Submit to:

ATTN: Carl Becker
IL Department of Natural Resources
Division of Natural Heritage
524 South Second St.
Springfield, IL 62701-1787

Biological Inventory of the Kaskaskia River Bottomlands, Part I

Submitted by:

Illinois Natural History Survey
607 East Peabody Drive
Champaign, IL 61820
Ph. (217) 333-6855
Fax (217) 333-4949

Make Grant to: The Board of Trustees of the University of Illinois
c/o Grants & Contracts
109 Coble Hall
801 South Wright Street
Champaign, IL 61820-6242

Project Period: 02/01/97 - 07/31/98
Amount Requested: $30,000

Scott K. Robinson, Principal Investigator
Illinois Natural History Survey

Lorin Nevling, Chief
Illinois Natural History Survey

Richard C. Alkire, Chair
Campus Research Board
(217)333-2187

J. J. Kamerer, Director
Grants & Contracts Admin.
(217) 333-2187

Title: Biological inventory of the Kaskaskia River Bottomlands

PI: Scott K. Robinson

CO-PIs: Chris Phillips, John Taft, Rip Sparks, Dave Wahl, Ed Heske, Tim Van Deelen, Jeff Brawn

Justification/Need

The Kaskaskia River Corridor (KRC) is the largest remaining contiguous forest tract in the State of Illinois. In places, the forested floodplain is more than two miles wide and contains within it oxbow lakes (sloughs) of many sizes and successional stages. Although the hydrology of the area has been altered by Carlyle Lake upstream and navigational alterations downstream, the area still has a distinct spring flood pulse during which oxbow lakes are connected by water to the river. The numerous backwater sloughs gradually dry during the summer, except for those in which water levels are maintained by beaver or human dams. In addition to the extensive floodplain forests, the KRC also contains some of the largest undisturbed flatwood plant communities in the Midwest. Some of these flatwoods have likely never been cut.

Although much of the floodplain forest has been logged in the past, some sections have not been cut for a very long time (100 years or more) and others may have been only selectively logged. As a result, the area is a mosaic different forest types and ages depending upon terrain, and logging history.

One of the most significant aspects of the KRC is the "Kaskaskia River Corridor Stewardship Plan (KRCSP)." If implemented successfully, this plan would represent one of the first initiatives to result in coordinated stewardship of an area in which virtually all of the land is privately owned. The purpose of the KRCSP is "to develop, enhance, and protect the ecological and socioeconomic values of the natural resources while continuing private ownership" (Evans et al. 1995). Indeed, the large number (over 2400) of different land owners has provided a measure of protection for the forest. For many of these landowners, their primary use of their land has been for hunting and fishing near

clubs located along the banks of the river. As a result, it is in their interests to maintain the area in forest.

A significant part of the KRCSP is conducting a baseline plant and wildlife inventory. The purpose of such an inventory would be to develop lists or inventories of species that are currently present in all communities and their relative abundance and productivity. Although some studies have been conducted in the region (summarized in Evans et al. 1995), the area remains poorly known compared with other large and important habitat tracts in the state. There has never been a coordinated inventory of the plants, wildlife, and fishes of the KRC such as the one proposed here.

Objectives

1. To conduct inventories of species composition, and relative abundance, of birds, mammals, plants, fish, reptiles, and amphibians in the major ecological communities (wet-mesic and mesic floodplain forest, southern flatwoods, shrub swamps, marshes, sloughs and oxbows, creeks, and the river itself).
2. To link these plant and animal communities to topography, flooding, and other disturbances such as logging history, proximity to edges (e.g., agriculture), and dams.
3. To establish private landowner contacts and help them develop plans for preserving and using the resources on their land by visiting with them and conducting tours of their property.
4. Write a report that provides preliminary recommendations for conserving the KRC in general so that the assessment can be included in the modified Stewardship Plan.
5. Develop a long-term monitoring/study plan that would focus on some of the most interesting biological features identified during this preliminary, baseline study.

Approach

Our goal is to provide the best possible information on the composition, and abundance, reptiles and amphibians, birds, mammals, and fishes of the major ecological communities. Each group of organisms will have a separate PI(s) (plants: John Taft; birds: Scott Robinson and Jeff Brawn; fish: Rip Sparks and Dave Wahl; reptiles and amphibians: Chris Phillips mammals: Ed Heske and Tim Van Deelen). Each taxon group requires different sampling methods, but the overall sampling effort will be closely coordinated so that we have complete information on the plants, fish, and wildlife in the same study areas chosen to represent each ecological community. This coordination will be maintained by cooperation among the PIs and by using the same field crew for most sampling. Our approach is to have each PI design a sampling scheme and assist with the sampling during critical periods. This team approach should maximize the efficiency of sampling. Each field season will have a slightly different emphasis based on the skills of the people hired as assistants, but we will gather data on fish, birds, reptiles, mammals, amphibians, and plants each year so that we can get at least some indication of how their abundances vary in years of different hydrologic patterns.

METHODS

Birds

Bird work will include both extensive censuses and intensive studies of nesting success on smaller plots.

Extensive Censuses. At least one of the four assistants (2 each year) will be chosen based on the ability to identify birds by vocalizations. This assistant and Robinson will visit all tracts to which we are granted access and conduct standard (5-minute, 50-m fixed-radius) point counts at 200-300-m intervals from May 20-June 30. A GPS unit will enable us to locate each point accurately. These census data will be combined with the 150 points already censused to provide a reasonably complete picture of the abundance and distribution of each of the nesting species in the KRC and many of the migrants. Vegetation will be described at each point and, at some points, vegetation will be sampled

using methods developed in consultation with the plant ecologist (John Taft) so that we can link bird and plant communities. The census data can be used to address the following questions: (1) How do bird populations vary among communities with different logging histories? (2) How do forest bird populations vary among different topographical features (e.g., natural levees, old sloughs, river edges, backwater)? (3) What are the characteristic bird communities of each major ecological community? (4) How do populations of key predators (e.g., blue jays and crows) and cowbirds vary with corridor width and distance from edges? (5) What are the habitat requirement of key floodplain species (e.g., Cerulean Warbler, Brown Creeper)?

The most extensive census work will be in the first year of the study when we plan to hire an assistant who can identify bird songs. In the second year, Robinson will continue to census tracts that were not censused the first year. Censusing will require approximately 30 mornings (0530-1030) of one of the assistants, primarily in June. Robinson will census 5-10 mornings/summer and will recensus the intensive study plots (see below) in the second year of the study.

Nesting Success will be studied in 6-10 intensive study plots of 5-40 ha chosen to represent the following ecological communities: (1) oxbow lake with shrub swamp, (2) southern flatwoods, (3) wet-mesic and mesic floodplain forest in a wide forested corridor, and (4) wet-mesic floodplain forest in a narrower corridor. At least two of the forest plots will border the river to include a natural levee. If necessary, plots will be extended to include additional backwater habitats and areas that have been more heavily logged.

Each plot will be gridded with census points at 150-m intervals and visited twice a week. On each visit, two observers will search for new nests and monitor the progress of nests found previously. In year one we will search for nests of all species. In the second year, we will focus on a few of the species that are abundant and have nests that are relatively easy to find (e.g., Prothonotary Warblers in sloughs and shrub swamps, Acadian Flycatchers in wet-mesic floodplain forest, American Redstart along rivers and in partially logged areas, and Kentucky Warblers and Indigo Buntings in flatwoods). Special attention will be given to locating nests of Cerulean Warblers to help evaluate their tree species use.

Nest searching and monitoring will be conducted May-July of both years with most intensive effort in the first year. Most nesting will be in May and June. Each plot will be searched intensively for nests one day per week. The second weekly visit will only be for monitoring the fates of nests.

Each census point in the intensive study plots will be censused three times in the first year and once in the second year. The same methods used for extensive censuses (see above) will be used on the intensive study sites.

Questions that can be addressed with these data include the following: (1) Is nesting success higher in the KRC than it is elsewhere in Illinois? (2) Is nesting success higher in the wider corridor? (3) What are the effects of "natural" edges (river, sloughs) and anthropogenic edges (farms) on nesting success? (4) How is nesting success affected by logging?

Amphibians and Reptiles

In the first year, amphibians and reptiles will be sampled using visual encounter surveys (VES) in the same plots used for the bird nesting-success study. A randomized-walk design will be used on 10 randomly selected subplots within each of the plots. These subplots, which will be 150 m by 150 m (defined by the Nesting Success census points, above), will be searched twice each in the spring and once each during the summer. This will give a total of 40 subplots sampled three times each during the first year. Each search will take approximately one hour and can be carried out any time during the day.

The VES will be augmented with frog-call surveys carried out at the two best breeding habitats in each of the four plots. The frog-call census points will be visited three times each during the first year (early March, late April and late May) for a total of 24 visits. Each census will last 10 minutes and will be conducted on damp or rainy nights. An audio tape will be made at each census point to help with identification.

Other techniques that may be used as time permits include: driving local roads at night, setting turtle traps in selected aquatic environments, and seining smaller pools and ditches. All of these activities will be under time and effort constraint so that the appropriate comparisons can be made among habitat types.

The results of the VES and the auditory censuses will allow a statistically rigorous measurement of relative species richness and relative abundance among the four habitat types. The auxiliary techniques will help to establish absolute species richness in each of the four habitat types.

In the second year, the visual encounter surveys will be replace with less labor-intensive techniques such as minnow-trapping and drift-fence/pitfall arrays. These techniques and continued night-driving, seining, and turtle trapping will allow us to increase our confidence in the estimates of absolute species richness because they will target species that are likely to be missed during a VES.

Fishes

The primary fish sampling effort will take place during low water in mid-late summer when fish are cut off from the river in oxbow lakes that may provide a refuge from predation. A crew of 4 from the INHS Center for Aquatic Ecology will visit the area for approximately one week (or longer if necessary). During this visit, the crew will sample fishes in multiple (up to 10) oxbow lakes (sloughs). Oxbows will be stratified to include replicates of "typical" lakes. Lakes will be selected during a preliminary visit in the winter of 1996-1997. All oxbows included within the intensive study plots (see sections describing birds, amphibians, and reptiles) will also be sampled for fish. Fish will be seined and trapped except where the water is too deep, in which case other methods will have to be used. Only a very small portion (less than 1%) of the fish will be caught. Dissolved oxygen will also be measured in the oxbows at 4:00 am the period of most likely oxygen depletion. All measurements and sampling will be repeated in the second year of the study. Additional measurements of dissolved oxygen will be made in midwinter under the ice. All fish will be preserved, taken to the River Research Laboratory, and identified.

A graduate student, Alison Hess, will also visit the river several times during the flood season to sample fish movements.

Mammals

Because of the great ecological and morphological diversity of mammals potentially occurring in the KRC, a variety of field methods will be necessary to conduct an initial inventory. A monitoring program can them be established that will focus on species of particular importance or concern. Sampling will take place both years.

Live trapping using Sherman live traps (7.5 x 8.75 x 22.5 cm) will be used to survey small rodents and large shrews (*Blarina brevicauda* and *B. carolinensis*) in the same ecological communities where intensive censuses of birds are conducted. Trapping will be conducted along line transects, with traps spaced 10 m apart and run 3 successive nights. Captured small mammals will be marked by either ear tags or small, dorsal fur clips to identify recaptures and allow comparisons of indices of abundance (captures per 100 trap-nights) between habitats. Live trapping using Tomahawk live traps (15 x 15 x 60 cm) will be used to survey squirrels. To capture squirrels, Tomahawk traps will need to be locked open and prebaited with walnuts for one week, followed by a week when traps are set each morning and checked each afternoon.

To survey habitats for small shrews (*Sorex, Cryptotis*), standard arrays of 4 pitfall traps connected by drift fences will be set up and run for 10 days each. Pitfall traps will consist of 25-cm deep, 4-liter cans sunk in the soil, and drift fences will be constructed from black, construction-grade vinyl, 2 m long and 25 cm high. Arrays will be set up in all habitats where soil moisture conditions permit (pitfalls can not be used where soils are wet). Moles will be detected by observation of their digging activities.

Medium-sized and large mammals will be surveyed by slowly driving the roads along KRC at night and scanning with high-powered spotlights. Spotlight surveys will be conducted at least 3 times before foliage becomes too dense for penetration by spotlight beams. Track stations will be set up along KRC in all habitats to record the presence of more elusive species. Track stations will consist 1-m diameter patches of smoothed sand or talc baited with a commercial scent attractant. Where track stations indicate the presence of species of particular interest (bobcat-*Felis rufus*, gray fox-*Urocyon cinereoargenteus*), Trailmaster cameras with infrared-beam triggers may be used to document species records. Track stations will be set and monitored for one night each month. Repeated surveys will indicate whether species are resident in the area, or records represent the activity of

transient individuals. Other mammal sign (tracks, scats, dens) will be recorded as encountered. Mammals associated with aquatic habitats (river otter-*Lutra canadensis*, beaver-*Castor canadensis*, muskrat-*Ondatra ziebethicus*) will be surveyed by searching river and stream banks for tracks and other sign.

Bats will be captured by mist-netting over streams and shallow sections of river. Black, nylon mist nets (3.75-cm mesh) will be suspended between a pair of pulleys attached to poles 6 or 9 m tall.

Vegetation sampling

Intensive Study Plots

Vegetation will be described within targeted community types in the Kaskaskia River study area with a combination of quantitative data from vegetation plot samples and floristic inventory data. Vegetation will be subsampled by strata including trees, shrubs and saplings, and ground-cover vegetation. The tree stratum at each intensive-sample site will be sampled with a stratified-random sampling procedure in relatively homogeneous vegetation (within each community type [*sensu* White and Madany 1978]) using eight to ten 0.05-ha (500 m^2) circular plots. Tree basal areas will be determined by measuring the diameter at breast height (dbh) of all woody plants ≥ 6 cm dbh. Density of shrubs (woody plants < 6 cm dbh but taller than 50 cm) will be measured in a single nested 0.005-ha (50 m^2) circular plot within each tree plot. Importance values (IV 200) for trees will be calculated by summing relative dominance and relative density; importance values for shrubs and saplings will be calculated by summing relative density and relative frequency.

Frequency and cover data for herbaceous species, seedlings (woody plants < 50 cm), and vines will be collected from 20 to 25 0.25-m^2 quadrats in each tree plot. These quadrats will be placed every meter along a line transect across a diameter of the tree plot that passed through the plot center. The orientation of the transect will be determined randomly. Cover of herbaceous species, seedlings, and vines will be estimated by cover class: 1 = 0-1%; 2 = 1-5%; 3 = 5=25%; 4 = 25-50%; 5 = 50-75:; 6 = 75-95%; 7 = 95-100%. Only plants rooted within the frame of the quadrat will be recorded. Importance values (IV 200) for ground-cover species will be determined by summing relative cover

and relative frequency. Bare ground will be measured using a point-intercept method (Mueller-Dombois & Ellenberg 1974). The point-intercept plot frame is a modified frame using five points which will be taken at one-meter intervals along the ground-cover transect. All vegetation sampling will be conducted between June and August.

Floristic inventory data using observational survey methods will provide an additional measure of species richness by adding species not found in quantitative plot sampling, including any threatened and endangered taxa, and assigning relative abundance values to each taxon (e.g., 1=rare, 2=occasional, 3=common, 4=abundant).

Extensive Sample Plots

Vegetation in the extensive survey effort will follow standard methods for bird studies. Community structure will be determined at each 0.05-ha census station from a pair of 2-m wide and 25.24-m long belt transects which pass through the center point of the census station. Trees and shrubs sampled in the transects will be identified and assigned to size-class intervals. The relative density for most common species will be determined. Percent cover of the ground cover vegetation will be empirically estimated at each 0.05-ha census station.

Literature Cited

Mueller-Dombois, D. & Ellenberg, H. 1974. *Aims and methods of vegetation ecology*. John Wiley & Sons, New York.

White, J. and M.H. Madany. 1978. Classification of natural communities in Illinois. Pages 310-405 (Appendix 30) *in*: White, J. Illinois Natural Areas Technical Report, Volume 1. Survey Methods and Results. Urbana. Illinois Natural Features Inventory.

Time Line

X = Intense Activity

M = Moderate Activity

O = Occasional Visits

		Assistants	Birds	Reptiles Amphibians	Plants	Fish	Mammals
1997	Jan						
	Feb			M			
	March	2		X			O
	April	2		X	O	O	O
	May	2	X	X	X	O	X
	June	2	X	M	X	O	O
	July	1-2	X	O	X	O	M
	Aug			O	M	X	
	Sept			O			
	Oct			O			
	Nov						
	Dec					O	
1998	Jan					O	
	Feb			X			
	March	1-2		X		O	O
	April	2		X		O	O
	May	2-3	M	X	X	O	O
	June	2-3	M		X	O	M
	July	1-2	M	M	X	X	
	Aug			O	M	X	

Sept-Dec: Data analysis and report writing.

Budget: Year 1

Personnel	
Field Assistants: 2 @ $1,000/mo. x 4.5 mos. each	$ 9,000
Travel	
Mileage, per diems	2,000
Canoe/boat	500
Supplies	636
Field Station Rental (5 mos. x $300/mo.)	1,500
Facilities and Administrative Costs (10%)	1,364
Total	$15,000

Year 2

Personnel	
Field Assistants: 2 @ $1,000/mo. x 5 mos.	$10,000
Travel	
Mileage, per diem	2,000
Supplies	136
Field Station Rental	1,500
Facilities and Administrative Costs (10%)	1,364
Total	$15,000

Justification

The field crew will be undergraduate and graduate students at the University of Illinois hired over the summer; which means that we will not have to pay fringe benefits other than medicare (<$1.00). They will work as a team and assist with all phases of data gathering. The canoe will be used for working in areas during the spring flood. Supplies will be flagging tape, compasses, canoe paddles, and such. Field Station Rental is an estimate. We have not yet found a station.

Submit to:

ATTN: Carl Becker
IL Department of Natural Resources
Division of Natural Heritage
524 South Second St.
Springfield, IL 62701-1787

Biological Inventory of the Kaskaskia River Bottomlands, Part II

Submitted by:

Illinois Natural History Survey
607 East Peabody Drive
Champaign, IL 61820
Ph. (217) 333-6855
Fax (217) 333-4949

Make Grant to: The Board of Trustees of the University of Illinois
c/o Grants & Contracts
109 Coble Hall
801 South Wright Street
Champaign, IL 61820-6242

Project Period: 07/01/97 - 06/30/98
Amount Requested: $10,000

Scott K. Robinson, Principal Investigator
Illinois Natural History Survey

Lorin Nevling, Chief
Illinois Natural History Survey

Richard C. Alkire, Chair
Campus Research Board
(217)333-2187

J. J. Kamerer, Director
Grants & Contracts Admin.
(217) 333-2187

Title: Biological inventory of the Kaskaskia River Bottomlands

PI: Scott K. Robinson

CO-PIs: Chris Phillips, John Taft, Rip Sparks, Dave Wahl, Ed Heske, Tim Van Deelen, Jeff Brawn

Justification/Need

The Kaskaskia River Corridor (KRC) is the largest remaining contiguous forest tract in the State of Illinois. In places, the forested floodplain is more than two miles wide and contains within it oxbow lakes (sloughs) of many sizes and successional stages. Although the hydrology of the area has been altered by Carlyle Lake upstream and navigational alterations downstream, the area still has a distinct spring flood pulse during which oxbow lakes are connected by water to the river. The numerous backwater sloughs gradually dry during the summer, except for those in which water levels are maintained by beaver or human dams. In addition to the extensive floodplain forests, the KRC also contains some of the largest undisturbed flatwood plant communities in the Midwest. Some of these flatwoods have likely never been cut.

Although much of the floodplain forest has been logged in the past, some sections have not been cut for a very long time (100 years or more) and others may have been only selectively logged. As a result, the area is a mosaic different forest types and ages depending upon terrain, and logging history.

One of the most significant aspects of the KRC is the "Kaskaskia River Corridor Stewardship Plan (KRCSP)." If implemented successfully, this plan would represent one of the first initiatives to result in coordinated stewardship of an area in which virtually all of the land is privately owned. The purpose of the KRCSP is "to develop, enhance, and protect the ecological and socioeconomic values of the natural resources while continuing private ownership" (Evans et al. 1995). Indeed, the large number (over 2400) of different land owners has provided a measure of protection for the forest. For many of these landowners, their primary use of their land has been for hunting and fishing near

clubs located along the banks of the river. As a result, it is in their interests to maintain the area in forest.

A significant part of the KRCSP is conducting a baseline plant and wildlife inventory. The purpose of such an inventory would be to develop lists or inventories of species that are currently present in all communities and their relative abundance and productivity. Although some studies have been conducted in the region (summarized in Evans et al. 1995), the area remains poorly known compared with other large and important habitat tracts in the state. There has never been a coordinated inventory of the plants, wildlife, and fishes of the KRC such as the one proposed here.

Objectives

1. To conduct inventories of species composition, and relative abundance, of birds, mammals, plants, fish, reptiles, and amphibians in the major ecological communities (wet-mesic and mesic floodplain forest, southern flatwoods, shrub swamps, marshes, sloughs and oxbows, creeks, and the river itself).
2. To link these plant and animal communities to topography, flooding, and other disturbances such as logging history, proximity to edges (e.g., agriculture), and dams.
3. To establish private landowner contacts and help them develop plans for preserving and using the resources on their land by visiting with them and conducting tours of their property.
4. Write a report that provides preliminary recommendations for conserving the KRC in general so that the assessment can be included in the modified Stewardship Plan.
5. Develop a long-term monitoring/study plan that would focus on some of the most interesting biological features identified during this preliminary, baseline study.

Approach

Our goal is to provide the best possible information on the composition, and abundance, reptiles and amphibians, birds, mammals, and fishes of the major ecological communities. Each group of organisms will have a separate PI(s) (plants: John Taft; birds: Scott Robinson and Jeff Brawn; fish: Rip Sparks and Dave Wahl; reptiles and amphibians: Chris Phillips mammals: Ed Heske and Tim Van Deelen). Each taxon group requires different sampling methods, but the overall sampling effort will be closely coordinated so that we have complete information on the plants, fish, and wildlife in the same study areas chosen to represent each ecological community. This coordination will be maintained by cooperation among the PIs and by using the same field crew for most sampling. Our approach is to have each PI design a sampling scheme and assist with the sampling during critical periods. This team approach should maximize the efficiency of sampling. Each field season will have a slightly different emphasis based on the skills of the people hired as assistants, but we will gather data on fish, birds, reptiles, mammals, amphibians, and plants each year so that we can get at least some indication of how their abundances vary in years of different hydrologic patterns.

METHODS

Birds

Bird work will include both extensive censuses and intensive studies of nesting success on smaller plots.

Extensive Censuses. At least one of the four assistants (2 each year) will be chosen based on the ability to identify birds by vocalizations. This assistant and Robinson will visit all tracts to which we are granted access and conduct standard (5-minute, 50-m fixed-radius) point counts at 200-300-m intervals from May 20-June 30. A GPS unit will enable us to locate each point accurately. These census data will be combined with the 150 points already censused to provide a reasonably complete picture of the abundance and distribution of each of the nesting species in the KRC and many of the migrants. Vegetation will be described at each point and, at some points, vegetation will be sampled

using methods developed in consultation with the plant ecologist (John Taft) so that we can *link* bird and plant communities. The census data can be used to address the following questions: (1) How do bird populations vary among communities with different logging histories? (2) How do forest bird populations vary among different topographical features (e.g., natural levees, old sloughs, river edges, backwater)? (3) What are the characteristic bird communities of each major ecological community? (4) How do populations of key predators (e.g., blue jays and crows) and cowbirds vary with corridor width and distance from edges? (5) What are the habitat requirement of key floodplain species (e.g., Cerulean Warbler, Brown Creeper)?

The most extensive census work will be in the first year of the study when we plan to hire an assistant who can identify bird songs. In the second year, Robinson will continue to census tracts that were not censused the first year. Censusing will require approximately 30 mornings (0530-1030) of one of the assistants, primarily in June. Robinson will census 5-10 mornings/summer and will recensus the intensive study plots (see below) in the second year of the study.

Nesting Success will be studied in 6-10 intensive study plots of 5-40 ha chosen to represent the following ecological communities: (1) oxbow lake with shrub swamp, (2) southern flatwoods, (3) wet-mesic and mesic floodplain forest in a wide forested corridor, and (4) wet-mesic floodplain forest in a narrower corridor. At least two of the forest plots will border the river to include a natural levee. If necessary, plots will be extended to include additional backwater habitats and areas that have been more heavily logged.

Each plot will be gridded with census points at 150-m intervals and visited twice a week. On each visit, two observers will search for new nests and monitor the progress of nests found previously. In year one we will search for nests of all species. In the second year, we will focus on a few of the species that are abundant and have nests that are relatively easy to find (e.g., Prothonotary Warblers in sloughs and shrub swamps, Acadian Flycatchers in wet-mesic floodplain forest, American Redstart along rivers and in partially logged areas, and Kentucky Warblers and Indigo Buntings in flatwoods). Special attention will be given to locating nests of Cerulean Warblers to help evaluate their tree species use.

Nest searching and monitoring will be conducted May-July of both years with most intensive effort in the first year. Most nesting will be in May and June. Each plot will be searched intensively for nests one day per week. The second weekly visit will only be for monitoring the fates of nests.

Each census point in the intensive study plots will be censused three times in the first year and once in the second year. The same methods used for extensive censuses (see above) will be used on the intensive study sites.

Questions that can be addressed with these data include the following: (1) Is nesting success higher in the KRC than it is elsewhere in Illinois? (2) Is nesting success higher in the wider corridor? (3) What are the effects of "natural" edges (river, sloughs) and anthropogenic edges (farms) on nesting success? (4) How is nesting success affected by logging?

Amphibians and Reptiles

In the first year, amphibians and reptiles will be sampled using visual encounter surveys (VES) in the same plots used for the bird nesting-success study. A randomized-walk design will be used on 10 randomly selected subplots within each of the plots. These subplots, which will be 150 m by 150 m (defined by the Nesting Success census points, above), will be searched twice each in the spring and once each during the summer. This will give a total of 40 subplots sampled three times each during the first year. Each search will take approximately one hour and can be carried out any time during the day.

The VES will be augmented with frog-call surveys carried out at the two best breeding habitats in each of the four plots. The frog-call census points will be visited three times each during the first year (early March, late April and late May) for a total of 24 visits. Each census will last 10 minutes and will be conducted on damp or rainy nights. An audio tape will be made at each census point to help with identification.

Other techniques that may be used as time permits include: driving local roads at night, setting turtle traps in selected aquatic environments, and seining smaller pools and ditches. All of these activities will be under time and effort constraint so that the appropriate comparisons can be made among habitat types.

The results of the VES and the auditory censuses will allow a statistically rigorous measurement of relative species richness and relative abundance among the four habitat types. The auxiliary techniques will help to establish absolute species richness in each of the four habitat types.

In the second year, the visual encounter surveys will be replace with less labor-intensive techniques such as minnow-trapping and drift-fence/pitfall arrays. These techniques and continued night-driving, seining, and turtle trapping will allow us to increase our confidence in the estimates of absolute species richness because they will target species that are likely to be missed during a VES.

Fishes

The primary fish sampling effort will take place during low water in mid-late summer when fish are cut off from the river in oxbow lakes that may provide a refuge from predation. A crew of 4 from the INHS Center for Aquatic Ecology will visit the area for approximately one week (or longer if necessary). During this visit, the crew will sample fishes in multiple (up to 10) oxbow lakes (sloughs). Oxbows will be stratified to include replicates of "typical" lakes. Lakes will be selected during a preliminary visit in the winter of 1996-1997. All oxbows included within the intensive study plots (see sections describing birds, amphibians, and reptiles) will also be sampled for fish. Fish will be seined and trapped except where the water is too deep, in which case other methods will have to be used. Only a very small portion (less than 1%) of the fish will be caught. Dissolved oxygen will also be measured in the oxbows at 4:00 am the period of most likely oxygen depletion. All measurements and sampling will be repeated in the second year of the study. Additional measurements of dissolved oxygen will be made in midwinter under the ice. All fish will be preserved, taken to the River Research Laboratory, and identified.

A graduate student, Alison Hess, will also visit the river several times during the flood season to sample fish movements.

Mammals

Because of the great ecological and morphological diversity of mammals potentially occurring in the KRC, a variety of field methods will be necessary to conduct an initial inventory. A monitoring program can them be established that will focus on species of particular importance or concern. Sampling will take place both years.

Live trapping using Sherman live traps (7.5 x 8.75 x 22.5 cm) will be used to survey small rodents and large shrews (*Blarina brevicauda* and *B. carolinensis*) in the same ecological communities where intensive censuses of birds are conducted. Trapping will be conducted along line transects, with traps spaced 10 m apart and run 3 successive nights. Captured small mammals will be marked by either ear tags or small, dorsal fur clips to identify recaptures and allow comparisons of indices of abundance (captures per 100 trap-nights) between habitats. Live trapping using Tomahawk live traps (15 x 15 x 60 cm) will be used to survey squirrels. To capture squirrels, Tomahawk traps will need to be locked open and prebaited with walnuts for one week, followed by a week when traps are set each morning and checked each afternoon.

To survey habitats for small shrews (*Sorex, Cryptotis*), standard arrays of 4 pitfall traps connected by drift fences will be set up and run for 10 days each. Pitfall traps will consist of 25-cm deep, 4-liter cans sunk in the soil, and drift fences will be constructed from black, construction-grade vinyl, 2 m long and 25 cm high. Arrays will be set up in all habitats where soil moisture conditions permit (pitfalls can not be used where soils are wet). Moles will be detected by observation of their digging activities.

Medium-sized and large mammals will be surveyed by slowly driving the roads along KRC at night and scanning with high-powered spotlights. Spotlight surveys will be conducted at least 3 times before foliage becomes too dense for penetration by spotlight beams. Track stations will be set up along KRC in all habitats to record the presence of more elusive species. Track stations will consist 1-m diameter patches of smoothed sand or talc baited with a commercial scent attractant. Where track stations indicate the presence of species of particular interest (bobcat-*Felis rufus*, gray fox-*Urocyon cinereoargenteus*), Trailmaster cameras with infrared-beam triggers may be used to document species records. Track stations will be set and monitored for one night each month. Repeated surveys will indicate whether species are resident in the area, or records represent the activity of

transient individuals. Other mammal sign (tracks, scats, dens) will be recorded as encountered. Mammals associated with aquatic habitats (river otter-*Lutra canadensis*, beaver-*Castor canadensis*, muskrat-*Ondatra ziebethicus*) will be surveyed by searching river and stream banks for tracks and other sign.

Bats will be captured by mist-netting over streams and shallow sections of river. Black, nylon mist nets (3.75-cm mesh) will be suspended between a pair of pulleys attached to poles 6 or 9 m tall.

Vegetation sampling

Intensive Study Plots

Vegetation will be described within targeted community types in the Kaskaskia River study area with a combination of quantitative data from vegetation plot samples and floristic inventory data. Vegetation will be subsampled by strata including trees, shrubs and saplings, and ground-cover vegetation. The tree stratum at each intensive-sample site will be sampled with a stratified-random sampling procedure in relatively homogeneous vegetation (within each community type [*sensu* White and Madany 1978]) using eight to ten 0.05-ha (500 m^2) circular plots. Tree basal areas will be determined by measuring the diameter at breast height (dbh) of all woody plants ≥ 6 cm dbh. Density of shrubs (woody plants < 6 cm dbh but taller than 50 cm) will be measured in a single nested 0.005-ha (50 m^2) circular plot within each tree plot. Importance values (IV 200) for trees will be calculated by summing relative dominance and relative density; importance values for shrubs and saplings will be calculated by summing relative density and relative frequency.

Frequency and cover data for herbaceous species, seedlings (woody plants < 50 cm), and vines will be collected from 20 to 25 0.25-m^2 quadrats in each tree plot. These quadrats will be placed every meter along a line transect across a diameter of the tree plot that passed through the plot center. The orientation of the transect will be determined randomly. Cover of herbaceous species, seedlings, and vines will be estimated by cover class: 1 = 0-1%; 2 = 1-5%; 3 = 5=25%; 4 = 25-50%; 5 = 50-75:; 6 = 75-95%; 7 = 95-100%. Only plants rooted within the frame of the quadrat will be recorded. Importance values (IV 200) for ground-cover species will be determined by summing relative cover

and relative frequency. Bare ground will be measured using a point-intercept method (Mueller-Dombois & Ellenberg 1974). The point-intercept plot frame is a modified frame using five points which will be taken at one-meter intervals along the ground-cover transect. All vegetation sampling will be conducted between June and August.

Floristic inventory data using observational survey methods will provide an additional measure of species richness by adding species not found in quantitative plot sampling, including any threatened and endangered taxa, and assigning relative abundance values to each taxon (e.g., 1=rare, 2=occasional, 3=common, 4=abundant).

Extensive Sample Plots

Vegetation in the extensive survey effort will follow standard methods for bird studies. Community structure will be determined at each 0.05-ha census station from a pair of 2-m wide and 25.24-m long belt transects which pass through the center point of the census station. Trees and shrubs sampled in the transects will be identified and assigned to size-class intervals. The relative density for most common species will be determined. Percent cover of the ground cover vegetation will be empirically estimated at each 0.05-ha census station.

Literature Cited

Mueller-Dombois, D. & Ellenberg, H. 1974. *Aims and methods of vegetation ecology*. John Wiley & Sons, New York.

White, J. and M.H. Madany. 1978. Classification of natural communities in Illinois. Pages 310-405 (Appendix 30) *in*: White, J. Illinois Natural Areas Technical Report, Volume 1. Survey Methods and Results. Urbana. Illinois Natural Features Inventory.

Time Line

X = *Intense Activity*

M = Moderate Activity

O = Occasional Visits

		Assistants	Birds	Reptiles Amphibians	Plants	Fish	Mammals
1997	Jan						
	Feb			M			
	March	2		X			O
	April	2		X	O	O	O
	May	2	X	X	X	O	X
	June	2	X	M	X	O	O
	July	1-2	X	O	X	O	M
	Aug			O	M	X	
	Sept			O			
	Oct			O			
	Nov						
	Dec					O	
1998	Jan					O	
	Feb			X			
	March	1-2		X		O	O
	April	2		X		O	O
	May	2-3	M	X	X	O	O
	June	2-3	M		X	O	M
	July	1-2	M	M	X	X	
	Aug			O	M	X	

Sept-Dec: Data analysis and report writing.

Budget: FY 98

Personnel

Field Assistants: 2 @ $1,000/mo. x 3.5 mos. each (includes fringe benefits)	$ 7,000
Travel	
Mileage, per diems	1,641
Field Station Rental	450
Facilities and Administrative Costs	909
Total	$10,000

Field Assistants will work in July, 1997 (1 month) and April 15-June 30, 1998 (2.5 months)

Justification

University of Illinois undergraduates and graduate students will be hired for the field crew, which means that fringe benefits will include medicare only (<$1.00). These field assistants will work as a team and gather all data.

Biological Inventory of the Kaskaskia River Corridor:
Populations and Nesting Success of Birds. Year 1 (1997)

Scott K. Robinson, Illinois Natural History Survey,
607 E. Peabody Drive, Champaign, IL 61820

EXECUTIVE SUMMARY

The Kaskaskia River Corridor (KRC) between Fayetteville and Carlyle contains more than 30,000 acres of forest and includes the largest single tract of forest in the state. We inventoried bird populations in the KRC and measured nesting success of birds in the interior and edge of the corridor in 3 sites: the Fayetteville area, the Damiansville area, and the Venedy area. We predicted that the KRC would contain significant, regionally important populations of species characteristic of midwestern floodplain forest, a habitat that has undergone severe reductions since the 1960s. We further predicted that the interior of the widest, least disturbed sections would have high nesting success (low nest predation rates and levels of brood parasitism by Brown-headed cowbirds) compared with forests closer to edges and with more fragmented forest elsewhere in the state.

We censused breeding birds at 272 points in the 3 study areas. Overall, we detected 81 species, 62 of which breed regularly within the forested corridor. Of these 62 species, 27 spend the winter south of the U.S. in the tropics ("neotropical migrants"), 13 winter mainly in the southern U.S. and 22 are year-round residents in the KRC. Breeding bird densities were among the highest in the state and are only matched by floodplain forest in far southern Illinois. Of the birds detected during the censuses in each area, 54-60% were neotropical migrants. The KRC likely contains one of the two or three highest populations in the state of several rare, local, and declining species characteristic of floodplain forest, including the Red-shouldered Hawk, Red-headed Woodpecker, Cerulean Warbler (probably the state's largest population with 300-1100 pairs nesting mainly in mature oak-dominated forest), American Redstart (very abundant in younger forests dominated by maples and the largest population in the state), and Prothonotary Warbler (especially in sloughs). Several other species that are characteristic of both floodplain and upland forest were very abundant within the corridor, including the Acadian Flycatcher, Yellow-billed Cuckoo (erratic, but the abundance in the Venedy Area in 1997 was the highest ever recorded in Illinois), Barred Owl, Whip-poor-will, Ruby-throated Hummingbird (Fayetteville had the highest detection rates ever in Illinois), Red-bellied Woodpecker (especially in Fayetteville), Downy Woodpecker, Eastern Wood-Pewee, Great Crested Flycatcher (Damiansville and Fayetteville had among the highest abundances in the state), Carolina Chickadee, Tufted Titmouse, White-breasted Nuthatch, Carolina Wren, Blue-gray Gnatcatcher, Northern Cardinal, and Indigo Bunting. Oxbow lakes (sloughs) contained breeding Green Herons, Wood Ducks, Hooded Mergansers, Gray Catbirds, White-eyed Vireos, Warbling Vireos, Yellow

Warblers, Common Yellowthroats, Song Sparrows, Baltimore Orioles, and Red-winged Blackbirds.

Some species that might have been expected were absent (e.g., Yellow-crowned Night Heron and Louisiana Waterthrush) or somewhat less abundant than expected (e.g., Wild Turkey, Hairy Woodpecker, Pileated Woodpecker, Fish Crow, Brown Creeper, Yellow-throated Vireo, Red-eyed Vireo, Northern Parula, and Yellow-throated Warbler). Other species that seem to be rare statewide in floodplain forest were also rare or absent in the KRC (e.g., Broad-winged and Cooper's Hawks, Hooded Warbler, Black-and-white Warbler, Blue Jay, Scarlet Tanager, Summer Tanager, and Ovenbird). Kentucky Warblers and Wood Thrushes, both of which forage on the ground, were, as expected, confined mainly to upland areas, especially around Venedy.

Several avian nest predators and the Brown-headed Cowbird were much less abundant than expected. Blue Jays, American Crows, Fish Crows, and Common Grackles all occurred at low population densities. The cowbird, which lays its eggs in the nests of other species, was detected at a much lower rate than usual for Illinois, especially in the Venedy area. These data suggest that cowbirds may be less of a problem for birds in the KRC than they are elsewhere in the state.

Overall, we located and monitored the success of more than 400 nests in 1997, of which the majority were Yellow-billed Cuckoos, Acadian Flycatchers, Wood Thrushes, Prothonotary Warblers, Northern Cardinals, and Indigo Buntings. Nest predation rates varied among species and study areas, but were generally lower than usual for Illinois, and were low in all 3 areas for the Yellow-billed Cuckoo, Prothonotary Warbler, and Indigo Bunting. Each study area had species with unusually high nesting success (Acadian Flycatcher in Venedy, Northern Cardinal in Damiansville, Indigo Bunting in Fayetteville). Acadian Flycatchers, however, suffered higher-than-average predation rates in Damiansville and Fayetteville and Northern Cardinals suffered unusually high predation rates in Venedy and Fayetteville. Within sites, nest predation rates were almost always lower in the forest interior than they were close to agricultural edges (8 of 9 comparisons) and in recently logged areas (4 of 5 comparisons).

Levels of cowbird parasitism were either much lower than usual or, at worst, typical for the more forested regions of southern Illinois. The Venedy area, which had the fewest cowbirds, also had the lowest levels of parasitism yet recorded in Illinois for the Wood Thrush, Prothonotary Warbler, Northern cardinal, and Acadian Flycatcher. Parasitism levels in the Fayetteville area were lower than usual for the state, but were higher than those in Venedy. Parasitism levels were highest in the Damiansville area where pastures provide feeding habitat for cowbirds, but levels were still below those in more fragmented forest in the state. Parasitism levels were lower in the forest interior of all 3 sites than they were close to agricultural edges (7 of 8 comparisons) and in recently logged areas (3 of 4 comparisons).

These results demonstrate that the KRC: (1) contains regionally significant populations of several rare, local, and declining species characteristic of floodplains and

(2) contains extensive areas of forest interior in which nesting success is high because nest predation rates and levels of cowbird parasitism are low. These results suggest that the KRC should be a high-priority area for the conservation of potentially viable populations of forest birds. Future management recommendations will likely focus on: (1) maintaining sufficient mature, oak-dominated forest to maintain populations of such species as Cerulean Warbler and Red-headed Woodpecker, (2) maintaining "forest-interior" habitat within the KRC to enhance nesting success, and (3) maintaining sloughs and lakes.

INTRODUCTION

The Kaskaskia River Corridor, (KRC) between Fayetteville and Carlyle contains over 30,000 acres of forest and the largest single tract of forest in Illinois. For these reasons, the KRC has outstanding potential for maintaining significant populations of floodplain forest birds. Loss of floodplain forest habitat has been especially severe in the Midwest and most remaining floodplain forests are small and grow in areas in which levees have severely altered natural flooding cycles. The KRC contains the largest remaining contiguous tract of floodplain forest in the state and has no levees to restrict access of floodwaters to the surrounding floodplain. As such, the KRC has reasonably natural flood "pulses", which create wildlife habitats for many species.

The large size of the KRC forest between Fayetteville and Okawville (up to 5 km wide in some places) also provides potential "forest interior" conditions in which breeding birds can escape the negative consequences of forest fragmentation. For many birds nesting in Illinois' forests, nesting success is so low that populations are almost certainly not self-sustaining. Nest predators such as raccoons, Blue Jays, and rat snakes thrive in the small, edge-dominated forest tracts characteristic of most of Illinois. As a result, nest predation rates in Illinois are much higher than they are elsewhere in the Midwest; for many forest species, nest predators consume 60-90% of the eggs and nestlings. The brood parasitic Brown-headed Cowbird also thrives in small, fragmented forests. Cowbirds lay their eggs in the nests of more than 200 "host" species, which then raise cowbirds in place of their own young. Cowbirds do not feed in the forest; they feed mainly in pastures and commute up to 3 miles to breeding areas inside the forest. No forest tracts in Illinois are more than 3 miles from pastures or other feeding habitats such as row crop fields, mowed grass, and bird feeders. As a result, cowbird parasitism levels are high state-wide, and are even higher adjacent to areas where cowbirds forage. Effects of fragmentation are especially severe for migratory songbirds because most have short nesting seasons, build "open cup" nests that are easily accessible to nest predators and cowbirds and most accept cowbird eggs. Year-round resident birds tend to nest in cavities in trees (e.g., woodpeckers, nuthatches, chickadees, titmouses, wrens) and have long nesting seasons (April-September) in which they have many opportunities to escape predators and cowbirds. Forest fragmentation has often been cited as a likely cause of long-term population declines in some migratory songbirds and of the absence of many migrants from small woodlots ("area sensitivity"). Potentially, the KRC may be wide enough to provide interior conditions in which nest predators and cowbirds are less abundant and nesting success is higher than usual in Illinois.

The purpose of this study is to measure (1) the populations of breeding birds, and (2) the nesting success of forest birds within the KRC. We predicted that the KRC would contain large populations of typical floodplain species and that levels of nest predation and cowbird parasitism would be lower in the forest interior and lower than usual for Illinois. At the end of the report, we describe future research needs in the KRC.

STUDY AREAS

Field work during the 1997 field season (1 May – 23 August) took place at three general areas: (1) the northwestern section of the largest tract southeast of Fayetteville (hereafter referred to as "Fayetteville"), (2) the northeastern section of the same tract south of Damiansville (hereafter referred to as "Damiansville"), and (3) the southcentral section of the largest tract north of Venedy (hereafter referred to as "Venedy"). These three areas were chosen because they represent three different sections of the largest forest tract in the state of Illinois. Fayetteville includes a large section of floodplain forest, much of which is close to the agricultural fields that border the KRC forest. The area contains several outstanding meander loops, several restored and unrestored sloughs (oxbow lakes), several stands of old growth forest (including a stand owned by The Nature Conservancy), and extensive tracts of mature forest, most of which has not recently been logged. Post Oak flatwoods and other upland plant communities are present around some clubhouses. Damiansville contains extensive tracts of mature floodplain forest but also contains a number of agricultural openings, a pasture, and residential openings. Several restored and unrestored sloughs were present in the area, and several tracts contained what appeared to be old growth timber as well as several areas that had recently been logged. Venedy sites are deep in the interior of the largest tract and contain a diverse array of open-water lakes, sloughs with varying amounts of woody growth, an extensive Post Oak flatwood, extensive Pin Oak-dominated "second bottoms", logged and unlogged floodplain forest, and Bur Oak-dominated swamps. More complete descriptions of the vegetation and other characteristics of the study areas will be forthcoming in the final report for Year 2 of this project. Field work was conduted in 300-800 acre sections of each study area. All intensive work was conducted on private land; we are grateful to all of the landowners who allowed us to work on their property.

FIELD METHODS

Field work was conducted during June of 1994 (census only), May-June of 1996 (census only), and 5 May – 23 August, 1997 (censuses and nesting studies). The field crew for nesting studies consisted of Stavros Daniels (crew leader), Leonardo Chapa, and Joseph Siegrist. Chapa is working on his Ph.D. dissertation at the University of Illinois and Siegrist was completing a Senior Honor's Thesis at Millikin University. Censuses were conducted by Scott Robinson (1994, 1996, 1997), Dan Niven (1996), Leonardo Chapa (1997), Jeannette Morss (1997) and David Meisenheimer (1997).

(1) Census methods involved the fixed-radius point count method during which observers stand at a point for 5 minutes and record all birds heard or observed

within a circle of 70-m radius around the point. Census points were located at least 150 m apart; most were at least 250 m from any other point to minimize multiple registrations of the same bird. The number detected/10 point counts gives a reasonable index of abundance that can be compared within and among sites for the same species. Points were arranged along transects designed to give the study areas systematic coverage, including all forest types present (e.g., Post Oak flatwoods, Pin Oak second bottoms, younger forest on meander tongues and in logged areas, mature floodplain forest, bur oak and silver maple sloughs, edges of larger lakes, edges of agriculture, and natural levees along river edges). During this study, 272 points were censused (see Appendix for distribution among sites).

(2) Nesting studies. A field crew of 3 rotated among study sites at 3-day intervals. Members of the crew searched for nests and monitored the fates of nests previously located. Nests were mapped with respect to census transects and distances to various edges (lakes, river, agricultural fields). Each time a nest was visited, its contents were checked and identified (cowbirds versus hosts) until the young either fledged or were consumed by predators. The field crew located 414 nests of 29 species during the 1997 field season. Nest predation rates are presented as the % nests taken by predators each day (The "daily predation rate" DPR). For most species, DPRs of less than 3% (less than 50% of nests depredated) represent background levels of predation likely to occur regardless of fragmentation. Any DPR over 6% represents losses of more than 80% to predators, a level far higher than normal, and probably more than most populations can sustain over the long term.

RESULTS AND DISSCUSSION

Censuses

General composition of the bird community. During the censuses, 81 species were recorded (Appendix). Of these, 6 were only recorded flying overhead (Double-crested Cormorant, Chimney Swift, Barn Swallow, Northern Rough-winged Swallow, Red-tailed Hawk), 9 were only recorded in adjacent farm land (Turkey Vulture, American Kestrel, Northern Bobwhite, Eastern Kingbird, Brown Thrasher, Yellow-breasted Chat, Chipping Sparrow, and Field Sparrow), and 4 were so rarely recorded that their presence in the forest may not represent breeding birds (Brown Creeper, Cedar Waxwing, Solitary Vireo, and American Goldfinch). Several other species were noted within the study areas, but not during censuses (Little Blue Heron, Great Egret, American Woodcock, Eastern Screech-Owl, Great Horned Owl, and Common Nighthawk), most of which are nocturnal. Surrounding farmland also had abundant Dickcissels and at least 3 sites Loggerhead Shrikes were observed regularly. Of the 62 regular forest species, 27 are neotropical migrants (winter in the tropics), 13 are short-distance migrants (winter mainly in southern U.S.), and 22 are year-round residents.

General patterns of abundance. Census data suggest that the KRC has some of the highest densities of breeding birds in the state (Appendix). The number of detections/10 point ranges from 159-174, values matched only by floodplain forest in the Cache River and Cave/Cedar Creek areas of southern Illinois. Of these detections, 54-60% are neotropical migrants that are only present during the breeding season; these values are typical for Illinois' forests. Most sites have a few very abundant species (>5 per 10 points) and many rare species (<1 detection per 10 points). Roughly half of the birds detected at each site nest in cavities; the rest build open-cup nests.

Abundant species of typical floodplains. The KRC contains some of the highest populations I have recorded in the state for several typical floodplain species, including the following:

1. Red-shouldered Hawk. This species, which is on the state threatened list, was heard regularly at all 3 sties, but was most frequently heard in the Venedy area. It is the only common forest hawk; Red-tailed, Cooper's and Broad-winged Hawks were not detected within the forest. Although we found no nests, Red-shouldered Hawks almost certainly breed throughout the KRC and appear to tolerate moderately disturbed sites. The KRC is one of the strongholds for this species in Illinois.
2. Red-headed Woodpecker. This nationally declining species remains abundant in the KRC, especially in the Fayetteville area. Although tolerant of disturbance, this species depends upon acorns for much of the year. Red-headed Woodpeckers also nest in Post Oak flatwoods, but in small numbers. The 6.8 detections/10 points in the Fayetteville area is one of the highest abundances in the entire state; in this area, they prefer extensive, relatively mature floodplain forest, but will also forage extensively along edges.
3. Acadian Flycatcher. This species is very abundant statewide in floodplain and mesic forest; this is the most abundant bird at most sites. Values for this species are typical for Illinois floodplains.
4. Cerulean Warbler. The KRC probably contains the highest total population of this seriously declining species. The Cave/Cedar Creek floodplain of the Shawnee National Forest has a higher population density, but the KRC is much larger. Cerulean Warblers inhabit most of the taller, older sections of the forest, including Bur Oak stands, tall levee forest, White Oak-dominated forests of drier areas, Pecan-dominated floodplain forest, and any other sites characterized by tall, old oak trees (even some Pin and Post Oak sites). They are absent from younger forest, heavily logged areas (unless clumps of tall trees are left uncut), Silver Maple stands, and stunted Post Oak flatwoods. They tolerate clubhouses well, often nesting right over yards. Based on an estimated average of 2.5 pairs/38.5 acres (1.9-3.2 detections/10 70-m radii point counts, which is roughly 15.4 ha, or 38.5 acres), the 17,000 acre KRC forests may could contain as many as 1100 pairs, although the total population is likely a less assuming that many sections of the KRC are younger and more heavily logged than those we studied. A conservation estimate would be 300 pairs.

5. American Redstart. This species of the upper canopy is the most abundant warbler in the floodplain and in some areas (e.g., Fayetteville) rivals the Acadian Flycatcher for "most abundant bird" status. Unlike the Cerulean Warbler, which strongly prefers older forest, redstarts are most abundant in younger forests dominated by Silver Maple and Boxelder. Originally they were probably confine to the young forest at the tip of meander tongues and in sloughs that are filling in with woody vegetation. Logging activities, however, also favor this species, and have enabled it to nest throughout the KRC. The total KRC population of this species may number over 5,000 pairs, which makes it, by far, the largest population of this species in Illinois. Elsewhere in Illinois, the redstart is extremely patchy and only nests abundantly along the Mississippi River and in a widely scattered sites along a few other smaller rivers.
6. Prothonotary Warbler. This typical floodplain species is abundant near sloughs, lakes, and other backwaters. They also nest along some sections of the river channel. Abundances of this species are typical of natural floodplains; some highly disturbed forests along the Mississippi River have higher population densities, but only because massive tree die-offs temporarily create superabundant nesting habitat. Many, but not all nests are in snags standing in water.
7. Wood Duck. This species nests abundantly in most lakes; large, fledged families are a common sight in sloughs and lakes throughout the 3 study areas.
8. Hooded Merganser. Although much less abundant than the Wood Duck, fledged families of this species were found on several sloughs. The KRC likely contains one of the largest populations in the Illinois, a state in which Hood Mergansers are rare breeders.
9. Great Blue Heron. This typical wetland species is common in all lakes and along the river. No rookeries were located within our study areas.

Other Abundant Species. Some of the most abundant species in the KRC are not confined to floodplain forest.

1. Yellow-billed Cuckoo. This nomadic species, which is declining nationally, is abundant in some years. In 1997, they were often seen feeding in Hackberries. In 1994, however, only a few were detected in an extensive June census in the Venedy area. Large floodplain forests such as the KRC may be extremely important in maintaining the region-wide population, especially during years when foraging conditions (caterpillar outbreaks) in the more abundant upland forests are not good. The population density in the Venedy area in 1996-1997 was, by far, the highest I have ever recorded in the state. Although cuckoo populations are very difficult to estimate, the total nesting population in the KRC in 1997 undoubtedly numbered in the thousands of pairs.
2. Barred Owl. This common forest owl of Illinois is also abundant throughout the KRC.
3. Whip-poor-will. This species nests on the ground, especially in drier, upland areas along edges.

4. Chimney Swift. Forages regularly over the forest; we found no natural cavity nests.
5. Ruby-throated Hummingbird. This relatively common species of forests is very abundant in the KRC in virtually all forest types. The 4.2 dections/ 10 points in the Fayetteville area is the highest value yet recorded in the state.
6. Red-bellied Woodpecker. Abundant statewide, this species is especially common in floodplain forests such as the KRC. The detection rate in the Fayetteville area is among the highest in the state.
7. Downy Woodpecker. This abundant woodpecker is roughly twice as abundant in the KRC than in most Illinois forests.
8. Eastern Wood-Pewee. This flycatcher is abundant throughout the KRC and is one of Illinois' most abundant and widespread forest birds. The Damiansville area has an unusually high population density for floodplain forests.
9. Great Crested Flycatcher. Another widespread species throughout the state, this cavity-nesting flycatcher is most abundant in floodplain forests. The Fayetteville and Damiansville areas have among the highest population densities in the state.
10. Carolina Chickadee. The KRC has an unusually high population density of this very abundant species, especially in the Damiansville area.
11. Tufted Titmouse. This very abundant species is often the most abundant breeder in upland forests. The KRC area has typically high abundances of this species.
12. White-breasted Nuthatch. The KRC has roughly the same population densities of this very common and widespread species as virtually every other forest tract in Illinois.
13. Carolina Wren. Although this species nests commonly throughout the KRC, it is less abundant than in some other swamps in southern Illinois.
14. Blue-gray Gnatcatcher. One of southern Illinois' most abundant forest birds, it is also very abundant throughout the KRC. In the Damiansville area, it is the most frequently detected bird.
15. Northern Cardinal. The population densities of this bird in the KRC, which nests virtually everywhere in Illinois, are among the highest ever recorded in a forest habitat.
16. Indigo Bunting. Usually, this abundant species nests only in more disturbed habitats. In the KRC, however, it nests throughout the forest interior where it is one of the 5-10 most abundant species in all study areas.

Less abundant than expected. A few species that are often common in floodplain forest were less abundant than expected in the KRC.

1. Green Heron. Although they were detected in several sloughs, they were rarely noted during censuses.
2. Yellow-crowned Night Heron. No individuals of this State Endangered species were detected in any of the sites.
3. Turkey Vulture. Only rarely observed soaring overhead.
4. Wild Turkey. This species was only rarely encountered, although one nest was located.

5. Hairy Woodpecker. This woodpecker is usually more common in floodplain than in upland forests, but abundances in the KRC were lower than usual.
6. Pileated Woodpecker. This woodpecker was detected at low population densities at all three sites. Only in the Fayetteville area was their abundance comparable to usual values for southern Illinois (1-2/10 point counts).
7. Eastern Phoebe. This species nested in many clubhouses, but we found little evidence of "natural" breeding in riverbanks.
8. Fish Crow. We had only a few widely scattered records of this floodplain species, which is at the northern limit of its range.
9. Brown Creeper. Only one individual of this state threatened species was recorded.
10. House Wren. Mostly restricted to clubhouses, this species was only rarely detected in its "natural" habitat—piles of driftwood and logjams along river channels.
11. Yellow-throated Vireo. Another species that is often more abundant in floodplains than in uplands, population densities in the KRC were only about half as high as expected.
12. Red-eyed Vireo. Like the Yellow-throated Vireo, the Red-eyed Vireo was only about half as abundant as usual for Illinois.
13. Northern Parula. Although found at all sites, this Sycamore-preferring warbler is usually more abundant in floodplain than we detected in our KRC censuses.
14. Yellow-throated Warbler. As with the Northern Parula, the low population densities of this species may result from the relative scarcity of Sycamores.
15. Common Grackle. An abundant species of floodplain forests elsewhere in Illinois, the Common Grackle was only infrequently recorded in the KRC.
16. Mississippi Kite. We detected none, which suggests that this species has not yet colonized this area at the northern edge of their breeding range.

Species typically rare or absent in floodplain forests. Many characteristic species of upland forests are rare in floodplain forests statewide. Our intensive studies in the KRC confirmed that Cooper's and Broad-winged Hawks, and Hooded and Worm-eating Warblers avoid floodplain altogether. Other species that are usually much less abundant in floodplains than in uplands were also rare in the KRC, including Wood Thrushes and Kentucky Warblers (ground foragers confined to flatwoods, areas on the edge of the floodplain, and high natural levees that seldom flood), Ovenbirds (nested only in upland areas on the edge of the floodplain), Louisiana Waterthrush (not detected in the KRC), Blue Jay, Summer Tanager, and Scarlet Tanager. Interestingly, many of these species are preferred cowbird hosts. Some of these species were most abundant around the Venedy area, which has the most extensive uplands in the KRC.

Species mostly confined to oxbow lakes. In addition to the wetland birds already described, several landbirds were mainly confined to shrubby, open vegetation along oxbow lakes/sloughs. These include Gray Catbird (also in a few recently logged areas), White-eyed Vireo (logged areas also), Warbling Vireo, Yellow Warbler, Common

Yellowthroat, Song Sparrow, Baltimore Oriole (rare), and Red-winged Blackbird (very abundant).

Abundances of cowbirds and avian nest predators. Somewhat surprisingly, avian nest predators and cowbirds were generally rare in the KRC. Blue Jays were mainly present in upland areas, American Crows were rare throughout, and Common Grackles were much less abundant in the KRC than they were in most other floodplain habitats in the state. Fish Crows, which are at the northern edge of their breeding range, were also detected only a few times all summer. American Crows rarely enter upland forest in Illinois, but sometimes forage and nest in floodplains. Crows, however, seemed not to spend much time searching for nests in the canopy in the KRC.

Brown-headed Cowbird populations were the lowest ever recorded in Illinois. The typical values for Illinois range from .03-.09 female cowbirds per host. The values of .004-.018 recorded in the KRC are well below this range. Even the absolute abundances of 0.3-1.5 cowbird females/10 points are below the usual range of 2-4 cowbirds/10 points. These results suggest that cowbirds are both less abundant and more "dilute" in the KRC than they are in other forest habitats in Illinois. It is worth noting, however, the "prime" cowbird hosts (those that usually contain multiple cowbird eggs/nest: Wood Thrush, Red-eyed Vireo, Yellow-throated Vireo, Kentucky Warbler, Worm-eating Warbler, Scarlet Tanager, Summer Tanager) are rare in the KRC. The most abundant hosts are amongst the least heavily parasitized species in the state and rarely incubate clutches with more than a single cowbird egg (e.g., Eastern Wood-Pewee, Acadian Flycatcher, Northern Cardinal, Indigo Bunting, American Redstart). The ratio of cowbirds to "prime" hosts in Fayetteville (0.18) and Damiansville (0.14) are typical for the state. The ratio for Venedy (0.03), however, is extremely low, which suggests that even preferred hosts should not be heavily parasitized in this area.

NESTING SUCCESS

Although we found over 400 nests (Table 1), we only have enough data for detailed comparisons of nesting success of Yellow-billed Cuckoos, Acadian Flycatchers, Wood Thrushes, Prothonotary Warblers, Northern Cardinal and Indigo Buntings. The extremely tall canopy of the forest made it impossible to study species that nest in the upper canopy (e.g., American Redstart, Cerulean Warbler, Red-eyed Vireo).

Nest predation: General patterns. Nest predation rates varied among species and sites, but were generally lower than usual for Illinois (Table 2). Yellow-billed Cuckoos, for example, had a daily predation of only 0.9 (106 exposure days) for all sites combined, which translates to a loss of only 17% of its nests to predators. Typically, values for this species range from 3-4.5% of nests lost per day (46-60% losses to predators). Acadian Flycatchers suffered high predation rates in two sites (Damiansville: 6.0% Daily Predation Rates (DPR) = 81% of nests lost to predators; Fayetteville: 5.0% daily = 75% lost to predators), but had low predation rates (2.2% daily = 45% overall) in Venedy. Prothonotary Warbler losses were consistent among sites and relatively low (2.9-3.2% daily = 49-53% overall) compared with many sites in the Cache River. Northern

Cardinal predation rates were unusually low in Damiansville (3.1% daily = 50% overall), but were unusually high in Fayetteville and Venedy (7.5-7.6% daily = 82% overall). Indigo Bunting nest predation rates were low in all three sites; Fayetteville (2.1% daily = 37% overall) had the lowest overall predation rate of any site in Illinois. Even losses in Damiansville (3.7% daily = 56% overall) and Venedy (4.6% daily = 65% overall) were low for this species, which typically loses 65-95 % of its nests to predators in other parts of the state. White-eyed Vireos had lower predation rates in the Venedy Area (2.8% daily = 51% overall) than usual elsewhere in southern Illinois (55-75%). Clearly, nest predation is a problem for some species in each of the sites but each site also has species that are nesting successfully: Yellow-billed Cuckoo in all 3 sites, Acadian Flycatcher in Venedy, Prothonotary Warbler in all 3 sites, Northern Cardinal in Damiansville, Indigo Bunting in all 3 sites (but especially in Fayetteville).

Nest predation rates in relation to edges. In general, predation rates were higher near agricultural edges and in recently logged areas, but there were exceptions (Table 3). Acadian Flycatchers, for example, had significantly ($P<0.05$) higher predation rates within 100m of agricultural edges in Fayetteville and Venedy combined. But, in Damiansville, predation rates were significantly lower near agricultural edges. For this species, nest predation rates were high even in the forest interior of Damiansville (5.0% daily=75% overall), but dropped to 2.7% daily (=52% overall) in the forest interior of Fayetteville and to 1.8% (=39% overall) in the forest interior of Venedy. Predation rates were significantly higher in recent logged sections of Damiansville (14.6% daily=99% overall), but this is based on a very small sample size (Table 3).

Prothonotary Warblers had much higher predation rates near agricultural edges (5.8-6.9% daily=76%-82% overall) than in the forest interior in Fayetteville (2.4% daily=44% overall) and Venedy (1.4% daily=29% overall). This strong negative edge effect may reflect the preference of raccoons, its major nest predator, for agricultural edges.

Northern Cardinals also had much higher predation rates near agricultural edges (10.9-11.15 daily=93% overall) than in the forest interior (2.6-6.7% daily=45-80% overall). Predation rates in recently logged areas of Venedy, however, were not unusually high (5% daily=69% overall).

Indigo Buntings also had lower predation rates in the interior of all 3 sites (0-3.4% daily; 2.4% daily all sites combined) = 41% overall) than close to agricultural edges in Venedy (12.9% daily = 95% overall) and in selective cuts in Damiansville (4.1% daily = 60% overall) and Venedy 10.2% daily = 91% overall). In Fayetteville, however, nest predation rates were relatively low in selective cuts (2.5% daily = 43% overall) and near agricultural edges (3.3% daily = 52% overall).

In summary, nesting success is nearly always higher in the forest interior than close to agricultural edges (8 of 9 comparisons) and in recently logged sections (4 of 5 comparisons). These data demonstrate the value of the forest interior conditions present in much of the KRC. Areas near edges and those that have recently been logged,

however, are not uniformly bad for nesting success. We have much to learn about why there is so much variation in the nesting success of birds near agricultural edges and in logged areas.

Cowbird parasitism: General patterns. Cowbird parasitism levels were relatively low throughout the KRC (Table 4). Parasitism levels in the Venedy area were among the lowest ever recorded in the state for the Wood Thrush (0%), Acadian Flycatcher (9%), Prothonotary Warbler (14%), and Northern Cardinal (9%), although parasitism levels of Indigo Buntings were typical of those in more forested sections of southern Illinois. These results are consistent with the very low cowbird: host ratio in the Venedy area. The absence of cowbird eggs in the 4 Wood Thrush nests located is extraordinary; statewide, parasitism levels average 88% with 2.4 cowbird eggs/nest. Parasitism levels in the Fayetteville area were low for the Acadian Flycatcher (15%) and, to a lesser extent, for the Prothonotary Warbler (19%), Northern Cardinal (22%), and Indigo Bunting (24%). Parasitism levels in the Damiansville area were relatively high for the Acadian Flycatcher (42%) and Prothonotary Warbler (44%), but were only moderate for the Indigo Bunting (39%) and relatively low for the Northern Cardinal (19%). These data are generally consistent with the greater relative abundance of cowbirds in the Damiansville area where there are pastures adjacent to the forest.

Parasitism levels in relation to edges. Parasitism levels were usually higher close to agricultural edges and in recently logged areas (Table 5). Except in Fayetteville, parasitism levels in Acadian Flycatchers were more than twice as high near agricultural edges. This trend was most clear in Damiansville where there are pastures, but the difference was not statistically significant (P=0.085, Fisher Exact Test). Prothonotary Warblers also suffered much higher levels of cowbird parasitism near agricultural edges in Fayetteville (P=0.004) and Venedy (P=0.019). Northern Cardinals and Indigo Buntings also showed non-significant trends toward higher parasitism levels near agricultural edges in Fayetteville and Venedy.

Although there are few data, parasitism levels in recently logged areas were higher in Damiansville for Acadian Flycatchers and Indigo Buntings and in Venedy for Acadian Flycatcher.

In summary, parasitism levels were lower in the forest interior in 7 of 8 comparisons and higher in selective cuts in 3 of 4 comparisons (excluding sites in which only a single nest was found in a category). These data support the conclusions from data on nest predation: the KRC has forest interior habitat in which nesting success in unusually high.

PRELIMINARY MANAGEMENT RECOMMENDATIONS

The KRC contains some of the most significant populations in Illinois of several rare, local, and declining species. The KRC also contains forest interior conditions that have some of the lowest levels of nest predation and brood parasitism ever recorded in the state. The large size of the KRC is vital to maintaining and enhancing its value to birds. Because it is large, the KRC has extensive areas far from agricultural openings and

it contains large populations of birds nesting under some of the best conditions available in the state. The KRC may be a vital to maintaining regional populations of several species.

A complete set of management recommendations will accompany the final report for the project, which will include at least one more year of data. It seems clear, however, that three general guidelines should be followed:

(1) Maintain a significant percentage of the KRC in older forest dominated by oaks (especially Bur Oaks) and hickories (especially Pecans). These areas will be vital for Cerulean Warblers and Red-headed Woodpeckers, among other species. Future work will be directed toward developing guidelines for the minimum extent of mature forest that would maintain populations of key species.

(2) Keep the KRC as wide as possible in the core area by minimizing agricultural openings. Nesting success is negatively affected by some (but not all) agricultural openings, and is very high in the widest sections of forest. The KRC is already one of the two best areas in the state for nesting success of forest birds in Illinois. For this reason, managing to maintain a forested core area is more likely to be successful than in other areas of the state.

(3) Maintain oxbow lakes. Oxbow lakes create habitat for many wetland birds and for terrestrial birds of wet, shrubby habitats. Nesting success of birds also seems to be high in and near oxbow lakes. Lakes with shrubby borders and emergent vegetation seem to provide the best habitat for birds.

FUTURE RESEARCH DIRECTION BIRDS
Near-term (1998)

1. Completing the inventory (censusing). The willingness of landowners to allow us to census birds on their property far exceeded our ability to follow through, even when we "borrowed" personnel from another project. For this reason, we will continue and, perhaps, expand our census efforts in 1998 to include all of the tracts that are available to us. Such censuses will enable us to locate more populations of focal species such as the Cerulean Warbler and continue searching for other rare birds and measuring the abundance of cowbirds in various parts of the forest.
2. Continuing studying nesting success. In our original plan, we had only planned a single year of studying the nesting success of birds. The exciting results from 1997, however, make a second field season imperative. We need a second field season to accomplish the following goals:
    a. Add replicate sites to test the generality of patterns from 1997.
    b. Increase sample sizes of nests adjacent to edges and deep in the forest interior.
    c. Determine how far from agricultural openings high levels of parasitism and predation persist.

d. Increase sample sizes of nests from recently logged areas.

Long-term(after 1998)

After determining the basic patterns of distribution, abundance, and nesting success, possible research topics include:

1. Nesting success relative to forest age, composition, and structure. This research will help determine the best way to log areas and how long it takes after logging for a bird community to recover.
2. Tree species use of forest birds. This research could help identify particularly important tree species for restoration and for leaving behind in selective cuts.

Table 1. Nest located in each region of the Kaskaskia River Corridor, May-August, 1997.

Species	Damiansville	Mascoutah	Venedy	Total
Wood Duck	2	3	0	5
Hooded Merganser	0	1	0	1
Wild Turkey	1	0	0	1
Mourning Dove	0	2	1	3
Yellow-billed Cuckoo	5	4	4	13
Whip-poor-will	0	0	3	3
Red-headed Woodpecker	0	1	0	1
Red-bellied Woodpecker	1	0	0	1
Downy Woodpecker	1	2	0	3
Northern Flicker	1	0	0	1
Acadian Flycatcher	39	32	36	107
Eastern Phoebe	2	3	0	5
Great Crested Flycatcher	0	1	0	1
Carolina Chickadee	2	2	1	5
Carolina Wren	1	1	0	2
House Wren	0	1	0	1
Blue-gray Gnatcatcher	1	0	1	2
Eastern Bluebird	1	0	1	2
Wood Thrush	1	3	5	9
Gray Catbird	0	1	0	1
Brown Thrasher	0	1	3	4
White-eyed Vireo	0	0	4	4
Cerulean Warbler	0	1	0	1
American Redstart	2	3	1	6
Prothonotary Warbler	9	24	34	67
Kentucky Warbler	1	0	3	4
Northern Cardinal	18	19	13	50
Indigo Bunting	23	48	39	110
Field Sparrow	0	2	1	1
Total	111	153	150	414

Table 2. Daily nest predation rates in the three major regions of the Kaskaskia River. Values with the same letter (a, b, c) are statistically indistinguishable by the program CONTRAST.

	% Nests depredated per day ± SD (exposure days)		
Species	Damiansville	Mascoutah	Venedy
Yellow-billed Cuckoo	2.0 ± 2.0 (49.5)[a]	0 (32)[a]	0 (25)[a]
Acadian Flycatcher	6.0 ± 1.2 (385)[a]	5.0 ± 1.1 (383.5)[a]	2.2 ± 0.6 (511)[b]
Prothonotary Warbler	3.1 ± 1.5 (130)[a]	3.2 ± 1.1 (279)[a]	2.9 ± 1.0 (307.5)[a]
Northern Cardinal	3.1 ± 1.5 (225.5)[a]	7.6 ± 2.0 (170.5)[b]	7.5 ± 2.9 (80.5)[b]
Indigo Bunting	3.7 ± 1.4 (191)[a,b]	2.1 ± 0.6 (473.5)[a]	4.6 ± 1.2 (282)[b]
White-eyed Vireo	----	----	2.8 ± 2.0 (71)

Table 3. Daily nest predation rates of species in different habitats.

		Daily Predation Rate (%) ± SD (exposure days)			
Species	Site	Forest Interior	<100m from Agriculture Edge	Selective Cut	All Human Disturbed Forest Types
Acadian Flycatcher	Damiansville	5.0 ± 1.3 (279)	1.4 ± 1.4 (71)	14.6 ± 7.8 (21)	----
	Mascoutah	2.7 ± 1.0 (259)	6.6 ± 2.4 (107)	----	----
	Venedy	1.8 ± 0.6 (451)	5.0 ± 2.8 (61)	----	----
	Total	2.9 ± 0.5 (989)	4.6 ± 1.4 (239)	14.6 ± 7.8 (21)	5.4 ± 1.4 (259)
Prothonotary Warbler	Damiansville	3.1 ± 1.5 (130)	----	----	----
	Mascoutah	2.4 ± 1.1 (210)	5.8 ± 2.8 (70)	----	----
	Venedy	1.4 ± 0.8 (220)	6.9 ± 2.7 (88)	----	----
	Total	2.1 ± 0.6 (560)	6.4 ± 2.0 (158)	----	----
Northern Cardinal	Damiansville	2.6 ± 1.3 (155)	----	----	----
	Mascoutah	6.7 ± 2.2 (135)	11.1 ± 5.2 (36)	----	----
	Venedy	5.7 ± 3.2 (53)	10.9 ± 5.9 (28)	5.1 ± 5.0 (19.5)	----
	Total	4.7 ± 1.1 (343)	11.0 ± 3.9 (64)	5.1 ± 5.0 (19.5)	9.6 ± 3.2 (83)
Indigo Bunting	Damiansville	0 ± 0 (56)	----	4.1 ± 2.3 (73)	----
	Mascoutah	2.2 ± 0.8 (365)	3.3 ± 2.3 (61)	2.5 ± 2.5 (40)	----
	Venedy	3.4 ± 1.2 (236)	12.9 ± 5.4 (16)	10.2 ± 5.5 (30)	----
	Total	2.4 ± 0.6 (657)	5.2 ± 2.5 (77)	4.9 ± 1.8 (143)	5.3 ± 1.4 (245)

Table 4. Parasitism levels in each region of the Kaskaskia River Corridor, May-August, 1997.

	% Nests Parasitized (n)		
Species	Damiansville	Mascoutah	Venedy
Acadian Flycatcher	42.4 (33)	14.8 (27)	9.1 (33)
Carolina Wren	0 (1)	0 (1)	----
Blue-gray Gnatcatcher	100 (1)	----	----
Eastern Bluebird	0 (1)	----	0 (1)
Brown Thrasher	----	0 (1)	0 (3)
Wood Thrush	100 (1)	50 (2)	0 (4)
White-eyed Vireo	----	----	25.0 (4)
Cerulean Warbler	----	0 (1)	----
American Redstart	0 (1)	100 (1)	50.0 (2)
Prothonotary Warbler	44.4 (9)	19.0 (21)	14.2 (28)
Kentucky Warbler	0 (1)	----	33.3 (3)
Northern Cardinal	18.8 (16)	22.2 (18)	9.1 (11)
Indigo Bunting	39.1 (23)	23.9 (46)	40.0 (35)

Table 5. Parasitism levels in different microhabitats within sites May-July nests only.

		% Nests Parasitized (n)		
Species	Site	Forest Interior	<100m Agriculture	Selective Cut
Acadian Flycatcher	Damiansville	36.0 (25)	80.0 (5)	30.0 (6)
	Mascoutah	17.6 (17)	0 (10)	----
	Venedy	7.7 (26)	25.0 (4)	0 (1)
	Total	20.6 (68)	26.3 (19)	42.9 (7)
Prothonotary Warbler	Damiansville	44.4 (9)	----	----
	Mascoutah	6.3 916)	80.0 (5)	----
	Venedy	0 (16)	36.4 (11)	----
	Total	12.2 (41)	50.0 (16)	----
Northern Cardinal	Damiansville	20.0 (15)	0 (1)	0 (1)
	Mascoutah	21.4 (14)	33.3 (3)	0 (1)
	Venedy	12.5 (8)	33.3 (3)	----
	Total	18.9 (37)	28.6 (7)	0 (2)
Indigo Bunting	Damiansville	30.8 (13)	----	85.7 (7)
	Mascoutah	40.7 (27)	100 (1)	0 (3)
	Venedy	39.1 (23)	40 (5)	66.7 (3)
	Total	38.1 (63)	50.0 (6)	61.5 (13)

Appendix 1. Breeding birds of the Kaskaskia River Corridor, 1994, 1996-1997 with relative abundances determined by the fixed-radius (70-m) point count method.

Species	Mascoutah Area (79 points)	Venedy Area (86 points)	Damiansville Area (97 points)
	No. detected/10 points (70-m radius)		
Double-crested Cormorant *Phalacrocorax auritus*	+		
Great Blue Heron *Ardea herodias*	0.8	0.1	0.1
Great Egret *Ardea alba*	+	+	+
Little Blue Heron *Egretta caerulea*	+		
Green Heron *Butorides virescens*	+	0.2	0.1
Wood Duck *Aix sponsa*	0.1	0.2	1.1
Mallard 0.1 *Anas platyrhynchos*	+	+	
Hooded Merganser *Lophodytes cucullatus*	+	0.1	0.1
Turkey Vulture *Cathartes aura*	0	0	0
Red-shouldered Hawk *Buteo lineatus*	0.3	1.9	1.1
Red-tailed Hawk *B. jamaicensis*	+e	+e	+e
Wild Turkey *Meleagris gallopavo*	+	0	0
Northern Bobwhite *Colinus virginianus*	+	+	+
Killdeer *Charadrius vociferus*	+	0.1	+
American Woodcock *Scolopax minor*	0	0	0
Mourning Dove *Zenaida macroura*	0.3	0.4	0.4
Yellow-billed Cuckoo *Coccyzus americanus* 1996-1997	6.6	9.8	6.3
1994	--	1.1	--
Eastern Screech-Owl *Otus asio*	+	+	+
Great Horned Owl *Bubo virginianus*	+	+	+
Barred Owl *Strix varia*	+	0.7	0.1
Common Nighthawk *Chordeiles minor*	+	+	+
Whip-poor-will *Caprimulgus vociferans*	+	+	+
Chimney Swift *Chaetura pelagica*	+	+	+
Ruby-throated Hummingbird *Archilochus colubris*	4.2	3.0	2.4

Species	Mascoutah Area (79 points)	Venedy Area (86 points)	Damiansville Area (97 points)
Belted Kingfisher *Ceryle alcyon*	+	+	+
Red-headed Woodpecker *Melanerpes erythrocephalus*	6.9	2.8	4.4
Red-bellied Woodpecker *M. carolinus*	5.0	3.0	4.1
Downy Woodpecker *Picoides pubescens*	5.8	5.1	5.9
Hairy Woodpecker *P. villosus*	1.4	1.6	1.1
Northern Flicker *Colaptes auritus*	+	0.2	+
Pileated Woodpecker *Dryocopus pileatus*	0.8	0.4	0.2
Eastern Wood-Pewee *Contopus virens*	7.2	4.8	8.3
Acadian Flycatcher *Empidonax virescens*	17.0	17.8	12.4
Eastern Phoebe *Sayornis phoebe*	0.1	+	0.1
Great Crested Flycatcher *Myiarchus crinitus*	4.9	2.6	4.7
Eastern Kingbird *Tyrannus tyrannus*	+	0.1	+
Northern Rough-winged Swallow *Stelgidopteryx serripennis*	+	+	+
Barn Swallow *Hirundo rustica*	+	+	+
Blue Jay *Cyanocitta cristata*	0.8	0.1	0.6
American Crow *Corvus brachyrhynchos*	1.0	0.9	0.2
Fish Crow *C. ossifragus*	0.1	+	+
Carolina Chickadee *Parus carolinensis*	7.9	5.7	9.9
Tufted Titmouse *P. bicolor*	11.5	11.5	13.4
White-breasted Nuthatch *Sitta carolinensis*	7.1	6.9	5.6
Brown Creeper *Certhia americana*	0	+	0
Carolina Wren *Thryothorus ludovicianus*	4.4	2.8	3.0
House Wren *Troglodytes aedon*	0.3	+	0.3
Blue-gray Gnatcatcher *Polioptila caerulea*	11.6	12.6	15.1
Eastern Bluebird *Sialia sialis*	0.1	+	0.1
Wood Thrush *Hylocichla mustelina*	0.4	3.9	0.4

Species	Mascoutah Area (79 points)	Venedy Area (86 points)	Damiansville Area (97 points)
American Robin *Turdus migratorius*	0.1	0.1	+
Gray Catbird *Dumetella carolinensis*	0.1	0.2	0.2
Brown Thrasher *Toxostoma rufum*	+	+	0.1
Cedar Waxwing *Bombycilla cedrorum*	+	+	+
European Starling *Sturnus vulgaris*	0.1	+	0.1
White-eyed Vireo *Vireo griseus*	1.1	2.1	0.9
Solitary Vireo *V. solitarius*		+	
Yellow-throated Vireo *V. flavifrons*	1.6	0.9	1.6
Warbling Vireo *V. gilvus*	0.6	0.1	0.1
Red-eyed Vireo *V. olivaceus*	3.6	3.7	3.4
Northern Parula *Parula americana*	1.6	0.9	2.0
Yellow Warbler *Dendroica petechia*	0.4	0.1	0.3
Yellow-throated Warbler *D. dominica*	0.9	0.2	1.1
Cerulean Warbler *D. cerulea*	3.2	1.9	3.2
American Redstart *Setophaga ruticilla*	15.7	13.5	6.8
Prothonotary Warbler *Protonotaria citrea*	6.1	5.1	3.3
Ovenbird *Seiurus aurocapillus*	+	0.5	0
Kentucky Warbler *Oporonis formosus*	0.3	2.0	1.9
Common Yellowthroat *Geothlypis trichas*	0.1	+	+
Yellow-breasted Chat *Icteria virens*	0	0	+
Summer Tanager *Piranga rubra*	0.1	0.5	0.6
Scarlet Tanager *P. olivacea*	0	0.7	0.3
Northern Cardinal *Cardinalis cardinalis*	12.0	9.9	12.7
Indigo Bunting *Passerina cyanea*	10.8	10.1	9.6
Eastern Towhee *Pipilo erythrophthalmus*	0.6	3.4	2.1
Chipping Sparrow *Spizella passerina*	0.1	+	0.1

Species	Mascoutah Area (79 points)	Venedy Area (86 points)	Damiansville Area (97 points)
Field Sparrow *S. pusilla*		0.4	+
Song Sparrow *Melospiza melodia*		0.2	0.4
Red-winged Blackbird *Agelaius phoeniceus*	3.0	1.6	0.5
Common Grackle *Quiscalus quiscula*	1.1	2.0	1.3
Brown-headed Cowbird			
Molothrus ater Females	1.5	0.3	0.8
Males solo	2.0	1.7	2.8
Baltimore Oriole *Icterus galbula*	0.1	+	0.3
American Goldfinch *Carduelis tristis*	0.4	+	1.1
Total	174.0	161.4	159.1
Neotropical Migrants (%)	98.1 (56.4)	97.1 (60.2)	85.2 (53.6)
Cowbird Hosts	83.0	82.2	71.4
Prime (multiply parasitized) Cowbird Hosts	8.5	10.8	9.5
Cowbird (female): Host Ratio	0.018	0.004	0.011