

**Figure 1a. General relationship of upland forest types to the base-related gradient (left to right), and to mesic versus xeric conditions (lower to upper).** The typical gradient in hilly landscapes from mesic to xeric conditions (Classes 05 to 11 to 12) is similar to that on deeper soils in farmed landscapes, from forest to thickets to open woodland and old fields (Classes 07 to 08 to 10); see text for differences and further explanation.

<b>XERIC &amp; SERAL SITES</b> Class 12 (+10)	<b>Virginia pine</b> <b>HARD PINE</b> pitch pine                      shortleaf pine		<b>redbud</b> <b>RED CEDAR</b> apple, haw, plum                      honey locust	
narrow ridges, southwest slopes  <b>SUBXERIC SITES</b> Class 11 (+08)	scarlet oak chestnut oak  <b>OAK-CHESTNUT</b>  (white pine) sourwood	sassafras, persimmon black oak, white oak  <b>OAK-HICKORY</b>  black gum                      black locust red maple                      black cherry		shumard oak chinquapin oak  <b>OAK-ASH</b>  (yellowwood) elm
<b>MESIC SITES</b> northeast slopes, well-drained bottoms Class 05 (+07)	birch magnolia  <b>HEMLOCK</b> (more common in the Appalachians)	sweetgum tulip poplar  <b>BEECH</b> (widespread in eastern states)	walnut basswood  <b>SUGAR MAPLE</b> (more common in the mid-west)	coffee tree hackberry  <b>BUCKEYE</b> (locally associated with ungulates)
<b>NUTRIENT STATUS</b>	pH ca. 4.0 nutrient-poor soil typically on sandstone	pH ca. 5.5 average soils on various parent materials		pH ca. 7.0 nutrient-rich soil typically on limestone

**Figure 2b. Trends in ground cover of mature stands on Daniel Boone National Forest along major compositional gradients: base-related (low to high fertility) and water-related (mesic to xeric).**

Water-related gradient division	Base-related gradient division				
	A: low (hemlock, chestnut oak, etc.)	B: low-moderate (transitions)	C: moderate (beech, white oak, etc.)	D: moderate-high (transitions)	E: high (sugarmaple, chinquapin oak, etc.)
Xeric (pine, cedar)	1(4.5)	1(5)	1.5	??	3.5?
Xeric-subxeric (transition)	1.5(?)	1.5(4.5)	2(?)	??	??
Subxeric (oaks, hickories, etc.)	1(4)	2(4)	2.5(4.5)	3.5	3?
Subxeric-mesic (transition)	1.5(4)	2.5	4	3.5	4
Mesic-subxeric (transition)	1	2.5	3	4	4.5?
Mesic: colluvial (sugar, beech, etc.)	1	3.5	3.5	4.5	5?
Mesic: alluvial-riparian transition	2	3	4	4	??

**Explanation.** In 1993-95, J. Campbell, M. Hines & D. Taylor surveyed 500+ plots of 10 m radius along transects chosen to represent the full range of soil conditions on DBNF. Displayed values are medians. Units are quasi-logarithmic: 1 = 0-1%; 2 = 1-2%; 3 = 2-5%; 4= 5-10%; 5= 10-20%; ? indicates < 5 plots; ?? indicates no data yet available. Cover is defined as total leaf area (from horizontal to vertical and including overlaps) of herbaceous species, including graminoids and prostrate phases of woody vines, all visually estimated as percentages of plot area. Excluded are subshrubs (woody species less than 0.3 m tall), which are mostly Ericaceae; *but these subshrub covers are in parentheses*. Data come from mature forest only, typified by sugar maple, beech, hemlock, oaks, hickories & (on xeric sites) pines or cedar; reports to DBNF provides detailed descriptions of each forest type.

**Figure 2a. Diagram showing general relationships between vegetation, hydrology, topography and disturbance.**

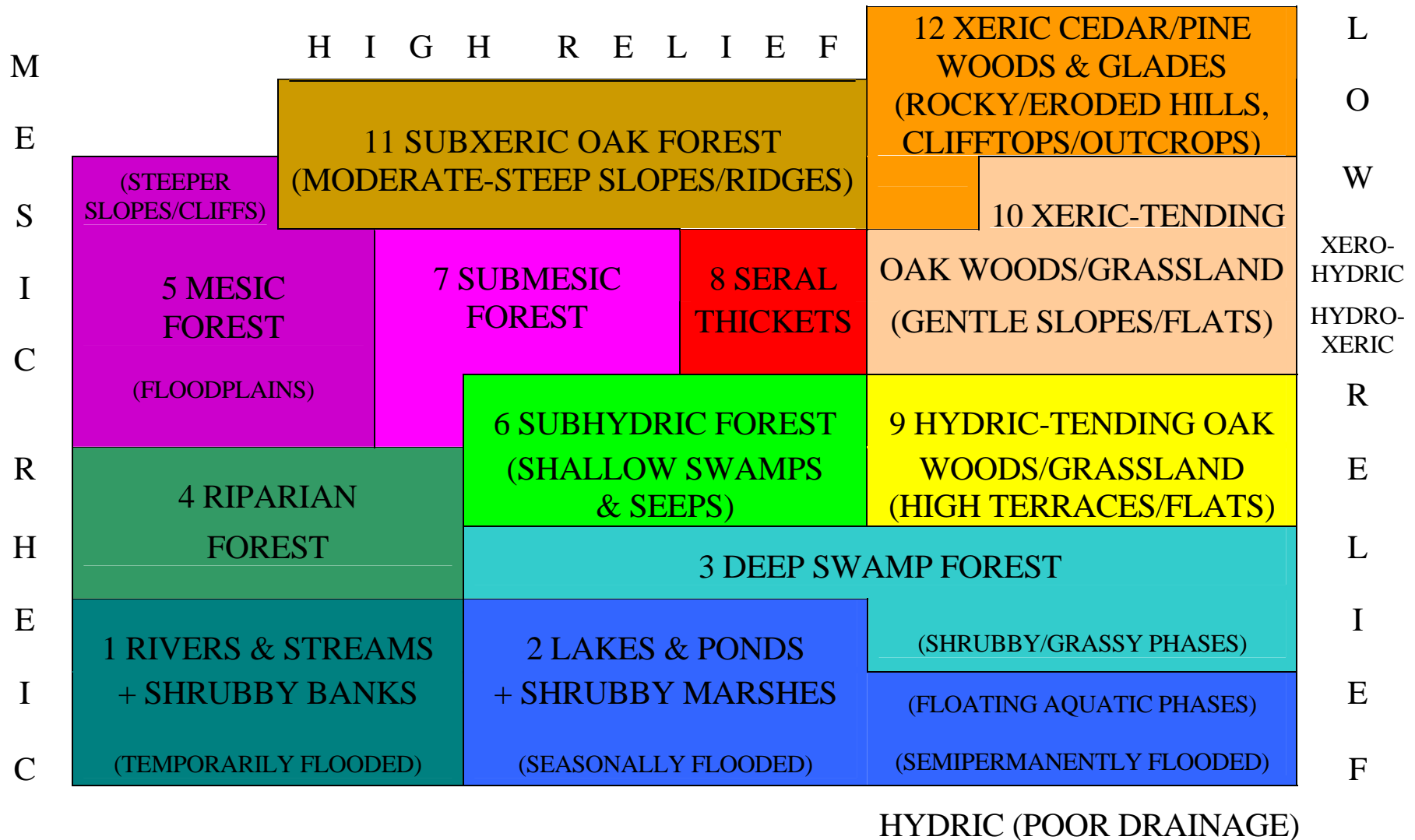
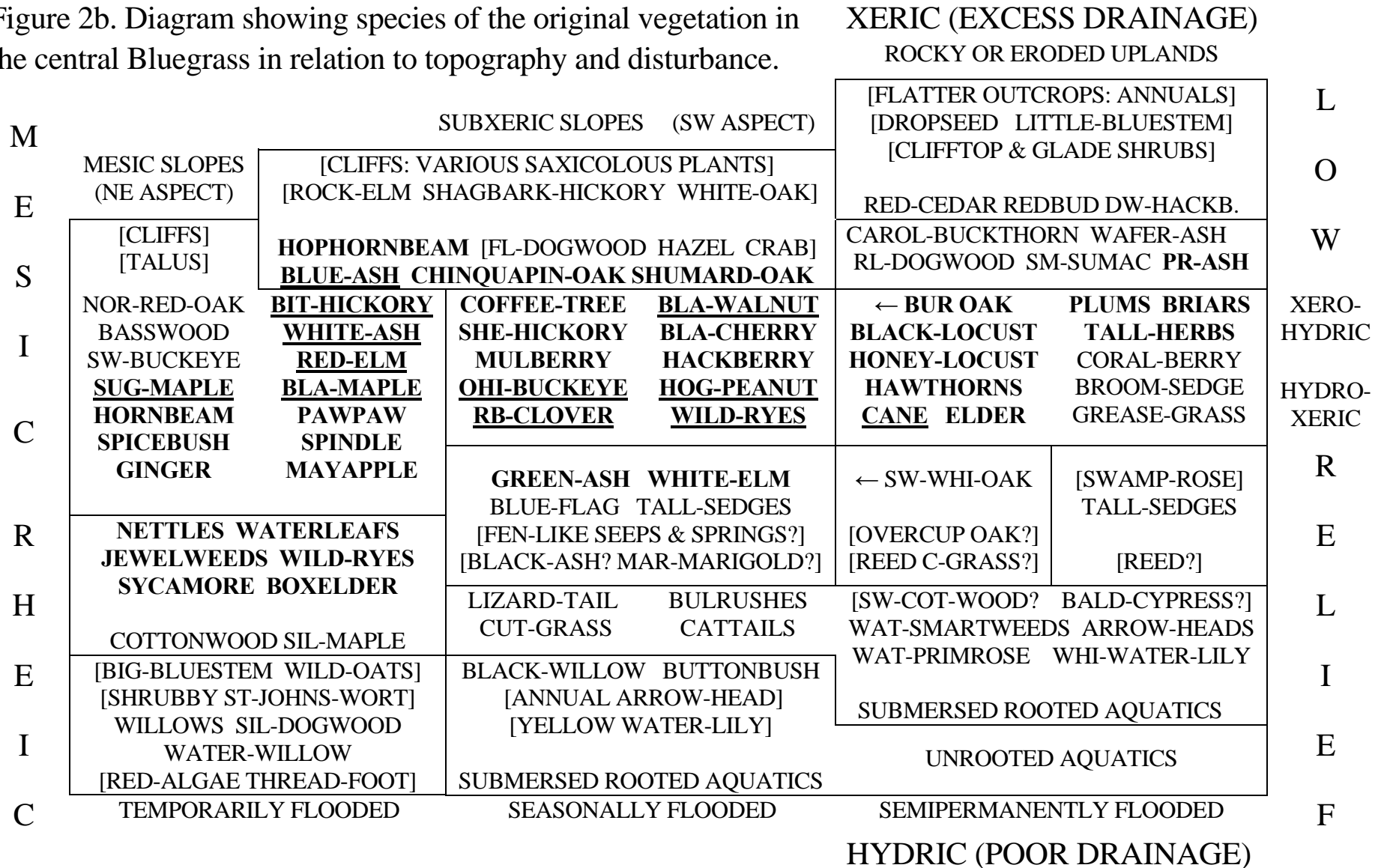


Figure 1. Diagram showing general relationship of habitat classes to hydrology. Cliffs and other rocky openings occur on the upper side; aquatic openings occur on the lower side. Between these extremes, more open, stressed or disturbed vegetation tends to occur to the right, but there are exceptions. See text for further details.

Figure 2b. Diagram showing species of the original vegetation in the central Bluegrass in relation to topography and disturbance.



\*Species in bold were common across the region; underlined were locally abundant; species in brackets were largely restricted to peripheral hills and other special habitats. Some names need further explanation: “nettles” indicate Urticaceae in general; “waterleaves” indicate Hydrophyllaceae in general.

Figure 2c. Soil Series of the Eastern Bluegrass and transitions to the Eden Shale Hills.

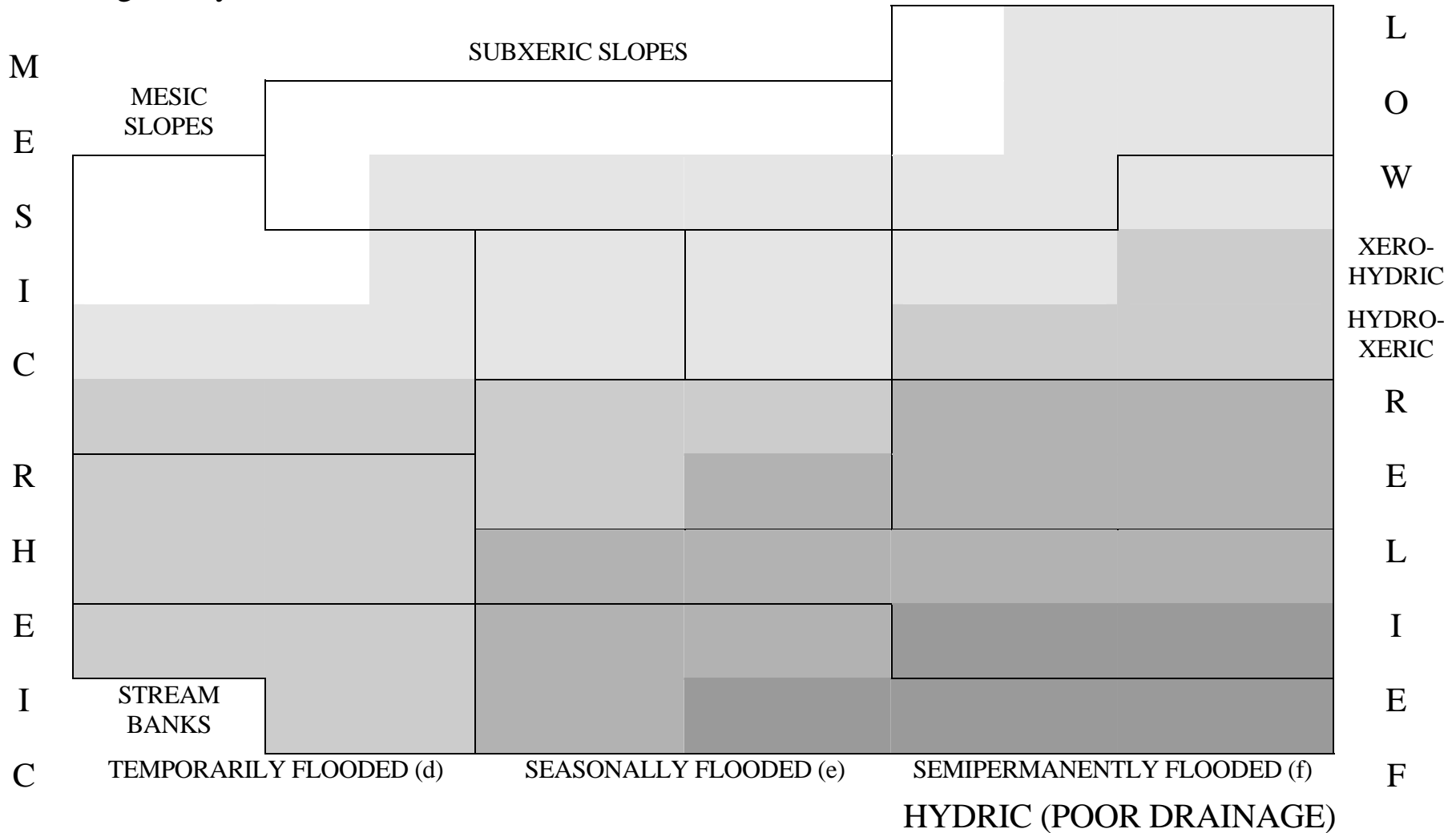
XERIC (EXCESS DRAINAGE)  
ROCKY/ERODED UPLANDS

		SUBXERIC SLOPES					L	
M	MESIC SLOPES				Ab: lithic HDA 6 (Cynthiana)		O	
F			B: typic HDA 6 (Eden)			B: typic HDA 2 (Heitt)	W	
C		B: ultic HDA 4 (Culleoka)	B: typic HDA 3 (Lowell)	B: mollic HDA 2 (Shelbyville)	B: typic ADO 1 (Loradale)	C: typic FDA 1 (Nicholson)	XERO-HYDRIC	
I			B: typic ADO 3 (Woolper)				HYDRO-XERIC	
C		B: typic HDU 2 (Allegheny)	B: ultic HDA 2 (Elk)	C: typic HDA 3 (Brashear)	C: aquic HDA 2 (Licking)	D: aquic FDA 1 (Lawrence)	E: typic FQA 0 (Robertsville)	R
R		B: flu HDO 0 (Boonesboro)	B: flu HDO 0 (Huntingdon)	Bc: cumulic HDO 0 (Egam)	C: typic FDA 1 (Otwell)	D: aeric OGA 0 (McGary)	E: typic HQE 0 (Zipp)	E
H		B: dys-flu ECR 0 (Skidmore)	B: dys-flu ECR 0 (Chagrin)	B: dys-flu ECR 0 (Nolin)	D: aer-flu HQE 0 (Newark)			L
E								I
I	STREAM BANKS							I
C	TEMPORARILY FLOODED	SEASONALLY FLOODED			SEMIPERMANENTLY FLOODED		F	
		HYDRIC (POOR DRAINAGE)						

\* Brief explanation: xeric = dry enough to maintain open woods with red cedar, scrub pine or shrubs; subxeric = moderate, dry enough for oak dominance with little disturbance; xerohydric = with alternating dry summers/falls and wet winters/springs; submesic = intermediate conditions between mesic, xeric and hydric; mesic = with low enough stress to maintain sugar maple, beech or hemlock dominance; subhydric = somewhat poorly drained; hydric = poorly drained (anaerobic subsoils); riparian = generally well drained but floodplain.

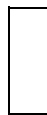
Figure 2d. Generalized summary diagram showing relationship to flooding and hydric conditions\*.

XERIC (EXCESS DRAINAGE)  
ROCKY/ERODED HILLS



\*Shading classes

Colluvial uplands



Residual uplands



Temporarily flooded/pools



Seasonally flooded



Semipermanently flooded



Figure 2e. Generalized summary diagram showing relationship of vegetation classes to drought stress and xeric conditions\*.

XERIC (EXCESS DRAINAGE)  
ROCKY/ERODED UPLANDS

M E S I C R I P A R I A N S		SUBXERIC SLOPES			XERIC	EXTREME XERIC	L
	MESIC SLOPES	SUBXERIC -MESIC	SUBXERIC	SUBXERIC (-XERIC)	XERIC-(SUBXERIC)	XERIC	O
	MESIC CLIFF/TALUS	SUBXERIC -MESIC	SUBXERIC -SUBMESIC	SUBXERIC (-SUBMESIC)	SUBXERIC (-XERIC)	XERIC	W
	MESIC-SUBXERIC	MESIC-SUBXERIC	SUBMESIC (-SUBXERIC)	SUBXERIC (-SUBMESIC)	SUBXERIC (-SUBMESIC)	SUBXERIC-XEROHYDRIC	XERO-HYDRIC
	MESIC	MESIC	SUBMESIC (-SUBHYDRIC)	SUBXERIC (-SUBMESIC)	SUBXERIC (-SUBMESIC)	SUBXERIC-HYDROXERIC	HYDRO-XERIC
	MESIC RIPARIAN	MESIC RIPARIAN	SUBHYDRIC -SUBMESIC	SUBHYDRIC -SUBMESIC	SUBHYDRIC -HYDRIC	HYDRIC -HYDROXERIC	R
	RIPARIAN	RIPARIAN -SUBHYDRIC	SUBHYDRIC	SUBHYDRIC	HYDRIC-SUBHYDRIC	HYDRIC	E
	RIPARIAN	RIPARIAN -SUBHYDRIC	HYDRIC-RIPARIAN	HYDRIC	HYDRIC	HYDRIC	L
	SCOURED RIPARIAN	SCOURED RIPARIAN	SUBAQUATIC -RIPARIAN	SUBAQUATIC	DEEPLY HYDRIC	DEEPLY HYDRIC	I
	STREAM BANKS	SCOURED RIPARIAN	AQUATIC -RIPARIAN	AQUATIC	AQUATIC	AQUATIC	I
C	TEMPORARILY FLOODED	SEASONALLY FLOODED		SEMIPERMANENTLY FLOODED		F	
				HYDRIC (POOR DRAINAGE)			

\* Brief explanation: xeric = dry enough to maintain open woods with red cedar, scrub pine or shrubs; subxeric = moderate, dry enough for oak dominance with little disturbance; xerohydric = with alternating dry summers/falls and wet winters/springs; submesic = intermediate conditions between mesic, xeric and hydric; mesic = with low enough stress to maintain sugar maple, beech or hemlock dominance; subhydric = somewhat poorly drained; hydric = poorly drained (anaerobic subsoils); riparian = generally well drained but floodplain.

Figure 2f. Proportion of trees and shrubs with ring-porous wood. In some species, wood is partially ring-porous (indicated by \*).

XERIC (EXCESS DRAINAGE)  
ROCKY/ERODED UPLANDS

M	MESIC SLOPES	SUBXERIC SLOPES			codom.	codom.	L
		codom.	dominant	dominant	codom.	codom.	O
E	codom.	codom.	dominant	dominant	dominant*	dominant*	W
		codom.	codom.	codom.	dominant*	dominant*	XERO-HYDRIC
C	local	local	codom.	dominant*	dominant*	dominant*	HYDRO-XERIC
		rare	local	codom.	dominant	dominant	R
R	none	rare	codom.	dominant	dominant	dominant	E
		none	none	rare	rare	rare	L
H	none	none	none	none	none	none	I
		STREAM BANKS	none	none	none	none	none
E	TEMPORARILY FLOODED	SEASONALLY FLOODED			SEMIPERMANENTLY FLOODED		F
		HYDRIC (POOR DRAINAGE)					

\* Estimated levels of significant effects before settlement: strong = much land burned with effects at ca. 1-5 year intervals; moderate = most land burned with effects at ca.. 5-50 year intervals; weak = most land burned with effects at ca. 50-100+ intervals; rare = most land not influenced by fire; none = no land influenced by fire.



Figure 2g. Proportion of trees and shrubs with hairy leaves.

XERIC (EXCESS DRAINAGE)  
ROCKY/ERODED UPLANDS

		SUBXERIC SLOPES			moderate	moderate	L
M	MESIC SLOPES	moderate	moderate	moderate	moderate	moderate	O
E		low	moderate	moderate	moderate	moderate	W
S		low	moderate	moderate	high	high	XERO-HYDRIC
I		low	moderate	moderate	high	high	HYDRO-XERIC
C		low	low	moderate	moderate	high	R
R		low	low	low	low	high	E
H		low	low	low	low		L
E		low	low	low	low		I
I	STREAM BANKS	low					I
C		TEMPORARILY FLOODED	SEASONALLY FLOODED	SEMIPERMANENTLY FLOODED			F
						HYDRIC (POOR DRAINAGE)	

\*

Species with densely hairy leaves include walnut, hickories, hackberry, elms, some oaks, hophornbeam, roughleaf dogwood, downy hawthorn, most briars, most plums; species with less dense hairs or variable conditions include basswoods, buckeyes, black maple, white ash, other dogwoods. Other are glabrous or usually so.

Figure 2h. Proportion of trees and shrubs with thorns or toxins.

XERIC (EXCESS DRAINAGE)  
ROCKY/ERODED UPLANDS

		SUBXERIC SLOPES			common	common	L
M	MESIC SLOPES	moderate	moderate	moderate	common	common	O
E		moderate	moderate	moderate	common	dominant	W
C		moderate	moderate	common	common	dominant	XERO-HYDRIC
I		moderate	moderate	common	common	dominant	HYDRO-XERIC
C		moderate	moderate	moderate	moderate	moderate	R
R		moderate	moderate	low	low	moderate	E
H		low	low	low	low		L
E		low	low	low	low		I
I	STREAM BANKS	low					I
C	TEMPORARILY FLOODED		SEASONALLY FLOODED		SEMIPERMANENTLY FLOODED		F
							HYDRIC (POOR DRAINAGE)

\*

Species with strong thorns or toxins are mostly in Rosaceae, Fabaceae; Fagaceae are generally considered moderate, some though some have high repellance due to tannins.

Figure 2i. Proportion of trees and shrubs with bird-dispersed fruit.

XERIC (EXCESS DRAINAGE)  
ROCKY/ERODED UPLANDS

		SUBXERIC SLOPES			high	high	L
M	MESIC SLOPES	low	low	moderate	high	high	O
E		low	low	moderate	high	high	W
S		low	low	moderate	high	high	XERO-HYDRIC
I		low	low	moderate	high	high	HYDRO-XERIC
C		low	low	low	low	low	R
R		rare	rare	rare	rare	rare	E
H		rare	rare	rare	rare		L
E		rare	low	none	none		I
I	STREAM BANKS	rare					I
C	TEMPORARILY FLOODED						F
					SEMIPERMANENTLY FLOODED		
					HYDRIC (POOR DRAINAGE)		

\*

Species with strong thorns or toxins are mostly in Rosaceae, Fabaceae; Fagaceae are generally considered moderate, some though some have high repellance due to tannins.

Figure 2j. Abundance of native warm-season (C4) graminoids.  
 In most upland woods the only species are *Muhlenbergia* spp. (\*)

XERIC (EXCESS DRAINAGE)  
 ROCKY/ERODED UPLANDS

		SUBXERIC SLOPES			common	common	L
M	MESIC SLOPES	local*	local*	local*	local	common	O
E		rare*	local*	local*	local	common	W
S		rare*	rare*	rare*	local	common	XERO-HYDRIC
I		none	rare*	rare*	local	common	HYDRO-XERIC
C		none	rare*	rare*	local	local	R
R		local	rare	rare	rare	rare	E
H		local	rare	none	none	none	L
E		local	local	none	none	none	I
I	STREAM BANKS	local	none	none	none	none	I
C	TEMPORARILY FLOODED		SEASONALLY FLOODED		SEMIPERMANENTLY FLOODED		F
					HYDRIC (POOR DRAINAGE)		

\*

Species with densely hairy leaves include walnut, hickories, hackberry, elms, some oaks, hophornbeam, roughleaf dogwood, downy hawthorn, most briars, most plums; species with less dense hairs or variable conditions include basswoods, buckeyes, black maple, white ash, other dogwoods. Other are glabrous or usually so.

Figure 2k. Generalized summary diagram suggesting presumed relationship between vegetation classes and fire history\*.

XERIC (EXCESS DRAINAGE)  
ROCKY/ERODED UPLANDS

		SUBXERIC SLOPES			weak	weak	L	
M	MESIC SLOPES	weak	moderate	moderate	moderate	moderate	O	
E		rare	weak	moderate	moderate	mod-str	strong	W
C		rare	weak	moderate	mod-str	mod-str	strong	XERO-HYDRIC
I		rare	weak	moderate	mod-str	mod-str	strong	HYDRO-XERIC
C		rare	weak	weak	moderate	moderate	moderate	R
R		none	rare	rare	weak	weak	weak	E
H		none	none?	none	none	rare	rare	L
E		none	none?	none	none	none	none	I
I	STREAM BANKS	none	none	none	none	none	none	I
C		TEMPORARILY FLOODED	SEASONALLY FLOODED	SEMIPERMANENTLY FLOODED	HYDRIC (POOR DRAINAGE)		F	

\* Estimated levels of significant effects before settlement: strong = much land burned with effects at ca. 1-5 year intervals; moderate = most land burned with effects at ca.. 5-50 year intervals; weak = most land burned with effects at ca. 50-100+ intervals; rare = most land not influenced by fire; none = no land influenced by fire.

Figure 21. Suggested general direction of succession without major disturbances of human origin.

XERIC (EXCESS DRAINAGE)  
ROCKY/ERODED UPLANDS

		SUBXERIC SLOPES			mostly stable	mostly stable	L
M		mostly stable	mostly stable	mostly stable		mostly stable	O
E	MESIC SLOPES	mostly stable	mostly stable	mostly stable	↙	mostly stable	
C		mostly stable	↙	↙	↙	←	W
		mostly stable	←	←	←	←	XERO-HYDRIC
		mostly stable	←	←	←	←	HYDRO-XERIC
		mostly stable	←	←	mostly stable?	←?	R
R		mostly stable	↖	↖	mostly stable	mostly stable	E
H		mostly stable	mostly stable	mostly stable	mostly stable	mostly stable	L
E		mostly stable	mostly stable	mostly stable			I
I	STREAM BANKS	mostly stable	mostly stable				I
C		TEMPORARILY FLOODED	SEASONALLY FLOODED		SEMIPERMANENTLY FLOODED		F
						HYDRIC (POOR DRAINAGE)	

\* Based on general knowledge of vegetation from field work and the literature: see Appendix 3 and Campbell (2001a). Large arrows indicate general directional change for most of the vegetation type (expected within ca. 10-100 years). Small arrows indicate partial, minor or slow changes (expected to take 100+ years for complete transition).

Figure 2m. Generalized division of vegetation into degrees of overall development from bare substrate to deep wooded shade.

XERIC (EXCESS DRAINAGE)  
ROCKY/ERODED UPLANDS

M E S I C  R H E I C		SUBXERIC SLOPES			3-4	5-6	L
	MESIC SLOPES	2	2	2-3	3-4	4-5	O
	1	1-2	2	2-3	3-4	4-5	W
	1	1	2	2-3	3-4	4-6	XERO-HYDRIC
	1	1	2	2-3	3-4	4-6	HYDRO-XERIC
	1	1	2	2	2-3	4-5	R
	2	2	2-3	2-3	2-3	4-5	E
	2-3	2-3	3-5	3-5	4-5	5-6	L
	4-6	4-5	4-5	4-5	5-6	5-6	I
I C	STREAM BANKS	4-6	5-6	5-6	6	6	I
	TEMPORARILY FLOODED	SEASONALLY FLOODED		SEMIPERMANENTLY FLOODED		F	
				HYDRIC (POOR DRAINAGE)			

\* Based on general knowledge of vegetation from field work and the literature: see Appendix 3 and Campbell (2001a). Large arrows indicate general directional change for most of the vegetation type (expected within ca. 10-100 years). Small arrows indicate partial, minor or slow changes (expected to take 100+ years for complete transition).

### **Figure 3. Hypothetical major gradients in composition and eco-morphology within Bluegrass Woodlands before settlement.**

These diagrams are designed to allow application of Vera's (2000) concepts; see text for further explanation. The outline of vegetation types, and the location of each species' modal position, are first approximations, based on multivariate analysis of modern compositional data within the region, and of eco-morphological characters.

Figure 3a. Overview of structural types and dynamic relationships between them; note that these conceptual types would have intergraded extensively in composition, structure and processes; in reality, there may not have been any special consistency or stability within each of them.

Figure 3b. Typical plants suggested for each structural type; note that most species probably occurred widely in adjacent types. This is only a provisional sketch, to be explored further with ordination methods.

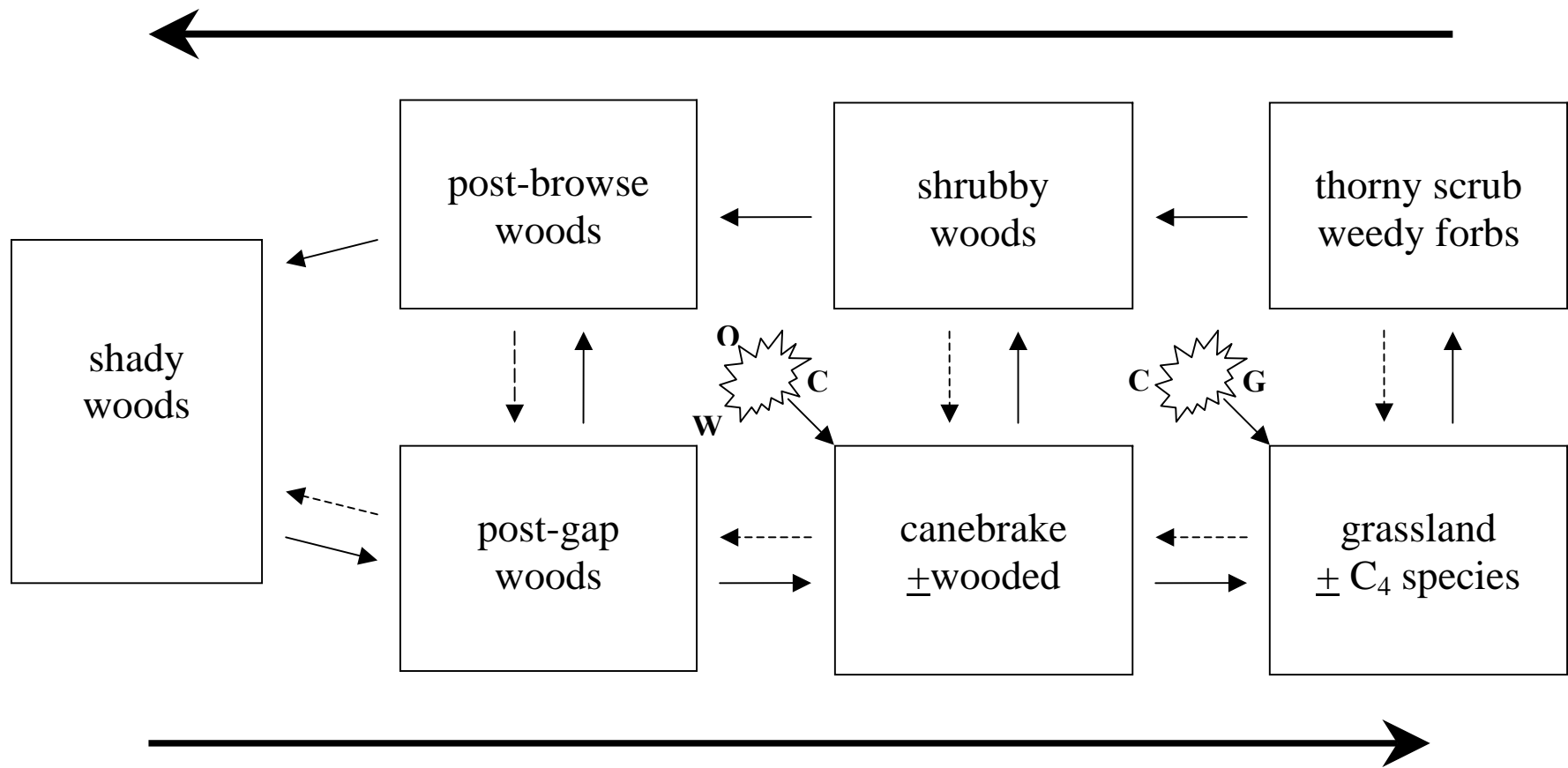
Figure 3c. Primary ecological processes that may have been involved in transitions between types; note that these are largely hypothetical within the context of Bluegrass woodlands, but several are consistent with literature elsewhere. Only the primary suggested directional trends are detailed here; the potential for reversed trends is discussed in the text.

These processes are identified by each transition (A1-3, B1-3, C1-3) and subcategories within each transition (a,b,c,d,e). Transitions B1, B2 and B3, with no room in the diagram, are detailed here.

- B1a Decrease in browsing-sensitive plants, especially grasses, elms, ashes.
- B1b Increase in browsing-resistant plants, especially trees with large/nutty seeds.
- B1c Decrease in prolonged winter/spring browsing; continued along trails and for fruit/nuts.
  
- B2a Decrease in cane, hog-peanut, and other browsed plants.
- B2b Increase in browsing-resistant plants, especially thorny/suckering locusts, weedy/toxic forbs & shrubs.
- B2c Regeneration of more resistant long-lived trees with large seeds.
- B2d Decrease in prolonged browsing; continued along trails, and for fruit/nuts.
  
- B3a Decrease in grasses and palatable forbs.
- B3b Increase in browsing-resistant plants, especially toxic forbs & thorny scrub.
- B3c Decrease in browsing, except along trails.
- B3d Increase in birds feeding and roosting in scrub; local input of minerals in droppings.

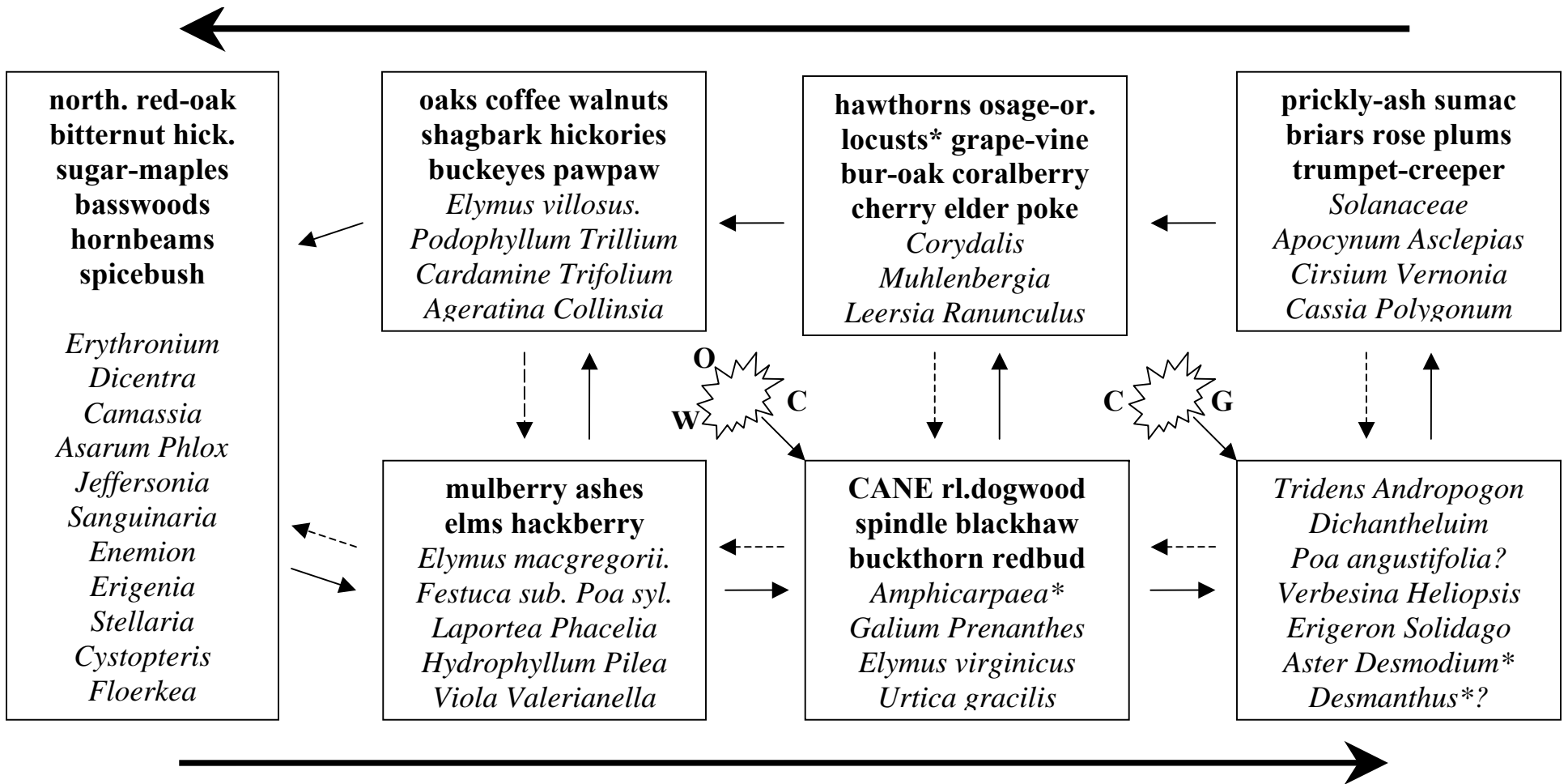


Woodland development after intense browsing/grazing, with resistant species

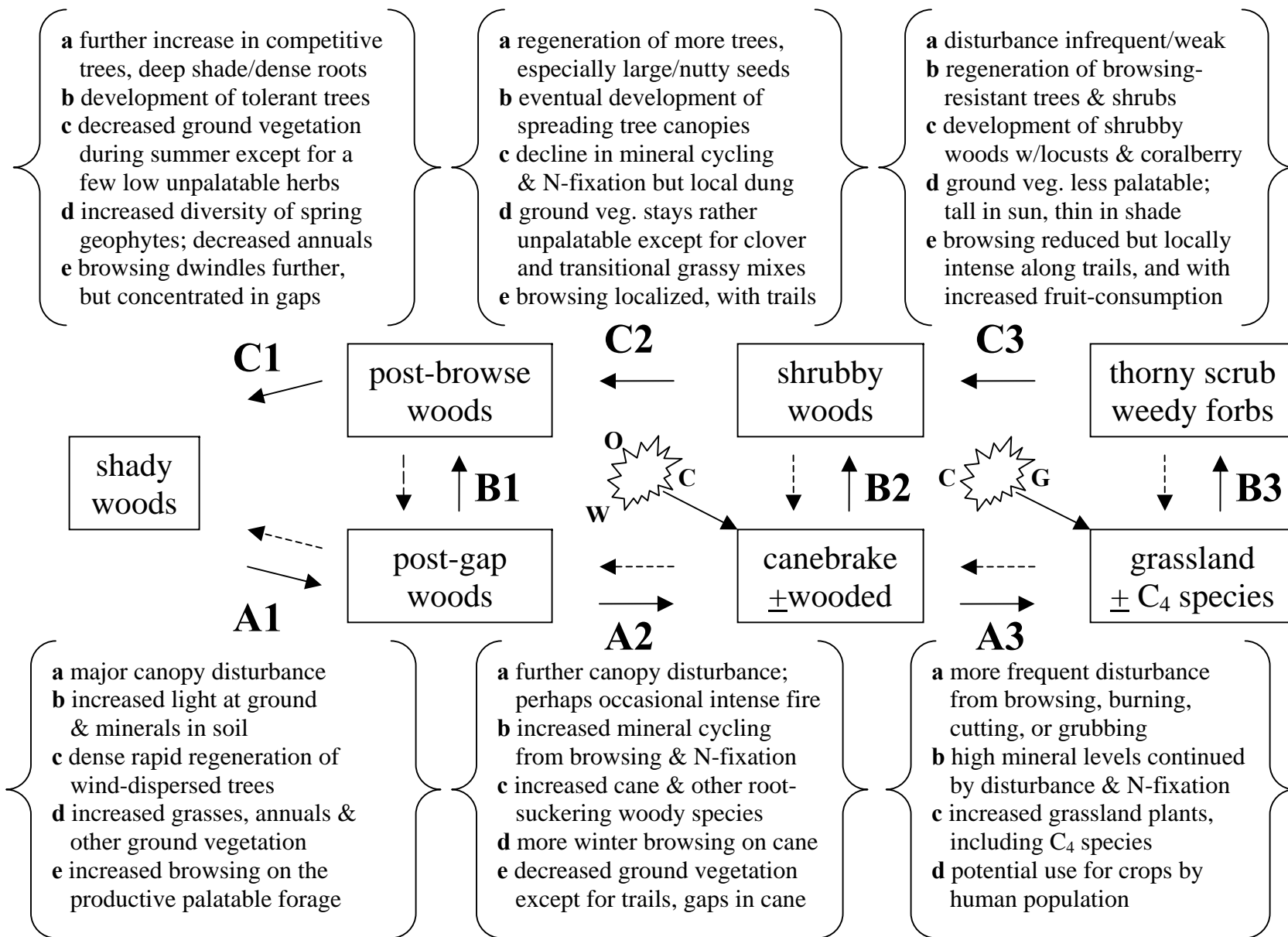


Tree canopy decline due to wind/ice, dry/wet episodes, pests/pathogens, fire, cutting; plus increases in forage for ungulates/other herbivores; formerly elephants/mammoths. Potential fuel types are: W = woody debris; O = oak litter; C = old cane; G = old grass.

Woodland development after intense browsing/grazing, with resistant species



Tree canopy decline due to wind/ice, dry/wet episodes, pests/pathogens, fire, cutting; plus increases in forage for ungulates/other herbivores; formerly elephants/mammoths. Potential fuel types are: W = woody debris; O = oak litter; C = old cane; G = old grass. Asterisks indicate nitrogen-fixing legumes.



**Table XX. General targets for conservation, initial priorities for action, summaries of progress (see also next page).**

<b>Conservation Targets</b>	<b>Goals and Strategies</b>	<b>Research Problems</b>	<b>Priority Projects</b>	<b>Progress Reports</b>
<b>1. Landscape Level: General Goal [priorities with asterisks]</b>	<b>Restore a parcel of the central Bluegrass towards natural conditions</b>	<b>Geographic analysis of soil fertility (esp. P), land use history &amp; hydrology</b>	<b>Mapping of natural P levels, Virginian witness-tree data, human uses</b>	<b>[To be developed in a subsequent document]</b>
(a)* Best opportunity for restoration of native woodland on uplands of central Bluegrass	Develop working-group on farm and public support; sustain funding partly with some income from the farm	Explore economic models, business plans, cooperative systems for sustainable management with natives	Focus on how to derive appropriate farm income from native plants, fruits & nuts, wood products, game	?
(b) Part of Lower Licking River watershed program (peripheral)	Integrate watershed and farm planning, demonstration, education & research	Small-scale analysis of farm watersheds in relation to land use effects	Focus on potential demonstration of riparian plantings with cane, etc.	
(c) Potential center for rural greenbelt around southern Harrison Co. (possible)	Explore partnerships with local governments and neighborhoods in area	Conduct regional surveys to gauge support for rural preservation, best land uses	Meet with neighbors and local leaders in community to advance mutual interests	
<b>2. Habitat Level: General Goal [priorities with asterisks]</b>	<b>Begin to simulate original topographic patterns of habitats &amp; disturbances</b>	<b>Analysis of current and historical relationships with disturbance</b>	<b>Measure effects of deer &amp; livestock using exclosures, deep shade to full sun</b>	
(a)* Mesic eutrophic woodland (sugar maples, bitternut hickory, etc.)	Set aside 50-100 acres of woods to make diverse experimental plantings	Analysis of limitations for species of deeper shade; include dispersal patterns	Compare spread of selected species at initial plantings in various levels of shade	
(b)* Submesic eutrophic woodland (walnuts, elms, ashes, buckeyes, oaks, etc.)	Plan most woods (200-400 acres) for experimental plantings and browsings	Develop experimental plans for controlled plots and open-range browsing	Focus on initial small trials with goats & sheep in order to maintain RB-clover	?
(c)* Canebrakes and open eutrophic woodland or thickets (bur oak, locusts)	Plan most fields (200-400 acres) for experimental planting, browsing, burning	Develop experimental plots for comparing planting- and disturbance-effects on veg.	Cane-prairie-fescue comparisons (USDA); also cane clone comparisons	(!)
(d) Riparian corridors, wetter openings and ponds (local)	Set aside small areas (10-20 acres) for potential habitat, initial plantings	Potential small-scale study of hydrological effects on vegetation	Cane plots in gullies to examine local effects on soil water and chemistry	
(e) Droughty openings on rocky, eroded or compacted soils (local)	Set aside small areas (10-20 acres) for potential habitat, initial plantings	Potential small-scale study of drought-stress effects on vegetation	Small trial plantings with drought-resistant natives; check tap-root problems	

<b>Conservation Targets</b>	<b>Goals and Strategies</b>	<b>Research Problems</b>	<b>Priority Projects</b>	<b>Progress Reports</b>
<b>3. Species Level: General Goal [priorities with asterisks]</b>	<b>Develop site to propagate, demonstrate &amp; conserve local plant material</b>	<b>Relationships of typical species to disturbance, dispersal &amp; herbivory</b>	<b>Selected plantings to compare ecologies and effects on alien species</b>	<b>[To be developed in a subsequent document]</b>
(a)* Small trees & large shrubs in general	Potting nursery; larger plots for seed, divisions & demos	Comparative ecology as applied to restoration	RL-dogwood replacement trials for bush-honeysuckle	((!))
(b)** Early/small woodland perennials; esp. RB-clover	Ditto; include controlled environments for RBC	Ditto; find optimal conditions for RC-clover	Experiments with RB-clover in nursery & woods	((!))
(c)** Larger woodland perennials (flw. May-June)	Ditto; include plots in woods to suppress aliens	Ditto; find best natives to compete with aliens	Experiments with wood-nettle, white-snake-root	
(d)** Biennials & winter-annuals of woods, edges	Ditto; include Miami mist etc. for initial “clean-slates”	Ditto; find best ways to produce seed & establish	Measurements of rates of spread into young woods	((!))
(e)** Hog-peanut; some other summer annuals	Ditto; include trials with hog-peanut in cane, etc.	Ditto; find best ways to propagate this unusual sp.	Plantings with cane; study growth, N-fixation	
(f)** Cane; some other small shrubby species	Ditto; improve divisions in plots using amended soil	Ditto; find best ways to propagate & best habitats	Experiment with USDA plantings, clone-collection	((!))
(g)* Tall late summer-fall perennials of fields, edges	Ditto; develop plots for efficient seed collection	Ditto; link plantings to disturbance experiments	Test plantings in USDA plots, other cane, etc.	((!))
(h) Selected summer-fall grassland perennials	Ditto; develop plots for efficient seed collection	Ditto; link plantings to disturbance experiments	Test plantings in USDA plots, other cane, etc.	
(i) Selected woodland grasses & sedges	Ditto; develop plots for efficient seed collection	Ditto; find best ways to produce seed & establish	Measurements of rates of spread into young woods	
<b>4. Worst Alien Species: General Goal [priorities with asterisks]</b>	<b>Cost-effective alien reduction, native refuges; integrate farm economy</b>	<b>Explore &amp; apply ecological controls of aliens versus natives</b>	<b>Integrate alien-native analysis into experiments with browsing &amp; burning</b>	
(a)*** Emerald ash-borer; other tree pests, pathogens	Integrate farm plans with state & regional strategies	Find best ways to secure refuges, seed, nursery, etc.	Determine if resistance exists in populations	
(b)** Garlic-mustard; other woodland biennials/annuals	Native plantings, seasonal browsings, herbicidings (?)	Study competition from planted natives (see above)	Determine if fall-winter browsing can reduce	
(c)** Purple winter-creeper (and other evergreen vines)	Native plantings, seasonal browsings, herbicidings (?)	Assess potential reduction by controlled livestock	Determine if fall-winter browsing can reduce	
(d)** Bush-honeysuckle and some other shrubs	Cutting, use of wood/chip, browsing, native plantings	Ergonomics, economics & applications of methods	Conduct trials with uses of material for goats, chip...	((!))
(e)* Tree-of-heaven, white mulberry and other trees	Compare herbiciding with long-term shading, etc.	Review problems across region and costs/benefits	Measure rates of decline in the TOH patch	((!))
(f)* Tillering-grasses and other grassland runners	Compare herbiciding with long-term succession, etc.	Review problems across region and costs/benefits	Use USDA plantings, etc., to assess costs/benefits	((!))

