELIA	x	x	x		P-Forb	FAC	0
<i>Lupinus perennis - S</i>	WILD LUPINE		x	x		P-Forb	UPL	5
<i>Manfreda virginica</i>	AMERICAN AGAVE		x			P-Forb	UPL	5
<i>Melica nitens</i>	THREE-FLOWERED MELIC GRASS	x	x			P-Forb	UPL	5
<i>Moehringia lateriflora</i>	BLUNT-LEAF SANDWORT	x		x		P-Forb	FACU	3
<i>Monarda bradburiana</i>	MONARDA	x	x			P-Forb	UPL	5
<i>Muhlenbergia sobolifera</i>	ROCK SATIN GRASS	x	x			P-Grass	UPL	5
<i>Orbexilum pedunculatum var. gracile</i>	SAMPSON'S SNAKEROOT	x	x			P-Forb	UPL	5
<i>Osmorhiza claytonii</i>	HAIRY SWEET CICELY				x	P-Forb	FACU-	4
<i>Oxalis violacea</i>	VIOLET WOOD SORREL	x	x			P-Forb	UPL	5
<i>Paronychia canadensis</i>	TALL FORKED CHICKWEED	x	x			A-Forb	UPL	5
<i>Paronychia fastigiata</i>	LOW FORKED CHICKWEED	x	x			A-Forb	UPL	5
<i>Parthenium integrifolium</i>	WILD QUININE	x	x	x		P-Forb	UPL	5
<i>Pedicularis canadensis</i>	WOOD BETANY	x				P-Forb	FACU+	2
<i>Penstemon pallidus</i>	PALE BEARDTONGUE	x				P-Forb	UPL	5
<i>Perideridia americana</i>	THICKET PARSLEY	x		x		P-Forb	UPL	5
<i>Phegopteris hexagonoptera</i>	BROAD BEECH FERN				x	Fern	FAC-	1
<i>Phlox divaricata</i>	BLUE PHLOX				x	P-Forb	FACU	3
<i>Phlox pilosa</i>	SANGAMON PHLOX		x			P-Forb	FAC-	1
<i>Poa wolfii</i>	MEADOW BLUE GRASS	x	x			P-Grass	UPL	5
<i>Polemonium reptans</i>	JACOB'S LADDER				x	P-Forb	FAC	0
<i>Polymnia canadensis</i>	PALE LEAFCUP				x	P-Forb	UPL	5
<i>Polystichum acrostichoides</i>	CHRISTMAS FERN				x	Fern	UPL	5
<i>Porteranthus stipulaceus</i>	INDIAN PHYSIC	x	x			P-Forb	UPL	5
<i>Potentilla simplex</i>	COMMON CINQUEFOIL	x	x	x		P-Forb	FACU-	4
<i>Pycnanthemum pilosum</i>	HAIRY MOUNTAIN MINT	x	x			P-Forb	UPL	5
<i>Quercus alba</i>	WHITE OAK	x	x	x		Tree	FACU	3
<i>Quercus macrocarpa</i>	BURR OAK	x		x		Tree	FAC-	1

SCIENTIFIC NAME	COMMON NAME	Woodland	Barrens	Savanna	Forest	Growth Form	Wetness	Wetness Coef.
<i>Quercus marilandica</i>	BLACKJACK OAK	x	x	x		Tree	UPL	5
<i>Quercus rubra</i>	NORTHERN RED OAK				x	Tree	FACU	3
<i>Quercus stellata</i>	POST OAK	x	x	x		Tree	FACU-	4
<i>Quercus velutina</i>	BLACK OAK	x	x	x		Tree	UPL	5
<i>Rhus aromatica</i>	AROMATIC SUMAC	x	x			Shrub	UPL	5
<i>Sanguinaria canadensis</i>	BLOODROOT				x	P-Forb	FACU-	4
<i>Sanicula canadensis</i>	CANADIAN BLACK SNAKEROOT				x	B-Forb	FACU+	2
<i>Sanicula gregaria</i>	CLUSTERED BLACK SNAKEROOT				x	P-Forb	FAC+	-1
<i>Schizachyrium scoparium</i>	LITTLE BLUESTEM		x	x		P-Grass	FACU-	4
<i>Silene stellata</i>	STARRY CAMPION	x		x		P-Forb	UPL	5
<i>Smilacina racemosa</i>	FEATHERY FALSE SOLOMON SEAL				x	P-Forb	FACU	3
<i>Smilax bona-nox</i>	CATBRIER		x			W-Vine	FACU+	2
<i>Smilax glauca</i>	GLAUCOUS CATBRIER		x			W-Vine	FACU	3
<i>Solidago flexicaulis</i>	BROAD-LEAVED GOLDENROD				x	P-Forb	FACU	3
<i>Solidago nemoralis</i>	FIELD GOLDENROD	x				P-Forb	UPL	5
<i>Solidago speciosa</i>	SHOWY GOLDENROD	x				P-Forb	UPL	5
<i>Solidago ulmifolia</i>	ELM-LEAVED GOLDENROD	x				P-Forb	UPL	5
<i>Sorghastrum nutans</i>	INDIAN GRASS		x	x		P-Grass	FACU+	2
<i>Taenidia integerrima</i>	YELLOW PIMPERNEL	x	x			P-Forb	UPL	5
<i>Talinum rugospermum</i>	FAME FLOWER		x	x		P-Forb	UPL	5
<i>Tephrosia virginiana- S</i>	GOAT'S RUE		x	x		P-Forb	UPL	5
<i>Thalictrum dioicum</i>	EARLY MEADOW RUE				x	P-Forb	FACU+	2
<i>Thaspium barbinode</i>	HAIRY MEADOW PARSNIP	x		x		P-Forb	UPL	5
<i>Thaspium trifoliatum</i>	PURPLE MEADOW PARSNIP				x	P-Forb	UPL	5
<i>Tilia americana</i>	AMERICAN LINDEN				x	Tree	FACU	3
<i>Tradescantia virginiana</i>	VIRGINIA SPIDERWORT	x	x	x		P-Forb	UPL	5

SCIENTIFIC NAME	COMMON NAME	Woodland	Barrens	Savanna	Forest	Growth Form	Wetness	Wetness Coef.
<i>Trifolium reflexum</i>	BUFFALO CLOVER	x	x			A-Forb	UPL	5
<i>Trillium flexipes</i>	DECLINED TRILLIUM				x	P-Forb	FAC-	1
<i>Trillium recurvatum</i>	RED TRILLIUM				x	P-Forb	FACU-	4
<i>Triosteum aurantiacum</i>	EARLY HORSE GENTIAN	x				P-Forb	UPL	5
<i>Triosteum perfoliatum</i>	LATE HORSE GENTIAN	x				P-Forb	UPL	5
<i>Uvularia grandiflora</i>	BELLWORT				x	P-Forb	UPL	5
<i>Verbesina helianthoides</i>	YELLOW CROWNBEARD	x	x			P-Forb	UPL	5
<i>Veronicastrum virginicum</i>	CULVER'S ROOT	x		x		P-Forb	FAC	0
<i>Viburnum prunifolium</i>	BLACK HAW	x				Shrub	FACU	3
<i>Viola pedata</i>	BIRD'S FOOT VIOLET	x	x			P-Forb	UPL	5
<i>Viola pubescens v. eriocarpa</i>	SMOOTH YELLOW VIOLET				x	P-Forb	FACW-	-2
<i>Woodsia obtusa</i>	COMMON WOODSIA	x	x			Fern	UPL	5



### A.3. Community Type by Natural Division and Section

This part of Appendix A summarizes results from the existing INAI and succeeding efforts from the standpoint of natural communities and Illinois' Natural Divisions and Sections. The Natural Divisions and Sections form the label for each column and the natural community types are identified on the horizontal lines. The intersection of each line and column provides our current assessment as to the occurrence of each natural community type in each Natural Division and Section.

Table 5 uses the following symbols:

**Green:** Yes, the natural community type does occur, or did occur, in the Natural Division and Section.

**Yellow:** The natural community may have occurred in the Section; or the natural community may still occur in the Section, but most likely is poorly developed or severely degraded.

**Black Crosshatch:** The natural community never occurred, or probably never occurred, in the Section.

Such determinations are difficult and require some level of subjective determination. Our knowledge about natural community types that no longer occur in Illinois is scant. Although judgements about possible occurrences of natural communities were made based on collective experiences of many experts, future work may no doubt result in changes in the annotations.











## **Appendix B: Category I Natural Community Grading and Stream Grading Protocols**

B.1. Natural Community Grading Protocol

B.2. Stream Grading Protocol

## **B.1. Natural Community Grading Protocol**

During the INAI Update project, the *Illinois Natural Areas Inventory Update: Grading Handbook* (White 2009)(Grading Handbook) was written to provide guidance on how to evaluate the natural quality of a natural community and assign appropriate grades. This handbook provides a wealth of information and should be referenced frequently. The following protocol, along with the INAI Grading Form Guidance that accompanies the INAI Grading Form (Appendix F), has been modified from the Grading Handbook to fit the current needs of the Natural Areas Program. This protocol is used on all communities in every Category, from high quality to degraded.

### **Grade Descriptions (White 1978, White 2009):**

#### **Grade A - Very high-quality terrestrial or aquatic natural community**

Grade A natural communities exhibit a native species composition, vegetation structure, and ecological function with no or very minimal signs of degradation. Sites experiencing minimal degradation will show near complete recovery - the compositional, structural, and functional integrity are intact. Generally, Grade A communities need minimal or no restoration, though they may require management to maintain their present conditions (e.g., periodic fire, removal of exotic invasive species).

Examples of Grade A natural communities: old-growth, ungrazed Forest; Prairie with undisturbed soil and native plant species composition; Wetlands with unpolluted waters, unaltered hydrology, and native vegetation; Streams with coarse substrates, high spatial heterogeneity of physical features, and an intact biotic community.

#### **Grade B – High-quality terrestrial or aquatic natural community**

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

Examples of Grade B Natural Communities: old-growth Forest selectively logged five 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; Streams with minimal deposition of sediments from anthropogenic activities sedimentation, limited eutrophication, and communities that are diverse, yet may lack species intolerant of degradation.

#### **Grade C – Medium-quality terrestrial or aquatic natural community**

Grade C communities either (1) have experienced moderate to heavy degradation and may or may not be in the process of recovering its species composition, vegetation structure, and ecological function, but possesses restoration potential appropriate for complete and functional communities of that type, or (2) have experienced severe degradation and has recovered the structure and function of the community. Degradation of a Grade C community can be so great that its species composition, vegetation structure, and ecological function have been significantly altered, but it possesses restoration potential for improvement or maintenance at this grade. Grade C communities may be restored to Grade B communities with intensive, specifically prescribed management and/or a significant interval of time. Grade C communities can be maintained in their 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 have changed the structure and composition of the vegetation; Streams with altered hydrology, sedimentation from anthropogenic activities, recovering from channelization, and containing communities with few species intolerant of degradation.

#### **Grade D – Low-quality natural community**

Grade D communities (1) have experienced severe degradation and have not recovered the species composition and vegetation structure of a natural community of that type, or (2) have experienced very severe degradation, but have just begun to recover the vegetation structure appropriate for such a community. Grade D communities have been so severely degraded that, while a community type can be assigned, its vegetation structure and ecological 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. Grade D natural communities typically can only be rehabilitated through replacing and supplementing



species composition and vegetation structure, through significant management efforts, or through intensive physical and chemical enhancement.

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; channelized Streams with little or no intact riparian zones and exhibiting limited species diversity and containing communities with no species intolerant of degradation.

### **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 ecological function has been removed and there are few or no plants or animal species of an ecologically functioning 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 are in the Cultural natural community class (Appendix A.2.): newly cleared land, cropland, improved pasture, residential / commercial development, parking lot, road or railroad embankments, rights of way, concrete waterways.

#### **When to Grade:**

- Once a site has been determined to have a potential qualifying feature, a boundary for the possible INAI should be determined.
- Within the site boundary, natural communities are then identified, and their boundaries determined. These natural communities and boundaries could change during the grading process.
- If not a Category I site, the community grades can simply be shown on a natural community map. No grading form is required.
  - It may be too difficult to map and grade some large Category II or VI sites. In these cases, mapping without grades, to the community class or subclass level is acceptable.
- For Category I sites, an INAI Grading Form (Appendix F) and Qualitative Vegetation Sampling (i.e., plant list) is required for all potential qualifying features. Quantitative Vegetation Sampling is required for only for the highest quality natural community type within each community class. Qualitative and Quantitative Vegetation Sampling guidance can be found in Appendix C.1.

#### **How to Grade:**

For the experienced, grading is done constantly while doing any activity in a natural community, even if only in the back of their mind. Formal grading is done by evaluating *Quality Indicators* and rating the four grading Components and their Sub-components. After the Components have been rated, a grade is assigned to the natural community. All of this is recorded on the INAI Grading Form (Appendix F).

## 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. In other words, a Quality Indicator is an *expression* of the Natural Quality of a community. Examples of Quality Indicators are small gaps in the tree canopy or an abundance of broadleaf forbs. More examples of Quality Indicators can be found in the Grading Handbook (White 2009; Table 7).

Disturbance Factors are what causes the Quality Indicator. These could be actions such as timber harvest, wildfire, farming practices, or a wind event. In the Grading Handbook, Disturbance Factors correspond to the Quality Indicators in Table 7. This table should be studied for a better understanding on how Quality Indicators and Disturbance Factors influence the quality of a Natural Community. However, the Natural Areas Program does not require the documentation of the Disturbance Factors in the same manner as the INAI Update Project. Instead, surveys will evaluate the Quality Indicators observed.

While evaluating the Quality Indicators, surveyors are asked to consider **Effect** (whether the Indicator has a positive, negative or neutral effect on the natural community's quality), **Extent** (the proportion of the natural community that is affected by the Indicator), **Level** (the degree to which the Indicator is affecting the quality of the natural community), and the **Trend** (whether the *Extent* or *Level* of the Quality Indicator is neutral, increasing or decreasing.)

## Grading Components:

Four Grading Components and their Sub-components are rated after the Quality Indicators are evaluated. The four Components are not rated until after all of their Sub-components are rated.

**Species Composition-** 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*.

### Sub-components:

- **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 natural community, 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.
- **Increasers:** Native or non-native plant species that tend to increase in number or vigor when their habitat is lightly to moderately disturbed.
- **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.

**Vegetation Structure-** *Structure* has three aspects:

- the vertical arrangement and character of vegetation layers (including the size and density of trees),
- the horizontal distribution of individual species or groups of species in a community (e.g., zones related to environmental gradients, or natural community that develop in response to disturbance history and succession, or apparently random or pattern-less distribution), and
- a species' growth form (graminoid, forb, shrub, tree) and the appearance of individual plants (vigor, disfigurement from herbivory, pathogens, and environmental stressors).

### Sub-components:

- **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 natural community.

- **Horizontal pattern:** The horizontal distribution of individual species or groups of species in a natural 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.

**Ecological Process-** Ecological *process* consists of the biological and physical actions that shape and control an ecosystem and cause it to function.

Sub-components:

- **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.

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

Sub-components:

- **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 (e.g., a trail).

**Rating the Condition of Grading Components and Sub-components**

When evaluating a Natural Community, the overall condition of each of the four Grading Components and their 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:

<b>Low</b> Lower quarter	<b>Medium</b> Middle half	<b>High</b> 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 a theoretically 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.

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 (Potentially Grade B Community)

VH = Very High (Potentially Grade A Community)

The Grading Handbook (White 2009, Table 4) shows examples of different ratings for each Component.

## Assigning Grades

Evaluating and assigning a grade to a natural community is not based off a scoring system. Experience and comparative knowledge of similar communities is required to assign a grade. Following the Grading Rules below can assist with assigning a Natural Quality Grade (A, B, C, D, or E) for each natural community type. However, professional judgment, not rules, ultimately is the deciding factor in assigning the grade. Do not use plus or minus signs (e.g., B+ or C-); the grading system is not so precise. The Grading Models found in the Grading Handbook (White 2009; page 23 and 95) can also be useful when assigning a grade.

### **Grading Rules**

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

- **Composition** is the primary component for determining a grade:
  - If Composition is Low, the grade is D.
  - If Composition is Medium, the grade is 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.
- **Structure** is the primary consideration for separating Grade A and Grade B, after the Composition has been considered:
  - If Composition and Structure are both High, the grade may be either A or B.
  - If Composition is High but the Structure is Medium or Low, the grade is B.
- If Composition or Structure is rated High, and Processes or Environment is rated Low:
  - Reexamine the analysis and rating of Composition or Structure to determine whether that component should be rated Medium instead of High.
  - If the rating of Composition or Structure remains High, consider whether the grade should be lowered from Grade A or B to Grade C.
- 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 Natural Areas Program. The current rules may prove to be oversimplified or otherwise inadequate.

## B.2. Stream Grading Protocol

### Conceptual Framework

INAI community grading attempts to qualitatively assess degree of biological intactness. In terrestrial and some aquatic systems, the composition of plant communities is used as a surrogate for disturbance. High-quality terrestrial communities are those with highly intact plant communities and are identified as grade A or B within the INAI grading framework. A similar grading framework is used to assess Stream natural community integrity in the Illinois Biological Stream Rating System (Bol et al. 2007). The Rating System describes integrity as the wholeness or intactness of a Stream community and evaluates a community's composition relative to expectations based on least-disturbed communities. This relative intactness is rated on an A-E qualitative scale. The integrity rating shall be used to identify the INAI grade for a Stream natural community.

Integrity ratings have been assigned to 1,019 valley segments (i.e., groups of connected Stream segments with similar characteristics), or approximately 3% of all valley segments in Illinois. Approximately 9% of assessed valley segments received an A grade and 31% received a B grade, and these A and B-graded Stream segments qualify as Category I high-quality natural communities. Graded Stream segments can be viewed at: <https://dnr.illinois.gov/conservation/biologicalstreamratings.html>.

Novel grading may occur at valley segments meeting data requirements, and regrading may occur as contemporary data become available. Valley segments shall be graded in accordance with Bol et al. (2007), with a few minor modifications to improve synchrony with other sections of the INAI Standards and Guidelines. Grading requires community samples from at least one, but preferably multiple, eligible taxa: fish, mussels, and benthic macroinvertebrates. The Ephemeral Stream community type cannot be graded using these methods.

The general approach to calculating an integrity grade for a valley segment is (assuming all three eligible taxa have been appropriately sampled):

1. Calculate fish Index of Biotic Integrity (fIBI) and benthic macroinvertebrate Index of Biotic Integrity (mIBI) scores, if applicable. Calculate mussel integrity score. Samples occurring within the past 10 years are preferred.
2. Convert fIBI, mIBI, and mussel integrity scores into proportional scores, if applicable. Only the highest score within a valley segment for each taxon is used for step 3.
3. Calculate the valley segment integrity score using the following formula:  
$$\text{Integrity Score} = \text{average (proportional fIBI score} + \text{proportional mIBI score} + \text{proportional mussel integrity score)}$$
4. Identify the valley segment grade using the score from step 3.

Methods for calculating taxa scores and grading communities are summarized below, but greater detail is found in Bol et al. (2007). Information needed to calculate taxa scores (e.g., major watershed, link number) can be accessed via an online data viewer found here: <https://idnr.maps.arcgis.com/apps/instant/sidebar/index.html?appid=fbc0d4a834ed487aba8b7037d19b8bdc>.

### Fish

Fish must be sampled using Illinois Environmental Protection Agency basin survey protocols. The fIBI classifies fish communities into 5 categories (Smogor 2000). These categories are converted into proportional scores according to the table below:

Numerical fIBI score	Qualitative Category	Proportional Score for Integrity Grading
0-15	Very low	0.2
16-30	Low	0.4
31-45	Moderately low	0.6
46-55	Moderate	0.8
56-60	Moderately high	1.0

**Benthic Macroinvertebrates**

Benthic macroinvertebrates must be sampled using Illinois Environmental Protection Agency basin survey protocols. The mIBI classifies benthic macroinvertebrate communities into 4 categories (Tetra Tech, Inc. 2007). These categories are converted into proportional scores according to the table below:

Numerical mIBI score	Qualitative Category	Proportional Score for Integrity Grading
0-26.3	Poor	0.25
26.4-52.6	Fair	0.50
52.7-72.9	Good	0.75
73.0-100	Exceptional	1.0

**Mussels**

Mussel samples must be collected using wading techniques (i.e., without an underwater diving apparatus) and using 4 person-hour qualitative procedures. Mussel community integrity may be calculated using one of two methods. The preferred method is:

Multiple Sample Mussel Integrity Score = sample live species richness / valley segment live species richness

Major Watershed and Stream Size	Multiple Mussel Sample Integrity Score			
Illinois River				
Link 1	0.01-0.22	0.23-0.50	0.51-0.79	0.80+
Link 2-3	0.01-0.20	0.21-0.62	0.63-0.79	0.80+
Link 4+	0.01-0.21	0.12-0.44	0.45-0.69	0.70+
Mississippi River				
Link 1-3	0.01-0.20	0.21-0.57	0.58-0.79	0.80+
Link 4+	0.01-0.16	0.17-0.45	0.46-0.63	0.64+
Ohio River				
Link 1	0.01-0.15	0.16-0.27	0.28-0.59	0.60+
Link 2+	0.01-0.14	0.15-0.31	0.32-0.53	0.54+
Wabash River				
Link 1	0.01-0.17	0.18-0.50	0.51-0.71	0.72+
Link 2-3	0.01-0.14	0.15-0.41	0.42-0.71	0.72+

Link 4+	0.01-0.13	0.14-0.40	0.41-0.62	0.63+
<b>Final Proportional Score for Grading:</b>	<b>0.25</b>	<b>0.50</b>	<b>0.75</b>	<b>1.0</b>

This method requires multiple samples within a valley segment. Only the sample with the highest species richness is used as this represents the biological potential for the valley segment. This integrity score is converted to a proportional score for grading using the table below:

Where only one sample is available for a valley segment the integrity score is calculated as:

$$\text{Single Sample Mussel Integrity Score} = \frac{\text{sample live species richness}}{\text{sample live species richness} + \text{dead and relict shell species richness}}$$

This integrity score is converted to a proportional score for grading using the table below:

Major Watershed and Stream Size	Single Mussel Sample Integrity Score			
Illinois River				
Link 1	0.01-0.27	0.28-0.65	0.66-0.83	0.84+
Link 2-3	0.01-0.26	0.27-0.71	0.72-0.90	0.91+
Link 4+	0.01-0.21	0.22-0.50	0.51-0.83	0.84+
Mississippi River				
Link 1	0.01-0.19	0.20-0.50	0.51-0.83	0.84+
Link 2-3	0.01-0.35	0.36-0.71	0.72-0.88	0.89+
Link 4+	0.01-0.32	0.33-0.64	0.65-0.77	0.78+
Ohio River				
Link 1	0.01-0.20	0.21-0.42	0.43-0.54	0.55+
Link 2+	0.01-0.12	0.13-0.44	0.45-0.76	0.77+
Wabash River				
Link 1	0.01-0.33	0.34-0.60	0.61-0.79	0.80+
Link 2-3	0.01-0.20	0.21-0.50	0.51-0.83	0.84+
Link 4+	0.01-0.24	0.25-0.55	0.56-0.88	0.89+
<b>Final Proportional Score for Grading:</b>	<b>0.25</b>	<b>0.50</b>	<b>0.75</b>	<b>1.0</b>

Final Grade

The integrity score for a valley segment is:

$$\text{Integrity Score} = \text{average (proportional fIBI score + proportional mIBI score + proportional mussel integrity score)}$$

Adjust the integrity score formula to include only those taxa which have been surveyed within the focal valley segment. For example, if only fish and benthic macroinvertebrates have been surveyed, the integrity score formula would be:

Integrity Score = average (proportional fIBI score + proportional mIBI score)

This score is then converted to a letter grade using the table below:

Valley Segment Integrity Score	Grade
0.90-1.0	A
0.70-0.89	B
0.50-0.69	C
0.30-0.49	D
<0.30	E

If multiple locales are sampled for a taxon within a valley segment only the greatest of locale proportional scores shall be used in the integrity score calculation. By using the greatest proportional score for each taxon the final valley segment integrity score represents the biological potential of the valley segment.



## **Appendix C: Vegetation and Cave Sampling Protocols**

C.1. Vegetation Sampling Protocol

C.2. Cave Sampling Protocol

## C.1. Vegetation Sampling Protocol

Qualitative and quantitative vegetation sampling data collected during site evaluations assist in determining natural community type and grade but are not required for grading. Qualitative vegetation sampling is **required when grading a potential significant feature**. Quantitative vegetation sampling data is **only required for the highest quality natural community type within each community class for Category I terrestrial sites**. Standardized sampling protocols provide for direct comparison between like community types and permit resampling at some future time to assess changes or management effects.

Vegetation sampling is **not** part of the INAI's triennial surveillance activities. Sampling is required only when a new site is being evaluated. If an existing site has experienced enough change to potentially affect the grade of an INAI natural community then vegetation sampling may assist in determining the new grade. Vegetation Sampling Forms can be found in Appendix F.

### Qualitative Vegetation Sampling:

Qualitative sampling (i.e. plant list) initially occurs when a natural community type is graded. Since species may not be present at the time of sampling, this list should continually be added to when new species are found. While sampling is only required for the highest quality natural community type within each community class, ideally a plant list would be maintained for each community type at a site. These lists will provide a measure of species diversity, occurrence of rare or indicator species, species dominance and composition, and weedy species prevalence as well as indicators of degradation. Examples of Woodland, Barrens, Savanna, and Forest characteristic species can be found in Table 4

- Required qualitative data for each natural community type is provided in Table 6
- Species Lists with an abundance estimate for each woody and herbaceous plant taxa encountered in a community type will be recorded by a meander survey.
- Abundance estimate for each species is based on a nominal scale of rare, occasional, common, very common, or abundant (White 2009).

**1. Rare** - A plant is rated as *rare* if it is known to have very few (say, up to three or 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."

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

**L. Locally**-- 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*.

Qualitative Plant List should be entered in to the Universal FQA Calculator <https://universalfqa.org/> using the "Flora of the Chicago Region, 2017" database for Boone, Cook, DeKalb, DuPage, Grundy, Kane, Kankakee, Kendall, Lake, McHenry, and Will Counties. For the rest of the State use the "Illinois (IL), 2020" database found on the Universal FQA Calculator webpage.

## Quantitative Vegetation Sampling:

### Methods

Transect lines and sampling plots will be used to sample woody overstory, woody understory, and groundlayer vegetation. The use of transect lines and sampling plots is easily reproducible and is highly applicable to vegetation with a wide range of morphological features (Curtis 1959). Sample sizes of between 20 and 30 plots are recommended for most natural vegetation types because this usually represents the threshold beyond which statistical precision is not significantly increased (Elzinga et al. 1988).

For woody overstory and understory, 20 sample plots will be required; for groundlayer vegetation, 30 sample plots will be required. Data collected with these methods will also help to monitor site condition and will be sensitive to any physical changes that occur in communities.

Time of sampling should be planned to optimally represent the extant vegetation. This will vary with natural community type, latitude, and seasonal phenology.

- Quantitative sampling is required:
  - only in community types that are potential qualifying features
  - only if the feature is supporting a new community class for the site.
  - only one transect per natural community type.
  - when more than one potentially eligible natural community type (from different community classes) occurs at a site, each must be sampled separately.
- Quantitative Sampling will:
  - be performed in most community types (see Table 6 for required lists and exceptions).
  - produce a representative sample of vegetation within the natural community.
  - assist in determining community type and quality grade (not required for grading).
  - provide permanent sampling locations for subsequent site monitoring.
  - produce estimates of species presence, frequency, density, and cover.

### Transect and Plot Layout

- The transect should be located across a homogeneous area of the natural community type to be sampled and as far from community boundaries as possible to eliminate edge effect.
- Transects should not cross from one qualifying community type to another.
- Community Complexes may be sampled as one community type.
- A single digit (0-9) random numbers table (or equivalent) will be used to determine the distance to the sample plot, in meters, perpendicular to the transect line. The first plot will be located to the right of the transect line, the second one to the left, continuing to alternate until all plots are located. The distance to each plot will be recorded.
- The distance from the transect line to each plot will be recorded.

### Groundlayer

- Groundlayer sampling will occur along line transects.
- 30 sampling plots.
- Plots will be 0.25m<sup>2</sup> quadrats.
- Plots are spaced every 5m along the transect line (Figure 4).
- For small or irregularly shaped areas, a single transect may not accommodate 30 plots. In these instances:
  - The transect may be split into two or more lengths to fit the natural community dimensions.
  - Distance between plots can be reduced from 5m to no less than 0.5m apart. (using the widest possible spacing to fit the 30 plots).
  - Full species inventory of natural community should be done if transects don't fit after reducing spacing.
- Once the transect is established, beginning and end points should be permanently marked with metal pins and GPS coordinates (latitude/longitude) recorded.
- Only plants rooted within the frame of the quadrat are recorded.
- All woody plants less than 40cm tall are included in the groundcover sampling.
- Sampling quadrats must not overlap.

Standard vegetation descriptors which can be calculated from these data and can assist in determining site eligibility include frequency, relative frequency, and species importance values (see definitions below).

A simple and accurate method of sampling groundlayer is species presence and cover class (Curtis 1959). Ground layers are dynamic and can be a simple or complex collection of plant species that vary seasonally. Temporal changes, especially in forest groundlayers, make sampling time sensitive. Sampling should be planned to maximize community diversity.

The percent “cover” of a species is determined using the Daubenmire (1959) cover classes as modified by Bailey and Poulton (1968) below. Litter, rock, bare ground, etc. can also be determined using the cover classes listed below.

Cover Classes	Midpoint
Class 1 = 0-1%	0.5
Class 2 = 2-5%	3.0
Class 3 = 6-25%	15.0
Class 4 = 26-50%	37.5
Class 5 = 51-75%	62.5
Class 6 = 76-95%	85.0
Class 7 = 96-100%	97.5

Percent cover of a species is determined by assigning the midpoint value for each class and summing the midpoint values for each species over all plots. Sum the midpoint values of all species over all plots and divide the total for all species into each total for individual species to get percent cover for each species. The total of these values for each species should add up to 100%.

### Woody Overstory and Understory

Woody plant sampling (over- and understory as necessary, see Table 6)

- Woody plant plots will occur along line transects with 20 sampling stations spaced every 20m along the transect line (Figure 5).
- For small or irregularly shaped areas, a single transect may not accommodate 20 stations. In these instances:
  - the transect may be split into two or more lengths to fit the natural community dimensions.
  - If 20 stations still cannot fit after splitting the transect,
    - A full species inventory of the overstory is to be performed.
    - For understory, spacing can be reduced from 20m down to 4m (using the widest possible spacing to fit the 20 plots).
- Once the transect is established, beginning and endpoints should be permanently marked with metal pins and GPS coordinates (latitude/longitude) recorded.

Standard vegetation descriptors which can be calculated from these data and can assist in determining site eligibility include frequency, relative frequency, density, relative density, basal area, relative dominance, and species importance values (see definitions below).

- Woody overstory vegetation
  - 20 plots sampled (plots should not overlap).
  - All individuals identified to species recorded.
  - Within an .025ha circular plot (r=8.92m).
  - DBH (diameter at breast height, approximately 1.37m) of 10cm or more.
  - DBH recorded to the nearest 0.1 cm.
  - Each stem will be recorded for individuals that split below DBH.
  - Stems that split above DBH are recorded as one.
  - Dead standing trees can be recorded but should be analyzed separately from live trees. It is recommended that they are recorded on a separate form.
  - For natural communities with very open canopies (e.g., some Savannas or Barrens), the plot size for sampling the overstory aspect may be increased to 0.04ha (r=11.28m). However, to keep individual plots from overlapping, the distance between plots must be increased from 20m to 25m. This modification must be noted on all data sheets. If entering into a form with formulas, formula adjustments will need to be made.
- Woody understory vegetation
  - 20 plots sampled are nested within overstory plots (unless a full species inventory is being done for overstory).
  - All individuals identified to species recorded.
  - Within a 0.001ha circular plot (r=1.78).
  - With a DBH (diameter at breast height, approximately 1.37m) less than 10cm.
  - Taller than 40cm in height.
  - Stems that split above ground are recorded as one.

- For stems that split below ground (e.g., root suckers), each stem is recorded.

### Equipment List for Transects

- Clipboard
- Pens or pencils
- Paper for notetaking
- Groundlayer, Understory and Overstory Sampling Forms (2 overstory forms, one for dead standing trees)
- INAI Grading Form
- Random numbers table
- GPS, phone, or other device for recording transect position
- Camera or phone for photo documentation
- 100 meter tape
- Survey Pins
- DBH tape (cm)
- Stakes for marking transects (minimum of 4, 18 inch sign post sections work well)
- Hammer
- Non-stretching poly rope or metal cable
  - 8.92 meters long
  - marked at 1.78 meters from each end
- Laminated “cheat card” with 1% and 5% cover estimates
- Electric fence post
  - marked at 40 cm from ends
  - 3 minimum, 1 metal with flange, 2 fiberglass
- Ziploc bags or portable herbarium press for plant specimens
- 0.25m<sup>2</sup> quadrat
  - 4 - ½” CPVC pipe 50cm sections
  - 4 - ½” CPVC elbows
  - PVC glue

### Definitions and Calculations

- Frequency
  - How often a species is likely to occur in a plot.
  - Number of plots where a species is present divided by total number of plots. Multiply by 100 to obtain a percentage
  - Example: Little bluestem occurs in 7 of 30 plots.  $7/30=0.23 \rightarrow 0.23 \times 100=23\%$ . Little bluestem is likely to occur in a plot 23% of the time.
- Relative Frequency
  - Frequency of one species as a percentage of total plant species.
  - Divide frequency of an individual species by the sum of the frequencies of all species. Multiply by 100 to obtain a percentage.
  - Example: Little bluestem frequency is 0.23. Sum of the frequencies of all species is 6.73. Then  $0.23/6.73 \times 100 = 3.42\%$  relative frequency for little bluestem.
- Density
  - Trees per hectare or Stems per hectare: the number of stems counted divided by the area sampled in hectares.
  - Example: Understory sampling plots are 0.001ha. 20 plots are sampled total.  $0.001 \times 20=0.02$ ha total is sampled. If 4 farkleberry stems are sampled in the 20 plots then:  $4/0.02=200$  stems of farkleberry per hectare.
- Relative Density
  - Density divided by sum of the densities of all species, multiplied by 100 to obtain a percentage.
  - Example: Farkleberry has a density of 200/ha. The sum of all species densities is 1150. Then  $200/1150 \times 100 = 17\%$  Relative Density for farkleberry.
- Diameter Breast Height (DBH)
  - Diameter of a tree at 1.37m above the ground.
  - Always take measurement from the uphill side.

- Basal Area (BA)
  - Area of the cross section of a tree at breast height (1.37m).
  - Diameter in  $\text{cm}^2 \times 0.00007854$ 
    - 0.00007854 is a constant that converts cm to meters
  - Example: A white oak has a DBH of 63.2 cm.  $63.2^2 \times 0.00007854 = 0.31^2\text{m BA}$
- Basal Area per hectare
  - Basal Area divided by the area sampled in hectares.
  - Example: overstory sampling plots are 0.025ha. 20 plots are sampled total.  $0.025 \times 20 = 0.5\text{ha}$  total is sampled. If 8 white oaks are sampled in the 20 plots with a total BA of  $1.9^2\text{m}$  then:  $1.9/.5 = 3.8^2\text{m BA/ha}$  for white oak.
- Dominance
  - Total basal area of a species (See Basal Area per hectare for Example)
- Relative Dominance
  - Dominance divided by sum of the dominance of all species, multiplied by 100 to obtain a percentage.
  - Example: BA of white oak is  $3.8^2\text{m/ha}$ . Total BA of all species is  $8.36^2\text{m/ha}$ . Then  $3.8/8.36 \times 100 = 45.45\%$  relative dominance of white oak.
- Cover
  - Proportion of the soil surface covered by an individual species, rock, litter, or bare soil. See groundlayer sampling under the “Quantitative Sampling” section for more info.
- Relative Cover
  - Cover of a particular species as a percentage of total plant cover.
  - Example: Leadplant has a % cover of 25. Sum of all plant cover is 961.  $(25/961) \times 100 = 2.6\%$  Relative Cover for Leadplant.
- Species Importance Value
  - How dominant a species is in a given area.
  - Groundlayer: Sum of Relative Cover and Relative Frequency divided by 2
  - Understory: Sum of Relative Frequency and Relative Density divided by 2
  - Overstory: Sum of Relative Frequency, Relative Density, and Relative Dominance divided by 3

Figure 4. Groundlayer sampling schematic (not to scale).

### Ground Layer Sampling Transect (not to scale)

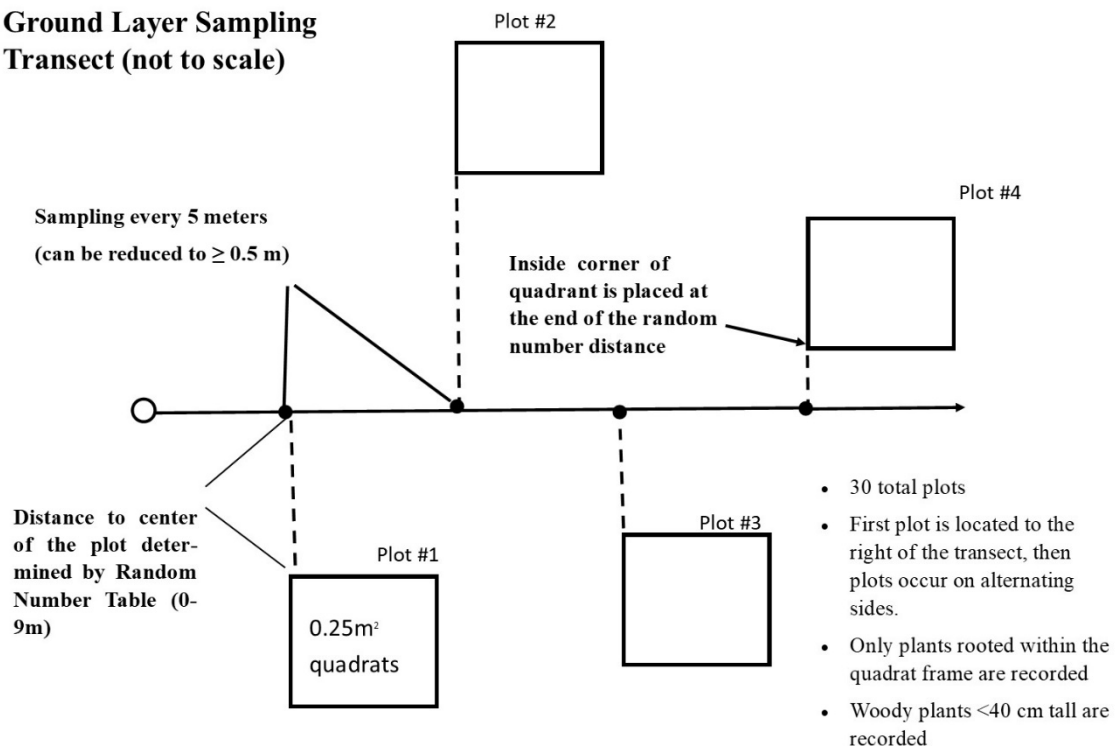


Figure 5. Overstory sampling procedure schematic (not to scale).

**Overstory/ Understory  
Sampling Transect (not  
to scale)**

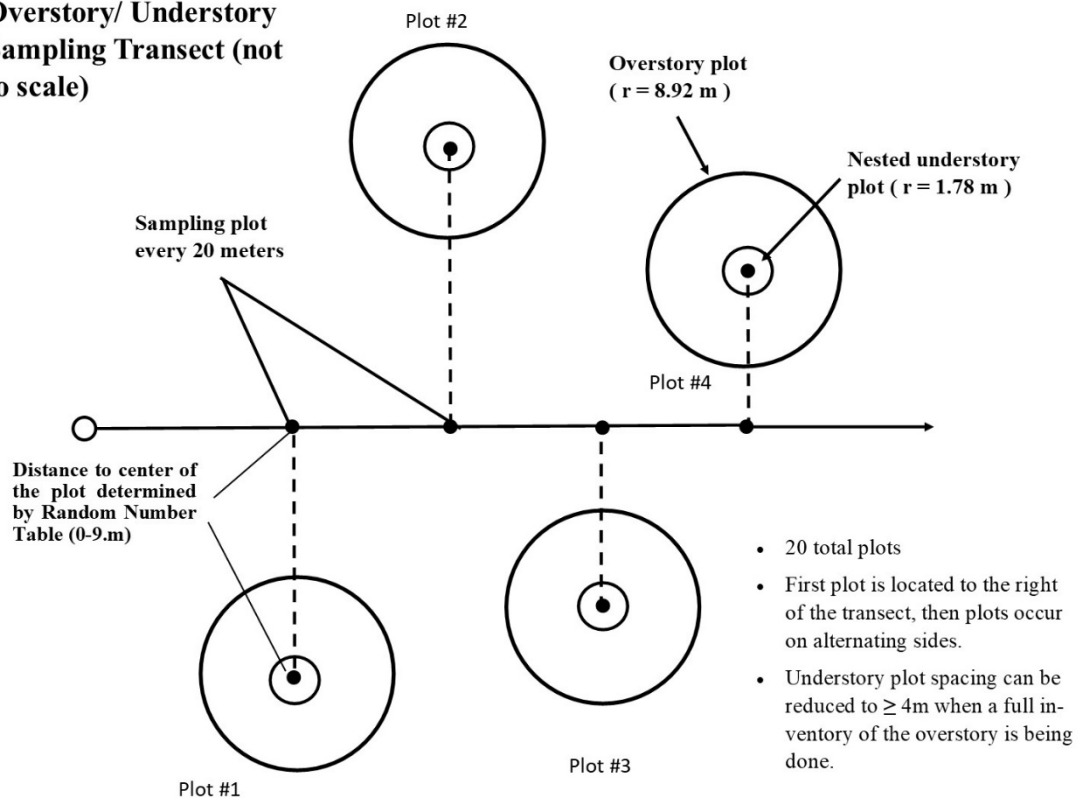




Table 6. Vegetation sampling required in potential INAI Category I sites

Natural Community	Qualitative		Quantitative		
	Woody Plant List	Herbaceous Plant List	Overstory Sampling	Understory Sampling	Groundlayer Sampling
<b>FOREST</b>					
All Forest Types	X	X	X	X	X
<b>SAVANNA &amp; WOODLAND</b>					
All Savanna & Woodland Types	X	X	X	X	X
<b>PRAIRIE</b>					
All Prairie Types	X	X			X
Shrub Prairie	X	X		X	X
<b>WETLAND</b>					
All Marsh Types	X	X			X
All Swamp Types	X	X	X	X	X
Sedge Meadow	X	X			X
Fens					
Forested Fen	X	X	X	X	X
Shrub Fen	X	X		X	X
Graminoid Fen	X	X			X
Bog					
Forested Bog	X	X	X	X	X
Tall/Low Shrub Bog	X	X		X	X
Graminoid Bog		X			X
All Seep Types	X	X	X	X	X
Panne		X			X
Springs		X			
<b>OPEN WATER</b>					
Pond		X			
Lake		X			
<b>STREAM</b>					
All Stream Types					
<b>BEDROCK</b>					
All Glade Types	X	X	X	X	X
All Cliff Types	X	X			
<b>SHORE</b>					
Beach		X			X
Foredune	X	X		X	X
<b>CAVE</b>					
All Cave Types					
<b>CULTURAL</b>					
All Cultural Types					

## **C.2. Cave Sampling**

**PLEASE NOTE: Cave Sampling Protocol remains under review with proposed revisions forthcoming. (2022)**

## **Appendix D: Plant and Animal Translocation Policies**

- D.1. Illinois Plant Translocation/Restoration Policy (IDNR, INPC, IESPB – 1992)
- D.2. Illinois Endangered Species Protection Board Policy on Translocation of Endangered and Threatened Animal Species (1989)
- D.3. Illinois Nature Preserves Commission Policy and Procedures for Translocation of Animal Species (2015)

## D.1. Illinois Plant Translocation/Restoration Policy

**PLEASE NOTE: This Translocation Policy will undergo review with proposed revisions forthcoming (2022). The guidance found below is the last known revision to the Plant Translocation Policy as approved by IDNR, INPC, and IESPB in 1992.**

### Summary

Translocation refers to the reintroduction of a plant species which is listed as threatened or endangered.

Restoration refers to the management of entire native plant communities.

Central Philosophy - the establishment of new populations of native plants in the wild:

- Should replicate as closely as possible the pre-settlement vegetation at that site
- Once established, should be able to survive & reproduce with minimum human intervention
- Should:
  - 1) be within the historic distributional range of a plant species
  - 2) be within the range of habitats in which a species is known to occur
  - 3) not exceed the pre-settlement abundance of a species
- Should not be introduced into high-quality INAI natural areas unless
  - 1) it is known to have occurred there before, or
  - 2) it is a listed (endangered or threatened) species and:
    - a) requires high-quality habitat and,
    - b) the only know examples of that habitat occur in INAI natural areas
- Should only be done with the permission of the landowner (this includes the source site as well as the recipient site)

### Guidelines

Translocations may be added to the INAI as Category II natural areas and restorations as Category I natural areas if they conform to the following guidelines:

#### Translocations

- Contributes to the overall recovery of the species
- Recipient site is the natural community in which the species is known to have occurred
- Long-term protection and site management capability is provided

#### Restorations

- Should use local ecotypes; seed and plants should be “clean” (disease-free, with no exotic plant materials)
- Source of plant materials used in the restoration should either be previously restored areas or degraded areas with little promise for restoration themselves.
- For very large restorations, separate seed propagation areas should be established, rather than continually returning to a wild population as a source of plant materials.
- Plant materials should not be taken from high-quality natural communities or INAI sites unless those plant materials are not available elsewhere.

- If materials must be taken from such high-quality sites:
  - 1) for perennials, no more than 50% of the seed should be taken in any one growing season
  - 2) for annuals, no more than 10% of the seed should be taken in any one growing season
  - 3) seed should not be taken from the same location for more than three consecutive growing seasons
  - 4) seed should not be taken during a drought year
  - 5) whole plants should never be taken

## **Illinois Plant Translocation and Restoration Policy**

Developed by the Illinois Nature Preserves Commission, Illinois Endangered Species Protection Board, and the Illinois Department of Conservation (now IDNR) – 1992

### **Establishing New Populations of Native Plants**

The “Central Philosophy” guiding establishment of new populations of native plants in the wild is that such plantings should replicate as nearly as possible the pre-settlement vegetation of the site at which new populations are established. Once established, the population should be able to survive and reproduce over the long-term with a minimum of human intervention. Such plantings should not expand the historic ranges of distribution, the range of habitats in which a plant species is known to have occurred, nor exceed the pre-settlement abundance of a species in a community or in the state. Plants should not be introduced into high-quality natural communities within designated Illinois Natural Areas Inventory (INAI) natural areas unless they are known to have previously occurred in that natural area, or the species is a state or federally- listed endangered or threatened (listed) species and is known to require high-quality habitats and the only known examples of the species’ habitat occur in INAI natural areas. In some cases, it may be necessary to weigh the good of the listed species against maintenance of the integrity of the composition of the high-quality natural community. Plants should only be introduced to disturbed communities within designated INAI natural areas and Illinois Nature Preserves as part of restorations which comply with the restoration guidelines outlined hereafter, and with permission of the landowners. Locations of INAI natural areas and high-quality natural communities occurring within them are tracked by the Illinois Natural Heritage Database, housed in the Division of Natural Heritage, Illinois Department of Natural Resources (IDNR).

### **Statutes and Regulations Pertaining to Plants**

Plants and animals are treated quite differently under common law. Animals are considered to be property falling within the public domain, i.e., an individual landowner does not own the wildlife occurring on his/her property; wildlife is public property which is held and managed as such under the public trust by state and federal authorities. Plants, however, are considered private property of the landowner on whose land they occur. If a landowner wishes to protect a plant under their ownership from taking or harm, they have at their disposal the same legal means they have to protect their other private property. It is, therefore, a legal necessity that any plant materials removed from a site only be removed with the permission of the landowner.

The current treatment of plants under common law makes protection of endangered or threatened plants more difficult than the protection of animals listed by states or the federal government as endangered or threatened. For example, if a landowner shoots a federally-listed endangered Bald Eagle or other state-listed species on his or her property, it is a legal offense, but he or she may plow under a federally or state-listed endangered or threatened plant without legal repercussions. As a means of providing a modicum of additional protection for listed plants, the Illinois Endangered Species Protection Act requires “expressed written permission” from the landowner for removal of a state or federally-listed plant. To do so without that permission is a “Class A” misdemeanor (up to a \$1000 fine and/or six months to a year in prison). The Illinois Endangered Species Protection Act may also require issuance of an Endangered Species Permit by the IDNR, Division of Natural Heritage for the possession of a federally-listed endangered plant, and prohibits the sale of state-listed endangered plants, or any part thereof.

Removal of plant materials from or translocation of plant materials to most public properties requires issuance of special permits. Examples of such public properties include, but are not limited to, state parks, conservation areas, wildlife management areas, state natural areas, state nature preserves, county forest preserves, county conservation district properties, and county or village park district properties. Therefore, if any species is removed from public land without permission, the perpetrator may be subject to additional penalties.

One of the most important provisions of the Illinois Endangered Species Protection Act is the consultation provision. This provision requires state and municipal agencies taking actions that might affect state or federally-listed species (including plants) to

consult with the DNR to avoid, minimize, or mitigate impacts to the listed species. The uncontrolled proliferation of translocated state or federally-listed plants, especially upon private properties, could jeopardize the credibility of this program with private interests and the public.

### **Providing Protection for Community Restorations and Translocated or Planted Endangered and Threatened Species Populations - Category II Natural Areas**

All listed plants and their propagules represent valuable genetic material; however, to be most useful in future restoration efforts, it is imperative that the source of translocated material be recorded. It is therefore the policy of the Illinois Natural Heritage Database to accept records of any occurrence of listed species, even those translocated to gardens, arboreta, or nonnative communities. The "Element Occurrence Report Form" may be used to submit any record of a listed species to this database. Translocations or plantings of listed species which conform to the central philosophy articulated above and are consistent with approved state or federal recovery plans, represent an important natural heritage resource worthy of preservation and protection. Likewise, restorations that reproduce as nearly as possible the ecological conditions present in pre-settlement natural communities, represent not only a significant natural heritage resource but also a significant investment of human, financial, and natural resources, and as such should receive greater consideration than disturbed landscapes.

In order to provide an added degree of protection for such resources, restorations and translocations of listed plants which conform to the guidelines articulated hereafter, as determined by the Natural Areas Evaluation Committee (NAEC), may be added to the Illinois Natural Areas Inventory - restorations as Category I and translocations as Category II sites. As INAI natural areas, such sites will receive the added protections provided by Executive Order #7, which requires that state agencies undertaking capital projects consult with the IDNR on projects that could impact natural areas. They also may be eligible for other considerations and protection programs available to INAI natural areas. The NAEC is comprised of representatives of the IDNR, the Illinois Nature Preserves Commission (INPC), and the Illinois Endangered Species Protection Board (ESPB); it meets quarterly to update the INAI. The INAI nomination form may be used to nominate restorations and translocations for INAI status. These forms should be completed and submitted to the Natural Areas Program Manager of the IDNR, Division of Natural Heritage, who will present them to the Natural Areas Evaluation Committee (NAEC). The guidelines which follow are designed to encourage conformity with generally accepted scientific standards and to provide guidance, encouragement, and assistance to those interested in participating in the recovery of listed plants or the restoration of pre-settlement natural communities.

This program has been designed to conform with and complement existing statutory and regulatory protections provided plant species and maintain the integrity and credibility of existing protection programs. While this program has been designed to provide incentives for compliance with the following guidelines, due to the treatment of plants as private property, we must largely rely upon the good will and good intentions of conservation biologists, restorationists, plant ecologists, and botanists for voluntary compliance with these guidelines. Further, no matter how important vanishing plant species may be to the general public welfare, we must ultimately rely on public and private landowners to ensure their continued survival.

### **Guidelines for the Translocation and Establishment of Populations of state or Federally- Listed Plants**

Native plants which are listed by state or federal agencies as endangered or threatened, or their propagules, should only be translocated when such a project contributes to the overall recovery of the species. Not all proposed translocations of listed plants that conform to the "Central Philosophy" articulated above will contribute to the recovery of a species. Where a comprehensive recovery strategy or plan has been developed for a species, conformity with that strategy or plan should be established.

As previously mentioned, listed species may only be removed from a property with the expressed written permission of the landowner. Beyond these requirements, most other legal obligations relating to the establishment of new populations of listed species are a function of the requirements of the landowner upon whose property the new populations are to be established. For example, the IDNR or the INPC would have to approve the translocation of any plant species (including listed species) to state parks or state nature preserves, respectively.

Due to the amount of time, energy and money involved in the reintroduction and establishment of populations of threatened and endangered species, one must evaluate the habitat suitability, long-term viability, and security of the site to which listed species are proposed to be translocated. The habitat chosen should be the natural community in which the species is known to have occurred. Long-term protection of the site and management capability at the site must be assured to maximize the potential success of the translocation. Most often these sites will occur on public land where a translocation and management agreement can be reached with the landowner. In some instances, translocations to private lands can and will occur; however, such translocations should not be undertaken at public expense unless the site will receive long-term protection (e.g., through conservation easements, nature preserve dedication, etc.).

### **Emergency Translocation of Listed Plants**

State or federally-listed plants that are in imminent danger of destruction may be salvaged with the written permission of the landowner; however, emergency circumstances alone are not considered justification for translocation of listed species to inappropriate habitats in the wild or to public properties without appropriate permissions. We recommend that salvaged species be placed in cultivation until appropriate arrangements for their translocation to the wild can be made.

### **Guidelines for the Establishment of Restorations**

It is recommended that restorations, whether they be restorations of degraded natural community remnants or natural community reconstructions (wherein one must “start from scratch,” planting, for example, on land previously under cultivation) be accomplished to the greatest degree possible with the use of local ecotypes. Plant materials for restorations should be taken from previously restored areas or degraded natural communities which do not themselves hold great promise for restoration. For very large restorations or reconstructions it may be necessary to develop “seed gardens.” In order to ensure enough seed to complete the restoration, seed from nearby degraded natural community remnants can be placed in cultivation, thereby generating greater amounts of seed than might be collected directly from such remnants. Seed obtained must be clean, disease-free, and not containing seed or stem segments of exotic species. Plant materials to be used in restorations, whether the species are listed or not, should not be taken from high-quality natural communities or INAI natural areas, unless those plant materials are unavailable elsewhere. In that case, no more than 50% of the seed of perennial species should be taken in any one growing season and no more than 10% of the seed from annual species should be harvested in any one growing season for the use in the restoration. Seed should not be taken from the same location for more than three consecutive growing seasons, or during drought years. Under no circumstances should whole plants be removed from high-quality natural communities for use in a restoration.

Restoration goals, including target communities, species presence, abundance, and dispersion, should be based on extant high-quality remnants of the subject community, Public Land Survey notes, 1930 series aerial photography, soil types, and any historic floristic data. Basic floristic data is available for high-quality examples of most community types for most Natural Divisions from the INAI files maintained by the DNR Division of Natural Heritage. A species should be reintroduced with the intent of establishing it at the same percent composition as it occurred historically in similar communities on similar sites, so far as they may be known. In other words, it is important to conform to the “Central Philosophy” articulated previously, even for common species. The criteria on which the a restoration will ultimately be judged for eligibility as an INAI Category I natural area, is the degree to which it resembles high-quality remnants of the same natural community type in the same natural division in terms of species composition.

# Nomination of Translocated Populations of Endangered or Threatened Plants to the Illinois Natural Areas Inventory

## Category II

### Applicant:

Name –  
Organization –  
Address and Phone –

### Plant Material Being Translocated:

Scientific Name –  
Common Name –  
Status (State/Federal, Threatened/Endangered) –

### References:

Historic Range –  
Current Range –  
Range of Community Occurrence –  
Historic Abundances –

### Does a Recovery Plan Exist for this Species and Does this Translocation or Planting Support that Plan?

### Source of Plant Material:

Site Name –  
County: Township: Range: Section: PM:  
Topographic Quadrangle (Attach Map) –  
Type and Quantity of Propagules –  
Name and Address of Landowner:  
Landowner's Signature granting permission (required if translocated after 1990):

### Translocation Site:

Receiving Community (Type, Quality, and Current Land Use):  
Site Name –  
County: Township: Range: Section: PM:  
Topographic Quadrangle (Attach Map) –  
Name and Address of Landowner –  
Signature of Landowner:

### Method of Distribution of Propagules (cyclone seeder, hand sowing, Nesbitt drill, etc.):

### Other Management Planned (By Year):



## **D.2. Illinois Endangered Species Protection Board Policy on Translocation of Endangered and Threatened Animal Species**

**PLEASE NOTE: This Translocation Policy will undergo review with proposed revisions forthcoming (2022). The guidance found below is the last known revision to the Animal Translocation Policy as approved by IESPB in 1989.**

Adopted by the Endangered Species Protection Board at its 66<sup>th</sup> meeting on August 18, 1989

### General Policy

For the purposes of this policy statement and proposal review criteria, the term “translocation” will include the intentional movement of animals from one location to another either within the State of Illinois or from out-of-state locations into Illinois for the purposes of population restoration or enhancement.

It will be the policy of the Endangered Species Protection Board to give first and most favorable consideration to proposals for translocation of animals which will reintroduce a species to Illinois which has been extirpated in the state or will move animals from within Illinois to areas in which they formerly occurred but have been locally extirpated.

Persons submitting proposals for the translocation of animals should be prepared to provide evidence that their proposals meet all of the basic criteria listed below. A simple statement that the proposal meets these criteria may not be considered adequate evidence.

Basic Criteria – translocation proposals meeting ALL of the following criteria will be considered by the Board.

1. Habitat suitable for the species in both quality and quantity is present in the area of the proposed translocation.
2. Translocation of the species will not have negative effects on extant Illinois populations of the same species or other native species.

Individuals to be translocated must be of the same subspecies and/or race as those animals which inhabit or have historically inhabited the target site unless; the native subspecies or race is extinct, or there is no information about the genetics of historic populations.

The translocation must not introduce pathogens, parasites, or other factors which may negatively affect existing animal populations.

3. Required approvals from other State and Federal agencies have been secured.
4. If a State or Federal recovery plan for the species has been developed, the translocation is compatible with the goals, objectives, and methods of the recovery plan.
5. The translocation plan includes recommended methods and procedures for monitoring and management of released individuals.
6. The target area for the translocation effort is known to have been inhabited historically by the species.

Detailed Review – translocation proposals that are found to meet all the basic criteria will be reviewed on a case-by-case basis. Factors included in that review will include, but not necessarily be limited to:

1. Regional population trends of the species – are the species’ range and abundance diminishing in surrounding states, or are there indications that the species may naturally target site in the foreseeable future?
2. Available sources of animals to be imported – are animals available from areas near enough to the target site to give a reasonable expectation of their being genetically suited to habitat and climate conditions at the target site? Are adequate numbers of animals available to establish a viable population?
3. What is the status of remaining suitable habitat – is it formally protected as a Nature Preserve or State Park, is it private property for which a management agreement is in place, etc?
4. Is the species likely to affect agriculture, public health, or other non-conservation interests? If so, have adequate measures to limit those effects and educate the public about the species’ natural role in the ecosystem been planned and implemented?
5. Does the proposal include a review of translocation attempts for the same species in other areas? Have reasonable precautions been included in the translocation plan to avoid problems encountered in other attempts?

### **D.3. Illinois Nature Preserves Commission Policy and Procedures for Translocation of Animal Species**

Vol. 2, No. 4 Approved 9/15/15

#### **Section I – General Policy**

For the purposes of this policy statement and review of proposals, the term “translocation” will include the intentional movement of animals from one location to another either within the State of Illinois or from out-of-state locations into Illinois for the purposes of population restoration, enhancement or rescue. For purposes of this policy, rescue would mean relocation of native animal populations (whole populations or portions of) at risk from negative impacts due to human caused adverse modifications to habitat.

For sites in the Illinois Nature Preserves system, it will be the policy of the Illinois Nature Preserves Commission (INPC) to give consideration to proposals for translocation of animal populations in need of rescue or to reintroduce a species to Illinois which has been extirpated in the state or will move animals from within Illinois to areas in which they formerly occurred but have been locally extirpated.

Consideration by INPC of animal translocation requests will require a detailed proposal which provides information addressing the “Basic Criteria” and factors in the “Detailed Review” in Section III. A simple statement that the proposal meets these criteria will not be considered adequate evidence.

INPC staff will consult with and seek reviews for the proposed translocation from the Illinois Department of Natural Resources and the Illinois Endangered Species Protection Board (for species listed as threatened or endangered). Review from other biologists or specialists will also be requested as appropriate. INPC will consider reviewer comments if available. INPC approval of translocations at INPC sites does **NOT** confer any other approvals or permits that may be required by local, State or Federal agencies.

#### **Section II – Illinois Nature Preserves Commission – Legal Authorities**

All activities taking place at sites in the **Illinois Nature Preserves Commission** system are under the authority of the:

- **Illinois Natural Areas Preservation Act** (525 ILCS 30/)  
<http://www.ilga.gov/legislation/ilcs/ilcs3.asp?ActID=1739&ChapAct=525%26nbsp%3BILCS%26nbsp%3B30%2F&ChapterID=44&ChapterName=CONSERVATION&ActName=Illinois%2BNatural%2BAreas%2BPreservation%2BAct%2E%20> and
- **Administrative Rules** for Nature Preserves and Land and Water Reserves including:
  - Rules for Management 17 ILL. ADM. CODE CH. V, SEC. 4000,  
<https://dnr.illinois.gov/content/dam/soi/en/web/dnr/adrules/documents/17-4000.pdf>
  - Register of Land and Water Reserves 17 ILL. ADM. CODE CH. V, SEC. 4010  
<https://dnr.illinois.gov/content/dam/soi/en/web/dnr/adrules/documents/17-4010.pdf>
  - Regulation of Public Use 17 ILL. ADM. CODE CH. V, SEC. 4015  
<https://dnr.illinois.gov/content/dam/soi/en/web/dnr/adrules/documents/17-4015.pdf>
- As well as any restrictions outlined in the **Nature Preserve Dedication** or **Land and Water Reserve Registration** document for the site.

### **Section III – Procedures – INPC Review Criteria**

**Basic Criteria** – translocation proposals MUST include information on all of the following criteria to be considered by the INPC:

1. What species is/are being proposed for translocation?
2. Is the species listed as endangered or threatened?
3. What is the purpose of the proposed translocation?  
    \_\_\_Recovery      \_\_\_Research      \_\_\_Rescue
4. **Site Information** – Information on all locations that animals will be translocated from or to, including the names of the INPC sites involved (nature preserves or land and water reserves).
5. **Habitat Information** - proposals must document that habitat suitable for the species in both quality and quantity is present in the area of the proposed translocation.
6. **Impacts to Extant Populations** – scientific documentation indicating that the translocation of the species will not have negative effects on extant Illinois populations of the same species or other native species.
  - Individuals to be translocated must be of the same subspecies and/or race as those animals which inhabit or have historically inhabited the target site unless: the native subspecies or race is extinct or; there is no information about the genetics of historic populations.
  - The translocation must not introduce pathogens, parasites, or other factors which may negatively affect existing animal populations. Quarantine or other disease prevention measures must be described in detail.
7. **Compatibility with Recovery Plan** - if a State or Federal recovery plan for the species has been developed, the translocation should be compatible with the goals, objectives, and methods of the recovery plan.
8. **Monitoring and Management Procedures** - the proposal should include adequate methods and procedures for monitoring and management of translocated individuals after release at the INPC site(s).
9. **Historical Occupancy** – information indicating that the target area for the translocation effort is known to have been inhabited historically by the species.
10. **Landowner Approvals** - both the landowner(s) of the site(s) the animals will be removed from must agree in writing to allow access to their property for the removal and the landowner(s) of the site(s) that the animals will be translocated to must agree in writing to allow the animals to be translocated to their property.
11. **Other Approvals** - documentation that all other required approvals and permits from appropriate local, State and Federal agencies are being secured. INPC approvals will be contingent on all other permits having been approved.

**Detailed Review** – translocation proposals which are found to meet all the basic criteria will be reviewed on a case-by-case basis. Proposals should take into consideration/address, but not necessarily be limited to the following factors:

1. **Regional population trends of the species** – are the species’ range and abundance diminishing in surrounding states or are there indications that the species may naturally re-inhabit the target site in the foreseeable future?
2. **Available sources of animals to be imported** – are animals available from areas near enough the target site to give a reasonable expectation of their being genetically suited to habitat and climate conditions at the target site? Are adequate numbers of animals available to establish a viable population?
3. **What is the status of remaining suitable habitat** – is it formally protected as a Nature Preserve or State Park, is it private property for which a management agreement is in place, etc?
4. **Is the species likely to affect agriculture, public health, or other non-conservation interests?** If so, have adequate measures to limit those effects and educate the public about the species’ natural role in the ecosystem been planned and implemented?
5. **Does the proposal include a review of translocation attempts for the same species in other areas?** Have reasonable precautions been included in the translocation plan to avoid problems encountered in other attempts?

**Section IV – Procedures - Permits \***

This information is provided for reference only and does not necessarily list all required permits. The following describes permit reviews that should occur concurrently when a request to translocate animals is received. INPC staff will work to coordinate with other reviewers, but the submission of all appropriate permit applications is the responsibility of the person submitting the proposal to translocate.

	Permit Requirements for Species Listed as Endangered or Threatened in Illinois	Permit Requirements for Not-Listed Species
<p>For Sites that are Nature Preserves (NP) or Land and Water Reserves (LWR)</p> <p>Including Illinois Department of Natural Resources (IDNR) owned NPs or LWRs</p>	<ul style="list-style-type: none"> <li>● Illinois Nature Preserves Commission (INPC) Special-Use Permit</li> <li>● IDNR Endangered Species Possession Permit</li> <li>● IDNR Scientific Permit</li> </ul> <p>NOTE: An IDNR General Scientific Permit is needed for all wild birds and mammals listed as protected under the Wildlife Code (520 ILCS 5/2.2) – this list includes both listed and non-listed animals. To show due diligence, researchers often request a Scientific Permit to cover research activities involving: reptiles, amphibians, fish, invertebrates, and plants/plant products. Scientific Permits may be issued as a service to the researcher(s) and to track the types of scientific research being conducted in Illinois.</p>	<ul style="list-style-type: none"> <li>● INPC Special-Use Permit</li> <li>● IDNR Scientific Permit</li> <li>● If working with amphibians or reptiles a permit under the Herptiles-Herps Act would be required.</li> </ul>
<p>Illinois Department of Natural Resources (IDNR) Owned Property</p>	<ul style="list-style-type: none"> <li>● IDNR Endangered Species Possession Permit</li> <li>● IDNR Scientific Permit</li> <li>● IDNR Permit for Research in Illinois State Parks, Forests and Conservation Areas</li> </ul>	<ul style="list-style-type: none"> <li>● IDNR Scientific Permit</li> <li>● IDNR Permit for Research in Illinois State Parks, Forests and Conservation Areas</li> <li>● If working with amphibians or reptiles a permit under the Herptiles-Herps Act would be required.</li> </ul>
<p>Not INPC or IDNR (Lands may include all parcels owned by Municipalities/ Townships, businesses, corporations, individuals, etc.)</p>	<ul style="list-style-type: none"> <li>● IDNR Endangered Species Possession Permit</li> <li>● IDNR Scientific Permit</li> </ul>	<ul style="list-style-type: none"> <li>● IDNR Scientific Permit</li> <li>● If working with amphibians or reptiles a permit under the Herptiles-Herps Act would be required.</li> </ul>
<p>* Permits from other agencies or entities that may be needed:</p> <ul style="list-style-type: none"> <li>- Federal Fish and Wildlife Permits from the U.S. Fish and Wildlife Service are required for: <ul style="list-style-type: none"> <li>● Animals listed as federally endangered or threatened</li> <li>● Migratory birds</li> </ul> </li> <li>- Forest Preserve Districts, Conservation Districts, Park Districts, other municipalities, Land Trusts and other landowning agencies may also require permits.</li> </ul>		

## Appendix E: Category VI Timber Rattlesnake Guidance

**PLEASE NOTE: Timber Rattlesnake Guidance remains under review with proposed revisions forthcoming soon. The guidance found below was approved by the NAEC at the 21<sup>st</sup> Meeting held on July 10, 2001.**

The Illinois Natural Areas Inventory defines Category VI sites as lands and waters of the state that support unusual concentrations of flora or fauna that are especially vulnerable to disturbance and/or are important in fulfilling the life history requirements of the species present. Timber rattlesnakes (*Crotalus horridus*) are a state-threatened species in Illinois. Of the pit vipers subjected to widespread human-caused mortality, the timber rattlesnake has been so extensively persecuted (Brown 1992, Martin 1992a) that there is a 10% probability of extinction within 100 years (Mace and Lande 1991). Pit viper conservation must include preservation of sufficient habitat. Few of the 80 vulnerable pit viper species (such as the timber rattlesnake) are encompassed by existing preserves and/or do not receive special conservation considerations (Greene and Campbell 1992). Timber rattlesnakes are especially vulnerable to disturbance because they are known to aggregate in large numbers at denning sites and because populations display relatively low turnover due to constraints in their reproductive ecology. **Denning sites and birthing rookeries of timber rattlesnakes meet the criteria for Category VI designation and protection.**

These guidelines assist in the long-term viability of the timber rattlesnake by increasing awareness of denning sites, birthing rookeries, and the minimum home range for females (critical component for the reproductive population) for extant populations of timber rattlesnakes. Loss of any one of these components will have serious implications for timber rattlesnakes because of their life history characteristics. The protection of females, denning areas, and birthing rookeries are considered critical to the reproduction and viability of any given snake population. Timber rattlesnakes possess several characteristics putting them at high risk for extinction. These characteristics include large body size, late maturation time of females, relatively small litters, and low intrinsic rates of population increase (Greene and Campbell 1992).

Guidelines:

**A recommended one-mile core area centered on an extant den or birthing rookery location is the first step in boundary design for the species.**

The boundary should be refined to consider important topographic and habitat features, waterways, and critical foraging areas. The one-mile radius that is used to create INAI boundaries around timber rattlesnake denning sites and birthing rookeries should not be a perfect/symmetrical circle, but instead incorporate some landscape features so as to keep the actual den site or birthing rookery location cryptic. However, it is strongly recommended that the landscape boundary line not be smaller than a one-mile radius.

Denning and birthing rookeries are considered highly sensitive information. Specific locality information must NEVER be given to the public, and our Department must be cautious in regard to exact den or birthing rookery locations wherein the public has free access to anything through the Freedom of Information Act (FOIA).

This strategy is based on the following life history characteristics information known for timber rattlesnakes:

**REPRODUCTIVE AGE** - Female timber rattlesnakes generally are not sexually mature (i.e., cannot reproduce) until they are eight or nine years of age (Brown 1991). Reproduction classes have varied from four years in Wisconsin and Kansas (Keenlyne 1978; Fitch 1985), five years in Pennsylvania (Galligan and Dunson 1979), six years in South Carolina (Gibbons 1972), five to nine years in Virginia (Martin 1988), and five to eleven years in the central Appalachian Mountains region, with seven and eight year olds making up the majority of first-time reproducers (Martin 1993). The study by Brown (1991) was done in New York over a period of ten years, and the study by Martin (1993) in the Appalachians was over 19 years. The low reproductive rate of this species makes it clear that the loss of any reproductive female may significantly reduce the ability of the population to remain viable.

**FECUNDITY** - Female timber rattlesnakes, once sexually mature, have young every two to three years. Other studies have shown that this can vary from two years in South Carolina (Gibbons 1972), Wisconsin (Keenlyne 1978), Pennsylvania (Galligan and Dunson 1979), and Kansas (Fitch 1985), three years in Virginia (Martin 1988) and western Wisconsin/southeastern Minnesota (Oldfield and Keyler 1993), three to four years in New York (Brown 1991), two to five years in the Appalachian Mountains region (Martin 1992a), and three years in northwestern Illinois (Bielema 1998). The low fecundity of the species seen in a nine-year study in northwestern Illinois demonstrates that the loss of any reproductive female may significantly reduce the ability of the population to remain viable (Bielema 2000).

**REPRODUCTIVE CONDITION** - If a female timber rattlesnake's fat reserves are low, reproduction may be delayed one or more years (Martin 1988). Yolking of the female's follicles cannot begin until a minimum level of fat has been stored (Martin 2000).

**MINIMUM HOME RANGE FOR FEMALES** - Female timber rattlesnakes travel up to one mile from the den site to forage. Based on his work, Brown (in Macartney et. al. 1988; and from some of his own unpublished data) found that the mean maximum migratory distance from the den was 2.5 miles for males and 1.3 miles for females. Additionally, it was found that the maximum single migratory movement from the den was 4.5 miles for males and 2.3 miles for females. Newborns spend their first fall near the den. The movement of juveniles is restricted during their first year and these juveniles return to the dens sooner than the adults (Martin 2000). Mortality is high in juveniles (Martin 1988, Martin 1990), and during the first couple of years juveniles are concentrated at the denning area. A study in northwestern Illinois (Bielema 1998, Bielema 2002) showed that females and neonates occupy birthing rookeries from May 3 through October 12. Because gravid females (critical component of the reproductive population) prefer this range of habitat, protecting at least the minimum home range will minimize threats to the reproductive potential of a known population.

**SITE FIDELITY** – Timber rattlesnakes show site fidelity to dens and birthing rookeries (Brown 1993, Ditmars 1907, Bielema 1998, Ballard, Brandon, & Palis, unpublished data). Since there is site fidelity, it is imperative to protect these areas for the long term. Unlike heron and egret nesting rookeries, areas utilized by timber rattlesnakes are NOT transitory in nature. Opportunistic dispersal to new denning locations does occur, but this is more probable in contiguous suitable habitat and unlikely in fragmented or highly trafficked areas. While denning sites and birthing rookeries are separate entities, neonates and young may use the same overwintering sites. Young snakes initially find the dens by following adult scent trails to the site (Ernst 1992, Brown and MacLean 1983, Reinert and Zappalorti 1988, Zappalorti and Reinert 1992). During a Jackson County study ongoing since 1995, neonate timber rattlesnakes marked at the birthing rookery with the adult female were located a couple of weeks later at a known den site (Ballard, Brandon & Palis, unpublished data). Rookeries are typically within 0.25 miles of an overwintering den but have been reported as far as 0.75 miles, and some are probably farther (Martin 2000).

**MATING** - Timber rattlesnakes can mate in the spring after emergence from the den, in the fall before going into hibernation, and from July through mid-September (Brown 1987, Brown 1991, Martin 1988, Martin 1990). Females can store sperm from fall breedings overwinter. This is another reason for adequate long-term protection with a minimum one-mile radius.

**SURVIVORSHIP** - Based on studies in the northeast, timber rattlesnake survival over the first year of life is very low but can be quite high after that (Brown 1993, Martin 1992b). In the central Appalachians, the juveniles' winter mortality rate is 61%, with overall overwinter mortality of 50% for all age classes (Martin 1988, Martin 1990, Ernst 1992).

## **Summary**

The one-mile radius around timber rattlesnake denning sites and birthing rookeries that I have recommended is considered the most conservative amount of distance and should be considered as a minimum core area to protect these types of Category VI sites. Brown (1993) recommends a radius of 1.5 miles around a den to adequately protect a viable population of timber rattlesnakes. Brown (op. cit.) feels that a 1.5- mile radius will protect most females, but may not be adequate for the protection of the entire population, as males use a home range area of approximately 160-500 acres and females use a home range area of approximately 40-100 acres.

INAI boundaries established as a one-mile radius from known timber rattlesnake denning sites and birthing rookeries increase awareness of the more important part of the population (reproductive potential in the females), as well as juveniles during their more vulnerable early years. Also, since some mating occurs near the denning area, protection will be provided for this important activity. To adequately implement a conservation strategy for timber rattlesnake viability in Illinois, it is recommended that a two-mile radius be established in order to also protect male foraging habitat. Martin (1992b) reported that most of the timber rattlesnake population spends the summer with 2.5 miles of the den, although some adult males have been known to travel three to five miles from the den.

It is well documented that numbers of timber rattlesnakes at denning sites have decreased significantly from historic levels. Whereas timber rattlesnakes used to congregate at suitable hibernacula in numbers of 50-100, many of the heavily populated dens have been reduced or extirpated (Ernst 1992, Oldfield and Keyler 1993). One den site in northwestern Illinois has been estimated to maintain a population of at least 25 (Bielema 1998). Historically, rattlesnake dens occurred all along the bluffs in northwestern Illinois and were frequently visited by locals and snake hunters, who removed and killed snakes. This, coupled with the overshadowing of many of these dens and rock outcrops, has left few if any snakes (Bielema 2001).

It is paramount to keep the location of timber rattlesnake denning sites and birthing rookeries confidential. Specific locality information must be protected to the utmost and the agency should be cautious with regards to exact den or birthing rookery locations.

## Appendix F: Illinois Natural Areas Inventory Forms

Forms can be found on the Division of Natural Heritage website here:

<https://naturalheritage.illinois.gov/naturalareasdivisions/natural-areas-evaluation-committee.html>

- F.1. [INAI Checklist for Site Nomination](#)
- F.2. [INAI Nomination and Approval Form](#)
- F.3. [INAI Site Evaluation Form](#)
- F.4. [INAI Grading Form and Guidance](#)
- F.5. [INAI Stream Grading Form](#)
- F.6. [INAI Qualitative Vegetation Sampling](#)
- F.7. [INAI Category I Woody Overstory Vegetation Sampling Form](#)
- F.8. [INAI Category I Woody Understory Vegetation Sampling Form](#)
- F.9. [INAI Category I Groundlayer Vegetation Sampling Form](#)
- F.10. [Element Occurrence Record Form](#)
- F.11. [INAI Specific Suitable Habitat Form](#)
- F.12. [INAI Category II Feature Deletion Form](#)
- F.13. [Surveillance Form](#)