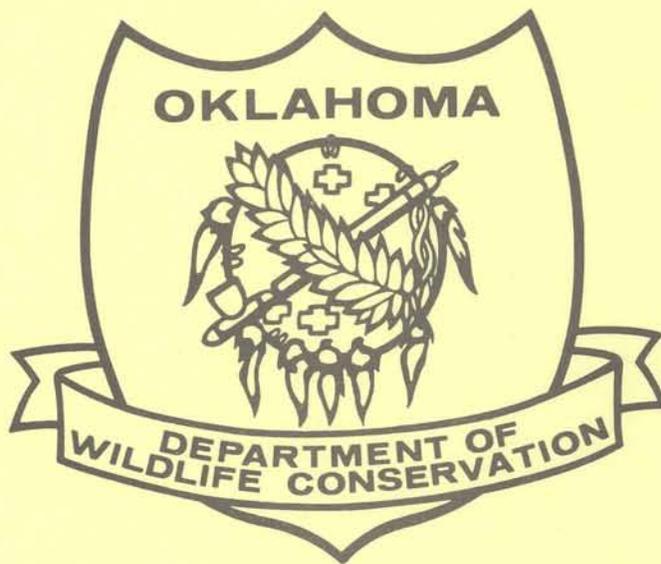


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# PERFORMANCE REPORT

## SECTION 6

### ENDANGERED SPECIES ACT



FEDERAL AID PROJECT E-33-1

Habitat Requirements of the  
Arkansas River Shiner, Notropis girardi

AUGUST 1, 1994 - JULY 31, 1995

## ANNUAL PERFORMANCE REPORT

STATE: Oklahoma Project Number E-33-1

PROJECT TYPE: Research

PROJECT TITLE: Habitat Requirements of the Arkansas River Shiner, *Notropis girardi*

SEGMENT DATES: 1 August 1994 - 31 July 1995

### I. PROGRAM NARRATIVE OBJECTIVE

A proposal is currently pending with the United States Fish and Wildlife Service (USFWS) to grant the Arkansas River Shiner protection under the guidelines of the Endangered Species Act of 1973. In order to designate areas of its native range as protected areas for the undisturbed recovery of local populations, more information on the characteristics of the microhabitats that *Notropis girardi* most frequently utilize is required. In accordance with the above requirement, the study in progress is being conducted to provide the USFWS with accurate information about microhabitats and life history of *Notropis girardi*.

### II. JOB SEGMENT OBJECTIVES

1. Determine which characteristics best describe the microhabitats most frequently used by *Notropis girardi* using a multivariate approach to the analysis of habitat variables, and other statistical procedures as necessary.
2. Compare the gonadosomatic index with flow regimes encountered during the breeding season (approximately April-September) to determine whether changes in flow patterns influence the reproductive cycles of *Notropis girardi*.
3. Analyze foraging periodicity and the type, size, and number of prey items for variation in the ability to acquire food in the various habitats sampled.

### III. SUMMARY OF PROGRESS

*A. Job Objective 1:* Determine which characteristics best describe the microhabitats most frequently used by *Notropis girardi* using a multivariate approach to the analysis of habitat variables, and other statistical procedures as necessary.

#### *Procedures:*

Three localities for study of microhabitat were selected along the South Canadian River in

Cleveland Co., Oklahoma where large populations of *Notropis girardi* exist (Table 1). Criteria for site selection also included accessibility and safe wading conditions (under most flow regimes) of the river. Regularly spaced transects across the river were set at least 50 m apart along the bank. Independent seine hauls were taken at regular intervals along each transect (4-6 hauls/transect, for a total of 35-50 hauls/locality) such that no seine haul was closer than 10 m to any other seine haul. At each seine haul site, dissolved oxygen concentration, pH, conductivity, current speed, depth, temperature and the number of *Notropis girardi* individuals present were recorded. In addition each of the sites was assigned a microhabitat type (bank, island, underwater sand ridge, mid-channel, backwaters, pool). With each of the physicochemical variables listed above, as well as the microhabitat variables, individual seine hauls were ordinated using multivariate techniques (canonical correspondence analysis and detrended correspondence analysis) to compare relative abundances of *Notropis girardi* in each of the microhabitats sampled. This process was repeated for each season (Fall, Winter, Spring, Summer, in that order) for comparison of microhabitat use between seasons. This is of special interest during the breeding season when distinctions were made between adult (>28 mm SL) juvenile (<28mm SL) individuals for detection of any ontogenetic differences in microhabitat use.

#### *Results:*

At the time of preparation of this report, only the microhabitat samples for the Fall and Winter collections have been dealt with rigorously. Detrended correspondence analysis (DCA) over these two seasons, using the data for the entire fish assemblage indicates that *Notropis girardi* is most closely associated with taxonomically similar species such as *Cyprinella lutrensis* and *Notropis stramineus* (Figure 1). To investigate the possible importance of "natural" flow regimes, depth and current speed were examined more closely. Sixteen resource states (Figure 2) were defined that corresponded to sets of seine hauls in which depth and current speed fell into the given range. Using a proportional similarity index (PSI), it was determined that *Notropis girardi* utilize a specialized range of depths and current speeds. In this case, the PSI measures use of a resource state relative to availability of that resource state (niche breadth) with PSI values ranging from 0 to 1 where 1 indicates that all resources are being utilized exactly in proportion to their availability. If the proportion of the total number of *Notropis girardi* individuals (at a given locality) in each resource state is equal to the proportion of the total number of seine hauls taken in that resource state, then the niche breadth value would be close or equal to 1.

Niche breadth (as measured by PSI values) for *Notropis girardi* in Fall and Winter collections ranged from 0.4 to 0.7 (Figure 3) indicating a specialization on a proper subset of the available depth and current speed cells. A chi-square test across all 16 combinations of depth and current speed demonstrated that the depth and current speed combinations where *Notropis girardi* were most likely to occur were resource states 5 and 6 (Figure 2) corresponding to depth of 25-50 cm and currents of 0-50 cm/s (Table 2). The distribution was slightly more plastic in the winter months at different localities.

B. *Job Objective 2:* Compare the gonadosomatic index with flow regimes encountered during the breeding season (approximately April-September) to determine whether changes in flow patterns influence the reproductive cycles of *Notropis girardi*.

*Procedures:*

At sampling locality #1 (Table 1), 10-15 individuals were collected roughly every 10 days during the breeding season (15 April to 20 September 1995). These individuals will be examined in the laboratory to determine the reproductive condition of both males and females as well as the gonadosomatic index (GSI) of females during different flow regimes encountered during the breeding season. The data of particular interest will be immediately following major stage rises during the sampling period.

*Results:*

Data are currently being processed and analyzed

C. *Job Objective 3:* Analyze foraging periodicity and the type, size, and number of prey items for variation in the ability to acquire food in the various habitats sampled.

*Procedures:*

During regular collections for the microhabitat study, some individuals were collected and preserved for analysis of food habits and foraging periodicity. In addition, two 24 hour collections (3 hour intervals) were made to detect nocturnal foraging, if present. Time of day, locality, and microhabitat (seine haul) were noted. These data will be used to determine (1) the type and relative frequency of abundant prey items, (2) whether *Notropis girardi* forage more actively at certain times of the day, and (3) whether the microhabitats that support large numbers of *Notropis girardi* also tend to be the microhabitats where stomach fullness is greatest.

*Results:*

Data are currently being processed and analyzed

#### IV. REMARKS

Analysis of remaining data that have been collected continues at present in year II of the study. Collection of data for the second year of this project is also in progress. No recommendations concerning the habitats best suited to the recovery of *Notropis girardi* can be made until year II is completed.

V. SIGNIFICANT DEVIATIONS: None

VI. PREPARED BY:

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DATE: 30 November 1995

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Table 1. Description of sampling localities for all fieldwork performed in this study.

Locality Number	Location
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- 1 Cleveland Co., S.W. 24th Ave., Norman, Oklahoma
- 2 Cleveland Co., S. Jenkins Ave., Norman Oklahoma
- 3 Cleveland Co., HWY 39 Bridge between Lexington and Purcell, Oklahoma

Resource	df	F	P	Season
2.6	12	>0.01	794.738	Fall 1
2.6	12	>0.01	364.890	Fall 2
6	12	>0.01	123.361	Fall 3
1.9	12	>0.01	219.250	Winter 1
6.7	12	>0.01	72.388	Winter 2
2.6	12	>0.01	759.088	Winter 3

Table 2. Results of chi-square test of proportional use of resource states at each Season + Locality (e.g. Fall 1). *N. girardi* was most frequently found in resource states 5 and 6 during the fall, but the distribution was slightly more plastic with respect to depth in the Winter.

Distribution Across Defined Resource States:

Collection	$X^2$	p	df	Resource
Fall 1	794.738	<0.01	15	5,6
Fall 2	364.890	<0.01	15	5,6
Fall 3	123.361	<0.01	15	6
Winter 1	519.550	<0.01	15	1,9
Winter 2	72.388	<0.01	15	6,7
Winter 3	759.088	<0.01	15	5,6

Year	Month	Day	Hour	Depth	Species
1980	09	01	07	1	sp. 01-0
1980	09	01	07	2	sp. 01-0
1980	09	01	07	3	sp. 01-0
1980	09	01	07	4	sp. 01-0
1980	09	01	07	5	sp. 01-0

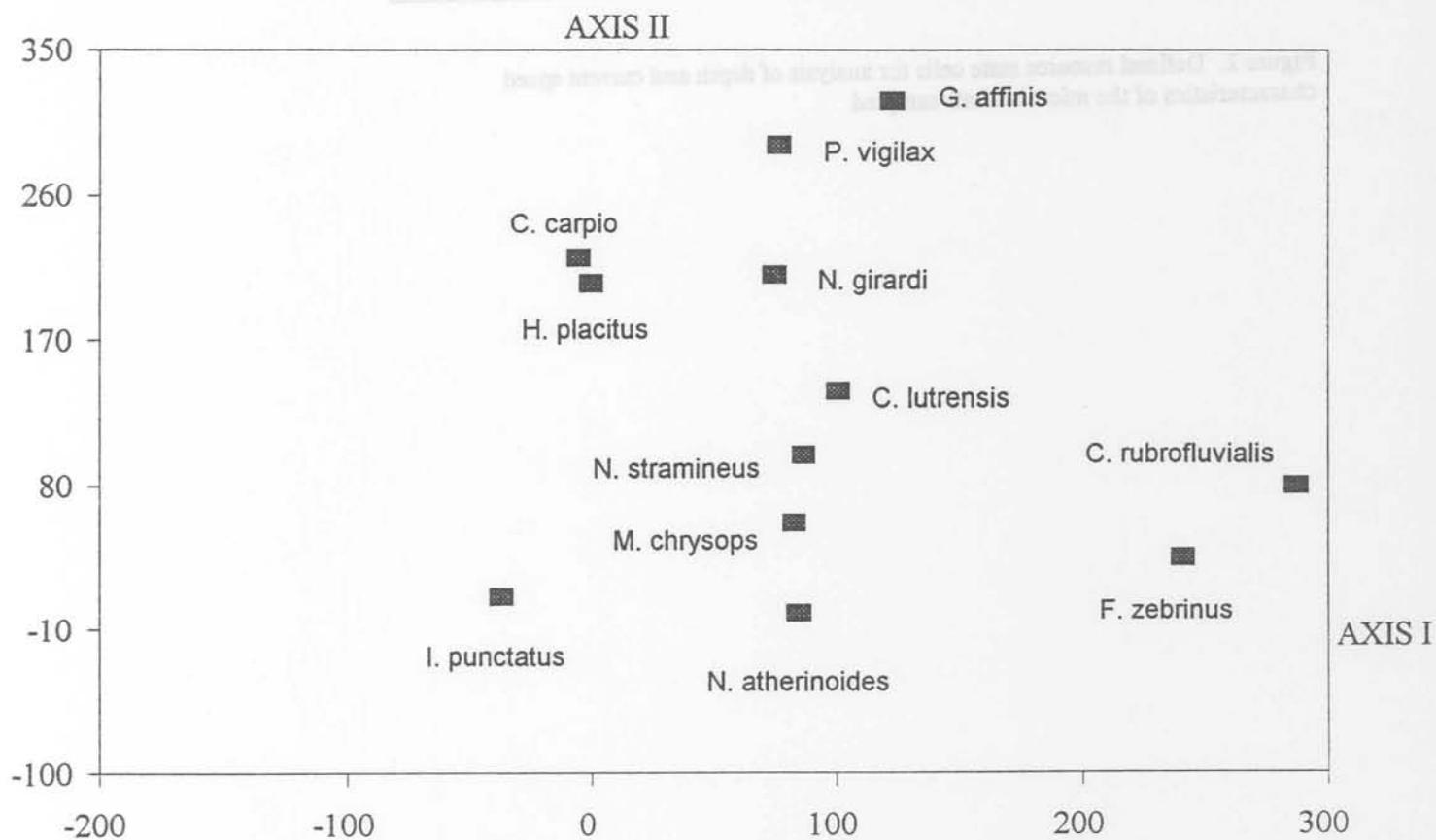
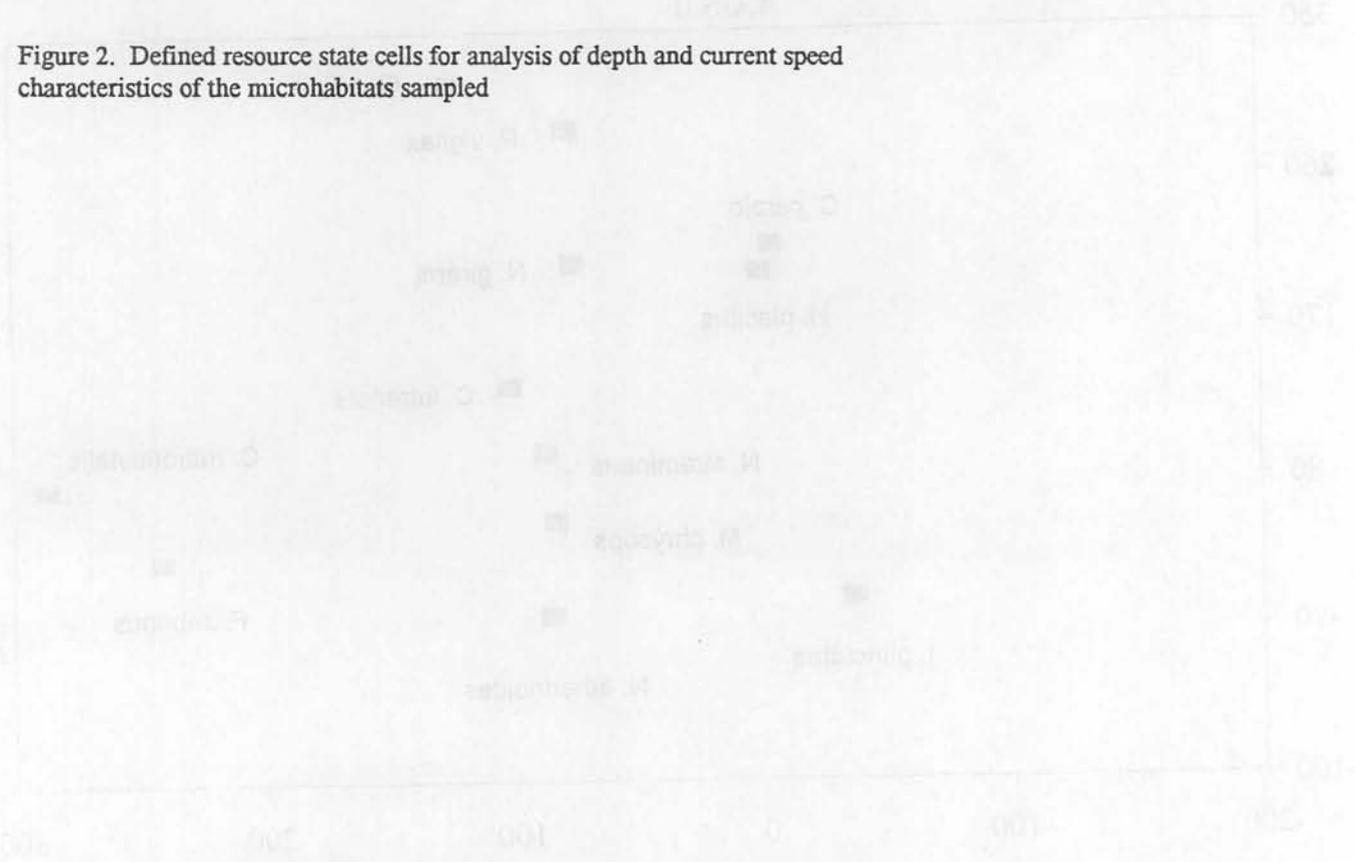


Figure 1. Species scores (multiplier = 100) plotted on first two axes (eigenvalues 0.54 and 0.30, respectively) for Fall and Winter collections. *Notropis girardi* clusters nearest related cyprinids *C. lutrensis* and *N. stramineus*.

DEPTH	CURRENT SPEED			
	0-25 cm/s	26-50 cm/s	51-75 cm/s	76-100 cm/s
0-25 cm	1	2	3	4
26-50 cm	5	6	7	8
51-75 cm	9	10	11	12
76-50 cm	13	14	15	16

Figure 2. Defined resource state cells for analysis of depth and current speed characteristics of the microhabitats sampled



# Niche Breadth

Fall vs. Winter

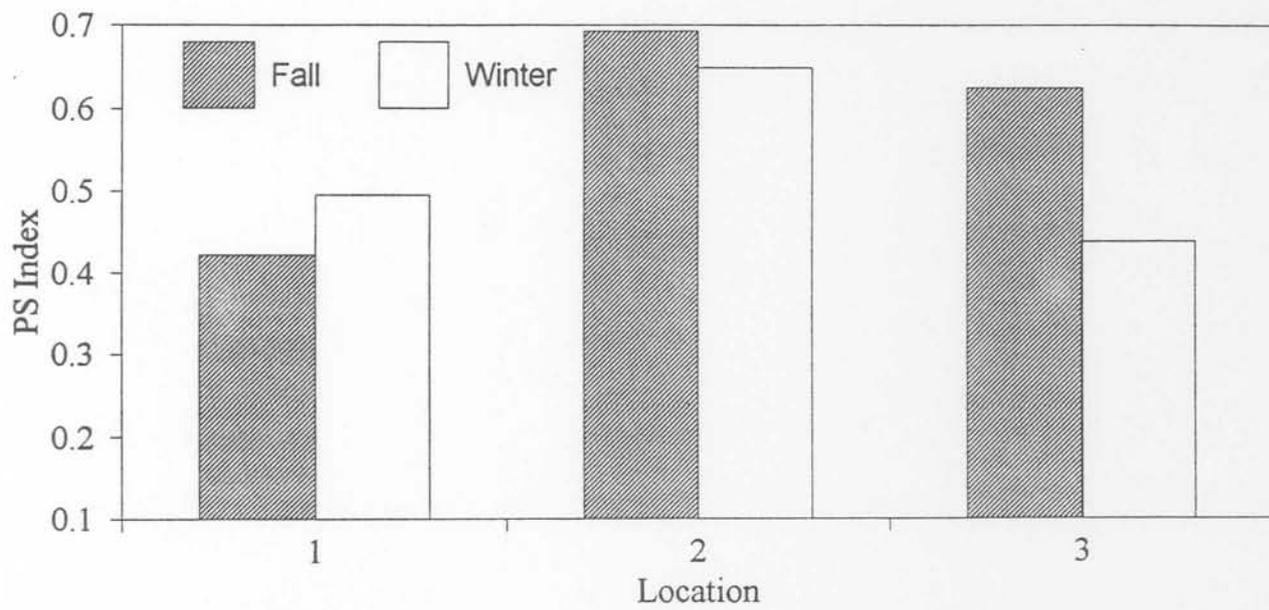


Figure 3. Proportional Similarity (PS) index comparing resource availability with resource use over the resource states defined in this study. There were no significant differences between seasons or localities.

7

# Niche Breadth

Fall vs Winter

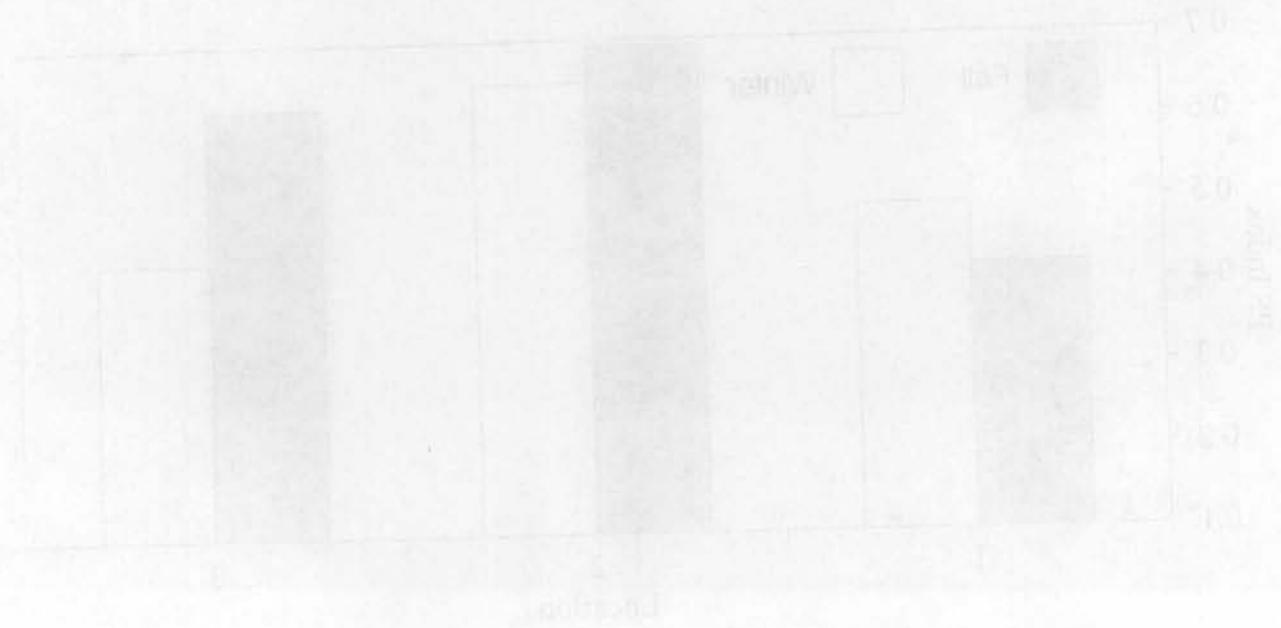


Figure 2. Proportional Standard Deviation (Niche Breadth) for three locations in winter and fall. There was no significant difference between fall and winter for any of the locations.