

Live Bait Pathway Analysis

STATUS OF THE LIVE BAIT INDUSTRY AND ITS
REGULATIONS IN THE MISSISSIPPI RIVER BASIN

Prepared By

Jeff Gunderson

Presented By

Doug Jensen



Funded by the Mississippi River Basin Panel on ANS

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Scope and Objectives

This report was undertaken in an effort to examine the risk of introducing nonindigenous animals, plants and pathogens via live aquatic bait movement.

Goal: to reduce the risk of introducing nonindigenous species and making regulation compliance easier for industry partners and users.

- ▶ **Objective 1:** To describe the live aquatic bait industry in the 28 states of the MRBP
- ▶ **Objective 2:** Summarize the state and federal laws that pertain to the production, harvest, transport, sale and use of live aquatic bait

Methods

On the Computer



On the Phone



Methods

On the Computer



- ▶ Management agencies were sent a survey by email to characterize the regulations related to aquatic bait farming, wild harvesting, importing/exporting, reporting, sales and species
- ▶ Sport fishing regulation pamphlets for each of the 28 states were reviewed for regulations related to live aquatic bait regulations
- ▶ State statutes, laws, and regulations were examined online

On the Phone



- ▶ Phone conversations with aquatic bait industry representatives (including farmers, wild trappers, wholesalers, internet sellers and retail shop owners)
- ▶ Expert opinions were collected and summarized
- ▶ I continued to seek other experts until I was satisfied with the information for each state
- ▶ In total, 325 phone calls were made and 149 individuals surveyed averaging 11.5 calls per state and 5.5 representatives interviewed per state

Results and Discussion

Live Aquatic Bait Pathway Analysis



Live Aquatic Bait Sold in the MRBP

42 total species (28 fish, 12 inverts, 2 verts)

- ▶ Golden Shiner
- ▶ Fathead minnow
- ▶ Rosy Reds
- ▶ Goldfish
- ▶ Black Salty
- ▶ White Sucker
- ▶ Emerald Shiner
- ▶ Spottail Shiner
- ▶ Bluegill
- ▶ Green Sunfish
- ▶ Hybrid Bluegills
- ▶ Northern Redbelly Dace
- ▶ Southern Redbelly Dace
- ▶ Finescale Dace
- ▶ Creek Chub
- ▶ Creek Chubs
- ▶ Common Shiner
- ▶ Hornyhead Chub
- ▶ Longnose Sucker
- ▶ Eastern silvery
- ▶ Western Silvery
- ▶ Flathead Chub
- ▶ Lake Chub
- ▶ Banded Killifish
- ▶ Central Mudminnow
- ▶ Pearl Dace
- ▶ Bullhead
- ▶ Tadpole Madtom
- ▶ Common Carp
- ▶ Israeli Carp
- ▶ American Eels
- ▶ Ribbon Leeches
- ▶ Red Swamp Crayfish
- ▶ White River Crayfish
- ▶ Papershell Crayfish
- ▶ Rusty Crayfish
- ▶ Northern Crayfish
- ▶ Horse Leeches
- ▶ Freshwater Shrimp
- ▶ Mayfly Nymphs
- ▶ Dragonfly Nymphs
- ▶ Grass Shrimp
- ▶ Hellgrammites
- ▶ Tiger Salamanders
- ▶ Frogs

Golden shiners (*Notemigonus crysoleucas*)

Common Names: golden shiners, silver shiners, shiners, crappie minnows, bass minnows, walleye minnows, pike minnows, brooders, golden roaches

Where Used in Basin: Every state except Montana, North Dakota, and Wyoming

Typical Sizes Sold: Bait shops typically carry from 2 to 4 sizes of golden shiners but wholesalers may list up to six sizes of golden shiners

#4	lbs/1000 fish	1.5 in	Below 21 grader
#6	6lbs/1000 fish	2.25 in	21 to 27 grader
#8	8lbs/1000 fish	2.5 in	
#12	12lbs/1000 fish	3 in	27 to 29 grader
#20	20lbs/1000 fish	3.5 in	
Brooders	38lbs/1000	> 4 in	Above a 29 grader

Where they're produced: The primary source of golden shiners in the Basin is from farms in Arkansas. Other states that produce golden shiners from managed lakes or the wild includes MN and WI. There is at least one golden shiner farm in MO and in TN. AR is the only state to export significant quantities.

Fathead minnows (*Pimephales promelas*)

Common Names: tuffy minnows, tuffies, fatheads, blacks, blackhead minnows, chubs, crappie minnows

Where used in Basin: Every state in the basin except possibly LA.

Typical Sizes Sold: Bait shops typically carry one or two sizes but wholesalers may carry up to four sizes.

Small	3.5lbs/1000 fish	1 to 1.5 in	Below 17 grader
Medium	5.5lbs/1000 fish	1.5 to 2 in	17 to 19 grader
Large	10lbs/1000 fish	2 to 2.75 in	19 to 21 grader
X-Large	14lbs/1000 fish	2.75 to 3.5 in	Above 21 grader

Where they're produced: The primary source of fathead minnows in the basin is from farms in Arkansas and managed lakes and wild harvest in ND, SD, MN, and WI. Some fatheads are also wild caught in WY and MT.

Ribbon Leeches (*Nephelopsis obscura*)

Common Names: ribbon leech, water leech, leech

Where they are used in the Basin: The ribbon leech identified as bait in CO, IL, IN, IA, KS, KY, MN, MO, MT, NE, NY, ND, OH, PA, SD, TN, WV, WI, WY (19)
The horse leech identified as bait in IL and MO

Typical Sizes: Bait shop typically carry 2 or more sizes of leeches (medium and large most often) and wholesalers sell four to five different sizes

Small	225 to 300 per pound
Medium	170 to 225 per pound
Large	125 to 160 per pound
Jumbo	85 to 120 per pound
Super Jumbo	50 to 80 per pound

Where they're produced: Leeches are primarily wild harvested in MN but some are also wild harvested in WI, ND, and SD

Goldfish and Black Salty

- ▶ Sold for bait and feeder fish
- ▶ Grown in Arkansas
- ▶ Illegal for use as bait in 9 states
- ▶ They are not legal in CO, MN, MT, NY, PA, ND, SD, WI, WY



Five states Export Live Aquatic Bait to Other MRBP States

- ▶ Arkansas
- ▶ Minnesota
- ▶ North Dakota
- ▶ South Dakota
- ▶ Wisconsin



Live Aquatic Bait Used in Each MRBP State

Alabama		Kansas		Nebraska		South Dakota	EXP
Arkansas	EXP	Kentucky		New York		Tennessee	
Colorado		Louisiana		North Carolina		Texas	
Georgia		Minnesota	EXP	North Dakota	EXP	Virginia	
Illinois		Mississippi		Ohio		West Virginia	
Indiana		Missouri		Oklahoma		Wisconsin	EXP
Iowa		Montana		Pennsylvania		Wyoming	

- 14** Bait mostly from Arkansas
- 9** Wild harvest bait in state
- 5** Bait from Arkansas and other states

EXP = Export State

Sample

Alabama

Bait used: Golden shiners, goldfish, fathead minnows, rosy reds, black salties from AR. Some locally caught crayfish enter bait market in Alabama.

Arkansas

Bait used: Golden shiners, goldfish, fathead minnows, rosy reds, crayfish, green sunfish, black salty from AR

Colorado

Bait used: Fathead minnows, golden shiners from AR. White suckers (likely from MN). Leeches from MN. Waterdogs from a Kansas distributor (not sure where they are harvested).

Georgia

Bait used: Fathead minnows, golden shiners, some rosy reds, some goldfish from AR.

Illinois

Bait used: Fathead minnows, golden shiners, goldfish from AR. White suckers from WI. Ribbon and horse leeches from MN.

Indiana

Bait used: Fathead minnows, golden shiners, some rosy reds, some goldfish from AR. White suckers and leeches from MN or WI. Fathead minnows from SD and MN. Some crayfish (source/species uncertain).

Iowa

Bait used: Fathead minnows, golden shiners, some rosy reds, some goldfish and some green sunfish from AR. Green sunfish and crayfish from MO. Fathead minnows, suckers and leeches from SD and MN. Leeches from WI. A few local crayfish are sold at retail. Some horse leeches (from MN) – but hard to get now. Some local harvest of creek chubs, suckers, common shiners and spottail shiners.

BMPs: H2O & Grading Live Aquatic Bait

- ▶ BMP: Use of well water to transport is very typical
- ▶ BMP: Graded for size – also unwanted species
 - Baitfish graded into several size categories
 - Grader bars at increments of 1/64 in
 - Fish body width greater than that will be retained
 - Baitfish graders range from 12/64 in to 32/64 in
 - Baitfish also sold by pounds per 1000 fish
 - Baitfish and some invertebrates often sold by the gallon (assume 1 gal = 8 lbs)



<u>Size</u>	<u>Lbs./1000 fish</u>	<u>Length</u>	<u>Grader Sizes (64ths of an inch)</u>
#4	4lbs/1000 fish	1.5 in	Below 21 grader
#6	6lbs/1000 fish	2.25 in	21 to 27 grader

Transporting Live Aquatic Bait

- ▶ Some trucks may have 44 different compartments each holding 100 to 125 pounds of baitfish for a total hauling capacity of 4,400 to 5,500 pounds of baitfish
- ▶ Many different types of trucks and trailers
- ▶ Insulated compartments
- ▶ Oxygen and aeration – salt added for stress relief
- ▶ Sometimes ice added before haul sometimes during haul
- ▶ Haulers bring to distributors or to bait shops or meet bait shop owners
- ▶ Large amounts of baitfish shipped by air freight

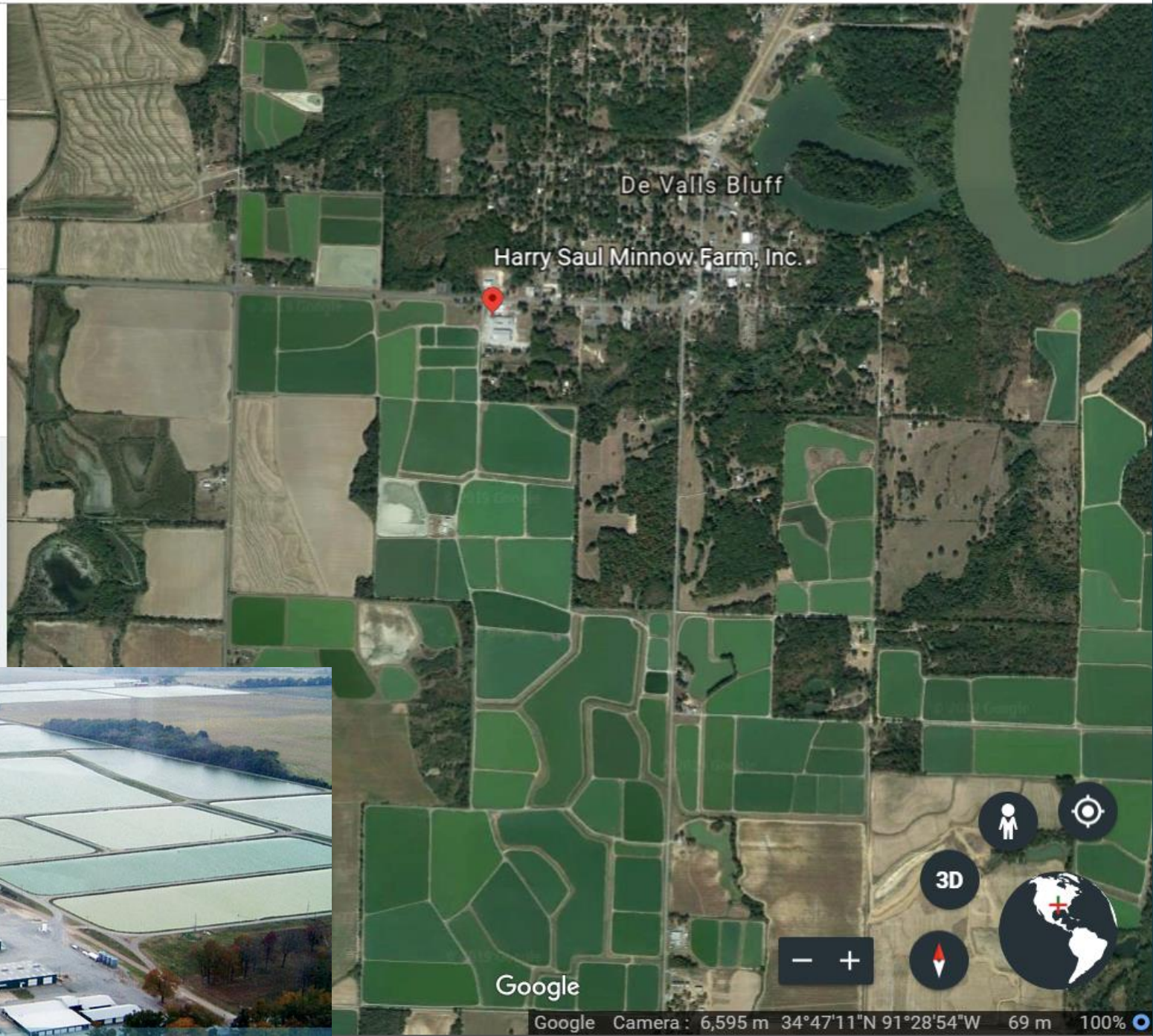




Where Aquatic Bait is Grown & Harvested? MN, ND, SD, WI



Where Aquatic Bait is Grown? AR



Arkansas Certified Bait Program

- ▶ Arkansas Commercial Bait and Ornamental Fish Certification Program officially began in 2007
- ▶ Program provides for third-party verification of farm-level fish disease inspections, biosecurity plans, and farm inspections for aquatic invasive species
- ▶ Arkansas Plant Board oversees the program
- ▶ University of Arkansas at Pine Bluff Fish Health Inspection Laboratory does the testing for pathogens and parasites



Arkansas Certified Bait Program

4 Pathogens

3 Plants

4 Invertebrates

6 Fish

- ▶ Spring Viremia of Carp (SVCV)
- ▶ Infectious Pancreatic Necrosis (IPNV)
- ▶ Viral Hemorrhagic Septicemia (VHSV)
- ▶ Infectious Hematopoietic Necrosis (IHNV)
- ▶ Eurasian watermilfoil (*M. spicatum*)
- ▶ Giant Salvinia (*Salvinia molesta*)
- ▶ Hydrilla (*Hydrilla verticillata*)
- ▶ Zebra mussel (*Dreissena polymorpha*)
- ▶ Quagga Mussel (*D. rostriformis bugensis*)
- ▶ New Zealand mudsnail (*P. antipodarum*)
- ▶ Red-rimmed melania (*Melanoides tuberculata*)
- ▶ Sticklebacks (Family Gasterosteidae)
- ▶ Rudd (*Scardinius erythrophthalmus*)
- ▶ Orfe (*Leuciscus idus*)
- ▶ Silver carp (*Hypophthalmichthys molitrix*)
- ▶ Bighead carp (*Hypophthalmichthys nobilis*)
- ▶ Snakehead fish (Family Channidae)

Production of Aquatic Bait in MRBP

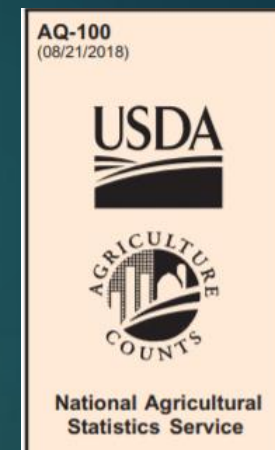
There is no way to get an estimate of baitfish production in the MRB

- ▶ **WILD HARVEST:** 16 States said they collect information, but only:
 - 3 states provided information (ND, MN, MO)
 - 6 of 16 states replied – they don't compile the information (IL, MT, TN, VA, WY)
 - Rest of states never responded
- ▶ **FARM PRODUCTION:** 8 States said they collect information
 - No states responded to requests for that data

Production of Aquatic Bait in the MRBP

There is no way to get an estimate of baitfish production in the MRBP

- ▶ Much of the fathead minnow production in ND, SD, MN, WI, and AR is sold as feeder fish
- ▶ Most goldfish raised in AR for feeder fish for aquarium industry
- ▶ No industry representatives thought USDA Aquaculture Census was accurate:
 - 2013 Census -- 12,891 acres of baitfish production in AR
 - AR baitfish growers estimate 20,000 acres in baitfish production



Exports from MN and ND

Sales of Farmed Fish in Arkansas

Minnesota Export 2016

- ▶ Fatheads 138,867 Gallons
- ▶ Leeches 93,727 Pounds
- ▶ White suckers 14,017 Gallons



North Dakota Export 2017

- ▶ Fatheads 18,823 Gallons

Arkansas Sales 2013 - USDA Census

- ▶ Fatheads \$ 5,148,000
- ▶ Golden shiners \$10,634,000
- ▶ Goldfish \$ 2,568,000



Results and Discussion

State Regulations

Purpose: Characterize live bait regulations in each state

- ▶ Developed email survey
- ▶ Email survey of 28 states
 - Natural resource management
 - Department of Agriculture

Aquatic Bait Regulations for Mississippi River Basin States

Alabama

Definition: Live aquatic bait for the purpose of this survey has been identified as fish, amphibians, and aquatic invertebrates.

The following questions are related to the commercial wild harvest and commercial raising of live aquatic bait (Questions 1 -15).

1. Is aquatic bait commercially wild harvested in your state? **Yes**__ **No**__
 - a. If yes, are commercial harvesters required to be licensed? **Yes**__ **No**__
2. Is aquatic bait commercially raised in your state? **Yes**__ **No**__
 - a. If yes, are aquatic bait farmers required to be licensed? **Yes**__ **No**__
3. Are there regulations governing the species of aquatic bait that can be commercially wild harvested in your state? **Yes**__ **No**__
 - a. If yes, please briefly explain the species restrictions for both aquatic vertebrates and invertebrates (include species specifically allowed and/or species specifically not allowed in regulations) and provide a web link if available.
4. Are there regulations governing the species of aquatic bait that can be commercially raised in your state? **Yes**__ **No**__
 - a. If yes, please briefly explain the species restrictions for both aquatic vertebrates and invertebrates (include species specifically allowed and/or species specifically not allowed in regulations) and provide a web link if available.
5. Does your state require pathogen testing of aquatic bait commercially wild harvested or commercially raised within your state? **Yes**__ **No**__
 - a. If yes, please briefly describe the pathogen testing or certification program for aquatic bait wild harvested or raised in your state and provide a web link if available.

Summary of Select Survey Results - Yes

- ▶ 1. Is aquatic bait commercially harvested in your state?.....96%
- ▶ 1a. If yes, are they required to be licensed?.....100%
- ▶ 2. Is aquatic bait commercially raised in your state?..... 92%
- ▶ 2a. If yes, are they required to be licensed?..... 85%
- ▶ 3. Regulations for wild harvested bait?..... 96%
- ▶ 4. Regulations governing species of aquatic bait raised?..... 96%
- ▶ 5. Pathogen testing of wild caught/raised aquatic bait?..... 39%
- ▶ 7. Restrictions where bait commercially can be wild harvested re: AIS.... 53%
- ▶ 9. Seasonal restrictions for commercial wild harvest of bait?..... 4%
- ▶ 11. Reporting requirements for commercially harvested live bait?..... 57%

Summary of Select Survey Results - Yes

- ▶ 12. Reporting requirements for commercially raised aquatic bait? 36%
- ▶ 13. Can aquatic bait be exported from your state? 96%
- ▶ 14. Can aquatic bait be imported into your state? 96%
- ▶ 14a. If yes, are there species restrictions? 93%
- ▶ 14b. If yes, is aquatic bait required to be tested for any pathogens? 48%
- ▶ 14c. Aquatic bait required to be tested for non-native/non-target species? 22%*
- ▶ 14d. If yes, are there reporting requirements for importing aquatic bait?.. 58%
- ▶ 15. Are there restrictions on the commercial transportation of aquatic bait? 57%
- ▶ 16. Can bait be wild harvested for personal use? 100%
- ▶ 17. Restrictions regarding release of unwanted aquatic bait? 78%

7. Are there restrictions where aquatic bait can be commercially wild harvested because of AIS?

- 53% Yes

Alabama	Kansas	Nebraska	South Dakota
Arkansas	Kentucky	New York	Tennessee
Colorado	Louisiana	North Carolina	Texas
Georgia	Minnesota	North Dakota	Virginia
Illinois	Mississippi	Ohio	West Virginia
Indiana	Missouri	Oklahoma	Wisconsin
Iowa	Montana	Pennsylvania	Wyoming

Yes

No

N/A

No Response

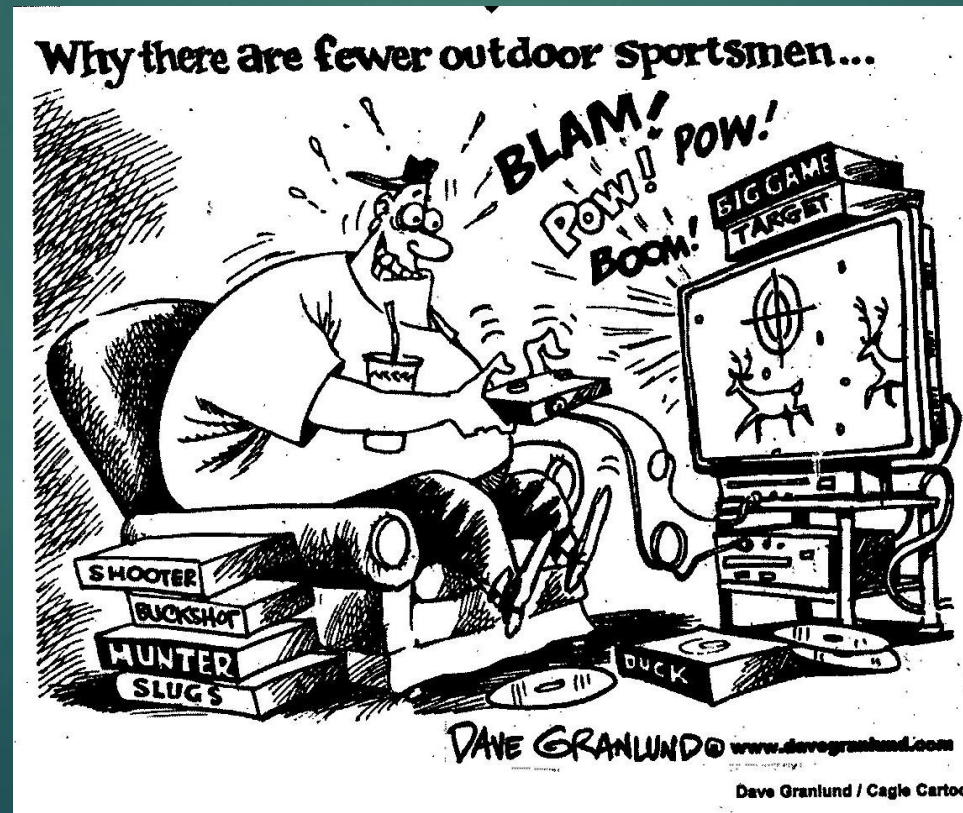
State Sportfishing Pamphlet Review

Bait Receipts Required in 9 States (32%)

- ▶ **CO** All live aquatic organisms from a commercial source and transported by anglers must be accompanied by a receipt.
- ▶ **MN** You must have a valid sales receipt from the vendor for suckers longer than 12 inches.
- ▶ **MO** Any number of live bait, when obtained from a source other than the waters of the state or a licensed commercial fisherman; the angler must carry a dated receipt for the bait.
- ▶ **MT** Anglers who import and fish with leeches must have a receipt from the approved out-of-state leech dealer.
- ▶ **NE** Sport fish may be used for bait if: they can be purchased from a bait dealer and the angler must keep a legible receipt.
- ▶ **NY** Certified bait needs a receipt to be used statewide. Baitfish without a receipt or with a receipt that is older than 10 days shall be considered uncertified bait. Uncertified baitfish outside of an overland transportation corridor must have a receipt.
- ▶ **TN** Trout used as bait - receipt needed.
- ▶ **TX** Transport and use of commercially purchased live bait in water while fishing from a vessel is allowed, provided persons in possession of the bait have a receipt that identifies the source of the bait.
- ▶ **VA** Legally purchased fish bait – the angler must have a receipt specifying # and species.
- ▶ **WY** Persons with live baitfish in possession shall produce either a receipt from a licensed live baitfish dealer

Industry Trends

- ▶ Less youth getting into fishing – video games and organized sports
- ▶ Fewer bait shops and more bait being sold at convenience stores.
- ▶ Lost lots of distributors in northern states because of regulations associated with discovery of VHSV in the region (fewer but bigger)



Risks of Spreading AIS and Pathogens Via the Live Aquatic Bait Pathway

- ▶ Asian Tapeworm (*Schyzocotyle acheilognathi*)
- ▶ Golden Shiner Virus
- ▶ Fathead Minnow Nidovirus
- ▶ Viral Hemorrhagic Septicemia
- ▶ Ovarian parasite (*Ovipleistophora ovariae*)
- ▶ Western Mosquitofish (*Gambusia affinis*)
- ▶ Non-native Crayfish (*Procambarus acutus* and *P. clarkii*)



Conclusions: Bait Poses Low Risks But Mixed

- ▶ 44 total live aquatic baits: GS, FHM, WS, GF, ES
- ▶ 50% of states get their bait from AK
 - Risk for AIS spread low due to Certification Program, but not risk free
- ▶ Five states export live aquatic bait to other MRBP states: AR, MN, ND, SD, WI
 - ND, SD, MN: Risk for AIS spread low for FHM and WS due to harvest from winter kill ponds, however, tiling of farm fields can allow access public waters during periods of high water
- ▶ Estimate of volume and value not possible
 - Due to inconsistent recording, inconsistent and lack of info



Conclusions: Bait Poses Low Risks But Mixed

- ▶ Nearly all states have regulations but policies vary widely
 - ▶ All states pose risk (low/higher)
 - ▶ SAH! prevention messages found in 78% of state fishing regulations
- ▶ Wild harvest bait from public waters with development, fishing, and boating has a greater risk of transporting AIS and pathogens of concern
- ▶ As with FHM and WS, wild harvested bait from public waters that is exported usually has pathogen testing required by the receiving state
- ▶ Several AIS and pathogens pose potential risks to wild populations as a result of being moved with live aquatic baits, but little evidence of problems and species not adequately studied





Thank you!

1. Is aquatic bait commercially wild harvested in your state? – 26 Yes (96%)

Alabama	Kansas	Nebraska	South Dakota
Arkansas	Kentucky	New York	Tennessee
Colorado	Louisiana	North Carolina	Texas
Georgia	Minnesota	North Dakota	Virginia
Illinois	Mississippi	Ohio	West Virginia
Indiana	Missouri	Oklahoma	Wisconsin
Iowa	Montana	Pennsylvania	Wyoming

Yes

No

N/A

No Response

1a. If yes to 1, are they required to be licensed? – 26 Yes (100%)

Alabama	Kansas	Nebraska	South Dakota
Arkansas	Kentucky	New York	Tennessee
Colorado	Louisiana	North Carolina	Texas
Georgia	Minnesota	North Dakota	Virginia
Illinois	Mississippi	Ohio	West Virginia
Indiana	Missouri	Oklahoma	Wisconsin
Iowa	Montana	Pennsylvania	Wyoming

Yes

No

N/A

No Response

2. Is aquatic bait commercially raised in your state? – 26 Yes (92%)

Alabama	Kansas	Nebraska	South Dakota
Arkansas	Kentucky	New York	Tennessee
Colorado	Louisiana	North Carolina	Texas
Georgia	Minnesota	North Dakota	Virginia
Illinois	Mississippi	Ohio	West Virginia
Indiana	Missouri	Oklahoma	Wisconsin
Iowa	Montana	Pennsylvania	Wyoming

Yes

No

N/A

No Response

2a. If yes to 2, are they required to be licensed? - 23 Yes (85%)

Alabama	Kansas	Nebraska	South Dakota
Arkansas	Kentucky	New York	Tennessee
Colorado	Louisiana	North Carolina	Texas
Georgia	Minnesota	North Dakota	Virginia
Illinois	Mississippi	Ohio	West Virginia
Indiana	Missouri	Oklahoma	Wisconsin
Iowa	Montana	Pennsylvania	Wyoming

Yes

No

N/A

No Response

3. Regulations for wild harvested bait?

- 26 Yes (96%)

Alabama	Kansas	Nebraska	South Dakota
Arkansas	Kentucky	New York	Tennessee
Colorado	Louisiana	North Carolina	Texas
Georgia	Minnesota	North Dakota	Virginia
Illinois	Mississippi	Ohio	West Virginia
Indiana	Missouri	Oklahoma	Wisconsin
Iowa	Montana	Pennsylvania	Wyoming

Yes No N/A No Response

4. Regulations governing species of aquatic bait raised? – 27 Yes (96%)

Alabama	Kansas	Nebraska	South Dakota
Arkansas	Kentucky	New York	Tennessee
Colorado	Louisiana	North Carolina	Texas
Georgia	Minnesota	North Dakota	Virginia
Illinois	Mississippi	Ohio	West Virginia
Indiana	Missouri	Oklahoma	Wisconsin
Iowa	Montana	Pennsylvania	Wyoming

Yes

No

N/A

No Response

5. Pathogen testing of wild caught or raised aquatic bait? - 11 yes (39%) 17 No (61%)

Alabama	Kansas	Nebraska	South Dakota
Arkansas	Kentucky	New York	Tennessee
Colorado	Louisiana	North Carolina	Texas
Georgia	Minnesota	North Dakota	Virginia
Illinois	Mississippi	Ohio	West Virginia
Indiana	Missouri	Oklahoma	Wisconsin
Iowa	Montana	Pennsylvania	Wyoming

Yes

No

N/A

No Response

7. Are there restrictions where aquatic bait can be commercially wild harvested because of AIS?

- 53% 15 Yes 13 No

Alabama	Kansas	Nebraska	South Dakota
Arkansas	Kentucky	New York	Tennessee
Colorado	Louisiana	North Carolina	Texas
Georgia	Minnesota	North Dakota	Virginia
Illinois	Mississippi	Ohio	West Virginia
Indiana	Missouri	Oklahoma	Wisconsin
Iowa	Montana	Pennsylvania	Wyoming

Yes No N/A No Response

8. Are there angler restrictions regarding where aquatic bait can be used because of AIS?

- 14 yes 14 No

Alabama	Kansas	Nebraska	South Dakota
Arkansas	Kentucky	New York	Tennessee
Colorado	Louisiana	North Carolina	Texas
Georgia	Minnesota	North Dakota	Virginia
Illinois	Mississippi	Ohio	West Virginia
Indiana	Missouri	Oklahoma	Wisconsin
Iowa	Montana	Pennsylvania	Wyoming

Yes

No

N/A

No Response

9. Are there seasonal restrictions for commercial wild harvest of bait? – 3 Yes 25 No (89%)

Alabama	Kansas	Nebraska	South Dakota
Arkansas	Kentucky	New York	Tennessee
Colorado	Louisiana	North Carolina	Texas
Georgia	Minnesota	North Dakota	Virginia
Illinois	Mississippi	Ohio	West Virginia
Indiana	Missouri	Oklahoma	Wisconsin
Iowa	Montana	Pennsylvania	Wyoming

Yes

No

N/A

No Response

10. Are there harvest limits or quotas for commercial harvest of aquatic bait?

Alabama	Kansas	Nebraska	South Dakota
Arkansas	Kentucky	New York	Tennessee
Colorado	Louisiana	North Carolina	Texas
Georgia	Minnesota	North Dakota	Virginia
Illinois	Mississippi	Ohio	West Virginia
Indiana	Missouri	Oklahoma	Wisconsin
Iowa	Montana	Pennsylvania	Wyoming

Yes

No

N/A

No Response

11. Are there reporting requirements for commercially harvested live bait? – 57% No

Alabama	Kansas	Nebraska	South Dakota
Arkansas	Kentucky	New York	Tennessee
Colorado	Louisiana	North Carolina	Texas
Georgia	Minnesota	North Dakota	Virginia
Illinois	Mississippi	Ohio	West Virginia
Indiana	Missouri	Oklahoma	Wisconsin
Iowa	Montana	Pennsylvania	Wyoming

Yes

No

N/A

No Response

12. Are there reporting requirements for commercially raised aquatic bait? - 36% Yes

Alabama	Kansas	Nebraska	South Dakota
Arkansas	Kentucky	New York	Tennessee
Colorado	Louisiana	North Carolina	Texas
Georgia	Minnesota	North Dakota	Virginia
Illinois	Mississippi	Ohio	West Virginia
Indiana	Missouri	Oklahoma	Wisconsin
Iowa	Montana	Pennsylvania	Wyoming

Yes

No

N/A

No Response

13. Can aquatic bait be exported from your state? – 96% Yes

Alabama	Kansas	Nebraska	South Dakota
Arkansas	Kentucky	New York	Tennessee
Colorado	Louisiana	North Carolina	Texas
Georgia	Minnesota	North Dakota	Virginia
Illinois	Mississippi	Ohio	West Virginia
Indiana	Missouri	Oklahoma	Wisconsin
Iowa	Montana	Pennsylvania	Wyoming

Yes

No

N/A

No Response

14. Can aquatic bait be imported into your state? – 96% Yes

Alabama	Kansas	Nebraska	South Dakota
Arkansas	Kentucky	New York	Tennessee
Colorado	Louisiana	North Carolina	Texas
Georgia	Minnesota	North Dakota	Virginia
Illinois	Mississippi	Ohio	West Virginia
Indiana	Missouri	Oklahoma	Wisconsin
Iowa	Montana	Pennsylvania	Wyoming

Yes

No

N/A

No Response

14a. If yes to 14, are there species restrictions? – 93% Yes

Alabama	Kansas	Nebraska	South Dakota
Arkansas	Kentucky	New York	Tennessee
Colorado	Louisiana	North Carolina	Texas
Georgia	Minnesota	North Dakota	Virginia
Illinois	Mississippi	Ohio	West Virginia
Indiana	Missouri	Oklahoma	Wisconsin
Iowa	Montana	Pennsylvania	Wyoming

Yes

No

N/A

No Response

14b. If yes to 14, is aquatic bait required to be tested for any pathogens? – 48% Yes

Alabama	Kansas	Nebraska	South Dakota
Arkansas	Kentucky	New York	Tennessee
Colorado	Louisiana	North Carolina	Texas
Georgia	Minnesota	North Dakota	Virginia
Illinois	Mississippi	Ohio	West Virginia
Indiana	Missouri	Oklahoma	Wisconsin
Iowa	Montana	Pennsylvania	Wyoming

Yes

No

N/A

No Response

14c. If yes to 14, is aquatic bait required to be tested for non-native or non-target species? - 22%

Alabama	Kansas	Nebraska	South Dakota
Arkansas	Kentucky	New York	Tennessee
Colorado	Louisiana	North Carolina	Texas
Georgia	Minnesota	North Dakota	Virginia
Illinois	Mississippi	Ohio	West Virginia
Indiana	Missouri	Oklahoma	Wisconsin
Iowa	Montana	Pennsylvania	Wyoming

Yes

No

N/A

No Response

14d. If yes to 14, are there reporting requirements for importing aquatic bait? 58% Yes

Alabama	Kansas	Nebraska	South Dakota
Arkansas	Kentucky	New York	Tennessee
Colorado	Louisiana	North Carolina	Texas
Georgia	Minnesota	North Dakota	Virginia
Illinois	Mississippi	Ohio	West Virginia
Indiana	Missouri	Oklahoma	Wisconsin
Iowa	Montana	Pennsylvania	Wyoming

Yes

No

N/A

No Response

15. Are there restrictions on the commercial transportation of aquatic bait? 57% Yes

Alabama	Kansas	Nebraska	South Dakota
Arkansas	Kentucky	New York	Tennessee
Colorado	Louisiana	North Carolina	Texas
Georgia	Minnesota	North Dakota	Virginia
Illinois	Mississippi	Ohio	West Virginia
Indiana	Missouri	Oklahoma	Wisconsin
Iowa	Montana	Pennsylvania	Wyoming

Yes

No

N/A

No Response

16. Can aquatic bait be wild harvested for personal use? 100% Yes

Alabama	Kansas	Nebraska	South Dakota
Arkansas	Kentucky	New York	Tennessee
Colorado	Louisiana	North Carolina	Texas
Georgia	Minnesota	North Dakota	Virginia
Illinois	Mississippi	Ohio	West Virginia
Indiana	Missouri	Oklahoma	Wisconsin
Iowa	Montana	Pennsylvania	Wyoming

Yes

No

N/A

No Response

17. Are there restrictions regarding the release of unwanted aquatic bait into waters of the state? 78% Yes

Alabama	Kansas	Nebraska	South Dakota
Arkansas	Kentucky	New York	Tennessee
Colorado	Louisiana	North Carolina	Texas
Georgia	Minnesota	North Dakota	Virginia
Illinois	Mississippi	Ohio	West Virginia
Indiana	Missouri	Oklahoma	Wisconsin
Iowa	Montana	Pennsylvania	Wyoming

Yes

No

N/A

No Response

Asian Tapeworm

- ▶ Asian tapeworms can be moved to new waterbodies with movement of fish or water with infected copepods or free-swimming coracidia
- ▶ Detected Asian tapeworm in bait shops throughout Michigan in 48 of 90 (53.3%) lots examined
- ▶ Asian tapeworms fairly common in AR baitfish farms
- ▶ Little information is available on impacts of Asian tapeworm on wild fish populations



Golden Shiner Virus



- ▶ GSV found in golden shiners, fathead minnows, creek chubs, white suckers, emerald shiners, muskellunge, silver carp, and smallmouth buffalo
- ▶ Pathogenicity of GSV very low and GSV rarely causes mortality
- ▶ GSV pathogenic to musky in MI hatcheries
- ▶ Pathogenicity to wild musky unknown
- ▶ Baitfish from AR, MN and SD tested -- Found that 41% of golden shiner lots, 32% of fathead minnow lots, and 5% of white sucker lots tested positive for GSV
- ▶ Clinical signs of GSV seen in fathead minnows, golden shiners, and white suckers

Fathead Minnow Nidovirus (FHMNV)



- ▶ McCann (2012) found 8% of fathead minnow lots from bait shops from AR, SD, and MN tested positive for FHMNV
- ▶ FHMNV is an emerging disease and causes mortality in fathead minnows and musky in hatcheries
- ▶ Impact to wild musky populations is unknown
- ▶ FHMNV is part of the Certification of Commercial Bait and Ornamental Fish Program in AR, if requested

Viral Hemorrhagic Septicemia (VHSV)

- ▶ VHSV is part of Certification of Commercial Bait and Ornamental Fish Program in AR
- ▶ Every state where VHSV is present or nearby has regulations in place to minimize risk of moving VHSV with baitfish
- ▶ Several baitfish are susceptible species and could move the virus to new waterbodies if regulations are not followed or the virus unexpectedly moves to new waters



Golden Shiner Ovarian Parasite

- ▶ Parasite infects ovaries and can cause sterility of farm-raised golden shiners
- ▶ Could have impacts on wild golden shiner reproduction
- ▶ No known impacts to wild golden shiner populations
- ▶ Need to better understand risks posed by this parasite

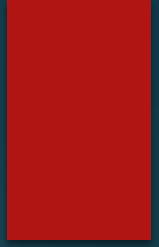


Western Mosquitofish

- ▶ Mosquitofish are voracious, aggressive predators that extirpated or caused declines in many native fish species
- ▶ Mosquitofish not thought to be cold tolerant and unlikely to become established in northern states
- ▶ Western mosquitofish Ecological Screening Summary (USFWS 2017b) concludes -- no climate barrier to this species invading the rest of the U.S.
- ▶ Occurrence of western mosquitofish in baitfish production ponds in AR is low but it happens
- ▶ Western mosquitofish are dealt with using BMPs in AR baitfish farms
- ▶ No range expansion found from movement with baitfish



Non-native Crayfish



- ▶ White River and possibly red swamp crayfish inhabit AR baitfish fish farms
- ▶ Crayfish often seen in minnow deliveries from AR
- ▶ Red swamp crayfish can be ordered on-line for bait from LA
- ▶ Both species may be able to colonize every state in the contiguous U.S according to White River and the Red Swamp Crayfish Ecological Risk Screening Summary (USFWS)
- ▶ Considered invasive species in many northern states



Alabama

Bait used: Golden shiners, goldfish, fathead minnows, rosy reds, black salties from AR. There are some locally caught crayfish that enter the bait market in Alabama.

Arkansas

Bait used: Golden shiners, goldfish, fathead minnows, rosy reds, crayfish, green sunfish, black salty from AR

Colorado

Bait used: Fathead minnows, golden shiners from AR. White suckers (likely from MN). Leeches from MN. Waterdogs from a Kansas distributor (not sure where they are harvested).

Georgia

Bait used: Fathead minnows, golden shiners, some rosy reds, some goldfish from AR.

Illinois

Bait used: Fathead minnows, golden shiners, goldfish from AR. White suckers from WI. Ribbon and horse leeches from MN.

Indiana

Bait used: Fathead minnows, golden shiners, some rosy reds, some goldfish from AR. White suckers and leeches from MN or WI. Fathead minnows from SD and MN. Some crayfish (source/species uncertain).

Iowa

Bait used: Fathead minnows, golden shiners, some rosy reds, some goldfish and some green sunfish from AR. Green sunfish and crayfish from MO. Fathead minnows, suckers and leeches from SD and MN. Leeches from WI. A few local crayfish are sold at retail. Some horse leeches (from MN) – but hard to get now. Some local harvest of creek chubs, suckers, common shiners and spottail shiners.

Kansas **Bait used:** Leeches from MN. Hybrid bluegills, bullheads, rosy reds, fathead minnows, goldfish, golden shiners, crayfish from AR. Some crayfish may come from MO.

Kentucky **Bait used:** Crayfish from LA. Golden shiners, fathead minnows, black salties, hybrid bluegills, goldfish from AR. Leeches from MN. Israeli carp mentioned but can't get them anymore.

Louisiana **Bait used:** Golden shiners from AR. Grass shrimp caught locally and sold commercially. Crayfish are harvested for personal use but not sold commercially.

Minnesota **Bait used:** Golden shiners, fathead minnows, white suckers, hornyhead chubs, emerald shiners, spottail shiners, northern redbelly dace, finescale dace, pearl dace, creek chubs, common shiners, tadpole madtoms, bullheads, mud minnows, bluntnose minnows, leeches, freshwater shrimp (*Gammarus*) all from MN waters.

Mississippi **Bait used:** Golden shiners, goldfish, fathead minnows, rosy reds from AR.

Missouri **Bait used:** Golden shiners, goldfish, fathead minnows, rosy reds from AR. One golden shiner farm in MO. Hybrid bluegill – may come from AR or MO farms. Only one species of crayfish legal (*Orconectes virilis*) and that is produced in MO. Leeches and horse leeches from MN.

Montana **Bait used:** Western silvery minnows, fathead minnows, lake chubs, creek chubs, longnose suckers, white suckers, plains minnows, emerald shiners, longnose dace, flathead chubs all wild harvested in MT. Leeches from certified dealers in MN and ND.

Nebraska **Bait used:** Golden shiners, fathead minnows, goldfish, hybrid bluegill from AR. Some fathead minnows from SD. Leeches from MN. Some suckers from MN. Crayfish mostly likely locally harvested. There is a limited wild harvest of baitfish out of Platte River (possible one or more of these species -- the western silvery minnow, plains minnow, flathead chub, and speckled chub).

New York **Bait used:** Golden Shiners, fathead minnows, rosy reds from AR. Crayfish (*Orconectes immunis*) mostly grown or harvested locally. Emerald shiners from Niagara River, eastern silvery minnow (hunts) (these could also be bluntnose minnows or emerald shiners), banded killifish from Lake Ontario/St. Lawrence River tributaries. Suckers from MN. Some emerald shiners from WI. Leeches from MN.

North Carolina **Bait used:** Golden shiners, goldfish, black salties, fathead minnows from AR. Eels from east coast.

North Dakota **Bait used:** Fathead minnows harvested from ND are used statewide (sticklebacks are a legal nontarget component of fathead minnow distribution). White suckers (probably from MN) can only be used in Red River and Bois de Sioux Rivers. Leeches from MN. There was some mention of leeches, tiger salamanders and frogs being harvested and used as bait in ND.

Ohio **Bait used:** Golden shiners, goldfish, fathead minnows, rosy reds from AR. Emerald shiners from Lake Erie but numbers are way down. Emerald shiners from WI. Crayfish locally grown. Bullheads, leeches and white suckers from MN/WI. Brought in Israeli carp from AR in the past but couldn't get any last year (2018).

Oklahoma **Bait used:** Golden shiners, goldfish, fathead minnows, rosy reds and hybrid bluegill from AR.

Pennsylvania **Bait used:** Small quantity golden shiners and fathead minnows raised in PA. Golden shiners, fathead minnows, rosy reds from AR. Emerald shiners from Lake Erie and from WI. White suckers from MN/WI. Leeches from MN.

South Dakota **Bait used:** Fathead minnows harvested in SD. Some white suckers are raised and used in SD. Some golden shiners may be brought in from AR. There may be some creek chubs and western silvery minnows wild harvested and sold in SD, but very limited. Leeches from MN.

Tennessee **Bait used:** Golden shiners, fathead minnows, rosy reds, goldfish. Black salties, hybrid bluegill from AR. One small farm in TN raises golden shiners and fathead minnows. Leeches from MN.

Texas **Bait used:** Golden shiners, goldfish, fathead minnows, black salties, rosy reds, hybrid bluegill from AR.

Virginia **Bait used:** Golden shiners, fathead minnows, rosy reds, goldfish, black salties from AR. Eels from east coast.

West Virginia **Bait used:** Golden shiners, fathead minnows, rosy reds, goldfish, sunfish sp. from AR. Israeli carp but unavailable last year. Leeches from MN. Some crayfish and hellgrammites locally harvested.

Wisconsin **Bait used:** Golden shiners, fathead minnows and rosy reds from AR. White suckers raised in WI and MN - some wild harvested in WI. Emerald shiners, creek chubs, common shiners, several dace sp., hornyhead chubs, golden shiners wild harvested in WI. Golden shiners and creek chubs farm raised in WI. Leeches mostly from MN but some harvested in WI. Mayfly and dragonfly nymphs harvested and sold in-state and exported. Rusty crayfish harvested for in-state use and for export (very small amount).

Wyoming **Bait used:** Fathead minnows imported from certified dealers (AR and SD). Wild caught bait that could include white suckers, fathead minnows, creek chubs or other native species. Leeches from MN.