

Fishes of Blue River on the Oka' Yanahli Preserve (The Nature Conservancy)

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OCLWA Conference

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The Blue River

439,399 acre watershed (rural and mostly privately owned)

~150 miles long

Sustained by discharge from the Arbuckle-Simpson aquifer

Minimally fragmented – no large dams (one of two OK rivers)

Water supply for city of Durant

Diverse biota has been reported

82 species freshwater fish

23 species mussels

Rare plants



The Nature Conservancy Oka' Yanahli Preserve:



Located near Blue River headwaters Johnston Co., OK

Oka' East:

Fee title ownership by TNC since December 6, 2011

490 acres

Approximately 1 mile Blue River frontage

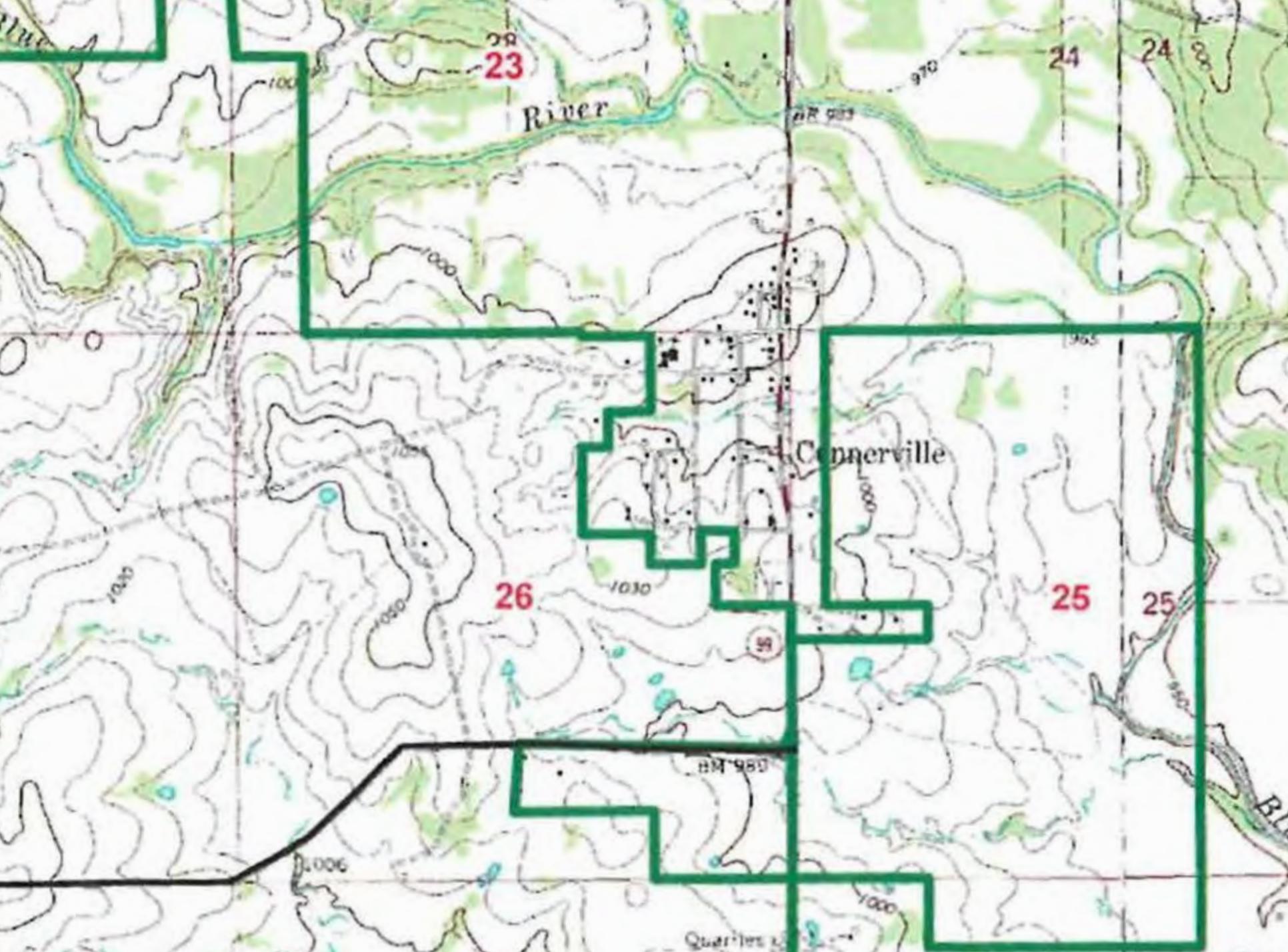
Oka' West:

Fee title ownership by TNC since November 2, 2015

3108 acres

Approximately 1 mile Blue River frontage

Total area: 3598 acres and 2 miles Blue River frontage (not continuous)



23

24

24

River

BM 983

970

1000

Connerville

1065

26

1030

25

25

59

BM 980

1006

1000

Quarries

Survey of Fishes on Oka' Yanahli

Goals: Determine current fish diversity and develop recommendations for long-term monitoring

Conducted June/August 2017

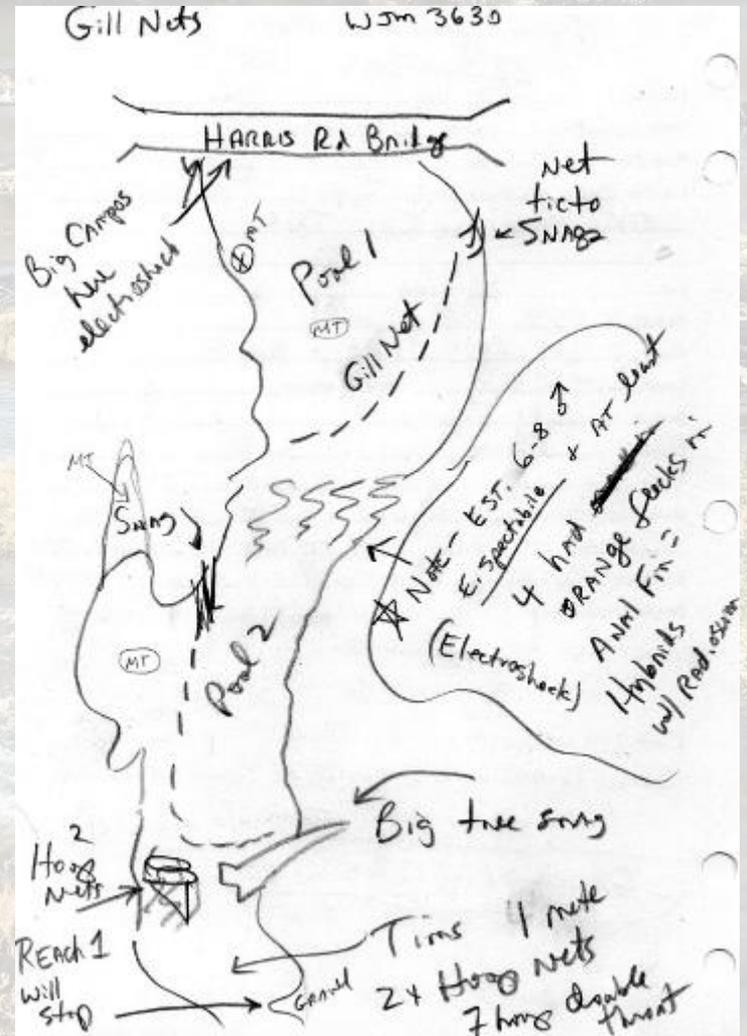
Multiple gear types: seine, gill net, bank electrofish, angling, minnow trap, hoop net

Participants from multiple entities: TNC, Univ. OK, East Central Univ., Southeastern Oklahoma State Univ., ODWC, USFWS, NEON (31 total participants)

22-23 June 2017

“Pilot” Survey

Oka’ East upstream reach





June participant list - 14 people

Jona Tucker - TNC

Bill Matthews – OU

Edie Marsh-Matthews – OU

Andy Schofield – TNC

Justin Anderson – TNC intern

Taylor McNutt – TNC intern

Tim Patton – SEOSU

Rachel Anders – SEOSU student

Ethan Lovelace – ODWC Blue River

Bruce Moring – ECU

Jonathan (JR) Lucas – ECU student

MacKenzie Tissington – ECU student

Lauren Hostert – NEON

Chris Burton– NEON



Multiple types of collecting gear



Gill nets
Seines
Bank electrofishing
Minnow traps
Hoop nets



Specimens of small species preserved in field for later ID in lab. Larger, easily-identified specimens released.



Number of Species Captured

Total number = 27 species in 7 Families

Gar = 1

Minnnows = 10

Suckers = 2

Catfish = 1

Livebearers = 1

Sunfishes and Black Basses = 7

Darters = 5

1019 Number of Individuals Captured

14 species accounted for 95% of total catch

Common Name	Scientific Name	June total	%total	Cumulative%
Central Stoneroller	<i>Campostoma anomalum</i>	288	28.26	28.26
Bigeye Shiner	<i>Notropis boops</i>	173	16.98	45.24
Western Mosquitofish	<i>Gambusia affinis</i>	98	9.62	54.86
Orangebelly Darter	<i>Etheostoma radiosum</i>	80	7.85	62.71
Redfin Shiner	<i>Lythrurus umbratilis</i>	63	6.18	68.89
Bluegill	<i>Lepomis macrochirus</i>	49	4.81	73.70
Mimic Shiner	<i>Notropis volucellus</i>	35	3.43	77.13
Orangethroat Darter	<i>Etheostoma spectabile</i>	33	3.24	80.37
Blacktail Shiner	<i>Cyprinella venusta</i>	32	3.14	83.51
Rocky Shiner	<i>Notropus suttkusi</i>	32	3.14	86.65
Green Sunfish	<i>Lepomis cyanellus</i>	31	3.04	89.70
Longear Sunfish	<i>Lepomis megalotis</i>	28	2.75	92.44
Largemouth Bass	<i>Micropterus salmoides</i>	24	2.36	94.80
Redspot Chub	<i>Nocomis asper</i>	9	0.88	95.68

Most Common Species ($\geq 10\%$ of total catch)

Campostoma anomalum – Central Stoneroller



Notropis boops – Bigeye Shiner



Gambusia affinis – Western Mosquitofish



Other Common Species (~5%-8% of total catch)

Etheostoma radiosum – Orangebelly Darter



Lythrurus umbratilis – Redfin Shiner



Lepomis macrochirus - Bluegill



Species Representing 2%-4% of Total Catch



Notropis volucellus – Mimic Shiner



Etheostoma spectabile pulchellum
Orangethroat Darter



Cyprinella venusta – Blacktail Shiner



Notropis suttkusi – Rocky Shiner



Lepomis cyanellus – Green Sunfish



Lepomis megalotis – Longear Sunfish



Micropterus salmoides – Largemouth Bass

Species Representing < 1% Total Catch



Nocomis asper – Redspot Chub



Percina copelandi – Channel Darter



Micropterus punctulatus – Spotted Bass



Lepisosteus osseus – Longnose Gar



Percina caprodes fulvitaenia – Ozark Logperch



Luxilus chrysocephalus – Striped Shiner

Species Representing <<1%



Pimephales notatus – Bluntnose Minnow



Micropterus dolomieu – Smallmouth Bass



Minytrema melanops – Spotted Sucker



Percina sciera – Dusky Darter



Moxostoma erythrurum – Golden Redhorse



Notropis stramineus – Sand Shiner



Ameiurus natalis – Yellow Bullhead



Lepomis microlophus – Redear Sunfish

Gear Selectivity in June Collection

Species captured by only one gear type:

Longnose Gar – Gill net

Redfin Shiner, Sand Shiner, Bluntnose Shiner, Dusky Darter - Seine

Striped Shiner, Redear Sunfish, Smallmouth Bass – Bank electrofish

Rest of survey delayed by rains.
Finally done in August 2, 8-10



August Survey

8/2/17 and 8/8-10/17

Collections on both Oka' East and Oka' West

Total of 31 participants from numerous entities
(including 14 undergraduate or graduate students):

The Nature Conservancy, Univ. Oklahoma, East Central Univ., Southeastern Oklahoma State Univ., Oklahoma Department Wildlife Conservation, 5 Smooth Stones Restoration

Seine, gill nets, electrofishing and angling
(hoop nets and minnow traps omitted)

Sample Reaches and Gill Net Sites

Aug. 2 and 8-10, 2017



Number of Species Captured

Total number = 33* species in 7 Families

4695 individuals

Gar = 1

Minnows = 12 (2 more)

Suckers = 2 *plus possible Black Redhorse

Catfish = 4 (3 more)

Livebearers = 1

Sunfishes and Black Basses = 8 (1 more)

Darters = 5

Note: All species captured in June were also captured in August

Additional Species found in August



Cyprinus carpio – Common Carp



Noturus nocturnus – Freckled Madtom



Chrosomus erythrogaster
Southern Redbelly Dace



Ictalurus punctatus – Channel Catfish



Lepomis humilis
Orangespotted Sunfish



Pylodictis olivaris– Flathead Catfish

Moxostoma duquesnei -Black Redhorse - Specimen identified in Blue River as “likely Black Redhorse” by ODWC personnel, August 2017. Specimen released after photograph. Photo sent to two experts in sucker taxonomy – no definitive answers.



4695 Individuals Captured August

15 species accounted for 95% of total catch

	Common Name	Scientific Name	Aug Total	%Total	Cumulative%
>10%	Bigeye Shiner	<i>Notropis boops</i>	1362	29.01	29.01
	Central Stoneroller	<i>Campostoma anomalum</i>	1098	23.39	52.40
5-8%	Orangebelly Darter	<i>Etheostoma radiosum</i>	506	10.78	63.17
	Redfin Shiner	<i>Lythrurus umbratilis</i>	357	7.60	70.78
★	Orangethroat Darter	<i>Etheostoma spectabile</i>	274	5.84	76.61
★	Rocky Shiner	<i>Notropus suttkusi</i>	159	3.39	80.00
★	Western Mosquitofish	<i>Gambusia affinis</i>	124	2.64	82.64
★	Green Sunfish	<i>Lepomis cyanellus</i>	120	2.56	85.20
★	Blacktail Shiner	<i>Cyprinella venusta</i>	119	2.53	87.73
	Golden Redhorse	<i>Moxostoma erythrurum</i>	79	1.68	89.41
★	Bluegill	<i>Lepomis macrochirus</i>	58	1.24	90.65
	Smallmouth bass	<i>Micropterus dolomieu</i>	57	1.21	91.86
★	Longear Sunfish	<i>Lepomis megalotis</i>	51	1.09	92.95
	Sand Shiner	<i>Notropis stramineus</i>	50	1.06	94.01
	Bluntnose Minnow	<i>Pimephales notatus</i>	48	1.02	95.04

Comparison of Relative Abundances June vs August

Ranks: Spearman's $\rho = 0.822$, $P < 0.001$

Relative abundances: Pearson's $r = 0.897$, $P < 0.001$

Relative abundances in one reach in June were highly and significantly correlated with relative abundances from much more extensive sample in August. Both collections dominated by four species:

Bigeye Shiner - *Notropis boops*

Central Stoneroller - *Campostoma anomalum*

Orangebelly Darter - *Etheostoma radiosum*

Redfin Shiner - *Lythrurus umbratilis*

!! Different combinations of gear types and greater effort in August

Gear Selectivity

Species captured by only one gear type in August:

Common Carp* - Gill net

Southern Redbelly Dace*, Orangespotted Sunfish*,
Redear Sunfish, Channel Darter - Seine

*Overall Gear Selectivity – Only these 3 species were captured with a single gear type with both collections combined.

Total Species Captured

Total number = 33* species in 7 Families

Gar = 1

Minnows = 12

Suckers = 2* plus possibly 1 more

Catfish = 4

Livebearers = 1

Sunfishes and Black Basses = 8

Darters = 5

Overall Relative Abundance

Common Name	Scientific Name	Survey total	%total	Cumulative%
Bigeye Shiner	<i>Notropis boops</i>	2102	27.61	27.61
Central Stoneroller	<i>Campostoma anomalum</i>	1988	26.11	53.72
Redfin Shiner	<i>Lythrurus umbratilis</i>	691	9.08	62.80
Orangebelly Darter	<i>Etheostoma radiosum</i>	681	8.95	71.75
Orangethroat Darter	<i>Etheostoma spectabile</i>	408	5.36	77.10
Western Mosquitofish	<i>Gambusia affinis</i>	257	3.38	80.48
Rocky Shiner	<i>Notropus suttkusi</i>	198	2.60	83.08
Greensunfish	<i>Lepomis cyanellus</i>	177	2.32	85.41
Blacktail shiner	<i>Cyprinella venusta</i>	151	1.98	87.39
Bluegill	<i>Lepomis macrochirus</i>	109	1.43	88.82
Golden Redhorse	<i>Moxostoma erythrurum</i>	101	1.33	90.15
Sand Shiner	<i>Notropis stramineus</i>	90	1.18	91.33
Smallmouth Bass	<i>Micropterus dolomieu</i>	89	1.17	92.50
Longear Sunfish	<i>Lepomis megalotis</i>	88	1.16	93.66
Mimic Shiner	<i>Notropis volucellus</i>	86	1.13	94.79
Bluntnose Minnow	<i>Pimephales notatus</i>	75	0.99	95.77



Darters unique to Blue River

Orangebelly Darter – *Etheostoma radiosum cyanorum*

Recognized as different from other Orangebelly populations in 1952 by Moore and Rigney and assigned to a different subspecies. Current work by Tom Turner and Bill Matthews to elevate to species.



Darters Unique to Blue River

Orangethroat Darter – *Etheostoma spectabile pulchellum*

Blue River form of Orangethroat Darter has been considered problematic by numerous authors. There have been suggestions that some may be hybrids with the Orangebelly Darter. Nick Lang has molecular evidence that suggests the Blue River form is distinct at a level that warrants recognition as a new species.



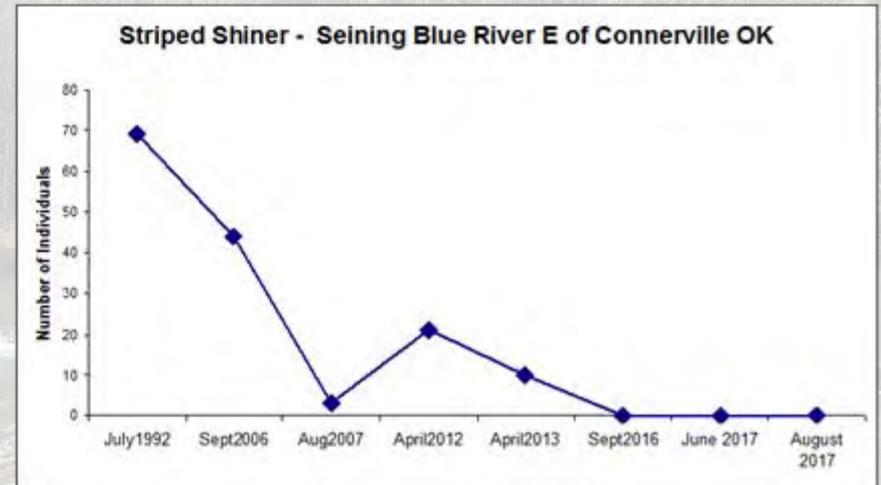
Another Genetically Distinct Species

Striped Shiner, *Luxilus chrysocephalus*

Molecular evidence from Tom Dowling suggests a unique form found only in Blue River and Little River that differs from other Striped Shiner populations.



Conservation alert! Striped shiner (*Luxilus chrysocephalus*) - common at 10 sites in Little River basin, not in Boggy or Kiamichi, but has disjunct population in upper Blue River that has sharply declined since Hwy99 bridge construction. Collections on TNC Oka' Yanahli Preserve site from 1992 to 2017.



Old Hwy 99 bridge north of Connerville replaced in 2009 Increased silt in river



Disjunct Populations in Blue River



Least Darter - *Etheostoma microperca* - Blue River population is widely separated from all other populations of the species and is genetically distinct. Not captured in our survey but common in nearby springs.



Nocomis asper - Redspot Chub - Redspot Chub is common in the Ozarks of northeast Oklahoma, but has a widely disjunct populations in the upper Blue River and in the upper Ouachita River in southwest Arkansas. The Blue River population is the southern and westernmost known population of Redspot Chub.



Southern Redbelly Dace - *Chrosomus erythrogaster* – Common in some Ozark streams, but has disjunct populations in spring-fed habitats in the Arbuckle Mountains including Blue River. Only 1 individual captured in survey.



Ozark Logperch - *Percina caprodes fulvitaenia* - Common in the Arkansas River basin but disjunct populations of this subspecies occur in Blue River and in the nearby Mill Creek, Johnston County. These populations are genetically distinctive from logperches elsewhere.

Fishes of Oka' Yanahli Preserve

Fish fauna diverse.

Biogeographically important. Several species unique to the drainage and several others that represent disjunct populations (some are most closely related to Ozark forms).

At least one species declining and possibly at risk.

Several species rare or found in very specific habitats.

Long-term Monitoring of Fish Community

Use multiple gear types: seines, gill nets, electrofishing

Target specific habitats to monitor habitat specialists (e.g., springs for Least Darter and Southern Redbelly Dace)

Do seasonal surveys for highly mobile species such as gar and suckers

Standardize effort for each gear type to make surveys done at different times comparable

Conservation Concerns

Effects of activities outside of Oka' Yanahli Preserve:

Siltation from bridge construction or other streambank disturbances.

Long-term viability of springs. Need to maintain water flow in these habitats essential for several species.

Natural hydrology in tributaries to Blue River.
Need to maintain mainstem flow.



Frack sand mining in area

Future of Oka' Yanahli Fishes

TNC stewardship of habitats and water quality on Oka' Yanahli will act to maintain diversity and preserve populations of endemic species.

But - fish community tied to much larger portion of the Blue River watershed and the ecosystem which includes other organisms.

Conservation measures should target the entire watershed.

Acknowledgements

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All who participated in surveys of Oka' Yanahli fishes.

