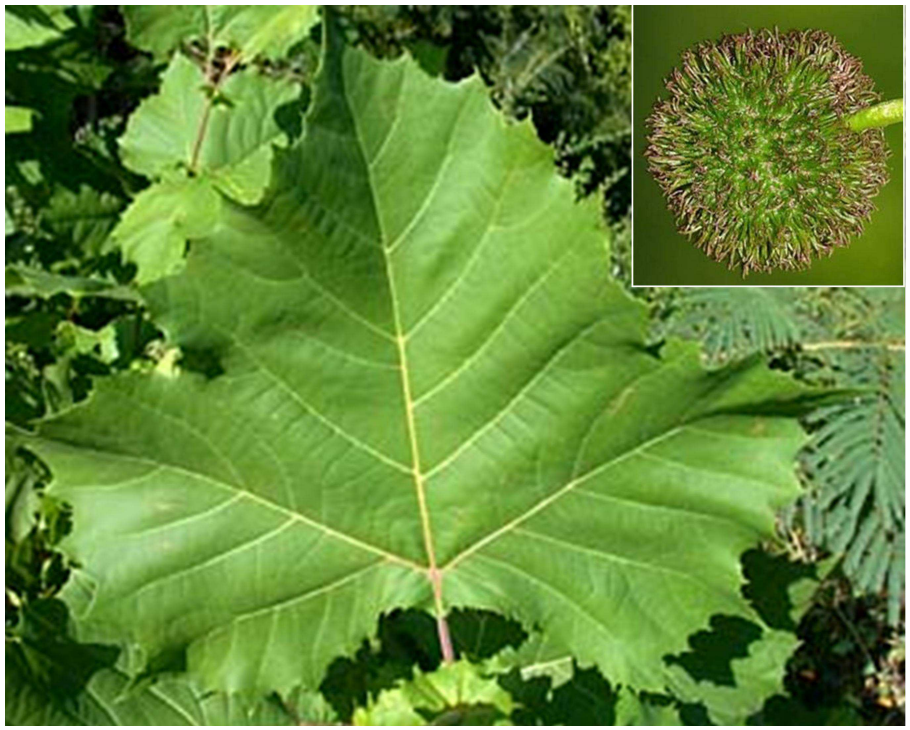
Riparian Vegetation of the Central Bluegrass Region

Cover: & above: Landsdowne Branch of West Hickman Creek, at the south edge of Lexington, partly channelized, partly being restored with native plants [JC]

Native Riparian Vegetation of the Central Bluegrass Region.
Notes by Julian Campbell, Aug 2012: http://bluegrasswoodland.com.

Summary (for more technical details see subsequent pages).
Riparian vegetation includes all zones along streams that have active influence from flowing water. These extend from seasonal runs (with some washing out of the stream bed) to larger rivers (with occasional flooding onto terraces 1000s of feet wide). Although these zones intergrade with wetlands, they are not necessarily dominated by hydric soils or even subhydric (see accompanying notes on "Bluegrass Wetlands"). Notes below focus on the calcareous Central Bluegrass region, including transitions to shaley soils of the adjacent Eden Shale Hills. Most riparian vegetation here occurs on more or less well-drained soils: highly organic in low fresh alluvium (mollisols) or less organic on moderately weathered younger terraces (inceptisols). Transitions to uplands occur on more deeply weathered older terraces (alfisols). In addition to this gradient in soils, the vegetation varies much in relation to patterns of drainage, stream-flow and other local disturbances. Natural patterns in vegetation deserve detailed understanding before conservation and restoration proceeds.

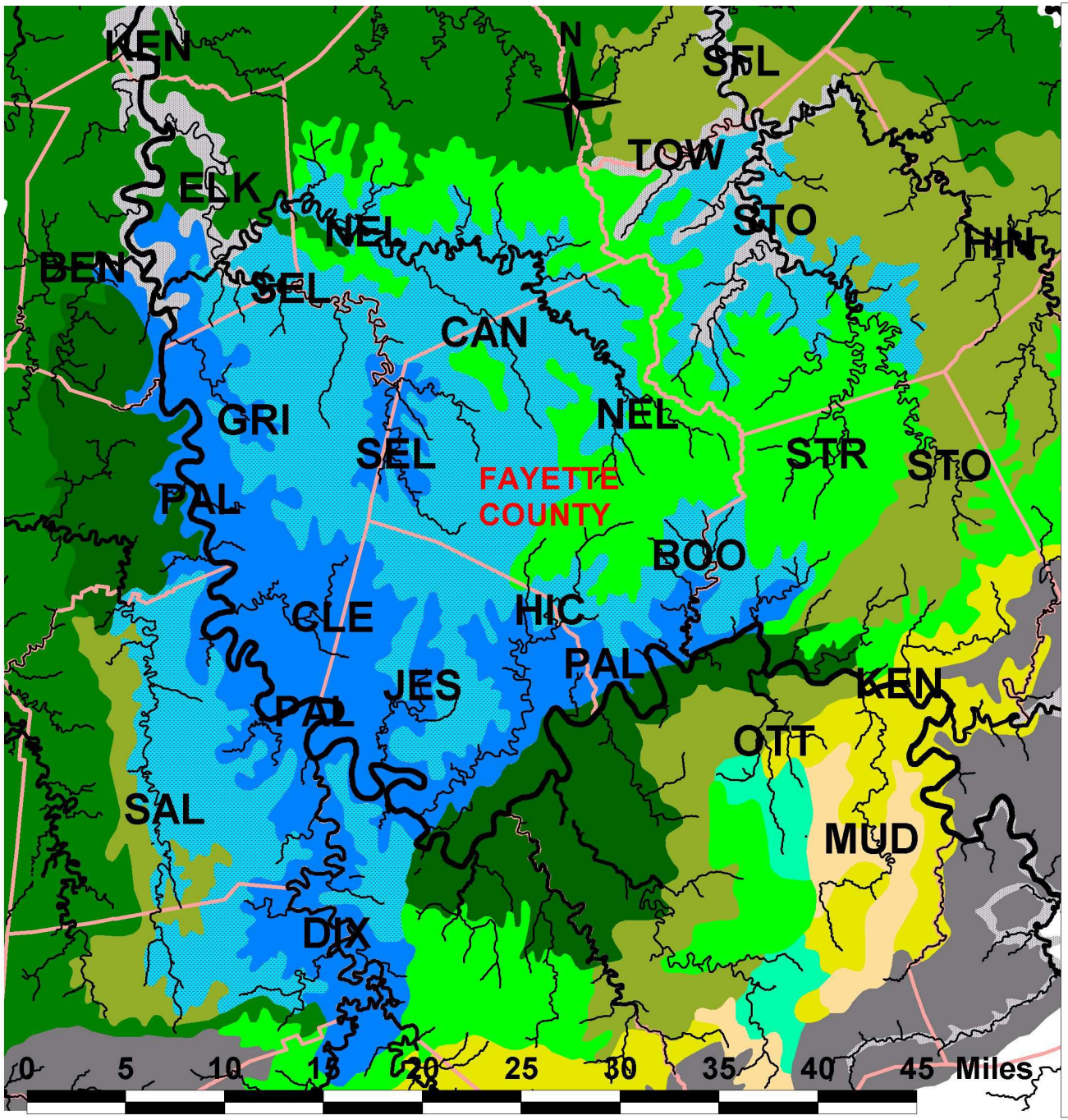
The most typical trees on fresh alluvium are sycamore, box-elder and—along larger streams—silver maple. Common (white/American) elm and green ash are also frequent, especially on hydric-tending sites. Some willows are also characteristic of particular habitats: black willow along more stagnant pools, and more shrubby species along rocky banks and gravel bars. These typical riparian trees are often intermixed with typical upland trees, especially on more mature alluvium with less frequent flooding (e.g. black walnut, hackberry, white ash, shellbark hickory, shumard oak, bur oak). Diverse shrubs, herbs and grasses occur in the shade of these trees, or on partially exposed stream-banks, or within the open scoured channel itself; these plants are detailed below. Most of these species have been much reduced after two centuries of settlement, and most are not readily available from local nurseries. It is important to connect interested people with knowledge of these species, which have varied functional, aesthetic and economic potentials.



Sycamore: commonest tall dominant tree in most riparian woods [1].

Box-elder: commonest tree in subcanopy of most riparian woods [2].

Streams of the Central Bluegrass Region (north-central Kentucky)



Abbreviations for major streams

Smaller streams can also have special features, especially in the Palisades.

BEN Benson Creek
BOO Boone Creek
CAN Cane Run
CLE Clear Creek
DIX Dix River
ELK Elkhorn Creek
GRI Griers Creek
HIC Hickman Creek
HIN Hinkston Creek
KEN Kentucky River
JES Jessamine Creek
MUD Muddy Creek
NEL North Elkhorn Creek
OTT Otter Creek
PAL Palisades Section of Ky. Rv.
SAL Salt River
SEL South Elkhorn Creek
STO Stoner Creek
STR Strodes Creek
TOW Townsend Creek

County Boundaries

Land Type Associations

- Inner Bluegrass Ravines
- Inner Bluegrass Plains
- Garrard Siltstone Hills
- Eden Shale Hills
- E Bluegrass-Eden Shale Hills (mix)
- East-central Bluegrass Plains
- E Bluegrass-Damp Flats (transition)
- Eastern Foothill Flats
- Dolomitic Foothills to Knobs
- Eastern Dolomitic Plains
- Black Shale/Siltstone Knobs (varied)
- Calcareous Terraces (Licking Rv)
- Riverine Bottomland

Geology and soils. The Central Bluegrass region is loosely defined here to include the Inner Bluegrass, underlain by Middle Ordovician bedrock, plus adjacent transitions to shaly bedrock of the "Eden Shale Hills." That Upper Ordovician shale interdigitates in several areas with phosphatic limestones of the Inner Bluegrass. Typical riparian woodland occurs mostly on alluvial silt loams that are classified as well-drained to moderately well-drained hapludolls (Boonesboro, Huntingdon, Egam) or eutrochrepts (Nolin, Lindside); the latter have more developed soil profiles. On older terraces, usually with less frequent flooding and more weathered soils, there are alfisols (Armour, Elk, Otwell) that were formerly covered with transitions to upland woods. The Kentucky River has left a complex series of terraces. On older acid terraces (with pH = 5-6 versus 6-7.5 in general), there are somewhat 'ultic' soils (usually mapped in the Elk series). The distinct vegetation on those terraces is noted below, but is not part of the central focus.

Characteristic species. The most typical trees on fresh alluvium are sycamore (*Platanus occidentalis*), box-elder (*Acer negundo*) and—along larger streams—silver maple (*Acer saccharinum*). Common (white/American) elm (*Ulmus americana*) and green ash (*Fraxinus pennsylvanica*) are also frequent, especially on hydric-tending sites. Some willows are also characteristic of particular habitats: black willow (*Salix nigra*) along more stagnant pools, and more shrubby species (*eriocephala, interior, caroliniana*) along rocky banks and gravel bars. In more open pooled or scoured zones, typical shrubs also include cane (*Arundinaria gigantea*), dogwoods (*Cornus*, especially *drummondii* and *obliqua*), elderberry (*Sambucus canadensis*) and buttonbush (*Cephalanthus occidentalis*). Shorter vegetation occurs along gentler shores and gravel bars, with varied sedges (*Carex, Eleocharis, Scirpus*, etc.), grasses (*Elymus, Leersia, Phalaris*, etc.) and herbs (*Bidens, Impatiens, Persicaria, Phyla, Rumex*). Water-willow (*Justicia americana*) is locally dominant in riffles, and a few uncommon to rare native aquatics still survive within the water itslelf (*Elodea, Potamogeton, Ranunculus*, etc.). Other aquatics used to be common in larger streams and rivers, but at least in the Kentucky River they have largely disappeared.

Salix eriocephala—a widespread willow in the upper mid-west; uncommon in Ky. but locally abundant in streams of Bluegrass hills [3].

Justicia americana—"water willow"; widespread in riffles of small to large streams but generally disappearing with intense settlement [4].

Low muddy banks of the Kentucky River are usually dominated by silver maples, dense herbs (especially wood nettle) and grasses (especially wild ryes). Larger tributaries used to have similar conditions in places, but nettles, in particularly, have been much reduced by livestock [JC]..

Rare species of plants and animals. Because of habitat destruction, about ¼ of the 100-120 typical species are uncommon to rare in this region. Some of the rarest species (state-listed or should be) have northern to upper midwestern ranges, and survive at few sites in cool streams with relatively little disturbance: *Carex emoryi, Elodea canadensis, E. nuttallii, Ranunculus longirostris* and *Salix eriocephala*. Others are typical of low terraces that are exposed to disturbance from larger herbivores as well as occasional flooding: *Monarda* "*serotina*" (undescribed), *Nabalus crepidineus* and *Trifolium stoloniferum* (federally endangered).

Several animals have declined greatly or disappeared in streams—notably several mussels and fishes in the Kentucky River. Others have been much reduced in the past but may now be stable or recovering: including beaver, streamside salamander and several turtles. Night-herons—Yellow and Black-crowned—are rare birds that tend to nest in riparian woods. A thorough zoological review would be useful.

Cross-walk with other classifications. In the Ky. Natural Heritage system, most woodland types outlined here correspond to phases of two broadly defined types: their "small stream scour forest" for small to medium streams or their "riparian forest" for larger streams or rivers. Less intensely flooded woods correspond partly to their "floodplain ridge/terrace forest." More intensely flooded shrubby vegetation largely corresponds to their broadly defined "gravel/cobble bar" type.

NatureServe Explorer (website) offers a more detailed classification, summarized here in diagrammatic form (see p. 10). In their system, types applicable to the central Bluegrass are listed in the right-hand column. More open or shrubby woods with cottonwood and willows occur mostly along larger streams and rivers, and have minor extent within the region. In hills adjacent to the central Bluegrass, there are shifts to types associated with more acid or infertile soils, as listed in the central column. [For internal reference, included here are JC classes 01/04 and transitions, with edaphic variants D/ E.]

Ranunculus longirostris: a white crowfoot that is widespread in cool-temperate regions of North America but rare in southeastern states [5]

Elodea nuttallii: another rare aquatic plant of cooler regions, discovered recently below Preston Spring near the edge of Lexington [6]

Yellow-crowned night herons are rare in Kentucky, sometimes seen along streams of the central Bluegrass, but nesting has dwindled here [7].

Issues in conservation. A salient problem with current restoration and management is lack of good understanding about the original native vegetation. There is considerable historical and floristic information that is relevant. However, there has been insufficient sharing among of data among interested people and there is little published consensus in some critical matters. Even the fundamental distinction of riparian habitats versus wetlands is often overlooked, and gradients related to further hydrological complexity or to soil pH and fertility are often ignored.

Without good knowledge of native species, it is difficult to support appropriate plantings at restored sites. Moreover, even if species are known and available, there is generally little interest in securing genotypes that are truly native to the region. There should be functional, genetic and aesthetic aspects to the development of selections for local use, but decision-making usually lacks such components.

Similar concerns pertain to decisions about reducing invasive alien plants. It is clearly important to reduce bush honeysuckle (*Lonicera maackii*), winter-creeper (*Euonymus fortunei*) and garlic-mustard (*Alliaria petiolata*). But the native versus alien status of several plants remains uncertain, and efforts to reduce them can be misguided—a prime example is reed "Canary" grass (*Phalaris arundinacea*). Methods for management of riparian zones should be geared to improving the balance of natives versus aliens. Occasional weeding by hand and selective mowing will be generally needed. In more rural areas, we need experiments with browsing or even burning.

There are some clear priorities for further research to resolve uncertainties, as well as for consensus-building based on existing results. In addition to better understanding of the original vegetation, we need research into optimal methods for maintenance of native vegetation—in remnants or in restored areas. The special problems of aquatic vascular plants involve general problems of water-quality—it would be useful to know what factors limit growth of these species.

Rough-leaf dogwood is one of the most useful shrubby species for general use in restoration of native vegetation, but it has taken 20 years to convince agencies and academics of its values [8, 9].

DIAGRAM OF GRADIENTS IN ORIGINAL RIPARIAN VEGETATION ACROSS KENTUCKY

This is a general summary for the whole state. Vegetation of the central Bluegrass belongs mostly in the upper right section.
Not shown in detail are transitions from mesic to hydric conditions, or to more browsed conditions; those are separate gradients.
Numbers are codes (CEGL) for vegetation types of NatureServe, followed by abbreviations for latin names of typical species.

Deep woods, little flooding **Thin woods, moderate flooding** **Open veg., intense flooding** **Aquatic zones**

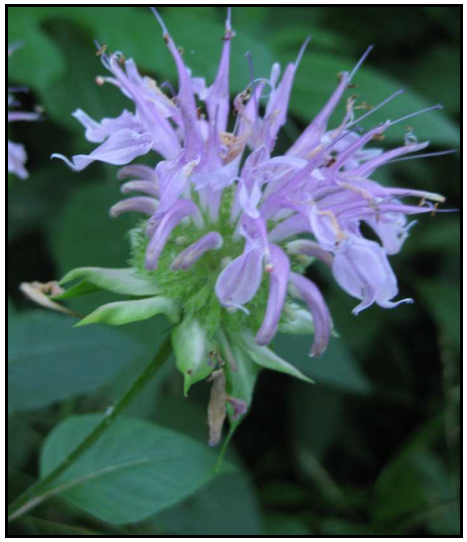
POSITION ON FLOODING GRADIENT	TYPICAL POSITION ALONG pH-RELATED GRADIENT IN SOILS		
	POOR ACID SOILS (pH ca 4-5) ultisols or dystrochrepts	**AVERAGE SOILS (pH ca. 5-6) mixed or intermediate classes**	**BASE-RICH SOILS (pH ca. 6-7) alfisols, eutrochrepts or mollisols**
Mesic terraces with sugar maple, beech or hemlock	HEMLOCK, TULIP+ 6620: Tsucan-Querub-(Plaocc, Betnig)	BEECH, RED MAPLE+ 5014: Faggra-Querub-Acerub-Jugnig	SUGAR MAPLE, BITTERNUT+ 5035: Acesac-Carcor
Riparian transitions; sycamore with much walnut, tulip or sweetgum	SYCAMORE, TULIP+ 7143: Tsucan-Lirtul-Plaocc 7340: Plaocc-Liqsty	SYCAMORE, TULIP+ 7340: Plaocc-Liqsty 8429: Plaocc-Cellae-Lirtul	SYCAMORE, WALNUT, ASH+ 7334: Plaocc-(Acesan, Jugnig, Ulmrub) 6575: Frapen/ame-(Jugnig, Plaocc)
Typical riparian woods; sycamore with boxelder or river birch	SYCAMORE, ALDER+ (sand) 3895: Alnser-Xansim 3894: Alnser	RIVER BIRCH, SYCAMORE+ 7312: Betnig-Plaocc 2086(7184): Betnig-Lirtul-(Aceneg)	BOXELDER, SYCAMORE+ 5033: Aceneg 4690: Aceneg-(Plaocc, Popdel)
More flooded banks of streams with sand, rock or stabilized silt	SILKY WILLOW/SEDGE+ [local Salix sericea]; 4103: Carex torta 6481: Persicaria spp.+ (exposed shores)	RIVER BIRCH, SYCAMORE+ 3896: Plaocc-Betnig-Salcar/nig 6476: Plaocc-Acesan-Betnig-Frapen	SILVER MAPLE+ (muddy silt) 2586(6548): Acesan-Ulmame-(Frapen) 2431: Acesan-Cellae-Carill
Lower, more often flooded zones adjacent to above	WATER-WILLOW+ (dystrophic) 8471: Andger-Bapaus (“prairie” zones) 4286: Justicia americana (marginal)	CAROLINA WILLOW/SEDGE+ 7064: Salcar; 6476: Carex emoryi 6481: Persicaria spp.+ (exposed shores)	COTTONWOOD/WILLOWS (bars) 2018: Popdel/Salnig 6481: Persicaria spp.+ (exposed shores)
Boulder, sand or gravel bars; and associated aquatic zones	THREADFOOT, EELGRASS+ 4331: Podostemum ceratophyllum 4333: Vallisneria americana	WATER-WILLOW+ (mesotrophic) 8471: Andger-Bapaus (“prairie” zones) 4286: Justicia americana	SANDBAR WILLOW+ 8562 (5078): Salint-(Saleri) 6483: Eragrostis hypnoides+ (low shores)
Aquatic zones on coarse or fine substrate	More acid infertile substrates are generally restricted to smaller rivers and streams, where the zonation in vegetation is less complex	THREADFOOT, EELGRASS+ 4331: Podostemum ceratophyllum 4333: Vallisneria americana	WATER-WILLOW+ (eutrophic) 4739: Andger-Chalat (“prairie” zones) 4286: Justicia americana (marginal)

Conservation, as a whole, would benefit greatly from more regular collaboration at appropriate regional scales. A significant large-scale effort has been initiated for the whole watershed of South Fork Licking River. More limited projects have been tried for the "Palisades" in general, Elkhorn Creek in general—now at least focused on Wolf Run and Cane Run, Boone Creek—at least on paper, Muddy Creek (Madison Co.), and probably elsewhere. There appears to be little regional coordination in restoration methods, though the Ky. Division of Water maintains a central database on water quality.

Synthesis of information from these projects would be useful, building an accessible long-term record of activities that are designed to improve watershed and restore riparian zones. Interested organizations would include state agencies, The Nature Conservancy, Lexington-Fayette County and other local governments, Friends of Wolf Run, other non-profit organizations. Not only should we continue to summarize the overall conditions of watersheds—we should also assess the success or failure of riparian restoration in terms of vegetation dynamics and floristic quality.

Restoration of streams and riparian vegetation has been funded largely due to the Clean Water Act and related laws. Thus assessment is tied, where possible, to monitoring of the water and its aquatic biota. Botanical interests have not generally been integrated into planning, implementation or assessment. This is largely a fault of the botanical community in Kentucky, which has little consensus-building focused on classification of native vegetation, selection of priority species for recovery, and related matters.

This situation would be improved if 'plants-people' of any type with interests in restoration would meet regularly, share information and address critical issues. Leadership could come from TNC, Kentucky Native Plant Society, Nature Preserves Commission, Wild Ones and other relevant organizations. It would be especially useful to anchor such efforts at the University of Kentucky. That institution has much potential to help, but it needs a revival of mutual support involving the Herbarium, Arboretum and associated staff.



An undescribed beebalm (*Monarda* "*serotina*") is restricted to stream terraces in the central and lower Ohio Valley. It is rare within the Bluegrass, but easily propagated. It deserves more attention [JC].

Native plants lining a roadside ditch in southern Madison County (Moran-Summitt Road): walnut and cane along fence; reed grass (*Phalaris arundinaria*) and meadow sunflower (*Helianthus tuberosus*) on roadside. In 1775, Felix Walker "traveled about thirty miles through cane and reed" into central Madison Counhty. The *Phalaris* is sometimes considered alien in Kentucky, but it appears native along many streams.

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Beds of water-willow used to be common in riffles of free-flowing streams in the region, but changes in hydrology and chemistry appear to have greatly reduced this species (Howell 1975) [10].

TYPICAL NATIVE SPECIES
The following list includes species of springs, open stream corridors and transitions to mesic or submesic terraces. It excludes most species restricted to larger river corridors or truly hydric sites. However, hydric sites are sometimes present as small inclusions; see notes on "Bluegrass Wetlands" for details. Many typical upland species can also occur locally in riparian zones.

Note codes after (/) names:
C = Species largely restricted to more acid soils, esp. old terraces.
H/h = all/most hydric transitions.
M/m= all/most mesic transitions.
R/r = all/most in large streams.
S/s = all/most submesic trans.
X/x = all/most subxeric trans.
[on rocky sites that dry out]
Z/z = all/most restricted to open zones in/near stream channel.
Many additional species can be expected in such transitions.

Underlined: commonest species, including disturbed weedy sites.
* Uncommon in most of region.
** Regionally-rare/state-listed.
*** Regionally disappeared.
Some rare species used to be much more extensive before settlement.

s.l. = sensu lato, implying that more than one segregate occurs.
[= ...]: broader genus concept.

Note that the native versus alien status of some species remains uncertain. Within this list, *Galium aparine* and *Phalaris arundinacea* are sometimnes considered alien. Another common riparian grass, *Poa trivialis*, is generally considered alien, but it may have been native in some parts of North America.

Typical larger trees
Acer negundo
Acer saccharinum/R
Aesculus glabra/s
Carya laciniosa/s
Celtis occidentalis/s
Fraxinus americana s.l./s
Fraxinus pennsylvanica/h
Juglans nigra/s
Platanus occidentalis
Populus deltoides/R
Quercus macrocarpa/s
Quercus shumardii/s
Salix nigra/H
Ulmus americana/h

Small trees, shrubs and vines
Ampelopsis cordata/R
**Arundinaria gigantea*
Asimina triloba/s
Carpinus caroliniana/r
Cephalanthus occidentalis/H
Cornus drummondii
Cornus obliqua/Rz
Lindera benzoin/s
**Physocarpus opulifolius*/XZ
**Ptelea trifolia*/sz
***Salix eriocephala*/Zr
Salix interior s.l./Zr
Salix caroliniana/ZR
Sambucus canadensis/s
Smilax hispida/s
**Viburnum dentatum* s.l./R
Viburnum prunifolium/s
Vitis riparia/Rz
Vitis vulpina/sz

Ferns and allies
Equisetum arvense/Crz

Aquatic and subaquatic herbs
***Elodea canadensis*/SZ
***Elodea nuttallii*/Z
Justicia americana/Zr
Potamogeton foliosus/Z
Potamogeton nodosus/Z
***Ranunculus longirostris*/zh
Saururus cernuus/zh

Herbs: not legumes/composites
Agastache nepetoides/s
Campanulastrum americana/s
[= *Campanula a.*]
**Cerastium nutans*/s
Circaea canadensis/m
Cryptotaenia canadensis
Cuscuta pentagona
Epilobium coloratum/z
Fallopia scandens
[= *Polygonum s.*]
Gaura biennis/s
**Hydrophyll. appendiculatum*/s
**Hydrophyllum canadense*/s
**Hypericum sphaerocarpum*/x
Impatiens capensis/sz
**Impatiens pallida*/r
**Laportea canadensis*/r
Lobelia siphilitica/z
Lobelia cardinalis/h
**Lysimachia ciliata*/z
**Mertensia virginica*/r
Mimulus alatus/hz
***Monarda "serotina"*/s
Osmorhiza longistylis/s
**Penstemon digitalis* s.l.
Persicaria lapathifolia/z
Persicaria pensylvanica/z
Persicaria punctata/z
[= *Polygonum* spp.]
Phacelia purshii/s
Phlox paniculata/r
Phyla lanceolata/h
Phytolacca americana/s
Pilea pumila/s
Polygonatum commutatum/s
Ruellia strepens/s
Rumex altissimus/Zh
Sanicula odorata/r [= *gregaria*]
Scrophularia marilandica
Sicyos angulatus
Stachys tenuifolia
**Thalictrum pubescens* s.l.
**Urtica chamaedryoides*/s
**Urtica gracilis*/R
Valerianella radiata/s

Verbena urticifolia/s
**Zizia aurea*/z

Typical legumes
**Amphicarpaea bracteata* s.l./s
**Apios americana*/Ch
**Desmanthus illinoensis*/rsz
***Trifolium stoloniferum*/s

Typical composites
Ageratina altissima/s
[*Eupatorium rugosum*]
Ambrosia trifida/sz
Bidens aristosa s.l./Csz
Bidens frondosa/sz
Eupatorium perfoliatum/hz
Eupatorium setotinum/ahz
Helenium autumnale/hz
**Helianthus decapetalus*/Rs
Helianthus tuberosus/sz
Heliopsis helianthoides/sz
Iva annua/rz
Lactuca biennis/s
***Nabalus crepidineus*/s
[= *Prenanthes c.*]
Rudbeckia laciniata
Rudbeckia triloba/s
Silphium perfoliatum
Smallanthus uvedalius/s
[= *Polymnia u.*]
Solidago altissima/s
Solidago gigantea/hz
Symphyotrichum lanceolatum/R
Symphyotrichum ontarionis/s
Symphyotrich. prenanthoides/C
[= *Aster* spp.]
Verbesina alternifolia/s
Vernonia gigantea/s

Typical graminoids
Allium canadense/s
Carex blanda/s
***Carex emoryi*/Zr
Carex grisea/s
Carex jamesii/s
**Carex radiata*/Ch
Carex sparganioides/s
**Chasmanthium latifolium*/Rz
**Cinna arundinacea*/h
Dichanthelium clandestinum/sz
Eleocharis erythropoda/Zr
Elymus macgregorii/s
Elymus riparius/rz
Elymus virginicus var. *v.*/s
E. v. var. *intermedius*/rz
**Festuca subverticillata*/s
Glyceria striata/Hz
Leersia oryzoides/HZ
Leersia virginica/s
Muhlenbergia frondosa/R
Phalaris arundinacea/Zh
**Poa sylvestris*/s
Scirpus atrovirens/Zh
Scirpus georgianus/Ch
Schoenoplectus tabernae-montani/Zh [= *Scirpus t.*]
**Sphenopholis intermedia*/r

Cryptotaenia canadensis: honewort, one of few Apiaceae [11].

Rumex altissimus: commonest native dock in region [12].

Persicaria punctata: one of most common native smartweeds [13]

Chasmanthium latifolium: mostly on crests of larger banks [14].

Elymus macgregorii: common on moist fertile terraces [JC].

Phalaris arundinacea: seems to be native on low wet banks [15].

Beaver can convert free flowing riparian systems into wetlands. Now returning to the Bluegrass region, this species used to have much ecological effect—and its extinct cousin, the giant beaver, even more. Their smaller rodentine cousins, the muskrats, are still common [16].

SOURCES FOR PHOTOGRAPHS [if not the author = "JC"]

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