

United States
Department of
Agriculture

Forest
Service

Washington
Office

14th & Independence SW
P.O. Box 96090
Washington, DC 20090-6090

Reply To: 4060-3

Date: October 23, 1991

Floyd J. Marita
Regional Forester
USDA Forest Service
310 W. Wisconsin Avenue, RM 500
Milwaukee, WI 53203

Dear Butch:

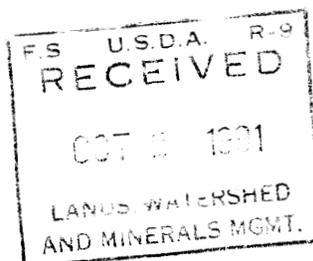
Enclosed is the approved signed ~~Decision Notice/Designation~~ Order and Establishment Record for Lakue-Pine Hills/Otter Pond RNA. It was approved by Chief on October 3, 1991.

Sincerely,

Stanley L. Krugman

for
STANLEY L. KRUGMAN, Director
Forest Management Research

Enclosure



DECISION NOTICE/DESIGNATION ORDER

Decision Notice Finding of No Significant Impact Designation Order

By virtue of the authority vested in me by the Secretary of Agriculture under regulations 7 CFR 2.42, 36 CFR 251.23, and 36 CFR Part 219, I hereby establish the LaRue-Pine Hills/Otter Pond Research Natural Area. It shall be comprised of lands described in the section of the Establishment Record entitled "Location."

The Regional Forester has recommended the establishment of this Research Natural Area in the Record of Decision for the Shawnee National Forest Land and Resource Management Plan. That recommendation was the result of an analysis of the factors listed in 36 CFR 219.25 and Forest Service Manual 4063.41. Results of the Regional Forester's Analysis are documented in the Shawnee National Forest Land and Resource Management Plan and Final Environmental Impact Statement which are available to the public.

The LaRue-Pine Hills/Otter Pond Research Natural Area will be managed in compliance with all relevant laws, regulations, and Forest Service Manual direction regarding Research Natural Areas. It will be administered in accordance with the management direction/prescription identified in the Establishment Record.

The Shawnee National Forest Land and Resource Management Plan is hereby amended to be consistent with the management direction identified in the Establishment Record and this Decision Notice/Designation Order. This is a non-significant amendment of the Shawnee National Forest Land and Resource Management Plan (36 CFR 219.10(f)).

The Forest Supervisor of the Shawnee National Forest shall notify the public of this decision and will mail a copy of the Decision Notice/Designation Order and amended direction to all persons on the Shawnee National Forest Land and Resource Management Plan mailing list.

Based upon the Environmental Analysis, I find that designation of the LaRue-Pine Hills/Otter Pond Research Natural Area is not a major Federal action significantly affecting the quality of the human environment (40 CFR 1508.27).

This decision is subject to appeal pursuant to 36 CFR Part 217. A Notice of Appeal must be in writing and submitted to:

The Secretary of Agriculture
14th & Independence Ave., S.W.
Washington, D.C. 20250

and simultaneously to the Deciding Officer:

Chief (1570)
USDA, Forest Service
P.O. Box 96090
Washington, D.C. 20090-6090

The Notice of Appeal prepared pursuant to 36 CFR 217.9(b) must be submitted within 45 days from the date of legal notice of this decision. Review by the Secretary is wholly discretionary. If the Secretary has not decided within 15 days of receiving the Notice of Appeal to review the Chief's decision, appellants will be notified that the Chief's decision is the final administrative decision of the U.S. Department of Agriculture (36 CFR 217.17(d)).



Chief



Date

UNITED STATES DEPARTMENT OF AGRICULTURE

FOREST SERVICE

LARUE-PINE HILLS/OTTER POND

RESEARCH NATURAL AREA



SHAWNEE NATIONAL FOREST

JULY 31, 1987

ERRATA SHEET

1. Authorities for biota nomenclature, unless otherwise noted, are as follows:

Flora:

a. Fernald, M.L., 1950, Gray's manual of botany, 8th ed., American Book Co., NY. 1632p

b. Little, E.L.Jr., 1979, Checklist of United States Trees (Native and Naturalized) Agri Handbook No. 541, Forest Service, USDA.

Fauna:

a. Banks, R.C., R.W. Diarmid, A.L. Gardner, 1987. Checklist of vertebrates of the United States, US Territories, and Canada, Resource Publ. 166, Fish and Wildlife Service, USDI. 81p

b. Holsinger, JR, 1972, The fresh water amphipod crustaceans (Gammaridae) of North Am., Biota of Freshwater Ecosystems. Identification Manual No. 5, EPA. 89p

c. Robins, C.R., R.M. Bailey, C.E. Bond, V.R. Brooker, E.A. Lachorer, R.N. Lea, W. B Scott, 1980. A list of common and scientific names of fishes from the U.S. and Canada, 4th ed., Am. Fisheries Soc., Spec. publ. No. 12, Bethesda, MD. 174p

d. Sutherland, D.W.S, 1978. Common names of insects and related organisms. Entomological Society of America. 132p.

2. Management Prescription

a. Hand removal of vegetation. This may be necessary because natural fires have been prevented or controlled in recent years. Once woody vegetation is controllable through prescribed burning or grazing, hand removal of woody vegetation will be unnecessary.

b. Fences are not needed to achieve management objectives.



Figure 1. Location of LaRue-Pine Hills/Otter Pond Research Natural Area shown (with arrow) on copy of J. A. Bier's Landforms of Illinois map, Ill. State Geol. Surv., Urbana, 1980

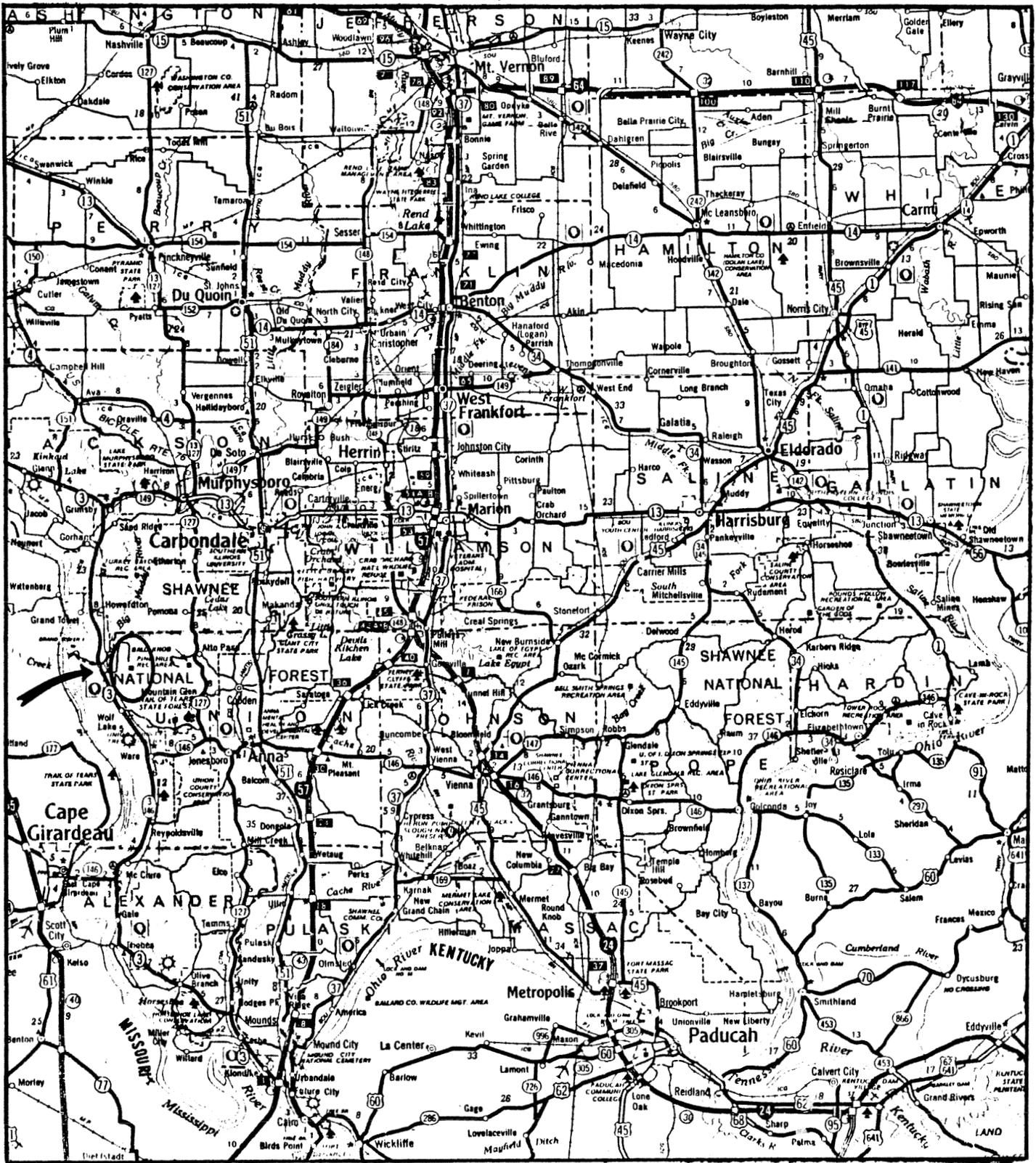


Figure 2. Location of LaRue-Pine Hills/Otter Pond Research Natural Area shown (with arrow and circle) on copy of Illinois Official Highway Map, 1985-86, Department of Transportation, Springfield

Quaternary system
(Pleistocene and Recent)
Clayey silt, clay; sand and gravel in places

Tertiary system
Pliocene series
"Lafayette" formation—20–50 feet
Eocene series
Paleocene series

Cretaceous system

Pennsylvanian system

Mississippian system
Upper Mississippian series
Lower Mississippian series
Meramec group
Osage group
a
Hartline "formation"—30–50 feet
Kinderhook group
Springville formation—60 feet

Devonian system
a
Clear Creek formation—300 feet
a, b
Grassy Knob "formation"—185 feet
Bailey formation—200–300 feet

Silurian system

Ordovician system

Succession of geologic formations at
LaRue–Pine Hills/Otter Pond Research
Natural Area

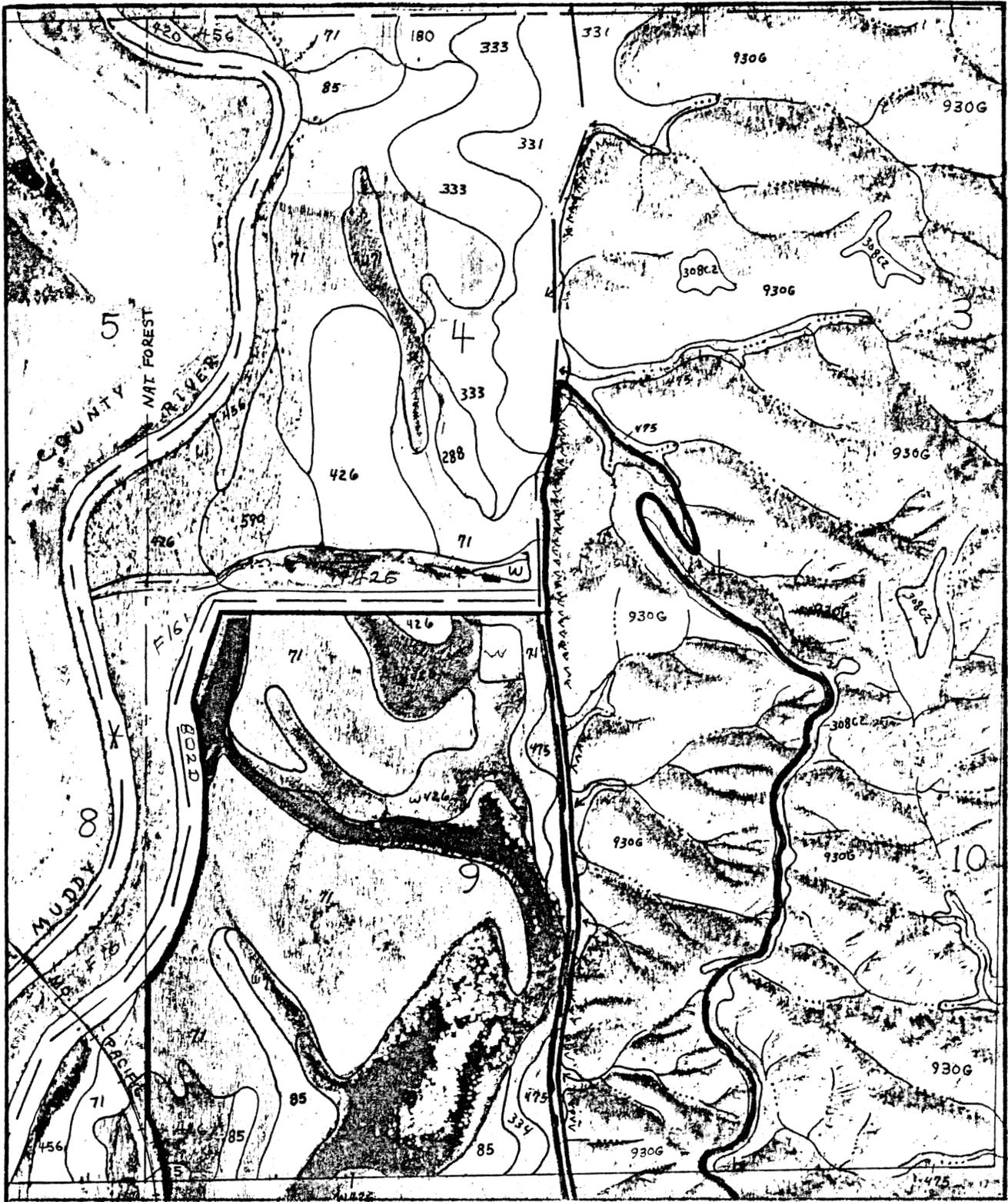


Figure 7. Location of north part of LaRue-Pine Hills/Otter Pond Research Natural Area shown (with bold line) on map of soils taken from Soil Survey of Union County, Illinois by C. C. Miles, et al., SCS and USFS, in cooperation with Ill. Agr. Exp. Sta., Urbana, 1979

scale 4" = 1 mile

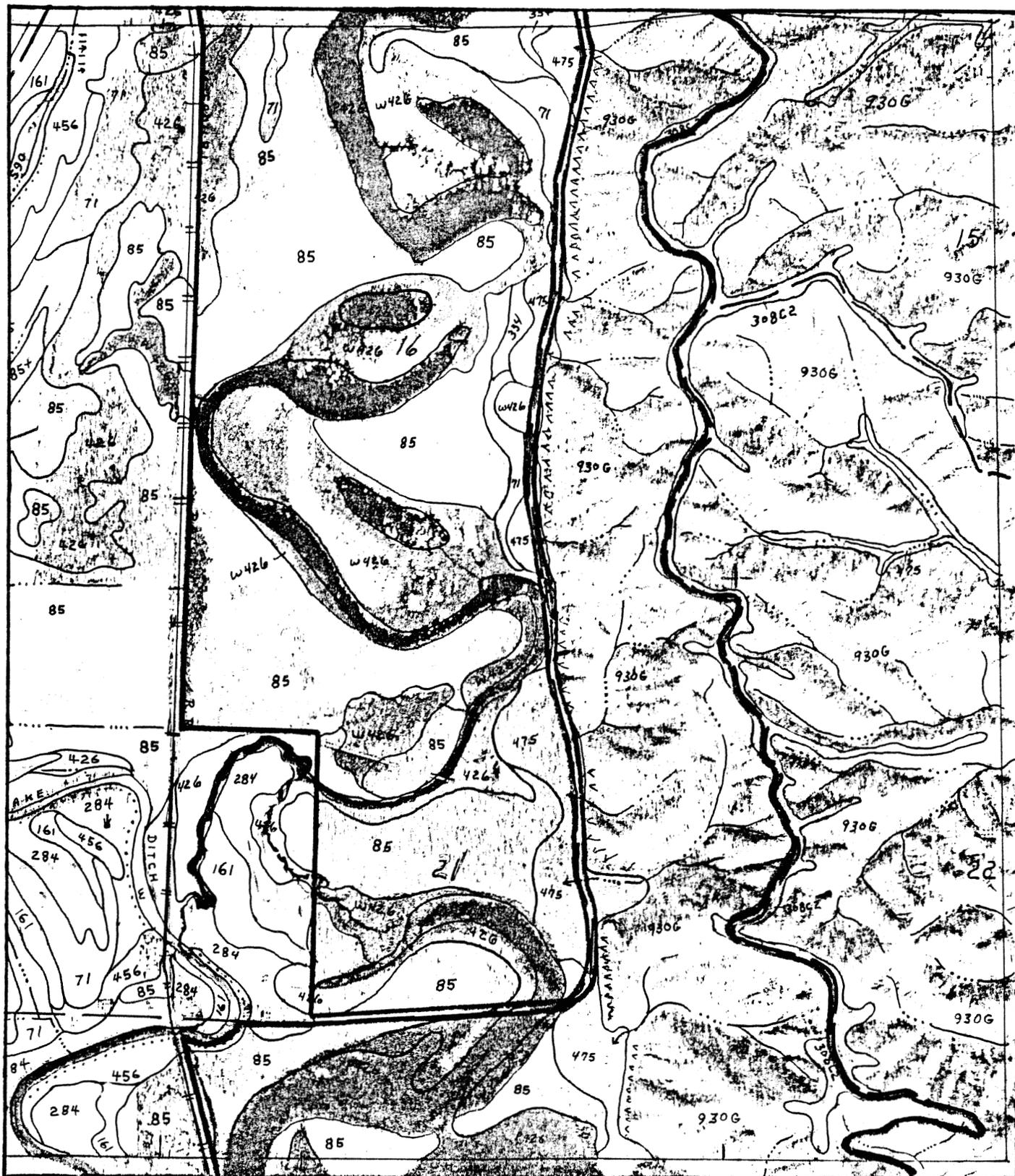


Figure 8. Location of middle part of LaRue-Pine Hills/Otter Pond Research Natural Area shown (with bold line) on map of soils taken from Soil survey of Union County, Illinois by C. C. Miles, et al., SCS and USFS, in cooperation with Ill. Agr. Exp. Sta., Urbana, 1979

scale 4" = 1 mile

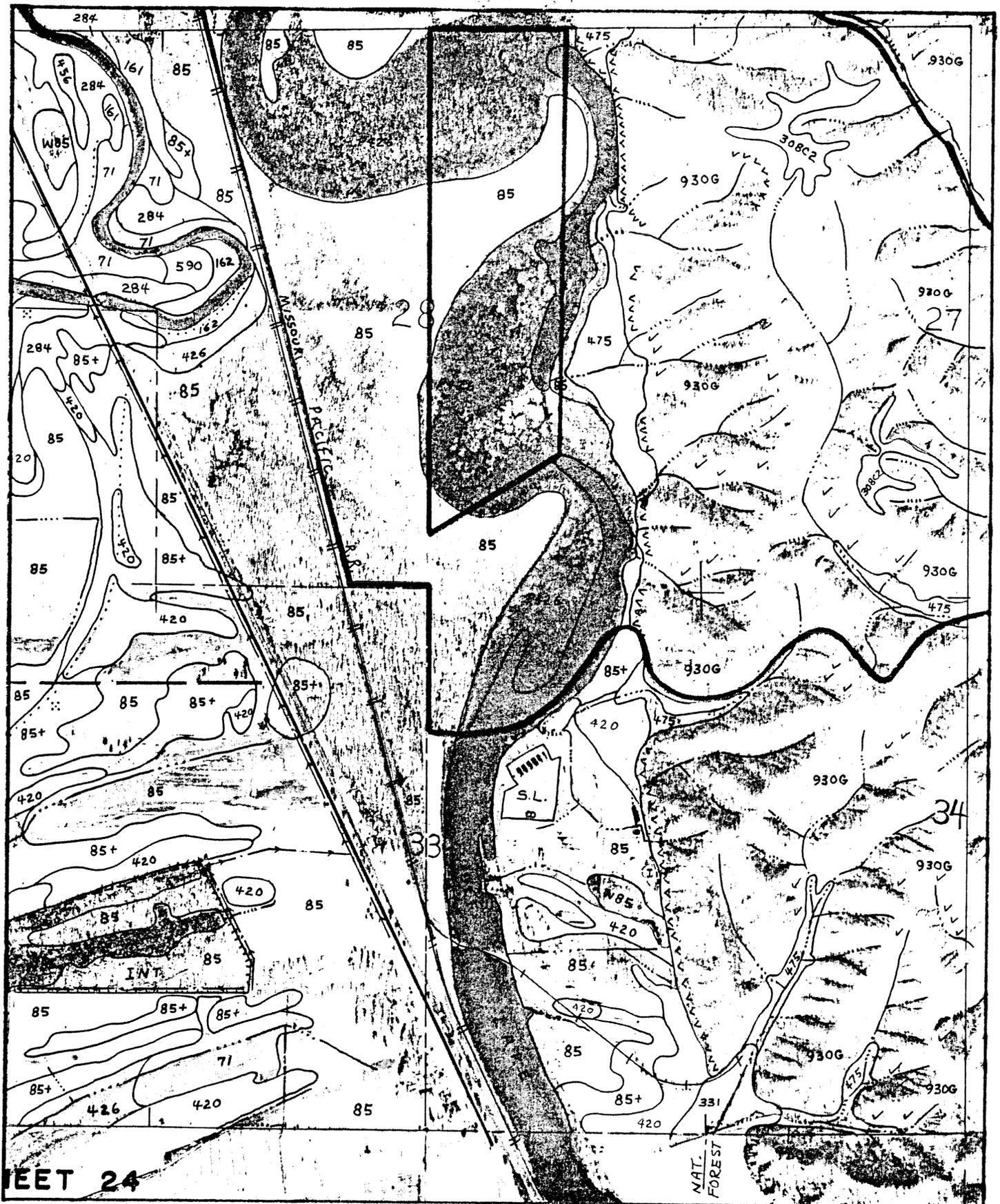


Figure 9. Location of south part of LaRue-Pine Hills/Otter Pond Research Natural Area shown (with bold line) on map of soils taken from Soil survey of Union County, Illinois by C. C. Miles, et al., SCS and USFS, in cooperation with Ill. Agr. Exp. Sta., Urbana, 1979 scale 4" = 1 mile

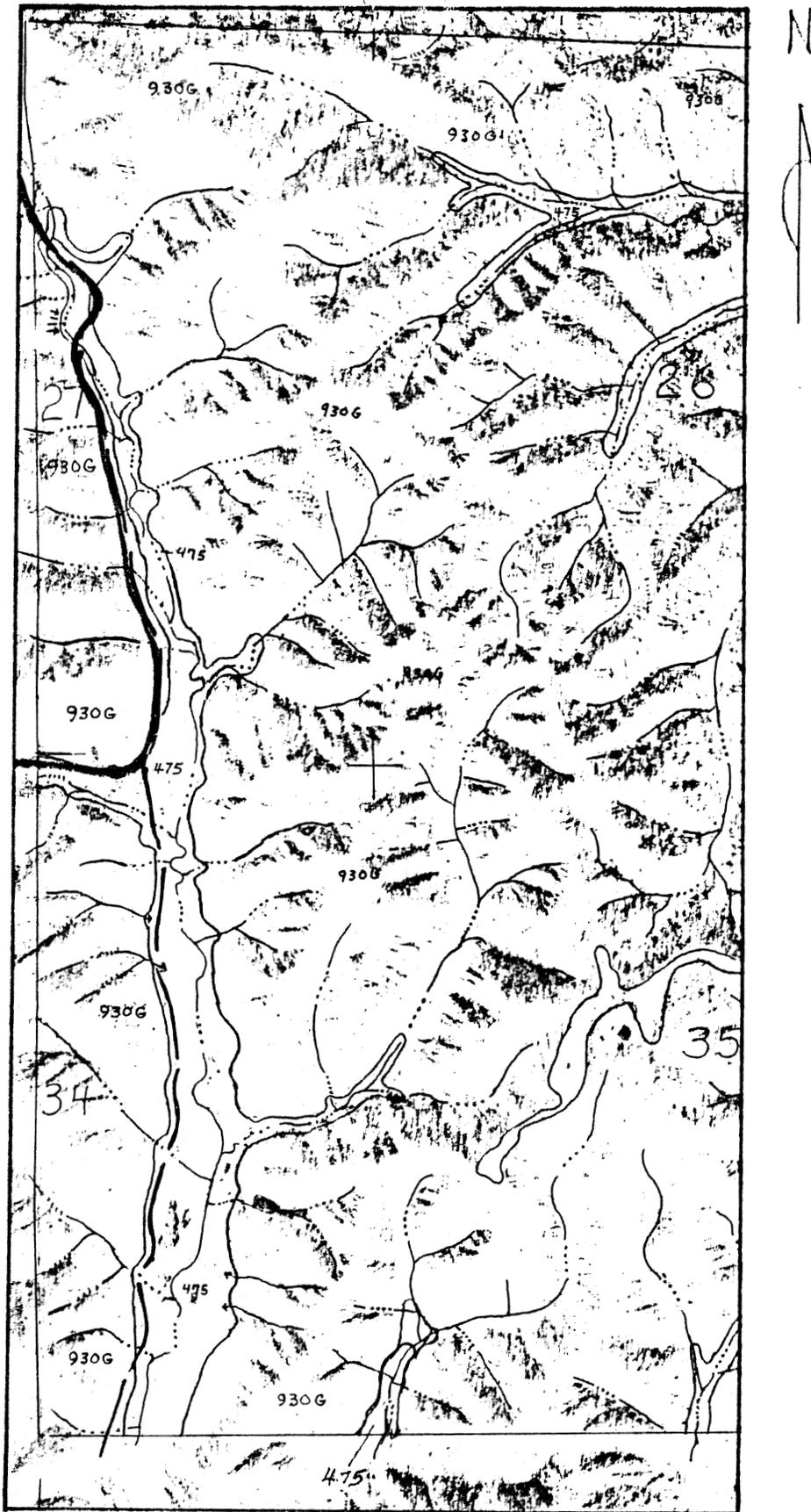


Figure 10. Location of southeast corner of LaRue-Pine Hills/Otter Pond Research Natural Area shown (with bold line) on map of soils taken from Soil survey of Union County, Illinois by C. C. Miles, et al., SCS and USFS, in cooperation with Ill. Agr. Exp. Sta., Urbana, 1979

scale 4" = 1 mile

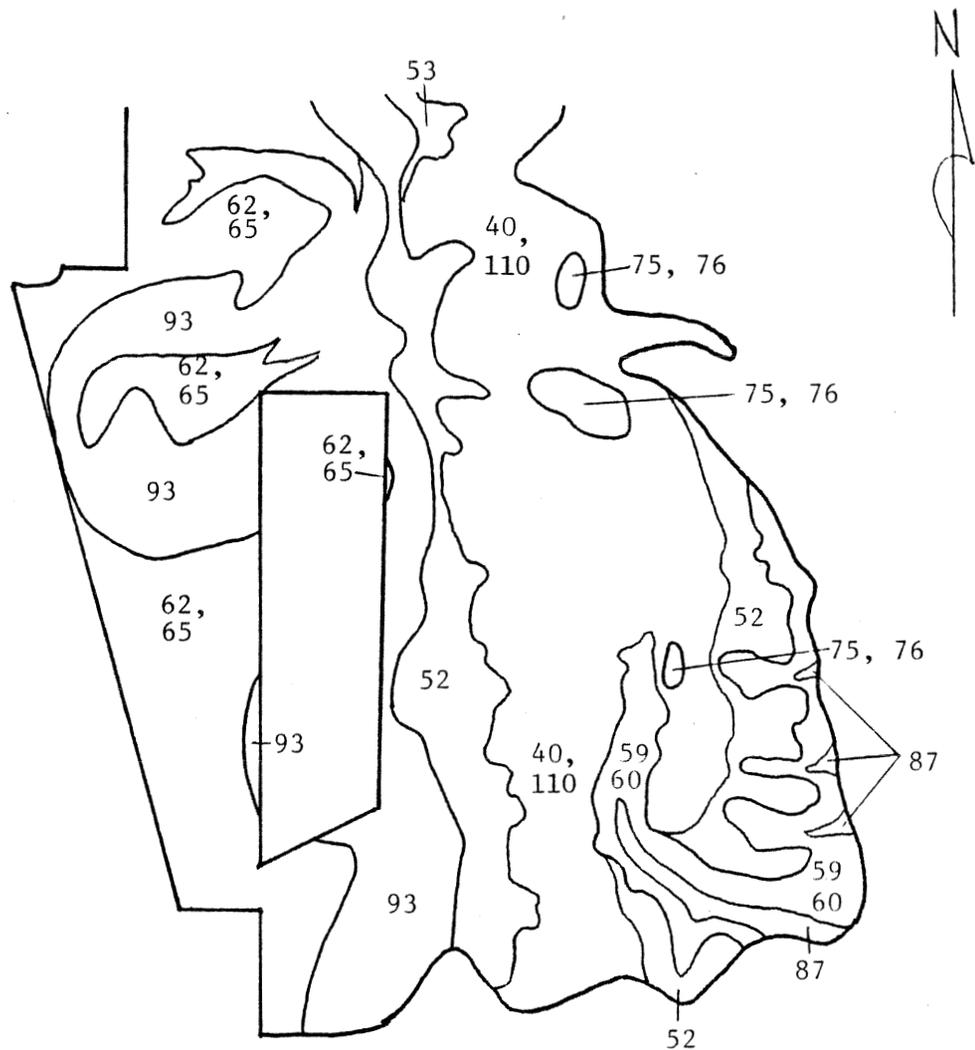


Figure 11. Society of American Foresters (SAF) Cover Types present at LaRue-Pine Hills/Otter Pond (south part)

legend

- | | |
|--|--|
| Sugarberry-American elm-green ash
(#93) | White oak-black oak-northern red oak
(#52) |
| Sweetgum-yellow poplar
(#87) | Silver maple-American elm/pin oak-sweetgum
(#62) (#65) |
| White oak
(#53) | Yellow poplar-white oak-northern red oak/beech-sugar maple
(#59) (#60) |
| Post oak-blackjack oak/black oak
(#40) | Shortleaf pine/shortleaf pine-oak
(#75) (#76) |

scale 1:24000

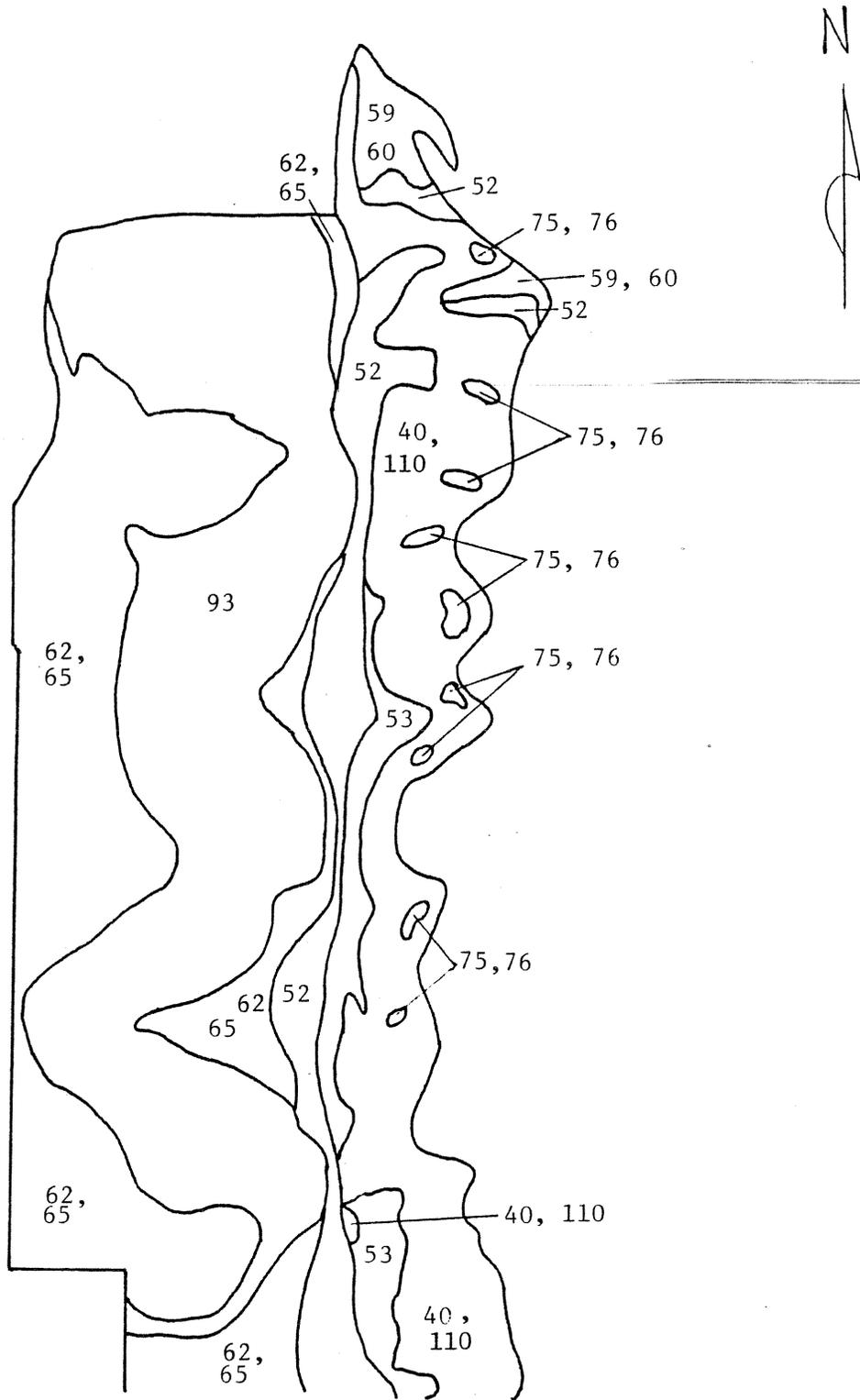


Figure 12. Society of American Foresters (SAF) Cover Types present at LaRue-Pine Hills/Otter Pond (north part)

Legend

see Figure 11.

scale 1:24000

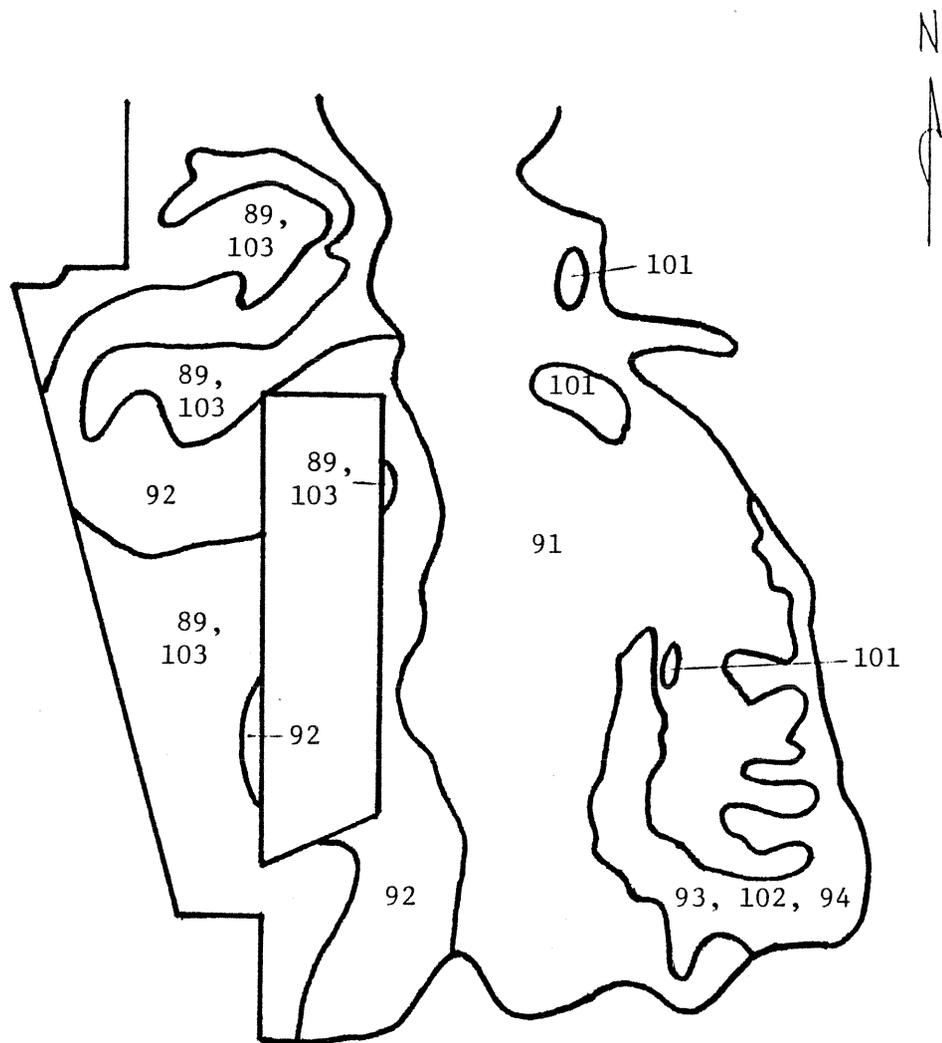


Figure 13. Kuchler Potential Natural Vegetation Types at LaRue-Pine Hills/Otter Pond (south part)

legend

- | | |
|---------------------------------------|---|
| Elm-ash forest
(#92) | Beech-maple/mixed mesophytic/southern mixed forests
(#93) (#94) (#102) |
| Bluestem prairie/cedar glade
(#66) | Oak-hickory-pine forest
(#74) (#101) |
| Oak-hickory forest
(#91) | Northern floodplain forest/southern floodplain forest
(#89) (#103) |

scale 1:24000

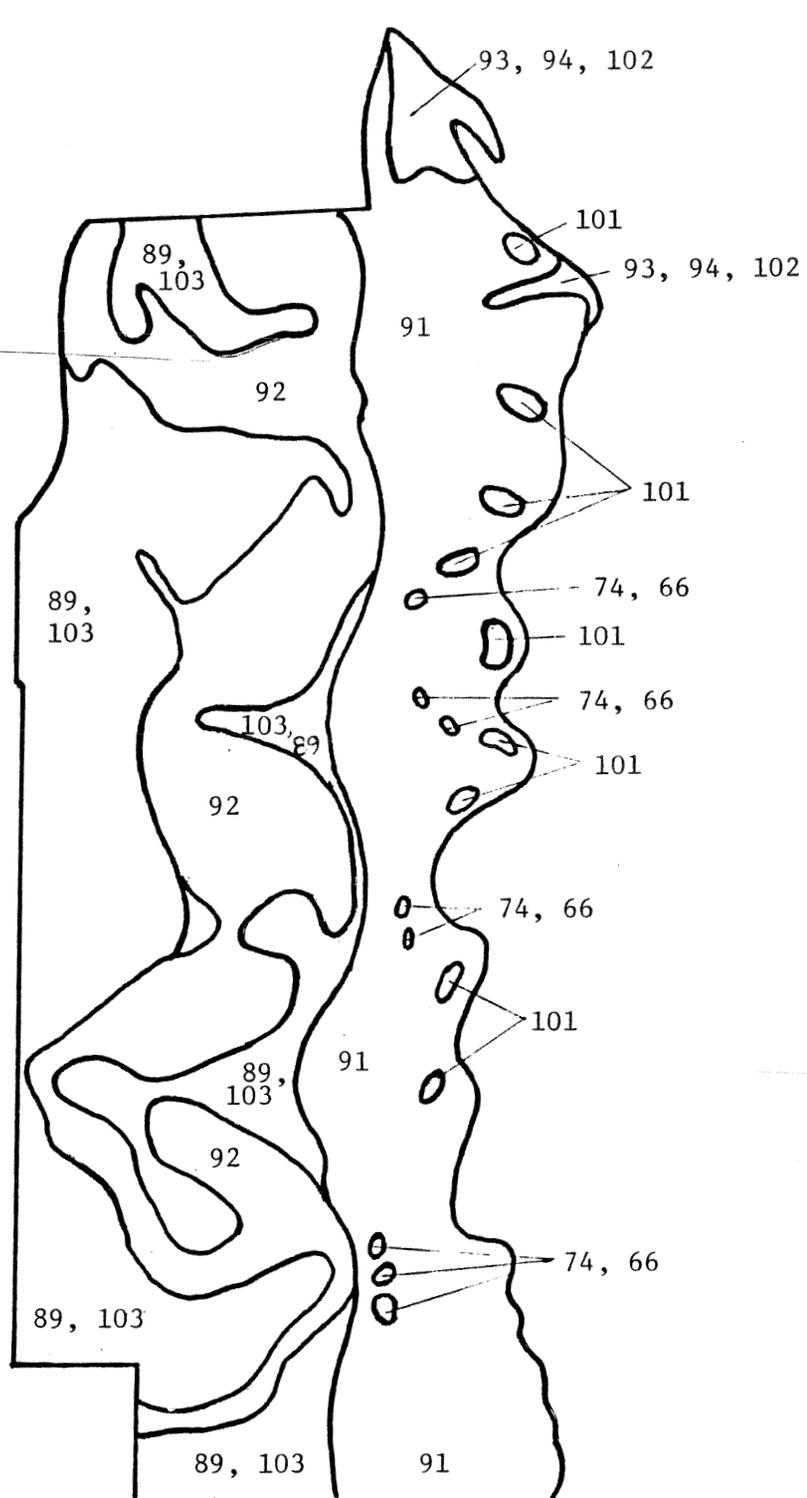


Figure 14. Kuchler Potential Natural Vegetation Types at LaRue-Pine Hills/Otter Pond (north part)

legend

see Figure 13.

scale 1:24000

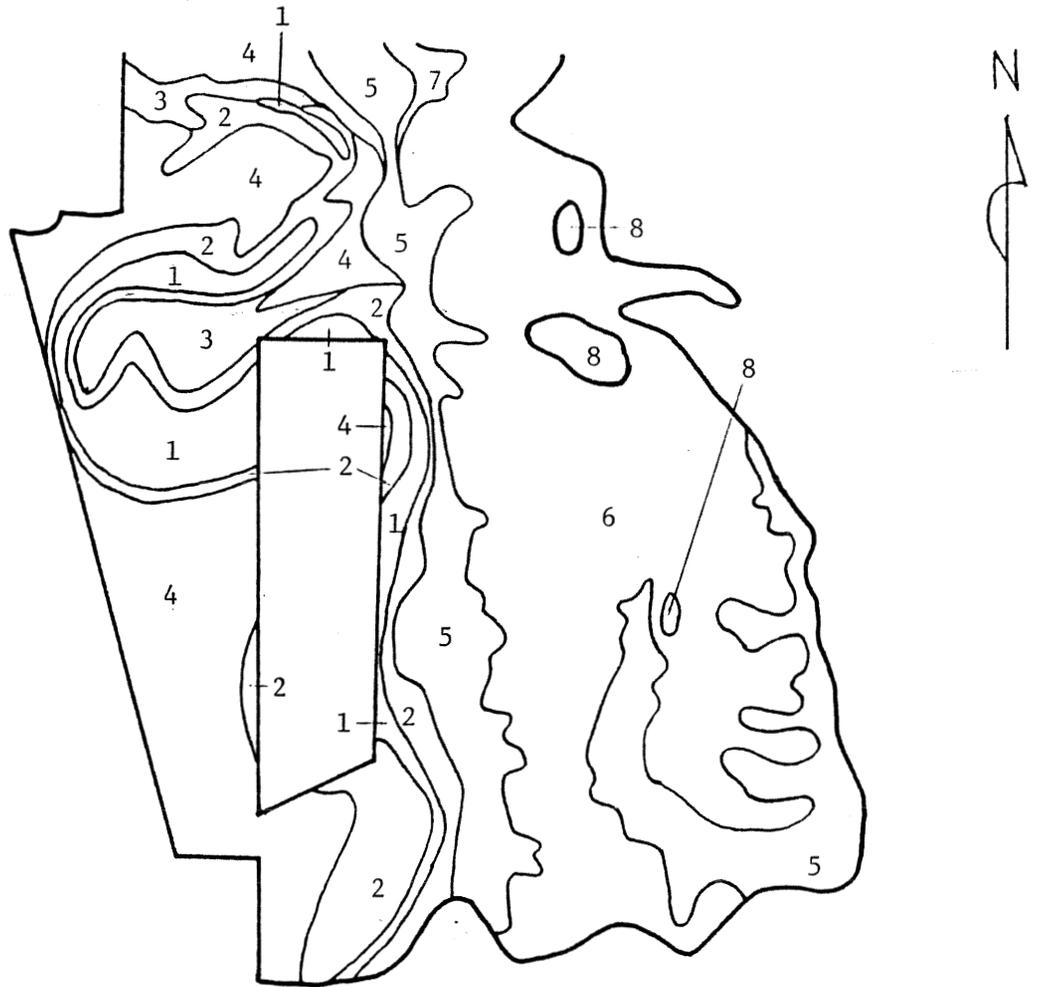


Figure 15. Natural communities in the south part of the LaRue-Pine Hills/Otter Pond Research Natural Area

Legend

- | | | |
|---------------------------------------|-----------------|--|
| 1 - Pond | 2 - Shrub swamp | 3 - Wet floodplain forest |
| 4 - Mesic/wet-mesic floodplain forest | | 5 - Mesic upland forest |
| 6 - Dry upland forest | | 7 - Dry-mesic upland forest |
| 8 - Xeric upland forest | | 9 - Loess hill prairie/limestone glade |

scale 1:24000

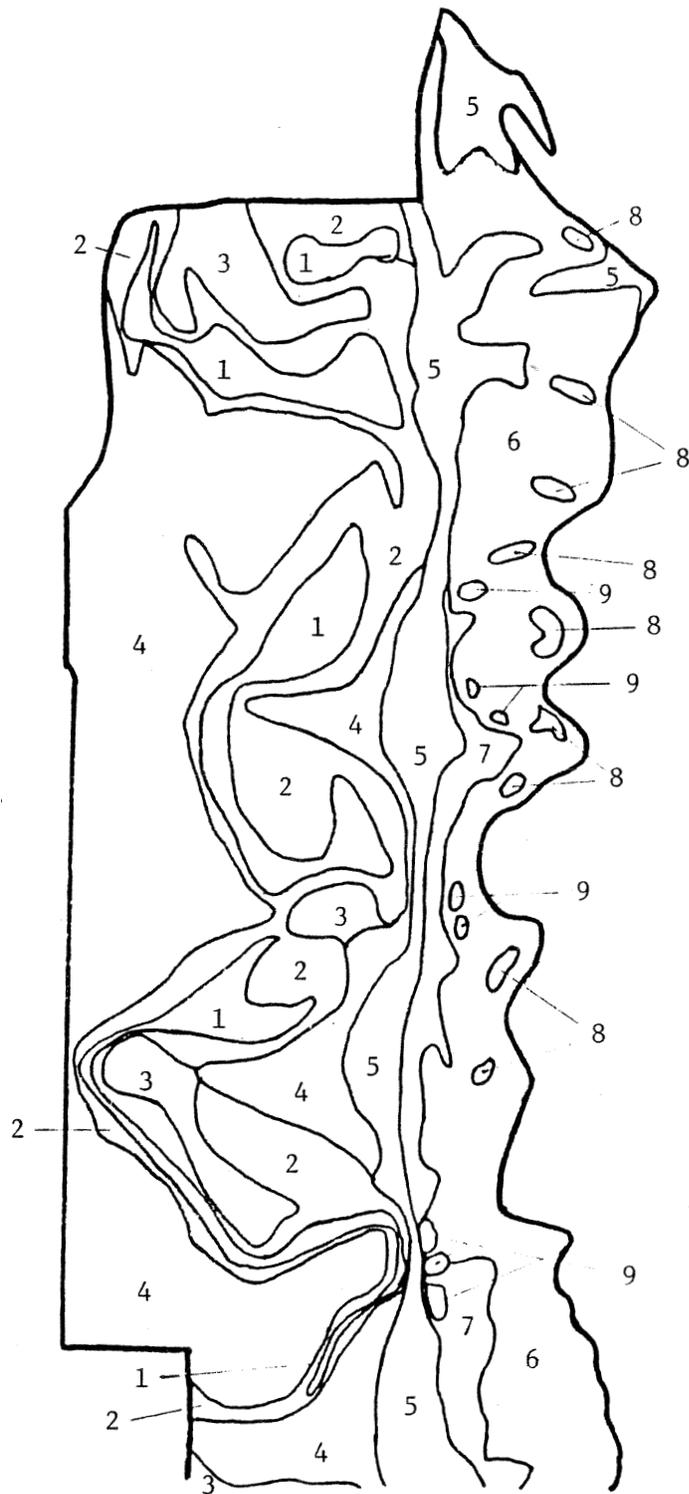


Figure 16. Natural communities in the north part of the LaRue-Pine Hills/Otter Pond Research Natural Area

- 1 - Pond 2 - Shrub swamp 3 - Wet floodplain forest
 4 - Mesic/wet-mesic floodplain forest 5 - Mesic upland forest
 6 - Dry upland forest 7 - Dry-mesic upland forest 8 - Xeric upland forest
 9 - Loess hill prairie/limestone glade

scale 1:24000

USDA-FOREST SERVICE

PHOTOGRAPHIC RECORD
(See FSM 1643.52)

PHOTOGRAPHER Copy of ASCS photo
(Copy made by M.D. Hutchison)

DATE SUBMITTED
July 198

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TEMP.	PERMANENT (To be filled in by the WO)					
(1)	(2)	(3)	(4)	(5)	(6)	(7)
			August 1938	Illinois Shawnee National Forest, Jonesboro District, Union Co.	vertical aerial view of the north part of LaRue-Pine Hills/Otter Pond Research Natural Area	35 mm. BW

Fig. 17



Figure 17. Copy of ASCS aerial photograph taken in August, 1938 and showing the north part of LaRue-Pine Hills/Otter Pond Research Natural Area; note old clearings and trails in the bottomlands; the slough represents an old channel of the Big Muddy River before capture by a Mississippi River meander

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(See FSM 1643.52)

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(1)	(2)	(3)	(4)	(5)	(6)	(7)
Fig. 18			August 1938	Illinois Shawnee National Forest, Jonesboro District Union Co.	vertical aerial view of the south part of LaRue-Pine Hills/Otter Pond Research Natural Area	35mm. BW



Figure 18. Copy of ASCS aerial photograph taken in August, 1938 and showing the south part of LaRue-Pine Hills/Otter Pond Research Natural Area; note old clearings and trails in the bottomlands; natural glade openings are visible (arrow) on the bluffs, and the canopy is more open on south slopes

PHOTOGRAPHIC RECORD

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TEMP.	PERMANENT (To be filled in by the WO)					
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Fig. 19			Aug. 22 1980	Illinois Shawnee National Forest, Jonesboro District Union Co.	vertical aerial view of the north part of LaRue-Pine Hills/Otter Pond Research Natural Area	35mm. BW



Figure 19. Copy of ASCS aerial photograph taken August 22, 1980 and showing the north part of LaRue-Pine Hills/Otter Pond Research Natural Area; the wetland (obvious as a meandering slough in LaRue Swamp) represents a channel of the Big Muddy River before capture by a Mississippi River meander

PHOTOGRAPHIC RECORD

(See FSM 1643,52)

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TEMP.	PERMANENT (To be filled in by the WO)					
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Fig. 20			Aug. 22, 1980	Illinois Shawnee National Forest, Jonesboro District Union Co.	vertical aerial view of the south part of LaRue-Pine Hills/Otter Pond Research Natural Area	35mm. BW



Figure 20 . Copy of ASCS aerial photograph taken August 22, 1980 and showing the south part of LaRue-Pine Hills/ Otter Pond Research Natural Area; note the larger areas of open water in the swamps due to timber kill from beaver dams

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PHOTOGRAPHIC RECORD

(See FSM 1643.52)

PHOTOGRAPHER

E. B. Trovillion

DATE SUBMITTED

July, 1987

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TEMP.	PERMANENT (To be filled in by the WO)					
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Fig. 21			Apr. 8, 1986	Illinois, Shawnee National Forest, Jonesboro District Union Co.	aerial view of LaRue-Pine Hills/Otter Pond Research Natural Area looking south at north end	35 mm. C

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M. D. Hutchison

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TEMP.	PERMANENT (To be filled in by the WO)					
(1)	(2)	(3)	(4)	(5)	(6)	(7)
			Oct., 1978	Illinois, Shawnee National Forest, Jonesboro District Union Co.	aerial view of rugged terrain looking southeast across upland at LaRue-Pine Hills/Otter Pond Research Natural Area	35 mm. C

Fig. 22



Figure 21. Aerial view of LaRue-Pine Hills/Otter Pond Research Natural Area looking south; sloughs and ponds are in bottomland to right; Pine Hills bluffs are in left part of photo
-photo by E. B. Trovillion, April 8, 1986



Figure 22. Aerial view of rugged terrain looking southeast from Pine Hills bluffs at LaRue-Pine Hills/Otter Pond Research Natural Area
-photo by M. D. Hutchison, Oct., 1978

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(See FSM 1643.52)

PHOTOGRAPHER

E. B. Trovillion

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TEMP.	PERMANENT (To be filled in by the WO)						(1)	(2)
Fig. 23			Apr. 8, 1986	Illinois, Shawnee National Forest, Jonesboro District Union Co.	aerial view of south part of LaRue-Pine Hills/Otter Pond looking northeast across Wolf Lake and Otter Pond	35 mm. C		

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July, 1987

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TEMP.	PERMANENT (To be filled in by the WO)						(1)	(2)
Fig. 24			Jan., 1977	Illinois, Shawnee National Forest, Jonesboro District Union Co.	aerial view of LaRue-Pine Hills/Otter Pond looking east at bluff showing pines	35 mm. C		

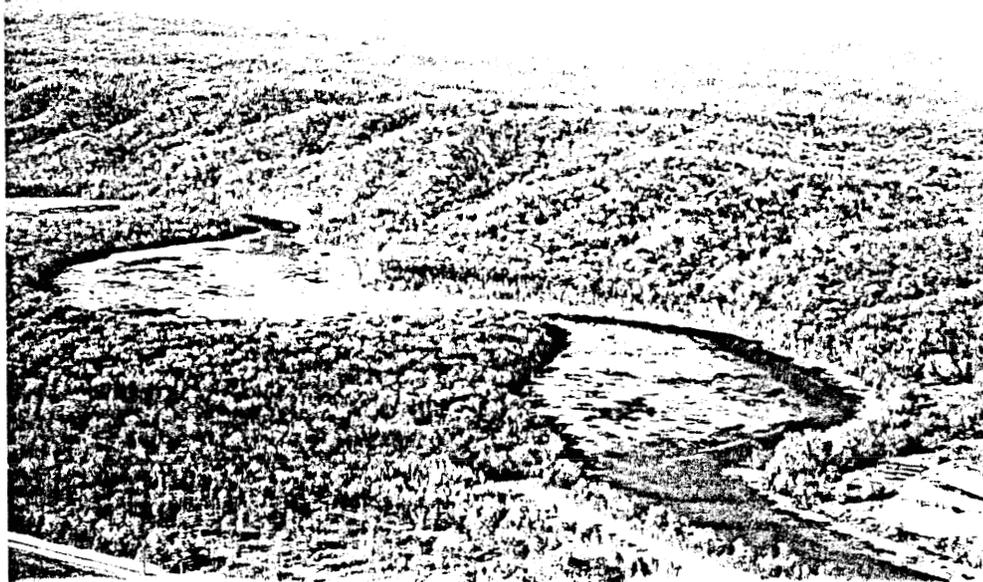


Figure 23. Aerial view of south part of LaRue-Pine Hills/Otter Pond Research Natural Area looking northeast; the north end of Wolf Lake is in lower right; Otter Pond is left of center
-photo by E. B. Trovillion, April 8, 1986



Figure 24. Aerial view of LaRue-Pine Hills/Otter Pond Research Natural Area looking east at Pine Hills bluffs; shortleaf pine stands are visible on slopes; note chert gravel slopes below pines in center of photo
-photo by M. D. Hutchison, Jan., 1977

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Fig. 25			Aug., 1986	Illinois, Shawnee National Forest, Jonesboro District Union Co.	bluffs at LaRue-Pine Hills/Otter Pond showing prairie glades and limestone	35 mm. C

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PHOTOGRAPHIC RECORD (See FSM 1643.52)		M. D. Hutchison	July, 1987
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TEMP.	PERMANENT (To be filled in by the WO)					
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Fig. 26			July, 1977	Illinois, Shawnee National Forest, Jonesboro District Union Co.	close view of prairie glade on limestone cliffs at LaRue-Pine Hills/ Otter Pond Research Natural Area	35 mm. C

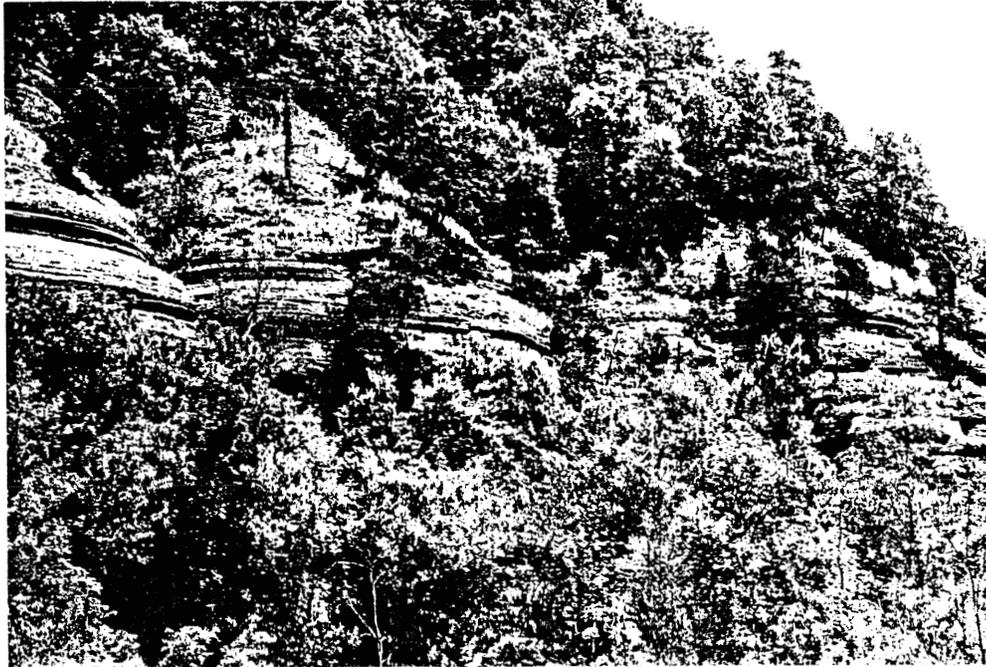


Figure 25. Bluffs at LaRue-Pine Hills/Otter Pond Research Natural Area; prairie glades can be seen above cliffs; limestone is in thin, even beds, and gullies are formed above the vertical joints -photo by M. D. Hutchison, Aug., 1986

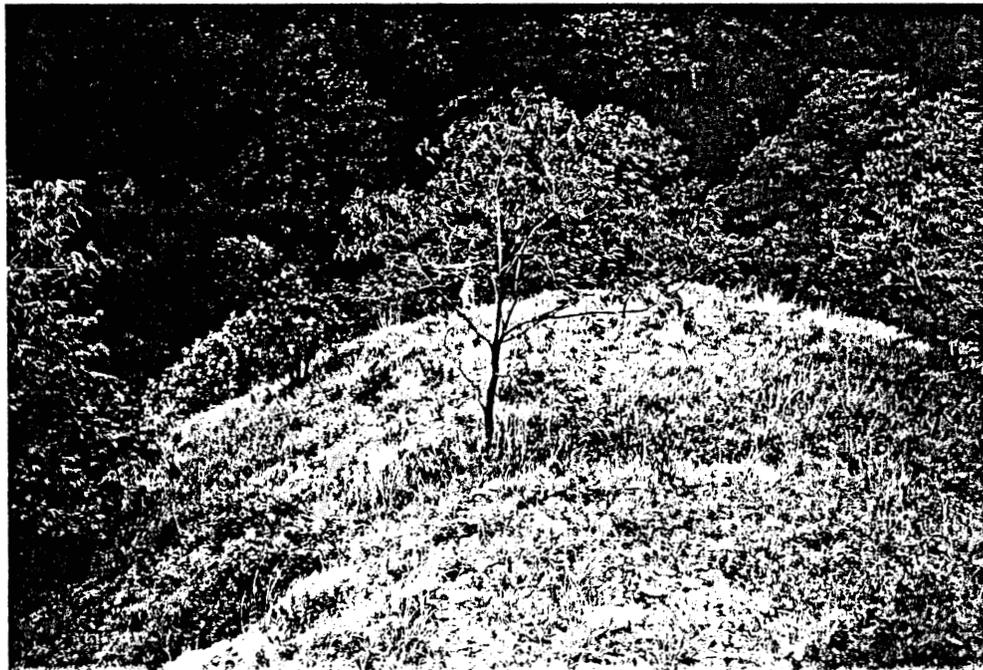


Figure 26. Close view of one of the prairie glades above the limestone cliffs at LaRue-Pine Hills/Otter Pond Research Natural Area; note cherty gravel -photo by M. D. Hutchison, July, 1977

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M. D. Hutchison

July, 1987

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TEMP.	PERMANENT (To be filled in by the WO)					
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Fig. 27			Nov., 1983	Illinois, Shawnee National Forest, Jonesboro District Union Co.	dry-mesic upland forest in north part of LaRue-Pine Hills/Otter Pond Research Natural Area	35 mm. C

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DATE SUBMITTED

PHOTOGRAPHIC RECORD

(See FSM 1643.52)

M. D. Hutchison

July, 1987

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LOCATION

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TEMP.	PERMANENT (To be filled in by the WO)					
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Fig. 28			June, 1986	Illinois, Shawnee National Forest, Jonesboro District Union Co.	beaver dam across gap in old railroad grade at LaRue-Pine Hills/Otter Pond Research Natural Area	35 mm. C



Figure 27. Dry-mesic forest in north part of LaRue-Pine Hills/Otter Pond Research Natural Area: trees are black oaks
-photo by M. D. Hutchison, Nov., 1983



Figure 28. View of beaver dam in SE 1/4 of NW 1/4 of sec. 21 at LaRue-Pine Hills/Otter Pond; note timber kill in beaver pond; dam is across a gap in an old railroad grade
-photo by M. D. Hutchison. June. 1986

USDA-FOREST SERVICE

PHOTOGRAPHIC RECORD
(See FSM 1643.52)

PHOTOGRAPHER

S. E. Harris

DATE SUBMITTED

July, 1987

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TEMP.	PERMANENT (To be filled in by the WO)					
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Fig. 29			Oct., 1963	Illinois, Shawnee National Forest, Jonesboro District Union Co.	Bailey Limestone cliffs from levee road at LaRue-Pine Hills/Otter Pond Research Natural Area	35 mm. C

USDA-FOREST SERVICE

PHOTOGRAPHIC RECORD

(See FSM 1643.52)

PHOTOGRAPHER

M. D. Hutchison

DATE SUBMITTED

July, 1987

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TEMP.	PERMANENT (To be filled in by the WO)					
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Fig. 30			Jan. 14, 1986	Illinois, Shawnee National Forest, Jonesboro District Union Co.	road along base of bluffs at LaRue-Pine Hills/Otter Pond Research Natural Area showing flooding from beaver dam	35 mm. C

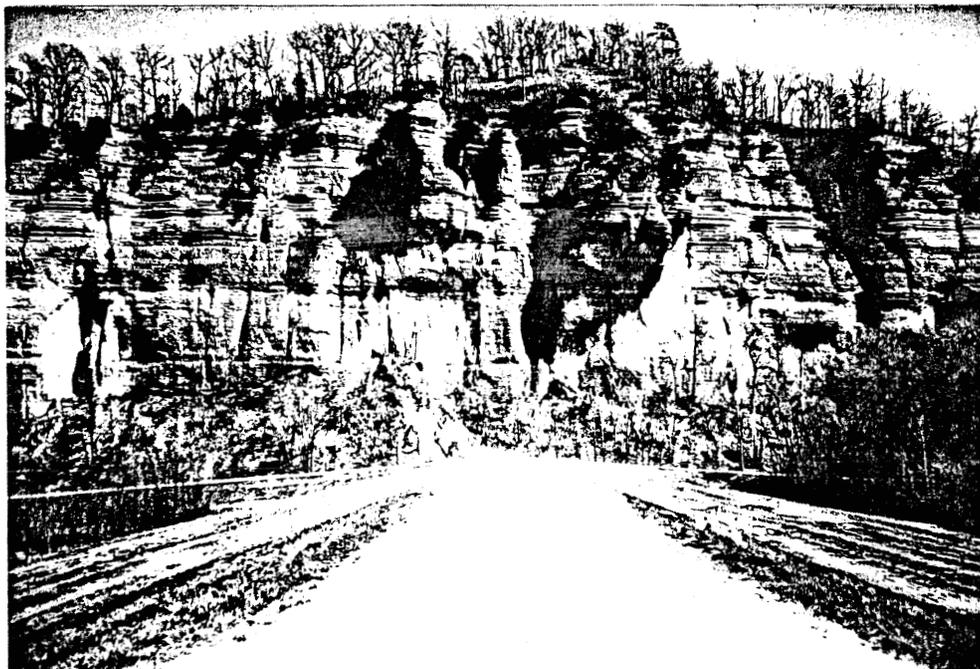


Figure 29. Bailey Limestone cliffs at LaRue-Pine Hills/Otter Pond Research Natural Area; road in foreground is on Big Muddy River levee at north edge of RNA -photo by S. E. Harris, Oct., 1963



Figure 30. Road along base of bluffs at LaRue-Pine Hills/Otter Pond Research Natural Area; level of water in swamp (to left) has been raised by beaver dams and is flooding the gravel road at this point; it is recommended that this road be closed, but at present, it is left out of the RNA boundaries -photo by M. D. Hutchison, Jan. 14, 1986

USDA-FOREST SERVICE

PHOTOGRAPHIC RECORD

(See FSM 1643,52)

PHOTOGRAPHER

S. E. Harris

DATE SUBMITTED

July, 1987

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TEMP.	PERMANENT (To be filled in by the WO)						(1)	(2)
Fig. 31			Oct, 1963	Illinois, Shawnee National Forest, Jonesboro District Union Co.	side view of upper cliffs of the Grassy Knob Chert Formation at LaRue- Pine Hills/Otter Pond Research Natural Area	35 mm. C		

USDA-FOREST SERVICE

PHOTOGRAPHIC RECORD

(See FSM 1643.52)

PHOTOGRAPHER

S. E. Harris

DATE SUBMITTED

July, 1987

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TEMP.	PERMANENT (To be filled in by the WO)					
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Fig. 32			April, 1963	Illinois, Shawnee National Forest, Jonesboro District Union Co.	falls over Bailey Limestone at LaRue-Pine Hills/Otter Pond Research Natural Area	35 mm. C



Figure 31. Side view of upper cliffs at LaRue-Pine Hills/Otter Pond Research Natural Area; these are of the Grassy Knob Chert Formation, Devonian System
-photo by S. E. Harris, Oct., 1963



Figure 32. View of falls over Bailey Limestone at LaRue-Pine Hills/Otter Pond Research Natural Area; note steep grade of V-shaped valley
-photo by S. E. Harris, April, 1963

USDA-FOREST SERVICE PHOTOGRAPHIC RECORD <i>(See FSM 1643.52)</i>	PHOTOGRAPHER M. D. Hutchison	DATE SUBMITTED July, 1987
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TEMP.	PERMANENT (To be filled in by the WO)					
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Fig. 33			Aug., 1986	Illinois, Shawnee National Forest, Jonesboro District Union Co.	a damselfly (<i>Telebasis byersi</i>) at LaRue Spring, NW 1/4 of SW 1/4 of sec. 9, LaRue-Pine Hills/Otter Pond Research Natural Area	35 mm. C

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M. D. Hutchison

July, 1987

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TEMP.	PERMANENT (To be filled in by the WO)					
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Fig. 34			Apr. 10, 1987	Illinois, Shawnee National Forest, Jonesboro District Union Co.	close view of limestone cliffs and talus at base of bluff at LaRue-Pine Hills/Otter Pond Research Natural Area	35 mm C



Figure 33. A small red damselfly, Telebasis byersi, is barely visible in the center of this photograph; its only Illinois location is at a spring at LaRue-Pine Hills/Otter Pond Research Natural Area
-photo by M. D. Hutchison, Aug., 1986



Figure 34. Close view of limestone cliffs and talus at base of bluff at LaRue-Pine Hills/Otter Pond Research Natural Area
-photo by M. D. Hutchison, April 10, 1987

USDA-FOREST SERVICE

PHOTOGRAPHER

DATE SUBMITTED

PHOTOGRAPHIC RECORD

(See FSM 1643.52)

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July, 1987

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TEMP.	PERMANENT (To be filled in by the WO)					
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Fig. 35			Feb. 10, 1987	Illinois, Shawnee National Forest, Jonesboro District Union Co.	staff personnel on field visit to LaRue-Pine Hills/Otter Pond Research Natural Area	35 mm. C

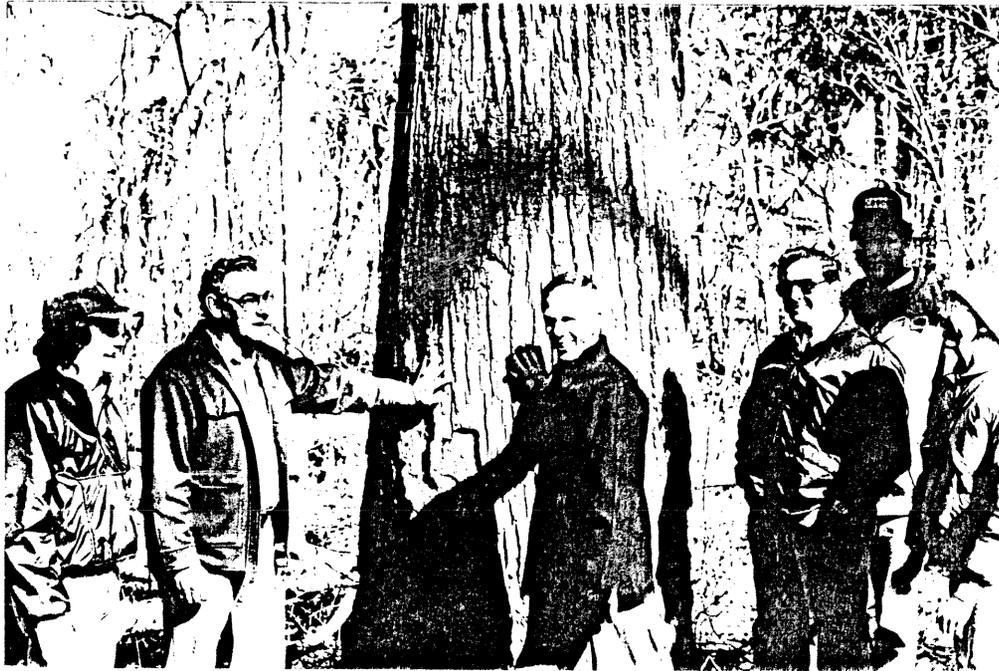


Figure 35. Staff personnel from the North Central Forest Experiment Station, Minnesota; the Forestry Sciences Laboratory, Carbondale, Illinois; the Shawnee National Forest, Harrisburg, Illinois; The Nature Conservancy, Chicago, Illinois; and the Natural Land Institute, Rockford, Illinois examining a large tuliptree at the LaRue-Pine Hills/Otter Pond Research Natural Area
-photo by M. D. Hutchison, Feb. 10, 1987

Fig. 17.

LaRue-Pine Hills/
Otter Pond RNA
Union Co., Ill.

Fig. 18.

LaRue-Pine Hills/
Otter Pond RNA
Union Co., Ill.
N part

Fig. 18.

LaRue-Pine Hills/
Otter Pond RNA
Union Co., Ill.
S part

Fig. 19.

LaRue-Pine Hills
Otter Pond RNA
Union Co., Ill.
N part

Fig. 19.

LaRue-Pine Hills/
Otter Pond RNA
Union Co., Ill.
S part

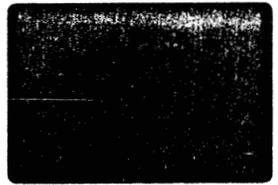
Fig. 20.

LaRue-Pine Hills/
Otter Pond RNA
Union Co., Ill.
N part

Fig. 20.

LaRue-Pine Hills/
Otter Pond RNA
Union Co., Ill.
S part

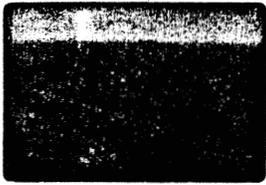
Fig. 21
LaRue-Pine Hills/Otter Pond
RNA



Union Co., Ill.

Fig. 22

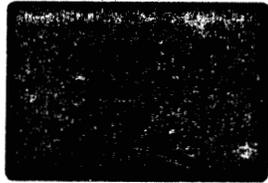
LaRue-Pine Hills/Otter Pond
RNA



Union Co., Ill.

Fig. 23

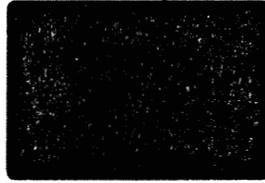
LaRue-Pine Hills/Otter Pond
RNA



Union Co., Ill.

Fig. 24

LaRue-Pine Hills/Otter Pond
RNA



Union Co., Ill.

Fig. 25

LaRue-Pine Hills/Otter Pond
RNA



Union Co., Ill.

Fig. 26

LaRue-Pine Hills/Otter Pond
RNA

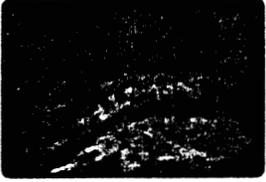


Fig. 27 - LaRue-Pine Hills/
Otter Pond RNA



Fig. 28

LaRue-Pine Hills/Otter Pond
RNA



Fig. 29

LaRue-Pine Hills/Otter Pond
RNA

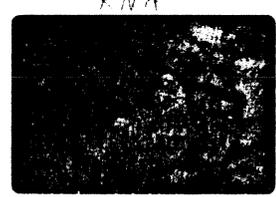


Fig. 30
LaRue-Pine Hills/Otter Pond
RNA



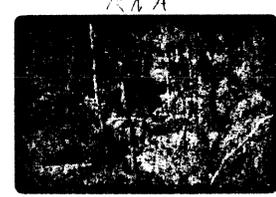
Union Co., Ill.

Fig. 31
LaRue-Pine Hills/Otter Pond
RNA



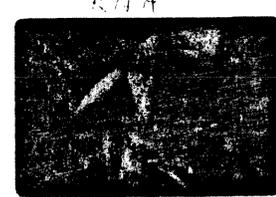
Union Co., Ill.

Fig. 32
LaRue-Pine Hills/Otter Pond
RNA



Union Co., Ill.

Fig. 33
LaRue-Pine Hills/Otter Po.
RNA



Union Co., Ill.

Fig. 34
LaRue-Pine Hills/Otter
Pond RNA
Union Co., Ill.

Fig. 35
LaRue-Pine Hills/
Otter Pond RNA
Union Co., Ill.

SIGNATURE PAGE

for

RESEARCH NATURAL AREA ESTABLISHMENT RECORD

LaRue-Pine Hills/Otter Pond Research Natural Area

Shawnee National Forest

Union County, Illinois

The undersigned certify that all applicable land management planning and environmental analysis requirements have been met in arriving at this recommendation.

Prepared by Max D. Hutchison, Field Representative, Natural Land Institute; Steven Olson, Technical Assistant, Natural Land Institute; and Stanley Harris, Jr., Ph.D., Professor Emeritus, Department of Geology, Southern Illinois University

Recommended by Joe F. Newcomb Date 2-11-88
Joe Newcomb, District Ranger, Jonesboro District

Recommended by Kenneth B. Henderson Date 4/13/88
Kenneth Henderson, Forest Supervisor, Shawnee National Forest

Recommended by Floyd J. Maritz Date 9/22/88
Floyd Maritz, Regional Forester, Eastern Region

Recommended by Ronald D. Lindmark Date 11/1/88
Ronald D. Lindmark, Station Director, North Central Station

1/ Insert: and that boundaries are clearly identified in accordance with FSM 4063.21, Mapping & Recordation, and FSM 4063.41 5.e(3)
LRS

1*

I certify that the enclosed boundary description of the LaRue Pine Hills / Otter Pond Research Natural Area was prepared under my direct supervision.

P.L.S. 2897
Seal

Randy R. Erickson
Forest Land Surveyor

2-28-91
Date



TITLE PAGE

Establishment Record for the LaRue-Pine Hills/Otter Pond
Research Natural Area within the Shawnee
National Forest, Union County, Illinois

ESTABLISHMENT RECORD FOR THE LARUE-PINE HILLS/OTTER POND
RESEARCH NATURAL AREA WITHIN THE SHAWNEE NATIONAL FOREST
UNION COUNTY, ILLINOIS

INTRODUCTION

The LaRue-Pine Hills/Otter Pond Research Natural Area (RNA) is a 2,585-acre (1,046.6-hectare) tract owned by the federal government and managed by the U. S. Forest Service, Shawnee National Forest. It contains relatively undisturbed natural community types, outstanding geological features, and many rare plants and animals. There are four (4) candidate Regional Forester's Sensitive Species known from the area, 23 Shawnee National Forest Listed plants, and 29 Shawnee National Forest Listed animals recorded from the area.

It is a part of the LaRue-Pine Hills Ecological Natural Area identified by the Illinois Natural Areas Inventory (1978) as being of significance because of its eight (8) high to very high quality natural communities, its outstanding exposure of Bailey Limestone, and the presence of 37 Illinois rare, Threatened, or Endangered plant and animal species (see Appendix III). The area contains more plant species than any other site of comparable size in the Midwest.

Eleven (11) Society of American Foresters (SAF) cover types are present in the LaRue-Pine Hills/Otter Pond Research Natural Area. Six of these, SAF Types 40, 52, 59, 60, 65, and 87, are listed as needed in the RNA system (Shawnee National Forest, Land and Resource Management Plan, 1986). There are nine (9) Kuchler potential natural vegetation types. At least 14 natural communities as defined by the Illinois Natural Areas Inventory (INAI) in 1978 are present. There are several variants and small stands with dominants different from those listed by SAF and Kuchler.

The area includes a portion of the Mississippi River bottomlands and the uplands adjacent to it. The bluffs bordering the Mississippi Valley rise 300 to 480 feet (91.4 to 146.3 meters) above the floodplain. The area drains southward and westward into the Mississippi River. The bedrock is of Devonian age limestones. The upland part of the RNA is within the Southern Section of the Ozark Natural Division. The bottomland part is within the Southern Section of the Lower Mississippi River Bottomlands Natural Division (Schwegman, 1973). The RNA is within the Salem Plateau Section of the Ozark Plateaus Physiographic Province (Figure 6).

The Public Land Survey surveyors, describing this region in 1810, noted the "poor stony bluffs" on the uplands

and the "swamps" and "wet level bottom land" on the floodplain. "Lakes" (Otter Pond and Wolf Lake) were described and mapped in the south part of the area. Pines were mentioned on the bluffs. Most of the upland timber was "oak and hickory." Trees were relatively small, and brush was common.

Permanent settlers first arrived in this part of Union County in 1825. Many made their homes in the hills and farmed in the river bottoms during the spring and summer.

The timber industry became important in the late 1800's, and several sawmills were located in and near the RNA. A railroad spur crossed the bottomland to load logs at the bluffs east of LaRue. There are still sections of the old grade visible (Figure 28). Timber was selectively cut over most of the area prior to 1930, but the steep rocky slopes had little timber of high quality, and these sites were never severely disturbed.

Waterfowl hunting was a major activity in the LaRue vicinity during the period 1920-1965, and some of the bottomland was acquired by hunting clubs. Dams were constructed to maintain water levels in the swamps for ducks during drought years (Figure 28).

In 1938, beavers were released by the U. S. Forest Service and Illinois Department of Conservation in the LaRue Swamp. Their dams have in recent years created large open ponds in depressions that were formerly forested swamps.

Because of the rugged terrain and thin rocky soils, the upland part of the RNA has never been suitable for agricultural use. On the ridge crests and rocky south-facing slopes, trees grow slowly and are of poor form and quality for lumber. The bottomland has been more disturbed, and old clearings are recognizable on 1938 aerial photographs. The original bottom timber was of better quality for lumber than that on the hills, and logging has disturbed most of that part of the RNA, although none has occurred within the last 50 years. This part has never been suitable for agricultural use because of its wetness and lack of drainage.

The RNA was first noted as a significant natural area in the 1880's (Forbes, 1881). Since that time, it has been recognized by the scientific community as one of the most valuable ecological research areas in the Midwest (see reference list). Many universities currently use the area, particularly for geological and ecological research studies and outdoor educational programs. *All memo's of understanding & permits to use the area will be reviewed & reissued when the area becomes an RNA. Russ & L 7 June '91*

The RNA was in private ownership prior to its acquisition by the federal government to become a part of the Shawnee National Forest. Most of the property was

acquired in the 1930's; one tract (east of Wolf Lake at the south end) was acquired in 1974.

The LaRue Swamp area was designated as a Botanical Area in 1939 by the Forest Service. This designation was soon changed to "Scenic Area" to comply with Forest Service classification standards. In 1970, the area received a new title, LaRue-Pine Hills Ecological Area, a classification then unique in the Forest Service management code (Shawnee National Forest, LaRue-Pine Hills Ecological Area Management Plan, 1970).

In 1974, the area was recommended for RNA designation. It received a deferred recommendation by the Research Branch of the Forest Service pending acquisition of property to the south, the Otter Pond tract (this property was acquired in 1974).

During the Illinois Natural Areas Inventory of 1976-78, the area was determined to be one of the most diverse and significant natural areas remaining in Illinois (White, 1978; see Appendix III).

Research Natural Area designation of the LaRue Swamp--Pine Hills--Otter Pond area was recommended in reports prepared by the Illinois Nature Preserves Commission (Hutchison, 1980) and the Illinois Department of Conservation (West, 1980) in 1980. In 1981, Dr. George Rink of the Forestry Sciences Laboratory in Carbondale, Illinois prepared and submitted an "Evaluation of Potential Research Natural Areas in Southern Illinois." In his report, Dr. Rink recommends that the 2,090-acre (846.2-hectare) Pine Hills/Otter Pond USFS Ecological Area be designated as an RNA (Rink, 1981).

LAND MANAGEMENT PLANNING

The LaRue-Pine Hills/Otter Pond natural area is recommended for designation as a research natural area in the Land and Resource Management Plan, Shawnee National Forest, approved November 24, 1986 (see SNF, Forest Plan, IV-3, Special Feature Management). The environmental analysis as a part of the planning process supports the recommendation to establish the RNA (SNF, Final EIS, 2-66, Identification and Management of Special Features). It is currently being protected under Management Prescription 8.2.

OBJECTIVES

The objectives of establishing the LaRue-Pine Hills/Otter Pond Research Natural Area are to:

- 1) preserve pristine forest, grassland, and geological natural situations for research, study, observation,

monitoring, and educational activities that maintain unmodified conditions,

- 2) preserve and maintain genetic diversity,
- 3) protect against serious environmental disruptions,
- 4) serve as reference area for the study of succession,
- 5) provide onsite and extension educational activities,
- 6) serve as baseline area for measuring long-term ecological changes,
- 7) serve as control area for manipulative research,
- 8) monitor effects of resource management techniques and practices.

JUSTIFICATION

The LaRue-Pine Hills/Otter Pond Research Natural Area is one of the outstanding natural areas in the Midwest (Quarterman and Powell, 1978; Zachry and Dale, 1979; Mohlenbrock, 1987). In rankings of significance of natural areas in Illinois (using criteria such as natural quality, diversity, uniqueness, size, rare species and community types, geological significance, and value for research), this area is at, or near the top of every list that has been developed.

The area is within the largest contiguous forest region left in Illinois. It closely resembles its presettlement character and reflects little disturbance from agriculture or timber harvest. Many of the forest stands are mature with old trees. The waters in the streams are clear and unpolluted. The prairie glades are essentially pristine. Most of the area has been protected through designation and management since Forest Service acquisition in the 1930's.

The RNA has outstanding geological exposures of Devonian age bedrock and excellent examples of a variety of landforms and geomorphic processes.

Sixty-six plant and animal species considered to be rare, Threatened, or Endangered in Illinois are now known from the area.

The Federally Endangered Indiana bat (Myotis sodalis) occurs in the area, and bald eagles (Haliaeetus leucocephalus) are frequently observed in winter.

Candidate Regional Forester's Sensitive Species known from the area are Price's groundnut (Apios priceana), Arkansas manna grass (Glyceria arkansana), pale manna grass (Puccinellia pallida), and giant sedge (Carex gigantea). An additional 23 Shawnee National Forest Listed plants, and 29 SNF Listed animals are here, including the entire Illinois population of the eastern woodrat (Neotoma floridana).

The area is an important refuge for migrating birds along the Mississippi Flyway. Many warblers can be observed here during the spring and fall seasons.

The LaRue-Pine Hills/Otter Pond RNA is a large area (compared with other natural areas recognized in the Midwestern states) and is well buffered with relatively natural forest land at most points along its boundaries.

It is the most diverse area in Illinois with 14 natural communities, eight of which are of high to very high quality (Appendix III). There are upland and lowland forest communities, ponds, springs, caves, cliffs, glades, and hill prairies (Mohlenbrock, 1985; Appendix I). Plant species of the eastern forest grow next to those typical of the Ozarks to the west, and northern species of the prairies meet those characteristic of the southern swamps (Mohlenbrock and Voigt, 1964). Over 1,150 species of vascular plants, 35% of all species known to occur in Illinois, have been collected in the area (Mohlenbrock, 1985; Appendix I). The forests include SAF cover types 40, 52, 59, 60, 65, and 87 that are listed as needed in the RNA system (Shawnee National Forest, Land and Resource Management Plan 1986).

The physical and biological relationships are unique. The wetlands of a major river valley are contiguous to the valley bluffs, essentially uninterrupted by cultural disturbance. Although a graveled road is along the base of the bluff in the north part of the area, it is little traveled and is closed part of the year. In the south half of the RNA, there is no cultural separation between the bluffs and swamps. This is an important attribute of the area, as highways, railways, leveed streams, farmland, and/or pastures nearly everywhere divide bottom land from upland sites. Upland and lowland forest communities, ponds, springs, caves, cliffs, glades, and hill prairies are in close proximity (Figures 15 and 16).

The area is particularly valuable because it is so well known to ecologists throughout the country. There are dozens of publications based on research conducted here over the last century. The great diversity and high natural quality of the area have attracted visitors of many backgrounds: scientists for observation and research; field excursions - local, national, international - in ecology, botany, zoology, limnology, geology, soils, and forestry; and laymen to enjoy the scenery and beauty of nature from the

bluff overlooking the RNA. RWS & LS 7 June 1991

This RNA is suitable for research, demonstration, and/or learning experience opportunities. Conditions are ideal for research on prairie-forest successional and interface questions, for studies of rock weathering and pedological research dependent upon the presettlement quality of the site, for studies of habitat requirements of rare and relic species, for studies of relationships between water level changes and biotic populations, and for studies of vegetational history and geography of plant and animal species migrations.

PRINCIPAL DISTINGUISHING FEATURES

The LaRue-Pine Hills/Otter Pond Research Natural Area includes a part of the Mississippi River floodplain and its adjacent valley wall. It is at the very eastern edge of the Ozark Plateaus Physiographic Province.

The area is characterized by bottomland forests, open ponds, shallow swamps, high bluffs with sheer cliffs of limestone, and rugged forested upland. The wetland includes a part of the former meandering course of the Big Muddy River before it was intersected, and its upper course was captured, by a meander bend of the Mississippi River.

Groundwater enters the wetland from springs along the base of the bluffs. These springs help maintain water in the swamps during drought periods. Beaver dams also help maintain water in the swamps.

The crevices of the limestone extend well below the floodplain level. Caverns exist below the water level that are open enough to support a population of spring cavefish. Small terrestrial caverns occur in the fissures along the cliff face. Pleistocene and Recent sediments over 100 feet (30 meters) thick lie beneath the floodplain, so the exposed cliffs were once much higher and groundwater circulation more rapid during the "deep stage(s)" of the Mississippi Valley.

Otter Pond has a deep center area rimmed by dense submergent growth and a thick growth of swamp loosestrife (*Decodon verticillata*). The swamps have areas of open water with low levels partially maintained by beaver. Trees in the swamps and the adjacent floodplain forests include pumpkin ash (*Fraxinus tomentosa*), red maple (*Acer rubrum*), silver maple (*A. saccharinum*), oaks (*Quercus palustris* and *Q. falcata pagodaefolia*), and hickories (*Carya ovata* and *C. laciniosa*).

The high limestone bluffs are prominently jointed vertically into towering columns. Many plants have established themselves in the joints and bedding planes and where silts washed from above have been caught. Small

glades and loess hill prairies can be seen on the tops of many of the vertical columns. The most common species here are little bluestem (Andropogon scoparius) and side-oats grama (Bouteloua curtipendula).

The dry and xeric upland forests on the ridges and upper slopes have post oak (Quercus stellata), black oak (Q. velutina), and native stands of shortleaf pine (Pinus echinata). Farkleberry (Vaccinium arboreum) is a common understory shrub, and there is a groundcover of poverty oat grass (Danthonia spicata).

The dry and mesic upland forests are dominated by white oak (Q. alba), red oak (Q. rubra), sugar maple (Acer saccharum), beech (Fagus grandifolia), and yellow poplar (Liriodendron tulipifera). Understory trees and shrubs include redbud (Cercis canadensis), flowering dogwood (Cornus florida), and spicebush (Lindera benzoin). The herbaceous layer has a very diverse spring ephemeral flora.

Two Federally Endangered Species are present. The occurrence of the Indiana bat (Myotis sodalis) has recently been documented, and bald eagles (Haliaeetus leucocephalus) are frequent winter visitors. There are four Candidate Regional Forester's Sensitive Species and 52 Shawnee National Forest Listed Species known to occur here.

This unique natural area provides opportunities for research, education and enjoyment of nature. The roads skirt the area so as to make available to the casual visitor the natural beauty and the scenery of the Mississippi River Valley and its bluffs. At the same time, the RNA remains protected for future educational and research purposes.

LOCATION

The LaRue-Pine Hills/Otter Pond Research Natural Area is on the Jonesboro Ranger District of the Shawnee National Forest. It is in the northwestern corner of Union County, Illinois in the extreme southwestern tip of Illinois (Figures 2 and 3). The site is centered at 37° 33' North latitude and 89° 26' West longitude. The RNA is in T. 11 S., R. 3 W. of the 3rd P. M., sections 4, 9, 10, 15, 16, 21, 22, 27, 28, 33, and 34 (Figures 4 and 5). Approximately 2,585 acres (1,046.6 hectares) are included within the boundaries. Elevation ranges from 350 feet (106.7 meters) above mean sea level in the swamp where Running Lake Ditch exits the area to over 840 feet (256 meters) between Government Rock and McGee Hill. A 140-acre (56.7-hectare) tract in section 28, owned by Southern Illinois University, is an inholding within the RNA boundaries (it is excluded from the 2,585-acre area) (Figures 4 and 5).

LaRue Pine Hills RNA boundary description

Beginning at the quarter corner to sections 28 and 33, Township 11 South, Range 3 West, thence;

West along the section line to sections 28 and 33 to the east right-of-way line of the Missouri Pacific Railroad, thence;

Northwest along the east right-of-way line of the Missouri Pacific Railroad to the intersection with the section line to sections 21 and 28, thence;

Continuing northwest along said right-of-way line in section 21 to the south bank of Running Lake Ditch, thence;

Northeasterly along said south bank to the south sixteenth line of section 21, thence;

East along south sixteenth line of section 21 to the southwest sixteenth corner of section 21, thence;

North along the west sixteenth line of section 21 to the northwest sixteenth corner of section 21, thence;

West along the north sixteenth section 21 to the intersection with the east right-of-way line of the Missouri Pacific Railroad, thence;

North along said right-of-way line to the north line of section 16, thence;

Northwesterly along said right-of-way line to the intersection with west line of section 9, thence;

North along the west line of section 9 to the south edge of County Road No. 2 at Big Muddy River levee, thence;

Northeasterly along the south edge of County Road No. 2 to its intersection with Forest Road No. 345 and across road to the east edge of said road, thence;

Northerly along the east edge of Forest Road No. 345 to the south sixteenth line of section 4, thence;

East along the south sixteenth line of section 4 to the southeast sixteenth corner of section 4, thence;

North along east sixteenth of section 4 to the west edge of Forest Road No. 236, thence;

Southerly along the west edge of Forest Road No. 236 through sections 4, 9, 10, 15, 16, 21, 22, and 27 to the north line of section 34, thence;

West along section line to the quarter corner to sections 27 and 34, thence;

South along north-south quarter line to the center-north sixteenth corner of section 34, thence;

West along the north sixteenth line of section 34 to the north sixteenth corner to sections 33 and 34, thence;

North along the section line to a point 1018 feet south of the corner to sections 27-28-33-34, thence;

N 77 48' W, 230.00 feet, thence; N 66 16' W, 375.00 feet, thence;
N 10 41' W, 47.00 feet, thence; N 10 38' E, 195.00 feet, thence; N 12 09' W,
235.00 feet, thence; N 70 06' W, 225.00 feet, thence;

West to the east bank of Wolf Lake, thence;

Southwesterly along the east bank of Wolf Lake to the north sixteenth line of section 33, thence;

West across Wolf Lake on the north sixteenth line of section 33 to the center north sixteenth corner of section 33, thence;

North along the north-south quarter line of section 33 to the point of beginning,

Excluding: The right-of-way of Forest Raod No. 345 through sections 9, 16, and 21. Also excluding;

A 140 acre tract in section 28 owned by Southern Illinois University beginning at the quarter corner to sections 21 and 28, thence east on the north line of section 28 to the east sixteenth corner to sections 21 and 28. thence south on the east sixteenth line of section 28 to a point 14.28 chains north of the east sixteenth corner to sections 28 and 33 , thence southwesterly to a point on the north-south quarter line of section 28 being 5.72 chains north of the south quarter corner of section 28, thence north along the north-south quarter line to the point of beginning.

Net acreage being approximately 2585 acres.

The area is about 3.5 miles (5.6 kilometers) southeast ot the village of Grand Tower, Illinois. Access is from IL Route 3 (one mile west of the RNA), via Union County Road #2 on the levee of the Big Muddy River. Forest Road #345 runs along the base of the bluff and crosses the swamp near the village site of LaRue. Forest Service Road # 236 runs the length of the Pine Hills ridge on the upland.

AREA BY COVER TYPES

The LaRue-Pine Hills/Otter Pond Research Natural Area is mostly forested. The following are SAF and Kuchler PNV cover types represented within the RNA:

SAF Cover Types (Figures 11 and 12)

Post oak-blackjack oak (SAF #40) is a type listed as needed in the RNA system. It occurs at Pine Hills along the tops and upper slopes of the dry ridges. Blackjack oak (Quercus marilandica) is codominant with post oak, and black oak and pignut hickory (Carya glabra) are also common.

White oak-black oak-northern red oak (SAF #52) is a type listed as needed in the RNA system. It occurs on many of the slopes on the east side of the ridge at middle elevations. The most common trees are white oak, red oak, black oak, shagbark hickory, and mockernut hickory (Carya tomentosa).

White oak (SAF #53) is a type that occurs at high elevations on the slopes of the east side and grades into the previous type. Other species present include black oak, red oak, and bitternut hickory (Carya cordiformis).

Yellow poplar-white oak-northern red oak (SAF #59) is a type listed as needed in the RNA system. It occurs at Pine Hills on the slopes below SAF #52 on the east side of the ridge. Black oak, Shumard oak (Quercus shumardii), and mockernut hickory are also common.

Beech-sugar maple (SAF #60) is a type listed as needed in the RNA system. At Pine Hills, this type occurs in the deep ravines, mainly in the east and south parts of the area. Sugar maple dominates these sites, but other common species include beech, white oak, red oak, basswood (Tilia americana), mockernut hickory, yellow poplar, and cucumbertree (Magnolia acuminata).

Silver maple-American elm (SAF #62) is a type found locally in the LaRue Swamp. Cottonwood (Populus deltoides), green ash (Fraxinus pennsylvanica), and slippery elm (Ulmus rubra) are also in these areas.

The roads referred to in the description of the RNA (FS Road #236, FS Road #345, and Union County Road #2) are shown on maps (Figures 4 and 5) in this document, and the RNA boundaries that follow them are as these roads exist at the present time.

Pin oak-sweetgum (SAF #65) is a type listed as needed in the RNA system. In the LaRue Swamp and around Otter Pond, this type is widespread and common. Pin oak is dominant, with cherrybark oak being second in abundance. Sweetgum (Liquidambar styraciflua) is occasional.

Shortleaf pine (SAF #75) and shortleaf pine-oak (SAF #76) are types that occur in the Pine Hills mostly on west- and southwest-facing exposures at high elevations. The scattered pure stands of pine are small, mostly less than five acres (2 hectares). The dominant tree is frequently blackjack oak, with some post oak and pignut hickory.

Sweetgum-yellow poplar (SAF #87) is a type listed as needed in the RNA system. It occurs in the area along the lower reaches of several ephemeral streams on the east side of the ridge.

Sugarberry-American elm-green ash (SAF #93) is a type found in the LaRue Swamp forming an interrupted strip just above the high water level of the beaver ponds. American elm and pumpkin ash (Fraxinus tomentosa) dominate these sites.

Black oak (SAF #110) is a very common type on the uplands at Pine Hills. It grades widely into SAF #40, and also into SAF #52 and SAF #59.

SAF #	NAME	ACRES	HECTARES
40	post oak-blackjack oak and	630	255.1
110	black oak		
52	white oak-black oak-northern red oak	270	109.3
53	white oak	70	28.3
59	yellow poplar-white oak-northern red oak and	100 50	40.5 20.2
60	beech-sugar maple		20.2
62	silver maple-American elm and	345	139.6
65	pin oak-sweetgum	690 315	279.4 139.6
75	shortleaf pine and	35	14.2
76	shortleaf pine-oak		
87	sweetgum-yellow poplar	20	8.1
93	sugarberry-American elm-green ash	770	311.7

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Kuchler Potential Natural Vegetation Types (Figures 13 and 14)

Types #66 (bluestem prairie) and #74 (cedar glade) occur on the high steep slopes above the west-facing limestone cliffs faces. These types intergrade widely, depending on the prevalence of redcedars at a given site.

Northern floodplain forest (K-89), elm-ash (K-92), and southern floodplain forest (K-103) occur in the bottomlands at LaRue Swamp. The elm-ash forest is on the low ridges, and on the highest of these ridges, may intergrade with oak-hickory forest (K-91). Northern floodplain forest is widespread in the bottoms.

Most of the uplands are predominantly oak-hickory forest (K-91), but on some west- and southwest-facing exposures, oak-hickory-pine forest (K-101) becomes conspicuous.

The mesic ravines on the east side of the ridge have various expressions of beech-maple forest (K-93), mixed mesophytic forest (K-94), and southern mixed forest (K-102).

K-#	NAME	ACRES	HECTARES
66	bluestem prairie and	10	4.0
74	cedar glade		
89	northern floodplain forest	860	348.2
103	southern floodplain forest		
91	oak-hickory forest	850	344.1
92	elm-ash forest	615	249.0
93	beech-maple forest and	210 105	85.0 42.5
94	mixed mesophytic forest and	105	42.5
102	southern mixed forest		
101	oak-hickory-pine forest	40	16.2

Illinois Natural Areas Inventory community types

Xeric upland forest stands occur on the ridge tops and on south- and west-facing slopes. These sites are dominated by shrubby blackjack oaks and small shortleaf pines, with an understory of farkleberry. Greenbriers (Smilax spp.) are also common, and the groundcover is of sparse grasses. The ground is usually bare of leaf litter. Soils are very cherty.

Dry upland forest sites are dominated by post oak and

black oak. Shadbush (Amelanchier arborea), farkleberry, and rarely azalea (Rhododendron prinophyllum) are in the understory. Pussytoes (Antennaria plantaginifolia) and dittany (Cunila origanoides) are common as groundcover species. On cherty slopes, blackjack oak may form a major portion of the canopy and shrub layer.

The dry-mesic and mesic upland forests are on lower slopes and in deep ravines. Many tree species share dominance including white oak, red oak, chinkapin oak (Q. muehlenbergii), sugar maple, tuliptree (yellow poplar), beech, and hickories. The understory has pawpaw (Asimina triloba), spicebush, wild hydrangea (Hydrangea arborescens), hophornbeam (Carpinus caroliniana), and flowering dogwood (Cornus florida). Groundcover species include Virginia creeper (Parthenocissus quinquefolia), poison ivy (Rhus radicans), and Christmas fern (Polystichum acrostichoides). Spring ephemeral wildflowers are exceptionally abundant in the ravines.

The mesic and wet-mesic floodplain forests on the low ridges in LaRue Swamp and around Otter Pond have cherrybark oak, kingnut hickory, sweetgum, and green ash, with red maple, sassafras (Sassafras albidum), and slippery elm in the understory. Some areas have nearly pure stands of pin oak. The groundcover is frequently only of sedges (Carex spp.), and poison ivy.

The wet floodplain forest is dominated by pumpkin ash, American elm, and red maple. A significant portion of the lowland has extensive ponds.

On the limestone cliffs, there are small pockets of soil which have alumroot (Heuchera parviflora), Drummond's goldenrod (Solidago drummondii), and poverty oat grass.

The tops of the bluffs have limestone glade and loess hill prairie communities. Little bluestem and side-oats gramma are the dominant grasses here.

The shrub swamps and ponds are densely ringed by buttonbush (Cephalanthus occidentalis), Virginia willow (Itea virginica), and swamp loosestrife. Scattered trees along the swamp edges include swamp cottonwood, black willow (Salix nigra), and red maple. Herbaceous growth includes arrow arum (Peltandra virginica), lizards-tail (Saururus cernuus), and many sedges. Submergent growth consists mostly of pondweeds (Potamogeton spp.) and coontail (Ceratophyllum demersum). The surface of the water is often nearly completely covered by duckweeds (Lemna spp.).

NATURAL COMMUNITY	ACRES	HECTARES
xeric upland forest	35	14.2
dry upland forest	730	295.5
dry-mesic upland forest	75	30.4
mesic upland forest	370	149.8
mesic floodplain forest and wet-mesic floodplain forest	645	261.1
wet floodplain forest	120	48.6
loess hill prairie and limestone glade	10	4.0
limestone cliff	---	---
shrub swamp	390	157.9
pond	210	85.0

PHYSICAL AND CLIMATIC CONDITIONS

The LaRue bottomland consists of a segment of the Mississippi River floodplain about 4.2 miles (6.8 kilometers) distant from the river at the foot of the valley wall (Figure 21). It is now separated from the Big Muddy River by an artificial levee, and the RNA part no longer receives the occasional backwater flooding that probably occurred in presettlement times. (Figure 29). The swampy portions occupy the former channel of the Big Muddy River "beheaded" by the intersection of a Mississippi River meander bend (Figure 21).

The Pine Hills bluffs form part of the Mississippi Valley wall. The crest is a very narrow divide with reticulate patterns of spurs to the east and west. High cliffs truncate many of the westward sloping spurs (Figures 4 and 5).

The general elevation of the floodplain is approximately 350 feet (106.7 meters) above mean sea level. High points on the ridge exceed 840 feet (256 meters), and most of the ridge is above 700 feet (213.4 meters).

Slope gradients in the Pine Hills are steep, commonly exceeding 60 degrees in valley heads. Waterway gradients have a typical sine curve, though the shorter valleys do not flatten out. Some valleys are interrupted at the top of the Bailey Limestone by cascades or waterfalls (Figure 32).

Waterway density is very high in the hills. Virtually the entire upland area is sloping with very narrow divides (Figure 22).

Drainage is generally poor in LaRue Swamp. The swamp consists of two converging drainages: the LaRue Swamp south of the Big Muddy River levee draining to the south; and Wolf Lake, Otter Pond and the far southern part of LaRue Swamp flowing northward. These converge and empty into Running Lake Ditch in the southwest quarter of section 21. Two additional outlets are: on the west line of section 16 and on the south line of section 21, both along the railroad tracks (Figures 4 and 5).

Climatological information is taken from the collection station at Anna which has records dating from 1951. It is 10 miles (16.1 kilometers) to the southeast of the RNA. The following description is copied from the Soil Survey of Union County, Illinois (1979):

Union County is cold in winter but generally hot in summer. Winter precipitation, which frequently occurs as snow, results in a good accumulation of soil moisture by spring and minimizes drought during summer on most soils.

The number of days between the average date of the last freezing temperature in the spring and the average date of the first freezing temperature in the fall is between 182 and 214.

In winter the average temperature is 36 degrees F (3 degrees C), and the average daily minimum temperature is 27 degrees F (-3 degrees C). The lowest temperature on record, which occurred at Anna on January 24, 1963, is -12 degrees F (-24.4 degrees C). In summer the average temperature is 77 degrees, and the average daily maximum temperature is 88 degrees F (31.1 degrees C). The highest recorded temperature; which occurred on July 28, 1952, is 107 degrees F (41.6 degrees C).

Of the total 46 inches (116.8 centimeters) annual precipitation, 25 inches (63.5 centimeters), or 54 percent, usually falls in April through September. In two years out of ten, the rainfall in April through September is less than 20 inches (50.8 centimeters). The heaviest one-day rainfall during the period of record was 5.4 inches (13.7 centimeters) at Anna on March 9, 1964.

Average seasonal snowfall is 13 inches (33 centimeters). The greatest snow depth at any one time was 14 inches (35.5 centimeters). On the average, six days have at least one inch (2.5 centimeters) of snow on the ground, but the number of such days varies greatly from year to year.

The average relative humidity in mid-afternoon is about 60 percent. Humidity is higher at night, and the average at dawn is about 80 percent. The percentage of possible sunshine is 75 in summer and 50 in winter. The prevailing wind is from the southwest. Average windspeed is highest, 11 miles per hour (17 kmph), in March.

Tornadoes and severe thunderstorms occur occasionally. These storms are usually local and of short duration and cause damage in an erratic pattern.

The microclimatic patterns are similar to those throughout the more hilly portions of the Shawnee Forest, yet here they are exaggerated by the steepness of slope and relief of the area.

The topography provides significant contrasts in orientation. The south-facing slopes have thin soils and extensive areas of scree slopes. In summer they are hot and dry, and in winter diurnal temperature changes cause frequent freeze-thaw. Thin soil, unstable slopes, severe microclimates, and relatively low moisture availability during the growing season result in relatively sparse vegetation adapted to dry and xeric conditions. Exposed situations on the cliffs are even more severe.

North-facing slopes are protected from the severity of the summer insolation, and in winter, experience a more moderate diurnal temperature change. The loess cover remains, providing a better root medium and moisture reservoir. The vegetation is, therefore, more abundant and more mesic. The valley bottom and lower slope vegetation flourish even more. More moderate temperature changes and better moisture retention is clearly reflected in the vegetation.

The south half of the area includes eastward trending valleys. Microclimates are less extreme in those orientations.

DESCRIPTION OF VALUES

Flora

LaRue-Pine Hills/Otter Pond is the most botanically diverse area in Illinois, and one of the most diverse in the continental United States for its size (Appendix III; Mohlenbrock, 1985). More than 1,150 species of vascular plants are known from this site (Mohlenbrock, 1985; Appendix I). It receives influences from the western prairies and the Ozarks, from the eastern deciduous forest and the Gulf Coastal Plain, and it has glacial relicts from the north.

The uplands have a mosaic of plant communities with dominants determined primarily by differences in aspect and location on the slopes. The ravines and lower slopes have sugar maple, beech, red oak, and tuliptree (yellow poplar). Pawpaw, spicebush, and hydrangea are common understory species. Groundcover species are Virginia creeper, poison ivy, and ferns, such as Christmas fern and glade fern (Athyrium pycnocarpon). Characteristic spring ephemerals are violets (Viola spp.), trilliums (Trillium spp.), and Jacob's ladder (Polemonium reptans).

On the upper south-facing slopes, white oak and black oak are dominant trees with post oak important locally. Hickories (Carya ovalis, C. glabra, and C. ovata) are common and widespread. Hophornbeam and flowering dogwood are common understory shrubs. Steep slopes have shrubby thickets of blackjack oak with little leaf litter or groundcover on the cherty gravels.

On the ridge tops, black oak and white oak are codominants, but there is considerable local variation in species composition. Large beeches and sugar maples are not rare, and cucumbertrees (Magnolia acuminata) occur scattered on the slopes as well as on the ridge tops. Shadbush, farkleberry, and greenbriers are common in the understory. Scattered patches of azaleas occur on the upper portions of south-facing slopes. Pussytoes and dittany are indicator herbs of the drier sites on the ridges.

On the highest, most open ridge crests, there are small patches of grasses and forbs, including little bluestem, poverty oat grass, asters (Aster spp.), flowering spurge (Euphorbia corollata), woodland sunflower (Helianthus divaricatus), tick trefoils (Desmodium spp.), and bush clovers (Lespedeza spp.). Where assemblages of such species occur in natural canopy gaps, these are probably remnants of prairie or barrens communities that were more extensive in presettlement times.

North-facing slopes are more mesic and generally have taller trees. Beech, sugar maple, and tuliptree (yellow poplar) occur all the way to the tops of ridges, and form a much denser canopy than the forests on the south slopes. Other mesic forest trees include basswood, blackgum (Nyssa sylvatica), and Kentucky coffeetree (Gymnocladus dioicus). Most understory shrubs and groundcover species typical of the ravines are found on the north-facing slopes as well.

The limestone cliffs have shrubs and herbaceous species growing in crevices and along their upper edges (Figure 34). Alumroot, Drummond's goldenrod, and poverty oat grass occur here, and vines, especially Virginia creeper, are common. Redcedar (Juniperus virginiana) grows on the narrow ledges along the blufftop.

The springs along the base of the bluff have lizard's-tail, false loosestrife, many sedges, and watercress (Nasturtium officinalis).

Along the escarpment where spur ridges terminate in west- and southwest-facing aspects above the cliffs, there are glades with assemblages of prairie species (Figures 24, 25, 26). These sites are dry with cherty gravels exposed. The openings are bordered with shrubby blackjack oak, post oak, and chinkapin oak. The glades are dominated by grasses, especially little bluestem, Indian grass (Sorghastrum nutans), and side-oats grama. Forbs include goldenrods, cleft phlox (Phlox bifida), flowering spurge, false boneset (Kuhnia eupatorioides), and white prairie clover (Petalostemum candidum). Upslope from the glades are oak thickets with little groundcover. Also on the spur ridges above the cliffs are scattering stands of shortleaf pine. These sites have an understory of farkleberry and greenbriers.

The mesic and wet-mesic forests on the low ridges have cherrybark oak, kingnut hickory, sweetgum, and green ash, with red maple, sassafras, and slippery elm in the understory. In the better stands, the canopy trees are often more than 24 inches (61 centimeters) in diameter at breast height (dbh).

The swamps have mostly shallow water, and many of the trees that were along the edges are now dead and have fallen (due partly to higher water levels maintained by beaver dams in recent years), creating a more open aquatic community. There are dense thickets of buttonbush, swamp loosestrife, and Virginia willow along the waters edge. Areas with fluctuating water levels have red maple, swamp cottonwood, and pumpkin ash. Black willow, pin oak, and honey locust (Gleditsia triacanthos) are locally common. Herbaceous species include arrow arum, lizard's-tail, copper iris (Iris fulva), and many sedges.

Deep water ponds are bordered by buttonbush and Virginia willow. They are covered with duckweeds, mosquito fern (Azolla mexicana), and sponge plant (Limnobium spongia) during the late summer season.

No Federally Endangered or Threatened plant species are known from this area. Four Candidate Regional Forester's Sensitive Species have been reported: Price's groundnut, Arkansas manna grass, pale manna grass, and giant sedge (Appendix IV). Twenty-three Shawnee National Forest Listed Species are also known from the area (Appendix IV).

Fauna

The great diversity of natural communities within a relatively small area is the primary reason so many kinds of

animals occur here. It is important to the survival of many species that the swamps are immediately adjacent to the bluffs. Animals move back and forth between the bluffs and swamps; some daily, and others seasonally. In a ranking of quality based on the uniqueness of fishes and habitats by the Illinois Natural History Survey, the LaRue Swamp and Otter Pond area rated among the best in the state. Many species occur here because of the clear cool water.

It is also important that much of the area reflects little disturbance. There are no significant barriers to the movement of animals, either from the wetlands to the bluffs or from the ridge crests to the eastern slopes. Although a gravel road runs at the base of the bluffs for more than half the length of the area, it is not heavily traveled, and is closed seasonally to allow safe migration of reptiles and amphibians (Figure 30). Along the escarpment from the north end of Wolf Lake to the north end of Otter Pond, there are no artificial barriers (such as roads, railroads, utility lines, etc.) between the bottom land and the upland ridge. Certain large birds and mammals, such as the wild turkey (Meleagris gallopavo) and the bobcat (Lynx rufus), occur here because of the rugged terrain with few roads or other human intrusions.

Approximately 90 percent of the mammal species which occur in southern Illinois can be found at Pine Hills (Klimstra, 1969). These include: shrews (Blarina brevicauda and Cryptotis parva); eight species of bats (including Myotis sodalia and Lasionycteris noctivagans); the swamp rabbit (Sylvilagus aquaticus); squirrels (Sciurus niger and S. carolinensis); the golden mouse (Ochrotomys nuttallii); the eastern woodrat (Neotoma floridana); foxes (Vulpes fulva and Urocyon cinereoargenteus); the mink (Mustella vison); and the white-tailed deer (Odocoileus virginianus).

Many birds are known from the area, and migrating waterfowl are plentiful in the swamps in the spring and fall. About 175 species of birds have been seen in the area including the wood duck (Aix sponsa), the red-shouldered hawk (Buteo lineatus), the pileated woodpecker (Dryocopus pileatus), and the wild turkey (Meleagris gallopavo).

Thirty-five species of reptiles have been observed here. Many are dependant on the protection and special habitats provided by the swamps, spring, and bluffs. Water snakes (Nerodia spp.), including the cottonmouth (Agkistrodon piscivorus), are common. The timber rattlesnake (Crotalus horridus), and copperhead (Agkistrodon contortrix) are common on the uplands. There are many turtles in the swamps.

Springs provide habitat for such amphibians as the cave salamander (Eurycea lucifuga) and long-tailed salamander (E.

longicauda). The green frog (Rana clamitans), green treefrog (Hyla cinerea), and bird-voiced treefrog (H. avivoca) are species that are abundant in the buttonbush thickets bordering the ponds.

The spring cavefish (Chologaster agassizi) occurs in the springs at the base of the bluffs. The bantam sunfish (Lepomis symmetricus) is found in the swamp. The bluehead shiner (Notropis hubbsi) was collected at Wolf Lake in 1973, and may still occur there.

Invertebrates known from Pine Hills also reflect the distinctiveness of the area. Unusual species include an endemic scud (Gammarus minus), a dwarf crayfish (Cambarellus shufeldtii), scorpionflies (Boreus brumalis, Merope tuber, and Bittacus punctiger), and butterflies (Amblyscrites carolina, Autochton cellus, and Atlides halesus). A small damselfly, Telebasis byersi, occurs at one of the springs. This is the only Illinois site for this species, and the next nearest localities are several hundred miles away, in Florida.

The Federally Endangered Indiana bat is known to occur in the area, and bald eagles are frequent migrants and winter visitors. Twenty-nine Shawnee National Forest Listed animal species are known from the area. Another six Candidate Regional Forester's Sensitive animal species are reported from the area. (See Appendix II for available species lists of animals).

Geology (Figure 6)

The bedrock of the Pine Hills is siliceous limestone and chert divided into two formations of Devonian age. The Bailey Formation is the lower unit which composes the prominent cliffs seen along the base of the valley wall. Overlying the Bailey is the Grassy Knob Formation which is entirely chert as seen at the surface (Figure 6).

The Bailey Formation extends along the base of the Pine Hills for its entire length. It forms high cliffs at the beveled ridges between the steep tributary valleys. The limestone is composed of irregular, wavy beds one to three inches (2.5 to 7.6 centimeters) thick. Somewhat more shaly layers interrupt the massive appearance of the cliffs. The rock is very light gray to buff; some layers are mottled. Though generally described as limestone, it is very siliceous. Rocks from some layers bubble furiously when immersed in hydrochloric acid, but still retain their original volume after the limestone has been dissolved. The remaining material is granular quartz silt. Other beds contain more calcium carbonate, but leave a residual skeleton of chert. Some beds appear to be microcrystalline chert which has replaced the original limestone. Somewhat "flattened" nodular chert masses and also dense, white

novaculite beds are common at some horizons. Where seen on the bedding surfaces, the nodules make a "pattern" distinctive of the Bailey Formation.

Even more prominent are the vertical joints which divide the cliff face into high columns. Solution and spalling of rock proceeds more rapidly at the joints so as to form reentrants and cavities. Many plants have established themselves in the joints and shaly zones or where silt washed from above has been caught.

The Grassy Knob Formation is not readily noticed when looking at the bluffs from below. It is the Grassy Knob which forms the modest cliffs at the lookouts along the ridge road. It is the bedrock beneath the upper portion of the Pine Hills. As seen in exposures, it is rusty red or orange in color and honeycombed. The rock is entirely chert, a finely crystalline silica which is stained with iron oxide during weathering. Broken surfaces are nearly white. Along much of the outcrop, the Grassy Knob is not particularly resistant. However, discontinuous cliffs up to 20 feet (6.1 meters) high are present, and locally resistant ledges occur at various elevations.

The rock was originally limestone, but it has been completely altered. Original bedding planes are distorted or obliterated. Brecciation took place during solution causing irregular collapse. The remaining rock was replaced by silica. Cherty bedrock possesses considerable strength and resistance to mass wasting. This foundation is the cause of the steep slopes. Most of the outcrop is veneered with loess or loose chert scree.

Loess of Pleistocene age mantles the ridge crest to a depth of more than 15 feet (4.6 meters). The loess is mostly quartz silt. At a depth of several feet, original carbonate grains and fossil pulmonate snail shells are present. Secondary irregular concretionary carbonate masses, "loess kindchen", have formed from the leachate of carbonates from the overlying zones. Concretions are found on the surface in places, but no deep cut on the upland has been seen where an undisturbed section might be visible.

The loess is much eroded and is completely removed from some slopes. It is important as a rooting medium, even where it is largely wash or redeposited in the waterways or at the base of slopes. Most of the silt in the LaRue Swamp has been derived from the upland loess.

Mounds Gravel once covered the upland, although it was mostly eroded before the deposition of the loess. Scattered chert cobbles and pebbles have been found in a number of headwaters of the steep water courses. These cobbles are brown with smooth surfaces containing rounded impact fractures. Concave irregularities preserve a glossy patina.

They have significance only in the interpretation of the geomorphic history.

As far as is known, the character of the sediments beneath the LaRue wetland has not been examined. Analogy can be made from studies made in nearly all parts of the Mississippi floodplain. Surficial materials are mainly fine grained silts. Organic matter is high in the swampy portions. Clays and sand are present as the result of backwater deposition. Sediment fill is probably about 100 feet (30.5 meters) thick beneath the wetlands, though as much as 200 feet (61 meters) is present south of Grand Tower. Wells drilled in Oakwood Bottoms are most suggestive. Sand and gravel make up most of the section below 20 feet (6.1 meters). These are of late Pleistocene origin, but have been reworked during Recent times.

The active geomorphic processes are dominantly those related to surface water, weathering, and mass wasting. Groundwater is of great importance through its springs and its influence on bottom land water levels and vegetation.

The steep character of the bluffs is due to the strength of the bedrock, its ability to maintain cliffs and steep slopes, and its resistance to erosion. For its entire length, the ridge crest is less than a half mile (0.8 kilometers) from the valley floor, resulting in steep gradients. The ridge crest is very narrow with slopes as steep on the east as on the west. The widest spots are at junctions with spur ridges.

The Pine Hills bluff is dissected into an alternation of ravines and spurs. When descending a ravine, the footing is difficult but the surroundings are interesting. From the crest, steep amphitheater-like forms develop with a rounded cross section and a floor of silt and organic matter. Downslope runoff is concentrated into ravines with V-shaped cross sections. At this point, chert blocks may appear, and the bounding slopes are very steep. Waterways descend steeply into a discontinuous channel of gullies and cascades. It is striking that channel dissection becomes pronounced at the junction of two first order ravines. Below this point, large chert blocks and finer gravels fill the channel.

As one follows the channel downward, bedrock appears as a series of cascades and ledges along the slopes. This marks the top of the Bailey Limestone. The largest ravines widen and have a flat floor, still with a rather steep gradient. Several large depositional alluvial fans occur at the junction with the Mississippi Valley bottoms. A number of lesser valleys have falls 15 to 20 feet (4.6 to 6.1 meters) high which drop over the Bailey Limestone.

The spurs between ravines are likewise interesting. The loess cover extends along them for some distance from

the main crest. The crests of most spurs slope gradually downward, then nose steeply downward. At the nose, rock fragments and exposed bedrock appear. This is the zone where the native pines grow most abundantly.

A similar change in gradient and depth of loess occurs on the slopes of the spurs. Loess is thickest and the gradient is less steep near the main ridge crest. On many steep slopes, loess is thin or absent, having been eroded away. Grassy Knob chert has disintegrated into angular fragments of gravel and sand size. Where these lie at about the angle of repose, the surface is very unstable, and loose material is continually sliding and rolling downslope. However, landslides appear to be rare.

On west-trending spurs, the south-facing and north-facing slopes show striking contrast in substrate and vegetation. South-facing slopes are subject to greater diurnal temperature changes and greater evaporation in all seasons. In summer, the prevailing southwesterly breezes are also a factor.

Erosion on the south-facing slopes is particularly severe in winter and spring. Freezing and thawing cause heaving of the silty loess. This lifts the surface silts during freezing and drops them downhill during thawing. Particles rest loosely and become subjected to rain impact and slope wash. Once chert is exposed, it is subject to rapid fracturing by freezing of moisture in the rock and along partings. Loose particles and fragments are also subject to gravity sliding when wet or impacted by the weight of a falling branch or a passing animal.

Erosion is less rapid on north-facing slopes where loess is generally still present, although some scree slopes can be found with this orientation. Freezing and thawing is much less frequent during winter, and moisture is retained longer during the summer. Vegetation clearly reflects these more favorable conditions.

At the base of the bluff, several large and small springs occur. Their source is not obvious, for the Pine Hills do not contain sinkholes. Sinkholes are present along Hutchins Creek and its tributaries which parallel Pine Hills on the east. Since the elevation of that drainage is considerably higher than the Mississippi Valley floodplain, it is quite possible that groundwater flows westward beneath Pine Hills. The largest springs have continued to flow even in the severest droughts on record.

The spring orifices are all at floodplain level, and no caverns have been discovered at a higher level. The healthy spring cavefish population suggests that large openings of considerable capacity exist beneath the upland. These caverns probably formed or were greatly enlarged during the

"deep stages" of the Mississippi Valley.

The LaRue wetland is characterized by the winding form of the swamp. The swamp represents the meandering course of the Big Muddy River before it was intersected by the Grand Tower meander bend of the Mississippi River. The natural gradient of the swamp was from north to south. Several control structures modify the flow today.

No thorough study has yet been made of the geomorphology of the floodplain of the valley in this vicinity. It is a project which should be soon undertaken.

Prior to levee construction, backwater from Mississippi River floods must have regularly entered the LaRue wetlands and provided both sediments and nutrients.

The LaRue wetland must be a very young geomorphic feature. The Big Muddy has been a Yazoo-type tributary of the Mississippi River since the early or mid-Recent period. Harris (1977) has shown that the Big Muddy did not reach the old meander bend of the Mississippi River above the entrance to Fountain Bluff gap. It hugged the Illinois bluffs as far as the meander in Union County Refuge. The Grand Tower meander probably intersected the Big Muddy channel within the last 2,000 years. At high water, the old channel continues to carry considerable flow.

The Pine Hills bluffs have a much more ancient history which cannot be discussed here in detail. The ancient Mississippi Valley must have occupied approximately this position long before the Pleistocene Epoch. It may have been superposed onto the very cherty and resistant bedrock of the area from a veneer of Coastal Plain deposits. The valley has been repeatedly eroded and partially filled as the Pleistocene glaciers waxed and waned. Throughout its history, the river channel impinged against one side of its valley wall and then the other.

In the reach between Grand Tower and Cape Girardeau, the resistant rocks tended to form cliffs which, however, were interrupted by short, steep ravines. As the river undercut the valley sides, the valley gradually widened and spurs between ravines were truncated. Thus, the Mississippi River occupies a trench-like valley with straight valley walls.

References: W. E. Cote, D. L. Reinertsen, and G. M. Wilson. 1965. Guide leaflet for the geological science field trip to the Alto Pass area, Jackson and Union counties. Illinois State Geological Survey, Urbana. 19 pages.

S. E. Harris, Jr., C. W. Horrell, and D. Irwin. 1977. Exploring the land and rocks of southern Illinois, a

geological guide. Southern Illinois University Press, Carbondale. 240 pages.

Soils (Figures 7 through 10)

The humid temperate climate of the region has favored the rapid weathering of soil materials and the downward movement of clays and minerals in the profile. Much of the annual precipitation occurs during short intense storms creating severe erosion potential.

The soils in the bottomlands are mapped as the Karnak-Darwin-Jacob association. These are level and poorly to very poorly drained soils formed in the clayey alluvial sediments. They have poor potential for most urban, residential, or recreational uses because of the potential for overflow, and their high clay content. Each has severe limitations for buildings and roads because of their low strength, their wetness, their tendency to shrink and swell, and their susceptibility to frost action.

The soils over most of the hills along the Mississippi River floodplain in this area are mapped as the Goss-Alford association. These are steep to very steep, well drained soils formed in material weathered from cherty limestone and in loess. The steep slopes, severe erosion hazard, and cherty, clayey subsoil limit the use of this association. Goss soils occur on middle and lower slopes and in coves. They have a very cherty silt loam surface. Alford soils occur on the upper slopes and on the ridges. They have chert in the subsoil. Water moves through Goss at a moderate rapid rate and through Alford at a moderately rate. Surface runoff is very rapid. Alford soils have severe limitations for buildings and roads because of the slope, low strength, and frost action. Organic matter is low, and fertility is low in Goss and medium in Alford. Both are acidic.

Reference: C. C. Miles, et al. 1979. Soil survey of Union County, Illinois. Soil Conservation Service and Forest Service, in cooperation with the Illinois Agricultural Experiment Station, Urbana, Illinois. 143 pages plus maps.

Lands

All of the RNA is federal land acquired by the U. S. Forest Service as a part of the Shawnee National Forest. The RNA boundaries are drawn on the attached maps (Figures 4 - 10) and described to exclude Forest Service Road #345 and the Southern Illinois University 140-acre (56.7-hectare) tract in section 28. There are outstanding mineral rights on 1,888 acres (764.4 hectares). According to Appendix E of the Shawnee National Forest, Final Environmental Impact Statement, Land and Resource Management Plan (1986), there

is no coal, and the potential for fluorite, lead, zinc, oil, and gas is low. *Should exploration, development, or extraction of minerals occur, those activities will be coordinated to protect RNA values. LRS*
Cultural features

Archaeological sites probably occur within the RNA (as other river bluffs in the vicinity have graves and evidence of Indian use), but little archaeological survey work has been completed. According to tradition, Government Rock, a high point along the bluff, was a Federal lookout post for observation of the Mississippi River during the Civil War. Near the north end of Otter Pond, there is an old lane and part of the foundation of a building that was used by Southern Illinois University as a field station in the 1960's. Faint evidence exists of old roadways ascending at least two valleys on the west side of the hills, and in a few locations where trails once crossed. These have now mostly reverted to forest and have no significant effect on the natural character of the area. There is a small pioneer cemetery in the woods east of the road near Winter's Pond. There are a few small graveled sites along the ridge road at the extreme eastern edge of the area where cars may pull off to park. There is a small picnic area at Winter's Pond. An elevation benchmark is at Government Rock. The levee of the Big Muddy River was built in part from fill taken from a site in the swamp. This borrow activity deepened a natural wetland to form what is now called Winter's Pond (Figure 4 and 5). *Note: All facilities at Winter's Pond have been removed. The area will be allowed to revegetate naturally. Invasion by non-native spp. has not occurred. LRS*

IMPACTS AND POSSIBLE CONFLICTS

The Shawnee National Forest's Land and Resource Management Plan (1986) contains standards and guidelines for the management and protection of special areas, including the proposed research natural areas. These standards and guidelines provide the basis for conflict resolution.

Mineral resources

Mineral rights are outstanding on 1,888 acres (764.4 hectares) of the LaRue-Pine Hills/Otter Pond region. Potential for fluorite, lead, zinc, gas, and oil is low, and no coal is in the area, according to the Final Environmental Impact Statement of the Shawnee National Forest Land and Resource Management Plan (1986).

Grazing

This area has never been grazed under Federal ownership, and is not presently under range allotment. There is no demand or need for grazing land in the vicinity, and the area is unsuitable for livestock use. The 8.2 management prescription expressly prohibits grazing.

Timber

All of the potential research natural areas identified in the SNF Land and Resource Management Plan (1986) were considered inappropriate for timber production. These lands were not included in the Shawnee National Forest timber base. Consequently, no additional withdrawals will be required. *Commercial Forest Land, 0 acres - Rm 34 L5 7 June 1991*

Watershed values

The designation of this area as an RNA will maintain the watershed in a minimal erosional condition, and thus protect the water quality of recipient streams and rivers. An adjoining private landowner has recently (1986) reported that beaver on the RNA are flooding a small area of cropland. Designation of this area as an RNA has no effect on this situation.

Recreational values

The primary recreational uses of this area are hiking, hunting, and sightseeing. There are no known cultural features that are in conflict with the protection and management of the RNA. There are seven scenic overlooks on the west side of the ridgetop road. Each of the pulloffs is less than one half acre (0.2 hectares) in size. These provide excellent views of the Mississippi Valley. A few established recreational trails are also present. The Inspiration Point Trail is included in the National Recreational Trail System. These short trails are well maintained and are frequently used by visitors. Few visitors leave the upland trails and pulloffs because of the rugged terrain of this area. A picnic area is at Winter's Pond, but it is quite small, about one acre (0.4 hectares) in size. *Note: This area has been closed and all facilities removed. The area will be allowed to revegetate naturally. LRS*

Some waterfowl hunting occurs during the fall season in the swamp, and there is some trapping of furbearers. An occasional fisherman uses Wolf Lake and Otter Pond. There have been very few use conflicts involving hunters or fishermen in the past.

Wildlife and plant values

Protection of the area as an RNA helps to preserve habitats for all wildlife and plant species native to the site. Some maintenance is required to keep woody invasion from eliminating some of the glade and prairie communities. Prescribed burning and hand removal of woody shrubs invading the natural openings is permitted to preserve the native herbaceous flora. Such should not cause any significant impact or result in any conflict with other uses in the vicinity. It is possible that some control of beaver

populations may be necessary if future flooding levels threaten significant plant or animal habitats.

Wilderness Values

This area is not within any existing wilderness, nor is it within any site proposed for further study for wilderness designation. The Clear Springs wilderness study area is immediately to the east across FS Road #236, and north of FS Road #279. Designation of the LaRue-Pine Hills Otter Pond area as an RNA enhances the value of the adjacent area.

Transportation plans

There is no known interest in developing roads or trails in the RNA. The current system is adequate for management, care, and use of the area. FS Road #345 is closed seasonally to allow migration of reptiles and amphibians to and from hibernacula at the base of the bluffs (Figures 4 and 5). This road should eventually be closed (except to management staff), and its right of way added to the RNA.

MANAGEMENT PRESCRIPTION

The primary objective of the LaRue-Pine Hills/Otter Pond Natural Area management is to protect and maintain its natural character, i.e., to preserve the area from unnatural disturbance.

The purpose of management is to provide an area to illustrate and typify for research and educational purposes some of the important forest, wetland, prairie, glade, and geologic types characteristic of the Midwest, as well as other plant communities and features that have special and unique characteristics of scientific interest and importance. *Recreation Management: Recreation will be discouraged. Existing trails will be closed & allowed to revegetate naturally. Regulations which prohibit use of the area will be enforced. LRS.*

Vegetation management

Prescribed burning and hand removal of small trees and shrubs are permitted to help control the invasion of woody vegetation into the naturally open areas. The tendency of natural openings in the Midwest to succeed to forest will result in the disappearance of glade and prairie communities without fire or the replication of other natural control measures that kept them open in presettlement times. A regular schedule of burning will be developed as results are monitored. Some control of water levels maintained by beavers in the bottom land may be necessary if rare plant species are threatened or if conflicts with adjoining landowners become serious.

Management prescriptions will be developed in cooperation with the NCFES and will be approved by the Forest Supervisor & Station Director.

LRS

ADMINISTRATIVE RECORDS AND PROTECTION

The proposed LaRue Pine Hills/Otter Pond Research Natural Area is administered from the Jonesboro Ranger District of the Shawnee National Forest. The contact person responsible for this area is:

~~Joe Newcomb~~ ~~Mary Hamford~~ Deleted Rmrs
Jonesboro District Ranger
Shawnee National Forest
521 N. Main
Jonesboro, IL 62952

The research coordinator is:

Director
North Central Forest Experiment Station
1992 Folwell Ave.
St. Paul, MN 55108

The research data file is maintained by the North Central Forest Experiment Station, and the Shawnee National Forest Headquarters, Harrisburg, Illinois 62946. The Natural Heritage Division of the Illinois Department of Conservation, 524 S. 2nd Street, Springfield, Illinois 62706, also maintains a file on this natural area. Most specimens that have been collected in this area, both botanical and zoological, are housed in the collections at Southern Illinois University, Carbondale, Illinois.

The RNA boundaries should be marked with signs to indicate its presence and clearly mark its location.

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APPENDIX I.

Vascular plant species known from the LaRue-Pine Hills/
Otter Pond area (list is copied from:
R. H. Mohlenbrock. 1985. Vascular flora of the
LaRue-Pine Hills area of southern Illinois. Journal
of the Southern Illinois Native Plant Society,
Erigenia 5:5-24.)

EQUISETACEAE

Equisetum arvense L.
Equisetum hyemale L. var. *affine*
(Engelm.) A. A. Eaton
Equisetum laevigatum A. Br.
Equisetum Xferrissii Clute

SELAGINELLACEAE

Selaginella rupestris (L.) Spreng.

OPHIOGLOSSACEAE

Botrychium dissectum Spreng. var.
dissectum
Botrychium dissectum Spreng. var.
obliquum (Muhl.) Clute
Botrychium biternatum (Sav.)
Underw.
Botrychium virginianum (L.) Sw.
Ophioglossum vulgatum L. var.
pseudopodium (Blake) Farw.
Ophioglossum engelmannii Prantl

POLYPODIACEAE

Adiantum pedatum (Tourn.) L.
Pteridium aquilinum (L.) Kuhn
var. *latiusculum* (Desv.)
Underw.
Pellaea atropurpurea (L.) Link
Cheilanthes feei Moore
Cheilanthes lanosa (Michx.) D.
C. Eaton
Polypodium virginianum (L.)
Eaton
Polypodium polypodioides (L.)
Watt var. *michauxianum* Weather-
erby
Polystichum acrostichoides
(Michx.) Schott
Onoclea sensibilis L.
Thelypteris hexagonoptera
(Michx.) Weatherby
Dryopteris carthusiana (Villars)
H.P. Fuchs
Dryopteris intermedia (Muhl.)
Gray
Dryopteris marginalis (L.) Gray
Athyrium pycnocarpon (Spreng.) Tidestrom
Athyrium thelypteroides (Michx.) Desv.
Athyrium angustum (Willd.) Presl
Athyrium asplenoides Michx.
Asplenium rhizophyllum L.
Asplenium pinnatifidum Nutt.
Asplenium Xgravesii Maxon
Asplenium Xkentuckiense McCoy
Asplenium Xherb-wagneri Taylor & Mohlenbr.
Asplenium bradleyi D.C. Eaton
Asplenium Xebenoides R.R. Scott

Asplenium trichomanes L.
Asplenium resiliens Kuntze
Asplenium platyneuron (L.) Oakes
Woodsia obtusa Torr.
Cystopteris bulbifera (L.) Bernh.
Cystopteris fragilis (L.) Bernh. var. *fragilis*
Cystopteris fragilis (L.) Bernh. var. *protrusa*
Weatherby
Cystopteris Xtennesseensis Shaver

SALVINIACEAE

Azolla mexicana Presl

PINACEAE

Pinus echinata Mill.

TAXODIACEAE

Taxodium distichum (L.) Rich.

CUPRESSACEAE

Juniperus virginiana L.

TYPHACEAE

Typha latifolia L.

SPARGANIACEAE

Sparganium chlorocarpum Rydb.
Sparganium androcladum (Engelm.) Morong
Sparganium eurycarpum Engelm.

POTAMOGETONACEAE

Potamogeton foliosus Raf.
Potamogeton pusillus L.
Potamogeton diversifolius Raf.
Potamogeton nodosus Poir.

ALISMACEAE

Echinodorus berteroi (Spreng.) Fassett var.
lanceolatus (Wats. & Coult.) Fassett
Echinodorus cordifolius (L.) Griseb.
Sagittaria calycina Engelm.
Sagittaria rigida Pursh
Sagittaria longirostra (Michx.) J.G. Sm.
Sagittaria latifolia Willd.
Alisma subcordatum Raf.

HYDROCHARITACEAE

Limnobium spongia (Bosc) Steud.

POACEAE

- Bromus tectorum* L.
Bromus secalinus L.
Bromus racemosus L.
Bromus commutatus Schrad.
Bromus japonicus Thunb.
Bromus inermis Leyss.
Bromus pubescens Muhl.
Bromus ciliatus L.
Vulpia octoflora (Walt.) Rydb. var. octoflora
Vulpia octoflora (Walt.) Rydb. var. tenella (Willd.) Fern.
Vulpia octoflora (Walt.) Rydb. var. glauca (Nutt.) Fern.
Festuca pratensis Huds.
Festuca obtusa Biehler
Festuca paradoxa Desv.
Lolium multiflorum Lam.
Lolium perenne L.
Puccinellia pallida (Torr.) Clausen
Poa annua L.
Poa chapmaniana Scribn.
Poa pratensis L.
Poa angustifolia L.
Poa compressa L.
Poa palustris L.
Poa sylvestris Gray
Dactylis glomerata L.
Koeleria macrantha (Ledeb.) Spreng.
Sphenopholis obtusata (Michx.) Scribn. var. obtusata
Sphenopholis obtusata (Michx.) Scribn. var. major (Torr.) Erdman
Sphenopholis nitida (Biehler) Scribn.
Avena sativa L.
Holcus lanatus L.
Agrostis eliottiana Schult.
Agrostis hyemalis (Walt.) BSP.
Agrostis perennans (Walt.) Tuckerm.
Agrostis alba L. var. alba
Agrostis alba L. var. palustris (Huds.) Pers.
Cinna arundinacea L.
Phalaris arundinacea L.
Alopecurus aequalis Sobol
Alopecurus carolinianus Walt.
Phleum pratense L.
Elymus hystrix L.
Elymus virginicus L.
Elymus villosus Muhl.
Elymus canadensis L.
Hordeum pusillum Nutt.
Hordeum jubatum L.
Triticum aestivum L.
Secale cereale L.
Melica nutica Walt.
Melica nitens (Scribn.) Nutt.
Glyceria septentrionalis Hitchcock
Glyceria arkansana Fern.
Glyceria striata (Lam.) Hitchcock
Brachyelytrum erectum (Schreb.) Beauv.
Distachya americana Beauv. var. obovata Gl.
Digitaria sanguinalis (L.) Scop.
Digitaria ischaemum (Schreb.) Muhl.
Eriochloa contracta Hitchcock
Paspalum fluitans (Ell.) Kunth
Paspalum pubiflorum Rupr. var. glabrum (Vasey) Vasey
Paspalum laeve Michx.
Paspalum ciliatifolium Michx.
Paspalum bushii Nash
Panicum dichotomiflorum Michx.
Panicum flexile (Gattinger) Scribn.
Panicum philadelphicum Bernh.
Panicum capillare L.
Panicum virgatum L.
Panicum rigidulum Bosc
Panicum anceps Michx.
Panicum depauperatum Muhl.
Panicum linearifolium Scribn.
Panicum laxiflorum Lam.
Panicum microcarpon Muhl.
Panicum dichotomum L.
Panicum lanuginosum Ell. var. lanuginosum
Panicum lanuginosum Ell. var. implicatum (Scribn.) Fern.
Panicum lanuginosum Ell. var. lindheimeri (Nash) Fern.
Panicum villosissimum Nash
Panicum sphaerocarpon Ell.
Panicum polyanthes Schult.
Panicum oligosanthos Schult. var. scribnerianum (Nash) Fern.
Panicum leibergeri (Vasey) Scribn.
Panicum commutatum Schult.
Panicum jooii Vasey
Panicum clandestinum L.
Panicum latifolium L.
Panicum boscii Poir.
Echinochloa walteri (Pursh) Heller
Echinochloa crus-galli (L.) Beauv.
Echinochloa pungens (Poir.) Rydb. var. pungens
Echinochloa pungens (Poir.) Rydb. var. wiegandii Fassett
Setaria lutescens (Weigel) Hubb.
Setaria faberi Herrm.
Setaria viridis (L.) Beauv.
Cenchrus longispinus (Hack.) Fern.
Erianthus alopecuroides (L.) Ell.
Sorghum halepense (L.) Pers.
Sorghastrum nutans (L.) Nash
Andropogon gerardii Vitman
Andropogon virginicus L.
Schizachyrium scoparium (Michx.) Nash
Tripsacum dactyloides (L.) L.
Zea mays L.
Eragrostis hypnoides (Lam.) BSP.
Eragrostis ciliaris (All.) Mosher
Eragrostis poaeoides Beauv.
Eragrostis spectabilis (Pursh) Steud.

Eragrostis pectinacea (Michx.) Nees
Eragrostis capillaris (L.) Nees
Eragrostis pilosa (L.) Beauv.
Eragrostis frankii C.A. Meyer
Tridens flavus (L.) Hitchcock
Muhlenbergia capillaris (Lam.) Trin.
Muhlenbergia cuspidata (Torr.) Rydb.
Muhlenbergia schreberi J.F. Gmel.
Muhlenbergia sobolifera (Muhl.) Trin.
Muhlenbergia bushii Pohl
Muhlenbergia frondosa (Poir.) Fern.
Muhlenbergia racemosa (Michx.) BSP.
Muhlenbergia tenuiflora (Willd.) BSP.
Muhlenbergia sylvatica (Torr.) Torr.
Muhlenbergia mexicana (L.) Trin.
Sporobolus vaginiflorus (Torr.) Wood
Sporobolus neglectus Nash
Eleusine indica (L.) Gaertn.
Leptochloa filiformis (Lam.) Beauv.
Leptochloa fascicularis (Lam.) Gray
Cynodon dactylon (L.) Pers.
Bouteloua curtipendula (Michx.) Torr.
Aristida oligantha Michx.
Aristida purpurascens Poir.
Aristida ramosissima Engelm.
Aristida longespica Poir.
Aristida dichotoma Michx.
Arundinaria gigantea (Walt.) Chapm.
Leersia lenticularis Michx.
Leersia oryzoides (L.) Swartz
Leersia virginica Willd.
Danthonia spicata (L.) Beauv.
Chasmanthium latifolium (Michx.) Yates

CYPERACEAE

Cyperus densicaespitosus Mattf. & Kükenth.
Cyperus aristatus Rottb.
Cyperus acuminatus Torr. & Hook.
Cyperus ovularis (Michx.) Torr.
Cyperus erythrorhizos Muhl.
Cyperus engelmannii Steud.
Cyperus esculentus L.
Cyperus ferruginescens Boeckl.
Cyperus strigosus L.
Eleocharis obtusa (Willd.) Schult. var.
 obtusa
Eleocharis obtusa (Willd.) Schult. var.
 detonsa (Gray) Drap. & Mohlenbr.
Eleocharis acicularis (L.) Roem. & Schultes
Timbristylis autumnalis (L.) Roem. & Schultes
Scirpus validus Vahl
Scirpus georgianus Harper
Scirpus atrovirens Willd.
Scirpus pendulus Muhl.
Scirpus cyperinus (L.) Kunth
Scirpus verecundus Fern.
Carex retroflexa Muhl.
Carex convoluta Mack.
Carex rosea Schk.
Carex socialis Mohlenbr. & Schwegm.

Carex cephalophora Muhl.
Carex muhlenbergii Schk.
Carex cephaloidea Dewey
Carex vulpinoidea Michx.
Carex decomposita Muhl.
Carex conjuncta Boott
Carex laevivaginata (Kükenth.) Mack.
Carex crus-corvi Shuttlew.
Carex muskingumensis Schwein.
Carex scoparia Schk.
Carex normalis Mack.
Carex albolutescens Schwein.
Carex brevior (Dewey) Mack.
Carex jamesii Schwein.
Carex pennsylvanica Lam.
Carex emmonsii Dewey
Carex artitecta Mack.
Carex physorhyncha Liebm.
Carex umbellata Muhl.
Carex eburnea Boott
Carex crinita Lam.
Carex shortiana Dewey
Carex lanuginosa Michx.
Carex hirsutella Mack.
Carex caroliniana Schwein.
Carex bushii Mack.
Carex granularis Muhl.
Carex grisea Wahlenb.
Carex flaccosperma Dewey
Carex glaucodea Tuckerm.
Carex oligocarpa Schk.
Carex albursina Sheldon
Carex blanda Dewey
Carex gracilescens Steud.
Carex frankii Kunth
Carex squarrosa L.
Carex typhina Michx.
Carex lacustris Willd.
Carex hyalinolepis Steud.
Carex comosa Boott
Carex hystericina Muhl.
Carex lurida Wahlenb.
Carex grayi Carey
Carex louisianica Bailey
Carex lupulina Muhl.
Carex lupuliformis Sartwell
Carex gigantea Rudge
Carex retrorsa Schwein.

ARACEAE

Acorus calamus L.
Peltandra virginica (L.) Kunth
Arisaema dracontium (L.) Schott
Arisaema triphyllum (L.) Schott

LEMNACEAE

Spirodela polyrhiza (L.) Schleiden
Spirodela oligorhiza (Kurtz) Hegelm.
Lemna trisulca L.

Lemna minor L.
Lemna perpusilla Torr.
Lemna trinervis (Austin) Small
Lemna valdiviana Phil.
Lemna obscura (Austin) Daubs
Wolffiella floridana (J.D. Smith) Thompson
Wolffia papulifera Thompson
Wolffia columbiana Karst.

COMMELINACEAE

Tradescantia subaspera Ker
Tradescantia ohiensis Raf.
Tradescantia virginiana L.
Commelina communis L.
Commelina diffusa Burm. f.
Commelina virginica L.

PONTERIACEAE

Pontederia cordata L.
Heteranthera reniformis R. & P.

JUNCEAE

Luzula multiflora (Retz.) Lejeune var. *multiflora*
Luzula multiflora (Retz.) Lejeune var. *echinata* (Small) Mohlenbr.
Juncus effusus L. var. *solutus* Fern. & Wieg.
Juncus biflorus Ell.
Juncus canadensis J. Gay
Juncus acuminatus Michx.
Juncus brachycarpus Engelm.
Juncus tenuis Willd.
Juncus dudleyi Wieg.
Juncus interior Wieg.

LILIACEAE

Lilium michiganense Farw.
Hemerocallis fulva L.
Ornithogalum umbellatum L.
Camassia scilloides (Raf.) Cory
Erythronium americanum Ker
Erythronium albidum Nutt.
Uvularia grandiflora Sm.
Uvularia sessilifolia L.
Polygonatum commutatum (Schult.) A. Dietr.
Polygonatum biflorum (Walt.) Ell.
Smilacina racemosa (L.) Desf.
Asparagus officinalis L.
Allium ampeloprasum L. var. *atropurpureum* (Boiss.) Regel
Allium canadense L.
Allium stellatum Ker
Allium vineale L.
Allium cepa L.
Nothoscordum bivalve (L.) Britt.
Trillium recurvatum Beck
Trillium sessile L.

Trillium viride Beck
Trillium flexipes Raf.
Narcissus pseudo-narcissus L.
Narcissus poeticus L.
Polyanthes virginica (L.) Shinnars
Hypoxis hirsuta (L.) Coville

SMILACACEAE

Smilax glauca Walt. var. *glauca*
Smilax glauca Walt. var. *leuophylla* Blake
Smilax bona-nox L. var. *bona-nox*
Smilax bona-nox L. var. *hederaefolia* (Beyrich) Fern.
Smilax rotundifolia L.
Smilax hispida Muhl.
Smilax lasioneuron Hook.
Smilax pulverulenta Michx.

DIOSCOREACEAE

Dioscorea villosa L.
Dioscorea quaternata (Walt.) J.F. Gmel.

IRIDACEAE

Iris fulva Ker
Iris shrevei Small
Iris cristata Ait.
Sisyrinchium angustifolium Mill.
Sisyrinchium atlanticum Bickn.
Sisyrinchium albidum Raf.

ORCHIDACEAE

Cypripedium calceolus L. var. *parviflorum* (Salisb.) Fern.
Orchis spectabilis L.
Habenaria peramoena Gray
Liparis liliifolia (L.) Rich.
Spiranthes ovalis Lindl.
Spiranthes cernua (L.) Rich.
Corallorhiza wisteriana Conrad
Corallorhiza odontorhiza (Willd.) Nutt.
Aplectrum hyemale (Muhl.) Torr.

SAURURACEAE

Saururus cernuus L.

SALICACEAE

Salix nigra Marsh.
Salix interior Rowlee
Populus deltoides Marsh.
Populus heterophylla L.

JUGLANDACEAE

Juglans cinerea L.

Juglans nigra L.
Carya illinoensis (Wang.) K. Koch
Carya aquatica (Michx. f.) Nutt.
Carya cordiformis (Wang.) K. Koch
Carya texana Buckl.
Carya ovalis (Wang.) Sarg.
Carya glabra (Mill.) Sweet
Carya tomentosa (Poir.) Nutt.
Carya ovata (Mill.) K. Koch
Carya laciniosa (Michx.) Loud.
Carya pallida (Ashe) Engl. & Graebn.

BETULACEAE

Betula nigra L.
Corylus americana Walt.
Ostrya virginiana (Mill.) K. Koch
Carpinus caroliniana Walt.

FAGACEAE

Fagus grandifolia Ehrh.
Quercus imbricaria Michx.
Quercus phellos L.
Quercus marilandica Muenchh.
Quercus falcata Michx.
Quercus pagodaefolia (Ell.) Ashe
Quercus velutina Lam.
Quercus rubra L.
Quercus palustris Muenchh.
Quercus shumardii Buckley
Quercus coccinea Muenchh.
Quercus bicolor Willd.
Quercus michauxii Nutt.
Quercus muhlenbergii Engelm.
Quercus alba L.
Quercus stellata Wangh.
Quercus macrocarpa Michx.
Quercus lyrata Walt.

ULMACEAE

Ulmus rubra Muhl.
Ulmus americana L.
Ulmus alata Michx.
Celtis occidentalis L. var. *occidentalis*
Celtis occidentalis L. var. *pumila* (Pursh) Gray
Celtis occidentalis L. var. *canina* (Raf.) Sarg.
Celtis laevigata Willd.
Celtis tenuifolia Nutt.

MORACEAE

Morus rubra L.
Morus alba L.
Maclura pomifera (Raf.) Schneid.

URTICACEAE

Boehmeria cylindrica (L.) Sw.
Pilea pumila (L.) Gray

Pilea opaca (Lunell) Rydb.
Laportea canadensis (L.) Wedd.
Parietaria pensylvanica Muhl.

LORANTHACEAE

Phoradendron flavescens (Pursh) Nutt.

ARISTOLOCHIACEAE

Asarum canadense L. var. *reflexum* (Bickn.)
Robins.
Aristolochia serpentaria L.

POLYGONACEAE

Rumex acetosella L.
Rumex obtusifolius L.
Rumex crispus L.
Rumex altissimus Wood
Rumex verticillatus L.
Rumex mexicanus Meisn.
Polygonum sagittatum L.
Polygonum convolvulus L.
Polygonum cristatum Engelm. & Gray
Polygonum scandens L.
Polygonum tenue Michx.
Polygonum aviculare L.
Polygonum exsertum Small
Polygonum ramosissimum Michx.
Polygonum erectum L.
Polygonum virginianum L.
Polygonum punctatum Ell.
Polygonum hydropiper L.
Polygonum persicaria L.
Polygonum setaceum Baldw. var. *interjectum*
Fern.
Polygonum hydropiperoides Michx.
Polygonum opelousanum Riddell
Polygonum coccineum Muhl.
Polygonum longistylum Small
Polygonum lapathifolium L.
Polygonum pensylvanicum L. var. *laevigatum*
Fern.

CHENOPODIACEAE

Chenopodium ambrosioides L.
Chenopodium album L.
Chenopodium gigantospermum Aellen
Chenopodium standleyanum Aellen

AMARANTHACEAE

Amaranthus spinosus L.
Amaranthus albus L.
Amaranthus graecizans L.
Amaranthus retroflexus L.
Amaranthus hybridus L.
Amaranthus tuberculatus (Moq.) Sauer
Amaranthus tamarascinus Nutt.
Froelichia gracilis (Hook.) Moq.

PHYTOLACCACEAE

Phytolacca americana L.

AIZOACEAE

Mollugo verticillatus L.

PORTULACACEAE

Portulaca oleracea L.
Claytonia virginica L.

CARYOPHYLLACEAE

Paronychia canadensis (L.) Wood
Paronychia fastigiata (Raf.) Fern.
Sagina decumbens (Ell.) Torr. & Gray
Holosteum umbellatum L.
Stellaria media (L.) Cyrillo
Cerastium vulgatum L.
Cerastium nutans Raf.
Cerastium viscosum L.
Cerastium brachypodum (Engelm.) B.L. Robins.
Dianthus armeria L.
Agrostemma githago L.
Silene stellata (L.) Ait.
Silene antirrhina L.
Saponaria officinalis L.

CERATOPHYLLACEAE

Ceratophyllum demersum L.
Ceratophyllum echinatum Gray

NYMPHAEACEAE

Nuphar luteum L. ssp. *macrophyllum* (Small)
Beal
Nymphaea tuberosa Paine

NELUMBONACEAE

Nelumbo lutea (Willd.) Pers.

CABOMBACEAE

Brasenia schreberi Gmel.
Cabomba caroliniana Gray

RANUNCULACEAE

Ranunculus laxicaulis (Torr. & Gray) Darby
Ranunculus abortivus L.
Ranunculus micranthus Nutt.
Ranunculus flabellaris Raf.
Ranunculus hispidus Michx. var. *hispidus*
Ranunculus hispidus Michx. var. *marilandicus*
(Poir.) L. Benson
Ranunculus septentrionalis Poir. var. *septentrionalis*

Ranunculus septentrionalis Poir. var. *caricetorum* (Greene) Fern.

Ranunculus carolinianus DC.
Ranunculus fascicularis Muhl.
Ranunculus sardous Crantz
Delphinium tricornis Michx.
Thalictrum revolutum DC.
Thalictrum dioicum L.
Actaea pachypoda Ell.
Hydrastis canadensis L.
Isopyrum biternatum (Raf.) Torr. & Gray
Anemonella thalictroides (L.) Spach
Anemone virginiana L.
Myosurus minimus L.
Aquilegia canadensis L.
Clematis virginiana L.
Clematis pitcheri Torr. & Gray

BERBERIDACEAE

Podophyllum peltatum L.
Caulophyllum thalictroides (L.) Michx.

MENISPERMACEAE

Calycocarpum lyonii (Pursh) Gray
Menispermum canadense L.
Cocculus carolinus (L.) DC.

MAGNOLIACEAE

Magnolia acuminata L.
Liriodendron tulipifera

ANNONACEAE

Asimina triloba (L.) Dunal.

LAURACEAE

Sassafras albidum (Nutt.) Nees var. *albidum*
Sassafras albidum (Nutt.) Nees var. *molle*
(Raf.) Fern.
Lindera benzoin (L.) Blume

PAPAVERACEAE

Sanguinaria canadensis L.
Stylophorum diphyllum (Michx.) Nutt.
Dicentra cucullaria (L.) Bernh.
Dicentra canadensis (Goldie) Walp.
Corydalis flavula (Raf.) DC.

CRUCIFERAE

Dentaria laciniata Muhl.
Iodanthus pinnatifidus (Michx.) Steud.
Capsella bursa-pastoris (L.) Medic.
Arabis canadensis L.
Arabis laevigata (Muhl.) Poir.

Descurainia pinnata (Walt.) Britt. var.
 brachycarpa (Richards.) Fern.
Cardamine bulbosa (Schreb.) BSP.
Cardamine hirsuta L.
Cardamine pensylvanica Muhl.
Cardamine parviflora L. var. *arenicola*
 (Britt.) O.E. Schulz
Sibara virginica (L.) Rollins
Draba verna L.
Draba brachycarpa Nutt.
Arabidopsis thaliana (L.) Heynh.
Lepidium campestre (L.) R. Br.
Lepidium virginicum L.
Armoracia aquatica (Eat.) Wieg.
Armoracia lapathifolia Gilib.
Nasturtium officinale R. Br.
Thlaspi arvense L.
Barbarea vulgaris R. Br. var. *arcuata* (Opiz.)
 Fries
Erysimum repandum L.
Brassica kaber (DC.) L.C. Wheeler var.
 schkuhriana (Reichenb.) L.C. Wheeler
Brassica nigra (L.) Koch
Brassica juncea (L.) Coss
Sisymbrium officinale (L.) Scop.
Rorippa sessiliflora (Nutt.) Hitchc.
Rorippa islandica (Oeder) Borbas var. *fern-*
 aldiana Butt. & Abbe

SAXIFRAGACEAE

Hydrangea arborescens L.
Robes cynosbati L.
Itea virginica L.
Heuchera hirsuticaulis (Wheeler) Rydb.
Penthorum sedoides L.

HAMAMELIDACEAE

Liquidambar styraciflua L.

PLATANACEAE

Platanus occidentalis L.

ROSACEAE

Prunus hortulana Bailey
Prunus mexicana S. Wats.
Prunus americana Marsh. var. *americana*
Prunus americana Marsh. var. *lanata* Sudw.
Prunus serotina Ehrh.
Amelanchier arborea (Michx. f.) Fern.
Pyrus communis L.
Malus coronaria (L.) Mill.
Malus ioensis (Wood) Britt.
Crataegus collina Chapm.
Crataegus crus-galli L.
Crataegus viridis L.
Crataegus pruinosa (Wendl.) K. Koch
Crataegus mollis (Torr. & Gray) Scheele

Rubus occidentalis L.
Rubus trivialis Michx.
Rubus flagellaris Willd.
Rubus enslenii Tratt.
Rubus allegheniensis Porter
Rubus pensylvanicus Poir.
Rubus frondosus Bigel.
Rosa multiflora Thunb.
Rosa setigera Michx.
Rosa palustris Marsh.
Rosa carolina L.
Potentilla simplex Michx.
Potentilla recta L.
Potentilla norvegica L.
Fragaria virginiana Duchesne
Aruncus dioicus (Walt.) Fern.
Gillenia stipulata (Muhl.) Baill.
Geum canadense Jacq.
Geum vernum (Raf.) Torr. & Gray
Agrimonia parviflora Ait.
Agrimonia pubescens Wallr.
Agrimonia rostellata Wallr.

LEGUMINOSAE

Cercis canadensis L.
Gymnocladus dioica (L.) K. Koch
Gleditsia triacanthos L.
Gleditsia aquatica Marsh.
Desmanthus illinoensis (Michx.) MacM.
Albizia julibrissin Duraz.
Robinia pseudoacacia L.
Crotalaria sagittalis L.
Psoralea psoraloides (Walt.) Cory var.
 eglandulosa (Ell.) Freeman
Vicia villosa Roth
Vicia dasycarpa Ten.
Vicia cracca L.
Vicia angustifolia Reich.
Lathyrus latifolius L.
Cassia hebecarpa Fern.
Cassia marilandica L.
Cassia fasciculata Michx.
Cassia nictitans L.
Apios americana Medic.
Apios priceana Robins.
Lotus corniculatus L.
Petalostemum candidum (Willd.) Michx.
Petalostemum purpureum (Vent.) Rydb.
Coronilla varia L.
Dalea alopecuroides Willd.
Tephrosia virginiana (L.) Pers.
Melilotus alba Desr.
Melilotus officinalis (L.) Lam.
Trifolium campestre Schreb.
Trifolium dubium Sibth.
Trifolium pratense L.
Trifolium repens L.
Trifolium hybridum L.
Medicago sativa L.
Medicago lupulina L.

Clitoria mariana L.
Stylosanthes biflora (L.) BSP.
Lespedeza striata (Thunb.) Hook. & Arn.
Lespedeza stipulacea Maxim.
Lespedeza procumbens Michx.
Lespedeza repens (L.) Bart.
Lespedeza hirta (L.) Hornem.
Lespedeza capitata Michx.
Lespedeza stuevei Nutt.
Lespedeza cuneata (Dum.-Cours.) G. Don
Lespedeza violacea (L.) Pers.
Lespedeza intermedia (S. Wats.) Britt.
Lespedeza virginica (L.) Britt.
Phaseolus polystachios (L.) BSP.
Desmodium nudiflorum (L.) DC.
Desmodium glutinosum (Muhl.) Wood
Desmodium pauciflorum (Nutt.) DC.
Desmodium sessilifolium (Torr.) Torr. & Gray
Desmodium rotundifolium DC.
Desmodium illinoense Gray
Desmodium canescens (L.) DC.
Desmodium cuspidatum (Muhl.) Loud.
Desmodium laevigatum (Nutt.) DC.
Desmodium marilandicum (L.) DC.
Desmodium ciliare (Muhl.) DC.
Desmodium rigidum (Ell.) DC.
Desmodium canadense (L.) DC.
Desmodium nuttallii (Schindl.) Schub.
Desmodium dillenii Darl.
Desmodium paniculatum (L.) DC.
Strophostyles leiosperma (Torr. & Gray)
Piper
Strophostyles helvola (L.) Ell.
Strophostyles umbellata (Muhl.) Britt.
Galactia volubilis (L.) Britt. var. *mississippiensis* Vail
Amphicarpa bracteata (L.) Fern. var. *bracteata*
Amphicarpa bracteata (L.) Fern. var. *comosa*
(L.) Fern.

LINACEAE

Linum sulcatum Riddell
Linum virginianum L.

OXALIDACEAE

Oxalis violacea L.
Oxalis dillenii Jacq.
Oxalis stricta L.

GERANIACEAE

Geranium maculatum L.
Geranium carolinianum L.

ZYGOPHYLLACEAE

Tribulus terrestris L.

RUTACEAE

Xanthoxylum americanum Mill.
Ptelea trifoliata L.

POLYGALACEAE

Polygala sanguinea L.

EUPHORBIACEAE

Croton glandulosus L. var. *septentrionalis*
Muell.-Arg.
Croton capitatus Michx.
Croton monanthogynus Michx.
Crotonopsis elliptica Willd.
Acalypha ostryaefolia Riddell
Acalypha rhomboidea Raf.
Acalypha virginica L.
Acalypha gracilens Gray
Euphorbia corollata L. var. *corollata*
Euphorbia corollata L. var. *mollis* Millsp.
Euphorbia obtusata Pursh
Poinsettia cyanthophora (Murr.) Kl. & Garcke
Poinsettia dentata (Michx.) Kl. & Garcke
Chamaesyce serpens (HBK.) Small
Chamaesyce supina (Raf.) Moldenke
Chamaesyce humistrata (Engelm.) Small
Chamaesyce maculata (L.) Small

CALLITRICHACEAE

Callitriche heterophylla Pursh
Callitriche palustris L.
Callitriche terrestris Raf.

ANACARDIACEAE

Toxicodendron radicans (L.) Kuntze
Rhus copallina L.
Rhus glabra L.
Rhus aromatica Ait. var. *aromatica*
Rhus aromatica Ait. var. *serotina* (Greene)
Rehder

AQUIFOLIACEAE

Ilex decidua Walt.
Ilex verticillata (L.) Gray

CELASTRACEAE

Euonymus atropurpureus Jacq.
Celastrus scandens L.

STAPHYLEACEAE

Staphylea trifolia L.

ACERACEAE

Acer negundo L.
Acer barbatum Michx.
Acer saccharum Marsh. var. *saccharum*
Acer saccharum Marsh. var. *schneckii* Rehder
Acer saccharinum L.
Acer rubrum L. var. *rubrum*
Acer rubrum L. var. *drummondii* (H. & A.)
 Sarg.

HIPPOCASTANACEAE

Aesculus discolor Pursh
Aesculus glabra Willd.

BALSAMINACEAE

Impatiens biflora Walt.
Impatiens pallida Nutt.

RHAMNACEAE

Ceanothus americanus L.

VITACEAE

Parthenocissus quinquefolia (L.) Planch.
Ampelopsis cordata Michx.
Ampelopsis arborea (L.) Koehne
Vitis aestivalis Michx.
Vitis cinerea Engelm.
Vitis rupestris Scheele
Vitis vulpina L.
Vitis riparia Michx.

TILIACEAE

Tilia americana L.

MALVACEAE

Hibiscus militaris Cav.
Hibiscus lasiocarpus Cav.
Abutilon theophrasti Medic.
Sida spinosa L.

HYPERICACEAE

Ascyrum hypericoides L. var. *multicaule* (Michx.)
 Fern.

Hypericum perforatum L.
Hypericum punctatum Lam.
Hypericum spathulatum (Spach.) Steud.
Hypericum sphaerocarpum Michx.
Hypericum mutilum L.
Hypericum gentianoides (L.) BSP.
Hypericum drummondii (Grev. & Hook.) Torr. &
 Gray
Triadenum walteri (Gmel.) Gl.

CISTACEAE

Lechea tenuifolia Michx.

VIOLACEAE

Hybanthus concolor (T.F. Forst.) Spreng.
Viola pedata L.
Viola pratensis Greene
Viola missouriensis Greene
Viola affinis LeConte
Viola sororia Willd.
Viola sagittata Ait.
Viola pubescens Ait. var. *eriocarpa*
 (Schwein.) Russell
Viola striata Ait.
Viola rafinesquii Greene

PASSIFLORACEAE

Passiflora lutea L. var. *glabriflora* Fern.
Passiflora incarnata L.

CACTACEAE

Opuntia compressa (Salisb.) Macbr.

ELAEAGNACEAE

Elaeagnus angustifolia L.
Elaeagnus umbellata Thunb.

LYTHRACEAE

Decodon verticillatus (L.) Ell.
Cuphea petiolata (L.) Koehne
Lythrum alatum Pursh
Peplis diandra Nutt.
Rotala ramosior (L.) Koehne
Ammannia coccinea Rottb.

NYSSACEAE

Nyssa sylvatica Marsh.

ONAGRACEAE

Circaea quadrisulcata (Maxim.) Franch. & Sav.
 var. *canadensis* (L.) Hara
Ludwigia palustris (L.) Ell. var. *americana*
 (DC.) Fern. & Griseb.
Ludwigia alternifolia L.
Epilobium coloratum Muhl.
Jussiaea repens L.
Jussiaea decurrens (Walt.) DC.
Oenothera speciosa Nutt.
Oenothera laciniata Hill
Oenothera pilosella Raf.
Oenothera biennis L. var. *biennis*
Oenothera biennis L. var. *canescens* Torr. &
 Gray
Oenothera linifolia Nutt.

HALORAGIDACEAE

Proserpinaca palustris L.

ARALIACEAE

Aralia spinosa L.
Aralia racemosa L.
Panax quinquefolius L.

UMBELLIFERAE

Thaspium trifoliatum (L.) Gray var. *trifoliatum*
Thaspium trifoliatum (L.) Gray var. *flavum*
 Blake
Sanicula gregaria Bickn.
Sanicula canadensis L.
Torilis japonica (Houtt.) DC.
Daucus carota L.
Ptilimnium costatum (Ell.) Raf.
Ptilimnium nuttallii (DC.) Britt.
Oxypolis rigidior (L.) Coulter & Rose
Cryptotaenia canadensis (L.) DC.
Zizia aurea (L.) Koch
Pastinaca sativa L.
Sium suave Walt.
Osmorhiza longistylis (Torr.) DC. var. *longistylis*
Osmorhiza longistylis (Torr.) DC. var. *villicaulis* Fern.
Osmorhiza claytonii (Michx.) Clarke
Anethum graveolens L.
Erigenia bulbosa (Michx.) Nutt.
Chaerophyllum procumbens (L.) Crantz
Chaerophyllum tainturieri Hook.
Taenidia integerrima (L.) Drude
Polytaenia nuttallii DC.
Cicuta bulbifera L.
Cicuta maculata L.

CORNACEAE

Cornus florida L.
Cornus stolonifera Michx.
Cornus drummondii C.A. Mey.
Cornus racemosa Lam.
Cornus obliqua Raf.
Cornus foemina Mill.

ERICACEAE

Monotropa hypopithys L.
Monotropa uniflora L.
Rhododendron prinophyllum (Small) Millais
Rhododendron periclymenoides (Michx.) Shinn-
 ners
Gaylussacia baccata (Wang.) K. Koch
Vaccinium arboreum Marsh. var. *arboreum*
Vaccinium arboreum Marsh. var. *glaucescens*
 (Greene) Sarg.
Vaccinium vacillans Torr.

PRIMULACEAE

Dodecatheon meadia L.
Androsace occidentalis Pursh
Samolus parviflorus Raf.
Anagallis arvensis L.
Lysimachia ciliata L.
Lysimachia lanceolata Walt.
Lysimachia hybrida Michx.
Lysimachia nummularia L.
Lysimachia terrestris (L.) BSP.
Hottonia inflata Ell.

EBENACEAE

Diospyros virginiana L.

OLEACEAE

Fraxinus quadrangulata Michx.
Fraxinus pensylvanica Marsh. var. *pensylvanica*
Fraxinus pensylvanica Marsh. var. *subintegerrima* (Vahl) Fern.
Fraxinus pensylvanica Marsh. var. *austinii*
 Fern.
Fraxinus americana L. var. *americana*
Fraxinus americana L. var. *biltmoreana* (Beadle)
 J. Wright
Fraxinus tomentosa Michx. f.
Forestiera acuminata (Michx.) Poir.

LOGANIACEAE

Spigelia marilandica L.

GENTIANACEAE

Swertia carolinensis (Walt.) Kuntze
Obolaria virginica L.
Sabatia angularis (L.) Pursh

APOCYNACEAE

Amsonia tabernaemontana Walt.
Vinca minor L.
Apocynum androsaemifolium L.
Apocynum cannabinum L. var. *cannabinum*
Apocynum cannabinum L. var. *pubescens* (Mitch-
 ell) A. DC.
Apocynum sibiricum Jacq.
Trachelospermum difforme (Walt.) Gray

ASCLEPIADACEAE

Asclepias tuberosa L. var. *interior* (Woodson)
 Shinn-
 ners
Asclepias verticillata L.
Asclepias viridiflora Raf.
Asclepias purpurascens L.

Asclepias syriaca L. var. *syriaca*
Asclepias syriaca L. var. *kansana* (Vail)
Palmer & Steyerl.
Asclepias quadrifolia Jacq.
Asclepias variegata L.
Asclepias exaltata L.
Asclepias perennis Walt.
Asclepias incarnata L.
Matelea gonocarpa (Walt.) Shinners
Cynanchum laeve (Michx.) Pers.

CONVOLVULACEAE

Convolvulus arvensis L.
Calystegia sepium (L.) R. Br. var. *americana* (Sims) Mohlenbr.
Ipomoea coccinea L.
Ipomoea pandurata (L.) G.F.W. Mey.
Ipomoea hederacea (L.) Jacq.
Ipomoea lacunosa L.
Ipomoea purpurea (L.) Roth
Cuscuta cuspidata Engelm.
Cuscuta compacta Juss.
Cuscuta polygonorum Engelm.
Cuscuta cephalanthi Engelm.
Cuscuta gronovii Willd.
Cuscuta pentagona Engelm.
Cuscuta campestris Yuncker

POLEMONIACEAE

Polemonium reptans L.
Phlox bifida Beck var. *bifida*
Phlox bifida Beck var. *stellaria* (Gray)
Wherry
Phlox divaricata L. ssp. *laphamii* (Wood)
Wherry
Phlox pilosa L.
Phlox paniculata L.
Phlox glaberrima L. ssp. *interior* (Wherry)
Wherry

HYDROPHYLLACEAE

Hydrolea uniflora Raf.
Hydrophyllum appendiculatum Michx.
Hydrophyllum canadense L.
Hydrophyllum virginianum L.
Phacelia purshii Buckley
Phacelia ranunculacea (Nutt.) Const.
Phacelia bipinnatifida Michx.

BORAGINACEAE

Mertensia virginica (L.) Pers.
Heliotropium indicum L.
Cynoglossum virginianum L.
Cynoglossum officinale L.
Hackelia virginiana (L.) I.M. Johnston
Myosotis virginica (L.) BSP. var. *virginica*
Myosotis virginica (L.) BSP. var. *macrosperma*
(Engelm.) Fern.

Lithospermum arvense L.
Lithospermum latifolium Michx.
Lithospermum canescens (Michx.) Lehm.

VERBENACEAE

Lippia lanceolata Michx.
Verbena canadensis Britt.
Verbena bracteata Lag. & Rodr.
Verbena simplex Lehm.
Verbena stricta Vent.
Verbena hastata L.
Verbena urticifolia L.
Verbena fillicita Moldenke

PHYRMACEAE

Phryma leptostachya L.

LABIATAE

Isanthus brachiatus (L.) BSP.
Mentha arvensis L. var. *arvensis*
Mentha arvensis L. var. *villosa* (Benth.) S.R.
Steward
Mentha spicata L.
Mentha Xpiperita L.
Lycopus americanus Muhl.
Lycopus virginicus L.
Lycopus rubellus Moench var. *rubellus*
Lycopus rubellus Moench var. *arkansanus*
(Fries.) Benner
Teucrium canadense L. var. *virginicum* (L.)
Eat.
Scutellaria nervosa Pursh
Scutellaria parvula Michx.
Scutellaria lateriflora L.
Scutellaria ovata Hill var. *ovata*
Scutellaria ovata Hill var. *versicolor* (Nutt.)
Fern.
Scutellaria ovata Hill var. *rugosa* (Wood)
Fern.
Scutellaria elliptica Muhl.
Scutellaria incana Biehler
Marrubium vulgare L.
Cunila origanoides (L.) Britt.
Monarda bradburiana Beck
Monarda fistulosa L.
Blephilia ciliata (L.) Benth.
Blephilia hirsuta (Pursh) Benth.
Collinsonia canadensis L.
Hedeoma hispida Pursh
Hedeoma pulegioides (L.) Pers.
Salvia lyrata L.
Pycnanthemum pycnanthemoides (Leavenw.) Fern.
Pycnanthemum incanum (L.) Michx.
Pycnanthemum albescens Torr. & Gray
Pycnanthemum tenuifolium Schrad.
Pycnanthemum pilosum Nutt.
Agastache nepetoides (L.) Ktze.
Nepeta cataria L.

Glecoma hederacea L. var. *micrantha* Moricand
Lamium amplexicaule L.
Lamium purpureum L.
Stachys palustris L. var. *homotricha* Fern.
Stachys tenuifolia Willd. var. *tenuifolia*
Stachys tenuifolia Willd. var. *hispida* (Pursh)
Fern.
Stachys hyssopifolia Michx. var. *ambigua* Gray
Leonurus cardiaca L.
Perilla frutescens L.
Physostegia virginiana (L.) Benth.
Prunella vulgaris L. var. *vulgaris*
Prunella vulgaris L. var. *lanceolata* (Bart.)
Fern.

SOLANACEAE

Solanum carolinense L.
Solanum americanum Mill.
Datura stramonium L.
Physalis angulata L.
Physalis pendula Ryd b
Physalis subglabrata Mack. & Bush
Physalis pruinosa L.
Physalis virginiana Mill.
Physalis heterophylla Nees var. *heterophylla*
Physalis heterophylla Nees var. *ambigua* (Gray)
Rydb.
Physalis pubescens L.
Physalis lanceolata Michx.

SCROPHULARIACEAE

Veronicastrum virginicum (L.) Farw.
Veronica peregrina L.
Veronica arvensis L.
Gratiola neglecta Torr.
Gratiola virginiana L.
Lindernia anagallidea (Michx.) Pennell
Lindernia dubia (L.) Pennell var. *dubia*
Lindernia dubia (L.) Pennell var. *riparia*
(Raf.) Fern.
Penstemon tubaeiflorus Nutt.
Penstemon digitalis Nutt.
Penstemon alluviorum Pennell
Penstemon calycosus Small
Penstemon pallidus Small
Penstemon hirsutus (L.) Willd.
Pedicularis canadensis L.
Gerardia flava L.
Gerardia gattingeri Small
Gerardia skinneriana Wood
Gerardia purpurea L.
Gerardia tenuifolia Vahl
Seymeria macrophylla Nutt.
Bacopa rotundifolia (Michx.) Wettst.
Mimulus alatus Ait.
Mimulus ringens L.
Scrophularia marilandica L.
Verbascum thapsus L.
Verbascum blattaria L.

BIGNONIACEAE

Campsis radicans (L.) Seem.

OROBANCHACEAE

Epifagus virginiana (L.) Bart.
Orobanche uniflora L.

LENTIBULARIACEAE

Utricularia gibba L.
Utricularia vulgaris L.

ACANTHACEAE

Justicia americana (L.) Vahl
Ruellia humilis Nutt.
Ruellia pedunculata Torr.
Ruellia strepens L.

PLANTAGINACEAE

Plantago aristata Michx.
Plantago pusilla Nutt.
Plantago lanceolata L.
Plantago virginica L.
Plantago rugelii Dcne.

RUBIACEAE

Cephalanthus occidentalis L. var. *occiden-*
talis
Cephalanthus occidentalis L. var. *pubescens*
Raf.
Galium circaezans Michx.
Galium lanceolatum Torr.
Galium pilosum Ait.
Galium triflorum Michx.
Galium aparine L.
Galium tinctorium L.
Galium trifidum L.
Galium concinnum Torr. & Gray
Galium obtusum Bigel.
Diodia virginica L.
Diodia teres Walt.
Spermacoce glabra Michx.
Houstonia minima Beck
Houstonia pusilla Schoepf
Houstonia nigricans (Lam.) Fern.
Houstonia purpurea L. var. *calycosa* Gray
Houstonia longifolia Gaertn. var. *longifolia*
Houstonia longifolia Gaertn. var. *tenuifolia*
(Nutt.) Wood
Houstonia canadensis Willd.

CAPRIFOLIACEAE

Sambucus canadensis L.
Lonicera japonica Thunb.

Symphoricarpos obovatus Moench
Viburnum rufidulum Raf.
Viburnum prunifolium L.
Viburnum recognitum Fern.
Triosteum angustifolium L.
Triosteum perfoliatum L.
Triosteum illinoense (Wieg.) Rydb.

VALERIANACEAE

Valerianella radiata (L.) Dufr.

CUCURBITACEAE

Cucurbita pepo L. var. *ovifera* (L.) Alef.
Sicyos angulatus L.

CAMPANULACEAE

Specularia biflora (R. & P.) Fisch. & Mey.
Specularia perfoliata (L.) A. DC.
Campanula americana L.
Lobelia cardinalis L.
Lobelia siphilitica L.
Lobelia puberula Michx.
Lobelia inflata L.
Lobelia spicata Lam. var. *spicata*
Lobelia spicata Lam. var. *leptostachys* (A. DC.)
Mack. & Bush

COMPOSITAE

Polymnia canadensis L.
Polymnia uvedalia (L.) L.
Silphium perfoliatum L.
Silphium integrifolium Michx.
Parthenium integrifolium L.
Iva annua L.
Ambrosia bidentata Michx.
Ambrosia trifida L.
Ambrosia artemisiifolia L.
Xanthium strumarium L. var. *canadensis*
(Mill.) Torr. & Gray
Xanthium strumarium L. var. *glabratum* (DC.)
Cronq.
Heliopsis helianthoides (L.) Sweet
Eclipta alba (L.) Hassk.
Rudbeckia triloba L.
Rudbeckia hirta L.
Rudbeckia bicolor Nutt.
Echinacea pallida (Nutt.) Nutt.
Ratibida pinnata (Vent.) Barnh.
Helianthus annuus L.
Helianthus rigidus (Cass.) Desf.
Helianthus microcephalus Torr. & Gray
Helianthus decapetalus L.
Helianthus divaricatus L.
Helianthus strumosus L.
Helianthus grosseserratus Martens
Helianthus mollis Lam.
Helianthus tuberosus L. var. *tuberosus*

Helianthus tuberosus L. var. *subcan-*
escens Gray
Helianthus hirsutus Raf.
Verbesina helianthoides Michx.
Verbesina alternifolia (L.) Britt.
Coreopsis palmata Nutt.
Coreopsis tripteris L.
Bidens cernua L.
Bidens coronata (L.) Britt.
Bidens aristosa L. var. *aristosa*
Bidens aristosa L. var. *retrorsa* (Sherff)
Wunderlin
Bidens connata Muhl.
Bidens comosa (Gray) Wieg.
Bidens bipinnata L.
Bidens frondosa L.
Bidens vulgata Greene
Bidens discoidea (Torr. & Gray) Britt.
Helenium amarum (Raf.) Rock
Helenium autumnale L.
Helenium flexuosum Raf.
Solidago graminifolia (L.) Salisb.
Solidago ridiga L.
Solidago caesia L.
Solidago flexicaulis L.
Solidago bicolor L. var. *bicolor*
Solidago bicolor L. var. *concolor* Torr.
Solidago buckleyi Torr. & Gray
Solidago missouriensis Nutt.
Solidago juncea Ait.
Solidago speciosa Nutt.
Solidago gigantea Ait.
Solidago arguta Ait.
Solidago strigosa Small
Solidago boottii Hook.
Solidago ulmifolia Muhl.
Solidago drummondii Torr. & Gray
Solidago radula Nutt.
Solidago canadensis L.
Solidago nemoralis Ait.
Boltonia asteroides (L.) L'Her.
Aster anomalus Engelm.
Aster shortii Lindl.
Aster azureus Lindl.
Aster cordifolius L.
Aster sagittifolius Wedem. var. *sagittifolius*
Aster sagittifolius Wedem. var. *drummondii*
(Lindl.) Shinnars
Aster novae-angliae L.
Aster oblongifolius Nutt.
Aster patens Ait.
Aster laevis L.
Aster pilosus Willd.
Aster ericoides L. var. *ericoides*
Aster ericoides var. *prostratus* (Ktze.) Blake
Aster vimineus Lam.
Aster praealtus Poir.
Aster turbinellus Lindl.
Aster ontarionis Wieg.
Aster lateriflorus (L.) Britt.

Aster simplex Willd.
Erigeron pulchellus Michx.
Erigeron philadelphicus L.
Erigeron annuus (L.) Pers.
Erigeron strigosus Muhl.
Erigeron divaricatus Michx.
Erigeron canadensis L.
Anthemis cotula L.
Achillea millefolium L. var. *millefolium*
Achillea millefolium L. var. *lanulosa*
(Nutt.) Piper
Matricaria matricarioides (Less.) Potter
Chrysanthemum leucanthemum L.
Artemisia annua L.
Pluchea camphorata (L.) DC.
Antennaria plantaginifolia (L.) Richards.
var. *plantaginifolia*
Antennaria plantaginifolia (L.) Richards.
var. *ambigens* (Greene) Cronq.
Gnaphalium purpureum L.
Gnaphalium obtusifolium L.
Erechtites hieracifolia (L.) Raf.
Cacalia atriplicifolia L.
Cacalia muhlenbergii (Sch.-Bip.) Fern.
Senecio aureus L.
Senecio glabellus Poir.
Eupatorium purpureum L.
Eupatorium coelestinum L.
Eupatorium incarnatum Walt.
Eupatorium serotinum Michx.
Eupatorium rugosum Houtt.

Eupatorium altissimum L.
Eupatorium perfoliatum L.
Eupatorium sessilifolium L.
Brickellia eupatorioides (L.) Shinnery
Liatris scabra (Greene) K. Schum.
Liatris cylindracea Michx.
Liatris squarrosa (L.) Michx.
Liatris spicata (L.) Willd.
Liatris aspera Michx.
Vernonia missurica Raf.
Vernonia fasciculata Michx.
Vernonia gigantea (Walt.) Trel.
Elephantopus carolinianus Willd.
Arctium minus (Hill) Bernh.
Carduus nutans L.
Cirsium vulgare (Savi) Tenore
Cirsium discolor (Muhl.) Spreng.
Cirsium altissimum (L.) Spreng.
Centaurea cyanus L.
Cichorium intybus L.
Krigia dandelion (L.) Nutt.
Krigia biflora (Walt.) Blake
Krigia virginica (L.) Willd.
Krigia oppositifolia Raf.
Taraxacum officinale Weber
Sonchus asper (L.) Hill
Lactuca canadensis L.
Lactuca serriola L.
Lactuca saligna L.
Lactuca floridana (L.) Gaertn.
Pyrrochappus carolinianus (Walt.)
DC.
Prenanthes altissima L.
Hieracium gronovii L.

APPENDIX II.

Federal Endangered (FE), Regional Forester's Sensitive (RFS), Shawnee National Forest Listed (FL), Illinois Endangered (SE), and Illinois Threatened (ST) Animal Species

FISHES

Bantam sunfish	<i>Leopomis symmetricus</i>	RFS, ST
Bluehead shiner	<i>Notropis hubbsi</i>	RFS, SE
Spring cavefish	<i>Chologaster agassizi</i>	RFS
Banded pygmy sunfish	<i>Elassoma zonatum</i>	RFS
Central mudminnow	<i>Umbra limi</i>	FL
Flier	<i>Centrarchus macropterus</i>	FL
Lake chubsucker	<i>Erimyzon sucetta</i>	FL
Pugnose minnow	<i>Notropis emiliae</i>	FL
Spotted gar	<i>Lepisosteus oculatus</i>	FL
Spotted sunfish	<i>Lepomis punctatus</i>	FL
Starhead topminnow	<i>Fundulus dispar</i>	FL

AMPHIBIANS

Green treefrog	<i>Hyla cinerea</i>	FL
Mole salamander	<i>Ambystoma talpoideum</i>	FL
Bird-voiced treefrog	<i>Hyla avivoca</i>	FL

REPTILES

Green watersnake	<i>Nerodia cyclopion</i>	RFS
Diamond-backed watersnake	<i>Nerodia rhombifera</i>	FL
Flat-headed snake	<i>Tantilla gracilis</i>	FL
Mud snake	<i>Farancia abacura</i>	FL
Western ribbon snake	<i>Thamnophis proximus</i>	FL

MAMMALS

Indiana bat	<i>Myotis sodalis</i>	FE, SE
Bobcat	<i>Lynx rufus</i>	FL, ST
Eastern Woodrat	<i>Neotoma floridana</i>	FL, SE
Golden mouse	<i>Ochrotomys nuttalli</i>	FL, ST
Swamp rabbit	<i>Sylvilagus aquaticus</i>	FL

BIRDS

Bald eagle	<i>Haliaeetus leucocephalus</i>	FE, SE
Mississippi kite	<i>Ictinia mississippiensis</i>	RFS, SE
Bewick's wren	<i>Thryomanes bewickii</i>	FL, ST
Black-crowned night-heron	<i>Nycticorax nycticorax</i>	FL, SE
Brown creeper	<i>Certhia americana</i>	FL, SE
Cooper's hawk	<i>Accipiter cooperii</i>	FL, SE
Great egret	<i>Casmerodius albus</i>	FL, SE
Little blue heron	<i>Egretta caerulea</i>	FL, SE
Loggerhead shrike	<i>Lanius ludovicianus</i>	FL, ST
Osprey	<i>Pandion haliaetus</i>	FL, SE
Purple Gallinule	<i>Porphyryla martinica</i>	FL, SE
Red-shouldered hawk	<i>Buteo lineatus</i>	FL, SE
Snowy egret	<i>Egretta thula</i>	FL, SE

APPENDIX III. Illinois Natural Areas Inventory data for the LaRue--Pine Hills
Ecological Area (1978)

1079

Illinois Natural Areas Inventory
Natural Land Institute

AREA # 1079

COUNTIES: 91 Union

REFERENCE NUMBER: 37

AREA NAME: LaRue--Pine Hills Ecological Area

NATURAL AREA CATEGORIES & SIGNIFICANT FEATURES:

CAT.	CODE / DESCRIPTION
V	U.S. Forest Service ecological area
I	A5.8 Limestone glade
I	B4.16 Spring community
I	A5.14 Aquatic cave community
IV	Outstanding exposure of Bailey Limestone
II	175 Pinus echinata (Dry, cherty slopes)
II	790 Green water snake (Otter Pond)
II	786 Flat-headed snake (Bluffs)
II	733 Bantam sunfish (Wolf Lake, LaRue Swamp)
II	740 Bluehead shiner (Deep, heavily vegetated margins of Wolf Lake)
II	883 Eastern woodrat (Bluffs)
II	594 Sparganium americanum (Springfed edge of LaRue Swamp)
II	553 Pycnanthemum albescens (Cherty slope)
II	470 Hydrolea uniflora (LaRue Swamp and Winter's Pond)
II	23 Hottonia inflata (Pool of water at base of cliff and in LaRue Swamp)
II	66 Heteranthera reniformis (LaRue Swamp)
II	634 Glyceria arkansana (LaRue Swamp)
II	143 Carex gigantea (Wet forest near swamp)
II	10 Carex decomposita (Winter's Pond)
II	341 Apios priceana (Shore of Wolf Lake)
II	590 Solidago arguta (Cherty slopes of McGee Hill)
I	B4.15 Shrub swamp
I	B4.11 Pond
V	National Natural Landmark

EXCEPTIONAL FEATURES:

CAT.	CODE / DESCRIPTION
I	A5.7 Limestone cliff community
I	B5.3 Terrestrial cave community
I	A1.9 Xeric upland forest
II	831 Brown creeper (Observed in June 1976 near swamp)
II	852 Purple gallinule (Observed during breeding season: good habitat)
II	41 Rhododendron prinophyllum (Cherty slopes)
II	138 Quercus phellos (Wet mesic bottomland forest)
II	220 Iris fulva (LaRue Swamp and Winter's Pond)
II	349 Asplenium resiliens (Shaded limestone cliff)
II	117 Asplenium bradleyi (Shaded, cherty slope)
II	880 Bobcat (Female and young observed in immediate area)
II	892 Swamp rabbit (Collected in 1950's)
II	889 Rice rat (Collected in 1950's)
II	884 Golden mouse (Canebreaks and honeysuckle thickets)
II	881 Cotton mouse (A questionable record of a 1963 collection)
II	763 Spring cavefish (Springs and swamp)
II	788

II 762 Spotted sunfish (Wolf Lake, LaRue Swamp)
 II 764 Starhead topminnow (Wolf Lake, LaRue Swamp)
 II 779 Bird voiced treefrog (LaRue Swamp)
 II 789 Green treefrog (Swampy bottomland)
 II 797 Mud snake (Bottomland; collected on road)
 II 806 Timber rattlesnake (Bluffs and bottomlands)
 VII Swamp
 VII Pond
 VII Spring
 IV Cave
 II 797 Mud snake (Collected 1969 near Bluff Lake)

PRESERVATION VALUE SCORE: 5

EVALUATOR: 8 Inventory Staff

LEGAL LOCATION:

TWP	RNG	PM	SEC	QUARTER	QUARTER-QUARTERS
11S	3W	3	3		C&10&15
11S	3W	3	4		D
11S	3W	3	9		
11S	3W	3	10		3&4&5&12&13
11S	3W	3	15		4
11S	3W	3	16		1
11S	3W	3	21		10+
11S	3W	3	22		7&B&C&10&15&16
11S	3W	3	27		1&2&7&B&C&10&15
11S	3W	3	28		A&B&11&12&14&D
11S	3W	3	33		A&3&6&11&D
11S	3W	3	34		2&7&B&C&10&15
12S	3W	3	3		2&7&B&12
12S	3W	3	4		1&2&8&9

TOPOGRAPHIC QUADRANGLES: 270c Wolf Lake 7.5

SPECIFIC STREAM : Big Muddy River

STREAM SYSTEM (Water Shed) : 25 Clear Creek--Horseshoe Lake system

LEGISLATIVE DISTRICT: 59

MUNICIPALITY:-- none

MINIMUM ALTITUDE: 350

MAXIMUM ALTITUDE: 820

TOPOGRAPHY:

PHYSIOGRAPHIC UNIT: 70 Salem Plateau Section
 MAJOR FEATURE: 82 Valley wall (thick loess)

PHYSIOGRAPHIC UNIT: 70 Salem Plateau Section
 MAJOR FEATURE: 76 Bottomland

INDIVIDUAL TOPOGRAPHIC FEATURES:

118 Valley wall
 1 Cliff
 114 Ravine

24 Floodplain

GEOLOGIC FORMATIONS:

80 Bailey Limestone
81 Grassy Knob Chert
82 Backbone Limestone
216 Peoria Loess
218 Cahokia Alluvium

SOIL ASSOCIATION (STATE) :

SOIL ASSOCIATION (COUNTY) :

Alford-Bodine
Karnak-Darwin

NATURAL COMMUNITY

1.9

Xeric upland forest

NATURAL DIVISION AND SECTION: 11c

Southern Section, Ozark Division

COMMUNITY CLASS : 1 Forest

RARITY INDEX: 4 Rare

NATURAL QUALITY:

Unknown acres of grade A ;

Relatively undisturbed

Unknown acres of grade C ;

Mature second growth

SAF COVER TYPE: 76 Shortleaf pine-oak

PLANT COMMUNITY:

352 *Cornus stolonifera*, red osier dogwood

394 *Commandra richardsiana*, bastard toadflax

NATURAL COMMUNITY

1.1

Dry upland forest

NATURAL DIVISION AND SECTION: 11c

Southern Section, Ozark Division

COMMUNITY CLASS : 1 Forest

RARITY INDEX: 3 Occasional

NATURAL QUALITY:

Unknown acres of grade C ;

Mature second growth

SAF COVER TYPE: 40 Post oak-black oak

PLANT COMMUNITY:

208 *Quercus stellata*, post oak

285 *Pinus echinata*, shortleaf pine

280 *Vaccinium arboreum*, farkleberry

NATURAL COMMUNITY

1.2

Dry-mesic upland forest

NATURAL DIVISION AND SECTION: 11c

Southern Section, Ozark Division

COMMUNITY CLASS : 1 Forest

RARITY INDEX: 2 Common

NATURAL QUALITY:

Unknown acres of grade C ;

Mature second growth

SAF COVER TYPE: 53 White oak

PLANT COMMUNITY:

208 *Quercus stellata*, post oak-

209 *Quercus velutina*, black oak

SAF COVER TYPE: 52 White oak--red oak -hickory

PLANT COMMUNITY:

195 *Quercus alba*, white oak

206 *Quercus rubra*, red oak-

6 *Acer saccharum*, sugar maple

NATURAL COMMUNITY

1.5

Mesic upland forest

NATURAL DIVISION AND SECTION: 11c

Southern Section, Ozark Division

COMMUNITY CLASS : 1 Forest

RARITY INDEX: 3 Occasional

NATURAL QUALITY:

Unknown acres of grade C ;

Mature second growth

SAF COVER TYPE: 59 Yellow poplar -white oak -northern red o

PLANT COMMUNITY:

206 *Quercus rubra*, red oak

202 *Quercus muhlenbergii*, chinquapin oak-

6 *Acer saccharum*, sugar maple

SAF COVER TYPE: 57 Yellow poplar

PLANT COMMUNITY:

206 *Quercus rubra*, red oak

138 *Liriodendron tulipifera*, tuliptree-

6 Acer saccharum, sugar maple

NATURAL COMMUNITY

5.8

Limestone glade

NATURAL DIVISION AND SECTION: 11c

Southern Section, Ozark Division

COMMUNITY CLASS : 5 Primary

RARITY INDEX: 5 Very rare

NATURAL QUALITY:

9.00 acres of grade A ;

Essentially undisturbed

SAF COVER TYPE: * Not collected

PLANT COMMUNITY:

6 Acer saccharum, sugar maple

138 Liriodendron tulipifera, tuliptree

NATURAL COMMUNITY

5.7

Limestone cliff community

NATURAL DIVISION AND SECTION: 11c

Southern Section, Ozark Division

COMMUNITY CLASS : 5 Primary

RARITY INDEX: 5 Very rare

NATURAL QUALITY:

Unknown acres of grade A ;

Undisturbed

Unknown acres of grade D ;

Disturbed by removal of talus

SAF COVER TYPE: * Not collected

PLANT COMMUNITY:

14 Andropogon scoparius, little bluestem

31 Bouteloua curtipendula, side-oats grama

25 Aster oblongifolius, aromatic aster

NATURAL COMMUNITY

5.3

Terrestrial cave community

NATURAL DIVISION AND SECTION: 11c

Southern Section, Ozark Division

COMMUNITY CLASS : 5 Primary

RARITY INDEX: 5 Very rare

NATURAL QUALITY:

Unknown acres of grade B ;

SAF COVER TYPE: * Not collected

PLANT COMMUNITY:

113 Heuchera richardsonii, alumroot -
246 Solidago drummondii, Drummond's goldenrod -
80 Danthonia spicata, curly grass

NATURAL COMMUNITY

4.16

Spring community

NATURAL DIVISION AND SECTION: 11c

Southern Section, Ozark Division

COMMUNITY CLASS : 4 Aquatic

RARITY INDEX: 5 Very rare

NATURAL QUALITY:

1.00 acres of grade B ;

Invaded by watercress, artificially ponded

SAF COVER TYPE: * Not collected

PLANT COMMUNITY: * Not collected

NATURAL COMMUNITY

2.12

Loess hill prairie

NATURAL DIVISION AND SECTION: 11c

Southern Section, Ozark Division

COMMUNITY CLASS : 2 Prairie

RARITY INDEX: 5 Very rare

NATURAL QUALITY:

Unknown acres of grade D ;

Nearly destroyed by woody invasion, mowing, trampling

SAF COVER TYPE: * Not collected

PLANT COMMUNITY: * Not collected

NATURAL COMMUNITY

6.6

Successional field

NATURAL DIVISION AND SECTION: 11c

Southern Section, Ozark Division

COMMUNITY CLASS : 6 Cultural

RARITY INDEX: 0 Not collected or not applicable

NATURAL QUALITY:

Unknown acres of grade E ;

SAF COVER TYPE: * Not collected

PLANT COMMUNITY:

14 Andropogon scoparius, little bluestem
31 Bouteloua curtipendula, side-oats grama

NATURAL COMMUNITY

6.3

Developed land

NATURAL DIVISION AND SECTION: 11c

Southern Section, Ozark Division

COMMUNITY CLASS : 6 Cultural

RARITY INDEX: 0 Not collected or not applicable

NATURAL QUALITY:

Unknown acres of grade E ;

Mowed areas, roads, etc.

SAF COVER TYPE: * Not collected

PLANT COMMUNITY: * Not collected

NATURAL COMMUNITY

1.4

Mesic floodplain forest

NATURAL DIVISION AND SECTION: 12b

Southern Sec., Lower Mississippi River Bottomlands

COMMUNITY CLASS : 1 Forest

RARITY INDEX: 5 Very rare

NATURAL QUALITY:

Unknown acres of grade C ;

Mature second growth

SAF COVER TYPE: 87 Sweetgum - yellow poplar

PLANT COMMUNITY: * Not collected

NATURAL COMMUNITY

1.7

Wet-mesic floodplain forest

NATURAL DIVISION AND SECTION: 12b

Southern Sec., Lower Mississippi River Bottomlands

COMMUNITY CLASS : 1 Forest

RARITY INDEX: 4 Rare

NATURAL QUALITY:

Unknown acres of grade C ;

Mature second growth

SAF COVER TYPE: 65 Pin oak--sweetgum

PLANT COMMUNITY:

137 Liquidambar styraciflua, sweetgum
203 Quercus falcata var. pagodaefolia, cherrybark oak-
105 Fraxinus pennsylvanica, red ash

NATURAL COMMUNITY

1.6

Wet floodplain forest

NATURAL DIVISION AND SECTION: 12b

Southern Sec., Lower Mississippi River Bottomlands

COMMUNITY CLASS : 1 Forest

RARITY INDEX: 4 Rare

NATURAL QUALITY:

Unknown acres of grade C ;

Mature second growth

SAF COVER TYPE: 62 Silver maple--American elm

PLANT COMMUNITY:

204 Quercus palustris, pin oak-
137 Liquidambar styraciflua, sweetgum-
105 Fraxinus pennsylvanica, red ash

NATURAL COMMUNITY

4.15

Shrub swamp

NATURAL DIVISION AND SECTION: 12b

Southern Sec., Lower Mississippi River Bottomlands

COMMUNITY CLASS : 4 Aquatic

RARITY INDEX: 5 Very rare

NATURAL QUALITY:

30.0 acres of grade B ;

Water level maintained by dam

SAF COVER TYPE: * Not collected

PLANT COMMUNITY:

335 Fraxinus tomentosa, pumpkin ash-
276 Ulmus americana, American elm-
2 Acer drummondii, Drummond's red maple

NATURAL COMMUNITY

4.11

Pond

NATURAL DIVISION AND SECTION: 12b

Southern Sec., Lower Mississippi River Bottomlands

COMMUNITY CLASS : 4 Aquatic
RARITY INDEX: 5 Very rare
NATURAL QUALITY:
74.0 acres of grade B ;
Water level maintained by dam

SAF COVER TYPE: * Not collected

PLANT COMMUNITY:
65 *Cephalanthus occidentalis*, buttonbush

NATURAL COMMUNITY

6.6

Successional field

NATURAL DIVISION AND SECTION: 11c
Southern Section, Ozark Division
COMMUNITY CLASS : 6 Cultural
RARITY INDEX: 0 Not collected or not applicable
NATURAL QUALITY:
Unknown acres of grade E ;
Former clearing

SAF COVER TYPE: * Not collected

PLANT COMMUNITY:
131 *Lemna* sp., duckweed-
27 *Azolla mexicana*, mosquito fern-
255 *Spirodela* sp., duckweed

NATURAL COMMUNITY

6.3

Developed land

NATURAL DIVISION AND SECTION: 11c
Southern Section, Ozark Division
COMMUNITY CLASS : 6 Cultural
RARITY INDEX: 0 Not collected or not applicable
NATURAL QUALITY:
Unknown acres of grade E ;
Mowed areas, roads, etc.

SAF COVER TYPE: * Not collected

PLANT COMMUNITY: * Not collected

NATURAL COMMUNITY

6.2

Cropland

Southern Sec., Lower Mississippi River Bottomlands
COMMUNITY CLASS : 6 Cultural
RARITY INDEX: 0 Not collected or not applicable
NATURAL QUALITY:
Unknown acres of grade E ;
Cultivated

SAF COVER TYPE: * Not collected

PLANT COMMUNITY: * Not collected

NATURAL COMMUNITY

5.14

Aquatic cave community

NATURAL DIVISION AND SECTION: 11c
Southern Section, Ozark Division
COMMUNITY CLASS : 5 Primary
RARITY INDEX: 5 Very rare
NATURAL QUALITY:
Unknown acres of grade A ;
Undisturbed (unenterable by humans)

SAF COVER TYPE: * Not collected

PLANT COMMUNITY: * Not collected

NATURAL COMMUNITY

6.1

Artificial pond

NATURAL DIVISION AND SECTION: 12b
Southern Sec., Lower Mississippi River Bottomlands
COMMUNITY CLASS : 6 Cultural
RARITY INDEX: 0 Not collected or not applicable
NATURAL QUALITY:
Unknown acres of grade E ;
Man-made

SAF COVER TYPE: * Not collected

PLANT COMMUNITY: * Not collected

DIVERSITY INDEX: 15

TOTAL ACREAGE: 4077

OWNERSHIP TYPE: 1 Private
2 Public

NUMBER OF OWNERSHIPS: 5

USE OF NATURAL AREA:

- 21 Low-intensity recreation
- 22 Research and education visits
- 23 Wildlife or fish management
- 32 Grazing (within past year)
- 34 Intensive agriculture
- 33 Mining
- 35 High-intensity recreation
- 41 Improved road
- 43 Artificial water impoundment
- 44 Buildings

USE OF SURROUNDING LAND (% wildland): 60

USE OF SURROUNDING LAND (% farmland): 30

USE OF SURROUNDING LAND (% developed land): 10

NEAREST SMSA: 9 St. Louis (Madison and St. Clair counties)

DISTANCE TO SMSA: 48

NUMBER OF NEARBY SCHOOLS: 3

NEAREST SCHOOL: 88 Southern Illinois University, Carbondale

NUMBER OF NEARBY D.O.C. FACILITIES: 4

MANAGEABILITY: 1

PRESERVATION STATUS:

- 2 Public land, formally designated as a natural area
- 4 Public land, not recognized as a natural area
- 6 Private land, not protected by owner or lessee

THREATS:

- 1 Threat of destruction within one year.
DESCRIPTION: Overcollecting of rare species
- 1 Threat of destruction within one year.
DESCRIPTION: Chemical pollution to Wolf Lake from powder co.

SPECIES LISTS:

- 1 Woody plants
- 2 Ferns and fern allies
- 3 Summer birds
- 4 Amphibians, reptiles, and mammals
- 5 Other species list

SAMPLING FORMS:

- 4 Prairie frequency

DISCUSSION OF PRESERVATION VALUES:

The LaRue--Pine Hills Ecological Area is a very large, very diverse area, protected by the Shawnee National Forest. The area has very high quality natural communities on the bluffs and in the bottomlands. Pine Hills is noted for its native shortleaf pines; the entire area, including the swampy bottomland, is known as present or recent habitat for about 37 rare, threatened, or endangered plant and animal species.

APPENDIX IV. Candidate Regional Forester's Sensitive Species (RFS) and Shawnee National Forest Listed (FL) plant species. Also indicated are those Under Federal Review (UFR), State Endangered (SE), and State Threatened (ST)

<i>Apios priceana</i>	Price's groundnut	UFR,RFS,SE
<i>Asplenium bradleyi</i>	Bradley's spleenwort	FL,ST
<i>Asplenium resiliens</i>	Black spleenwort	FL,ST
<i>Botrychium biternatum</i>	Southern grape fern	FL,SE
<i>Carex decomposita</i>	Sedge	FL,SE
<i>Carex gigantea</i>	Sedge	RFS,SE
<i>Carex physorhyncha</i>	Sedge	FL,SE
<i>Carya pallida</i>	Pale hickory	FL,SE
<i>Eupatorium incarnatum</i>	Throughwort	FL,SE
<i>Glyceria arkansana</i>	Manna grass	RFS,SE
<i>Heteranthera reniformis</i>	Mud plantain	FL,SE
<i>Hydrastis canadensis</i>	Goldenseal	FL,ST
<i>Iris fulva</i>	Swamp red iris	FL,ST
<i>Melothria pendula</i>	Squirting cucumber	FL,SE
<i>Panax quinquefolia</i>	Ginseng	FL,ST
<i>Panicum jooi</i>	Panic grass	FL,SE
<i>Paspalum bushii</i>	Hairy bead grass	FL,SE
<i>Pinus echinata</i>	Shortleaf pine	FL,SE
<i>Polygonum longistylum</i>	Smartweed	FL,SE
<i>Ptilimnium costatum</i>	Mock bishop's weed	FL,SE
<i>Ptilimnium nuttalli</i>	Mock bishop's weed	FL,SE
<i>Puccinellia pallida</i>	Grass	RFS,SE
<i>Pycnanthemum albescens</i>	White mountain mint	FL,SE
<i>Quercus phellos</i>	Willow oak	FL,ST
<i>Rubus enslenii</i>	Arching dewberry	FL,SE
<i>Sagittaria longirostra</i>	Arrowhead	FL,SE
<i>Scirpus verecundus</i>	Bulrush	FL,SE
<i>Solidago arguta</i>	Goldenrod	FL,SE
<i>Sparganium chlorocarpum</i>	Green-fruited burreed	FL,SE

APPENDIX V.

Copy of Page 21, Shawnee National Forest, Land and Resource Management Plan, Final Environmental Impact Statement, Appendix E illustrating the role of the LaRue-Pine Hills/Otter Pond Research Natural Area in natural diversity

APPENDIX E
Evaluation of Proposed RNA's

SAF Cover Type

SAF cover types in relation to RNA's

SAF Type:	ATWOOD RIDGE	BARKER BLUFF	BURKE BRANCH	KASKASKIA	LARUE/OTTER	MTN TOWNSHIP	OZARK HILL	PANTHER HOLLOW	WHOOPIE CAT	: Needed	: Comments
40	: X	: X	: X	: X	: X	: X	: X	:	:	: Yes	: In RNA in Kentucky, 1968 : RNA Directory
44	: X	:	:	:	:	:	:	:	:	: Yes	: Midwest example
46	:	: X	:	:	:	:	:	:	:	: Yes	: Not in any RNA
52	: X	: X	: X	: X	: X	:	: X	:	: X	: Yes	: Midwest example
53	:	:	: X	: X	:	: X	:	:	:	: Yes	: Midwest example
55	:	:	:	:	:	:	:	: X	:	: Yes	: Central Midwest example
59	:	:	:	: X	: X	:	:	:	:	: No	: In RNA in Indiana
60	: X	:	:	:	: X	:	: X	:	:	: No	: In RNA in Indiana
63	:	:	: X	:	:	:	:	:	:	: Yes	: Not in any RNA, Northern : Example
64	:	:	:	: X	:	:	: X	:	:	: Yes	: Not in any RNA
65	:	:	:	:	: X	:	:	:	:	: Yes	: Not in any RNA
75	:	:	: X	:	:	:	:	:	:	: Yes	: Northern example
87	:	:	:	:	: X	:	:	:	:	: Yes	: Not in any RNA

This table is from a Regional Office 4060 memo dated October 27, 1983. The memo recommends that we provide minimum coverage of all SAF cover types indicated as needed in the above table.

A 4060/1920 memo from the Regional Office dated December 22, 1983, updates the above table. This memo places SAF cover types into three categories. One, in which there is no representative nationally; two, a category in which there is only one RNA representative; and three, a category in which there are two RNA's representing the cover type. These categories are as follows:

<u>Not Represented</u>	<u>In one RNA</u>	<u>In two RNA's</u>
SAF 46	SAF 40	SAF 55
SAF 65	SAF 53	
SAF 87		

Based on the above information, establishment of the following RNA proposals were recommended to provide minimum coverage of the needed SAF cover types.

<u>SAF Cover Types</u>	
Atwood Ridge	40, 44, 52, 60
Barker Bluff	40, 46, 52
Burke Branch	40, 52, 53
LaRue Pine Hills/Otter Pond	40, 52, 59, 60, 65, 75, 76, 87
Panther Hollow	40, 54, 55

APPENDIX VI.

Copies of pages selected from the Shawnee National Forest, Land and Resource Management Plan documents describing the LaRue-Pine Hills/Otter Pond Research Natural Area and documenting the recommendations of the Forest for its designation and management

Murphysboro Ranger District

13. Oakwood Kite Site	53
14. Toothless Cave	8
15. Cave Spring Cave	120
16. Big Bayou Kite Site	80

Jonesboro Ranger District

1. Atwood Ridge	955
2. Clear Creek Swamp	4
3. LaRue Pine Hills/Otter Pond	3547
4. Opossum Trot Trail	3
5. Ozark Hill Prairies	535
6. Wolf Creek Area	495
7. Bald Knob Geological	7

Detailed descriptions of each of these sites is in the planning record. Analysis details are in Appendix F of this FEIS.

Research Natural Areas

Research Natural Areas are protected areas reserved for nonmanipulative research observation and study. Each area is part of a national network representing a full array of North American ecosystems, biological communities, habitats, and phenomena, and geological and hydrological formations and conditions. Research Natural Areas (RNA's) are established by the Chief of the Forest Service.

There are currently no RNA's established on the Shawnee National Forest; however, four separate proposals have been submitted to the Forest Supervisor for consideration.

As a result of the four proposals submitted to the Forest Supervisor, the following twelve areas were considered for Research Natural Area designation in the planning process:

CHAPTER III
Affected Environment

Table 3-15
Recommended Research Natural Areas

<u>AREA</u>	<u>ACRES</u> 1/
Atwood Ridge	955
Barker Bluff	60
Burke Branch	300
Dennison Hollow	205
Kaskaskia	1,050
Panther Hollow	180
Whoopie Cat Mountain	17
Ozark Hill Prairies	535
LaRue Pine Hills	1,905
Otter Pond	680
Cave Hill	465
Stoneface	176

1/ The acreage shown is as originally proposed. Some modifications have been made in individual alternatives (see Appendix E).

Detailed descriptions of each area and the analysis of RNA proposals is in Appendix E of this FEIS.

Roadless Areas

The Shawnee National Forest does not currently have any areas designated as units of the National Wilderness Preservation System. It does, however, have nine roadless areas which are being considered for their potential as wilderness or for nonwilderness uses. These areas and their acreage are:

Table 3-16
Roadless Areas

<u>Roadless Area</u>	<u>Size (Ac. NFS Land)</u>
Bald Knob	5,888
Burden Falls	2,999
Burke Branch	6,230
Clear Springs	4,777
Garden of the Gods	3,844
Lusk Creek	6,055
Murray Bluff	4,172
Panther Den	722
Ripple Hollow	3,530

These nine areas were originally inventoried in 1977 during the second Roadless Area Review and Evaluation. This study came to be known as RARE II and was completed in 1979 with the issuance of a Final Environmental Statement. Four areas totaling 15,093 acres were recommended for wilderness study: Garden of the Gods, Bald Knob, Clear Springs, and Panther Den. Three areas totaling 13,143 acres were recommended for non-wilderness management: Murray Bluff, Burke Branch, and Ripple Hollow. Two areas totaling 8,883 acres were recommended for further evaluation: Lusk Creek and Burden Falls.

APPENDIX E
RNA Assignment by Alternative

Alternative I

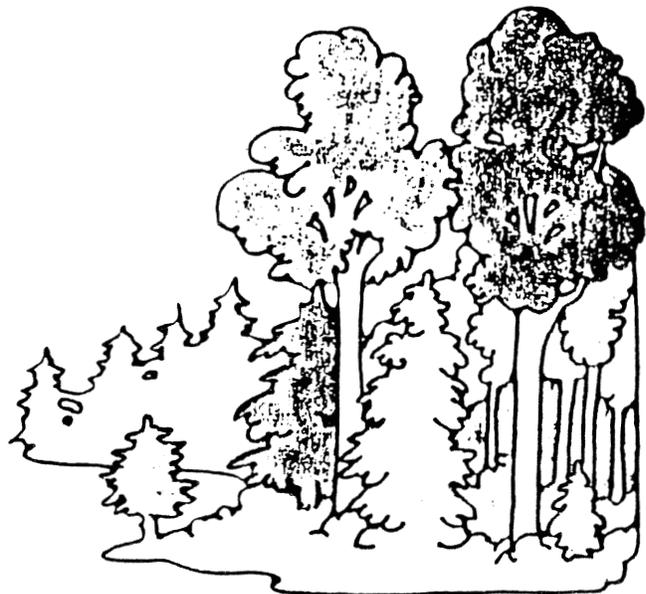
Alternative I emphasizes the maintenance and enhancement of wildlife habitat and preservation of unique natural features. A variety of motorized and nonmotorized recreation features are provided. All proposed Research Natural Areas are recommended for further evaluation.

Management Prescription 8.1

Kaskaskia Experimental Forest

Management Prescription 8.2

Barker Bluff
Atwood Ridge
Burke Branch
LaRue Pine Hills
Otter Pond
Dennison Hollow
Cave Hill
Stoneface
Ozark Hill Prairie
Whoopie Cat Mountain
Panther Hollow



INTRODUCTION

This appendix lists areas of significant physical, biological and cultural features. Where necessary, additional information is provided to assist in implementing management on an area by area basis.

INTENSIVE RESEARCH AREAS

The following areas are assigned to Management Prescription 8.1 to provide for on-going natural resource research and management.

<u>Name</u>	<u>Size (Acres)</u>
Palzo Reclamation Project	325
Dixon Springs Agricultural Research Station	4259
Kaskaskia Experimental Forest	2169
Sugar Creek Seed Orchard	105

NATURAL AREAS

The following areas are assigned to Management Prescription 8.2 (except as noted) to provide for the preservation and protection of their unique scientific or educational values. One or more natural area categories (National Natural Landmark, Research Natural Area Candidate, Botanical Area, etc.) may be assigned to an individual site as warranted.

National Natural Landmarks (existing)

These areas are managed for their landmark features in accordance with the Forest-wide Standards and Guidelines and those in the Management Prescription shown.

<u>Name</u>	<u>Mgmt. Prescription</u>	<u>Size (Acres)</u>
Bell Smith Springs	8.2	1,260
LaRue Pine Hills	8.2	1,905
Little Grand Canyon	8.2	1,023
Lusk Creek	9.3	720
Total Acres		<u>4,908</u>

Candidate Research Natural Areas (RNA)

The following areas will be managed for the site specific features listed. Direction is found in the Forest-wide Standards and Guidelines and those in Management Prescription 8.2. If through evaluation at higher organizational levels and area(s) is not accepted into the National System, it will continue to be managed under Management Prescription 8.2 (or in case of Kaskaskia, 8.1) for the life of the plan.

APPENDIX E
Special Features

<u>Name</u>	<u>Management Prescription</u>	<u>Size(acres)</u>
Atwood Ridge	8.2	955
Barker Bluff	8.2	60
Burke Branch	8.2	300
Cave Hill	8.2	465
Stoneface	8.2	175
Dennison Hollow	8.2	205
Ozark Hill Prairie	8.2	535
Panther Hollow	8.2	180
Whoopie Cat Mountain	8.2	17
Kaskaskia Exp. Forest	8.1	1,050
LaRue Pine Hills/Otter Pond	8.2	2,811
Total		6,753

Atwood Ridge

Location:

The Atwood Ridge RNA proposal is located in portions of Sections 4, 5, 8, 9, 16, and 17, T13S, R2W, Jonesboro Ranger District, Union County.

Area:

955 acres

SAF Cover Types Identified in Area:

SAF 40, SAF 44, SAF 52, SAF 60.

General Information:

The area includes a relic stand of chestnut oak as well as Magnolia acuminata and azalea near the western edge of their respective ranges. In addition, the area includes a number of Indian burial sites. The area is an example of dry, upland Illinois forest. Portions of the northern part of Atwood Ridge have been clearcut. Aside from the clearcuts, the area could provide baseline information on succession in upland hardwood forests.

Selective logging has occurred on some portions of the area. There remains representative mature dry upland forest stands with chestnut oaks that are essentially undisturbed. In many places, the steep slope timber was left (including many chestnut oaks).

A hiking trail exists within the area.

Purpose and Special Features:

To maintain the natural character of a large upland area with a diversity of habitats and to protect the following special features:

-Dry upland forest dominated by the rock chestnut oak (Quercus prinus).

APPENDIX E
Special Features

LaRue Pine Hills/Otter Pond

Location:

The area is located in portions of Sections 4, 9, 10, 15, 16, 21, 22, 27, 28, 33, and 34, T11S, R3W, Jonesboro Ranger District, Union County.

Area:

3,547 acres.

SAF Cover Types:

SAF 40, SAF 52, SAF 59, SAF 60, SAF 65, SAF 75, SAF 76, SAF 87.

General Information:

The LaRue Pine Hills is the most diverse ecosystem in Illinois. The area contains 43% of all the vascular plant species known to occur in Illinois.

There have been two proposals for designation of the LaRue Pine Hills/Otter Pond area. The area to be studied for RNA designation incorporated all past proposals and suggestions. The area has received little disturbance and is predominately natural in appearance. Some timber cutting and farming occurred long ago, but there is little evidence of these activities. Although there is a public road along the east boundary, the area receives limited recreation use due to the steep topography and swamps. Moderate amounts of fishing and waterfowl hunting occur in the swamps.

Purpose and Special Features:

To maintain the natural character of a large, mostly forested area with a diversity of habitats and species and to protect many significant plant and animal species.

This area contains one of only two native stands of shortleaf pine in Illinois and also contains practically the entire Illinois population of the eastern woodrat (Neotoma floridana).

Ecological research has been conducted in this area for many years.

Federal Threatened and Endangered Species:

-Indiana Bat (Myotis sodalis).

Sensitive Species (proposed):

-Price's groundnut (Apios pricens).

-Marma grass (Glyceria arkansana).

-Grass (Pucinelia pallida).

-Sedge (Carex gigantea).

Forest Listed Species:

- Bradely's Spleenwort (Asplenium bradleyi).
- Sedge (Carex decomposita).
- Mud Plantain (Heteranthera reniformis).
- One-Flower Hydrolea (Hydrolea uniflora).
- Swamp Red Iris (Iris fulva).
- White Mountain Mint (Pycnanthemum albescens).
- Willow Oak (Quercus phellos).
- Goldenrod (Solidago arguta).
- American Burreed (Sparganium americanum).
- Sedge (Carex physorhyncha).
- Smartweed (Polygonum longistylum).
- Black Spleenwort (Asplenium resiliens).
- Eastern Woodrat (Neotoma floridana illinoensis).
- Bobcat (Lynx rufus).
- Golden Mouse (Ochrotomys nutallii).

Other Natural Areas

Each of these areas will be managed for the protection or perpetuation of their individual special feature(s). The management of each area will be one of three methods.

Areas over 10 acres in size will be managed in most cases as separate and individual parts of the 8.2 Management Area.

Most areas less than 10 acres in size will be managed as inclusions within other Management Areas. The standards and guidelines established for Management Area 8.2 will also apply to these areas.

In the remaining cases, the areas are managed for their special feature as part of a much larger or higher level designated special feature or as part of an area proposed for Congressional study. An example is a natural area within an Experimental Forest or an area proposed for wilderness study. Some natural areas are within further study management areas (9.2 or 9.3), their identity pending Congressional action. If studied but not designated by Congress, natural areas within these management areas will be assigned to the 8.2 Management prescription.

Nationally recognized and designated special features management (Wilderness, National Register of Historic Sites, Experimental Forest, etc.) will take precedent over other special features if such conflicts should arise.

All recognized natural areas have been further classified into one of the following 4 categories: Botanical Area, Ecological Area, Geological Area, or Zoological Area. This classification is based upon the dominant or outstanding special feature of each natural area. Some natural areas may contain features of 2 or more categories, but only one category assignment has been made for each area.