



Restoring Native Vegetation in Lexington, Kentucky

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Julian Campbell, Jan 2012; <http://bluegrasswoodland.com>

One of the biggest challenges for a botanist living in Lexington (Fayette County, Kentucky) is confronting the forces here against restoration of native plants. These forces begin with the unusually fertile soil. Not only is Lexington the 'Horse Capital' of the world, it is also a Weed Capital. Phosphatic limestone, deep silty soil, and humid climate make for vigorous growth of weedy 'ruderal' plant species that have arrived from across the Atlantic and Pacific Oceans. In more open, disturbed sunny sites, these weeds tend to overwhelm most native plants.

Vigorous competitive native plants do exist but in most areas they have been eradicated by two centuries of intensive farming. Small patches of many natives survive at only a few sites, usually along streams or old fencerows, and in occasional woodlots. A few species remain quite common, but the general public tends to regard them as unwanted 'weeds'—plants in the wrong place, even if colorful.

General fear of weedy plants by the public—'phytophobia'—is a significant factor. It is important for the botanist, first, to be understanding. Some native plants are indeed irritating—in truth or appearance—and some are downright dangerous if abused. It took me several years of regular exposure to poison-ivy before I became largely immune (other than a little inoculating rash at the start of each new season). And it took an overdose of poke salad (three big helpings in a week) to convince me that the plant can be poisonous if enough mature foliage is consumed.

However, there can also be a degree of irrational paranoia in some reactions to wild-looking vegetation. Fear of snakes is sometimes invoked, but no poisonous snakes are known to reside in town today. Of course real decline in the value of Real Property might also occur if weeds are perceived to be a problem. But repression based on fears can become excessive or unfair, if there are no real practical problems, such as structural damage to buildings or obstruction of sidewalks. If we are to enhance some riparian corridors, some roadsides, and some backyard woodlots with more wild vegetation, it would be good to have more mutual understandings between

proponents and opponents. Better guidelines or even regulations for wilder sites can be developed, but clearer limits to governmental intrusion on private property should also be defined.

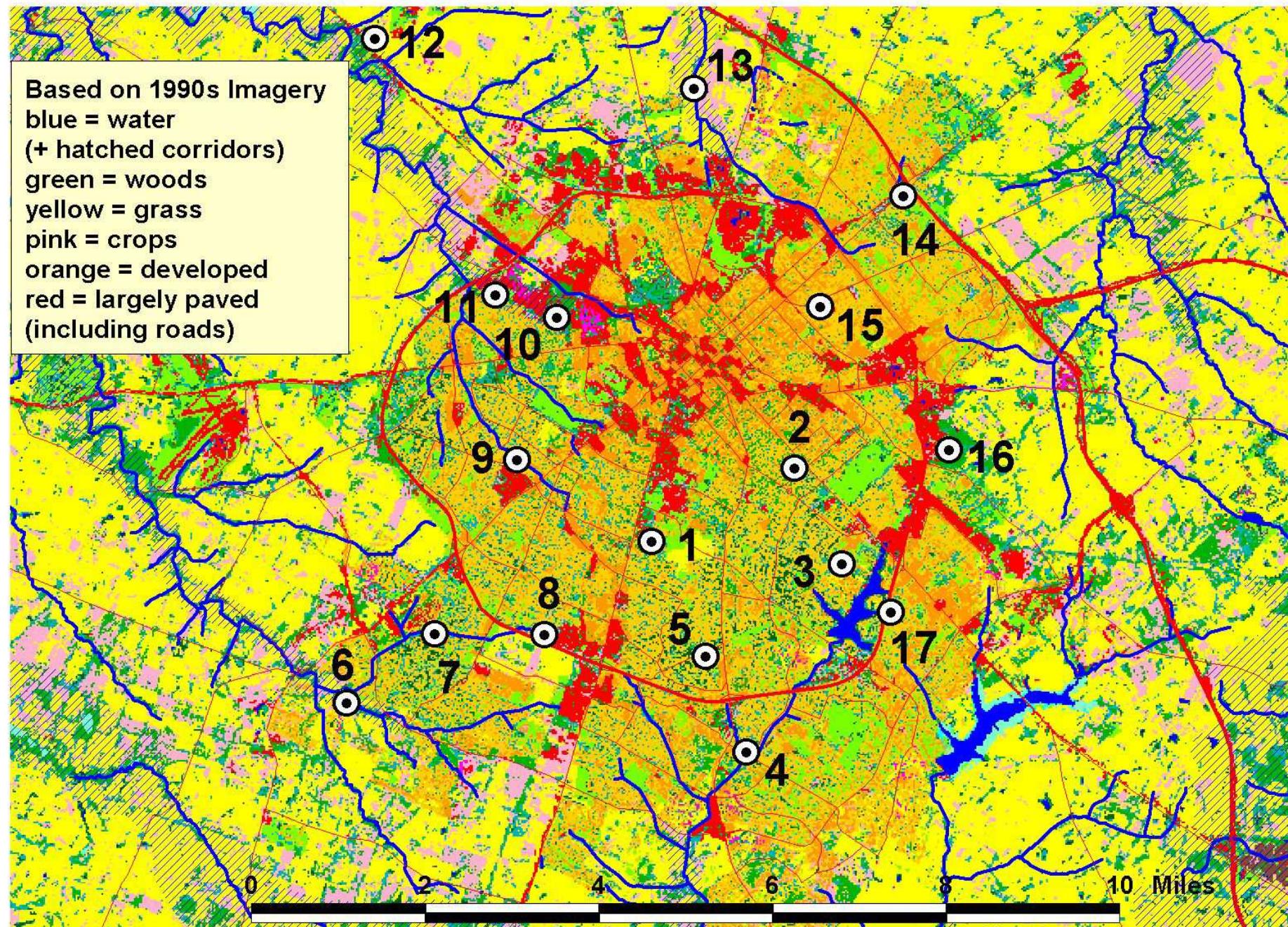
It is a paradox that wilder sites within urban areas can actually develop more biological diversity than many rural areas. If an urban neighborhood is designed for more natural features, and there is continuing commitment by residents, it can develop diverse habitats for native plants and animals. In contrast, much farmland becomes increasingly depauperate, especially with large uniform fields, herbicides, and cleaned up fencerows. Moreover, deeper shade is generally impossible where farming is intense, but shade trees can become highly influential in many urban areas.

The following notes focus on sites where special remnants of native vegetation exist or where they may be readily restored. The list of sites is provisional. Some sites are clearly priorities, but the fate of others hangs in the balance—much will depend on the degree of interest in them, followed by appropriate actions of neighborhoods and local government. There is potential at these sites for the community to learn from experiences in protection and restoration.

Optimal management of these areas remains uncertain, because there is little documented history of varied scenarios from which to compare and learn. While there is general agreement that some selected native species are good to promote, the widespread invasion of bush honeysuckle, winter-creeper, garlic-mustard and other alien weeds often seems to be an intractable problem. How much effort is needed to achieve a satisfactory degree of continual reduction in these weeds is hard to estimate. On top of that problem, we need to balance wilder looks with public intolerances, another unpredictable matter.

Native plants are relatively well known in the central Bluegrass region, but few local nurseries have special interest in promoting them. For restoration of sites devoted to truly native plants, ideally with genetic provenances from the region, there has to be propagation from local sources. Some of these sites, themselves, can become important living collections and offer propagation for the long-term. Cooperative work among interested people could lead to a network of sites, with shared material, information and insights.

Lexington (Fayette County): sites with special interest for restoration of native vegetation.
See text for notes under each number.



Landscapes: selected sites of special interest.

The most obvious large-scale connections between Lexington and its original natural landscape lie in its riparian corridors. These provide potential for broad greenways along the following creeks.

East and West Forks of Hickman Creek

South Fork of Elkhorn Creek

Wolf Run and Town Branch (to Middle Fork of Elkhorn)

Cane Run and North Fork of Elkhorn

The sites listed below are largely disconnected from those riparian corridors, and located in more urban settings. Most parks and cemetaries are not included, because of their more active management, but several do have special interest for wildlife and wild flowers (as in the Lexington Cemetary).

1. UK Arboretum (on south side of University of Kentucky campus). The 15 acre woodlot on the western side of the Arboretum, along Shady Lane, is the best remnant of original woodland within the city. Due to active management, the alien plants have been largely eradicated. The Arboretum itself also has much further value for selected plantings of species native to the region.

2. Ashland (the old Henry Clay home on Richmond Road).

This historic property is famous for the large old blue ash trees that were left around the house for shade, after the site was first settled. There is also a remarkable population of running buffalo clover.

3. Henry Clay High School Woods (on slope behind school).

Woods here used to have native wildflowers, but are now full of honeysuckle and winter-creeper. Some restoration has been tried..

4. Gainesway Greenway (from Tates Cr Rd to Armstrong Mill Rd).

Remnants of original woods are now starting to be enhanced with a grant for riparian restoration from LFUCG.

5. Lansdowne Woods (behind country club on slope by creek).

Woods here used to have native wildflowers, but now are overwhelmed by honeysuckle and winter-creeper.

6. South Elkhorn Corridor (general location along S side of town).

Needs assessment, with a series of sites upstream to Shillito Park.

7. Stonewall Elementary School Woods (with adjacent park).

Several wildflowers may still occur in woods. The neighborhood has tried to restore some areas, but there is much more work to do.

8. Stone Road Montessori School (field, stream, woods by school).

There are green ash woods on lower ground, plus much current planting by school, and the re-engineered creek.

9. Allendale Greenway (on north side of Lane Allen Road).

Riparian-wetland complex with much potential for further restoration and establishment of propagation center for riparian plants in town.

10. McConnell Springs (www.mcconnellsprings.org).

This original campsite of Lexington has now been converted into an historic park, with several original features in geology and vegetation, plus much recent planting. But alien plants still rule much of it.

11. Preston Springs (on N side of Dunkirk Drive).

Downstream of McConnell Springs, this flows into Wolf Run before passing under New Circle Rd. The adjacent Wolf Run corridor is also well-wooded, but much restoration is needed away from the creek.

12. Town Branch Trail (from Alexandria Drive to Bracktown).

This recently constructed trail connects several features of interest, including extensive cane near the railroad, and Lindsay Spring, where a rare aquatic plant was recently rediscovered (*Elodea canadensis*).

13. Cane Run Reforestation (between Citation Blvd. and I-75).

In 1999/2000 this area was the first ‘Reforest the Bluegrass’ project of LFUCG. A new canebrake was established by planting of JC et al.

14. Pinehurst Sink (SE side of Old Paris Pike, before I-75).

There is a curious collection of old trees here, including a huge cypress that some people have thought native but is probably not.

15. Castlewood Park (start of Bryan Station Rd near Loudon Ave).

A few ancient oaks remain in this remnant of old woodland pasture, now converted into a city park, gradually losing its original character.

16. Liberty Road Woods (largely destroyed in 1990s). Several special botanical features used to occur here, including patches of cane, the only *Helianthus mollis* known in central Bluegrass, and a few plants of running buffalo clover. JC attempted to raise issues during rezoning process, but was overwhelmed by W.T. Young et al.

17. Patchen Woods (largely destroyed in 1980s). This used to be a nice site for wildflowers. Willem Meijer and students in the 1970s found mayapple, wild hyacinth, trout lilies and trilliums. Communications with developers were too late and fruitless. Information about sites 16 and 17 still deserves to be written up for historical insight.

Habitats: problems in definition and restoration.

These classes of habitat often grade into each other, and can be defined or mapped in varied combinations.

A. Riparian and Wetland Habitats

A1. Riparian ('streamside') woods and streams. Streambanks (especially levees) are not usually 'hydric' in the sense of soil science. They have temporary flooding, scouring and siltation that significantly influences the vegetation, which often recovers rapidly after disturbance. Typical trees are able to resucker after damage, and have root systems that can form highly branched 'wads' on unstable banks (especially the dominant species). These are mostly sycamore and boxelder, plus local silver maple and occasional cottonwood along larger streams. Other trees include white elm, green ash (wetter sites), and black willow (especially ponds). Riparian habitat is still widespread in Fayette County, though much reduced and restricted to narrow strips.

The streams themselves, together with open shrubby or grassy banks, formerly had narrow zones of distinctive plants, but these species have mostly disappeared from more urban environments. Some aquatic plants would have occurred within relatively unpolluted free-flowing streams, plus water-willow (*Justicia*) in riffles. Woody willows (*Salix*) occurred on banks in broader corridors, plus some dogwoods (or 'osiers'). Larger streams would have had more zonations on banks, from shoals with partly submerged plants, to low lagoons with sedges, to exposed substrates with abundant annuals, to more stable shrubby levees, to higher ledges with perennial grasses and characteristic forbs. Wild ryes, wild oats (spangle-grass), and other species are characteristic of more shady transitions to adjacent riparian forest.

Land in riparian zones is generally protected by law from development in Lexington. However, the quality of remnants is generally low. The common tree species tend to spread rapidly and put on vigorous growth. But seed sources are generally absent for many shrubs, grasses and other wildflowers. There is an urgent need to propagate some of those species. Problematic alien species include a few aquatics and subaquatics. Also, on well-drained streambanks, common aliens of the uplands are usually abundant, especially Amur bush honeysuckle and purple winter-creeper.



Amur bush honeysuckle removal is good exercise and brings communities together around a common purpose; it is also goat food!



Mowed eroded bank below an old dam; woods in the background grew up where mowing ceased 20 years before, mostly boxelder.

A2. Hydric-tending woods and associated openings. This used to occur on lower floodplain terraces or in swampy upland swales and seeps, where there is temporary to seasonal flooding or saturation and high water tables. Although soils are generally damp or wet, there can be occasional droughts. There are scattered small openings, especially in wetter areas. Green ash was dominant in these woods, together with much white elm; other trees included shellbark hickory, bur oak, shumard oak and, on wetter sites, swamp white oak and swamp red maple. Sedges, rushes, grasses and shrubs are often abundant in the understory, especially in more open woods close to streams and seeps. Such woods are widespread in the state, but good examples here are mostly small and threatened by human disturbances.

Before Virginian settlement, open phases of this habitat class were promoted where there was seasonal ponding in winter—then perhaps licking, stamping and wallowing by larger animals in summer. Modern ponds tend to be more artificial, but often become recolonized by some native plants. Deeper ponds would have had buttonbush, black willow and perhaps swamp dogwood. Wetter zones can include locally abundant cat-tails, grasses, sedges and knotweeds, grading into duckweeds, pondweeds, water-lilies and other floating or submerged aquatic vegetation in open water. Mudflats and other exposed shorelines can become colonized by many native and alien annuals.

The few small remnants of these habitats in Lexington include the woods behind the Montessori School on Stone Road, the nearby woods on Eastway Drive, and parts of the Allendale Greenway. Given the pending demise of green ash due to Emerald Ash Borer (EAB), a special issue for the community is—what trees, if any, will be kept alive with insecticide, and will seed be collected for posterity?

More open phases of this habitat will increase when ashes die, and it will be important to have a ready supply of native trees or shrub species for replacing the ashes where needed. The Allendale Greenway could be developed partly as a nursery for wetland and riparian plants to be used in the community.

There are several invasive alien plants typical of hydric sites. However, detailed study is often needed to determine the exact mix of native or alien plants at a site; see notes below on alien plants.



Allendale Greenway: the wettest section was enhanced by LFUCG's contractors in 1980s, now harboring a family of snapping turtles.



Green ash is locally dominant in subhydric woods, but will be mostly killed by EAB; seed can easily be collected and stored for future use.

B. General upland woods, without hydric or xeric conditions.

There is a gradient associated with increasing disturbance history.

B1. Mesic woods. This habitat used to occur on alluvial terraces, on some relatively undisturbed uplands with residual soils, and on steeper colluvial slopes, especially NE-facing. It has largely disappeared in the modern landscape, but there are a few remnants on steeper slopes.

Typical trees were sugar maples, basswoods, buckeyes and bitternut hickory. Also, much beech and tulip poplar occurred locally on Eden Shale (to east side of town). More stressed or disturbed transitions can also have locally abundant white ash, red elm and northern red oak.

For restoration, it will be important to recover shade where needed, using additional plantings of sugar maple and its associates. This can be accomplished in just 10-20 years, depending on planting methods.

Many wildflowers generally deserve propagation, and we need trials with different species to determine which species can most reduce invasion by aliens. Effective species may include wild ginger, waterleafs, mayapple and wood-nettle. Invasion by honeysuckle and winter-creeper is generally extensive, and it is not clear what optimal methods should be used to reduce these plants (as discussed below).

B2. Submesic woods. This heterogeneous habitat class was extensive before settlement, and much woodland today represents depauperate variants. It was most extensive on gentle slopes and flats with residual or alluvial soils that have some dry or damp season. It was probably associated with much browsing by wild hooved animals, but influences of livestock have now generally been excessive. Typical trees included hackberry, black walnut, buckeye, mulberry, coffee tree, ashes, elms, hickories and oaks. There were local thickets of cane, pawpaw, coralberry, other shrubby species and common woody vines, also dense ground vegetation dominated by tall herbs and cool-season grasses.

For restoration, some propagation and planting of trees is generally needed, but less than in mesic woods. The main challenge is to determine what disturbance regime is needed to maintain a reasonable balance of native versus alien species (as discussed further below). Many wildflowers generally deserve propagation and planting. Species that may be most effective in reducing alien invasion include white snake-root, wild-rye and various sedges.



In sugar maple woods, deep shade and deer browsing can reduce the degree of invasion by honeysuckle, but continual work will be needed.



Young submesic woods of Dave Svetitch near Lexington; he reduces winter-creeper and honeysuckle by annual brush cutting and poison.

B3. Thickets maintained by repeated disturbance.

Before settlement, such vegetation included several thorny or root-sprouting species, including much cane (*Arundinaria*). Today small patches occur in forest-edges, brushy grasslands, and some old fields, but usually in a depauperate condition dominated by briars (*Rubus*). The most characteristic larger trees include honey locust, black locust, black cherry and osage orange; also, persimmon and sassafras are often present on more acid soils to the east or south. Smaller trees and shrubs used to include pawpaw, redbud, dogwoods, black haws, hawthorns, crabapples, plums, sumacs, roses, coralberry and prickly-ash.

Much opportunity exist for this habitat, especially along larger roads and in varied tranitions between open land and woods. However, the place of native species has been largely taken up by bush honeysuckle and other alien shrubs. Moreover, local seed sources for several of the typical native species are often lacking. And the optimal disturbance-regime remains unknown. It is likely that cutting, browsing or burning at 5-10 years intervals will be generally needed to simulate conditions that existed before Virginian settlement.

B4. More open oak-ash woodland and grassland.

Such habitat today appears to have been largely created by management for woodland-pasture during 1800-1860, but something like it probably used to occur around villages and campsites of native peoples, and along larger animal trails. Typical native species include bur oak, shingle oak, ashes, sedges and grasses (such as ‘nimble-will’). It is sometimes supposed that prairie-like conditions were common in the central Bluegrass before settlement, but historical evidence indicates otherwise. The original woodland was generally brushier, deeper or shadier than ‘savanna’ or ‘prairie’—in the usual sense of those words.

Restoration and maintenance of open grassy vegetation is a challenge, if the plants are to be truly native. We need more concerted trials with varied mixtures, in order to determine the best prescriptions. There has been much local sowing of grass seed from more western prairies, often in the name of ‘providing habitat for wildlife.’ Such efforts cannot be called true restoration, though they do provide some useful ecological function and biological interest. But if just left alone, old fields tend to become dominated by natives after 10-20 years.



Roughleaf dogwood is a good native substitute for bush honeysuckle; also, Miami-mist and native grasses can be sown to reduce reinvasion.



Cane was among the most common plants in more open woodland before settlement; we planted this patch at Cane Run in 1999/2000.

C. Subxeric oak woods and rocky glades.

These habitats occurred only on moderate to steep slopes and ridges, with well-drained to droughty soils that are locally rocky with outcrops or colluvium. Subxeric woods are best developed on steeper SW-facing slopes, but few remnants occur today. Disturbance from burning or browsing may have occurred before settlement but was probably not enough to thin out the tree canopy and maintain large grassy openings. Typical trees included chinquapin oak, shumard oak, shagbark hickory, white ash and blue ash. On more acid soils to the east (derived from Eden Shale) and south (on ridges near the river), other trees included white oak, black oak, pignut hickory and mockernut hickory. Without any disturbance, the understory often shifts through time to include more mesic species such as white ash, red elm and sugar maple.

For restoration, we need seed sources and propagation of the common oak, hickory and ash species. Although the Division of Forestry supplies a few from their nurseries, more diversity is desirable in species and provenances. It will also be important to select sites where frequent droughts and fires could be involved in a naturalistic ecology. Suitable sites may not exist within Lexington, but could be established locally along larger stream corridors a few miles distant.

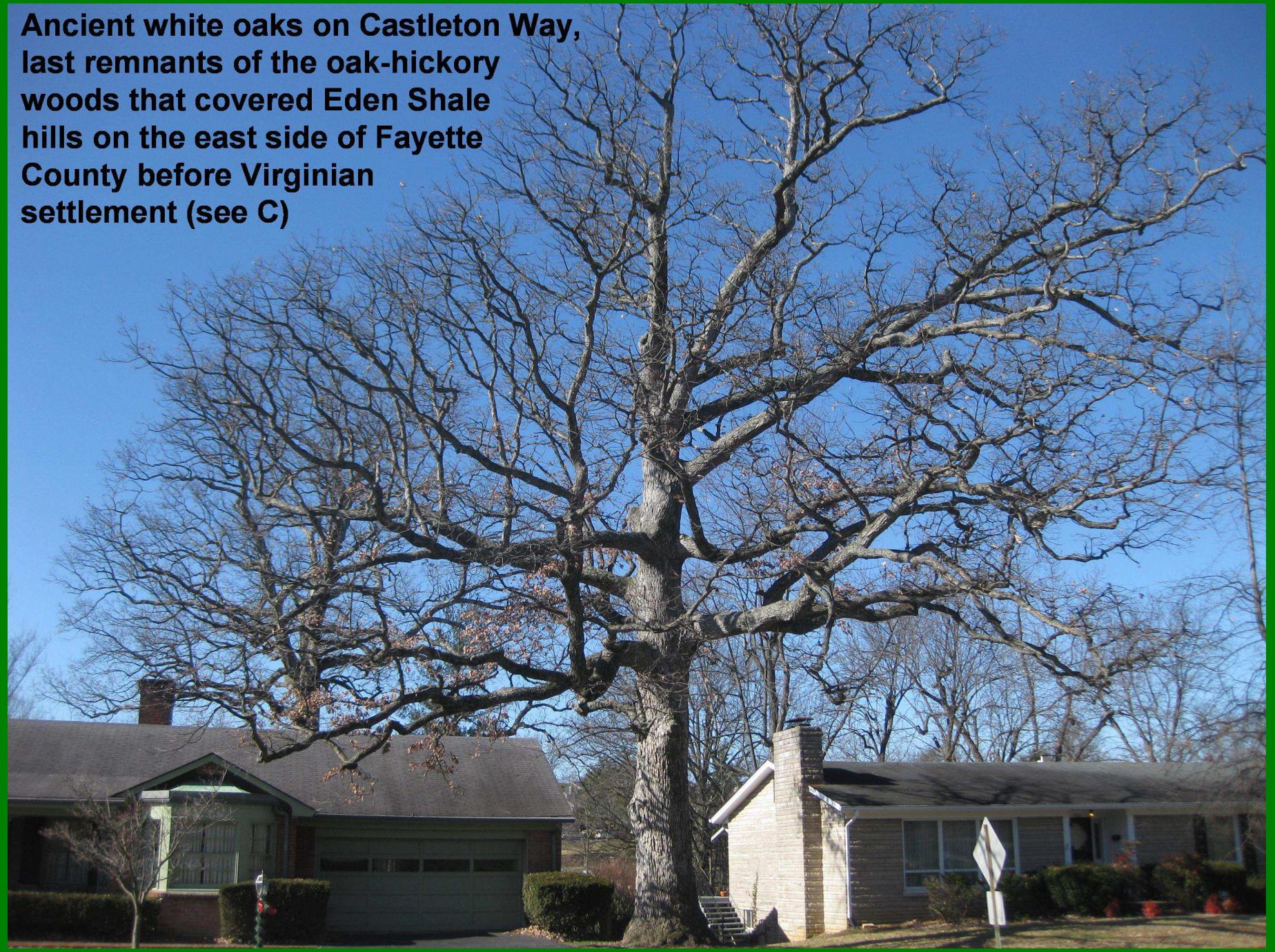
In nature, more open rocky sites with trees stunted by truly xeric conditions are largely restricted to cliffs along larger streams near the Kentucky River. However, intensive grazing, erosion and other modern disturbances has exposed rock in other areas. Within a few miles of Lexington, a few rocky sites have been found with prickly pear and gromwell (an endangered herb species). Such places may be remnants of old licks and buffalo roads.

Restoration of more xeric sites would generally not be a historically accurate pursuit for Lexington, but there is much interest in the ‘xeroscapes’ that can be designed for rocky roadcuts, paths with paving stones, hot rooftops and the like. Several showy species are known from glades and cliff tops in the wild that might be brought into more urban settings. These include annuals like pink stonecrop (*Sedum pulchellum*) and baby’s breath (*Minuartia patula*), plus perennials like *Phlox bifida* and cliff pink (*Silene caroliniana*). The prickly pear—a cactus—is also spectacular but rather dangerous close to paths!



Phlox bifida is a rare plant in Kentucky, largely restricted to cliff tops along the Kentucky River and Green River. But it is easily grown on rocky sites, such as this curb outside the author's house. Later in the year, this site supports a Saint John's wort (*Hypericum sphaerocarpum*) and a rare Rudbeckia (*R. truncata*).

**Ancient white oaks on Castleton Way,
last remnants of the oak-hickory
woods that covered Eden Shale
hills on the east side of Fayette
County before Virginian
settlement (see C)**



Species: natives for propagation and recovery.

Given the general removal of native vegetation it is difficult to develop initial priorities for propagation. But from an overall review, some ecological groups clearly deserve special focus.

Woody species. Trees of deeper woods deserve general planting on suitable sites: sugar maples, basswoods, buckeyes, elms, ashes, oaks and hickories. For species afflicted by pests and diseases, special efforts are needed to collect seed and develop resistance; these species include white and green ash, elms, walnuts and mulberry.

Small trees and large shrub species are especially reduced on the modern landscape, and there are few sources in local nurseries.

Species to focus on include spicebush, pawpaw, bladdernut, hornbeams, dogwoods, viburnums, plums (some edible) and cane.

Woodland perennials. Several ecological groups have been greatly reduced, but some relatively ephemeral and spring-flowering species can recover gradually from starts during initial restoration of shady woodland: fragile-fern, wild ginger, twinleaf, bloodroot, larkspur, false rue-anemone, mayapple, wood-spurge, spring beauty, sessile trillium and wild onion. Trout-lilies and wild hyacinth are slower.

More disturbance-tolerant species include buttercups, wood-chickweed, woodland phlox, woodland bedstraw, running waterleaf and gregarious sanicle. There is special interest in the globally imperiled running buffalo clover, and a few other rare stoloniferous species associated with trails and mowed areas. A few uncommon to rare ‘rosette’ plants also deserve attention, including rich woodland fern (*Dryopteris carthusiana*), wild comfrey and showy orchid.

Some species of less disturbed woods are relatively robust, with divided leaves and widely branched early inflorescences: doll’s eyes, blue cohosh, sweet cicely, golden alexanders, lowland coneflower and green dragon. Others have simple leaves: enchanter’s nightshade, wood-nettle, zig-zag goldenrod, Short’s aster and white snake-root.

Monocots of interest include common Solomon’s seals and cool-season grasses: woodland bluegrass, woodland fescue, the wild-ryes and common broad-leaved early-panic. Grasses more restricted to hilly terrain near the river are wild-oats, lowland wedge-scale and woodland brome. There are also several sedges to promote.



Goose plum, a midwestern delicacy that was probably associated with Indian villages and animal trails before Virginian settlement.



Blood-root, a spectacular early bloomer in less disturbed woods; it used to be frequent in the Lexington area according to Short (1828).

Selected perennials of more open woods and grassland.

Initial focus should be on less common species that are readily propagated and widely recoverable in open woodlands, old fields or other restored grasslands. Such species include agrimonies, milkweeds, germander, wood-mints, bergamots, beardtongues, running coneflowers and gray-headed coneflower. Additional rarer species are also appropriate for drier or damper sites.

Some plants are particularly tall, showy and suitable for damp meadows: senna, lowland phlox, lowland rosinweed, ox-eye sunflower, meadow sunflower, wingstems, lowland goldenrod and tall purple aster. Less common are tall nettle, bundle-flower, broad-leaved scurf-pea, figwort, giant hyssop, lowland rosinweed, tall wood-rosin (*Smallanthus*), giant wood-lettuce and midwestern lily.

Selected biennials and annuals. Several species can be sown and will increase on their own in suitable habitats. The biennial waterleaf and purple phacelia are particularly showy species for potential mass use in deeper woodlands on slopes. Biennials for more disturbed areas include the globally imperiled bladder-pod (*Physaria*), and some taller later flowering species: lowland gaura, beggar's lice, giant blue lobelia, tall bellflower, trilobed coneflower, tall blue lettuce.

Some spring annuals recover readily after initial sowings. Miami mist is especially useful and showy; others include corydalis, corn-salad and woodland wild-chervil. Uncommon to rare species include large mouse-eared chickweed, southern nettle, blue-eyed-Mary; mermaid-weed, and water stitchwort (formerly along North Elkhorn).

A few summer annuals also deserve attention: especially jewelweeds and the mysterious hog-peanut (or peavine). Hog-peanut is a twining species, abundant before settlement but now almost all gone in Lexington. Initial efforts to propagate it have been difficult, partly because the plant is a favorite of herbivorous mammals.

Aquatics. A varied set of natives can be tried, from fully submersed species such as milfoils and elodeas, to floating water-lilies, to emergents such as lizard-tail, blue-flag (iris) and larger sedges. There are several buttercups, arrowheads and allies. The rare white water-crowfoot (*Ranunculus longirostris*) is an indicator of less disturbed streams, and successful recovery would prompt celebration.



The midwestern “Michigan” lily has become virtually extinct in the region after settlement, when hogs began to root it out for food.



As recently as the 1970s, Miami mist was locally common along less kempt roadsides and in thin woods, before invasive of aliens.

Species: aliens for reduction and continuing control.

The following species present serious problems. These woody plants were all introduced and promoted initially for horticultural uses in North America, but most of them are now regarded as pests or veritably noxious. Some of them are still being purveyed.

Vines. Purple winter-creeper (*Euonymus fortunei* and variants), which is able to cover ground in the shade as well as climb up trees, is becoming the most serious alien problem for restoration of our woodlands, even more so than Amur bush-honeysuckle. Other vines are generally more local but may increase at some sites: English ivy; Japanese clematis, Asian bittersweet and porcelain berry.

Shrubs. Amur bush honeysuckle (*Lonicera maackii*) is the second most serious problem for restoration of native woodlands. Other widespread invasives include burning bush and multiflora rose. Less widespread are Japanese barberry, Siberian crabapple, Dahurian buckthorn, Russian olive, Chinese privet and others.

Trees. The most widespread invasive species are tree-of-heaven, which spreads by wind and root-suckers vigorously, and white mulberry, which spreads by birds and stump suckers vigorously. Also, the Bradford/Callery pear is becoming a serious problem. Other locally problematic species include white poplar and bird cherry, which both spread by root-suckers. Osage-orange has been introduced from its glacial refuge further south, but it prospers in rough cattle pastures and associated old fields, and could be considered part of the broader eutrophic woodland community in eastern North America.

Sustainable control of these woody species has not yet been clearly demonstrated in this region. For heavy infestations, initial removal costs about \$500-1000 per acre, and continuing prevention by human hand needs annually at least 10% of the initial effort. Some fundamental research is required to compare potential methods.

(1) Can intense seasonal browsing by larger herbivores (including livestock in the modern landscape) shift the balance towards natives? Most aliens are somewhat palatable, and would be relatively exposed during late summer and winter, when more natives are dormant.

(2) Can economic uses of the removed material be developed, at least on a non-profit basis for forage, fuel, chip or structural purposes?



UK Arboretum: honeysuckle removed, but winter-creeper remains locally dominant; perfect site for an experiment with goats or sheep.



Buckley Hills (Audubon Soc.): no management of aliens, but intense browsing by deer prevents winter-creeper from covering ground.

Woodland perennials. Few herbaceous aliens are widespread within more mature woods. But some of the escaped horticultural lilioids with bulbs do cause local problems, especially the little ‘Star-of-Bethlehem.’ Also, lesser celandine could become locally abundant (as in the Louisville parks). Due to their long dormant season, with underground storage, these two species are difficult to control and need prevention within natural areas.

The ‘subshrubby’ evergreen, periwinkle, is also a local problem. In more disturbed woods, especially in trails and mowed areas, some short sprawling weeds have become locally abundant, especially false strawberry and gill-over-the-ground. [Several other low sprawlers or runners occur in more open areas: some buttercups, clovers, crown-vetch, red sorrel, running yellow cress, ox-eye daisy, yarrow.]

Perennials of more open woods and grassland. Three ‘rosette’ plants of sunny habitats—English plantain, dandelion and chicory—are abundant, and can initially compete for space with some natives in old fields, but they generally decline without frequent disturbance. Taller aliens present more serious problems for grassland, especially sericea lespedeza and running thistle. Other widespread species include common St. John’s wort, palmate meadow cinquefoil, soapwort, butter-and-eggs, and (in wet places) mints.

The most robust aliens include Japanese knotweed, a particularly competitive perennial that can spread into fencerows, streambanks and thin woods. In wetlands, purple loosestrife can also become an unusually showy threat. And the unusual vine, potato-yam, can smother native vegetation in thin woods and edges.

Tillering or running grasses (and grass-like plants like ‘wild garlic’) are dominant in pastures, trampled and mowed areas, but tend to fade away in woodland. The abundance of such grasses in Europe presumably reflects a longer history of adaptation to large grazing animals over there. It is possible, however, that some bluegrass is native to North America. Johnson grass is a more of a problem, since it is a tall, aggressive, persistent, warm-season runner in upland grasslands. The common reed (*Phragmites*) provides a similar challenge in wetlands. Other robust alien ‘graminoids’ on wet ground are sweet-flag and yellow iris; these are sometimes assumed to be native.



Star-of-Bethlehem was a popular ornamental after settlement, but it has spread to become a weed in thin woods with disturbed ground.



Johnson grass was introduced for forage over a century ago, but it can become toxic for livestock, and has become a weed in general.

Biennials. There are several short summer-flowering biennials that do not generally present problems for restoration. But some taller species often compete for space with the native biennials and other species: including garlic mustard, poison hemlock, wild parsnip and wild carrot. Later flowering species include spiny amaranth, sweet-clovers, mulleins, teasles, bur-docks, knapweeds, thistles and lettuces. Several of these aliens are tolerant of grazing. Garlic-mustard is the only one that is generally abundant in woodland.

Annuals. Several winter-annuals are locally abundant in fields, and some can also become abundant in woodlands: common chickweed, common bitter-cress, ivy-leaved speedwell and common henbit. It is not yet clear if and how these aliens can be selectively decreased in restored woodlands, while allowing the natives to increase. However, since the aliens tend to creep on the ground at first, in contrast to the erect habit of most native annuals, mass seedings of the natives might be expected to reduce the aliens through competition.

Summer annuals include relatively benign, low weeds of open areas like pavement knotweed, carpet-weed (*Mollugo*), purslane, field speedwell and common dayflower. But taller species include two that are typical of disturbed woodlands: Japanese purple smartweed and beef-steak plant (*Perilla*). The unusual annual vine, Japanese hops, is locally abundant, especially along streambanks.

The several alien annual grasses are mostly problems for farmers and gardeners. But in disturbed woodlands, especially on somewhat acid soils, Chinese grass (*Arthraxon*) and especially Japanese grass (*Microstegium*) can become serious problems. These are both warm-season grasses with an unusual tendency to shade tolerance.

Aquatic plants. There are a few locally abundant aliens that are largely submersed (*Potamogeton crispus*, *Najas minor*, *Myriophyllum spicatum*). Another looming potential threat of this type is *Hydrilla*, recently discovered in Kentucky. But in several cases, aquatic or subaquatic plants have had uncertain status—as native versus alien? Some may have spread from the south, such as the creeping water-primrose and the American lotus. In other cases, there are reported to be both native and alien races within North America: sweet-flag, cat-tails, common reed and reed canarygrass.



Garlic-mustard is a seriously invasive (but edible) herb in woods; rather than herbicides, sheep might be used to reduce this species.



Floating water-primrose often grows into drying ponds during the summer; it is native to warmer regions and may have spread north.

Need for a Community-based Program

Restoring selected sites in Lexington to a largely native condition will require coordination among interested people. Regular meetings would be useful, with field trips and workshops. Meetings might be linked with existing schedules of relevant organizations, rather than completely ‘reinventing the wheelbarrow.’ Moreover, since problems of restoration in Lexington are largely similar to other parts of the central Bluegrass, the mission might well be extended across the whole region. There is a profound need for clearer goals, deeper partnerships, and more transparent assessment of conservation and restoration at local and regional levels.

Need for Sharing of Information and Materials

For lasting influence, the mission should connect with relevant professions and economic realities, crafting clear common concepts for what we want to restore. Academic interests must be balanced with the need to pay people and to seek contributions. Success or failure of projects must be addressed, especially if public funds or lands are involved. To keep costs low, we could establish cooperative systems for activities such as nursery propagation of plants with local provenance, for seasonal curb-side collection of cut honeysuckle, and for sharing costs in personnel or equipment.

Such cooperation will not develop without setting common goals, such as priorities for sites, concepts for restored habitats (still a rather difficult task), and lists of recommended locally native plants. Some technical underpinning will be needed in historical, biological, ecological and economic matters. My notes above on targets will, of course, need to be fleshed out in more detail, and varied perspectives of interested people will need to be compromised.

Need for Balance of Interests in Ecology and Economy

The origins of agriculture, economy and government by human beings probably had a lot to do with preserving and storing food over winter, then distributing it fairly to extended families. In the New Age of yearned-for sustainability, some of us interested in biological conservation and local production might well focus on common efforts to save seed of imperiled plants. For example, given the

impending doom for most ash trees due to EAB (except the more resistant blue ash), it would behoove us to collect and store seed locally for future propagation and breeding. Although the USDA does have a national program to collect and save ash seed, there is currently no organized partnership with efforts at state or local levels in Kentucky. I think it would be a mistake for local conservationists to let the federal government alone determine the future of our ashes.

New ideas for managing vegetation need to be tested, and we can learn from successes and failures. Given the current lack of sustainable models for converting alien to native composition—models that can pay for themselves when operated on a continual basis—we need deeper ecology and deeper economy. One general idea to be tried is using livestock to simulate the original effects of bison, elk, deer and beaver. For example, it is conceivable that removal of honeysuckle could be payed for by hauling freshly cut material into pens for goats, who relish the plant. There is a burgeoning market for locally produced goat meat. Removal of larger stems could then be followed by intense browsing for short periods at some sites, using both goats and sheep, trucked or herded in and out during the best season.



Despite increasing uses of livestock to reduce alien plants in southeastern states (as here in St. Louis), academic interest has lagged.