WEEK 2. PRESETTLEMENT FORESTS AND EARLY SETTLEMENT TIMES

It was a common belief that when the early European settlers entered North America they found an unbroken forest of large trees. It was often stated "a squirrel might have gone from Maine to Louisiana by leaping from one giant tree to the next, never touching the ground." Until the latter half of the twentieth century many foresters dismissed the possibility of any significant disturbance by the Native Americans. We now know that in many parts of North America indigenous people built large cities, had extensive farms, and operated far-ranging trading networks.

Though appearing pristine to the casual observer of the 1600s, these primeval forests had been subjected to extensive modification by both human and natural disturbances. Careful search and critical reading of many of the early European settler's journals and diaries reveal that large areas in eastern North American forests had been extensively modified by early indigenous cultures. In general, forest succession allows for relatively rapid recovery of a forest system, that to a casual observer gave the appearance of a pristine virgin forest. More careful observations, however, by someone familiar with a particular forest association, revealed a forest successional stage and not an end point in forest dynamics.

The Forest of Illinois at the Time of Settlement—an Overview

At the time of settlement by European man, prairie occupied over 61 percent of Illinois with forests, woodlands, and savannas accounting for most of the remainder. *Quercus* (oak) and *Carya* (hickory) species dominated the forests of Illinois except in the extreme northern and southern parts of the state. In northwestern Illinois *Acer saccharum* (sugar maple) and *Tilia americana* (basswood) dominated the moist valleys and ravines, oaks being restricted to dry sites and commonly giving way to prairie due to frequent fires. In extreme southern Illinois, in contrast, the western mesophytic forest association dominated. As many as ten mesic forest species were common canopy components with sugar maple, basswood, *Fagus grandifolia* (American beech), *Liriodendron tulipifera* (tulip tree), as well as oaks and hickories being common. In the swamps and backwaters of the Mississippi, Ohio, and Wabash rivers, swamp forest dominated by *Taxodium distichum* (bald cypress) and *Nyssa aquatica* (swamp tulepo) were common.

In the remainder of Illinois, oaks and hickories dominated timbered areas. Firebreaks determined the distribution of prairie and forest at the time of settlement. The position of lakes, marshes, swamps, rivers, and rugged topography controlled the frequency and intensity of fire. As a result, forests were more extensive, better developed, and with a denser understory on the east and south side of firebreaks, while prairie tended to be more extensive on the west side. This distribution pattern was the result of prevailing westerly winds that carried fires to the west sides of firebreaks, thus encouraging the development of prairies. In contrast, the east sides of firebreaks were protected from fires, and the forests developed, rarely being destroyed by fires.

Topographic relief was important in controlling the distribution of prairie and forest. Usually prairie vegetation was mostly found on the flat to gently sloping ground; savanna, woodland, and forest were mostly in dissected area. This segregation occurred because dissected landscapes do not readily carry fire. For the most part, these dissected lands have well-developed drainage systems that support permanent streams, which serve as firebreaks. In addition, fires in hilly areas tend to move up slope relatively rapidly due to rising convection air currents, but convection currents work against fires when they move down hill, not uncommonly causing them to burn themselves out.

When settlers entered the broad expanses of the central part of Illinois they traveled

through a mosaic of prairie, savanna, and forest. On flat to gently rolling areas, prairie vegetation commonly dominated. Though mostly devoid of trees, occasional prairie groves were encountered on the prairie, particularly where marshes or other aquatic features afforded some protection from prairie fires. In more rugged topography, or areas of sandy and coarser soils, savanna vegetation was common. These savannas were park-like with widely spaced, open-grown trees, having a grassy ground layer consisting of many prairie and forest grasses along with numerous forbs, and virtually no shrub layer. In these savannas the scattered trees varied from 1 to 47 stems/ha and the canopy cover ranged from 10 to 80 percent.

Occasionally oak grubs replaced the large oaks forming brush savannas. These grubs were formed where hot fires top-killed the oaks, which re-sprouted over and over after being repeatedly top-killed by frequent hot fires. These brush savannas were moderate to dense thickets of oak sprouts associated with some shrubs species along with many prairie species, and occasionally some open-grown trees.

In areas of very rough topography particularly in valleys, ravines, along rivers, and protected areas where hot fires were not a common occurrence, oak-hickory forests prevailed. These closed-canopy forests usually had more than 80 percent canopy closure and more than 47 trees/ha. Not uncommonly, closed forests in protected sites contained a mixture of various oaks and hickories along with more mesic species such as sugar maple, basswood, elms, and ashes.

Indigenous Cultures and Their Effects on Illinois Forests

When European settlers arrived in Illinois the Native Americans had been living in the deciduous forest of the state for more than 11,000 years. When they arrived in an area, these early Americans almost immediately began altering their environment, exploiting the plant, animal, and mineral resources. Their use of the natural resources caused the local extinction of some species, the introduction of new species, and extensive modification of the composition and structure of the forests and prairies. Also, they not uncommonly cleared the forests for villages, fuel, and agriculture. Just keeping the understory of the forest open, and the prairie low around their villages, was important.

Throughout the eastern deciduous forests many of the early indigenous cultures used fire to modify the environment of their immediate surroundings. Fire was commonly used to clear forest understory to facilitate travel, make it easier to hunt game, and to encourage the growth of native food plants. In the prairie peninsula of Illinois, Native Americans started fires for a multitude of reasons. Fire destroyed habitat for insect pests, reduced cover for enemies and predators, encouraged fire-dependent food plants, opened the forest and prairie for hunting, cleared areas for agriculture, and encouraged fruit production in some tree species. These activities had a profound effect on the vegetation, particularly in the prairie peninsula of Illinois where fires caused prairie and savanna to increase at the expense of the forest.

When European travelers and settlers entered the northern Midwest, numerous groups of Native Americans were living throughout the area. Nearly all lived in villages that varied in size and permanence, with most villages in what is now Illinois, being fairly small and used for relatively short periods of time. Even these small villages, many in prairie groves, but always near good quality streams and rivers, were located in/or close to forest or savanna habitats. Generally the establishment of even a small village involved clearing the area for home sites. It also involved foraging within a considerable radius for the plants and animals necessary to sustain life, including food, fiber, medicines, wood and bark for utensils, weapons, canoes, houses, and particularly firewood. Even surrounding a small village the forest was slowly removed for firewood, which was essential for

cooking, heating, the preparation of many hunting and household objects, and keeping away animal predators.

In the forest surrounding relatively permanent agricultural villages, women and children carried on a never-ending search for firewood. Though dead snags and dead-down wood was probably used first, living trees were also systematically consumed. This involved killing the trees by girdling, which involved removing the bark and sometimes the sapwood just below the bark, with stone axes. If the bark and sapwood were removed the tree died within a few weeks. Subsequent decay, and/or the use of fire at the base of the trunk, allowed the tree to be felled. If only the bark was removed, the tree could live for one to three years. Still the tree weakened rapidly making it easier to use fire to remove it. In northern climates firewood was an important commodity. Large amounts were used in even a relatively small village, and the exhaustion of the local supply meant moving the village.

The use of fire to remove the forest was, and still is, a common agricultural practice in aboriginal cultures throughout the world. Being particularly common in tropical areas, this slash and burn agriculture was also the method used by early agrarian cultures in the deciduous forests of North America. It involved girdling the trees, cutting most of the understory, allowing the dead vegetation to dry, burning the area to remove the ground layer and woody understory as well as destroying the girdled trees by killing the conducting sapwood and bark. Seeds of crop plants were planted among the remaining snags and downed trees. Yearly burns allowed for the release of nutrients from the plant material and kept the "farm" open for next year's planting. The continued removal of soil nutrients by crop plants, however, soon reduced fertility to the point that the area was abandoned. New areas were then subjected to the same slash and burn practices while abandoned areas underwent successional changes to mature forest.

It appears that, at least in some instances, these yearly fires became wild fires, burning through extensive areas of prairie and forest. Local examples are common of Native Americans setting fires that had a profound influence on the surrounding vegetation. In Brown County, northeastern Wisconsin an extensive oak savanna existed according to early survey records. Surrounding this 49 km^2 oak savanna was mixed conifer-hardwood forest of *Tsuga canadensis* (hemlock), *Acer saccharum* (sugar maple), *Betula alleghaniensis* (yellow birch), and various pines, the forest type typically found in northern Wisconsin. The oak savanna was not associated with unusual soil, topographic relief, or climatic conditions, but instead was associated with Potawatomi and Winnebago Indian agricultural villages; 28 were known to occur in the area. This oak savanna exists because of wild fires set by the Native Americans that over time changed the structure and composition of the vegetation. These Native Americans also used fire to open the surrounding forest that increased acorn production and made hunting easier.

Prior to the arrival of European man many Native American tribes inhabited the area that is now Illinois. Included in this list are Peoria, Cahokia, Kaskaskia, Tamaroa, Miami, Kickapoo, Sauk, Winnebago, and Potawatomi tribes. Many of these tribes raised some food crops, including maize, beans, gourds, pumpkins, and squashes, by using slash and burn agricultural practices. Most, however, relied on hunting and gathering for the majority of their livelihood. The use of fire in hunting by these tribes has been documented. These hunts were very carefully planned and organized. Commonly in the fall these tribes prepared for the annual hunt for bison and sometimes deer. Unlike Native Americans of the western plains, they did not have horses, a deficiency that was compensated for by using fire. A large group of hunters would form a ring or partial ring around a herd of bison and set the prairie on fire. The stampeding bison would be concentrated in an area where the hunters could fairly easily kill them. After the hunt

many of these “hunting” fires continued to burn being stopped only by heavy rain or some type of fire break such as rivers, lakes, marshes, swamps, or rugged topography.

It is clear that early Native Americans had a profound influence on the vegetation of eastern North America before European settlement. Most present day researchers have concluded that the use of fire by these Native Americans has been important in shaping the structure, composition, and extent of the deciduous forests of North America. For the most part, this research has relied on the historical accounts by early settlers and travelers who have documented the use of fire by these indigenous tribes. These early fire reports were mostly from regions where fire-tolerant vegetation types, such as prairie or savanna, were common. This indicates that the vegetation changes that have occurred only supplemented natural fire caused by lightning strikes. The excessive wild fires set by Native Americans, however, undoubtedly increased the extent of vegetation changes, particularly at the prairie/forest boundary.

Cahokia, an Early Agricultural Society in Southern Illinois

Though Native American agricultural activities were usually small and localized, some large Native American settlements did exist in pre-Columbian times. Probably the largest settlement north of Mexico was at Cahokia, in the American Bottoms of Illinois, across the Mississippi River from present day St. Louis, Missouri. In 1100 A.D. this settlement covered an area of 9 km^2, and had an estimated population of 25,500 to 42,700. It is estimated that more than 6,000 hectares (15,000 acres) were cultivated to supply Cahokia with food. In 1650, when European explorers entered the American Bottoms, all that remained of this advanced culture were numerous earthen mounds.

Present archeological research indicates that Cahokia was at the center of a regional settlement system that in 1000 A.D. (referred to as the Fairmount Phase) contained many smaller communities scattered throughout the American Bottoms on both sides of the Mississippi River.
The city of Cahokia was the geographical and urban center of this system and the largest community present. It represented the ceremonial, political, religious, and population center of the culture.

Scattered within 20 km of Cahokia in the American Bottoms, and on both sides of the Mississippi River were at least four multiple-mounded town sites of 80 to 100 hectares each. Numerous smaller villages were also present that were 4-10 hectares in size while numerous small hamlets, a few hectares in size were very common. Extensive areas of forest and prairie were destroyed using the slash and burn agricultural practices to produce the food and other necessities to maintain the large indigenous population of the American Bottoms. It is very likely that the entire floodplain of the Mississippi River within 20 km either side of Cahokia, and from the bluffs on both sides of the river, was subjected to slash and burn agriculture at various times during the history of this civilization.

Early Settlers and Forest Use

Low population densities and primitive technology of the Native Americans prevented extensive destruction of the forests and prairies of the northern Midwest. Though the destruction was significant in localized areas, such as around Cahokia, the majority of the broad expanse of forest and prairie remained relatively intact. Except for the use of fire, the Native Americans had a minor impact on the vegetation except in localized areas. With the arrival of European settlers, in contrast, the rapid destruction of this vast wilderness started. Although the first Europeans entered Illinois in the late 1600s, the era of active settlement occurred in the early 1800s, starting in the southern part of the state.

By 1820 the state of Illinois had an estimated population of 55,211, practically all within forested areas, and most of these were in southern Illinois (Telford 1826). These early settlers first established themselves along the major river courses and old Indian trails because these were the means of travel. The succeeding settlers pushed farther from the rivers up smaller streams, but always settled in the forest where clear running water and materials for fuel and shelter were available. In these early years timber was an important commodity, and was probably the controlling factor preventing the early settlement of the Illinois prairies.

The early Illinois settlers copied the Native Americans' practice of slash and burn agriculture. Since much of the early occupation of Illinois started in the south, the timbered lands of that region were some of the first to be cleared. After the trees died, as a result of girdling of the trunks, and the clearing and burning of the underbrush, the growing of crops could go along simultaneously with the gradual removal of the remaining trees. The use of more sophisticated tools, including steel axes and saws, made tree removal easier.

These early settlers were familiar with the forests and were accustomed to clearing areas for growing their crops. The forest soil was easily broken with the wooden plows of the time. Also, as for the Native Americans before them, the forests furnished materials needed by the early settlers: fuel, building materials, fencing for their livestock, and afforded shelter and food for both game and domesticated animals. For the most part, prairies were considered unsuitable for settlement due to the lack of wood and the inability of the primitive wooden plows to break the tough prairie sod. The use of the extensive Illinois prairies for agriculture had to await the development of the steel plow. Also, much of the prairie was wet during most of the year making ditching necessary. However, by the 1840s much of the Illinois prairie was being settled.

The early settlers used some trees for building their cabins, barns, and fences. Except for firewood, the remaining trees were burned or left to rot. Until the advent of steam power and the sawmill, there was not an extensive market for surplus timber. With the advent of the sawmill in about 1860 there began the extensive clearing of the forests. With a large supply of marketable timber, and the development of a reliable transportation system of roads and railroads, the market for hardwood timber increased. The railroads not only transported the lumber to market, they used large quantities of wood for fuel and railroad ties.

Numerous early industries relied on the steady supply of good quality lumber, resulting in more and more cutting of the high quality trees. In many areas the forests were "high graded", with the selective removal of the high quality *Juglans nigra* (black walnut), *Liriodendron tulipifera* (tulip tree), *Prunus serotina* (wild black cherry), and *Quercus alba* (white oak). This selective cutting was commonly followed, at a later time, by a much more drastic cut that removed all of the marketable trees. After the removal of all marketable trees these stands could be left and allowed to develop into secondary forest. More commonly, however, fire was used to convert the area into pastureland or cropland.

In addition to destroying nearly all of the savannas of Illinois and the majority of the forests, European settlers started other insidious changes that, over time, would have a profound effect on our present day forests. Their roads, plowed fields, and other structures effectively stopped the numerous wild fires that originally swept through the prairies and forests. Fire-suppression was starting to slowly change the composition and structure of the remaining savanna and forest communities by the late 1800s.

In addition to decreasing the fire frequency and intensity European man brought many

plant and animal species with him to the New World. Many were species he relied on for food and other products, some were ornamentals that he loved to have around, while others were "camp followers," Eurasian plants and animals that moved with man. Some of these introduced species were destined to enter the landscape, proliferate, and become a part of our flora and fauna. Some have become major environmental problems, changing the structure and composition of the plant communities that they entered. Fire suppression and exotic species were destined to become major problems that are having a profound effect on present day plant communities.

Government Land Office (GLO) Survey Records

Probably the best sources of information available to reconstruct the presettlement vegetation of Illinois are the Government Land Office (GLO) survey records. Also referred to as the Public Land Survey records these survey notes contain the most accurate record and scientific description of the structure and composition of the presettlement vegetation. Starting with Ohio, a system was developed involving square townships six miles on a side that were then divided into 36 sections, each approximately one square mile in size. This survey began in Illinois in 1804 and most of the state was surveyed by 1856. Though some mistakes and shoddy work did occur, as well as occasional outright fraudulent surveys, the work is an accurate and reliable source of information about the vegetation of Illinois near the time of settlement.

The job of the surveyors was to establish a grid system of township and range lines by the placement of section and quarter section posts. These township lines ran due north and south, the range lines crossing the township lines at right angles. Within each township 36 sections were established using a grid system of north/south and east/west section lines. The section posts were placed each mile, and the quarter section posts at each half-mile along these north/south and east/west section lines. All measurements were made with a surveyor chain that was 66 feet long. This chain was made of 100 steel links, each 7.92 inches long (Figure 2.1).

In addition, the surveys also recorded general information about the characteristics of the land crossed by each of the section lines: points of entry and departure from forest and prairie, topography, water features, unusual features, natural disturbances, soil fertility, and artificial features such as roads, settlements, and major animal trails (Table 2.1). After surveying a township the surveyors drew a rough map (plat) where the features listed in the survey were shown, including the position of most natural features, and the extent of forest and prairie (Figure 2.2).

The usual procedure for conducting the survey was to run the township and range lines first, forming a grid system consisting of square townships essentially six miles on a side. For most of Illinois the starting point for this grid system was the Third Principal Meridian that was run north/south, the length of the state, starting from the state's southern tip at the junction of the Ohio and Mississippi rivers. After the townships were delineated, the interior section lines of each township were run, often by a different survey crew.

To complete the internal survey of a township the survey crew usually began along the already established south township line one mile west of the southeast corner of the township. At this point the crew proceeded north, measuring the north/south section line, placing a quarter section post at the first half mile, and then continued north to the point where the section post was to be located. At this point a random line was run to the east to connect with the corner already established along the east/west township line. A true line was blazed back west along this east/west section line, the quarter section post and section post being accurately placed. In timbered areas two bearing trees (witness trees)

were commonly blazed, and the distance and

Table 2.1. The information recorded by the Government Land Office surveyors.

I. Features noted at corners and along section lines.
- A. Bearing trees – mostly two at each section corner and quarter section. Common name of tree, tree diameter (in inches), bearing from corner, distance from corner (in links).
- B. Line trees – trees located along section lines. Common name of tree, tree diameter (in inches), location along line (distance in chains from section corner).
- C. Major topographic features – noted and location along section line of cliffs, bluffs, hills, caves, etc.
- D. Water features – noted and location where encountered along section line.
  1. Rivers and streams – width (in chains and links) and direction and character of flow.
  2. Ponds – points of entering and leaving along section line.
  3. Swamps – points of entering and leaving along section line.
  4. Marshes – points of entering and leaving along section line.
  5. Lakes – points of entering and leaving along section line.
  6. Springs – locations, width of run, and direction of flow.
- E. Upland natural communities – points of entering and leaving along section line of timber, prairie, and barrens.
- F. Unusual natural features – noted, described, and location where encountered along section line for salt licks, mill seats, and mineral deposits.
- G. Artificial features – noted, described, and located where encountered along section line for Indian and European settlements and other structures, trails, paths, and roads.

II. General character comments describing each mile of section line.
- A. Topography – usually described as flat, level, low, broken, even, uneven, rolling, hilly, steep, ridges, etc.
- B. Soils – described as good for cultivation, poor for cultivation, rich, dry, wet, swampy, clayey, stony, rocky, sandy, first rate, second rate, etc.
- C. Vegetation
  1. Forested lands – list the dominant overstory tree species, sometimes note the tree size and timber quality, and common names of dominant understory shrubs, saplings, and vines.
  2. Prairie – usually list general characteristics such as level, brushy, rolling, wet, sandy, with scattered trees, but only very rarely lists plant species.
  3. Barrens – list the dominant trees, and general characteristics such as brushy, dry, wet, briery, with high grass, poor.

D. Anything else - general comments or unusual features.

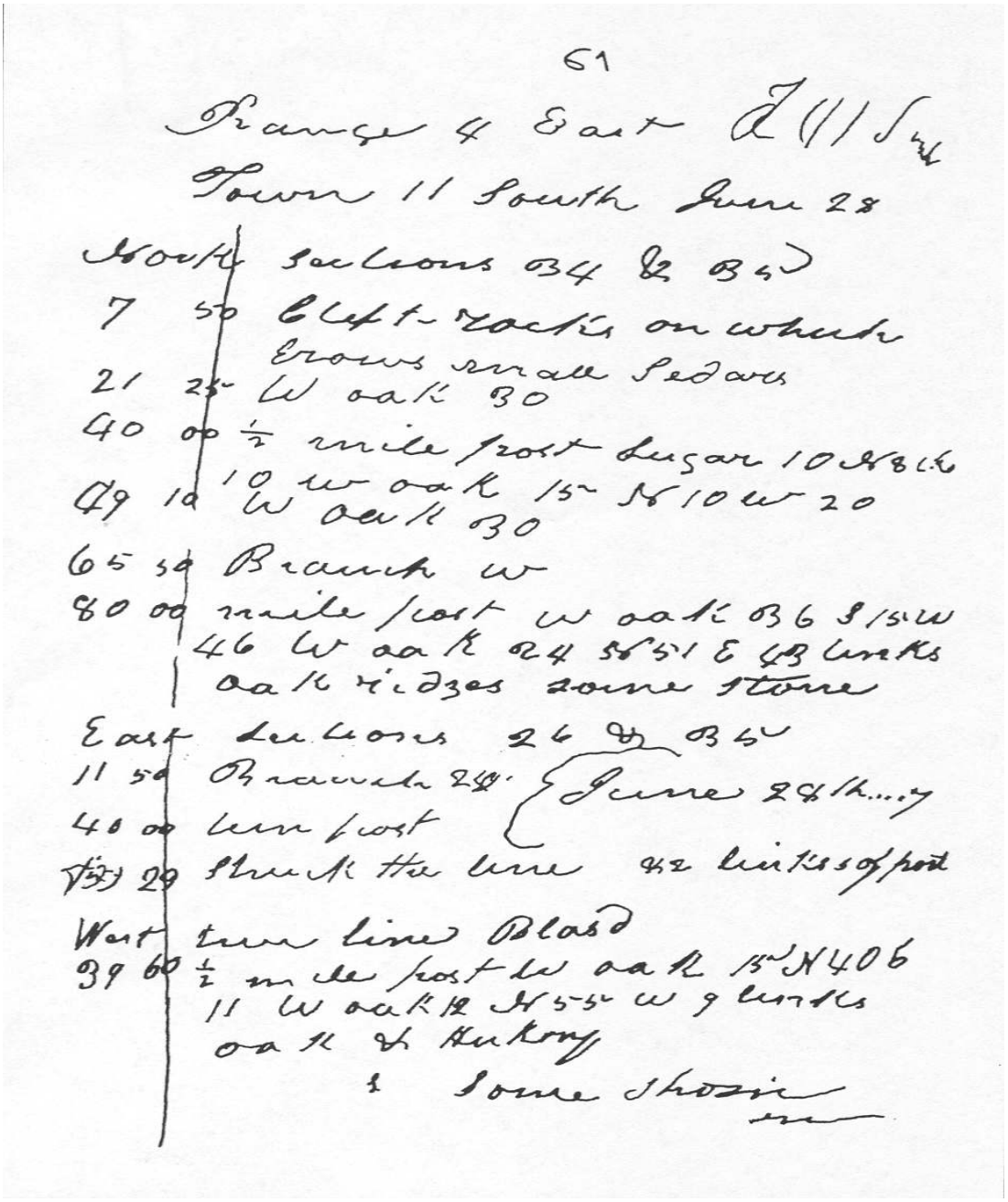

Figure 2.1. Facsimile of a page from the notebook by the government land surveyor who ran the lines in the northern part of Johnson County during the Government Land Office survey.

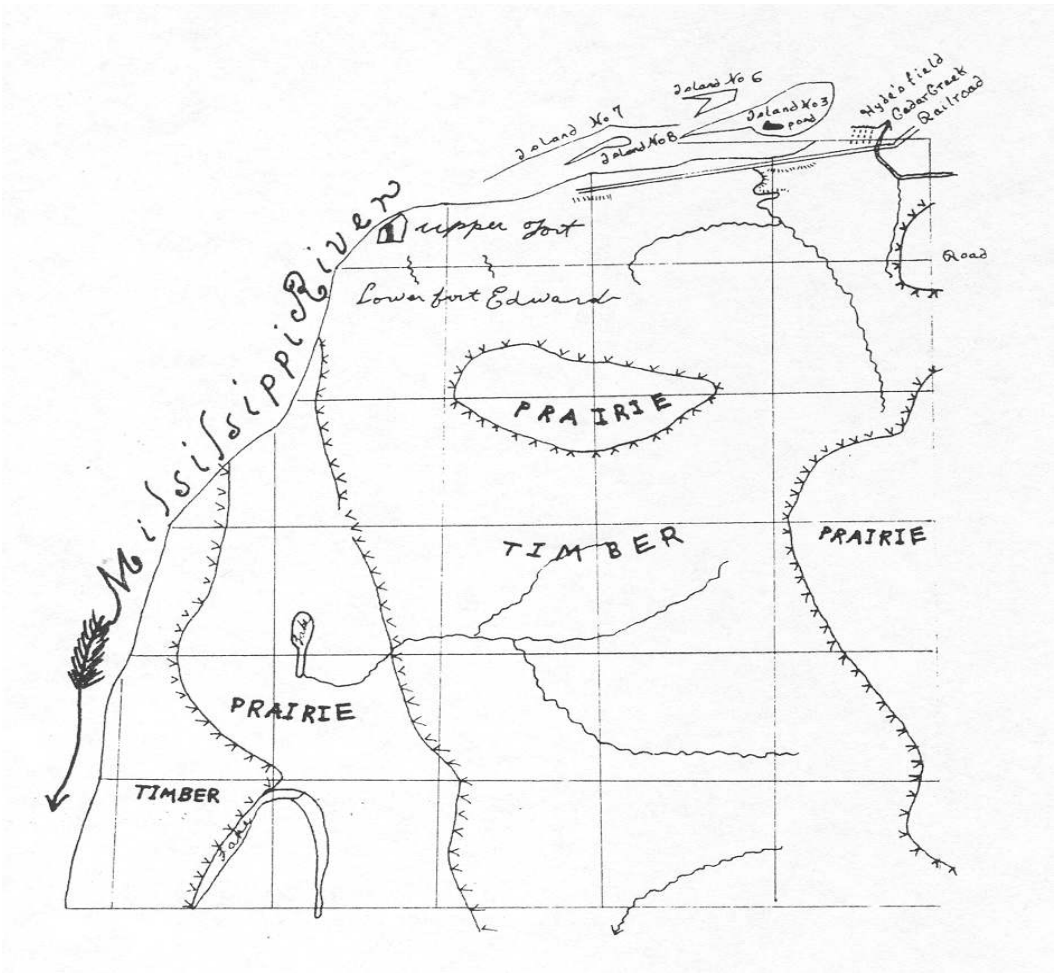

Figure 2.2. Facsimile of a plat of a Government Land Office survey of T4N, R9W in Hancock County, Illinois.

direction of these bearing trees from the section and quarter section posts were recorded along with the common name and estimated diameter at breast height (dbh) of each bearing tree (Figure 2.1). If in prairie or marsh vegetation, the section and quarter section posts were set and a dirt mound raised. The same procedure was then undertaken for the next section to the north. Therefore, a township was surveyed in tiers of sections. At the end of the first tier of six sections the survey crew returned to the southern east/west township line to start the next tier of sections until posts were established at the corners of all sections and quarter sections in the township.

In addition to recording the bearing tree data at each section and quarter section post, natural and artificial features were located in distances measured from the last section corner. Also, in forested areas the survey crew usually recorded and blazed any large trees on the section line (referred to as line trees), listing distance from the corner, as well as the name and diameter of the tree (Figure 2.1). The surveyors kept their notes in the order of the survey, and information for each section surveyed was frequently recorded on a single page (Figure 2.1).

The efforts of the GLO surveyors are still evident throughout the state. Roads are commonly placed along the boundaries of sections, creating the checkerboard pattern of the land that is so characteristic of the Illinois countryside. Sometimes these roads make a

jog in one direction before connecting with or crossing another road, corresponding to where a surveyor made a correction amidst the tallgrass prairie in order to connect with the next line. Also, many of the early farms were 40, 80, or 160 acres. A section is 640 acres, a quarter section is 160 acres, half of a quarter is 80 acres, while a quarter of a quarter is 40 acres.

The notes made by these early surveyors are invaluable to our understanding of the relatively undisturbed landscape of Illinois at the time settlement of the state was just beginning. These notes contain the most accurate records and scientific descriptions of this near-presettlement condition, as most of the surveys were completed before Europeans had greatly altered the landscape. By using these historical records, present day soil maps, and current field observations, it is possible to reconstruct the composition, and to some extent the structure of the presettlement vegetation of a particular area.

Many ecologists now believe that these early survey records provide the most reliable and accurate description of the presettlement vegetation that is available. Unfortunately, relatively few studies of the survey notes have been completed, with most studies involving a county-sized or smaller area. The few that have been completed for Illinois, however, indicate extensive prairie, mostly on relatively flat ground; open oak-hickory savanna and open woodlands on sloping topography of relatively low relief; and closed, more mesic forests on protected sites, particularly on areas of rugged topography.