

Closeup in Filson's (1784) map of Kentucky, showing the central Bluegrass region and early settlements either side of the Kentucky River Palisades, from Boonesboro (right center) to Lee's Town (upper left), which became the center of Frankfort—the current state capitol [2].

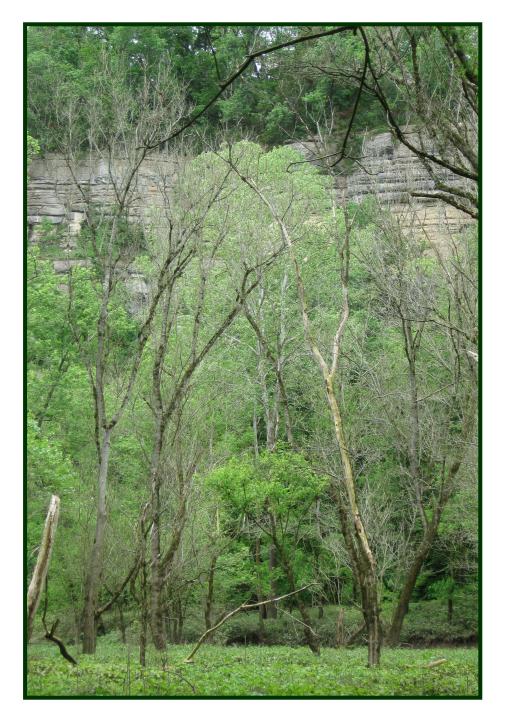
# **KENTUCKY RIVER PALISADES: Hope or Illusion of a Conserved Area through the Heart of the Bluegrass?**

[3]

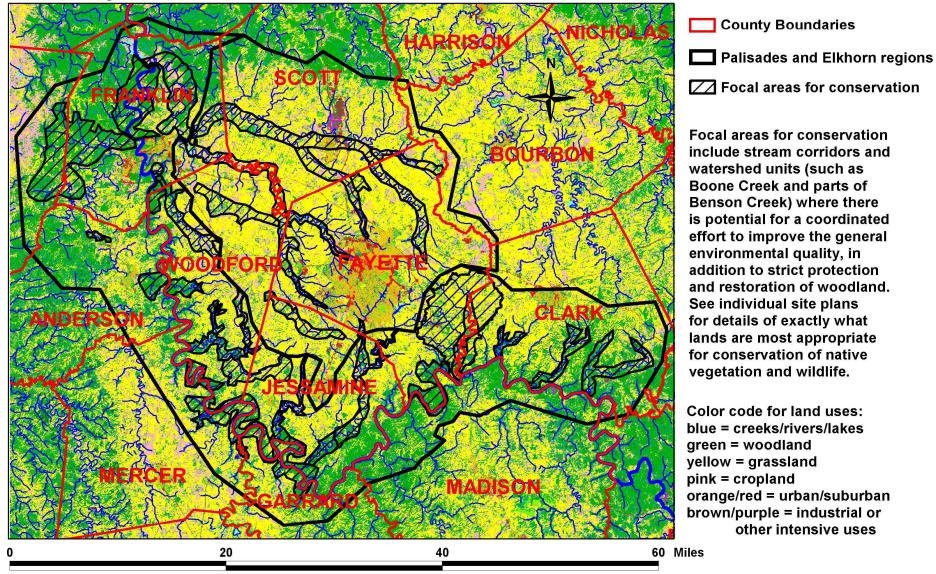
**SUMMARY.** The Palisades area is defined here to include all of the rugged corridors along the Kentucky River and its tributaries within the central Bluegrass region. Diverse properties here are owned with conservation in mind, but the current status of any cooperative effort for the Palisades is unclear. The major problems for management are: (1) how to reduce invasion of alien plants into woodland (especially bush honeysuckle, winter-creeper, garlic mustard); and (2) how to restore adjacent fields towards some reasonably natural condition. Teamwork and shared goals would be useful.

The Palisades form one of the most significant calcareous ravine systems within the Interior Low Plateaus. Simple protection of land at large scales ensures much conservation for common habitats, but some habitats need special attention since they are much less common or have more critical threats: especially remnants of white oak woods on adjacent uplands; also, woodland types that used to be kept open by browsing or other disturbance; caves; and sections of rivers or streams with more natural flooding regime. Even after protection of land and restoration of habitat, many species deserve micromanagment for recovery. These include globally rare plants of dry or disturbed phases in the woodland, bats, and aquatic species that can eventually be reintroduced when streams are restored.

An ecological basis for optimal management of vegetation is still not generally agreed. But further synthesis of historical data would greatly improve our collective picture of the original landscape, and further comparison of experiences from different managers would improve our ideas about what is best for the community. Effective conservation may, paradoxically, depend on productive working relationships with neighbors in farms and residential areas. Due to their proximity, knowledge and appreciation of the area, these people could ultimately form the core of support for conservation. And their interests should be central to resolving hard tradeoffs in planning any new infrastructure along the river, or perhaps even taken some out.



### Kentucky River Palisades and Elkhorn Plains: Land Uses, Counties and Streams

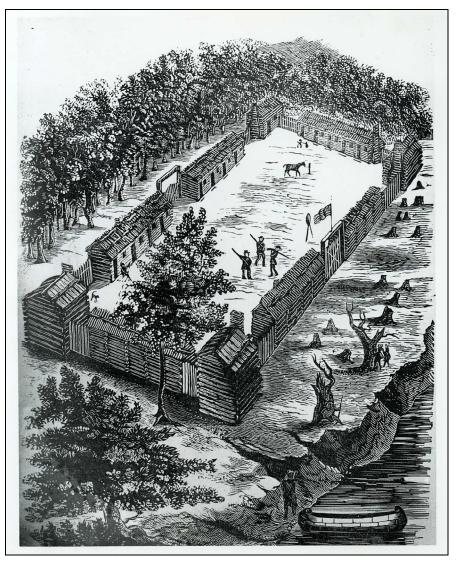


**TEAMWORK**. Effective conservation depends on cooperative effort in defined ecoregional areas with regular interaction on the ground.

The Palisades area can be broadly defined to include all of the rugged corridors along the Kentucky River and its tributaries within the central Bluegrass region, from Boonesborough to the mouth of Elkhorn Creek. These corridors are largely wooded, in marked contrast to the farmed uplands, but no more than 1-2 miles wide. The most rugged section—the true or central Palisades—lies between Camp Nelson (or US 27 bridge) and Shakertown (or US 68 bridge), where abrupt bends of the river and complex physiographic history have allowed a particularly varied set of habitats to develop, with unusually high biological diversity for the region.

The first Virginian settlers in this region, after 1770, found the river corridor to be rich in resources but challenging. They were soon confronted with problems involving native people, hunting, landownership, land-uses, and transportation routes. The steeper slopes remained mostly wooded, but larger trees were generally cut out and the river itself became locked-and-dammed during 1836-1917, for barges to transport varied materials. Direct functions of the river eventually became managed by government—the Kentucky River Authority now holds overall responsibility.

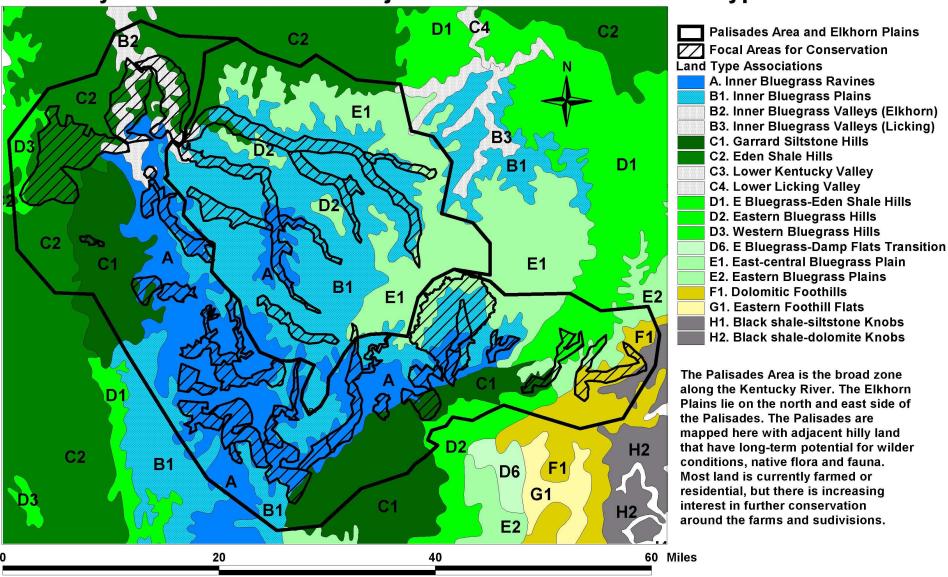
The concept of conserved land along the river was written about by Jillson (1927), who proposed that a set of parks be established across the state. But it was not until the 1970s that modern efforts to establish preserves began. In the 1990s, The Nature Conservancy (TNC) hatched a scheme to establish various levels of protection and compatible land use across the central Palisades. Partnership was suggested with other interested organizations and individuals, a plan was detailed, and a full-time manager was hired. However, we still lack regular interaction among managers of conserved lands along the whole length of the Palisades, representing at least a dozen non-profit organizations or governmental agencies. TNC's program itself was cut back in 2003 after difficulties in financial support and public relations, and they sold their Jessamine Gorge tracts to the county.



Above: from Ranck in 1901 [4], print of Fort Boonesboro', one of the first Ky. settlements made by Virginians. In 1779, under a large majestic elm tree, Richard Henderson and his companions established an early set of laws to govern their use of the land, including:

- "7. An act to preserve the range."—presumably from overgrazing.
- "8. An act for improving the breed of horses."—starting a trend!
- "9. An act for preserving game."—Can we now revive such plans?

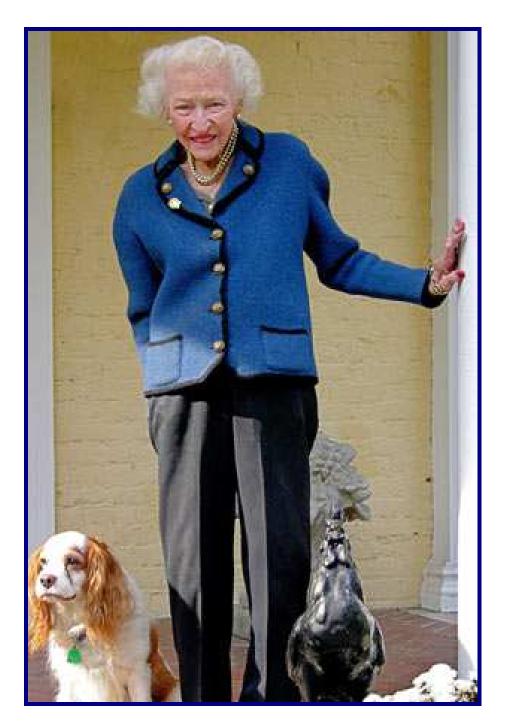
## Kentucky River Palisades and adjacent Elkhorn Plains: Land Type Associations



The current status of any cooperative effort for the Palisades is unclear. There is a diversity of properties managed with conservation in mind. These include legally restricted nature preserves established by the Ky. Heritage Land Conservation Fund, Ky. State Nature Preserves Commission (KSNPC), TNC and their partners in county governments or local non-profits (e.g. Flora Cliff in Fayette Co. and Howards Creek in Clark Co.). There are also some public properties that are not restricted for protection but remain largely focused on natural features, such as Boonesboro State Park (Madison Co.) and the Camp Nelson area (Jessamine Co.). Several independent nonprofit organizations also own land largely devoted to nature, such as Buckley Hills Wildlife Sanctuary (Woodford Co.), the Bluegrass Sportsman's League (Jessamine Co.), the Warwick Foundation (Mercer Co.) and, especially, the extensive tracts of Shakertown (Mercer Co.). In addition, many private landowners are of course devoted to protecting and enhancing varied natural aspects of their lands. Indeed, probably most of the forested slopes of the Palisades region are generally safe from excessive disturbance due to logging or farming, simply because they are so steep and inaccessible.

To a large extent, these varied properties share common challenges for conservation of native systems. Their major problems are: (1) how to reduce invasion of alien plants into woodland (especially bush honeysuckles, winter-creeper, garlic mustard); and (2) how to restore adjacent fields towards some reasonably natural condition. In the case of alien plants, the problem is obvious but methods of control vary and it is particularly difficult to integrate management into the economic fabric of the community—there are generally insufficient governmental funds or private donations to get the job done. In restoration of fields, little consensus exists on goals—from just letting woodland recover but filled with honeysuckle, to some kind of managed or partial succession, to continued maintenance for hay or pasture, to replanting with so-called "native warm season grasses" that are largely imported from more western regions.

Right: Sally Brown (1911-2011), stalwart supporter of the Palisades through science and stewardship with Shakertown and TNC [5].





From 1805 to 1901, Shakertown (at Pleasant Hill) was a utopian religious community with diverse farming, covering over 4000 acres at its peak. In the 1960s, efforts began to restore the village and farm. The site has become a major attraction for tourists and an excellent place for meetings among partners in the Palisades area. But maintenance of the buildings and land is a continual struggle. In recent years, much pasture has been converted to "native grasses"—although good use of livestock in the woods may be useful to reduce alien plants [6].

Prospects for progress are limited by the lack of regular meetings or cooperative networks among owners and users of significant lands. Such interaction could lead to clearer goals of general value for the community, rooted in science and tested through time. Can partners share details of successes and failures, learning together? Can specific targets be articulated for internal accountability and public education? Can compromises on goals be forged into synergetic projects, with cost-sharing and regular renewal of mutual planning? Actions that could be fostered through such interaction are as follows.

#### Protection of land and water.

- 1. With care to avoid conflicts among landowners, it would be useful to develop and share maps of areas with highest priority for further protection. In several cases, such areas lie on uplands somewhat set back from the cliffs, grading into old farmland that could be readily converted into subdivisions without proactive efforts.
- 2. A long-term vision for the river itself could be linked with overall ecoregional planning. It would be useful to show more clearly how changes in land use would improve water quality. It would be useful to at least discuss whether part of the river can be returned to a wilder, free-flowing condition.

#### Ecological management.

- 3. Scientific concepts could be applied for defining desired native vegetation types and how to promote them.
- 4. An economic basis for management could be sought together, exploring the potential for endowment funds, cooperative grants, and shared employees. And what income is appropriate from the land?

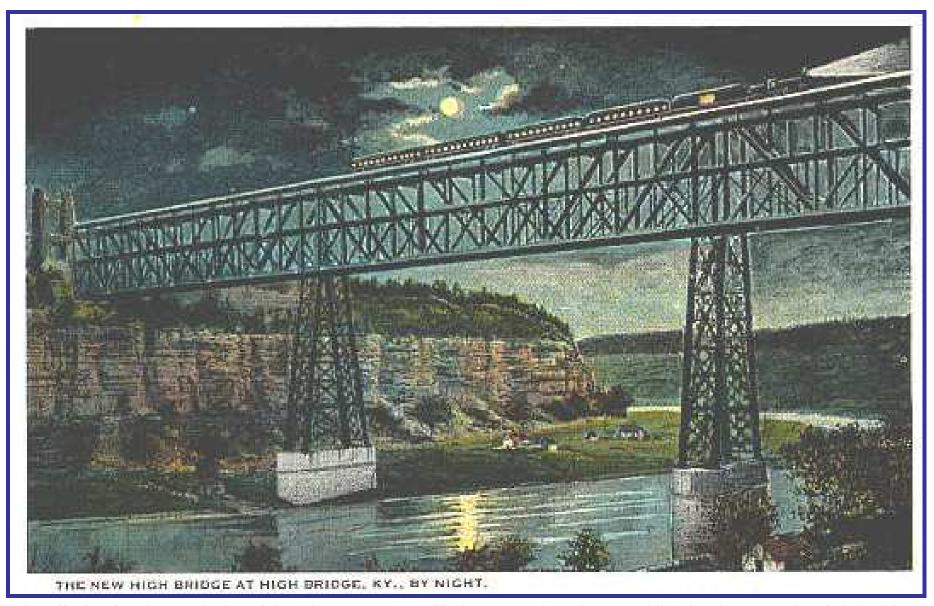
#### Research into biological details.

- 5. Which species are most important to monitor, or to micromanage—with propagation in some cases?
- 6. With limited financial resources, what are the best methods for reduction in alien plants? Can livestock be useful?

Notes below develop these themes with more specific examples, hoping that they can be developed into a basis for deeper plans.



Above: Overstreeet Falls at Jessamine Gorge, which has the greatest concentration of rare species known in the central Bluegrass, and an intense diversity of topography (Campbell & Meijer 1989) [7].

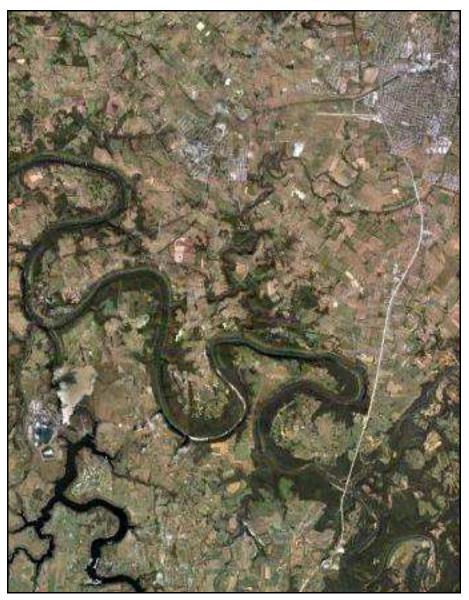


"The Palisades' fame increased when High Bridge was constructed in the 1870s and a park was established as the community of High Bridge. The park had picnic grounds, a restaurant, a dancing pavilion and riding stables and became a popular place to hold cultural and religious meetings...Trainloads of people from Cincinnati, Lexington and other northern points disembarked at High Bridge for recreation, sightseeing and dancing" [4]. But the site also developed a wild reputation, with criminals secluded in the neighborhood. And many suicides have occurred.

#### TARGETS: Landscape and Watershed Level.

The Palisades form one of the most significant calcareous ravine systems within the Interior Low Plateaus—geologically unique because of relatively recent, deep entrenching within the past 1-10 million years (Andrews 2006). Current floodplains, steep rocky slopes, extensive cliffs, narrow rocky points, dry bluff-tops and old high river terraces all occur within a mile-wide zone along these ravines, promoting diverse flora and fauna. Local contrasts with the largely agricultural uplands are striking—so that the Palisades area clearly has the highest priority for conservation of nature within the central Bluegrass region. The whole area contains 100-200 thousand acres, depending on how much 'buffer zone' is considered useful. Several sites have 100-1000+ acres of unusually mature woods or clusters of rare species deserving focus. There are several small caves (including horizontal and vertical passages), especially in the central section, with rare bats and invertebrates. The primary threats to this landscape have been general logging and partial conversion to farmland, but are now general invasion of alien plant species and residential subdivision close to the river.

The watershed of Kentucky River itself is impaired by two centuries of pollution and development, including locks and dams. Many aquatic species have disappeared since they were recorded in the 19th Century by C.S. Rafinesque, C.W. Short and others—most of the mussel and fish species currently surviving in the Green and Licking Rivers probably used to occur in the Kentucky. Tributaries tend to have more quality, or are at least free-flowing. Better streams include Boone Creek, Clear Creek, Benson Creek and some sections of the Elkhorn Creek system (where a few native mussels still live). But even these streams do not have significant occurrences of rare aquatic species, and they all deserve long-term attention for improvement through better land-uses in general, plus local riparian restoration. Projects have been initiated for a few sections of the Elkhorn watershed that drain from the city of Lexington. Such effort would also be justified for Jessamine and Hickman Creeks, which flow into the central Palisades—there are continuing problems with sewage.



Above: aerial view of central Palisades, 8.5 miles wide. Nicholasville is at upper right; Harrington Lake (impounded Dix River) is at lower left, with the power plant of Kentucky Utilities at center-left. This is the most significant section of the Palisades, especially Jessamine Gorge, which flows south to its mouth, located at center of view [9].



Jessamine Gorge, where the practical realities of upland life can be forgotten for a while, as in a dream. But take a closer look at the vegetation below cliffs, and you will find places with spreading aliens, bush honeysuckle and winter-creeper—especially where deer browse less [10].

**Habitat Level.** Simple protection of land at large scales ensures a lot of conservation for common habitats in the Palisades, but the following habitats need special (targeted) attention since they are much less common or have more critical threats.

White oak (*Quercus alba*) used to be dominant on moderately dry ground of gentler upper slopes and ridges above the cliffs, especially where old river terraces have created a relatively acid soil with less fertility. These oak-hickory woods have been almost all cleared for farmland. The best remnant is at 'Scott's Grove'—with about 100 acres that was bisected by the new US 27 during the 1970s. Other patches are scattered along the river, but mostly just 1-10 acres.

Before settlement, disturbed phases of woodland types appear to have occurred on these uplands, and locally on lower slopes and terraces. Clues today include small populations of rare plants that depend on trails, trampling, grazing or brushy edges, including utility rights-of-way. These species occur mostly in transitions to more gentle topography, probably with original influence of larger herbivores and later some local benefit from rough seasonal grazing of livestock. There is little or no evidence that fires were a regular feature in the original woodland, but it may have been a factor on drier uplands. Groups of indicator plant species can be outlined for xeric outcrops, for old dry pastures, for trails leading down dry points or gentler slopes, and for toeslopes or terraces.

Special subterranean and aquatic habitats also need to be targeted.

Caves: these are easily damaged by vandalism, as well as local water pollution. Endangered bat species deserve particular effort.

Ponds, springs and fens: no pristine examples are known, but further inventory is needed. Lowland oxbows (potentially enhanced by beaver) and upland ponds or wallows (potentially enhanced by ungulates) may have been widely scattered before settlement.

Stream riffles and associated rocky banks: although virtually eliminated from the river itself, some large riffles remain along the lower Elkhorn Creek. Also, rocky banks of the river still harbor rare vegetation with big bluestem and several rare plant species.



Above: entrance to Overstreet Cave in Jessamine Gorge, a small damp cave that harbors the only known maternity colony of gray bats in the Palisades. The bats have occasionally been disturbed, leading to much mortality of infants. TNC acquired the site in the 1990s but has recently transferred it to Jessamine County, using state funds [6].



Low banks of Kentucky River, with silver maples dominant and wood nettle on the ground; boxelder is dominant on the terrace to left [12].

**Species Level: Natives for Recovery.** Even after protection of lands and appropriate management of habitats, some species will deserve micromanagement to recover populations, including propagation in some cases. For a relatively simple initial approach, it is useful to group species as follows (excluding larger animals).

A few plant species in the Palisades are threatened or endangered within much of their ranges—and globally imperiled in some cases (\*). Several are typical of relatively stable habitats on dry clifftops, leads and ledges: *Paxistima canbyi\**, *Phlox bifida* var. *stellaria\**, *Rudbeckia truncata* (northern race)\*, *Solidago harrisii* (western race), *Trillium nivale*, *Viola walteri*. These have few populations within the Palisades, and some are threatened by invasive alien plants. The water stitchwort (*Stellaria fontinalis*)\* is a special case, confined to a few mossy dripping cliffs. Some of its sites have disappeared, and the common alien chickweed (*S. media*) is a continuing threat, especially in dry years.

Several regionally uncommon to globally rare (\*) species are associated with naturalistic disturbance regimes, as noted already under habitats. Xeric rocky uplands have included: *Malvastrum hispidum*\*, *Lithospermum canescens* and *Viola egglestonii*\*. Old dry pastures and associated trails through thin woods have included *Liatris squarrosa*, *Onosmodium hispidissimum*\*, *Opuntia compressa*, *Rudbeckia tenax*, *Silphium trifoliatum* and *Veronicastrum virginicum*. Thin dry woods have included *Cerastium velutinum*\*, *Hexastylis spicata*, *Physaria globosa*\*, *Perideridia americana*\* and *Trifolium* sp. nov.\* Woods on toe-slopes and terraces have included *Collinsia verna*, *Desmodium cuspidatum*, *Lilium michiganense*, *Nabalus crepidineus*\* and (in a few sites) *Trifolium stoloniferum*\*.

Bats have special problems from vandalism in caves, and now the devastating disease, "white-nose syndrome" (Foley et al. 2010).

Many riparian to aquatic plants and animals will also deserve attention if streams and rivers can be sufficiently restored for them. [Appendices in preparation will add details of these species.]



Southern Cleft Phlox (*Phlox bifida* var. *stellaria*): just grows on cliffs in southern Indiana, central Kentucky and central Tennessee [13].



Prostrate native clover (*Trifolium* sp.nov.): recently discovered by Joe Lacefield and Tara Littlefield along trails in rocky woods near Clear Creek (Woodford Co.) and Little Benson Creek (Franklin Co.) [14].



Blue-eyed Mary (*Collinsia verna*) at Raven Run (Fayette Co.); photo by Stan Lockwood [15]. This species may be most abundant where thin woods have been grazed in the past, and sometimes expands within a few decades to cover 10s of acres. It is generally absent in deeper woods with less obvious history of disturbance. Also, although it is capable of some self-pollination, initial horticultural experience (or lack thereof) suggests that small starter populations of just 10-100 plants may not be able to attract sufficient pollinators for persistence.

#### **Species Level: Aliens for Reduction.**

The most problematic plants are usefully grouped by life-form. **Shrubs and trees**. especially bush honeysuckle (*Lonicera maackii*); locally *L. standishii*, *Euonymus alatus*, *Rhamnus dahurica*, *Rosa multiflora*, *Morus alba*, *Ailanthus altissima*.

Evergreen woody creepers and other vines. especially winter-creeper (*Euonymus fortunei*) and Japanese honeysuckle (*Lonicera japonica*); locally *Hedera helix*, *Vinca minor* and others expected. Biennials and annuals in woods: especially garlic mustard (*Alliaria petiolata*) and common chickweed (*Stellaria media*).

**Prostrate creeping perennials in woods**: gill-over-the-ground (*Glechoma hederacea*) and false strawberry (*Duschesnea indica*). Initial control depends largely on cutting and herbiciding these plants, at a cost of roughly \$100-1000 per acre. But additional or alternative practices will probably be helpful, including planting of competitive natives and using browsing or burning to shift the balance. There is much uncertainty about how much control is feasible or desirable, and about how much help that alternative practices can contribute.

The other major functional class of problematic aliens is pests and diseases of tree species, especially the following.

**Emerald Ash Borer**: this threatens to kill 90-100% of all green and white ash trees, but most blue ash may survive (Tanis & McCullough 2012, Whitehill et al. 2012).

**Canker on black walnut**: the 'Thousand Cankers Disease" has recently spread from western states to Tennessee, and threatens to devastate black walnut (Grant et al. 2011).

**Canker on butternut**: this has killed virtually all trees in the Bluegrass region during the past 50 years, but there are prospects for replanting resistant trees across eastern states (Brosi 2010).

**Dutch Elm Disease**: this disease has killed many large elms during the past 50 years, but regeneration continues (Chondra et al. 2010). There is little management that can reduce these problems in most cases, although it may be important to keep a few seed-producing trees alive at some sites. A long-term approach is needed, based on seed collection, breeding and gradual replanting in suitable sites.



Winter-creeper (*Euonymus fortunei*): still used in horticulture but perhaps the worst alien plant in woodland of the Bluegrass region [16].



Emerald Ash Borer (*Agrilus plannipennis*): accidentally introduced from China to U.S.A. in the 1990s, now destroying most ashes [17].







*Loniicera standishii*, a bush honeysuckle that is locally abundant on rocky slopes in the central Palisades. It tends to sprout laterally, as well as from stumps, making it more difficult to control than *L. maackii*. It first appeared in the 1960s, and has become common in just three counties. But it remains unknown elsewhere in Ky. [18].

**TRADEOFFS**. If teamwork is established in the Palisades area, and if shared targets for conservation are defined, then we could begin to resolve the following controversial issues as a community. To deal with each problem, how much success will be satisfactory and how much cost (or collateral damage) can be born? What is a sustainable balance? How much financial input is reasonable?

Vegetation Management. An ecological basis for optimal management is still not generally agreed. But further synthesis of historical data (especially old surveys) can greatly improve our collective picture of the original landscape (e.g. Campbell 1989). And further comparison of experiences from different managers can improve our analysis of what would be optimal. Costs and benefits need to be measured, especially for the varied options in control of alien plants, from no action as at Buckley Hills and most private lands—to regular repeated action as at Flora Cliff, Raven Run, a few private tracts (e.g. Liz Hobson in Fayette Co.), and to some extent sites worked on by KSNPC or TNC. In particular, the more naturalistic effects of seasonal browsing or burning deserve careful attention through initial trials, then long-term research. And we need to understand the extent to which deeper shade plus deer browsing, alone, can reduce invasion of bush honeysuckle and winter-creeper.

The recovery or propagation of selected plants requires first prioritizing species for action—decisions that have still not been clearly made by any organization. Even TNC has not been checking the old pastures it has killed with herbicide before planting "native warm season grasses" that are imported from western regions. Yet is likely that endangered species like gromwell (*Onosmodium*) remain at a few sites in such pastures. If agreement on priorities for propagation can be achieved, then a market could be developed for a local nursery to provide material, at least on a non-profit basis.

Future funding for such work can be conceived from three general sources: governmental grants (supported by taxes), private donations and endowments (as at Flora Cliff), and local income directly from the land. The latter may well be most satisfactory and sustainable.



Above: gromwell (*Onosmodium hispidissimum*), a generally endangered remnant of open grassy vegetation in east-central states. It is somewhat resistant of herbivory, and appears to have been concentrated on dry calcareous ground with high fertility [19].



Prescribed fire is used by TNC to maintain plantings of grasses from western prairies that are not native to these uplands. Some continued uses of these old farms is reasonable, especially if useful funds come from hay or seed or livestock, but native flora deserves more attention [20].

#### **Building a Community of Conservationists.**

**Social Movement**. Effective conservation along the Palisades may, paradoxically, depend on productive working relationships with neighbors in farms and residential areas. Due to their proximity, knowledge and appreciation of the area, these people could ultimately form the core of support for conservation. However, traditional farming—and new residential developments, even with restrictive easements—do not necessarily support the goals of conservation. For example, it may be useful to promote seasonal browsing of livestock in the upland woods, but abruptly fenced boundaries tend to be established around preserves. And 'conservation buyers' of tracts with easements are often retired and tend to have little active interest in managing natural areas. An alternative focus is to solicit volunteers from further afield, but after 20 years of trying it does not seem that sufficient interest can be generated to accomplish the primary problem for workers: reduction of alien plants—a potentially demoralizing task! It might make more sense to explore new local initiatives, such as using goats and sheep to browse the aliens and converting alien plants to meat, compost or fuel. Again, research and education could be designed to support such initiatives, but to date there has been little direct linkage through academic institutions.

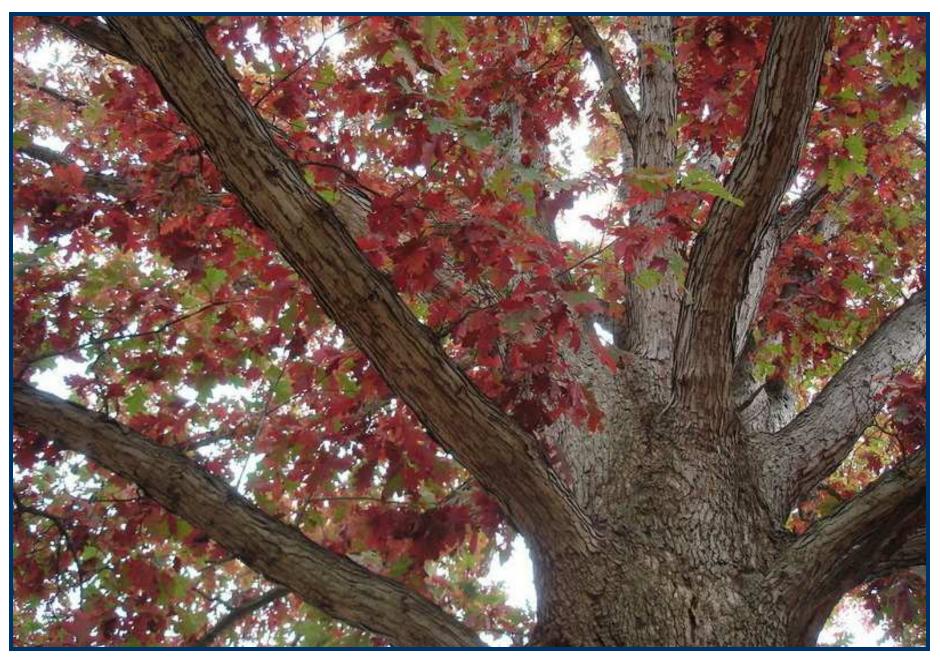
Economic Development. Diverse local products could be tried if the intent is focused on sustainable uses that are compatible with sufficient conservation. For example, TNC has already looked into production of superior grass seed and hay, plus selected wood products (e.g. uses for the abundant red cedar in old fields), and selected hunting leases. Many truly native plants—from wildflowers to trees—deserve to be propagated for restoration across the region, but such effort has not yet been directly linked with conservation in the Palisades. The special problems from pests and diseases of common trees could be addressed through local collection of any resistant material, and then development of nurseries for future restoration—especially when epidemics subside. But it is difficult to advance such efforts without regular interaction among potential partners—especially interested residents along the Palisades.



Old farms along the Palisades can be adapted for conservation [21]



A few decades ago farming extended into ravines now grown up [22].



Large white oaks like this use to dominate the uplands within a mile or two of the Kentucky River. Acorns should be collected from the few that remain, and planting programs should be initiated by conservationists if they want to restore something like the original woodland [23].

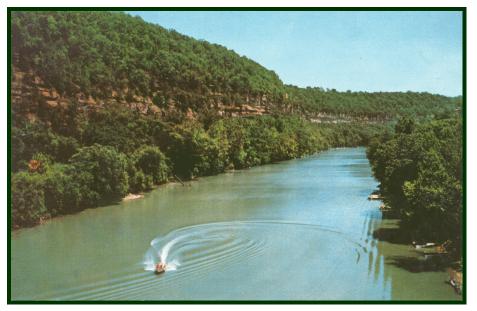
**Riverine Infrastructure.** Historically, the river itself has been an important route for travel by human beings through the region. But during the past century or so, it has sometimes formed a barrier to progress—as in the form of multi-lane highways that need new bridges for their flow. Locks-and-dams along the river have become largely disused for boating, but the pools themselves provide some recreation and have become critical for local water supplies.

The US 27 bridge from Jessamine to Garrard Co. destroyed much of Scott's Grove—an important site along the Palisades—and a new proposed bridge from Jessamine to Madison Co. would do much further damage. This bridge would traverse, or come close to, Marble Creek—one of the best ravines in the eastern half of the Palisades area. Costs and benefits of the whole proposed 'connector' road between Interstate 75 and US 27 are now being studied. It is important that environmental interests are well represented in the analysis, and that the community as a whole is provided with a transparent assessment. The proposal should be a 'wake-up call' for conservationists in the region who want to develop good long-term collaboration, not just react to short-term crises. Whether the road is built or not, a deeper cooperative network of interested people is needed for the Palisades. And it is important for all of us to address the question: should any new road across the Palisades be opposed?

Pool No 9 between Valley View (Dam No. 9) and Boonesboro (Dam No. 10) is the major source of water for Lexington, with a capacity of about 30-60 million gallons per day for 700,000 people. Other pools are used for cities from Beattyville to Frankfort, but there is much less withdrawal: Nicholasville and Lancaster draw up to 3 and 1.7 mgd from Pool No. 8; Harrodsburg, up to 2-3 mgd from No. 7; Wilmore, up to 1 mgd from No. 6. Such uses are relevant to any ideas about scaling down or removing the old locks-and-dams. There is virtually no potential for returning part of the river to a more natural free-flowing condition in the coming decades. But this goal might eventually become feasible for Pools 6 to 8. If the community becomes more interested in natural history, we could then look forward to a revival of many species in the river.



The I-75 bridge has been built in stages from 1946 to 1998. When first opened, it was the 7th highest bridge in the United States [24].



Pools are useful for boating and water supply, but they have greatly changed flooding regimes, water quality and aquatic ecology [25].



The Dixie Belle offers tours on the river from Shaker Landing, the historic access for trade with Shaker Village [26]. Long, majestic, peaceful vistas are available upstream in Pool No. 7. (In recent years, the boat has stopped going through the lock at Dam No. 7, a few hundred yards below the landing.) However, the impoundment has eliminated many aquatic species, and plants formerly associated with free-flowing rocky banks are now restricted to a few sites (including *Andropogon gerardii*, *Baptisia australis*, *Deschampsia glauca*, *Solidago rupestris*).

### Potential format for summary of cooperative conservation planning across the whole Palisades area.

Such an approach is essential for developing shared goals and transparent accountability among partners. TNC initiated planning of this type in the 1990s, but it did not lead to a 'big tent' for partners across the region. No written report is available for the community to measure success versus failure, and costs versus benefits.

Suggested Targets	Condition ► Goal	Primary Problems	Primary Solutions	Progress to 2012
1. 100,000+ acres of protected woods within protected farmland	Fair ▶ good with 100+ years of more development	Lack of public funds; Lack of local support? Lack of coordination?	Persist in coordinated effort with clear public goals, resolving conflicts	A few 1000 acres now protected, but long-term unclear
2. Extension of oakhickory woods onto uplands beyond cliffs	Poor ► fair with 100+ years of further work	Lack of understanding? Value of farmland and conversion to housing	Conversion of fields to woods; propagation and planting of native trees	Little or none; some initial experience in Camp Nelson area
3. Management of selected areas with browsing or burning	Poor ► fair (?) with decades of applied research	Lack of understanding! Lack of interest in browsing woodland	Initiate long-term research on effects of browsing and burning	Little or none; but much could be learned from TNC
4. Sensitive sections of karst or stream systems (caves, ponds, riffles)	Poor ► fair (?) with a few decades of focused effort	Lack of site-control; Past disturbances from vandalism, pollution etc.	Use governmental funds and regulations to protect sites	Some success in caves; little or none in ponds, riffles
5. Regionally imperiled plants of dry or disturbed woodland phases	Poor ▶ good with a few decades of recovery	Lack of understanding! Lack of inventory Lack of propagation	More detailed inventory, research, propagation and trials in recovery	Little or none except for small-scale or private efforts
6. Bats	Poor ► fair (?) with decades of applied research	White-nose syndrome; Disturbances of winter- ing or maternity colonies	Develop plan in coordination with national efforts	Some protection and recovery of populations but WNS
7. Selected aquatic species that have disappeared from streams	Poor ► fair (?) with decades of applied research	Past/continuing damage to habitats; lack of research, in vitro growth	If suitable habitat can be restored, conduct in vitro trials, reintroduction etc.	None; but potential for in vitro is well established





Above: High Bridge in winter, by David Stephenson [27]

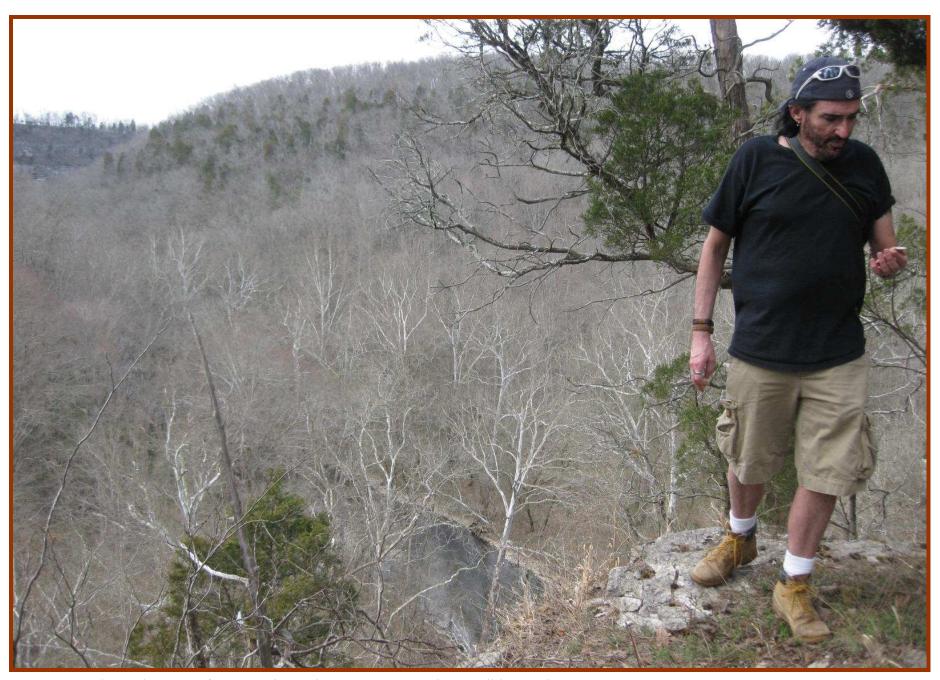
Below: Mother Ann Lee hydroelectric plant at Dam No. 7, built in 1926 [28].

#### **Bibliography** [selected for further reading]

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As we turn to leave the Gorge for Town, in our hearts can we say that we did enough? [30]

#### **Sources of Images**

- 1: cover photo, posted by Ash Brown at http://mw2.google.com/mw-panoramio/photos/medium/7396476.jpg
- 2: http://www.history-map.com/picture/003/pictures/Kentucky-1700s-the.jpg
- 3: author's photo from Jessamine Gorge (April 2009).
- 4: woodcut (?) printed in Ranck (1901), at http://heritage.ky.gov/kas/kyarchynew/fort+boonesborough.htm; other variants of this scene exist.
- 5: http://www.ket.org/kentucky/sallybrown/bio.htm; see also Martin et al. (1979) for an early project that Brown funded.
- 6: 3 rc.runryder.co/helicopter/gallery/27500/Shaker Village
- 7: author's photo of Overstreet Falls (November 2011).
- 8: http://worldtimzone.com/railtrail/highbridge/tourism.php; photo from 1913 postcard at moodyscollectibles.com/pixfiles14/14760.jpg
- 9: aerial view from GoogleEarth (2012), based on USDA Farm Service Agency imagery dated 2008-2010.
- 10-11: author's photos from Jessamine Gorge (November 2011).
- 12: author's photo from banks of Kentucky River near mouth of Jessamine Creek (April 2009).
- 13: http://plants.usda.gov/gallery/pubs/phbi3\_002\_php.jpg
- 14: author's photo from cultivation (May 2011).
- 15: blue eyed Mary http://www.flickr.com/photos/sklockwood/4158085009/sizes/l/in/photostream/
- 16: http://missouribotanicalgarden.org/gardens-gardening/your-garden/plant-finder/plant-details/kc/a420/euonymus-fortunei-coloratus.aspx
- 17: http://www.tn.gov/agriculture/images/regulatory/eab.jpg
- 18: author's photos from Jim Beam Preserve (May 2011).
- 19: http://vaplantatlas.org/index.php?do=plant&plant=330; see also bluegrasswoodland.com/uploads/Onosmodium Prairie Gromwell .pdf
- 20: posted by Steve Bishop at: http://www.flickr.com/photos/57478077@N00/485462523/sizes/l/in/photostream/
- 21: author's photo from above Jessamine Gorge (May 2011).
- 22: author's photo from end of Figg Lane (May 2011).
- 23: http://pics.davesgarden.com/pics/2007/11/19/ViburnumValley/c54aa7.jpg
- 24: posted by Richard Ambrose at http://walkoverstates.wordpress.com/category/kentucky/
- 25: http://nyx.uky.edu/dips/xt7x696zwx82/data/2008ms016/03/0071/0071.jpg
- 26: http://farm4.static.flickr.com/3085/2852117636 e468cb382f.jpg
- 27: http://www.davidstephenson.com/wp/wp-content/uploads/2009/10/091015dixiebelle infrared001a-950x362.jpg
- 28: http://www.kyhydropower.com/articles.html
- 29: posted by Tom Barnes at http://plants.usda.gov/gallery/pubs/hyap\_004\_php.jpg
- 30: author's photo from Paxistima Point at Jessamine Gorge (May 2011); the subject is Dr. Raymond Cranfill, a child of the Bluegrass.
- 31: http://www.cliftonandersonantiques.com/inventory/070320 157.html; follows on last page. "View of Lower Ferry on the Kentucky River.

Artist: George Beck, 1748-1812. Gouache and watercolor on paper. Ref. No. 070320\_157. 17" x 23" image size (21 3/8" x 27 3/8" frame size). Painting is inscribed, View of lower ferry on Kentucky River Geo. Beck 1812, on an applied label attached to the reverse. This painting, likely

#191 of the exact title, was entered by his wife in 1814 at the fourth annual exhibition of the Pennsylvania Academy of Fine Arts."

See also notes by Edna Whitley posted at http://www.tfaoi.com/aa/3aa/3aa181.htm; the "Lower Ferry" may have been at what became the US 68 crossing (Brooklyn Bridge). Although damaged, the painting has ecological interest in showing ridge tops overlooking the river, presumably cleared off for the view. Very few painted landscapes of central Kentucky have been found from this early period of settlement.

