BELL BOWL PRAIRIE AND CHICAGO ROCKFORD INTERNATIONAL AIRPORT

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SUMMARY

- Bell Bowl Prairie exists because of a highly unusual combination of topographic and soil conditions.

- Chicago Rockford International Airport was built on the same gravel deposit that was critical to the development and persistence of Bell Bowl Prairie. The prairie has survived to the present because the Greater Rockford Airport Authority has protected it.

- Native prairie is exceedingly rare in Illinois, and high quality examples are even rarer. The natural community at Bell Bowl, *Dry Gravel Prairie of the Winnebago Section of the Northeastern Morainal Division*, may exist in good condition nowhere other than Chicago Rockford International Airport.

- The Greater Rockford Airport Authority has an opportunity to permanently preserve a precious and irreplaceable remnant of our natural heritage.

WHY BELL BOWL PRAIRIE EXISTS

It is not mere coincidence that Bell Bowl Prairie is on the grounds of Chicago Rockford International Airport. Both the prairie and the airport are on a gravelly terrace beside the Rock River south of Rockford. The terrace was formed by torrents of water when the last glacier melted thousands of years ago.

The airport was built there to take advantage of the flat, elevated surface on the top of the terrace. Bell Bowl Prairie is on a bluff that forms one edge of the terrace. [*] Why is the prairie there in the V formed by the airport's two runways? Many factors are part of the answer, as discussed under the following headings.

Ecological factors

The region's climate is rainy enough to support the growth of forest vegetation. Trees grow well and can readily replace prairie vegetation in all but the driest situations, so the explanation for Bell Bowl Prairie lies largely in a suite of interacting factors which create dry conditions that retard the growth of trees.

[*] Originally the name Bell Bowl referred to an amphitheater-like niche in the bluffline. The name was subsequently applied to the prairie extending all along the bluff face (it was also called Airport Prairie). When I use the name Bell Bowl, I am applying it to the entire prairie-covered bluffline.

Topography and celestial geometry

The steep bluff at Bell Bowl faces southwest, fully exposing it to the sun in the middle of the afternoon. By that time of day, any surface moisture from dew or frost has already dissipated, so the energy of the sun that reaches the ground goes into warming and drying the soil.

At mid-afternoon on the Summer Solstice, the bluff at Bell Bowl Prairie faces directly toward the sun, and the bluff face is tilted so that sunlight strikes the steepest part squarely. When the sun's rays are perpendicular to the ground like that, they are the most intense. In other words, at the hottest time of day on the longest day of the year, the sun beats down the hardest on Bell Bowl Prairie.

At other times of the day and at other times of the year, sunshine is not so intense, but year-round the steep, southwest exposure at Bell Bowl receives more solar radiation than anywhere else around. The intense sunshine dries the soil and helps keep woody growth at bay, and this is key to the prairie's existence: if the slope were gentle or if it angled toward the north or east, prairie vegetation could not have persisted until today. Instead the prairie would have long ago grown up with trees if it was not farmed or developed.

The steep slope is what kept Bell Bowl from being farmed. Prairie used to blanket the regional landscape, but almost all of it was converted to farmland in the 1800s. Bell Bowl Prairie escaped this fate because the ground right there was too steep to farm.

Gravel

The terrace at Chicago Rockford International Airport is a great mass of gravel and sand laid down by glacial meltwaters. Although sand is intermixed with gravel at Bell Bowl, the gravel component is key because gravelly earth holds together better than sand. If the terrace were less gravelly and much more sandy, there would be no steep bluff: instead the slope would have long ago slumped down and spread out under the forces of gravity and water.

Because of the steep slope, Bell Bowl Prairie is exposed to the drying effects of the sun and wind, as discussed above and on page 3.

A steep slope promotes rapid runoff of rainwater and snowmelt. Runoff at Bell Bowl is retarded, though, by the fact that water readily soaks into coarse-textured, gravelly or sandy soil. However, this high infiltration rate is, in turn, counteracted by the fact that coarse-textured soil is highly permeable and has little capacity to hold moisture. Water that soaks into the ground percolates quickly down and beyond the reach of plant roots.

Calcium

The gravel at Bell Bowl is ground-up limestone or dolomite bedrock, which creates high concentrations of calcium (lime) in the soil. Excess calcium can be toxic to plants, and it can interfere with a plant's ability to absorb other minerals.

Bell Bowl has prairie plants that thrive on soil with high levels of calcium. Relatively few woody plant species grow well in high-calcium soil, so Bell Bowl generally favors the growth of prairie plants over trees and shrubs.

As the gravel particles at Bell Bowl very slowly weather and dissolve away, they act as billions of "timed-release" mineral capsules and constantly replenish calcium in the soil. If the soil at Bell Bowl were silty or loamy instead of gravelly, calcium probably would have been mostly leached out of the topsoil and depleted long ago.

Flat, open land adjacent to the prairie

To the south of Bell Bowl Prairie is a broad, level bottomland; to the north is a level upland. These flat, open surroundings are key to the development and persistence of Bell Bowl Prairie.

When the township that includes the Rockford airport was surveyed by the Federal government in 1836, the 36-square mile area was almost entirely prairie except for scattered groves and fringes of timber along watercourses. The presence of such extensive prairie is attributable to the level to gently rolling terrain, which allowed fires to spread unimpeded. Those fires were critical to creating and maintaining the prairie.

Prairie fires no longer spread all across the landscape, but level, open ground still plays a role in the ecology of Bell Bowl Prairie. If the bluff were hemmed in and sheltered by hills or woods to the south and west, it would not be covered with prairie. The presence of high ground instead of a lowland would dampen the drying effects of the prevailing southerly and westerly winds. If trees grew south and west of the bluff, they would do the same, even casting a shadow on the prairie if close enough.

At the top of Bell Bowl Prairie, the ground levels off and forms the extensive terrace that affords such a good site for an airport. Because this ground is so flat, there is no watershed to collect water and drain it onto the prairie; this lack of an uphill watershed contributes to the dry conditions that are so necessary for the prairie.

Wind

Wind comes predominantly from the south and west quadrants at Chicago Rockford International Airport, so the steep, abrupt, southwest-facing exposure of Bell Bowl is situated crosswise to the majority of moving air masses. Consequently the bluff is aligned to receive the maximum desiccating effect of wind – just as it is aligned to receive the maximum solar radiation.

Fire

All of the above physical factors are not enough to make the soil at Bell Bowl too dry to support woods instead of prairie in the long term. In the moist climate of northern Illinois, even the droughtiest soil will gradually be encroached upon by shrubs and trees if it is not periodically burned or otherwise cleared of woody vegetation. The ecological role of fire is further discussed below, under the heading *Early people*.

Other ecological factors and relationships

Ecological processes often work in concert. For instance, as noted above, gravel particles are responsible for the steep slope at Bell Bowl. The gravelly, highly permeable soil and the steep slope combine to create rapid drainage and dry conditions. Together the steep slope and the southwest orientation of the bluff face maximize the drying effects of the sun and wind.

Some ecological factors operate in a feedback loop at Bell Bowl, increasing their impact. For instance dry conditions make for sparse vegetation, and sparse vegetation allows more sunlight to reach the ground. Sunlight bakes the bare soil, and solar energy reflecting and radiating from the sandy and gravelly surface can cause plants to wilt and die – making the vegetation even thinner and the soil even drier. Here cactus is to be expected.

Unlike prairie in the arid Great Plains, prairie in the humid Midwest is prone to invasion by Eurasian grasses and weeds – which can gradually replace native prairie plants, especially if the vegetation is severely disrupted or is disturbed repeatedly over several years. The ecological factors that create dry soil and retard the encroachment of woody plants at Bell Bowl also limit the growth of most Eurasian grasses and weeds.

I will mention one more factor: low levels of nitrogen in the soil. The soil of Bell Bowl Prairie (and of most other native prairies) is naturally low in available nitrogen, the essential element that plants need in the greatest abundance. Weedy plants and woody plants in general require more nitrogen than prairie plants, so the limited nitrogen at Bell Bowl favors the growth of native prairie instead of weeds or woods.

Prairie persists at Bell Bowl because woody plants receive a one-two-three knockout punch from soil chemistry, extremely dry conditions, and fire.

Historical and human factors

Early people

Historical accounts reveal that lightning rarely started prairie fires in the Midwest. Instead people set the fires.

People migrated into the Rock River valley not long after the last glaciers retreated. This was at a time before prairie spread into the region, so people were present throughout the

developmental history of the prairie. Presumably those people set fire to the landscape, so the prairie must have developed its character under the influence of human-set fires.

Scientists studying the ancient climate and vegetation of the region have documented how prairie came in and replaced forest thousands of years ago. They found that prairie continued to prevail over forest even after the climate subsequently became cooler and moister, favoring a shift to forest. In other words, prairie persisted in a forest climate. Evidently fires that were set by people maintained prairie in a region that otherwise would have reverted to forest.

Prairie fires in Illinois usually spread toward the north and east from their ignition point because the prevailing winds are approximately from the south and west. Rivers acted as firebreaks, halting the flames. A widespread, repeated vegetation pattern in early Illinois was for prairie to extend right up to the south or west bank of a river, and for forest to extend out from the north or east bank in the "fire shadow" created by the river.

The Rock River (which flows immediately west of Bell Bowl) and the Kishwaukee River (immediately south of Bell Bowl) would have been effective in stopping fires that came from farther west or south. Therefore a dense forest might be expected north and east of the confluence of the two rivers. But instead when the land was surveyed in 1836, the area for many miles around Bell Bowl was open prairie with only small groves and wooded strips near the rivers.

People must have regularly set fire to this area or else it would not have been mostly prairie. The general vicinity would have been a suitable place for people to live (any high ground near water is likely to have an archaeological site). A large, permanent human population would not have been necessary in order to keep burning off the prairie. Once set, a fire could have spread far across the gently rolling landscape, so a few people occasionally passing through the area and setting it on fire may have been sufficient.

Bottom line: human-set fires are integral to the ecology of the region’s prairies.

Camp Grant

Bell Bowl Prairie became part of a big Army training camp in 1917. A natural amphitheater in the bluff served as an area for assembling troops (this amphitheater is the “Bowl,” the namesake for the prairie). According to the preserve management plan for Bell Bowl Prairie, the contours of the bowl were improved by grading in 1933. The preservation plan also states that there was “very minor damage along the bluff when it was used as a training site for trench warfare during World War I.”

The prairie was not grazed when it was part of Camp Grant, but it may have been pastured before it was acquired by the Army. Grazing probably was light and intermittent, though, because any source of water for livestock appears to have been distant from the prairie.

Chicago Rockford International Airport

Ownership of the area was transferred to the Greater Rockford Airport Authority in 1946. An aerial photo taken that year shows that Bell Bowl Prairie was largely intact. The bowl-shaped amphitheater is distinct in the photo, and two jeep trails extend up and down the face of the bluff.

The management plan states that light grazing caused minor damage to the middle of the prairie in 1957. Part of the south end of the prairie was hauled away for fill in 1968. An agreement between the Airport Authority and the Natural Land Institute in 1977 has allowed the Institute to manage the vegetation of the prairie preserve since that time.

Bell Bowl Prairie exists to this day because the Greater Rockford Airport Authority has protected it.

WHY BELL BOWL PRAIRIE IS VALUABLE

Value of natural areas in general

In 1972 George Fell [*] wrote an answer to the question, "Why preserve natural areas?" His answer spoke to the value of natural areas as sanctuaries for plants and animals – but it also spoke in terms of human uses: outdoor classrooms, living museums, reserves of breeding stock, and unknown but potential uses of wild creatures. Now half a century later, the list would include storage of carbon to forestall global warming. I don't expect, though, that a miracle drug will be derived from a microorganism in the soil at Bell Bowl, and this little prairie's contribution to carbon sequestration is infinitesimal on a global scale.

Prairies and other natural areas can be valued in their own right – not primarily for what they provide for people. A world in which society makes room for Bell Bowl Prairie is a better world. It is a world with a healthier environment not only for nature but for people too.

> "Even if there were no scientific values in a prairie, its aesthetic appeal alone would warrant its preservation. It is one of our links with the past – a tie with the natural world. It seems immoral to destroy an integral and important part of the biological world from which mankind arose." — Robert F. Betz, 1972.

[*] George Fell persuaded the board of the Greater Rockford Airport Authority to protect Bell Bowl Prairie in 1968. A lifelong resident of Rockford, George worked to establish the Illinois Nature Preserves Commission and The Nature Conservancy. His biographer, Arthur Melville Pearson, says, "George Fell is one of the most important but under-appreciated men in the history of American conservation."

High quality prairie community

With my first step onto Bell Bowl Prairie, I spotted New Jersey Tea, a prairie plant that I have never, ever seen growing naturally except on land that has never been plowed. Also there within the span of a yard were False Toadflax, Leadplant, and Prairie Cinquefoil – all of which are expected to occur only in an intact, high quality plant community.

I knelt and fingered through one-hundredth square meter of the prairie, a 4-by-4-inch square; in an area the same size and shape as the bottom of a half-gallon milk carton, I found nine different kinds of plants. Such extraordinarily high species diversity is a hallmark of truly high quality, primeval prairie, a community that developed over a very long time without disruption.

In 1867 John Muir, the father of wilderness preservation in America, spent a week studying the prairie about 17 miles west of Bell Bowl. He wrote to a fellow botanist about the plants:

"All were just in place; every leaf had its proper taper and texture and exact measure of green. Can it be that a single flower or weed or grass in all these prairies occupies a chance position? Can it be that the folding or curvature of a single leaf is wrong or undetermined in these gardens that God is keeping?"

Rare prairie community

As George Fell said, "Nothing becomes valuable until it becomes rare." Our native prairie is so highly valued because it is vanishingly rare. A high quality, old-growth prairie is the Midwest equivalent of a cathedral redwood grove – only far, far rarer.

Almost all of the prairie in Illinois was plowed up, except on land that is too steep, rocky, sandy, gravelly, or wet to cultivate. Most of the prairie that escaped the plow was destroyed by overgrazing or has grown up with trees. Only one-hundredth of one percent of the original prairie remains in good condition, in hundreds of fragments.

Gravel prairie is among the rarest of the rare, comprising about 3% of the remaining acreage of high quality prairie in the state. Among the three kinds of gravel prairie, Bell Bowl is a *dry* gravel prairie community.[*] The Illinois Natural Areas Inventory found 18.4 acres of dry gravel prairie in good condition in the entire state. In order to discuss the prairie at Bell Bowl further, I will provide some background about how prairies and other natural communities are classified.

[*] The other two types of gravel prairie are *mesic gravel prairie* (i.e. moist gravel prairie) and *dry-mesic gravel prairie* (in-between dry and mesic).

The "Classification of Natural Communities in Illinois" defines approximately 100 different community-types: dry gravel prairie, wet floodplain forest, high-gradient creek, and so forth. The natural community classification system incorporates the "Natural Divisions of Illinois," which subdivides the state into 34 natural regions on the basis of physiography, glacial history, bedrock, soil, and the distribution of native plants and animals.

Over the decades since I wrote the final report for the Illinois Natural Areas Inventory in 1978, a critical point about the natural community classification system has been pretty much overlooked and forgotten: A *natural community* is a combination of a *community-type* and one of the 34 *natural regions*. That is, each community-type is classified as a different, distinct natural community in each of the natural regions where it occurs. [*]

Specifically, the natural community at Bell Bowl is classified as *Dry Gravel Prairie of the Winnebago Section of the Northeastern Morainal Division*. This natural community is distinct from, for instance, *Dry Gravel Prairie of the Oregon Section of the Rock River Hill Country Division*.

According to the most recent information available to me from the Illinois Natural AreasInventory, the approximately 5 acres of high quality prairie at Bell Bowl is the only remaining intact example of this natural community in the state: that is, it is the only high quality remnant of Dry Gravel Prairie of the Winnebago Section of the Northeastern Morainal Division.

If the inventory and classification system that was developed by the Illinois Natural Areas Inventory could be extended across the state line into Wisconsin, there is a chance that more of this natural community might be identified. However, the current state of knowledge indicates that Chicago Rockford International Airport has the only high quality example of this prairie community in the state, and this may be the last bit of it on Earth.

Rare species

I will limit my discussion to plants instead of including animals in order to be briefer and to focus on what I know best.

The dry, calcium-rich soil at Bell Bowl provides habitat for a number of rare and unusual plants. This prairie is the only known place in Illinois where two rare species of wind-flower can be found together in the wild: the delicate Carolina Anemone and the beautiful Pasque Flower. Prairie Smoke, a member of the rose family, is at Bell Bowl too; it grows as far north as the Yukon Territory, and it is at the absolute southernmost margin of its vast range at Bell Bowl.

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[*] The purpose of combining community-types with Natural Divisions is to ensure that regional differences in the ecology of a community are recognized. A wet prairie north of Chicago, for instance, has soil, plants, and animals that are quite different from that of a wet prairie south of Springfield.

Several of Bell Bowl's plants are common on the Great Plains but rare in Illinois. These plants occur at Bell Bowl because its dry soil is similar to their western "home on the range." Two of the plants are so rare that they are listed by the State of Illinois as Endangered: Prairie Dandelion and Large-flowered Beardtongue.

Western prairie plants spread into the Illinois during a period of hotter and dryer climate that began about 8,000 years ago and ended about 5,000 years ago. Since then the climate has moderated, and this suite of western plants has gradually died out everywhere except on the very driest soil. Without Bell Bowl and a few other tiny refuges, we would have no living proof that these species ever occurred so far east on the continent – and we would have no such evidence of the last major episode of global warming.

Beauty

One of the last things George Fell wrote, in 1993, is this: "It seems to me that natural beauty is at the very basis of our love of nature and our striving to preserve the natural world."

Some will say that the beauty of prairie is subtle, and its appreciation is an "acquired taste." But to see Bell Bowl Prairie in the early spring when Shooting Stars and Pasque Flowers are abloom is an experience not to be forgotten. Rarity and beauty: that's Bell Bowl Prairie.

Bell Bowl Prairie in a broader context

The recently announced "30 x 30" initiative or "America the Beautiful" campaign calls for 30% of the land and water area in the United States to be under some sort of protected status by 2030. This project will start out as an accounting process: deciding what kinds of areas qualify as "protected" and then adding up their acreages. The hard work will be when more lands and waters are brought under protection: a new wildlife refuge, another nature preserve, and maybe farmland that is managed with extra conservation measures.

It will be easy to meet the 30% goal in some mountainous regions, but it will be a big challenge in Illinois – and impossible in many counties unless farms can qualify.

In my view, some protected acres should count for more than other protected acres: a natural prairie is far more valuable than a planted prairie, for instance. Winnebago County, the home of Chicago Rockford International Airport, is relatively blessed with wildland; other Illinois counties have mere vestiges of natural land. Considering the condition of the state as a whole, Bell Bowl has a "county's worth" of prairie.

PRESERVATION OF BELL BOWL PRAIRIE

In 1977 the Board of Commissioners of the Greater Rockford Airport Authority resolved that it "shall make every effort possible" to preserve Bell Bowl Prairie so long as it "shall not interfere with the necessary operation of the Airport." Now for the greater good, I am asking that the Greater Rockford Airport Authority make a further effort to preserve the prairie.

Bell Bowl Prairie can be spared by redesigning the airport expansion and by building "green infrastructure" next to the prairie – perhaps even showcasing the prairie. This will be more expensive than "business as usual" in the short term – but worth the price for a priceless prairie.

My plea for preservation is not an unfounded "land grab" attempt and it is not knee-jerk opposition to development. It is a plea to preserve the precious and irreplaceable. This is an opportunity for the Greater Rockford Airport Authority to build a model environmental facility and to take the lead into the future.