

U.S. Fish and Wildlife Service
U.S. Geological Survey

National Fish Strain Registry - Paddlefish and Sturgeon

Species Tables of Reported Populations

11/01/01



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USGS



National Fish Strain Registry - Paddlefish and Sturgeon (NFSR-PS)

Species Tables on Reported Populations and Broodstocks

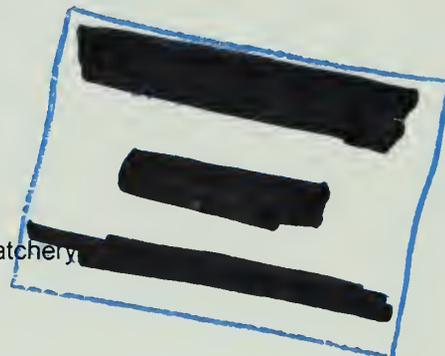
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1. Introduction

In the past, with little performance, habitat, or genetic information available, managers could not effectively manage fish populations for both sustained public use and preservation of genetic variability. Until recently, fish from "readily available" populations were shipped throughout the country and stocked in many fisheries before the potential long term detrimental implications on resident natural fish populations were understood. The need for detailed information on managed fish populations increased as managers became aware of the genetic consequences of mixing adapted and non-adapted populations. In 1994, the U. S. Geological Survey, Research & Development Laboratory (Wellsboro, Pennsylvania) and the U.S. Fish and Wildlife Service, Division of Fish Hatcheries undertook a joint project to catalog the population characteristics and performance information available on all managed fish populations, both cultured and wild populations, into a single information database. The resulting database, named the **National Fish Strain Registry (NFSR)**, is available to fisheries managers, fish producers, and researchers throughout the United States. The goal of this project is to provide fisheries managers the information needed to match the characteristics (life history, genetic, reproductive, and behavioral) of individual populations with the habitat and management objectives of a given fishery and to determine the population best suited for that fishery.

The National Fish Strain Registry (NFSR) is a centralized database of standardized information on managed wild and cultured fish populations, typically identified by fisheries personnel using the terms: stock, strain, and broodstock. The NFSR provides a catalog of reported populations with their characteristics; i.e., genetic, life history, broodstock history, behavioral, reproductive, culture, and post-stocking performance characteristics. The NFSR is divided into five component registries based on taxonomic families of managed species. The five component registries are: 1) Inland trout (family - Salmonidae, excluding Pacific salmon species), 2) catfish (family - Ictaluridae), 3) sturgeon and paddlefish (Order - Acipenseriformes), 4) perch (family - Percidae) and pikes (family - Esosidae), and 5) bass and sunfish (family - Centrarchidae).

Information on genetic and performance characteristics of fish source populations is frequently unavailable to the fisheries personnel who make the decisions on which populations will be used in production or management programs. The NFSR data repository strives to collect, analyze, and interpret the diverse information (breeding history, life history, disease tolerance, stress tolerance, habitat preference, hatchery performance, and field performance) needed by fisheries personnel to manage and culture populations of these species throughout the United States. The NFSR provides fisheries personnel the information needed to identify the most suitable broodstock for each program. The NFSR may also be used by commercial producers to identify populations that effectively meet the production objectives of widely divergent culture situations.

The NFSR-PS includes information on populations of all species of the Order - Acipenseriformes native to North America (Table 1). Designed as a dynamic database, the NFSR-PS can be updated as ongoing studies are completed and new information becomes available.

The Paddlefish and Sturgeon Advisory Committee was established at the beginning of the project to guide development of the NFSR-PS. The committee consisted of fisheries experts from the U.S. Fish and Wildlife Service, state fish and game agencies, and commercial aquaculture organizations. Advisory committee members were:

Mr. Richard St Pierre, USFWS, Susquehanna River Coordinator.
Mr. Herb Bollig, USFWS, Manager, Gavins Point NFH.
Mr. Frank Parauka, USFWS, Panama City Fisheries Research Office.
Mr. Ken Beers, The Fishery Inc.
Mr. L. Kim Graham, Missouri Department of Conservation.
Mr. Doug Carlson, New York State, Department of Environmental Conservation.
Dr. Fred Binkowski, University of Wisconsin-Milwaukee.

The committee identified a suite of traits believed to be most important to fisheries managers, broodstock managers, culturists, field biologists, commercial aquaculturists and research scientists. Traits include: genetic profile, breeding history, life history, reproduction, behavior, disease resistance, stress tolerance, cultural performance, post-stocking performance, and current management applications. A national survey questionnaire was developed to obtain the defined data set on managed populations throughout the United States (Appendix A). Surveys were distributed nationally to federal and state fisheries agencies, fisheries research facilities and commercial producers. As surveys were received, the information was entered into the NFSR-PS database, compiled, and summarized. Survey questions requiring subjective rating responses were coded and the relative ratings summarized (See Table 2 for rating codes and definition). This manual extracts selected trait information that is frequently requested by fisheries personnel. Information reported here include the name, address and telephone number(s) of contact persons for each reported population (Table 3), culture and field performance characteristics (Table 4), reproductive and cultural performance (Table 5), disease resistance (Table 6), post-stocking performance (Table 7), and current management recommendations (Table 8).

2. NFSR-PS structure

Information on reported populations is divided into four sections based on information type and source:

- A. The Population Identification and Contact Person Information Section contains the information needed to uniquely identify each population and establish the data relationships needed to manage the information found in tables throughout the database. This section contains three types of information:
 - 1) Species, population, and broodstock names are combined to determine the unique identification number for each population / broodstock, called the "taxon identification number".
 - 2) A specific contact person, with their name, title, address and telephone information, is identified for each population. This person may be contacted for additional information beyond that reported in the NFSR-PS.
 - 3) A list of publications and reports that contain background and performance information on the specific population.
- B. The Broodstock Section contains information, provided by the population manager, to describe population origin, broodstock history, life history, genetic characteristics, performance characteristics, etc.
- C. The Hatchery/Captive Production Section contains information provided by managers at one or more hatcheries where progeny from the population were cultured. Data include information on: reproduction, growth, survival, food consumption, disease resistance, stress tolerance, hatchery conditions during the culture period, etc.
- D. The Field Performance Section contains information provided by one or more field biologists who worked with fish from the population in different management situations. Data include information on: type of fishery stocked, post-stocking growth and survival, relative stocking success, etc.

3. Basis for "Relative ratings"

The Advisory committee recognized the impossibility of obtaining standardized trial data for many of the important culture and field performance traits due to uncontrolled variability in environmental conditions (temperature, water quality, elevation, location, etc.); production situations (wild fish, hatchery raceways, farm ponds, etc.); and management situations (restoration, enhancement, recreational, food fish, etc.). As a result, a subjective rating system based on the past experience of broodstock managers, hatchery managers, and field biologists was developed. Traits such as

handling stress, disease resistance, and post-stocking performance were measured using a five level rating scale (SEE Table 2 for rating systems and definitions) assigned by the manager or biologist based on performance of that population relative to other populations in the same situation. Reporters were given the option of a "0" rating, if they had no experience with other populations in the same situation or had not experienced a particular situation in their facilities. Throughout this manual tabled information based on subjective rating systems are identified as 'relative ratings'.

4. Description of NFSR-PS information

Tables in this manual contain information extracted from the NFSR-PS to provide cooperators and contributor agencies a complete set of the most commonly requested population information. Manual tables are divided into species sections listed in alphabetical order by species common name. Within each species section, reported populations are listed in alphabetic order with information on selected traits. Manual information is presented in three sections: introductory tables, population summary tables, and appendices.

A. Introductory tables - These tables provide information to guide users in interpreting the data in summary tables 3 to 8.

Table 1. A list of Acipenseriformes species (scientific and common names) with reported population information included in the National Fish Strain Registry - Paddlefish and Sturgeon .

Table 2. A list of codes used throughout the National Fish Strain Registry - Paddlefish and Sturgeon with their interpretation in categorizing traits or in describing the "relative" rating of performance traits.

B. Population summary tables - These tables summarize population information on selected traits reported in the NFSR-PS by trait type. Each table is divided into species sections listed alphabetically by species common name. Within each species, populations are listed in alphabetic order. When multiple broodstocks are reported for a population, broodstocks are listed in alphabetic order within population. Information presented in tables 3 to 8 includes:

Table 3. A list of the populations reported to the NFSR-PS with the designated contact person for each. Contact person, address, and telephone number information are provided to assist database users to contact these persons to obtain additional information not included in the database.

Table 4. A summary of selected broodstock history and status information (broodstock availability, origin, broodstock type, genetic analysis).

Table 5. A summary of selected reproductive performance and cultural information (spawning period, Hatchability, growth, stress tolerance).

Table 6. A summary of selected disease resistance ratings (relative rating) information.

Table 7. A summary of selected post-stocking field performance traits (relative rating) information (survival, growth, harvest, migration).

Table 8. A summary of current management applications information identified by reporting agencies.

C. Appendices The manual has three appendices to show the original survey questionnaire form used to develop the NFSR-PS database (Appendix A), the revised survey questionnaire form currently used for submission of new data (Appendix B) and the population recommendation form for NFSR-PS users to identify and recommend populations/ broodstocks that are managed by others (wild free ranging populations, cultured broodstocks, or commercial broodstocks) for inclusion in the NFSR-PS (Appendix C). Individuals using this manual will want to review Appendix B to identify the total trait list included in the NFSR-PS database.

Appendix A - Survey questionnaire distributed to fisheries agencies, commercial growers and researchers in the initial 1995 data collection effort.

Appendix B - Revised survey questionnaire currently used for data submission by contributors. This form is printed and returned to contributors periodically for information update and database expansion.

Appendix C - The population/broodstock recommendation form is used by database users to identify unreported populations for inclusion in the National Fish Strain Registry - Paddlefish and Sturgeon

5. Definition of traits and terms used in the tables

The traits included in the populations summary tables are described in the following discussion. Where traits were calculated, formulas and calculation procedures are described.

Agency - The type of agency that manages or cultures the reported population or broodstock: F = Federal, S = State, U = University, T = Tribal, P = Private or commercial organization.

Aquaculture production - Populations were rated for suitability for aquaculture production in raceways, ponds and tanks using a five-step scale to describe population performance relative to other populations the reporter has worked with. (See Table 2 for specific trait performance relative rating codes).

Availability - Population availability (Yes, No, or Limited) to other agencies or individuals as eggs, fry, fingerlings, or adults.

Broodstock name - The name used to identify the broodstock at the culture facility. Names typically contain the population or broodstock facility name. When the same broodstock name is used at two or more locations, the state abbreviation where the hatchery is located is appended to the broodstock name for state agencies and the hatchery name abbreviation is appended for federal facilities. Wild populations are identified by the letter "w" appended after the broodstock name.

Broodstock type - Broodstocks were classified into three types: Domestic = broodstock held in culture for two or more generations; Wild = broodstock are free ranging or natural fish, Captive = broodstock are progeny of wild broodstock which are reared to maturity in a culture / hatchery situation.

Contact person - Person identified for each reported population who can provide additional detailed information on that population. Usually the individual who prepared and reported the survey broodstock information or a person designated by the management agency. In cases where the named individual is no longer at the broodstock location, the current facility manager is the designated contact person.

Crowding stress (relative rating) - Crowding tolerance was measured using a five step scale to describe the performance of the population relative to other populations the reporter had worked with in the past. (See Table 2 for stress tolerance relative rating codes).

Disease resistance rating (relative rating) - Disease resistance was rated for the nine diseases/health problems most commonly reported on population records submitted for inclusion in the NFSR-PS. See Table 2 for the list of diseases / health problems rated by broodstock managers. Disease resistance ratings for each disease / health problem were established using a subjective five step scale to describe the performance of the particular population relative to other populations the reporter had worked with in the past. (See Table 2 for disease resistance relative rating codes).

Effective population size (N_e) - The calculated effective population size based on the reported number of parents used to produce the original broodstock generation or (if unknown) the current estimated populations size. Effective population size is calculated using the formula: $N_e = 4(N_m N_F) / (N_m + N_F)$.

Fluctuating temperature stress tolerance (relative rating) - Tolerance to temperature changes (a change of 5 °F or greater within a 15 minute time period) was measured using a five step scale to describe the performance of the population relative to other populations the reporter had worked with in the past. (See Table 2 for stress resistance relative rating codes).

Genetic analysis - The type(s) of genetic analysis that have been applied to characterize the population are recorded in this column. Types of genetic analysis reported are: Allozyme, Mitochondrial DNA, Nuclear DNA, and Isoelectric focusing. A blank in this column indicates the population has not been characterized or the analysis was unknown to the manager.

Handling stress (relative rating) - Handling stress was measured using a five step scale to describe the performance of the particular population relative to other populations the reporter had worked with in the past. (See Table 2 for stress resistance relative rating codes).

Harvest susceptibility (relative rating) - Measured using a five-step scale to describe population susceptibility to harvest relative to other populations the reporter has worked with. (See Table 2 for specific trait performance relative rating codes).

Hatchability - The mean percent hatch of egg lots over the entire spawning season. Percentages were measured from eyed egg stage through hatching using the formula: % hatch = (Number hatched fry / Number eyed eggs) X 100.

Management applications - Managers were asked to identify management situations where fish from this population were "well-adapted" or "poorly-adapted". Management situations include: Riverine supplementation, lacustrine supplementation, riverine enhancement, lacustrine enhancement, Riverine restoration, and lacustrine restoration.

Migration tendency (relative rating) - Tendency to migrate out of the stocking area was measured using a five step scale to describe the performance of the particular population relative to other populations the reporter had worked with in the past. (See Table 2 for specific trait performance relative rating codes).

Origin of population - The reported source (hatchery or body of water) where the original population was obtained or developed.

Population name - The name of the earliest known water body (river, lake, drainage etc.) or hatchery where the population originated. When managers did not know the population origin or the population had resided in a given facility for an extended time period, the facility name was assigned. When populations originated from a known wild source, the wild source name are assigned, without regard to past introductions from other sources. Population names are subject to change as new information becomes available.

Post - stocking growth (relative rating) - Growth rate after stocking was measured using a five step scale to describe the performance of the population relative to other populations the reporter had worked with in the past (See Table 2 for specific trait performance relative rating codes).

Post - stocking survival (relative rating) - Fish survival was characterized using a five step scale to describe the performance of the population relative to other populations the reporter had worked with in the past. (See Table 2 for specific trait performance relative rating codes).

Spawning period - The earliest and latest spawning dates each year (month and day) when females of the population "normally" spawn.

Survival percentage - The percent of fish surviving to 90 days was measured as the number of live fish at 90 days post-hatch divided by the number of fish hatched. This value is then multiplied by 100 to obtain percent.

Transportation stress tolerance (relative rating) - Tolerance to transportation stress was characterized using a five step scale to describe the performance of the population relative to other populations the reporter had worked with in the past. (See Table 2 for stress resistance relative rating codes).

Weight - The mean weight of fish at 90 days post-hatch and 1 year post-hatch was measured in units of number of fish per pound.

6. Using the NFSR-PS Tables

Tables 3 to 8 in this manual are divided into sections for each species listed alphabetically by common name. Populations within each species are listed in alphabetically by population name. These tables may be used: 1) to find information on a specific population or 2) to identify populations with the "preferred" performance for certain desirable traits

I. To find information on a specific population.

- a. Determine the species, population and broodstock name for that population.
- b. If certain traits are of primary concern, determine the table(s) containing those traits based on the information category sought (i.e., broodstock status, disease resistance, hatchery or post-stocking performance, etc.).
- c. Move to the species section within the appropriate table(s).
- d. Locate the population or broodstock name within the species section and read the information under the appropriate column title.
- e. Move to other tables and repeat step "d".
- f. If additional information is desired, go to table 3 and repeat step "d" and locate the contact person information (name, address and telephone information). The contact person can be contacted directly to provide more specific and current information.

2) To identify populations or broodstocks with specific desired traits among the reported populations.

- a. Determine the trait or traits of interest.
- b. Determine the performance level desired for each chosen trait.
- c. Determine the table where each trait is located.
- d. Move to the species section within the appropriate table(s).
- e. Locate the column for the trait-of-interest and scan the table values to identify "acceptable" values. Record the name of each population that meet the desired performance level for selected trait(s).
- f. Identify populations that meet all criteria (or best meet all criteria) when the objective is performance of multiple traits.
- g. Go to Table 3 and in the appropriate species section, locate the population(s) identified in step "f". Determine the contact person for each chosen population. Contact those persons to obtain additional information and to determine the current availability status if fish or eggs are to be acquired from these populations.

7. Procedure for updating NFSR-PS information

A mechanism for updating population information was built into the NFSR-PS by the survey format. Collectively, the contact persons identified in the surveys establish the network of individuals and organizations that manage and culture Acipenseriformes populations. This network can be contacted periodically to update the information on each population / broodstock. The network is continually expanding as additional wild or cultured populations are added to the database. Published literature and agency reports are used, where available, to confirm initial subjective or incomplete data provided by contact persons.

Fisheries managers are invited to submit data to the NFSR-PS on populations/ broodstocks they culture or manage using the blank form "National Fish Strain Registry - Paddlefish and Sturgeon, Survey of Acipenseriformes populations," found in appendix B. Completed surveys should be mailed to the address provided on that form.

Managers are also invited to recommend additional populations or broodstocks for inclusion in the NFSR-PS. A population/broodstock recommendation form is provided in Appendix C for this purpose. Enter the name of the recommended population and a contact person who can provide information on that population, and mail the completed form to the address provided in the instructions. When recommendation form is received, information is collected and the population is added to the NFSR-PS.

8. NFSR-PS distribution

The NFSR-PS data base application program is written using R-Base 6.0 software by Microrim (** no endorsement of this product by the U.S. Government is given or implied). The NFSR-PS was designed, developed, and documented by Harold L. Kincaid, Leslie J. Mengel, and Matthew J. Gray, USGS, Research and Development Laboratory. NFSR-PS information is available to all fisheries personnel -- federal and state management agencies, universities, private producers/growers and aquaculturists -- seeking information on individual fish populations or broodstocks. Copies of the NFSR-PS are available upon request (only available on CD-ROM in Windows format) while supplies last, by writing to:

USGS, BRD, R&D Laboratory
ATTN: NFSR-PS, Library
R.D. 4, Box 63
Wellsboro, PA 16901

Table 1. Paddlefish and Sturgeon species (Order: Acipenseriformes) included in the National Fish Strain Registry.

Scientific name	Common name
<u>Family Acipenseridae</u>	
<i>Acipenser brevirostrum</i>	Shortnose sturgeon
<i>Acipenser fulvescens</i>	Lake sturgeon
<i>Acipenser medirostris</i>	Green sturgeon
<i>Acipenser oxyrinchus</i>	Atlantic sturgeon
<i>Acipenser transmontanus</i>	White sturgeon
<i>Scaphirhynchus albus</i>	Pallid sturgeon
<i>Scaphirhynchus platyrhynchus</i>	Shovelnose sturgeon
<u>Family Polodontidae</u>	
<i>Polyodon spathula</i>	Paddlefish

Table 2. Codes used throughout the National Fish Strain Registry - Paddlefish and Sturgeon to describe and classify the characteristics of individual populations and to rate the relative performance of specified traits.

Category	Code	Code Interpretation
Availability of Broodstock	Y (YES)	Population is available (contact broodstock manager).
	N (NO)	Population is not available.
	L (Limited)	Population may be available in certain situations (contact broodstock manager).
	U	Unknown.
Agency / Organization Type	F	Agency of federal government
	S	Agency of state government
	T	Tribal (Native American)
	U	University
	P	Private organization or commercial producer
Stress Resistance Relative Rating	0	Unknown
	1	Resistance to specified stress is "Poor"
	2	Resistance to specified stress is "Below average"
	3	Resistance to specified stress is "Average"
	4	Resistance to specified stress is "Above average"
	5	Resistance to specified stress is "Superior"
Disease Resistance Relative Rating	0	Unknown
	1	Resistance to specified disease is "Susceptible"
	2	Resistance to specified disease is "Below average"
	3	Resistance to specified disease is "Average"
	4	Resistance to specified disease is "Above average"
	5	Resistance to specified disease is "Resistant"
Disease Codes	BGD	Bacterial Gill Disease
	COL	Columnaris
	COS	Costia
	FUR	Furunculosis (<i>Aeromonas salmonicida</i>)
	HYD	Hydrophila
	ICH	Ichthyophthirius
	IRI	Iridovirus
	SAP	Saprolegnia
TRI	Trichodina	
Specific Trait Performance Relative Rating	0	Unknown
	1	Performance for specified trait is "Poor"
	2	Performance for specified trait is "Below average"
	3	Performance for specified trait is "Average"
	4	Performance for specified trait is "Above average"
	5	Performance for specified trait is "Superior"

Table 3. Paddlefish and Sturgeon populations reported to the National Fish Strain Registry - PS with the name of person to contact for additional information.

Population	Broodstock	Contact person	Address	Telephone / FAX
Atlantic Sturgeon				
Albemarle Sound	Albemarle Sound - w	James Kornegay	306 Japonica Drive, Camden, NC 27921	Ph (252) 338-3607 Fax
Cape Fear River	Cape Fear - w	Mary Moser	UNC, Center Marine Science Research, 7205 Wrightsville Ave, Wilmington, NC 28403	Ph (910) 350-2021 Fax (910) 395-3942
Delaware River	Delaware	John W Fletcher	USFWS, Northeast Fishery Center, PO Box 75, Lamar, PA 16848	Ph (717) 726-4247 Fax (717) 726-7247
Delaware River	Delaware - w	Craig Shirey	4876 Hay Point Landing Road, Smyrna, DE 19977	Ph (302) 653-2882 Fax
Hudson River	Hudson Estuary	John W Fletcher	USFWS, Northeast Fishery Center, PO Box 75, Lamar, PA 16848	Ph (717) 726-4247 Fax (717) 726-7247
Hudson River	Lamar (Captive)	John W Fletcher	USFWS, Northeast Fishery Center, PO Box 75, Lamar, PA 16848	Ph (717) 726-4247 Fax (717) 726-7247
New Jersey Coastal	New Jersey - w	John W Fletcher	USFWS, Northeast Fishery Center, PO Box 75, Lamar, PA 16848	Ph (717) 726-4247 Fax (717) 726-7247
Santee River	Santee - w	Mark Collins	South Carolina DNR, PO Box 12559, Charleston, SC 29422-2559	Ph (843) 762-5008 Fax
Savannah River	Savannah - w	Mark Collins	South Carolina DNR, PO Box 12559, Charleston, SC 29422-2559	Ph (843) 762-5008 Fax
St. Helena Sound	Edisto River -w	Mark Collins	South Carolina DNR, PO Box 12559, Charleston, SC 29422-2559	Ph (843) 762-5008 Fax
Winyah Bay	Great Peedee - w	Mark Collins	South Carolina DNR, PO Box 12559, Charleston, SC 29422-2559	Ph (843) 762-5008 Fax
Green Sturgeon				
Klamath River	Klamath - w	Bruce G Halstead	USFWS, Coastal California Fish & Wildlife Office, 1125 16th Street, Room 209, Arcata, CA 95521	Ph (707) 822-7201 Fax (707) 822-8411

Table 3. Continued.

Population	Broodstock	Contact person	Address	Telephone / FAX
<u>Gulf Sturgeon</u>				
Apalachicola River	Apalachicola - w	Frank Parauka	USFWS, Panama City Field Office, 1612 June Avenue, Panama City, FL 32405-3721	Ph (904) 763-1059 Fax (904) 763-2177
Choctawhatchee River	Choctawhatchee - w	Frank Parauka	USFWS, Panama City Field Office, 1612 June Avenue, Panama City, FL 32405-3721	Ph (904) 763-1059 Fax (904) 763-2177
Lake Pontchartrain	Pearl River - w	Frank Parauka	USFWS, Panama City Field Office, 1612 June Avenue, Panama City, FL 32405-3721	Ph (904) 763-1059 Fax (904) 763-2177
Ochlockonee River	Ochlockonee - w	Frank Parauka	USFWS, Panama City Field Office, 1612 June Avenue, Panama City, FL 32405-3721	Ph (904) 763-1059 Fax (904) 763-2177
Suwannee River	Suwannee - w	Frank Chapman	1612 June Avenue, Panama City, FL 32405-3721 University of FL, Dept of Fisheries & Aquaculture, 7922 NW 71st Street, Gainesville, FL 32606	Ph (904) 392-9617 Fax (904) 392-3462
Suwannee River	Welaka	Allen Brown	Welaka NFH, PO Box 130, Welaka, FL 32193	Ph (904) 467-2374 Fax (904) 467-8108
Yellow River	Yellow River - w	Frank Parauka	USFWS, Panama City Field Office, 1612 June Avenue, Panama City, FL 32405-3721	Ph (904) 763-1059 Fax (904) 763-2177
<u>Lake Sturgeon</u>				
Alberta	Alberta - w	Frank Bishop	South YPM Place, 530 8th St., Lethbridge, AB T1J 2J8	Ph (403) 381-2181 Fax (403) 381-5723
Black Lake	Black Lake - w	Dave Borgeson	MI Dept. of Natural Resources, 1732 W. M-32, PO Box 007, Gaylord, MI 49735	Ph (517) 732-3541 Fax (517) 732-0794
Flambeau River	North Fork - w	Jeff Roth	3291 Statehouse Circle, Mercer, WI 54547	Ph (715) 476-2240 Fax (715) 476-7603
Lake Champlain	Champlain - w	Chet MacKenzie	VT Fish and Game Deprt., 317 Sanitorium Road, Pittsford, VT 05763	Ph (802) 483-2172 Fax (802) 483-9374
Lake Erie	Lake Erie - w	Chris Lowie	USFWS, Lower Great Lakes FRO, 405 N. French, Suite 120A, Amherst, NY 14228	Ph (716) 691-5456 Fax (716) 691-6154
Lake of the Woods/ Rainy River	Little Fork - w	Mike Larson	MN DNR, Fish & Wildlife, Rt 1 Box 1001, Baudette, MN 56623	Ph (218) 634-2522 Fax (218) 634-2563
Lake Ontario	Ontario - w	Chris Lowie	USFWS, Lower Great Lakes FRO, 405 N. French, Suite 120A, Amherst, NY 14228	Ph (716) 691-5456 Fax (716) 691-6154

Table 3. Continued.

Population	Broodstock	Contact person	Address	Telephone / FAX
Lake Winnebago	Wolf River - w	Steve Fajfer	Wild Rose SFH, N5871 State Road 22, Wild Rose, WI 54984	Ph (920) 622-3527 Fax (920) 622-3527
Menominee River	Menominee - w	Dell Siler	Michigan Dept. of Natural Resources, PO Box 300, Crystal Falls, MI 49920	Ph (906) 875-6622 Fax
Menominee River	White Rapids - w	Tom Thuemler	Wisc. DNR, PO Box 127, Peshigo, WI 54147	Ph (715) 582-5008 Fax (715) 582-5005
Quebec	La Prairie River - w	Rejean Fortin	Univ. du Quebec a Montreal, Dept Sciences Biol., C.P. 8888, SUCC Centre Ville, Montreal, PQ H3C 3P8	Ph (514) 987-6113 Fax (514) 987-4647
Quebec	La Prairie River - w	Steve La Pan	NYSDEC, 317 Washington St., Watertown, NY 13601	Ph (315) 785-2261 Fax (315) 785-2242
Saskatchewan River	Saskatchewan - w	Robert G Wallace	Saskatchewan Environment & Resource Manag., 112 Research Drive, Saskatoon, SK S7K ZH6	Ph (306) 933-7100 Fax (306) 933-5773
St. Lawrence River	St. Lawrence - w	Steve La Pan	NYSDEC, 317 Washington St., Watertown, NY 13601	Ph (315) 785-2261 Fax (315) 785-2242
St. Louis River	Lake Superior - w	Dennis Pratt	Wisconsin Depart. of Natural Resources, 1705 Tower Avenue, Superior, WI 55880	Ph (715) 392-7990 Fax
Wisconsin River	Wisconsin - w	Steve Fajfer	Wild Rose SFH, N5871 State Road 22, Wild Rose, WI 54984	Ph (920) 622-3527 Fax (920) 622-3527
Yellow Lake	Yellow Lake - w	Steve Fajfer	Wild Rose SFH, N5871 State Road 22, Wild Rose, WI 54984	Ph (920) 622-3527 Fax (920) 622-3527
Paddlefish				
Alabama River	Alabama	Kenneth J Semmens	Owen & Williams Fish Farm, Route 1 Box 555, Newton, GA 31770	Ph (912) 734-5144 Fax (912) 734-3046
Alabama River	Alabama - w	Dennis R DeVries	Auburn Univ. Swingle Hall, Dept. Fish. & Allied Aquac., Auburn University, AL 36849	Ph (334) 844-9322 Fax (334) 844-9208
Arkansas River	Grand Lake	Tommie Crawford	Milford SFH, 3100 Hatchery Drive, Junction City, KS 66441	Ph (913) 238-2638 Fax (913) 238-5775
Cumberland River	Cumberland - w	Richard Shelton	Pvt. John Allen NFH, PO Box 7317, Tupelo, MS 38801	Ph (601) 842-1341 Fax (601) 842-1341
Cumberland/Ohio River	Cumberland/Ohio	Steve Mims	Aquaculture Research Center, Kentucky State U., Frankfort, KY 40601	Ph (502) 564-9110 Fax (502) 564-9118

Table 3. Continued.

Population	Broodstock	Contact person	Address	Telephone / FAX
Grand Lake	Grand Lake - w	David Hendrix	Neosho NFH, 520 East Park St., Neosho, MO 64850	Ph (417) 451-0554 Fax (417) 451-4632
Mermentau River	Mermentau (1)	Bobby C Reed	LA Dept. Wildlife & Fisheries, 1213 N. Lakeshore Dr. Lake Charles, LA 70601	Ph (318) 491-2577 Fax (318) 491-2009
Mermentau River	Mermentau (2)	Karen M Kilpatrick	USFWS, Natchitoches NFH, 615 Highway 1 South, Natchitoches, LA 71457	Ph (318) 352-5324 Fax (318) 352-8082
Mississippi River	Mississippi - w	John Pitlo	Bellevue Research Station, 24143 Hwy 52, Bellevue, IA 52031	Ph (319) 872-4976 Fax (319) 872-4945
Missouri River	Minnesota - captive	Donn Schrader	Minnesota Dept. of Natural Resources 1200 Warner Road, St. Paul, MN 55106	Ph (612) 772-7968 Fax (612) 772-7977
Missouri River	Missouri - w	Herbert Bollig	Gavins Point NFH 31227 436th Ave., Yankton, SD 57078-6364	Ph (605) 665-3352 Fax (605) 665-3360
Ohio River	KSU	Steve Mims	Aquaculture Research Center, Kentucky State U., Frankfort, KY 40601	Ph (502) 564-9110 Fax (502) 564-9118
Osage River	Table Rock	Ernest J Hamilton	Blind Pony Lake Conservation Area, RR 2 Box 17, Sweet Springs, MO 65351	Ph (660) 335-4531 Fax (660) 335-4267
Yellowstone/ Sakakawea	Yellowstone/ Sakakawea	Fred Ryckman	North Dakota Game and Fish Dept., PO Box 2476, Williston, ND 58802-2476	Ph (701) 774-4320 Fax (701) 774-4305
Pallid Sturgeon				
Atchafalaya River	Old River Control	Bobby C Reed	LA Dept. Wildlife & Fisheries, 1213 N. Lakeshore Dr., Lake Charles, LA 70601	Ph (318) 491-2577 Fax (318) 491-2009
Mississippi - B	Missouri - w	Ernest J Hamilton	Blind Pony Lake Conservation Area, RR 2 Box 17, Sweet Springs, MO 65351	Ph (660) 335-4531 Fax (660) 335-4267
Missouri River	Lake Sharpe	James Riis	S. Dakota Dept. Game, Fish & Parks, Joe Foss Bldg., 523 E. Capitol Ave., Pierre, SD 57501	Ph (605) 773-5535 Fax (605) 223-2337
Missouri River - A	Missouri (Cult)	Herbert Bollig	Gavins Point NFH, 31227 436th Ave., Yankton, SD 57078-6364	Ph (605) 665-3352 Fax (605) 665-3360
Missouri River - A	Missouri - w	Herbert Bollig	Gavins Point NFH, 31227 436th Ave., Yankton, SD 57078-6364	Ph (605) 665-3352 Fax (605) 665-3360

Table 3. Continued.

Population	Broodstock	Contact person	Address	Telephone / FAX
<u>Shortnose Sturgeon</u>				
Cape Fear River	Cape Fear - w	Mary Moser	UNC, Center for Marine Science Research, 7205 Wrightsville Ave., Wilmington, NC 28403	Ph (910) 350-2021 Fax (910) 395-3942
Connecticut River	Connecticut - w	Tom Savoy	P.O. Box 719, Marine Fisheries Office, Old Lyme, CT 06371	Ph (860) 434-6043 Fax (860) 434-6150
Cooper River	Cooper River - w	Mark Collins	South Carolina DNR, PO Box 12559, Charleston, SC 29422-2559	Ph (843) 762-5008 Fax
Hudson	Hudson Estuary - w	William L Dovel	1797 Coconut Drive, Venice, FL 34293	Ph (941) 497-3287 Fax
Merrimack River	Merrimack - w	Boyd Kynard	USGS, Biological Resources Division, Conte AFRC, Box 796, Turners Falls, MA 01376	Ph (413) 863-8993 Fax (413) 863-9810
Santee River	Santee - w	Mark Collins	South Carolina DNR, PO Box 12559, Charleston, SC 29422-2559	Ph (843) 762-5008 Fax
Savannah River	Savannah - w	Mark Collins	South Carolina DNR, PO Box 12559, Charleston, SC 29422-2559	Ph (843) 762-5008 Fax
Winyah Bay	Great Peedee - w	Mark Collins	South Carolina DNR, PO Box 12559, Charleston, SC 29422-2559	Ph (843) 762-5008 Fax
<u>Shovelnose Sturgeon</u>				
Alabama shovelnose	Lower Alabama River	William C Nichols	Rt. 3, Box 85, Marion, AL 36756	Ph (334) 683-6550 Fax (334) 683-289
Mississippi River	Mississippi - w	John Pitlo	Bellevue Research Station, 24143 Hwy 52, Bellevue, IA 52031	Ph (319) 872-4976 Fax (319) 872-4945
Yellowstone River	Yellowstone - w	David Erdahl	Bozeman Fish Technology Center, 4050 Bridger Canyon Road, Bozeman, MT 59715	Ph (406) 587-9265 Fax (406) 582-0242

Table 3. Continued.

Population	Broodstock	Contact person	Address	Telephone / FAX
<u>White Sturgeon</u>				
Columbia River	Lower Columbia	Kim Daily	USFWS, Abernathy Salmon Culture Technology Ctr., 1440 Abernathy Road, Longview, WA 98632	Ph (360) 425-6072 Fax (360) 636-1855
Kootenai River	Kootenai	John T Siple	Kootenai Sturgeon Fish Hatchery, PO Box 1269, Bonners Ferry, ID 83805	Ph (208) 267-7082 Fax (208) 267-2960
Lower Fraser River	Lower Fraser	Dave Lane	Malaspina University College, 900 5th Street, Nanaimo, BC VQR 5S5, CANADA	Ph (604) 753-3245 Fax (604) 755-8749
Sacramento River	UC Davis	Joel Van Eenennaam	Dept. Animal Science, U. of California, Meyer Hall, One Shield Avenue, Davis, CA 95616-8521	Ph (530) 752-2058 Fax (530) 752-0175
Snake River	Snake River	Lynn Babington	Ark Fisheries Inc., 2849 So. 850 E., Hagerman, ID 83332	Ph (208) 837-4860 Fax (208) 837-6322

Table 4. Paddlefish and Sturgeon - Selected culture and field performance characteristics for reported populations.

Population	Broodstock	Avail ability ^{1/}	Facility type ^{2/}	Origin	Broodstock Type	Estimated N _e	Genetic Analysis
<u>Atlantic Sturgeon</u>							
Albemarle Sound	Albemarle Sound - w	N	S	Albemarle Sound - w	Wild	-----	Y
Cape Fear River	Cape Fear - w	N	U	Cape Fear River - w	Wild	-----	Y
Delaware River	Delaware	N	F	-----	Wild	-----	Y
Delaware River	Delaware - w	N	S	Delaware River - WILD	Other	-----	U
St. Helena Sound	Edisto River -w	N	--	Edisto River-Wild	Wild	-----	U
Winyah Bay	Great Peedee - w	N	--	Great Peedee River-wild	Wild	-----	U
Hudson River	Hudson Estuary	L	F	-----	Wild	-----	Y
Hudson River	Lamar (Captive)	L	F	-----	Wild	3.2	N
New Jersey Coastal	New Jersey - w	N	F	-----	Wild	-----	Y
Santee River	Santee - w	N	--	Santee River-wild	Wild	-----	U
Savannah River	Savannah - w	N	--	Savannah River-Wild	Wild	-----	U
<u>Green Sturgeon</u>							
Klamath River	Klamath - w	L	F	-----	Wild	-----	U

Table 4. Continued

Population	Broodstock	Avail ability ^{1/}	Facility Origin type ^{2/}	Facility Origin type	Broodstock	Estimated N _e	Genetic Analysis
Gulf Sturgeon							
Apalachicola River	Apalachicola - w	N	F	Apalachicola River - wild	Wild	-----	U
Choctawhatchee River	Choctawhatchee - w	N	F	Choctawhatchee River - wild	Wild	-----	U
Ochlockonee River	Ochlockonee - w	N	F	Ochlockonee River - wild	Wild	-----	U
Lake Pontchartrain	Pearl River - w	N	F	Pearl River - wild	Wild	-----	U
Suwannee River	Suwannee - w	L	U	-----	Wild	2.0	Y
Suwannee River	Welaka	L	F	Suwannee River	Wild	2.0	U
Yellow River	Yellow River - w	N	F	Yellow River - wild	Wild	-----	U
Lake Sturgeon							
Alberta	Alberta - w	U	F	-----	Wild	-----	U
Black Lake	Black Lake - w	L	S	Black Lake and the Great Lakes	Wild	-----	Y
Lake Champlain	Champlain - w	N	S	Lake Champlain, VT -- WILD (remnant population)	Wild	-----	U
Quebec	La Prairie River - w	L	F	La Prairie River - outside of Montreal	Other	-----	Y
Quebec	La Prairie River - w	L	S	La Prairie River outside Montreal, Quebec, Canada (eggs from 3 females and 2 males)	Wild	4.8	Y
Lake Erie	Lake Erie - w	U	F	Lake Erie and Upper Niagara River	Wild	-----	N
St. Louis River	Lake Superior - w	N	S	-----	Wild	-----	U

Table 4. Continued

Population	Broodstock	Avail ability ^{1/}	Facility type ^{2/}	Origin	Broodstock Type	Estimated N _e	Genetic Analysis
Lake of the Woods /Rainy River	Little Fork - w	N	S	Rainy River	Wild	7.5	Y
Menominee River	Menominee - w	U	S	Menominee River	Wild	-----	U
Flambeau River	North Fork - w	L	S	North Fork Flambeau River (Wild)	Wild	-----	Y
Lake Ontario	Ontario - w	N	F	Lower Niagara River/Lower Ontario	Wild	-----	N
Saskatchewan River	Saskatchewan - w	L	C	Churchill River	Wild	-----	U
St. Lawrence River	St. Lawrence - w	L	S	St. Lawrence River at Massena - wild located below Robert Moses Dam	Wild	-----	Y
Menominee River	White Rapids - w	L	S	White Rapids Stretch of Menominee River - wild fish	Wild	-----	N
Wisconsin River	Wisconsin - w	N	S	Wisconsin River - wild	Wild	-----	U
Lake Winnebago	Wolf River - w	L	S	Wolf and Fox Rivers	Wild	-----	Y
Yellow Lake River) - wild	Yellow Lake - w	L	S	Yellow Lake (upper St. Croix	Wild	3.0	N
Paddlefish							
Alabama River	Alabama	L	P	-----	Wild	24.0	N
Alabama River	Alabama - w	U	U	Tallapoosa River	Wild	-----	U
Cumberland River	Cumberland - w	U	F	Cumberland River	Wild	-----	U
Cumberland/Ohio River	Cumberland/Ohio River	N	U	-----	Wild	-----	N
Arkansas River	Grand Lake	U	S	Grand Lake, OK	Wild	-----	U

Table 4. Continued

Population	Broodstock	Avail ability ^{1/}	Facility type ^{2/}	Origin	Broodstock Type	Estimated N _e	Genetic Analysis
Grand Lake	Grand Lake - w	L	F	Grand Lake of the Cherokees	Wild	-----	N
Ohio River	KSU	N	U	Ohio River and KSU, Aquaculture Research Center	Domestic	11.7	U
Mermentau River	Mermentau (1)	L	S	-----	Wild	-----	N
Mermentau River	Mermentau (2)	L	F	Mermentau River	Wild	-----	N
Mississippi River	Mississippi - w	U	S	Mississippi River	Wild	-----	U
Missouri River	Minnesota - captive	N	S	-----	Unknown	-----	N
Missouri River	Missouri - w	Y	F	Missouri River above Gavins Point Dam - WILD	Wild	-----	Y
Osage River	Table Rock	L	S	Table Rock Reservoir - wild fish	Wild	166.7	N
Yellowstone/ Sakakawea	Yellowstone/ Sakakawea	L	F	Yellowstone River/Lake Sakakawea	Wild	-----	N
Pallid Sturgeon Missouri River	Lake Sharpe	U	S	Lake Sharpe	Wild	-----	U
Missouri River - A	Missouri (Cult)	L	F	Missouri River above Gavins Point Dam	Captive	-----	Y
Mississippi - B	Missouri - w	L	S	Missouri River Below Gavins Point to Mississippi River at confluence of Arkansas River	Wild	-----	N
Missouri River - A	Missouri - w	L	F	Missouri River above Gavins Point Dam (wild fish)	Wild	-----	Y
Atchafalaya River	Old River Control	L	S	Atchafalaya River - WILD	Wild	-----	Y

Table 4. Continued

Population	Broodstock	Avail ability ^{1/}	Facility type ^{2/}	Origin	Broodstock Type	Estimated N _e	Genetic Analysis
<u>Shortnose Sturgeon</u>							
Cape Fear River	Cape Fear - w	N	U	Cape Fear - w	Wild	-----	N
Connecticut River	Connecticut - w	L	S	Connecticut River-w	Wild	-----	N
Cooper River	Cooper River - w	N	--	Cooper River-Wild	Wild	-----	U
Winyah Bay	Great Pee Dee - w	N	--	Great Pee Dee River-wild	Wild	-----	U
Hudson	Hudson Estuary - w	U	P	Hudson Estuary	Wild	-----	U
Merrimack River	Merrimack - w	N	F	-----	Wild	-----	U
Santee River	Santee - w	N	--	Santee River-wild	Wild	-----	U
Savannah River	Savannah - w	N	--	Savannah River-Wild	Wild	-----	U
<u>Shovelnose Sturgeon</u>							
Alabama shovelnose	Lower Alabama River	N	S	Lower Alabama River	Captive	2.0	N
Mississippi River	Mississippi - w	U	S	Mississippi River	Wild	-----	U
Yellowstone River	Yellowstone - w	N	F	Yellowstone River	Wild	12.0	N

Table 4. Continued

Population	Broodstock	Avail ability ^{1/}	Facility type ^{2/}	Origin	Broodstock Type	Estimated N _e	Genetic Analysis
White Sturgeon Columbia River	Lower Columbia	U	F	Lower Columbia River	Wild	-----	U
Kootenai River	Kootenai	N	T	Kootenai River - WILD	Wild	-----	N
Lower Fraser River	Lower Fraser	L	C	-----	Wild	2.0	N
Snake River	Snake River	L	P	-----	Other	-----	U
Sacramento River	UC Davis	Y	U	-----	Captive	44.3	N

^{1/} Broodstock availability codes are: Y = Yes, the population is available, N = NO, the population is not available, L = Limited, the populations may be available in certain situations (contact broodstock manager), and U = Unknown.

^{2/} Facility type codes are: F = agency of the federal government, G = agency of state government, T = Agency of Indian tribe, U = University, and P = private organization or commercial producer.

Table 5. Paddlefish and Sturgeon - Selected reproductive performance and cultural information for reported populations.

Population	Broodstock	Spawning period		Hatch-ability (%)	Relative growth		Survival hatch to 90 days (%)	Stress tolerance to ^{1/}		Temperature ^{2/}	
		Start	End		90 day Weight (grams)	1-year Weight (grams)		Handling fry-90 days	Crowding 90-365 days		Transportation
<u>Atlantic Sturgeon</u>											
Hudson River	Hudson Estuary	05-01	08-31	23.0 (1)	4.0 (1)	4.0 (1)	90.0 (1)	3.0 (1)	5.0 (1)	3.0 (1)	4.0 (1)
<u>Gulf Sturgeon</u>											
Suwannee River	Suwannee - w	02-01	06-30	7.0 (1)	-----	-----	-----	-----	-----	-----	-----
Suwannee River	Welaka	-----	-----	-----	-----	-----	-----	3.0 (1)	3.0 (1)	2.0 (1)	-----
<u>Lake Sturgeon</u>											
Flambeau River	North Fork - w	05-07	05-09	80.0 (1)	6.0 (1)	85.0 (1)	80.0 (1)	3.0 (1)	3.0 (1)	3.0 (1)	3.0 (1)
Lake Erie	Lake Erie - w	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Lake of the Woods /Rainy River	Little Fork - w	05-01	06-08	72.0 (1)	-----	-----	-----	-----	-----	-----	-----
Lake Winnebago	Wolf River - w	04-15	05-05	94.0 (3)	10.0 (2)	26.0 (3)	75.0 (2)	3.3 (3)	3.6 (3)	3.3 (3)	3.3 (3)
Menominee River	Menominee - w	-----	-----	2.0 (1)	20.0 (1)	-----	3.0 (1)	3.0 (1)	3.0 (1)	3.0 (1)	-----
Menominee River	White Rapids - w	05-15	06-01	80.0 (1)	11.0 (1)	14.0 (1)	80.0 (1)	3.0 (1)	3.0 (1)	3.0 (1)	3.0 (1)
Quebec	La Prairie River - w	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Quebec	La Prairie River - w	-----	-----	90.0 (1)	-----	65.0 (1)	80.0 (1)	4.0 (1)	5.0 (1)	4.0 (1)	-----
St. Lawrence River	St. Lawrence - w	-----	-----	50.0 (1)	-----	-----	80.0 (1)	4.0 (1)	5.0 (1)	4.0 (1)	5.0 (1)

Table 5. Continued

Population	Broodstock	Spawning period Hatch-		Relative growth	Survival	Stress tolerance to ^{1/}			Temperature ^{2/}		
		Start	End ability			90 day	1-year	hatch to		Handling	Crowd-
		(month-day)	(%)	Weight (grams)	Weight (grams)	90 days (%)	fry-90 days	90-365 days	ing	port	ation
St. Louis River	Lake Superior - w	-----	65.0 (1)	-----	-----	70.0 (1)	3.0 (1)	4.0 (1)	4.0 (1)	3.0 (1)	3.0 (1)
Wisconsin River	Wisconsin - w	4-01	80.0 (1)	-----	-----	75.0 (1)	-----	-----	-----	-----	-----
Yellow Lake	Yellow Lake - w	-----	90.0 (1)	-----	-----	90.0 (1)	-----	-----	-----	-----	-----
Paddlefish											
Alabama River	Alabama	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Arkansas River	Grand Lake	-----	70.0 (1)	80.0 (1)	90.0 (1)	-----	2.0 (1)	2.0 (1)	1.0 (1)	2.0 (1)	4.0 (1)
Cumberland River	Cumberland - w	-----	-----	-----	-----	-----	-----	-----	-----	3.0 (1)	-----
Cumberland/Ohio River	Cumberland/Ohio	04-01	70.0 (1)	40.0 (1)	-----	65.0 (1)	3.0 (1)	4.0 (1)	1.0 (1)	3.0 (1)	3.0 (1)
Grand Lake	Grand Lake - w	03-01	80.0 (1)	67.0 (1)	67.0 (1)	95.0 (1)	3.0 (1)	3.0 (1)	1.0 (1)	1.0 (1)	3.0 (1)
Mermentau River	Mermentau (2)	02-20	68.0 (2)	45.0 (1)	-----	80.0 (1)	1.6 (3)	2.0 (3)	1.6 (3)	1.3(3)	2.0 (3)
Missouri River	Minnesota - captive	00-00	70.0 (1)	-----	-----	61.0 (2)	2.2 (4)	2.7 (4)	2.0 (4)	1.5(4)	1.2 (4)
Missouri River	Missouri - w	05-01	56.0 (1)	-----	-----	50.0 (1)	3.0 (1)	3.0 (1)	2.0 (1)	2.0 (1)	3.0 (1)
Ohio River	KSU	04-01	70.0 (1)	40.0 (1)	-----	65.0 (1)	-----	-----	-----	-----	-----
Osage River	Table Rock	03-15	70.0 (5)	-----	86.0 (5)	40.0 (3)	2.2 (5)	1.4 (5)	1.6 (5)	2.4(5)	2.4 (5)
Yellowstone/Sakakawea	Yellowstone/Sakakawea	05-15	35.0 (1)	5.0 (1)	-----	23.0 (1)	3.0 (1)	3.0 (1)	3.0 (1)	3.0 (1)	-----

Table 5. Continued

Population	Broodstock	Spawning period		Hatch-ability (%)	Relative growth		Survival hatch to 90 days (%)	Stress tolerance to ^{1/}		Temperature ^{2/}		
		Start	End		90 day Weight (grams)	1-year Weight (grams)		Handling fry-90 days	Crowding 90-365 days		Transportation	
Pallid Sturgeon												
Mississippi - B	Missouri - w	03-01	05-30	39.0 (1)	-----	-----	-----	3.0 (1)	3.0 (1)	2.0 (1)	1.0(1)	3.0 (1)
Missouri River - A	Missouri (Cult)	05-01	06-30	36.0 (1)	13.0 (1)	60.0 (1)	14.0 (1)	2.0 (1)	2.0 (1)	2.0 (1)	2.0 (1)	2.0 (1)
Missouri River - A	Missouri - w	05-01	06-30	36.0 (1)	13.0 (1)	60.0 (1)	14.0 (1)	2.0 (1)	2.0 (1)	2.0 (1)	2.0 (1)	2.0 (1)
Shortnose Sturgeon												
Alabama shovelnose	Lower Alabama River	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Connecticut River	Connecticut - w	04-25	05-15	-----	-----	-----	-----	-----	-----	-----	-----	-----
Yellowstone River	Yellowstone - w	05-15	06-30	95.0 (1)	9.0 (1)	-----	30.0 (1)	2.0 (1)	2.0 (1)	2.0 (1)	2.0(1)	3.0 (1)
White Sturgeon												
Columbia River	Lower Columbia	-----	-----	-----	-----	-----	96.0 (1)	1.0 (1)	4.0 (1)	2.0 (1)	-----	3.0 (1)
Kootenai River	Kootenai	05-10	06-30	-----	63.0 (1)	-----	-----	1.0 (1)	1.0 (1)	1.0 (1)	1.0(1)	6.0 (1)
Lower Fraser River	Lower Fraser	04-01	07-31	-----	-----	-----	-----	4.0 (1)	5.0 (1)	5.0 (1)	-----	5.0 (1)
Sacramento River	UC Davis	02-01	06-30	40.0 (1)	25.0 (1)	-----	90.0 (1)	4.0 (1)	5.0 (1)	4.0 (1)	3.0(1)	4.0 (1)
Snake River	Snake River	-----	-----	-----	10.0 (2)	-----	-----	3.0 (2)	4.0 (2)	4.0 (2)	5.0(2)	5.0 (2)

Table 5. Continued

Population	Broodstock	Spawning period		Hatch-ability (%)	Relative growth		Survival hatch to 90 days (%)	Stress tolerance to ^{1/}				
		Start	End		90 day Weight (grams)	1-year Weight (grams)		Handling	Crowd- ing	Trans -port -ation	Temper -ature ^{2/}	
			(month-day)					fry-90 days	90-365 days			

^{1/} Traits characterized using relative rating system (Table 2). Tabled values are arithmetic averages of subjective ratings provided by population and hatchery managers and field biologists completing surveys. Ratings for relative stress tolerance are 0 = Unknown, 1 = Poor, 2 = Below average, 3 = Average, 4 = Above average, and 5 = Superior. Only rating values of 1 to 5 were used to calculate the mean reported value.

^{2/} Temperature = Fluctuating temperature stress tolerance (relative rating) - Tolerance to temperature changes (a change of 5 °F or greater within a 15 minute time period) was measured using a five step scale to describe the performance of the population relative to other populations the reporter had worked with in the past. (See Table 2 for stress resistance relative rating codes).

Table 6. Paddlefish and Sturgeon - Disease resistance ratings (relative ratings) of reported populations for nine common *Acipenseriformes* diseases.

Population	Broodstock	Diseases ^{1,2/}								
		BGD	COL	COS	FUR	HYD	ICH	IRI	SAP	TRI
<u>Atlantic Sturgeon</u>										
Hudson River	Hudson Estuary	-----	4.0 (1)	-----	-----	-----	-----	-----	-----	-----
<u>Lake Sturgeon</u>										
Lake Winnebago	Wolf River - w	-----	-----	-----	-----	-----	-----	4.0 (1)	2.0 (1)	-----
St. Louis River	Lake Superior - w	4.0 (1)	-----	3.0 (1)	-----	-----	-----	-----	4.0 (1)	-----
<u>Paddlefish</u>										
Arkansas River	Grand Lake	1.0 (1)	-----	-----	-----	-----	-----	3.0 (1)	-----	-----
Grand Lake	Grand Lake - w	-----	-----	-----	-----	-----	-----	1.0 (1)	-----	-----
Mermentau River	Mermentau (2)	2.0 (1)	-----	-----	-----	-----	-----	2.0 (1)	-----	-----
Missouri River	Minnesota - captive	4.0 (1)	-----	-----	-----	-----	-----	4.0 (1)	-----	-----
Osage River	Table Rock	1.3 (3)	-----	-----	2.0 (1)	-----	-----	2.5 (2)	-----	-----
<u>Pallid Sturgeon</u>										
Missouri River - A	Missouri (Cult)	-----	-----	-----	-----	-----	-----	3.0 (1)	-----	-----
Missouri River - A	Missouri - w	-----	-----	-----	-----	-----	-----	2.0 (1)	-----	-----

Table 6. Continued

Population	Broodstock	Diseases ^{1,2/}											
		BGD	COL	COS	FUR	HYD	ICH	IRI	SAP	TRI			
White Sturgeon													
Kootenai River	Kootenai	1.0 (1)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Sacramento River	UC Davis	3.0 (1)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

^{1/} Traits were measured using relative rating system (Table 2). Tabled values are arithmetic averages of subjective ratings provided by population and hatchery managers and field biologists completing surveys. Ratings for relative disease tolerance are 0 = Unknown, 1 = Susceptible, 2 = Below average, 3 = Average, 4 = Above average, and 5 = Resistant. Only rating values of 1 to 5 were used to calculate the mean reported value.

^{2/} Diseases and acronyms: BGD = Bacterial Gill Disease, COL = Columnaris, COS = Costia, FUR = Furunculosis (Aeromonas salmonicida), HYD = Hydrophila, ICH = Ichthyophthirius, IRI = Iridovirus, SAP = Saprolegnia, and TRI = Trichodina.

Table 7. Paddlefish and Sturgeon - Selected post-stocking field performance traits (relative ratings)^{1/} for reported populations. Numbers in parenthesis is the number of reports used to calculate the mean rating for the trait.

Population	Broodstock	Survival Post-stocking	Growth Post-stocking	Susceptible to harvest	Tendency to migrate
<u>Atlantic Sturgeon</u>					
Hudson River	Hudson Estuary	3.5 (2)	2.0 (2)	2.5 (2)	1.5 (2)
<u>Gulf Sturgeon</u>					
Suwannee River	Suwannee - w	4.0 (1)	4.0 (1)	3.0 (1)	-----
Suwannee River	Welaka	-----	-----	-----	-----
<u>Lake Sturgeon</u>					
Alberta	Alberta - w	3.0 (1)	3.0 (1)	3.0 (1)	3.0 (1)
Flambeau River	North Fork - w	-----	-----	-----	-----
Lake Erie	Lake Erie - w	-----	-----	-----	-----
Lake Winnebago	Wolf River - w	4.0 (2)	4.5 (2)	1.0 (1)	3.0 (2)
Menominee River	White Rapids - w	-----	-----	-----	2.0 (1)
Quebec	La Prairie River - w	-----	-----	-----	-----
Saskatchewan River	Saskatchewan - w	3.0 (1)	-----	4.0 (1)	-----
Sturgeon River	Sturgeon	-----	-----	-----	5.0 (1)
Wisconsin River	Wisconsin - w	-----	-----	-----	-----

Table 7. Continued.

Population	Broodstock	Survival Post-stocking	Growth Post-stocking	Susceptible to harvest	Tendency to migrate
<u>Paddlefish</u>					
Alabama River	Alabama - w	4.0 (1)	-----	4.0 (1)	5.0 (1)
Cumberland/Ohio River	Cumberland/Ohio River	5.0 (1)	4.0 (1)	4.0 (1)	-----
Grand Lake	Arkansas River - w	4.0 (1)	4.0 (1)	-----	3.0 (1)
Mississippi River	Mississippi - w	-----	-----	-----	-----
Missouri River	Minnesota - captive	3.5 (2)	3.0 (1)	-----	1.5 (2)
Missouri River	Missouri - w	4.0 (1)	4.0 (1)	3.0 (1)	4.0 (1)
Ohio River	KSU	-----	-----	-----	-----
Osage River	Table Rock	3.0 (3)	1.3 (3)	1.3 (3)	2.6 (3)
Yellowstone/Sakakawea	Yellowstone/Sakakawea	-----	-----	-----	-----
<u>Pallid Sturgeon</u>					
Mississippi - B	Missouri - w	3.0 (1)	3.0 (1)	3.0 (1)	3.0 (1)
Missouri River	Lake Sharpe	-----	-----	-----	-----
Missouri River	Lewis and Clark Lake	-----	-----	-----	-----
Missouri River - A	Missouri (Cult)	-----	-----	-----	-----
Missouri River - A	Missouri - w	-----	-----	-----	-----

Table 7. Continued.

Population	Broodstock	Survival Post-stocking	Growth Post-stocking	Susceptible to harvest	Tendency to migrate
Shortnose Sturgeon					
Connecticut River	Connecticut - w	-----	5.0 (2)	-----	5.0 (2)
Hudson	Hudson Estuary - w	3.0 (2)	-----	1.0 (2)	3.0 (2)
Shovelnose Sturgeon					
Mississippi River	Mississippi - w	-----	-----	-----	-----
White Sturgeon					
Columbia River	Columbia	-----	-----	-----	-----
Columbia River	Lower Columbia	-----	-----	2.0 (1)	-----
Kootenai River	Kootenai	2.0 (1)	-----	-----	3.0 (1)

^{1/} Traits characterized using relative rating system (Table 2). Tabled values are arithmetic averages of subjective ratings provided by population and hatchery managers and field biologists completing surveys. Ratings for relative stress tolerance are 0 = Unknown, 1 = Poor, 2 = Below average, 3 = Average, 4 = Above average, and 5 = Superior. Only rating values of 1 to 5 were used to calculate the mean reported value.

Table 8. Paddlefish and Sturgeon - Management recommendations for reported populations ^{1/}.

Population	Broodstock	Aquaculture production			Supplementation		Management	
		Race-way	Pond	Tank	Riverine	Lacustrine	Enhancement	Restoration
					Riverine	Lacustrine	Riverine	Lacustrine
<u>Atlantic Sturgeon</u>								
Hudson River	Hudson Estuary	--	--	--	Y	--	--	--
<u>Gulf Sturgeon</u>								
Suwannee River	Suwannee - w	--	--	--	--	Y	--	--
Suwannee River	Welaka	--	--	--	Y	--	--	--
<u>Lake Sturgeon</u>								
Flambeau River	North Fork - w	--	--	--	--	Y	Y	--
Lake Erie	Lake Erie - w	--	--	--	Y	Y	Y	--
Lake Winnebago	Wolf River - w	--	--	--	Y	Y	Y	--
Menominee River	White Rapids - w	--	--	--	Y	--	--	--
Quebec	La Prairie River - w	--	--	--	Y	--	--	--
Sturgeon River	Sturgeon	--	--	--	Y	Y	Y	--
<u>Paddlefish</u>								
Cumberland/Ohio River	Cumberland/Ohio River	--	--	--	--	Y	Y	--
Grand Lake	Arkansas River - w	--	--	--	--	Y	Y	Y
Missouri River	Minnesota - captive	--	--	--	Y	Y	--	--

Table 8. Continued.

Population	Broodstock	Aquaculture production				Management				
		Race-way	Pond	Tank	Supplementation		Enhancement		Restoration	
					Riverine	Lacustrine	Riverine	Lacustrine	Riverine	Lacustrine
Missouri River	Missouri - w	N	Y	Y	Y	Y	Y	Y	Y	Y
Osage River	Table Rock	--	--	--	Y	Y	--	--	Y	--
Yellowstone/Sakakawea	Yellowstone/Sakakawea	--	Y	--	--	--	--	--	--	--
Pallid Sturgeon										
Mississippi - B	Missouri - w	--	--	--	Y	N	Y	N	--	--
Missouri River	Lake Sharpe	--	--	--	--	N	--	N	--	--
Missouri River	Lewis and Clark Lake	--	--	--	Y	Y	Y	Y	Y	Y
Missouri River - A	Missouri (Cult)	N	N	Y	Y	N	Y	N	Y	N
Missouri River - A	Missouri - w	N	N	Y	Y	N	Y	N	Y	N
Shortnose Sturgeon										
Hudson	Hudson Estuary - w	--	--	--	Y	--	Y	--	Y	--
White Sturgeon										
Kootenai River	Kootenai	--	--	--	--	--	--	Y	Y	Y

¹¹ Application recommendation codes are: Y = Yes, use is recommended, N = No, use is not recommended, and -- = Unknown, no management recommendation was reported.

Appendix A. National Survey of Paddlefish and Sturgeon Broodstocks - 1995, survey form used for initial collection of standardized information on managed Acipenseriformes populations and broodstocks, wild and cultured, throughout the United States.

NATIONAL SURVEY OF PADDLEFISH AND STURGEON BROODSTOCKS - 1995

SECTION 1, Broodstock information (to be completed by broodstock manager)

1. Species: _____
2. Broodstock name (Name used by management agency or hatchery): _____
3. Broodstock Strain (Name of water body or hatchery where it originated) _____
4. Designate a contact person who could provide additional information about the performance of this broodstock and clarify questions that may arise in the future.

Name: _____ Title: _____

Address: _____

City: _____ State: _____ Zip code: _____ Phone No. (_____) _____ FAX No. (_____) _____

5. Are there publications or in-house reports that describe the history and reproductive characteristics of this broodstock. If there are, please list below and identify a source where we can obtain a copy. Reports identified will be added to the library at the Research and Development Laboratory, Rt #4, Box 63, Wellsboro, PA 16901. All reports collected will be made available to cooperators and clients seeking information on specific broodstocks.

AUTHOR	DATE	TITLE	PUBLISHED BY
a. _____	_____	_____	_____
b. _____	_____	_____	_____
c. _____	_____	_____	_____
d. _____	_____	_____	_____

6. Source or location where original broodstock was obtained, if different from broodstock strain in Question 3: _____

7. Current location of the broodstock (water body or hatchery) _____

8. When (year) was this broodstock started _____

9. Broodstock is now classified as (CIRCLE ONE)

- a. Threatened
- b. Endangered
- c. Not classified / Not applicable

If classified as threatened or endangered, name the classifying federal or state agency: _____

10. The original source broodstock was classified as (CIRCLE ONE):

- a. Domestic - Broodstock from parents reared in a hatchery for 1 or more generations.
- b. Wild - Broodstock from parents that were a natural or free ranging population.
- c. Captive - Broodstock from parents that were wild fish and were themselves brought into the hatchery as eggs, larvae, or juveniles. Progeny of captive broodstock used for broodstock are classified as domestic.

11. How many male and female parents were used to produce the first broodstock?

Number females _____ Number Males _____

NATIONAL SURVEY OF PADDLEFISH AND STURGEON BROODSTOCKS - 1995
SECTION 1, Broodstock information (to be completed by broodstock manager)

12. Describe the breeding method used to produce replacement broodstock.

a. What is the age of the broodstock when the next broodstock generation is produced?

Males are _____ yrs: Females are _____ yrs

b. Criteria for pairing males and females at spawning: (CIRCLE APPLICABLE RESPONSE)

- | | |
|--------------------------------|--------------------|
| 1) No pairing criteria is used | 2) Fish color |
| 3) Body conformation | 4) Fish weight |
| 5) Body length | 6) Spawning timing |
| 7) Other trait(s) _____ | |

c. Was a selection system used?

(CIRCLE ONE) 1) Yes 2) No 3) Unknown

If YES, describe the system. _____

13. What is the ratio of males to females used in the spawning operation? (i.e., 1 male per female? 2 males per female? 3 males for 2 females?)

a. Production lots: No. _____ males/ No. _____ females

b. Broodstock lots: No. _____ males/ No. _____ females

14. Diet and feeding rate used to maintain the broodstock (adults or pre-spawning adult stage)?

a. Broodstock diet _____

b. Feeding frequency _____

c. Daily feeding rate(% of body weight) _____

15. Are fish induced to spawn artificially?

a. Females (CIRCLE ONE) 1) Yes 2) No 3) Unknown

b. Males (CIRCLE ONE) 1) Yes 2) No 3) Unknown

If Yes,

c. The method used was (CIRCLE ONE for females and one for males):

<u>Females</u>	<u>Males</u>
1) Light control	1) Light control
2) Injections	2) Injections
3) Other _____	3) Other _____

d. If injections are used:

	<u>Females</u>	<u>Males</u>
Initial injection		
1) Hormone used	_____	_____
2) Dose (mg/Kg)	_____	_____

Second Injection (If not used enter - None)

3. Hormone used	_____	_____
4) Dose (mg/Kg)	_____	_____

e. Egg spawning technique used:(CIRCLE APPROPRIATE RESPONSES)

- 1) Surgery
- 2) Strip spawn
- 3) Other _____

f. Describe the following procedures

1) Egg de-adhesion method _____

2) Egg incubation method _____

3) Fungus control method _____

16. Are individual broodstock identified by a tagging system?

(CIRCLE ONE) a. Yes b. No c. Unknown

If Yes, Describe the tagging system _____

NATIONAL SURVEY OF PADDLEFISH AND STURGEON BROODSTOCKS - 1995

SECTION 1, Broodstock information (to be completed by broodstock manager)

17. What is the inventory of current and future brood fish of this broodstock? List each year-class separately from youngest to oldest. If sex is unknown in a lot, record information for the total lot in the male columns below.

Year spawn (young to old)	Number fish currently on hand	Mean fish weight (kg)	Number of parents of this year-class
	Male/female	Male/female	Male/female
a. _____	_____/_____	_____/_____	_____/_____
b. _____	_____/_____	_____/_____	_____/_____
c. _____	_____/_____	_____/_____	_____/_____
d. _____	_____/_____	_____/_____	_____/_____
e. _____	_____/_____	_____/_____	_____/_____

18. Has broodstock been characterized by allozyme or DNA analysis?

a. (CIRCLE ONE) 1) Yes 2) No 3) Unknown

If NO or UNKNOWN, go to Question 19.

b. Type of characterization (CIRCLE TYPE)

- 1) Allozyme analysis
- 2) Mitochondrial DNA
- 3) Nuclear DNA
- 4) Other: _____

c. Characterization was done by (Person or Laboratory) _____

d. Date characterization was done (Month and Year) _____

d. Are copies of the report available

(CIRCLE ONE) 1) Yes 2) No 3) Unknown

If yes, give address to write to obtain a copy _____

19. Summary of broodstock reproductive characteristics

(Include both wild and domestic broodstocks)

<u>Traits</u>	<u>Males</u>	<u>Females</u>
<u>Domestic and wild broodstocks:</u>		
a. Spawning period (Month and day)	From _____	From _____ To _____ To _____
b. Earliest age when first mature	____ Years	____ Years
c. Average age when first mature	____ Years	____ Years
d. Mean fecundity at first maturity	XXX	_____
e. Eggs per kilogram of fish weight (mean)	XXX	_____
f. Mean weight at first maturity	_____ Kg	_____ Kg
g. Mean length at first maturity	_____ cm	_____ cm
h. Period between spawning cycles	____ Years	____ Years

Wild broodstocks:

- i. Spawning habitat preferred _____
- _____
- j. Water velocity (meters/sec) _____
- k. Water temperature (C°) _____
- l. Water depth (meters) _____
- m. Substrate type _____
- n. Estimated population size: No male ____ No. female ____
- o. Period (years) between spawning cycles
No. male ____ No. females ____

20. Disease and parasite history of this broodstock

(DESCRIBE):

NATIONAL SURVEY OF PADDLEFISH AND STURGEON BROODSTOCKS - 1995
SECTION 1, Broodstock information (to be completed by broodstock manager)

21. Are fish from this broodstock available to other organizations within the aquaculture industry (federal, state, and private sectors) for purposes of starting new broodstocks and conducting strain evaluation?

a. (CIRCLE ONE) 1) Yes 2) No 3) Limited*

(* Limited = Eggs are available under certain conditions.
Contact agency to determine.)

b. If Yes or Limited, what life stage(s) are available?
(CIRCLE APPROPRIATE RESPONSES)

1) Eggs 2) Fry 3) Fingerlings 4) Adults

22. List any information (characteristics, traits, life history, etc.) about this broodstock that you feel would be useful to potential users and should be included in the National Fish Broodstock Database. _____

23. Has this broodstock or their progeny been provided to other agencies or growers?

a. (CIRCLE ONE) 1) Yes 2) No 3) Unknown

b. If Yes, Please list agencies and year provided:

	<u>Agency</u>	<u>Year</u>	<u>Hatchery receiving</u>
1)	_____	_____	_____
2)	_____	_____	_____
3)	_____	_____	_____

NATIONAL SURVEY OF PADDLEFISH AND STURGEON BROODSTOCKS - 1995

SECTION 2, Hatchery/captive production (to be completed by hatchery manager)

1. Species: _____

2. Broodstock name (Name used by management agency or hatchery): _____

3. Broodstock Strain (Name of water body or hatchery where it originated) _____

4. Designate a contact person who could provide additional information about the performance of this broodstock and clarify questions that may arise in the future.

Name: _____ Title: _____

Address: _____

City: _____ State: _____ Zip code: _____ Phone No. (____) _____ FAX No. (____) _____

5. Are there publications or in-house reports that describe the hatchery performance characteristics of this broodstock. If there are, please list below and identify a source where we can obtain a copy. Reports identified will be added to the library at the Research and Development Laboratory, Rt #4, Box 63, Wellsboro, PA 16901. All reports collected will be made available to cooperators and clients seeking information on specific broodstocks.

AUTHOR	DATE	TITLE	PUBLISHED BY
a. _____	_____	_____	_____
b. _____	_____	_____	_____
c. _____	_____	_____	_____

6. Hatchery where the lot was reared: _____

7. What is the source of water used to rear these fish (CIRCLE ONE)? a. Surface b. Well c. Spring d. Combination

e. Other _____

8. Water quality parameters

a. Water Temperature (F° or C°, CIRCLE ONE) :

January _____ February _____ March _____

April _____ May _____ June _____

July _____ August _____ September _____

October _____ November _____ December _____

b. Water pH: Mean _____ High _____ Low _____

c. Water Total Hardness CaCO₃) Mean _____ High _____ Low _____

d. Dissolved oxygen: Mean _____ High _____ Low _____ (ml/l)

e. Gas supersaturation: Mean _____ High _____ Low _____ level (%)

f. Salinity (ppt) Mean _____ High _____ Low _____

g. Total alkaloids (ppt): Mean _____ High _____ Low _____

9. Source of eggs or fish used in the culture performance evaluation described in this report.

Name of water body or hatchery _____

10. What production year-classes were used for reported performance information?

a. If information is from a single year-class, give the year-19 __, or

b. If information is averaged over multiple year-classes, give the time interval from first to last:

First year-class 19____ Last year-class 19____ .

NATIONAL SURVEY OF PADDLEFISH AND STURGEON BROODSTOCKS - 1995

SECTION 2, Hatchery/captive production (to be completed by hatchery manager)

11. Estimated cost (dollars) of production is \$ _____ per kilogram or \$ _____ per fish at average weight of _____ gm

12. Feeds used during the rearing period were (if more than one was tested at a given stage, enter the diet to be used in future culture of the species):

Feeding stage	Feed type	Daily feed rate (gm)	Feeding frequency
---------------	-----------	----------------------	-------------------

- | | | | |
|---------------|-------|-------|-------|
| a. Starter | _____ | _____ | _____ |
| b. Fry | _____ | _____ | _____ |
| c. Fingerling | _____ | _____ | _____ |
| d. Production | _____ | _____ | _____ |

13. Type of production facilities used to hold fish and the carrying capacity (CIRCLE TYPES USED AND GIVE CAPACITY IN LB FISH / REARING UNIT)

Rearing unit	Unit size	Carrying capacity
--------------	-----------	-------------------

- | | | |
|--------------------|-------|-------|
| a. Ponds | _____ | _____ |
| b. Raceway | _____ | _____ |
| c. Circular tanks | _____ | _____ |
| d. Cages | _____ | _____ |
| e. Other (_____) | _____ | _____ |

14. Tolerance to stress -- Based on your experience with other broodstocks, rate the relative stress tolerance of these fish to each stress category below using the scale: 0 = unknown, 1 = poor, 2 = below average, 3 = average, 4 = above average, 5 = Superior.

Type of stress	Relative Stress Tolerance
----------------	---------------------------

- | | |
|---|-------|
| a. Handling stress (swim-up to 90 day-of-age) | _____ |
| b. Handling stress (90 days-of-age to 1-year | _____ |
| c. Handling stress -- broodstock | _____ |
| d. Tolerance to crowding | _____ |
| e. Tolerance to temperature fluctuation | _____ |
| f. Tolerance to crowding during transport | _____ |

15. Do fish require special consideration during handling and transport

a. (CIRCLE ONE) 1) Yes 2) No

b. If yes, describe the special handling requirements: _____

16. Survival, growth, and feed conversion during growout from hatch to stocking. Record mean and range values for each trait if available.

Trait measured	Mean	High	Low
----------------	------	------	-----

- | | | | |
|---|-------|-------|-------|
| a. % eye of egg lots | _____ | _____ | _____ |
| b. % hatch (eyed stage to hatch) | _____ | _____ | _____ |
| c. % fry survival (hatch to feeding stage) | _____ | _____ | _____ |
| d. % fry survival (feeding stage to 90 d on feed) | _____ | _____ | _____ |
| e. Mean fish weight (grams) at 90 d on feed | _____ | _____ | _____ |
| f. Mean fish length (mm) at 90 d on feed | _____ | _____ | _____ |
| g. Mean fish weight (grams) at stocking | _____ | _____ | _____ |
| h. Mean fish length (mm) at stocking | _____ | _____ | _____ |
| i. Age stocked (months of age) | _____ | _____ | _____ |
| j. Feed conversion from first feed to stocking | _____ | _____ | _____ |

17. List diseases, parasites, and other health problems this stock has been exposed to; then rate their relative tolerance to each compared to other stocks you have reared using the following scale: 0 = unknown, 1 = susceptible, 2 = below average, 3 = average, 4 = above average, or 5 = resistant.

Disease (List)	Relative disease resistance
-----------------	-----------------------------

- | | | |
|----------|-------|-------|
| a. _____ | | _____ |
| b. _____ | | _____ |
| c. _____ | | _____ |

NATIONAL SURVEY OF PADDLEFISH AND STURGEON BROODSTOCKS - 1995
SECTION 3, Field performance information (to be completed by field biologist)

1. Species: _____

2. Broodstock name (Name used by management agency or hatchery): _____

3. Broodstock Strain (Name of water body or hatchery where it originated) _____

4. Designate a contact person who could provide additional information about the performance of this broodstock and clarify questions that may arise in the future.

Name: _____ Title: _____

Address: _____

City: _____ State: _____ Zip code: _____ Phone No. (____) _____ FAX No. (____) _____

5. Are there publications or in-house reports that describe the field performance characteristics of this broodstock? If there are, please list below and identify a source where we can obtain a copy. Reports identified will be added to the library at the Research and Development Laboratory, Rt #4, Box 63, Wellsboro, PA 16901. All reports collected will be made available to cooperators and clients seeking information on specific broodstocks.

AUTHOR	DATE	TITLE	PUBLISHED BY
A. _____	_____	_____	_____
B. _____	_____	_____	_____
C. _____	_____	_____	_____
D. _____	_____	_____	_____

6. Name of hatchery where the production lot was reared?

7. Production from this broodstock is best suited for what management situation(s) (i.e., lake fishery where no reproduction is expected; river fishery to enhance wild stock)?

a _____

b _____

8. Production from this broodstock is poorly suited for what management situation(s) (i.e., lake fishery where no reproduction is expected; river fishery to enhance wild stock)?

a _____

b _____

9. Does the fish have special habitat preference?

a. (CIRCLE ONE) a. Yes b. No c. Unknown

b. If Yes, describe: _____

NATIONAL SURVEY OF PADDLEFISH AND STURGEON BROODSTOCKS - 1995

SECTION 3, Field performance information (to be completed by field biologist)

10. Field performance characteristics - Based on your experience with other broodstocks, rate the relative performance of these fish to each trait below using the scale: 0 = unknown, 1 = poor, 2 = below average, 3 = average, 4 = above average, 5 = Superior.

Trait	Rating
a. Growth rate after stocking	_____
b. Survival rate after 1-year post-stocking	_____
c. Susceptibility to harvest	_____
d. Tendency to migrate	_____
e. Other traits measured:(_____)	_____

11. A series of fisheries and fish stocking time combinations are listed below. For each combination that matches a fishery you manage with fish from this broodstock, enter your rating of how the fish performed relative to other broodstocks you have used in this type fishery. Use the following rating scale: 0=Unknown, 1=Poor, 2=Below average, 3=Average, 4=Above average, and 5=Superior.

**** Rate ONLY those combinations where you have stocked this broodstock or their progeny.**

Fishery	Fry	Fingerling	Yearling
a. Rivers (freshwater)	_____	_____	_____
b. Ponds (< 20 acres)	_____	_____	_____
c. Impoundments (20 to 500 A)	_____	_____	_____
d. Impoundments (>500 A)	_____	_____	_____
e. Tail waters	_____	_____	_____
f. Eutrophic lakes	_____	_____	_____
g. Oligotrophic lakes	_____	_____	_____
h. Estuary waters (salinity ___ ppt)	_____	_____	_____
i. Marine waters	_____	_____	_____

12. Other observations on the performance or behavioral characteristics of this population?

Appendix B. National Fish Strain Registry - Paddlefish and Sturgeon, Survey of Acipenseriformes Populations, Blank copy of the current survey form provided fisheries personnel to submit information on additional populations, wild and cultured, for inclusion in NFSR-PS.

NATIONAL FISH STRAIN REGISTRY - PADDLEFISH AND STURGEON SURVEY OF ACIPENSERIFORMES POPULATIONS

---- INSTRUCTIONS ----

This record is designed to collect information on wild populations and cultured strains/ broodstocks managed by fisheries agencies or cultured by commercial growers. Species included in the NFSR-PS and for which information is requested are:

Scientific name	Common name	Scientific name	Common name
Family Acipenseridae			
<i>Acipenser brevirostrum</i>	Shortnose sturgeon	<i>Acipenser transmontanus</i>	White sturgeon
<i>Acipenser fulvescens</i>	Lake sturgeon	<i>Scaphirhynchus albus</i>	Pallid sturgeon
<i>Acipenser medirostris</i>	Green sturgeon	<i>Scaphirhynchus platyrhynchus</i>	Shovelnose sturgeon
<i>Acipenser oxyrhynchus</i>	Atlantic sturgeon		
Family Polodontidae			
<i>Polyodon spathula</i>	Paddlefish		

The record is composed of four sections: Section 1 (Population/broodstock identification and reporting person information) must be completed by each cooperator to allow information to be assigned to the correct population/broodstock within the database. Also, space is given at the bottom of Section 1 for the name, address and telephone number of up to three additional persons you feel could provide information on the management, culture, performance, or genetic characteristics of this strain/broodstock. Sections 2 - 4, request specific information on broodstock, cultural, and post-stocking management and performance characteristics of the particular population/broodstock:

1. Section 2 (Broodstock Information) - Broodstock origin, reproductive traits, handling, genetic characterization, disease rating, egg/fish availability etc.
2. Section 3 (Hatchery/Captive Fish Production) - Hatchery/culture rearing information, relative handling characteristics, production objectives, survival, relative disease resistance.
3. Section 4 (Post-stocking Field Performance) - Current management applications used and relative performance in management situations.

If you have questions about any of the survey questions, contact one of the following persons:

NAME	PHONE	FAX	E-MAIL
Harold L. Kincaid	570-724-3322 ext 232	570-724-2525	hkincaid@usgs.gov
Leslie J. Mengel	570-724-3322 ext 236	570-724-2525	ljmengel@usgs.gov

Mail completed records to: Dr. Harold L. Kincaid
USGS, BRD, R&D Laboratory
R.R. 4, Box 63
Wellsboro, PA 16901

The NFSR-PS is a dynamic database capable of continuous updating to insure that information is current. Your assistance in providing the requested information is essential for future NFSR-PS releases to be complete and as up-to date as possible.

Thank you.

RECORD No. _____

NATIONAL FISH STRAIN REGISTRY - PADDLEFISH AND STURGEON SURVEY OF ACIPENSERIFORMES POPULATIONS

SECTION 1, Strain/broodstock identification and reporting person information

1. Species: _____
2. Strain name (usually name of hatchery or water body where originated) _____
3. Broodstock name (name used by grower or managing agency): _____
4. Designate a contact person from your organization we can contact in the future to obtain additional information about this broodstock and to clarify questions.
- Name: _____ Title: _____
- Address: _____ City: _____ State: _____
- Zip code: _____ Phone No. (____) _____ FAX No. (____) _____ E-mail : _____

5. Are there publications or in-house reports describing the breeding history or reproductive characteristics of this broodstock? If there are, please list below and identify a source where copies can be obtained. Reports identified will be added to the library at the Research and Development Laboratory, R. R. # 4, Box 63, Wellsboro, PA 16901. All reports collected will be made available to cooperators and clients seeking information on specific broodstocks.

	AUTHOR	DATE	TITLE	PUBLISHED BY
a.	_____	_____	_____	_____
b.	_____	_____	_____	_____
c.	_____	_____	_____	_____
d.	_____	_____	_____	_____

6. Identify additional individuals who have experience with this strain/broodstock and could provide additional information such as: it's origin, reproduction, life history, genetic traits, cultural performance or post-stocking success in different management situations. (NOTE: These individuals will be contacted to provide information similar to that requested here).

Contact # 1: Name: _____ Title: _____

Address: _____

City: _____ State: _____ Zip code: _____ Phone No. (____) _____ FAX No. (____) _____

Contact # 2: Name: _____ Title: _____

Address: _____

City: _____ State: _____ Zip code: _____ Phone No. (____) _____ FAX No. (____) _____

Contact # 3: Name: _____ Title: _____

Address: _____

City: _____ State: _____ Zip code: _____ Phone No. (____) _____ FAX No. (____) _____

NATIONAL FISH STRAIN REGISTRY - PADDLEFISH AND STURGEON SURVEY OF ACIPENSERIFORMES POPULATIONS

SECTION 2, Broodstock information

7. Current location (name of hatchery, farm, or water body) of the broodstock?

Name: _____

8. Source (name of hatchery, farm, or water body) where original broodstock was obtained?

Name: _____

9. Original source of broodstock was classified as? (CIRCLE ONE)

- a. Domestic - Broodstock from parents reared in a hatchery for one or more generations.
- b. Wild - Broodstock from parents that were a natural or free ranging population.
- c. Captive - a broodstock from parents that were wild fish and were themselves brought into the hatchery as eggs, larvae, or juveniles. Progeny from a captive broodstock used for broodstock would be considered to be domestic broodstock.
- d. Unknown.

10. Broodstock is now classified as? (CIRCLE ONE.)

- a. Threatened b. Endangered c. Not classified
 - d. If classified as threatened or endangered, name classifying agency?
- Agency: _____

11. What life stage was introduced to start original broodstock? (CIRCLE ONE and enter the year introduced):

- a. Egg (19 ____)
- b. Fingerling (19 ____)
- c. Sub-adult (19 ____)
- d. Adult (19 ____)

12. How many brood fish contributed to initial broodstock generation?

- a. No. females _____
- b. No. Males _____
- c. Year started 19 ____

13. Male to female ratio (M/F) used in spawning operation? (i.e., 1 male per female, 2 males per female, 3 males per 2 females)

- a. Production lots: No. male _____ No. female _____
- b. Broodstock lots: No. male _____ No. female _____

14. Breeding method used to produce broodstock?

a. Age of brood fish when next brood generation is produced?

1) Males: _____ years 2) Females: _____ years

b. Males and females are chosen for spawning based on which of the following traits? (CIRCLE ALL APPROPRIATE RESPONSES):

- 1) Random (no selection) 2) Body color
- 3) Body weight 4) Body length
- 5) Body conformation 6) Spawning age (yrs)
- 7) Early/late in spawn season
- 8) Other criteria were (list trait (s)): 1) _____

2) _____

c. If selection system was used, describe how it was applied.

15. Diet and feeding rate used to maintain brood fish (adults or pre-spawning adults) ?

- a. Broodstock diet: _____
- b. Feeding frequency: _____
- c. Daily feeding rate (% of body weight): _____

16. Are individual brood fish identified using a tagging system? (CIRCLE ONE)

- a. YES b. NO c. UNKNOWN
- d. If YES, describe tagging system: _____

17. What is current inventory of fish being held for future broodstock needs? List year-classes separately (youngest to oldest). If sex of fish is unknown, record information assuming a 50/50 sex ratio.

Year spawned	Number fish	Mean fish	Number of
	on hand	weight (lb)	parents
	Male/Female	Male/Female	Male/Female
1	____/____	____/____	____/____
2	____/____	____/____	____/____
3	____/____	____/____	____/____

NATIONAL FISH STRAIN REGISTRY - PADDLEFISH AND STURGEON SURVEY OF ACIPENSERIFORMES POPULATIONS

SECTION 3, Hatchery/captive production

28. Information reported here are from production year-class(s)?

- a. If single year-class (give the year) 19__
- b. If multiple year-classes (give interval): From 19__ to 19__

29. Estimated production cost (dollars) is \$ _____ per kilogram for fish weighing _____ gm

30. Feeds used during the rearing period were ? (if more than one was tested at a given life stage, enter diet to be used in future culture of the species):

Feeding stage	Feed type	Daily feed rate (gm)	Feeding frequency
a. Starter	_____	_____	_____
b. Fry	_____	_____	_____
c. Fingerling	_____	_____	_____
d. Production	_____	_____	_____

31. Type of production facilities used to culture these fish? (ENTER UNIT SIZE AND CARRYING CAPACITY IN POUND PER REARING UNIT).

Rearing unit	Unit size	Carrying capacity
a. Ponds	_____	_____
b. Raceway	_____	_____
c. Circular tanks	_____	_____
d. Cages	_____	_____
e. Other (_____)	_____	_____

32. List diseases, parasites, and other health problems this stock has been exposed to; then rate their relative tolerance to each compared to other stocks you have reared using the following scale: 0 = unknown, 1 = susceptible, 2 = below average, 3 = average, 4 = above average, or 5 = resistant.

Disease / health problem (List)	Relative tolerance
a. _____ _____
b. _____ _____
c. _____ _____
d. _____ _____

33. Tolerance to stress -- Based on your experience with other strains, rate the relative tolerance of these fish to stress categories listed below using the scale: 0 = unknown, 1 = poor, 2 = below average, 3 = average, 4 = above average, 5 = superior.

Type of stress	Relative stress tolerance
a. Handling stress -- emergence to 90 d	_____
b. Handling stress -- 90 d to 1 yr	_____
c. Handling stress -- during spawning period	_____
d. Tolerance to crowding	_____
e. Tolerance to temperature fluctuation	_____
f. Tolerance to crowding during transport	_____

34. Do fish require special consideration during handling and transport not required by other strains? (CIRCLE ONE)

- a. YES b. NO
- c. If YES, list special handling requirements: _____
- _____
- _____

35. Growth, survival, and feed conversion during production from hatch to stocking or market. Record mean and range values for each trait.

Traits	Mean	High	Low
a. % eye (eyed egg stage)	_____	_____	_____
b. % hatch (eyed stage to hatch)	_____	_____	_____
c. % fry survival (hatch to first feeding stage)	_____	_____	_____
d. % fry survival (first feeding to 90 d on feed)	_____	_____	_____
e. Mean fish weight (grams) at 90 d on feed	_____	_____	_____
f. Mean fish length (mm) at 90 d on feed	_____	_____	_____
g. Mean fish weight (grams) at 1-year	_____	_____	_____
h. Mean fish length (mm) at 1-year	_____	_____	_____
i. Age stocked (months of age)	_____	_____	_____
j. Feed conversion from first feed to stocking	_____	_____	_____

Appendix C. National Fish Strain Registry - Paddlefish and Sturgeon (NFSR-PS) - New population recommendation form (FORM PS-3). Recommendation form provided for fisheries personnel to identify additional paddlefish and sturgeon populations, wild and cultured, for inclusion in the NFSR-PS. This recommendation form may be reproduced locally.

National Fish Strain Registry - Paddlefish and Sturgeon New population recommendation form (FORM PS-3)

1. Species: _____

2. Population name (usually name of water body, drainage or hatchery where fish originated): _____

3. Broodstock name (usually the name used by management for these fish): _____

4. Contact person who could provide performance information for this broodstock and clarify questions that may arise in the future.

Name: _____ Title: _____

Address: _____

City: _____ State: _____ Zip code: _____ Phone No. (____) _____ FAX No. (____) _____

5. Recommended by:

Name: _____ Title: _____

Address: _____

City: _____ State: _____ Zip code: _____ Phone No. (____) _____ FAX No. (____) _____

Instructions:

The National Fish Strain Registry - Paddlefish and Sturgeon (NFSR-PS) is designed to collect a standardized set of information on known populations / broodstocks (wild and cultured) of the following Acipenseriformes species

Scientific name	Common name	Scientific name	Common name
Family Acipenseridae			
<i>Acipenser brevirostrum</i>	Shortnose sturgeon	<i>Acipenser transmontanus</i>	White sturgeon
<i>Acipenser fulvescens</i>	Lake sturgeon	<i>Scaphirhynchus albus</i>	Pallid sturgeon
<i>Acipenser medirostris</i>	Green sturgeon	<i>Scaphirhynchus platyrhynchus</i>	Shovelnose sturgeon
<i>Acipenser oxyrinchus</i>	Atlantic sturgeon		
Family Polodontidae			
<i>Polyodon spathula</i>	Paddlefish		

If you are aware of one or more populations or broodstocks not currently included in the NFSR-PS, those populations may be identified using this form. You will need to include the name of one or more person(s) who can provide information on each population identified. We will contact the person(s) you identify to obtain the necessary information on each recommended population and include that population in future NFSR-PS releases. Please use a separate form for each population recommended.

Mail completed forms to: Dr. Harold L. Kincaid
USGS, BRD, R&D Laboratory,
RR 4, Box 63
Wellsboro, PA 16901

Your assistance in providing this information is essential for us to make future releases of the NFSR-T as complete as possible. Thank You in advance for your assistance.

U.S. Geological Survey
Research and Development Laboratory - Biological Resources Division
RD 4, Box 63
Wellsboro, PA 16901