AN INTERNET SURVEY OF PRIVATE POND OWNERS AND MANAGERS IN TEXAS

A Thesis

by

APRIL ELIZABETH SCHONROCK

Submitted to the Office of Graduate Studies of
Texas A&M University
in partial fulfillment of the requirements for the degree of

MASTER OF SCIENCE

August 2005

Major Subject: Wildlife and Fisheries Sciences

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Approved by:

Chair of Committee,	Michael P. Masser
Committee Members,	Robert Ditton
	Gregory Clary
Head of Department,	Robert Brown

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ABSTRACT

An Internet Survey of Private Pond Owners

and Managers in Texas. (August 2005)

April Elizabeth Schonrock, B.S., University of Alabama in Huntsville

Chair of Advisory Committee: Dr. Michael P. Masser

This study was designed to integrate a mailing list-based survey with an internet-based presentation/response in order to take into account the trend toward self-administration that is evident in everyday interactions with automated services that have taken the place of personal interactions. A random sample of 2,999 was taken from applicants for Triploid Grass Carp Permits from the Texas Parks and Wildlife Department. A forty-nine question survey was constructed containing five sections: general pond characteristics, physical pond characteristics, aquatic vegetation, fish and other wildlife, and management goals. The primary emphasis of this study was to determine what specific problems Texas pond owners faced, how widely these problems occurred, and where pond owners got the information they used to deal with pond management problems. A secondary emphasis of the project was to examine the potential presented by the Internet for use in this type of information gathering and distribution for Texas Cooperative Extension. An overall response rate of 21.3% (excluding non-deliverables and unusable submitted surveys) was obtained. Summary statistics for each question were calculated and then compared in order to gain a clearer

picture of the pond management practices employed by Texas pond owners. These results indicated some initial discrepancies between pond owners' management practices and current management recommendations, most dramatically where aquatic vegetation was concerned. The internet-based survey methodology worked effectively to lower the cost of distribution and the workload of data entry when compared to the mail survey. These benefits outweighed the disadvantages caused by survey error with the new methodology.

To my husband,

the survey's biggest supporter and official third party.

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I would also like to thank my committee members, Dr. Robert Ditton and Dr. Gregory Clary, for their efforts. They provided me with invaluable information and suggestions which have gone into the preparation of this thesis.

I also wish to thank all those who took the time to participate in the survey; it couldn't have been a success without them.

To all my family: my mom and dad, who put up with my crazy ideas and were nothing but encouraging; to my brother, in college now himself; and finally to my husband, who has supported me every step of the way with patience I didn't think anyone possessed. I can't thank any of them enough.

TABLE OF CONTENTS

Page

LIST OF FIGURES

FIGURE Page

INTRODUCTION

The first extensive pond management experiments began in 1934 with H.S. Swingle at the Agriculture Experiment Station of Alabama Polytechnic Institute at Auburn. There, he identified the primary issues of concern to pond owners in the construction and maintenance of healthy and productive aquatic systems. This research emphasized ponds for fishing and fish production. According to Swingle's research, efficient pond management included "an adequate and clean water supply, protection from excessive overflow or flood waters, deepened pond edges to facilitate weed control, an overflow slot or spillway of sufficient width to insure overflow leaving the pond in sufficiently shallow depths to prevent escape of fish, and a drain pipe and valve" (Swingle 1952). Swingle's further studies at the Experiment Station and throughout Alabama led to recommendations for fertilization and stocking in order to maintain balanced fish populations, providing long-term sustained yields in recreational fishing ponds. This introduction will discuss the important elements in proper pond management, the economic impact of outdoor recreation according to the National survey of fishing, hunting and wildlife-associated recreation, and the history of mail and internet survey methodology.

An estimated 1,000,000 private impoundments can be found throughout Texas (Participant Survey 2001). Also known statewide as ponds or tanks, impoundments have multiple uses including fishing, irrigation, livestock watering, water gardening and

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This thesis follows the style of Transactions of the American Fisheries Society.

wildlife attraction. Different pond uses and pond management goals dictate discrete management practices. Even so, there are basic issues common to most ponds. Six steps are critical in pond management: 1) construction, 2) soil and water quality management, 3) developing the food chain, 4) stocking, 5) maintaining balance, and 6) controlling aquatic vegetation and other problems (Masser 1996).

1) Construction

The first step to a healthy pond, regardless of its intended use, is proper physical construction; poor construction can lead to problems such as leaking, whether through the dam or the pond bottom. To avoid this, dams should have a solid clay core, trees and other woody vegetation should never be allowed to grow on a dam, and pond lining should contain a minimum of 30% clay (Masser 1996). During the construction phase when the pond is dug, the pond basin should be in the middle layer of the soil profile (called the B horizon), as this layer typically contains the most clay content, and deeper layers may contain much less (Stone 1999). Pond banks should slope at a ratio of 2 or 3: 1 to depths of at least 2.5 feet. Ponds should be constructed to have at least 3 to 4 feet average depth throughout the year (4 to 5 feet, ideally) with maximum 6 foot depths in the humid eastern regions to 12 to 14 foot depths in arid western regions (USDA 1997, Whitis 2002). To maintain adequate water levels, ponds also need a sufficient watershed; the land surrounding a pond that channels runoff. In Texas, this area generally ranges from 4 to 100 acres per acre-foot of pond, depending on soil type, slope and surrounding vegetative cover (Masser 1996).

2) Soil and Water Quality Management

Soils of the pond site and watershed affect pond productivity. Many Texas soils, especially those in eastern regions, are highly acidic. In experiments on Alabama ponds, Boyd (1974) found that those ponds on alkaline soils (with pH values above 7.0) did not require lime, while those on acidic soils require liming at 1.5 to 2 tons per surface acre or greater, based on pH. Total hardness as calcium carbonate ($CaCO_3$) and alkalinity levels below 20 mg/L (parts per million, ppm) are often associated with low pH and can cause wide pH fluctuations and limit pond productivity. Liming, if needed, is recommended in order to improve response to fertilization by decreasing the amount of phosphorus that needs to be added in the form of fertilizers. Dissolved phosphorus promotes plankton growth, which increases productivity (Wurts and Masser 2004). In order to increase the number of fish a pond can support naturally without supplemental food sources, applications of agricultural lime over the entire pond surface to create an alkalinity of 20 mg/L or more every two to five years is recommended (Masser et al. 1999). Once soil and water pH and alkalinity have been addressed, increased productivity can be accomplished by fertilizing a pond to maintain algal blooms (see Developing the Food Chain section).

Pond water quality is affected by a number of variables which must all be in balance in order to maintain a healthy pond ecosystem. The most important of these in recreational ponds are dissolved oxygen, ammonia, and nitrite.

The oxygen produced by submerged plants through photosynthesis is not only used by aquatic animal life, but is consumed by bacterial decomposition and plants during respiration. Oxygen is produced only during sunlight hours, but oxygen consumption continues 24 hours a day, causing oxygen levels to reach minimums near dawn (Brunson et al. 1994, Boyd 1995, Hargreaves and Brunson 1996). Dissolved oxygen depletion can arise from many sources, including phytoplankton die-off, pond turnover, and aquatic vegetation decomposition. All of these can stress or kill fish (Masser et al. 1999). Normal dissolved oxygen concentrations should be at least 3 to 4 mg/L; concentrations as low as 3 mg/L stress fish, and concentrations of 2 mg/L or lower become deadly (Masser 1996).

The presence of ammonia and nitrite in aquatic systems can be detrimental to fish and aquatic life at high enough concentrations. The sources of these problem compounds come from animal wastes and organic decomposition within ponds (Egna and Boyd 1997, Masser et al. 1999). Ammonia at levels above 1 mg/L and nitrites at levels above 0.5 mg/L can cause stressful complications. In fish ponds, ammonia comes from wastes excreted by fish from their gills, in their feces, and from decaying organic matter. There are two forms of ammonia present in ponds: toxic ammonia (NH_3) and non-toxic ammonium ($NH^+{}_4$). The proportion of the toxic to non-toxic form increases as temperature and pH increase; a pH increase of one unit (for example, from a pH of 9 to a pH of 10) can increase toxic ammonia tenfold (Boyd 1985, Durborow et al. 1997a). Liming, as discussed earlier, reduces large pH swings, buffering toxic ammonia problems in ponds.

Nitrites (NO_2), which are produced by bacteria from the breakdown of ammonia, are generally converted into non-toxic nitrate (NO_3), but an imbalance in the nitrogen cycle due to increased loads of nitrogen into the system, often from fertilizers and feeds, can cause a toxic build-up to occur. Nitrites at levels above 0.5 mg/L can cause stress complications in fish (Egna and Boyd 1997, Masser et al. 1999). Bass, bluegill, and other sunfishes are more tolerant of high nitrite levels than are tilapia, catfish, and many cold-water fishes such as trout (Durborow et al. 1997b). The first step in treating a nitrite problem is to reduce the amount of nitrogen introduced into the system by reducing feeding rates (Durborow et al. 1997b).

3) Developing the Food Chain

The health of a pond is dependent upon having each trophic level, or position in the food chain (determined by energy transfer steps) in balance. The lowest trophic level is comprised of autotrophs, which are organisms, such as plants, that manufacture their food from inorganic materials. The following trophic levels are comprised of heterotrophs, organisms which consume other organisms: first herbivores, then first level carnivores, second level carnivores, and so on. The total number of trophic levels within an ecosystem is dependent on the amount of energy that is transferred from one level to the next. Food chain efficiency is generally higher in aquatic systems than in terrestrial systems. For example, tropical forest communities with an estimated 5% ecological efficiency have an average of 3 trophic levels, whereas pelagic communities with an ecological efficiency of 25% have an average of 7 trophic levels (Ricklefs 1996). The base of the pond food web is formed by plants, either macrophytes or phytoplankton. All plants are called primary producers, because they transform light energy through the process of photosynthesis into chemical energy that is then consumed by organisms in higher trophic levels. Research into pond productivity has shown that phytoplankton-based food chains are superior to macrophyte-based ones (Garg and Bhatnager 2000). Moriarty (1997) cited three major reasons that microbial food webs have a direct effect on overall productivity: 1) algae and bacteria are responsible for a pond's oxygen content, 2) microorganisms contribute directly to the food web as nutrition for grazers (while most macrophytes do not), and 3) nitrogen and phosphorus are recycled by heterotrophic decomposers. Zooplankton graze on the phytoplankton, and are themselves then eaten by small fish and aquatic invertebrates. These small fish become prey for larger fish comprising the upper levels of the food chain. The final step in the energy cycle of the pond food web is conducted by decomposers, organisms that break down waste materials and release nutrients back into the food web.

In order to establish a plankton-based food chain, fertilizers can be applied to promote phytoplankton growth. There are four common formulas of fertilizers that can be used: granular, powder, timed release, and liquids. The amount per acre per application of each type is based on formulation and the calcium hardness of pond water (Masser et al. 1999, Brunson et al. 1999). Application of fertilizers should be according to the product labeling, using the indicated safety equipment. Granular formulations are applied by placing the fertilizers on a platform 4-12 inches below the water's surface and allowing it to dissolve; contact of the fertilizer with soil should be avoided. Powder formulations are applied by broadcasting the powder over as much of the pond surface as possible. Liquid formulations can be diluted with water and sprayed over the pond surface, or, for larger ponds, the diluted mixture can be poured into the prop wash of a boat and spread throughout the pond (Masser et al. 2001, Avery 2003).

Garg and Bhatnager (2000) found fish production increased with an increase in primary productivity (phytoplankton) as a result of fertilization. To determine whether or not fertilizer needs to be applied, a Secchi disk is used to determine algal bloom density by determining the depth of visibility. A Secchi disk is comprised of a 6 to 8 inch diameter disk, with surface quarters painted alternatively black and white. This disk is then attached at the center to a pole on which height (in inches) from the disk is marked. To use a Secchi disk to measure visibility, submerge the disk until it is no longer visible, then bring it back up until just visible, and read the depth. Based on Secchi disk readings, fertilization should be done when visibility is 24 inches or more; 18 to 24 inches indicates a good bloom, 12 to 18 inches indicates a heavy bloom, and 12 inches or less indicates a bloom which is too dense (Masser et al. 1999, ALDCNR 2003, TCAFS 2005).

Pond fertilization is not recommended for use in ponds with issues such as turbidity, excessive water flow, aquatic weeds, and out of balance populations (Brunson et al. 1999). These problems should first be corrected to avoid complications or the need to repeat treatments.

4) Stocking

Existing ponds often become contaminated with undesirable species of fish, or stunted populations of desired fish species and have to be renovated. The treatment for this problem is the application of the restricted use chemical Rotenone, at an application rate of 2 to 5 mg/L to kill all the fish (Masser et al. 1999).

Once the physical and chemical preparation of the pond is complete, the emphasis turns to stocking of appropriate species. Just as there can be many different pond management goals, species selection and stocking can reflect a range of fishing needs and goals. Two of the most common stocking strategies are: 1) the combined bass and bluegill system or 2) the catfish system. A combined bass and bluegill system is generally successful only in ponds of one acre or more. Smaller ponds are generally recommended for catfish stocking (Davies 1973, Masser 1996).

Common stocking rates in Texas for a bass and bluegill system are 1000 bluegill fingerlings and 100 bass fingerlings per surface acre in fertilized systems, and 500 bluegill fingerlings and 50 bass fingerlings per surface acre in non-fertilized systems (Masser 1996, TCAFS 2005). The bass and bluegill system in a healthy pond should be capable of self-regulation and perpetuation, providing long-term productivity. Properly fertilized systems provide microorganisms and other macroinvertebrates as forage for bluegill which then become forage for the larger bass.

When the primary goal for a pond is catfish angling, channel and blue catfish can be stocked either together or individually. Commonly recommended stocking rates for recreational (as opposed to commercial) catfish ponds range from very light density (100 fish per acre) to very heavy density (1000 to 1500 fish per acre), which can result in up to 3000 pounds of catfish after the first year. (Collins and Mitchell 1996, Masser et al. 1999, TCAFS 2005).

Greater productivity can be achieved from catfish systems, as well as other stocking strategies, by using commercial feeds to supplement the natural forage available (Bennett 1971, Davies 1985, Stickney 1985, Egna and Boyd 1997). Optimum stocking rates are dependent not only on the carrying capacity of the pond system, but on the management goals and fishing pressures the pond will receive.

5) Maintaining Balance

The most commonly cited reason for poor bass fishing in Texas ponds, according to the Texas Chapter of the American Fisheries Society (2005), is improper harvesting. Ponds need to be harvested in order to maintain pond balance: the proper ratios of bass to bluegill. Ponds that are heavily harvested should be stocked at higher rates than those which are not harvested or where catch-and-release is practiced. Ponds which are not harvested or which are managed as catch-and-release often become over-populated, resulting in stunted fish populations (Davies 1973, Collins and Mitchell 1996, Masser et al. 1999). Over-harvesting bass in the first year or two after stocking will lead to an overpopulation of bluegill in the following years, while under-harvesting bass after 2 to 3 years have passed will lead to stunted bass populations. An over-harvest of bass is indicated when a large number of smaller bluegill and a small number of bass are being caught; alternatively, when only a few larger bluegill and numerous smaller bass are caught, an under-harvest of bass is the problem (Collins and Mitchell 1996, Masser 1996, ALDCNR 2003, TCAFS 2005). While optimum harvest rates are determined by the specific population structure of individual ponds, general recommendations indicate maximum harvest rates should not exceed approximately 125 to 150 pounds of bluegill and 25 to 30 pounds of bass per acre annually in fertilized systems (Masser 1996, ALDCNR 2003, TCAFS 2005).

To check pond balance, different techniques can be used. Keeping catch records by species and length will provide the means to estimate the size and abundance of species, and can be used to determine if supplemental stocking or additional harvesting is needed to correct any existing balance problems. If catch records are unavailable, shoreline seining is another method used to assess balance. Seining is done in June or September, and can be used to create a profile of species size, abundance, and reproductive success in the pond (Masser 1996, ALDCNR 2003, TCAFS 2005). Another highly effective method for determining pond balance, which can only be performed by private consultants with a TPWD license, is electrofishing.

6) Controlling Aquatic Vegetation

Aquatic vegetation is present to some extent in all aquatic systems. The level to which it is tolerated by specific pond owners dictates differing management goals and thus differing aquatic vegetation management strategies. According to Participant Surveys 2001, 2003, entitled "BASS 101: Managing Ponds and Lakes for Better Bass Fishing" workshops, 53% of attendees in 2001 and 44% of attendees in 2003 stated that aquatic vegetation was their biggest problem. Common to all situations is that original pond construction is vital in vegetation management. Pond banks with a rapid slope to depths of at least 2.5 feet keeps vegetation establishment to a minimum if the pond is fertilized (Masser 1996, USDA 1997). Pond fertilization to establish an algal bloom with 18 to 24 inch visibility (discussed above in Developing the Food Chain) will prevent the establishment of submerged vegetation within a pond. Under these conditions, growth of submerged vegetation is suppressed by the lack of sufficient light reaching the depths at which submerged plants establish.

There are four main types of aquatic vegetation: 1) algae, 2) submerged, 3) floating, and 4) emergent. Not all aquatic vegetation is nuisance or needs to be managed. The algae group consists of microscopic, or planktonic, algae; stringy, or clumping, filamentous algae; and macroalgaes, like chara, which resemble higher plants but have no roots. Submerged plants are rooted in the pond sediment while their vegetative portions remain mostly under the water surface, and include eelgrass, pondweeds, and hydrilla. Floating plants have roots that hang in the water, but do not attach to the bottom sediments, with examples such as duckweed, water hyacinth, and salvinia. Emergent plants are those that are rooted in sediment but project mostly above the water surface, and are most often found on pond banks. Examples of emergent plants include rushes, reeds, and cattails. Aquatic vegetation is not inherently problematic; it is only a problem once it inhibits use of a pond, or is deemed undesirable by the pond owner.

Once aquatic vegetation becomes a problem, there are three general methods used to reduce the problem: mechanical, chemical, and biological (Swingle 1952, Thayer 1985, Shelton and Murphy 1989, Egna and Boyd 1997). Mechanical removal includes uprooting shoreline vegetation and dredging submerged weeds from pond centers. Chemical treatments vary according to the species of vegetation that is to be targeted, and come in a variety of formulations either applied to the plant directly or to the water.

The chemical used is dependent upon vegetation type as well as uses for the pond water, such as livestock watering, irrigation, and/or drinking water. Biological methods use natural enemies of certain plants to keep them under control. This method provides the most stable long-term solutions, but is not feasible for all types of vegetation problems. One of the most common biological control methods for submerged plants is the use of the grass carp, or white amur, *Ctenopharyngodon idella*, which, during warm weather, can consume 30 to 40% of their body weight per day (Thayer 1985, Masser 1992).

Overall pond management, including watershed management, can provide for many pond uses instead of, or in addition to, fishing. Wildlife is attracted to ponds as water sources, and this provides opportunities for wildlife watching. A number of aquatic birds such as ducks and geese as well as aquatic predators such as herons use ponds year-round or seasonally. Ponds also provide aquatic amphibians, frogs and salamanders, and reptiles, turtles, lizards, and snakes valuable habitat. Many types of mammals visit ponds for water, including deer, rabbits, and raccoons. Some, including beavers and muskrats, make ponds their homes. All provide ample wildlife-watching opportunities, a hobby that, according to the U.S. Fish and Wildlife Service (2001), is growing steadily in popularity.

Ponds have an economic value. This was highlighted in the U.S. Fish and Wildlife Service survey in 2001. In the survey, all wildlife-related recreation included 82 million participants over 16 year of age, and these participants reported a total of $108 billion in expenditures (USFWS 2001). These figures included sportspersons (anglers and hunters), as well as residential wildlife watchers (those watching wildlife within one mile of home), and non-residential wildlife watchers (those traveling more than one mile to observe wildlife). Of the 38 million total sportspersons, 34 million of those were anglers, and accounted for $36 billion in wildlife-related spending. Wildlife watching recreation accounted for the largest percentage of participants, and of the 66 million who reported engaging in these various activities, 63 million participated within one mile of their homes. The growth of wildlife-related spending shows that there is a growing market in America today for wildlife-related activities; that means an increasing need for information about these new nature-related interests and the means by which to pursue or manage them.

The multitudes of private ponds found throughout Texas provide ample opportunity for pond owners to engage in one or more of these activities. Texans showed numbers just under the national averages in wildlife-related recreation with 29% overall participation. Within the state, an estimated 25% of recreational fishing takes place in private ponds (Masser 1996). Eighteen percent of the state's population reported being sportspersons, while 20% indicated wildlife watching participation. This accounted for over $5 billion in wildlife-related expenditures within the state (USFWS 2001).

Private companies currently provide many pond management services such as chemical management, vegetation management, and fish stocking, as well as the more traditional construction assistance. Government agencies involved in pond management service include Natural Resources Conservation Service (NRCS), Texas Cooperative

Extension (Extension), and Texas Parks and Wildlife Department (TPWD). Since 1978, Texas Parks and Wildlife has changed the way they provide services to pond owners, focusing only on providing information resources via telephone and online information, while NRCS and Extension provide telephone and internet information as well as professionals to travel to ponds and make recommendations.

Ponds are dynamic systems and, while no two are exactly alike, similar ponds contend with similar problems. While there are differences observed between management practices in different states, similar general guidelines are applied to ponds across the United States. Most of the issues concerning pond owners are well understood by professionals, however, the need and desire for information by pond owners as well as the relative importance of problems is not as well documented.

7) Survey

The common methodology of the social survey has undergone major changes in the past thirty years. Before the Total Design Method was published in 1978, telephone survey and personal interview were the desired methods, but after publication, the mail survey became a consistently productive survey methodology (Dillman 2000). Evolving technology, as well as the public's increasing awareness of technology, is changing survey methodology once again. Tailored Design was Dillman's response to his first publication taking into account these changes and the possibilities that new technology offers to survey research. He noted that "computer technology and people's familiarity with computers are also having a great influence in how questionnaires can be completed and returned" and that this is coupled with a societal trend toward self-administration of surveys (Dillman 2000).

The most popular method of gathering wildlife management information is the mail survey. The Total Design Method of the 1970's that employed a one-size-fits-all approach to successful mail surveys has been updated to the more flexible Tailored Design Method, which allows for the differences between survey situations to dictate differing methods and still receive successful results (Dillman 2000). With the updated design, the methodology may differ between surveys while each still follows Tailored Design. The common elements include utilizing social design theory, multiple contacts, respondent-friendly questionnaires, and emphasizing the survey's usefulness and importance. The main emphasis of Tailored Design is to develop surveys that foster respondent trust, perceived rewards, reduced costs, and account for specific survey situations (Dillman 2000).

The goal of following these guidelines in every step of the survey process is to reduce survey error. Dillman identified the following four separate sources of error that could contribute to a survey failing to achieve its goals (Dillman 2000). Sampling error takes place as the result of surveying only a percentage of the population, not the population as a whole. Coverage error occurs when the sample does not allow for all members of the target population to have equal chances of being included in the sample. Measurement error takes place when questions are poorly worded, are not clearly understood by respondents, or the values received are unusable or inaccurate. Non-response error occurs when the respondents, those who participated in the survey, and non-respondents, those who did not participate in the survey differ in a way, such as by income level or education that will skew the results of the survey.

This trend toward self-administration is evident in everyday interactions with automated services that have taken the place of personal interactions, including ATM's, electronic pharmacies, and self-checkout grocery lines. Home technologies, especially computers, are becoming increasingly prevalent in the United States. The percentage of U.S. households with computers has risen from 8.2% in 1984 to 51% in 2000, while home internet access more than doubled from 18% in 1997 to 41.5% in 2000 (Newburger 2001). U.S. households with computers and home internet access have presented themselves as the next advance in survey methodology.

Both email-based and internet-based surveys are being considered because of the possibility of reaching a large, widely-distributed sample, ease of data collection and analysis, and the benefits of reduced costs. New technologies, however, can bring new sets of problems in addition to new possibilities. While a survey may be accessible and understandable to a majority of Web users, individual technological difficulties can present themselves, such as website inaccessibility or screen configuration appearing differently to different respondents, and this can cause increased error. Whereas the traditional mail survey format is familiar to most people, internet surveys may not be, and this should be considered in the design (Dillman 2000). Surveys over the Web have not yet been refined to the degree that mail surveys have, but they are a relatively new resource for research. Nonetheless, with the trends in home technology and increasingly available computer technology, the internet is a powerful force in the way society communicates. In a comparison of internet vs. access point intercept surveys, Penkala (2004) found that age-related questions produced significantly different results between the two surveys, where internet users were younger (Miller 2003). They determined that in most cases, the overall differences were not great, and that the potential for lower cost and time saving may outweigh the bias.

The primary purpose of this study is to determine what specific problems Texas pond owners are facing, how widely these problems are occurring, and where they are getting the information they are using to deal with these problems. Having a basic description of the common problems that pond owners are seeing and the options they are using to deal with these problems will help Extension Fisheries personnel in the content development of educational programs and information packets designed for private pond owners. Results from the 2001 and 2003 *Bass 101* workshop pre- and post-tests indicated that participants increased their knowledge by 74% and 65% for all combined questions, respectively. A secondary emphasis of the project is to examine the potential presented by the internet for use in this type of information gathering and distribution for Extension. Utilizing this internet survey method will serve to gauge the response by pond owners to determine if this method can be more widely applied, and also to discover the drawbacks of internet-based methods for use by Extension and make preliminary recommendations on future use of this tool.

The following section consists of the design methodology of the survey, sample selection, survey construction, and development of the internet-based portions of the survey. The next section contains a report of the results gathered from the survey, and the final section includes the discussion of the results and the implication of these results for pond management professionals.

METHODS

In November, 2003, a random sample was taken of 2,999 applicants for Triploid Grass Carp Permits from the Texas Parks and Wildlife Department. The list contained only private applicants; no survey of public entities was included at this time. The Texas Parks and Wildlife list contained records of complete names and mailing addresses, and was the only source used to generate the sample population information. Any incomplete or duplicate files were discarded prior to selection. The use of the permit application list was determined to be the most appropriate way to target pond owners while avoiding bias in the sample toward Extension clients. County Extension agents do not always keep records of individuals who request pond information or services. A list could not be generated that would be comprised of entirely Extension clientele, and so the permit application list was the most accurate representation of pond owners available.

A forty-nine question survey (Appendix A) was constructed using the new guidelines for mail and internet survey methods for question writing and graphic design as suggested by the Tailored Design Method (Dillman 2000). The survey contained five sections: general pond characteristics, physical pond characteristics, aquatic vegetation, fish and other wildlife, and management goals. The first section dealt with the most general characteristics of the pond, beginning with the number of ponds owned, type of watershed, pond construction, pond use, and general pond problems encountered. The next section encompassed the physical and biological characteristics of pond water testing, water sources, fertilization, liming, and Rotenone use. The third section dealt with aquatic vegetation: preferences, problems, and management treatments. Fourth, questions regarding fish and other wildlife in and around the pond area were asked. These included fish stocking, accidental inhabitation by undesirable fishes, fishing preferences and goals, fish kills and disease problems, and predators and other animal pest problems. The final section related to achieving management goals using four questions; two concerning the use of private pond consultants and two concerning annual pond management expenditures presently and in the future. A comments blank was provided at the end of the questionnaire (Appendix B).

A first postcard mailing to inform the sample members of their selection and the web address at which the survey could be accessed was sent out December 1, 2003 (Appendix C). December 8, 2003, a second thank you and reminder card was mailed out to the respondents (Appendix D). The survey period was closed three weeks following, for a total four week sampling period. Mailing addresses were run through print services software before mailing to check for undeliverable addresses, and corrections to address formats were made as applicable. Of 2,999 surveys sent, 1,819 were deliverable, 423 were submitted on the survey site, and of these, 387 were useable. This gave an overall response rate of 21.3%.

The overall design of the survey followed more closely the design for mail surveys found in Tailored Design Method (Dillman 2000). This was intended to give respondents a sense of familiarity with the format of the questions and the overall look of the questionnaire, and to minimize any intimidation that less computer-oriented respondents might have felt using an unfamiliar technology to complete the questionnaire. It was designed to be easily accessible to people with as wide a range of technological capabilities as possible.

Upon a respondent beginning a survey, a few general pieces of information were collected. The individual data file specific to each respondent logged this information automatically. The first information collected was the referrer, the website through which the survey was accessed. This was important, as access was made available through both the Extension and Aquaplant websites. Next, a number unique to the individual survey was generated at the time the *I Agree* button was clicked in order to identify it. The date and time the survey started (once the *I Agree* button was clicked) was also recorded. Once a survey was finished by clicking the *Submit* button, a second unique number was recorded. This pair of numbers was used to prevent any submitted survey data file from overwriting another by being submitted at the same time due to the likelihood of two respondents clicking both *I Agree* and *Submit* at the exact same times. The date and time the survey ended was recorded in order to calculate the total time the respondent used to complete the survey. This information was also used to document the temporal distribution of responses, and to facilitate the removal of multiple submits of questionnaires. No field was required to be answered in order for respondents to submit and to proceed.

The questionnaire was taken from its original Microsoft Word format and translated into Hypertext Markup Language (HTML) and C programs were written and compiled in order to make the program run properly and store questionnaire data files on the server. All HTML and C programming was performed by a third party. After the final survey day, the results were taken off the server to prevent any additionally submitted questionnaires from being entered as survey data. The survey site was then taken down and in its place a page informing visitors to the survey site that the survey period had ended was posted.

The survey was tested on both Microsoft Internet Explorer and Netscape web browsers, which comprise most users. Basic HTML commands were used to try not to preclude any users. The only elements that should change from user to user would be spacing of text and images due to individual computer format settings or screen resolution. Simplistic design with no animations was used so that the survey would not require any additional software in order to run. All buttons and check boxes would appear the same on respondents' personal computers. Standard HTML form elements that were used were text, radio buttons (single-answer questions) or check boxes (multiple-answer questions). As recommended by Dillman (2000), the questionnaire was a single scrolling page with no distracting images or animations. The directions for each section of questions were presented within the questionnaire, not on a separate page, and within each question more specific directions were included.

The questionnaire was prefaced with a *Welcome* page which included the statement of importance and presented the same information as a first contact letter (Appendix E). Logos for Texas A&M University and Texas Cooperative Extension were present, and researcher contact information in the case of respondent questions was listed. After the questionnaire was submitted by the respondent via the *Submit* button at the bottom of the page, a *Successful Submit* page was loaded with thanks and contact information in the cases of additional questions by respondents (Appendix F). Including both email and phone contact information was important in order to give people a sense of trust that the form was being actively monitored, and was not just absently floating in cyberspace. A link back to the Extension website was also provided on the *Successful Submit* site.

Survey results were calculated for each useable survey (after multiple submissions and blank surveys were excluded). Summary statistics, frequency, distribution and mean, as well as cross-tabulation where appropriate were calculated for each variable using SPSS version 12.0. Chi-square values were calculated and significance values (using 95% confidence) were determined.

RESULTS

When the study period was completed, 387 useable surveys had been submitted resulting in an overall response rate of 21.3% (useable returns/ (total mailed – undeliverable)). The average time it took respondents to complete the questionnaire was 14 minutes (5% trimmed mean), with a range from one minute to 158 minutes. The website used most often to access the questionnaire was Wildlife at TAMU, followed by Aquaplant at TAMU.

1) General Pond Characteristics

Due to the presence of extreme outliers, the 5% trimmed mean was used to determine the mean number of ponds owned as 1.84 (Ott and Longnecker 2001). Cumulatively, 95% of respondents owned 6 or fewer ponds.

The most frequently reported watershed was a pasture watershed with 56.2%, followed by creek-fed with 15.7%, pit pond or dugout with 14.7%, forest with 10.8%, row crops or field with 2.1%, and gravel quarry with 0.5% (Figure 1). Using the chi-squared statistic to test for equality of proportions led to the rejection of the null hypothesis that responses are equally distributed across the categories, and an observed chi-squared significance level of less than 0.0005. For advice on building ponds, 21.7% of respondents used a pond contractor, 19.1% used NRCS, 7.5% used other sources, 5.7% used Extension, and 3.9% used a professional consultant. Eighteen percent used no advice, and the remaining 41.1% reported pre-existing ponds (Figure 2). When asked how closely recommendations from the above sources were followed, 75.9% reported

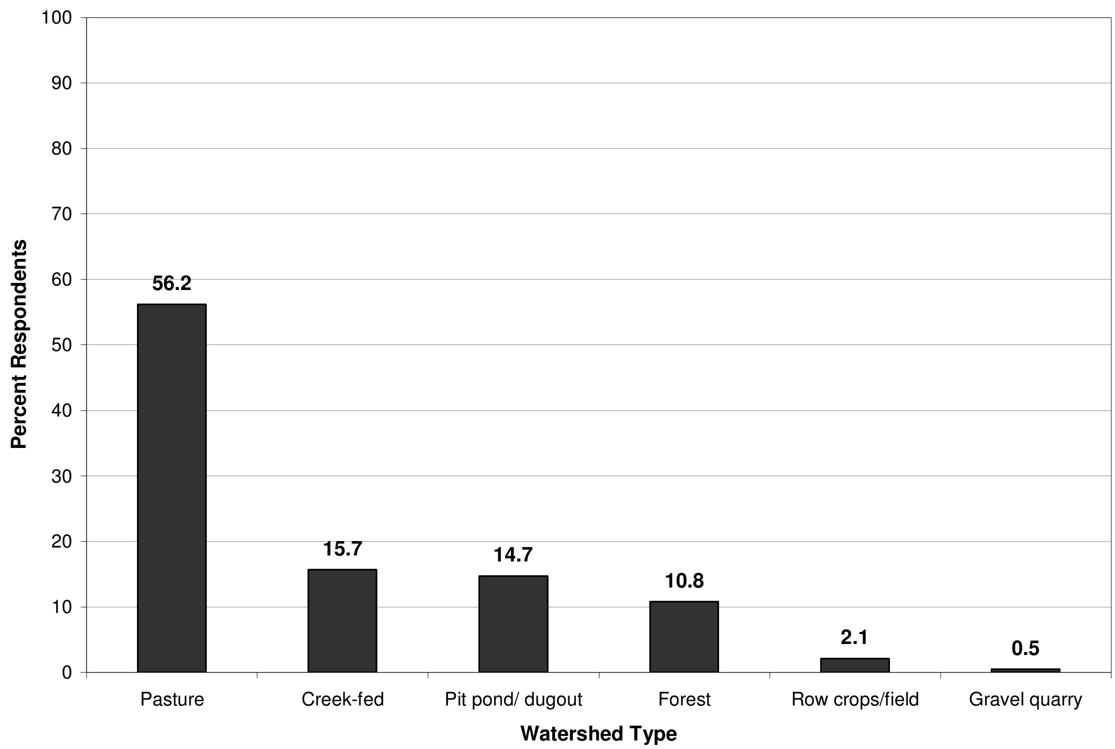

Figure 1. Principal watershed type of the pond (as reported by survey respondents)
**observed chi-squared significance level of less than 0.0005*

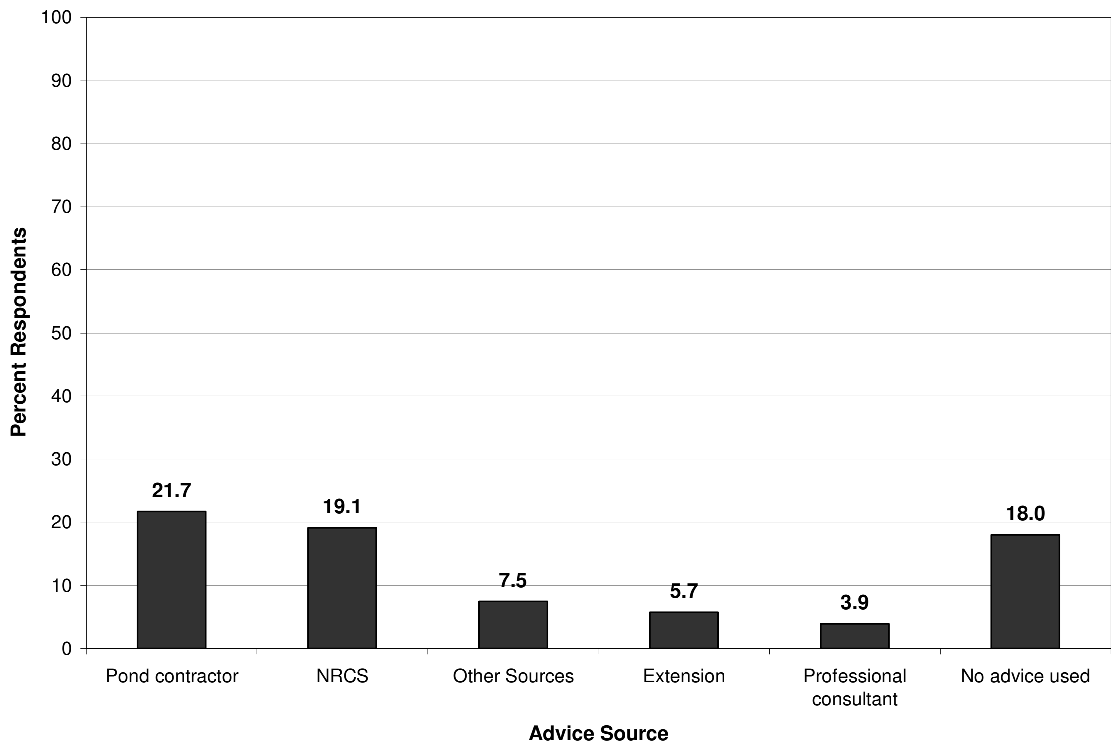

Figure 2. Sources of advice used in pond construction (as reported by survey respondents)

following recommendations more than 80% of the time (observed chi-squared significance level of less than 0.0005).

Problems with leaking ponds were reported by 31.2% of respondents, and of these, reported causes were 48.6% poor soils, 20.9% fractured underlying rock, 18.9% cited bad construction and 11.7% vegetation on the dam (observed chi-squared significance level of less than 0.0005) (Figure 3).

The most often encountered general problem reported was excessive vegetation by 80.9% of respondents. Second most frequently reported were algae problems by 56.3%. Water quality was reported as problematic 16.8%, followed closely by pond predators with 16.0%. All other problems, fish kills, unwanted fish species, poor fishing, other animal pests, poaching and fish diseases were reported in descending order by fewer than 15% of respondents (Figure 4).

2) Physical Characteristics

Of the 14.7% of respondents who reported having their pond water tested in the last five years, 28% used Extension soil/water testing services, 24.6% used private consultants, 22.8% used private labs, 19.3% reported using other services or methods, and 5.3% used local health departments. The predominant other method listed was self-test strips (Figure 5).

Well water was used to fill or supplement 28.4% of ponds. Respondents that fertilized their ponds within the last five years made up 21.3%. Those who reported fertilizing did so with a frequency of 50.6% once per year, 40.0% as needed, 7.1% twice per year, and 2.4% once per month (observed chi-squared significance level of less than

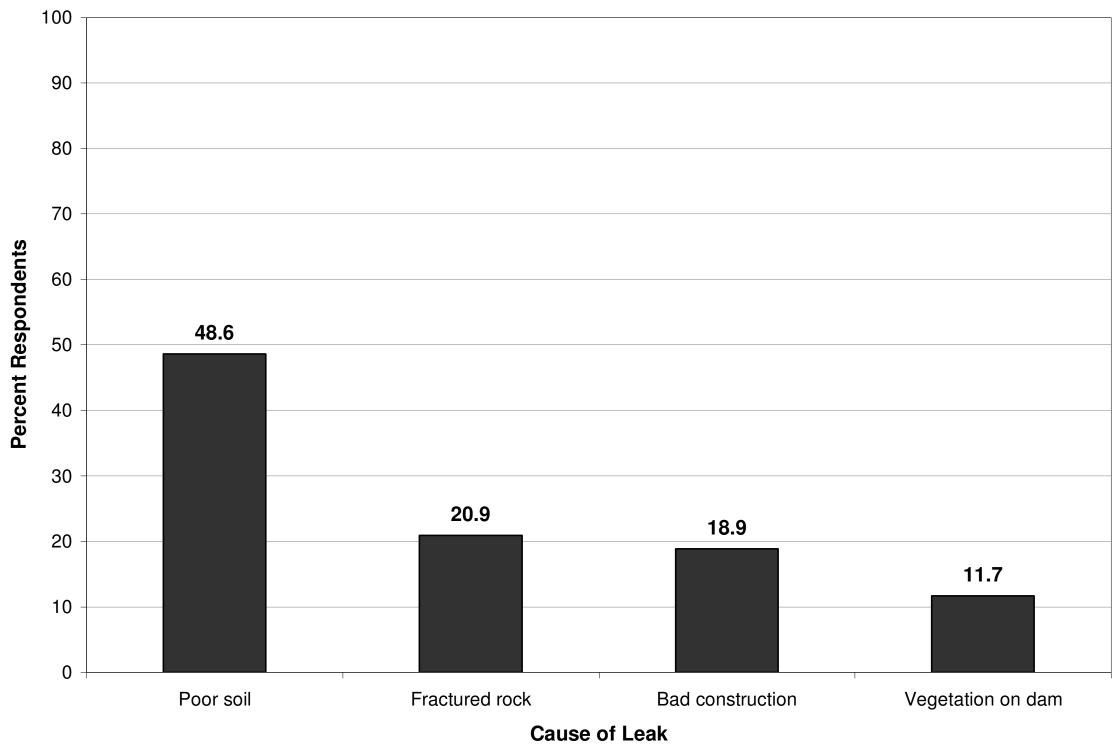

Figure 3. Causes of pond leakage (as reported by survey respondents)
**observed chi-squared significance level of less than 0.0005*

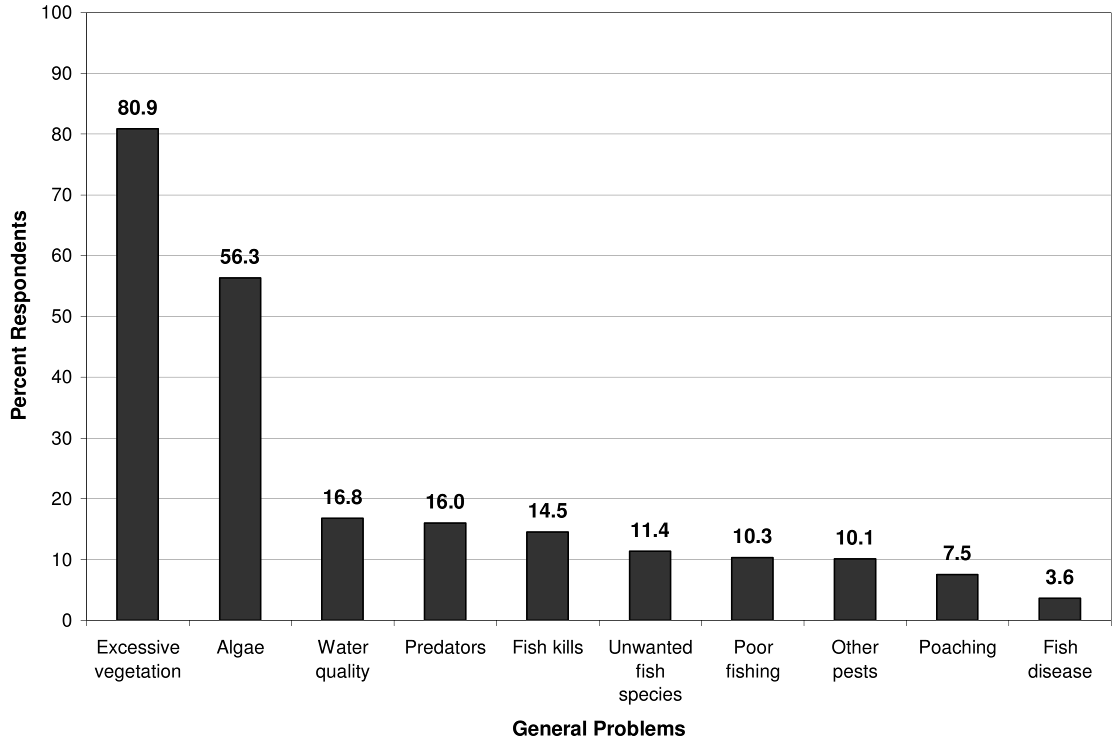

Figure 4. General pond problems encountered (as reported by survey respondents)

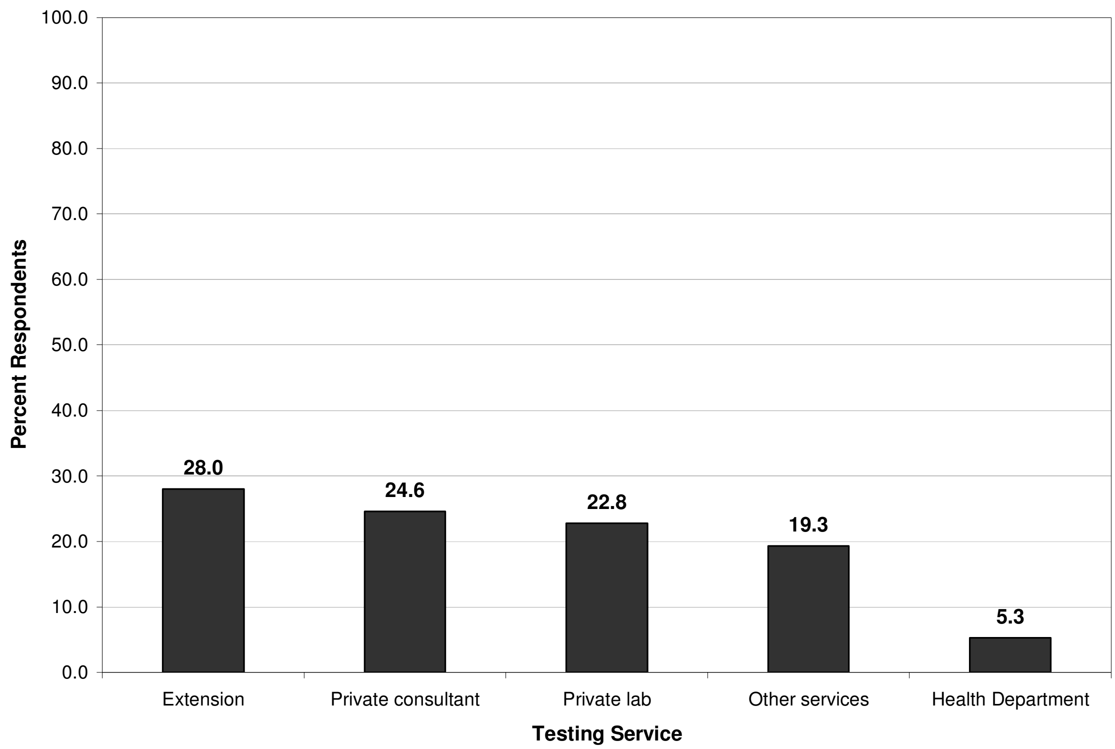

Figure 5. Agencies/methods used in pond water testing within the last five years (as reported by survey respondents)

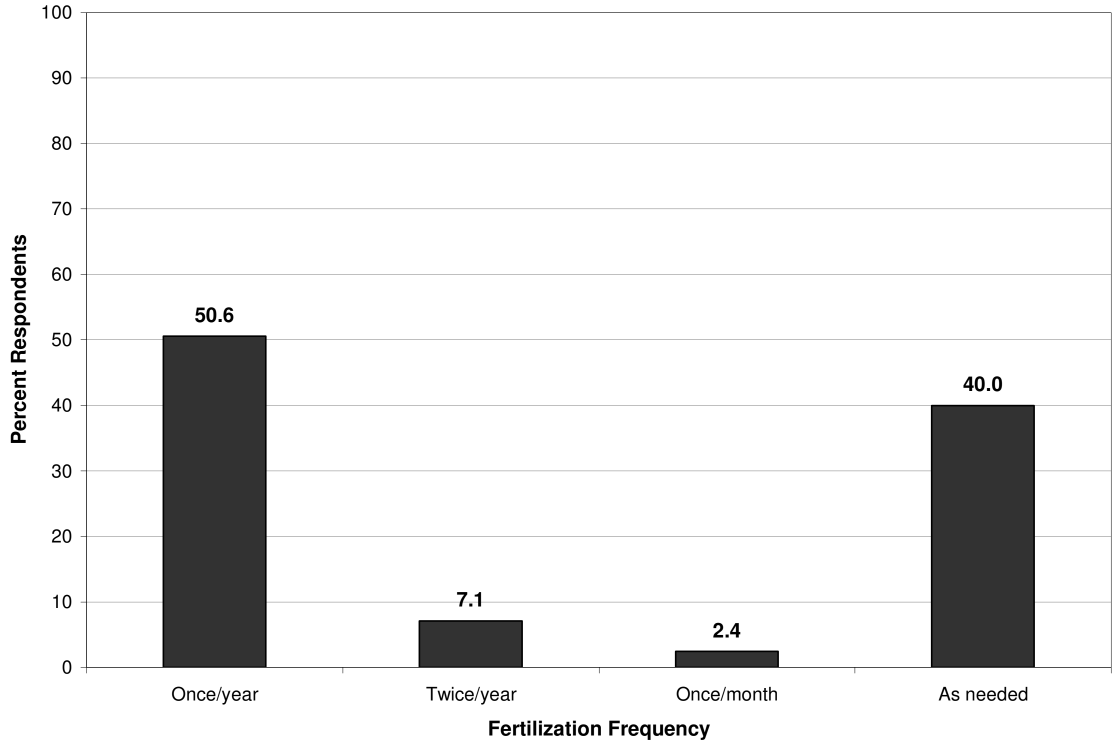

Figure 6. Frequency of pond fertilization (as reported by survey respondents)
**observed chi-squared significance level of less than 0.0005*

0.0005) (Figure 6). When recommendations were used for fertilization, 32.3% were from private consultants, 26.9% were from Extension, 17.2% from hatcheries, 16.1% from TPWD, and 7.1% from NRCS (Figure 7).

Liming, a technique often necessary before fertilization, was reported by only 8.3% of respondents. When cases of liming and fertilizing were cross tabulated, only 5.3% of cases reported both liming and fertilizing.

Rotenone was employed by only 3.7%, and of these 86.7% cited starting over, 13.3% cited unwanted species removal, and zero respondents reported using Rotenone to reduce overpopulation (observed chi-squared significance level of less than 0.0005).

If muddy water problems, suspended sediments, were reported, 69.6% of the time no action was taken to correct the problem, 13.9% reported other, most commonly hay, 9.1% used lime to clear muddy water, 6.1% used gypsum, and 1.3% used alum, (Figure 8).

3) Aquatic Vegetation

Aquatic vegetation in general was considered important in a pond by 66.7% of respondents. Out of all respondents, 53.5% preferred submerged vegetation, 14% prefer both floating and emergent, and 10.6% prefer algae (Figure 9). Only 8.2% of total respondents reported adding vegetation to their ponds within the last five years. Of respondents who answered that aquatic vegetation was important to their ponds, 9.3% of those also reported adding vegetation to their ponds. Types of vegetation reportedly added were most commonly water lilies, cattails, and duckweed.

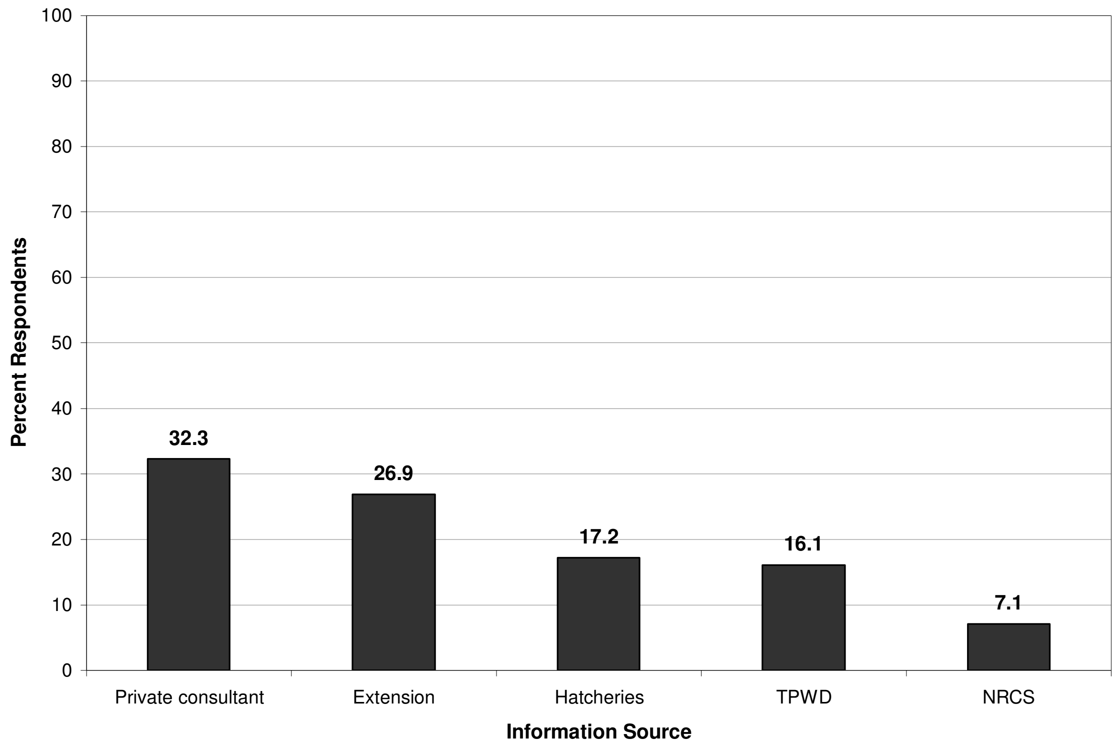

Figure 7. Source of recommendations used for fertilization (as reported by survey respondents)

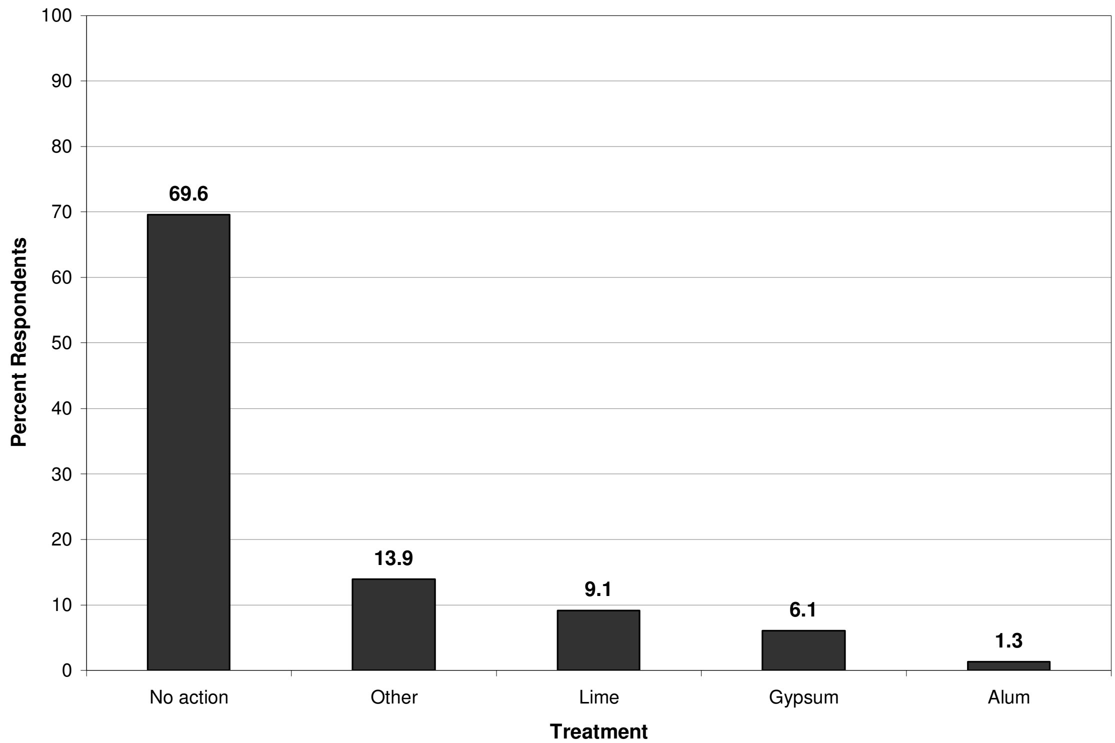

Figure 8. Treatment of problems with muddy water (as reported by survey respondents)

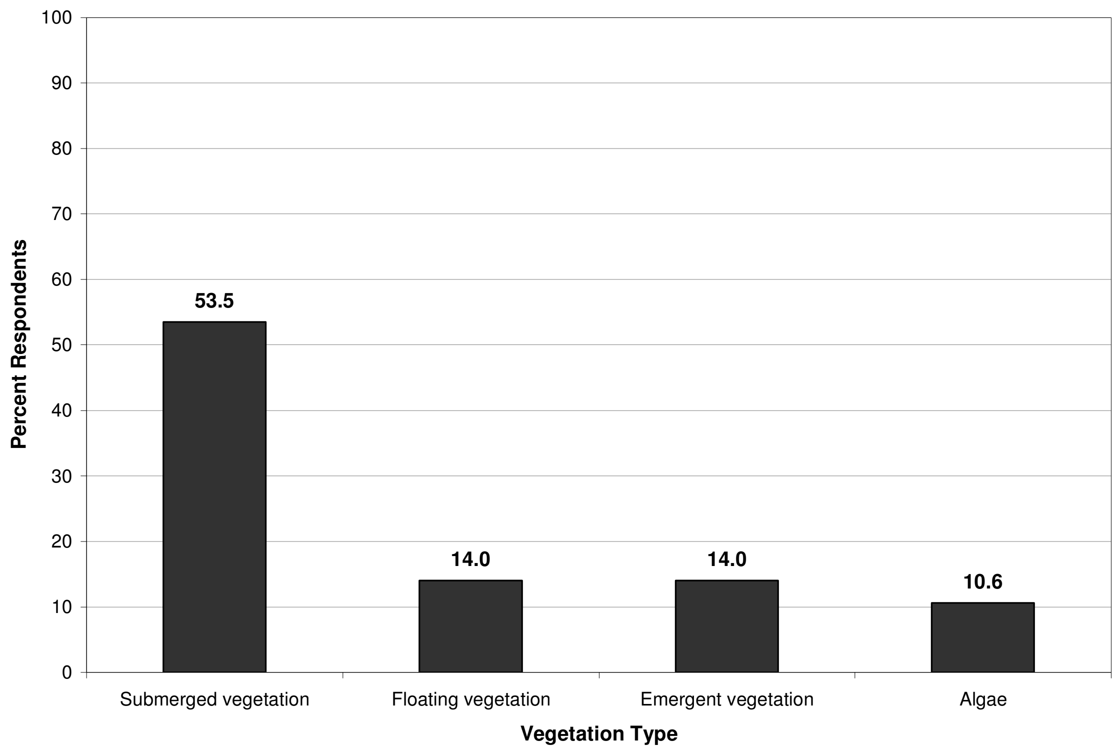

Figure 9. Pond aquatic vegetation preferences (as reported by survey respondents)

Vegetation problems of at least one of the following types were reported by a majority of respondents. The most prevalent was filamentous algae with 55.6% of respondents reporting this problem, followed by submerged weeds with 51.7%, emergent weeds with 49.1%, floating weeds with 41.3%, and green water, or planktonic algae with 12.7%. Only 4.1% of respondents reported having no problems with aquatic vegetation (Figure 10).

For those that reported vegetation problems, 61.2% used biological treatments, including triploid grass carp, 40.6% used chemical herbicides, 28.4% used mechanical or physical removal of vegetation, and 16.8% used no treatment (Figure 11). When asked where respondents got their information regarding the treatment of aquatic vegetation, 27.4% received information from TPWD, 25.6% from Extension, 20.7% from retail stores, 20.4% from private consultants, and 8.0% from NRCS (Figure 12). Other resources listed included internet references, the Army Corps of Engineers, and pond management magazines. For those who used a consultant or service in regards to vegetation treatment, 67.8% reported following instructions more than 80%, 20.6% reported following 50%-80%, and the remaining 11.7% reported following less than 50% (observed chi-squared significance level of less than 0.0005) (Figure 13). For actual treatment of the problem, 91.5% reported performing the treatment themselves, 5.8% reported private consultants performing the actual treatment, 1.4% reported other, while 1.0% reported farm or ranch hands treating the problem (observed chi-squared significance level of less than 0.0005) (Figure 14).

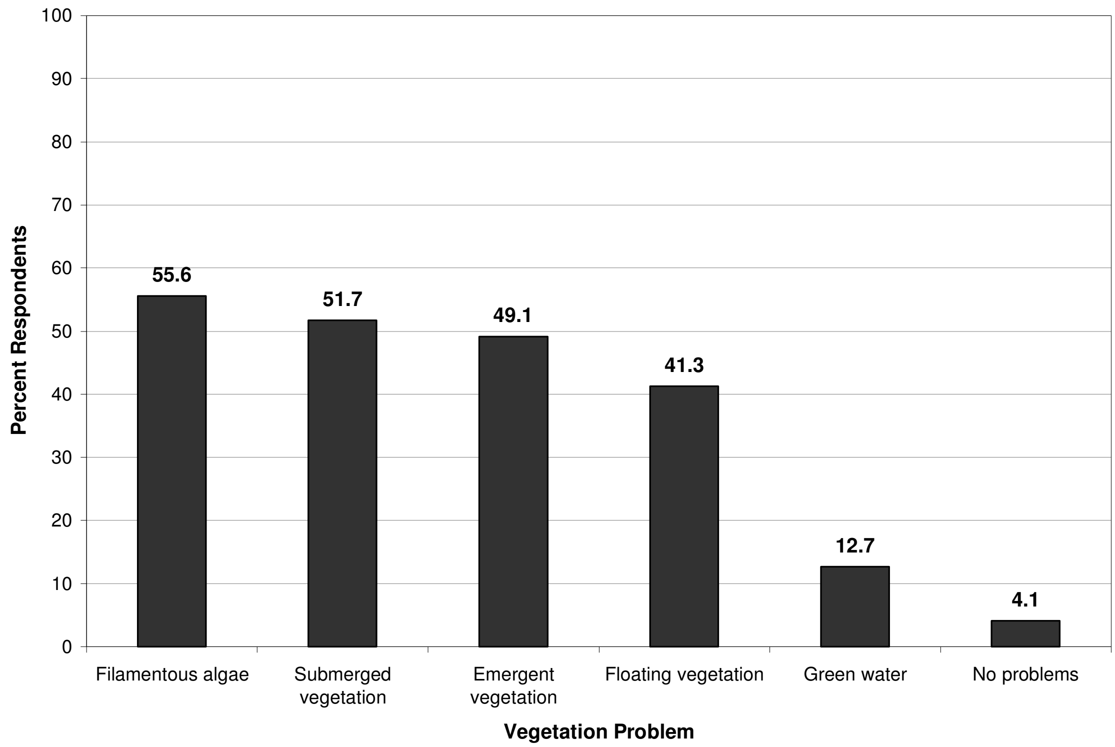

Figure 10. Vegetation problem by type (as reported by survey respondents)

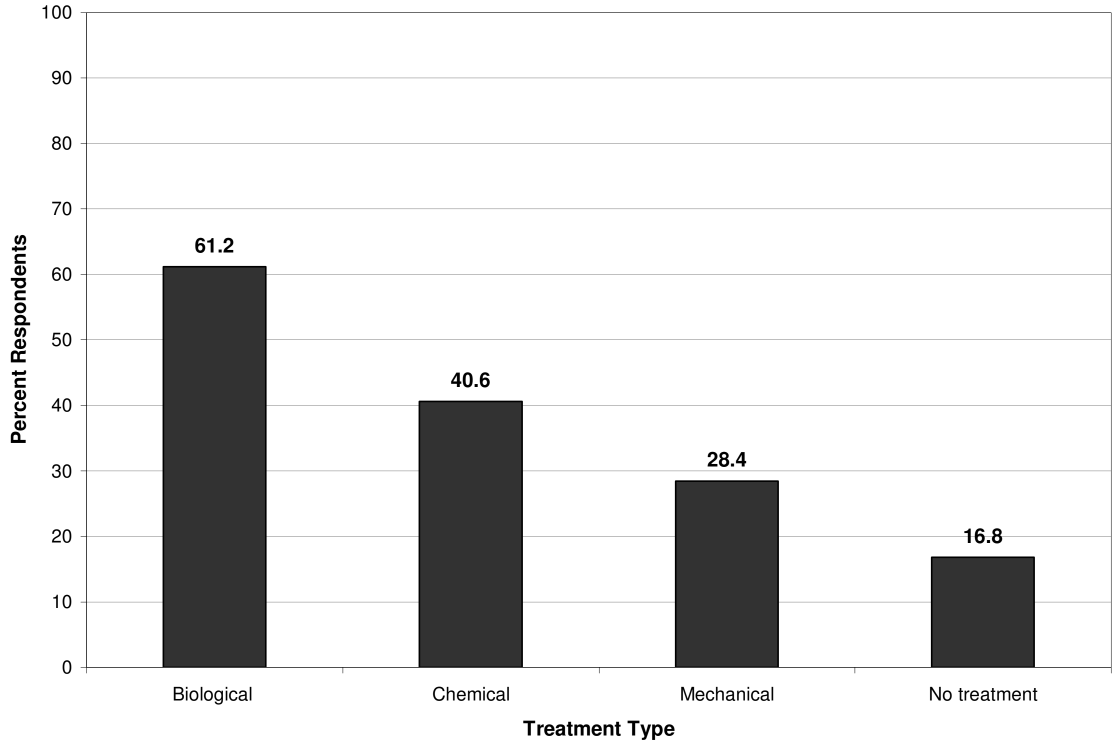

Figure 11. Treatment method of aquatic vegetation problems (as reported by survey respondents)

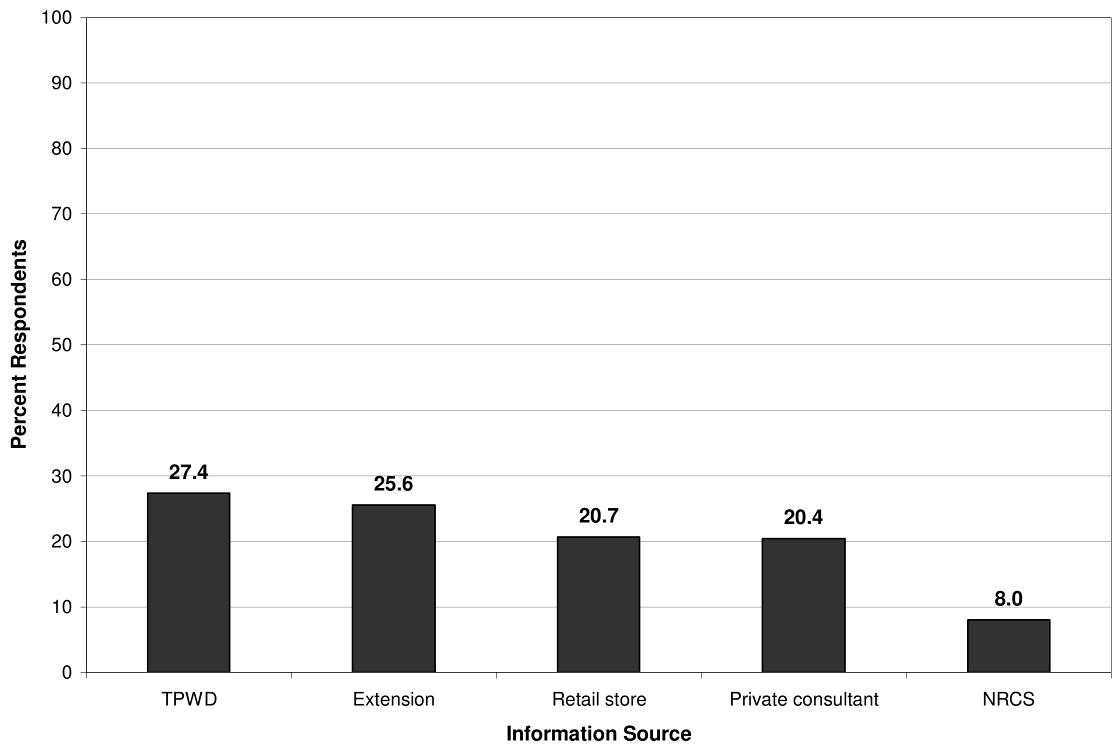

Figure 12. Sources of information regarding aquatic vegetation treatment (as reported by survey respondents)

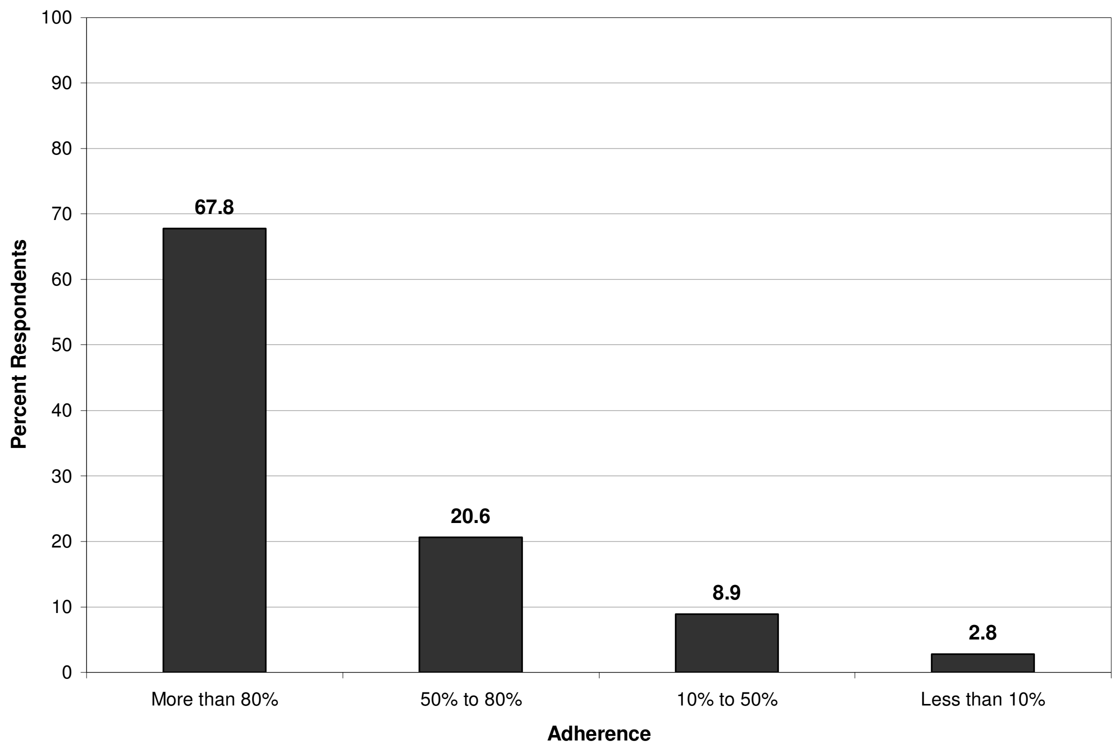

Figure 13. Adherence to recommendation in regards to aquatic vegetation treatment (as reported by survey respondents)
**observed chi-squared significance level of less than 0.0005*

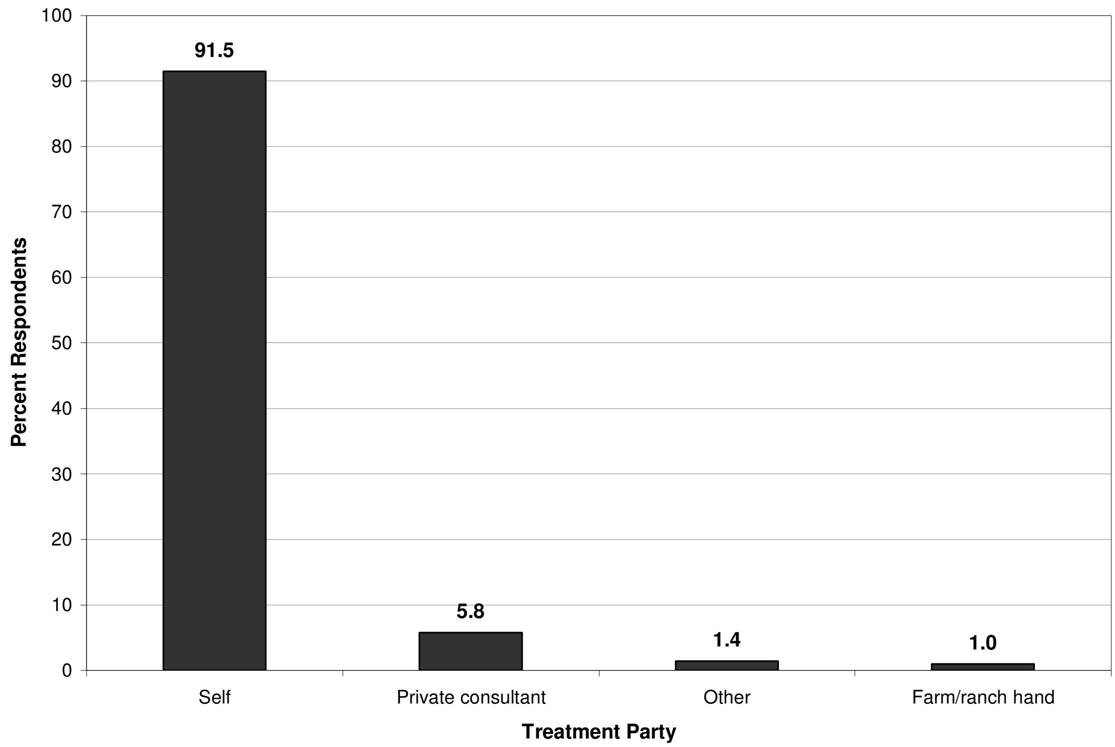

Figure 14. Individual responsible for treatment of aquatic vegetation problem (as reported by survey respondents)
**observed chi-squared significance level of less than 0.0005*

4) Fish and Other Wildlife

Pond owners reported intentionally stocking 20 species of fish into their ponds within the last five years. The most common fish stocked included bass at 54.8% of total respondents and catfish at 54.5% (channel catfish); 49.1% stocked fathead minnows, 48.8% stocked bluegill, and fewer than 20% reporting stocking blue catfish, goldfish/carp/koi, redear sunfish, other sunfish, crappie, other fishes, golden shiner minnows, no fished stocked, shad (threadfin or gizzard), or trout, in descending order (Table 1). For those pond owners who stocked bass, 66.5% stocked bluegill as well. In regards to recommendations on stocking, 38.0% used recommendations from fish hatcheries, 19.4% reported using no advice, 16.8% used TWPD recommendations, 13.4% used Extension, 12.1% used private consultants, and fewer than 10% used NRCS, neighbors' advice, or other sources (Figure 15). These recommendations were followed at the more than 80% level 68.7% of the time, at the 50%-80% level 22.8% of the time, and 50% or less 8.5% of the time (observed chi-squared significance level of less than 0.0005) (Figure 16).

Accidental fish inhabitation was reported less frequently, with the most common group being bullhead/mudcats/pollywogs at 20.7%. Other sunfish/perch followed closely at 19.1%, minnow species at 15.8%, bass at 13.2%, and all other groups with less than 10% each including bluegill, catfish, green sunfish, crappie, carp/koi, shad, and goldfish in descending order. That no fish had accidentally inhabited their ponds was reported by 32.3% of respondents (see Table 1).

Table 1. Species of fish purposely stocked into ponds and invasive species that have accidentally inhabited ponds within the past five years by percentage of total respondents.

fish species	purposely stocked (by % total respondents)	invasive species (by % total respondents)
bass	54.8	13.2
bluegill	48.8	10.1
crappie	15.8	8.0
redear sunfish	18.6	n/a[1]
green sunfish	n/a[1]	8.8
other sunfish/perch	17.6	19.1
channel catfish	54.5	10.1[2]
blue catfish	19.4	n/a[1]
fathead minnow	49.1	15.8[3]
golden shiner	12.1	n/a[1]
shad	7.5	3.1
trout	0.5	n/a[1]
goldfish/carp/koi	18.1	4.7
bullhead/mudcat/pollywogs	12.4	20.7
none	10.1	32.3

1 category not included within the question
2 invasive species list includes combined category for all catfish
3 invasive species list includes combined category for all minnows

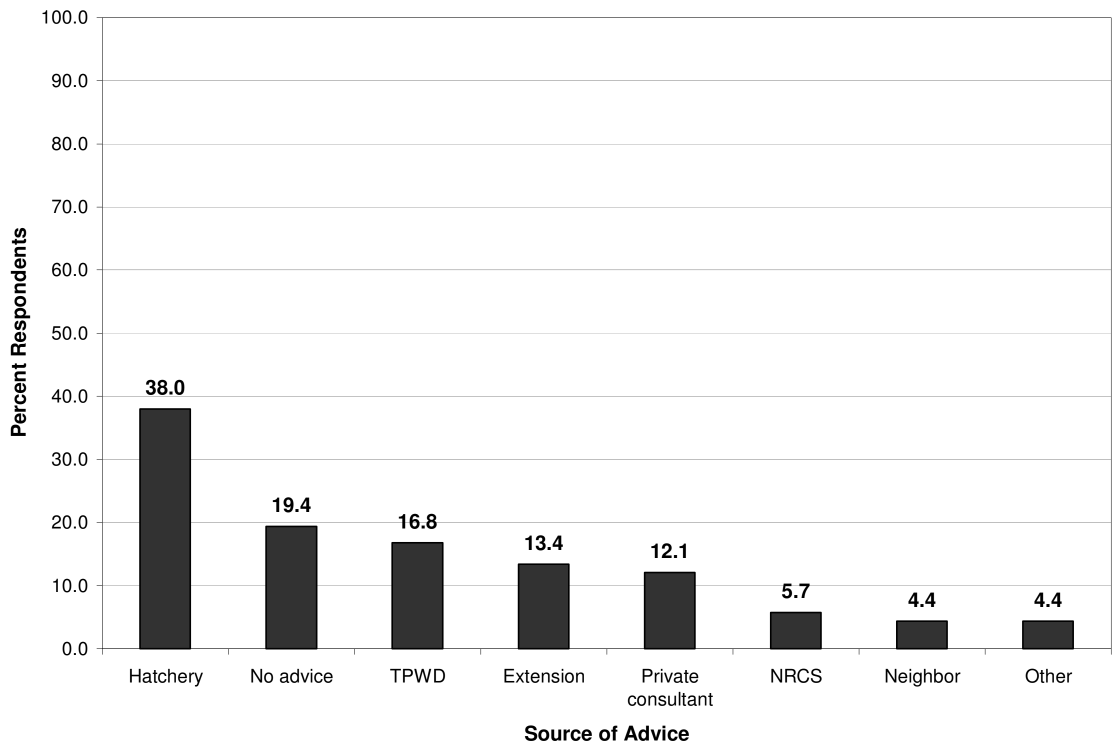

Figure 15. Sources of advice regarding fish stocking (as reported by survey respondents)

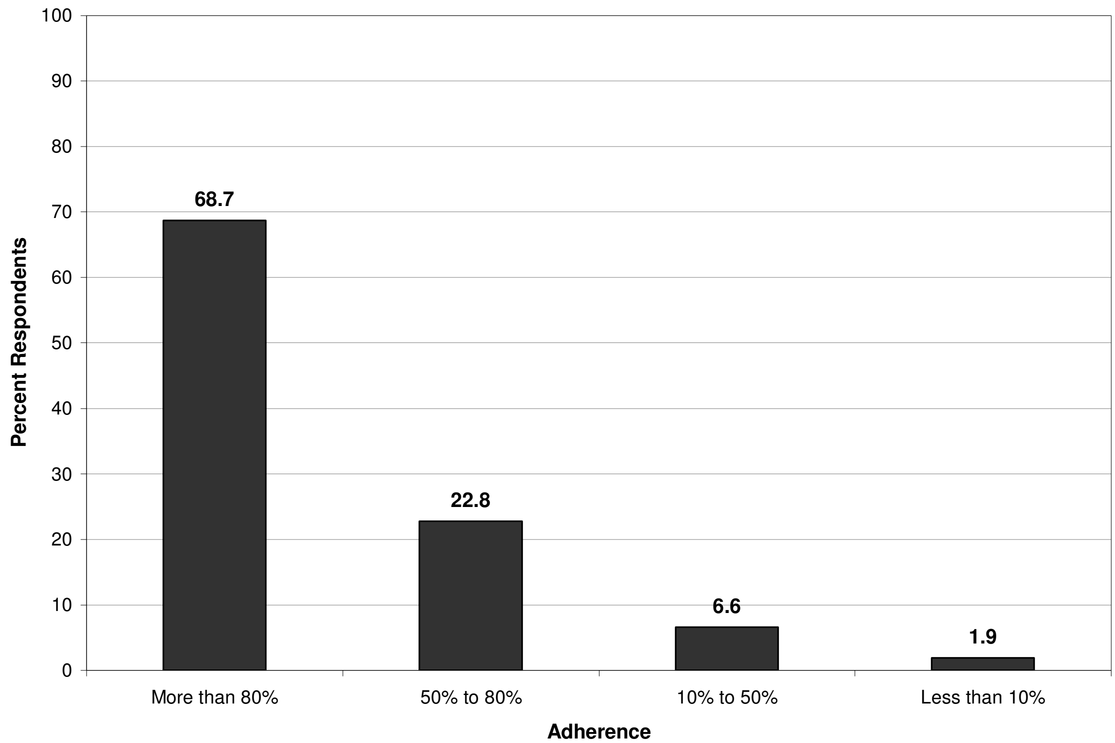

Figure 16. Adherence to recommendations regarding fish stocking (as reported by survey respondents)
**observed chi-squared significance level of less than 0.0005*

Primary fishing goals showed that 83.3% of respondents whose ponds were used for fishing had goals of good general fishing, as opposed to 9.2% who desired catfish only, 6.5% whose goal was trophy bass, and 0.9% whose goal was large sunfish (observed chi-squared significance level of less than 0.0005) (Figure 17). Most fishing in respondents' ponds was by the respondent at 65.6%, with extended family next at 17.8%, friends at 12.8%, and 3.9% other (observed chi-squared significance level of less than 0.0005) (Figure 18). Frequency of fishing was most commonly reported at once per month by 51.7%, every six months by 21.5%, once per week by 18.1%, more than once per week by 6.5%, and once per year by 2.2% (observed chi-squared significance level of less than 0.0005) (Figure 19).

Four fish harvesting strategies were presented, and respondents were asked to report their typical behavior. Respondents indicated that 55.0% kept a select few fish, 31.7% released all fish caught, 7.1% released only undersized fish, and 6.2% kept all fish caught (Figure 20).

Respondents most often considered catching fish 2-4 lbs to be good fishing for their ponds at 59.5%, 21.0% considered 5 lb or larger fish good fishing, and 19.5% considered 1-2 lb fish good fishing (observed chi-squared significance level of less than 0.0005) (Figure 21).

Fishing problems reported by respondents included nuisance animals 21.2%, too many small bass 12.1%, too many small sunfish 8.5%, and unwanted species 5.7% (Figure 22). Fish kills were reported by 35.1% of respondents, with low dissolved oxygen the most common cause at 61.8%, other causes reported by 27.2%, and poor

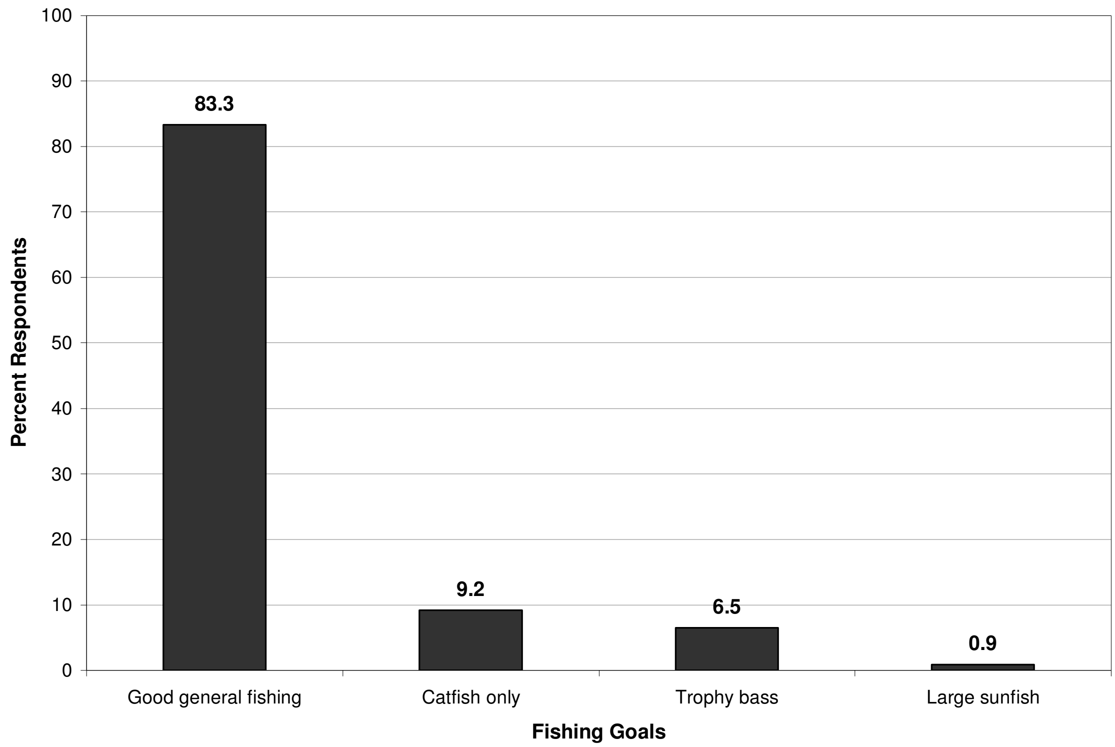

Figure 17. Primary fishing goals (as reported by survey respondents)
**observed chi-squared significance level of less than 0.0005*

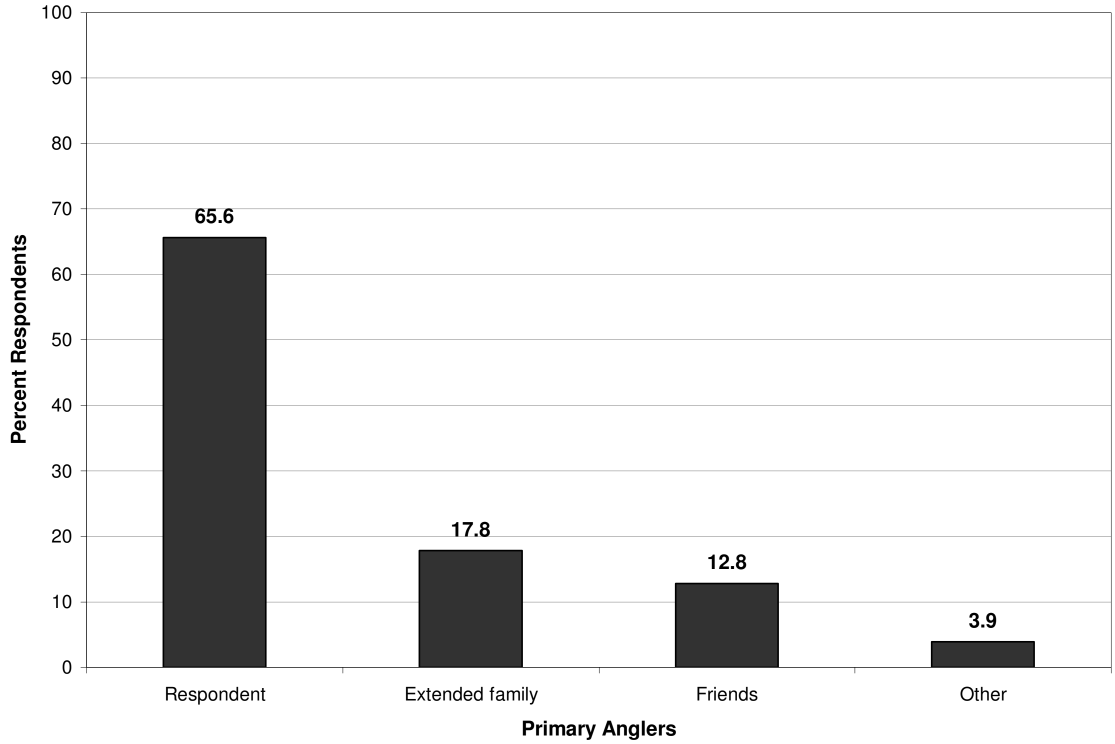

Figure 18. Individuals performing the majority of fishing (as reported by survey respondents)
**observed chi-squared significance level of less than 0.0005*

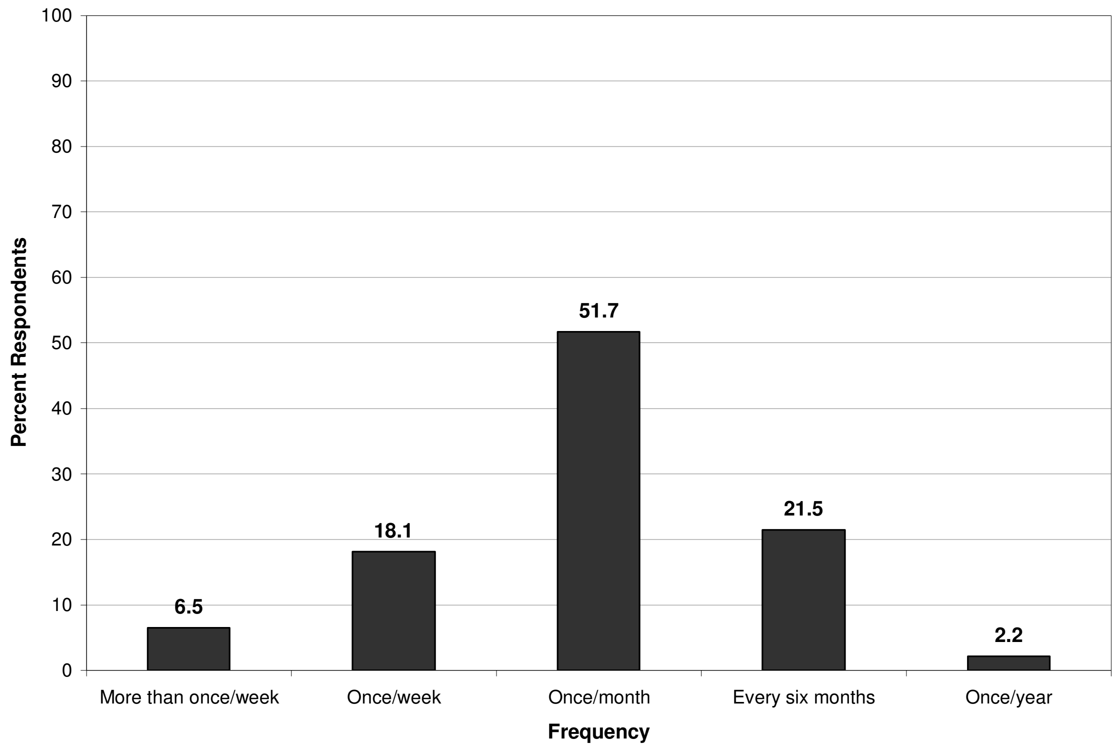

Figure 19. Frequency of fishing (as reported by survey respondents)
**observed chi-squared significance level of less than 0.0005*

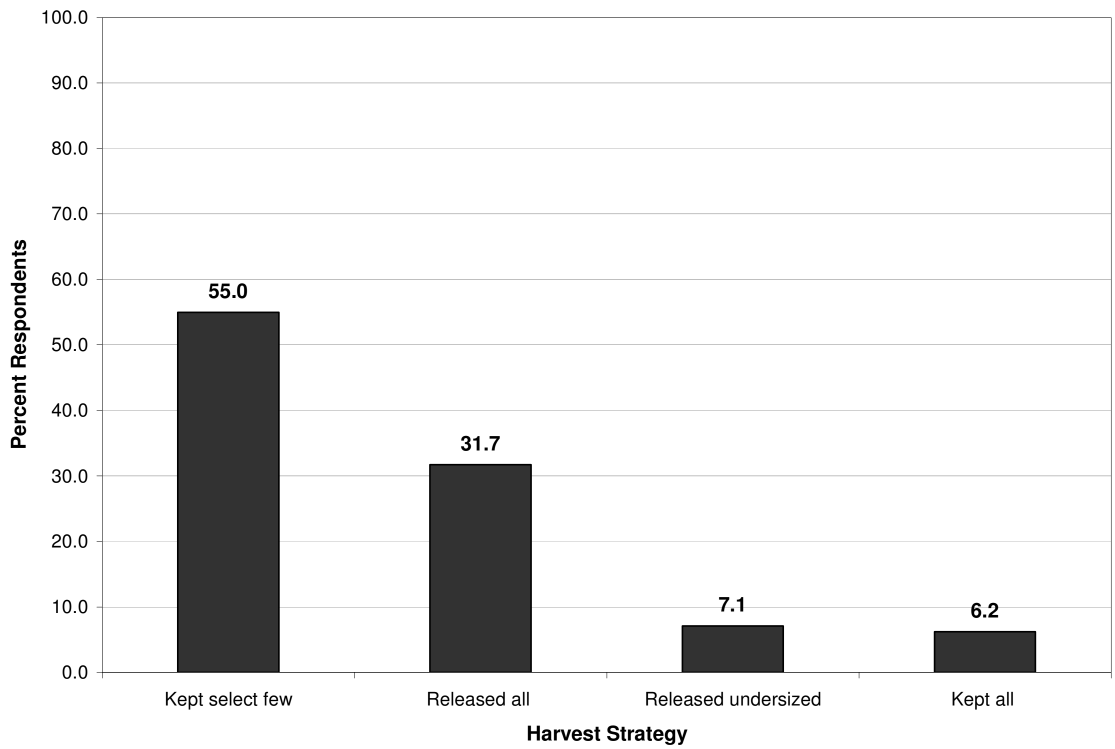

Figure 20. Fish harvesting strategies (as reported by survey respondents)

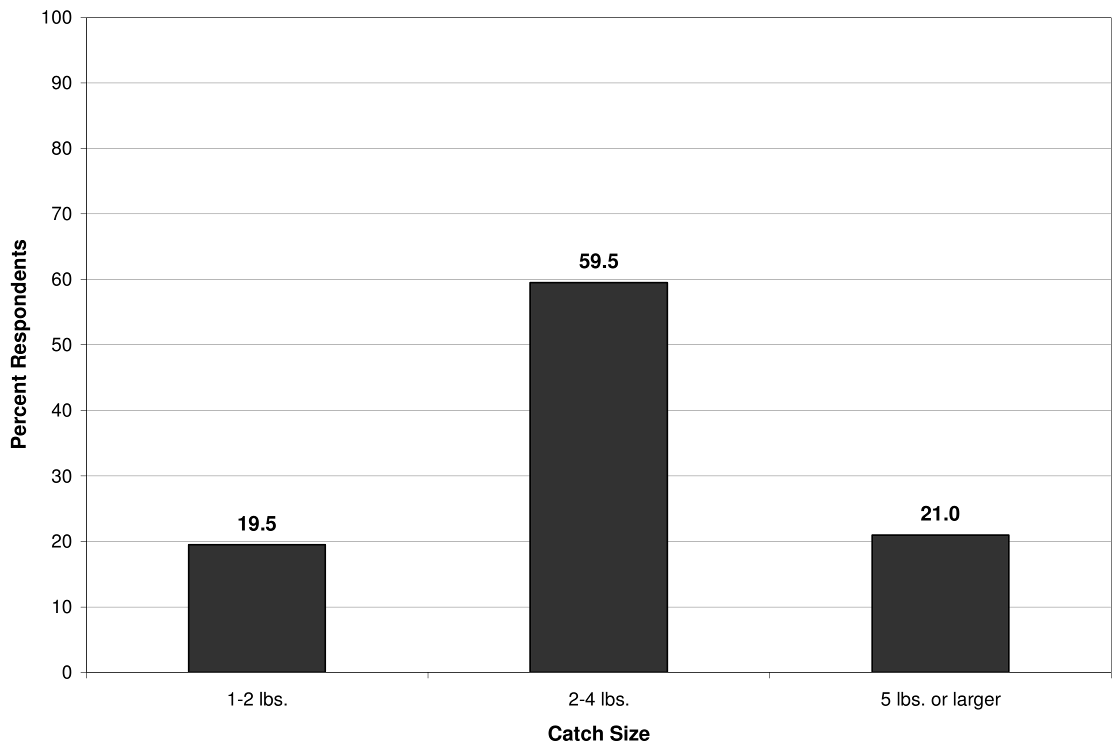

Figure 21. Catch size considered good fishing (as reported by survey respondents)
observed chi-squared significance level of less than 0.0005

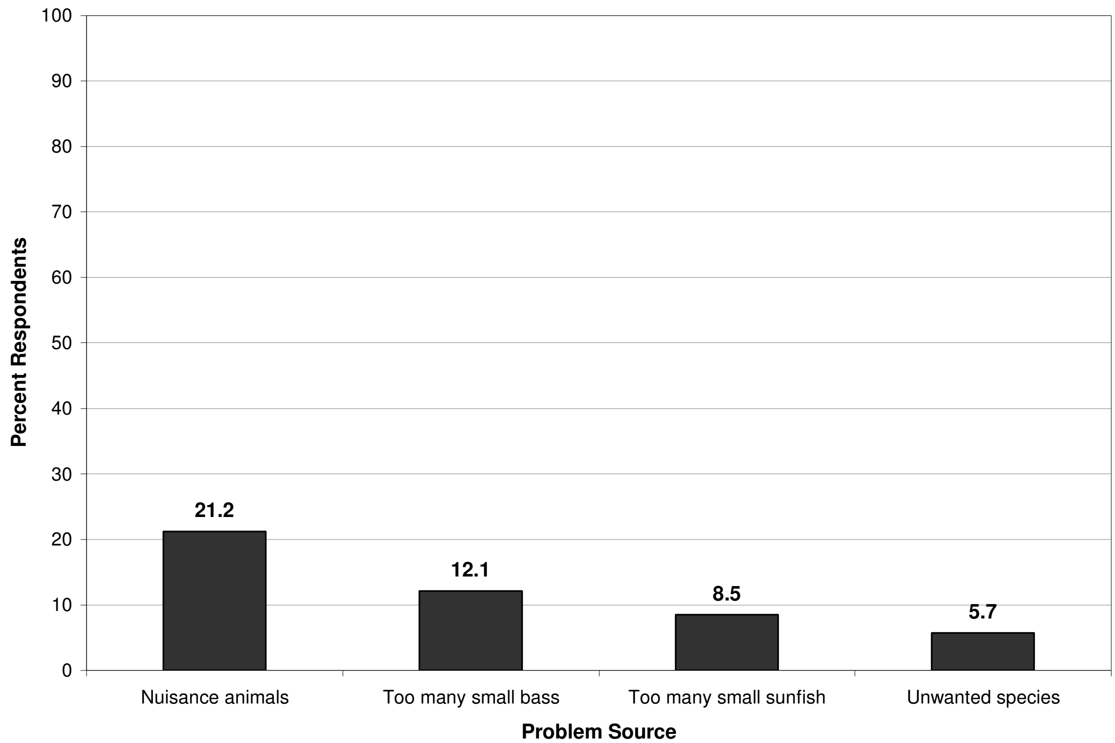

Figure 22. Fishing problems (as reported by survey respondents)

water quality, disease, and pesticide runoff reported by less than 10% each (observed chi-squared significance level of less than 0.0005) (Figure 23). In response to fish kills, 3.7% had a fish diagnostician look for disease in their fish. Treatments were used rarely, with other treatments used 20.5% of the time, chemicals used 4.5% of the time, and antibiotics used 2.3% of the time. Pond owners with disease problems did not treat the problem 72.7% of the time (observed chi-squared significance level of less than 0.0005) (Figure 24).

Predator problems were common among pond owners, and most often were due to turtles with 69.8% of total respondents reporting problems, followed by wading birds 53.0%, snakes 38.8%, cormorants 37.5%, and raccoons 28.7%. Otters, pelicans, alligators, and other predators were reported by less than 10% of respondents (Figure 25). Non-predator pest problems were less common, and included ducks/geese 27.6%, beavers 17.6%, nutria 14.2%, and other 1.0%. Zero respondents reported muskrats as problematic, while 29.5% reported having no animal pest problems at all (Figure 26).

In recognition of the growing trend of leasing ponds to private individuals or organizations for fishing purposes, respondents were asked whether they had ever leased their ponds for fishing and for those who had never leased their ponds, if they had considered doing this. Most respondents, 96.8%, reported never having leased their ponds for fishing, but 9.1% of these indicated that they had considered this option.

5) Economics of Achieving Management Goals

Pond balance is important to healthy and productive pond systems, and balance can be checked periodically to determine if there are any problems within a pond. When

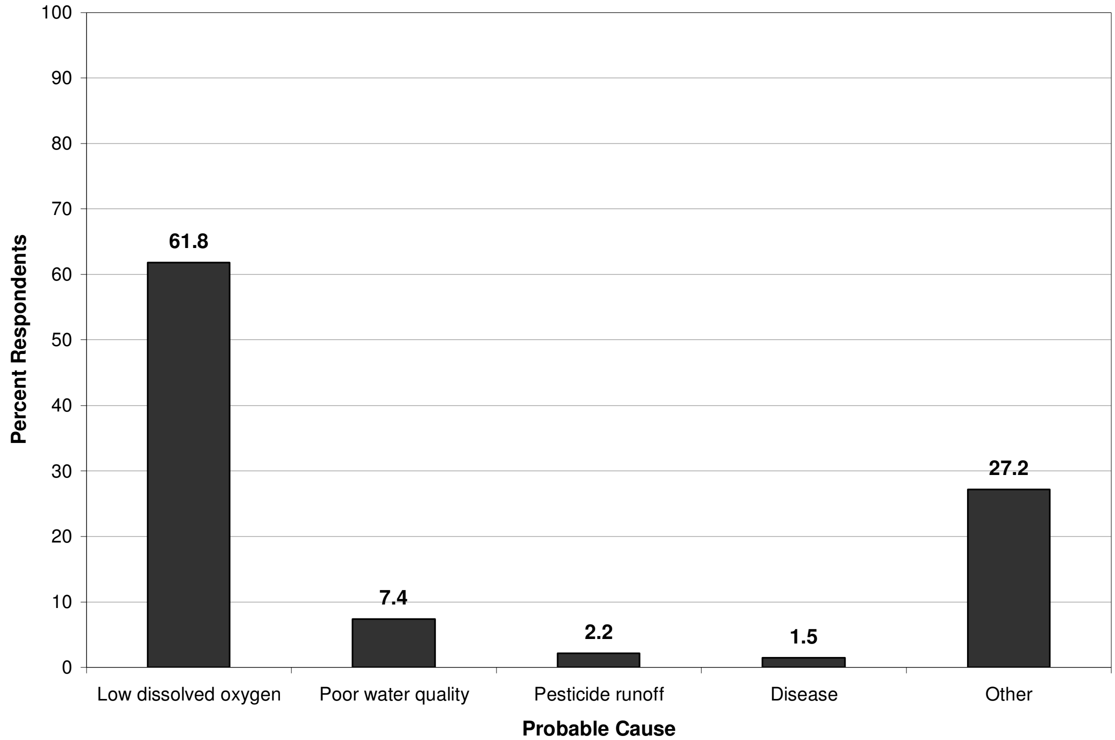

Figure 23. Probable causes of fish kills (as reported by survey respondents)
**observed chi-squared significance level of less than 0.0005*

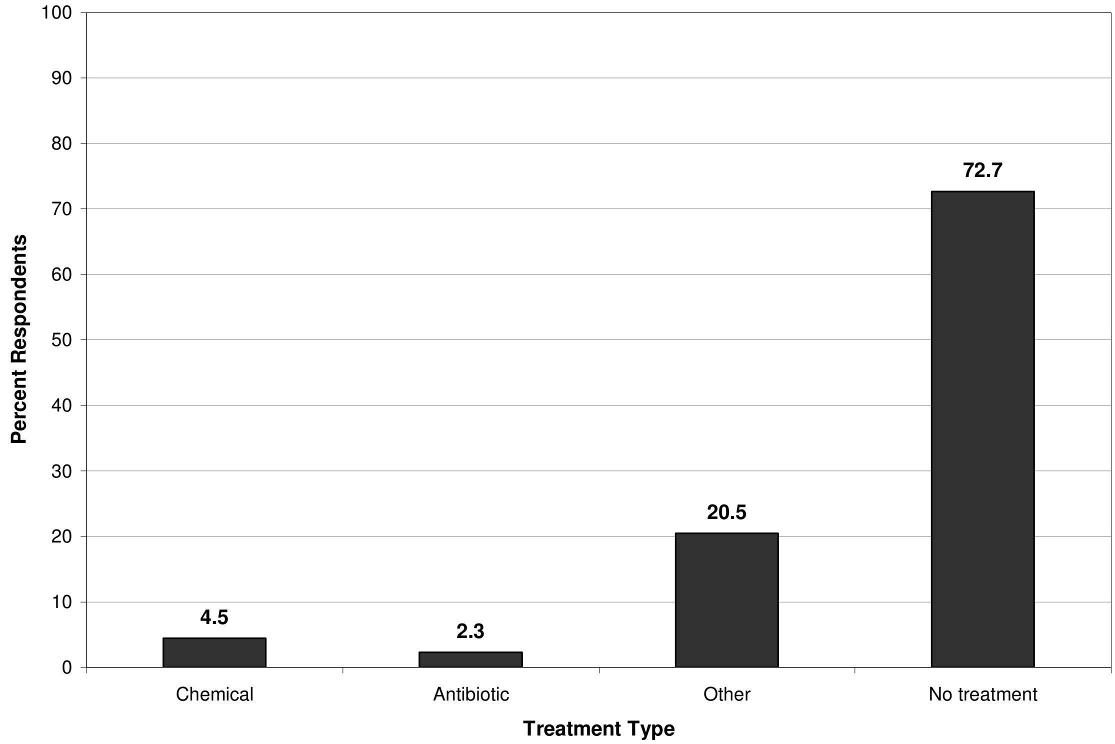

Figure 24. Treatment of fish disease problem (as reported by survey respondents)
**observed chi-squared significance level of less than 0.0005*

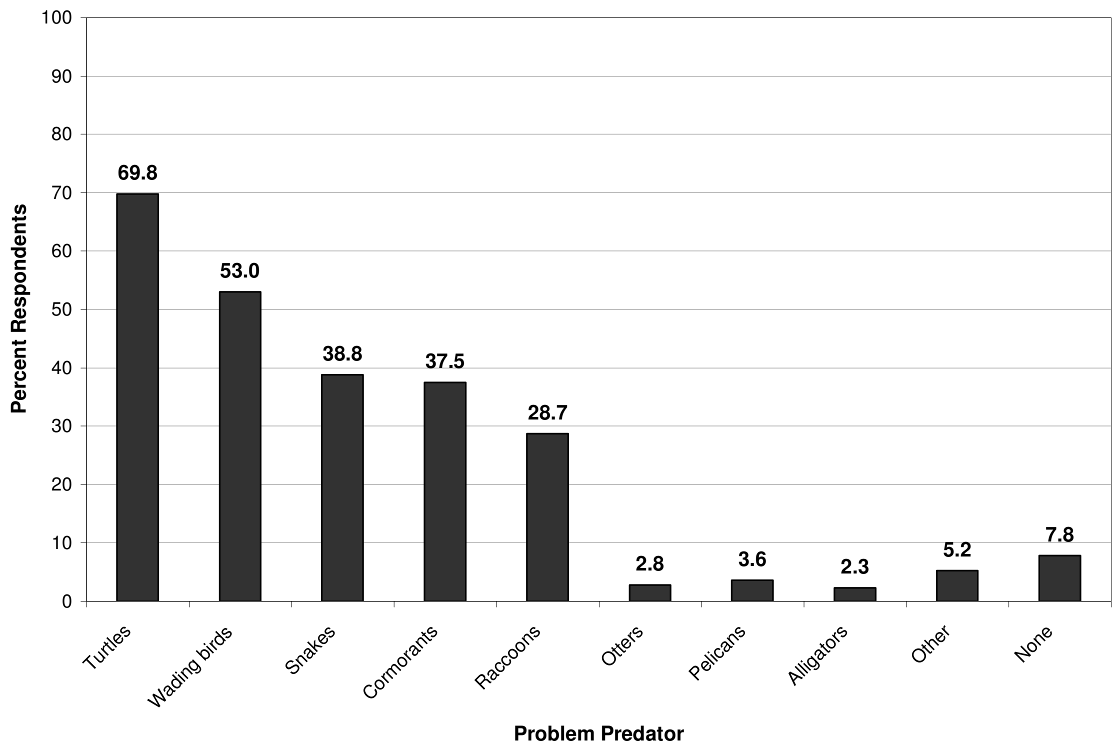

Figure 25. Predator problems (as reported by survey respondents)

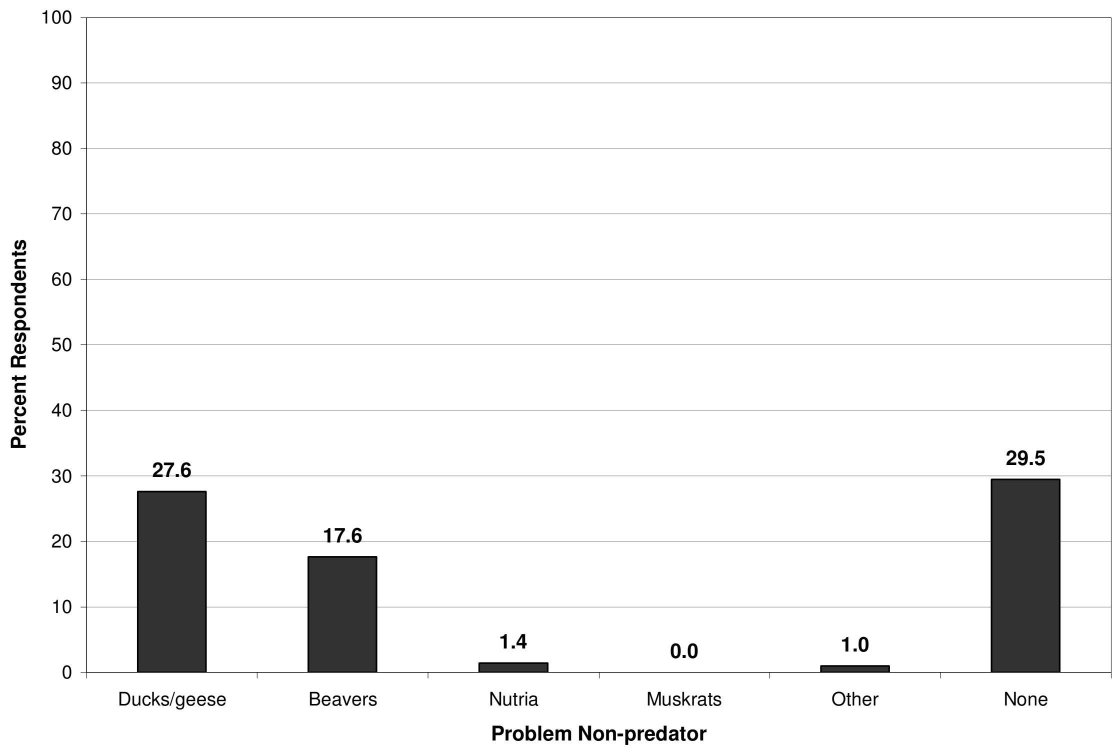

Figure 26. Non-predator pest problems (as reported by survey respondents)

asked if they had ever paid a private consultant to check pond balance, 7.3% of respondents indicated they had done so. Of these, 40.7% had done so once within the lifetime ownership of their pond, 37.0% reported 2-5 times , 11.1% reported both annual balance checks and having balance checked more than once per year (observed chi-squared significance level of less than 0.0005) (Figure 27). When asked about willingness to use a private pond consultant if it would help pond owners reach their management goals, 58.4% said they might be willing, 21.9% said they would be willing, and 19.7% indicated they would not be willing to use a pond consultant (observed chi-squared significance level of less than 0.0005) (Figure 28).

Annual expenses for pond owners fell primarily in low to moderate spending categories, with reported per surface acre per year expenditures as follows: 50% spent $50 or less, 19.7% spent $51-$100, 17.2% spent $101-$250, 8.5% spent $251-$500, 4.4% spent $501-$1000, and 0.3% spent $1001 or more (observed chi-squared significance level of less than 0.0005) (Figure 29). When asked how much pond owners would be willing to spend per surface acre per year if it helped reach management goals, responses indicated 28.2% would be willing to spend $50 or less, 25.9% would be willing to spend $51-$100, 24.1% would be willing to spend $101-$250, 15.3% would be willing to spend $251-$500, 5.6% would be willing to spend $501-$1000, and 0.9% would be willing to spend $1001 or more (observed chi-squared significance level of less than 0.0005) (Figure 30). Current spending compared to reported willingness to spend showed a 43.6% decrease at the $50 or less level, 31.5% increase at the $51-$100 level, 39.0% increase at the $101-$250 level, 80% increase at the $251-$500 level,

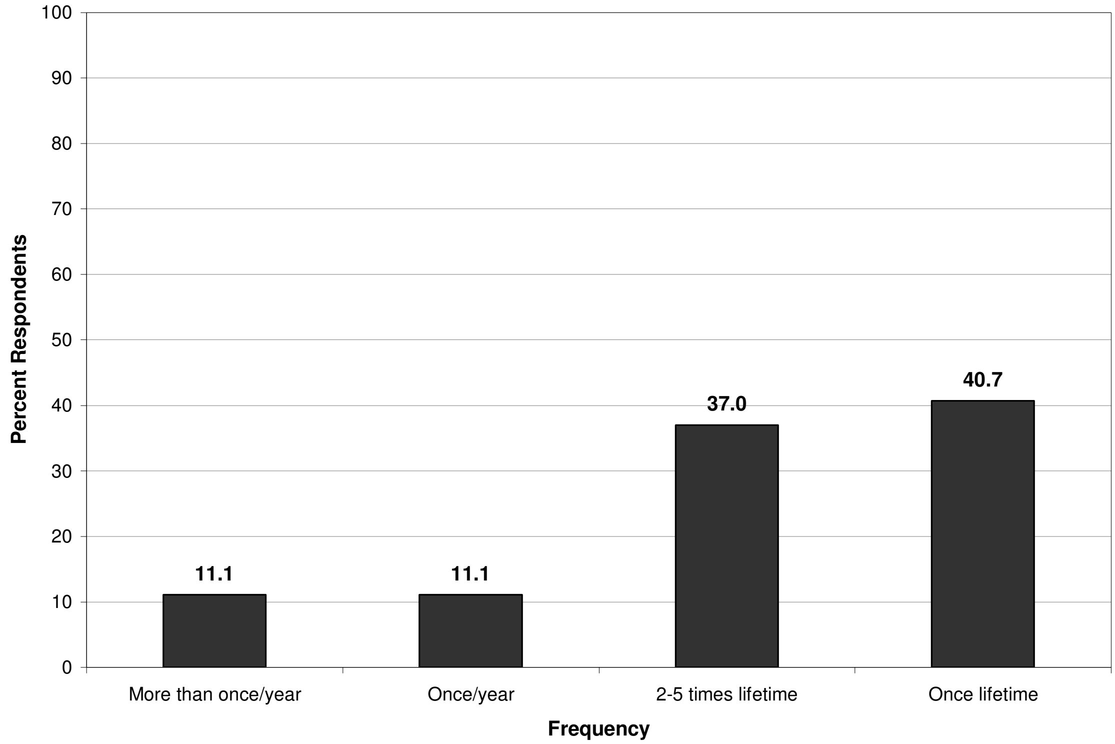

Figure 27. Frequency of pond balance check by private consultant (as reported by survey respondents)
**observed chi-squared significance level of less than 0.0005*

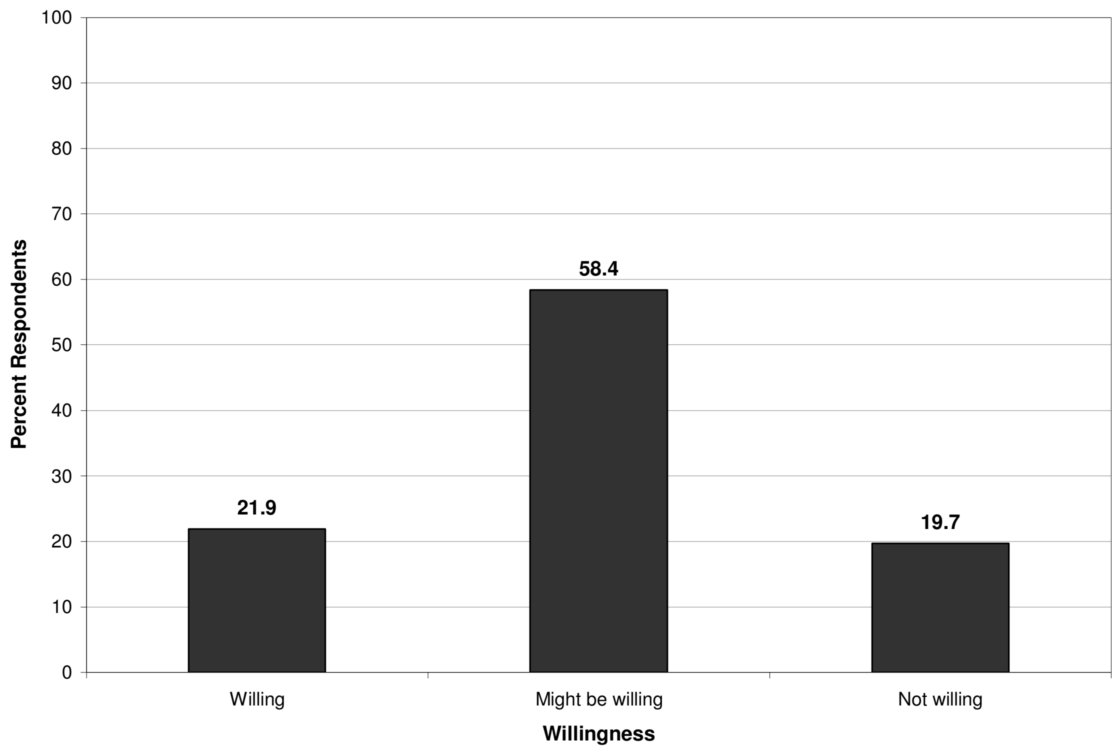

Figure 28. Willingness to use private consultant to reach management goals (as reported by survey respondents)
**observed chi-squared significance level of less than 0.0005*

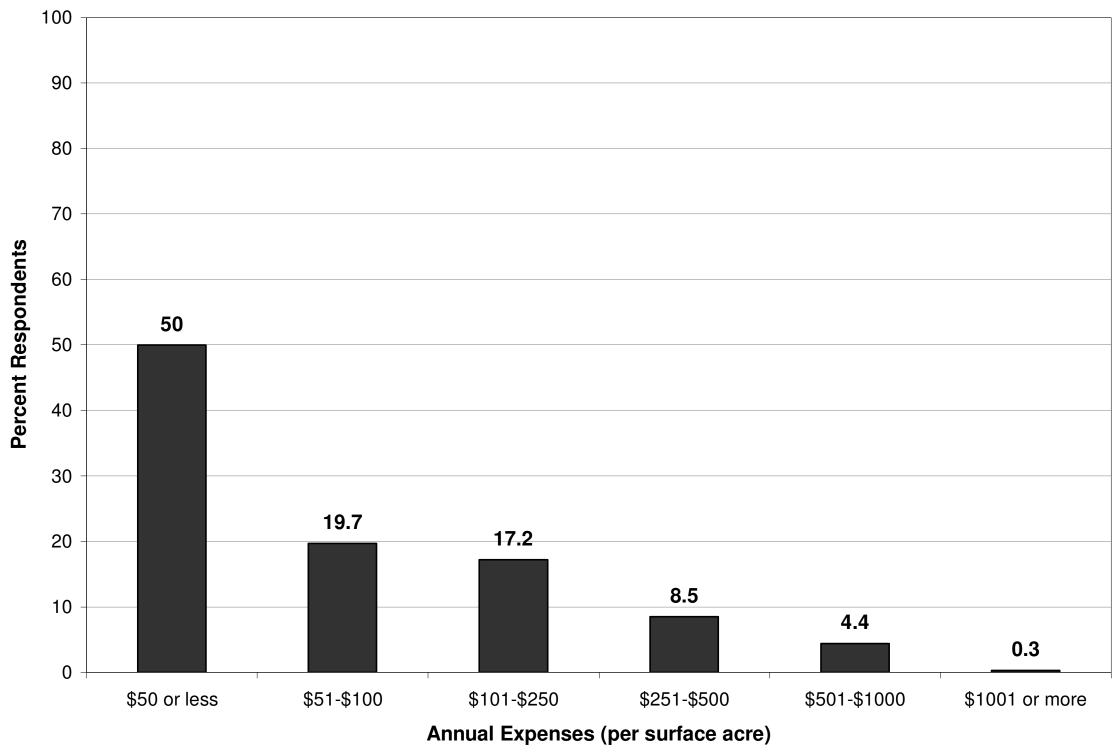

Figure 29. Annual expenses per surface acre per year (as reported by survey respondents)
**observed chi-squared significance level of less than 0.0005*

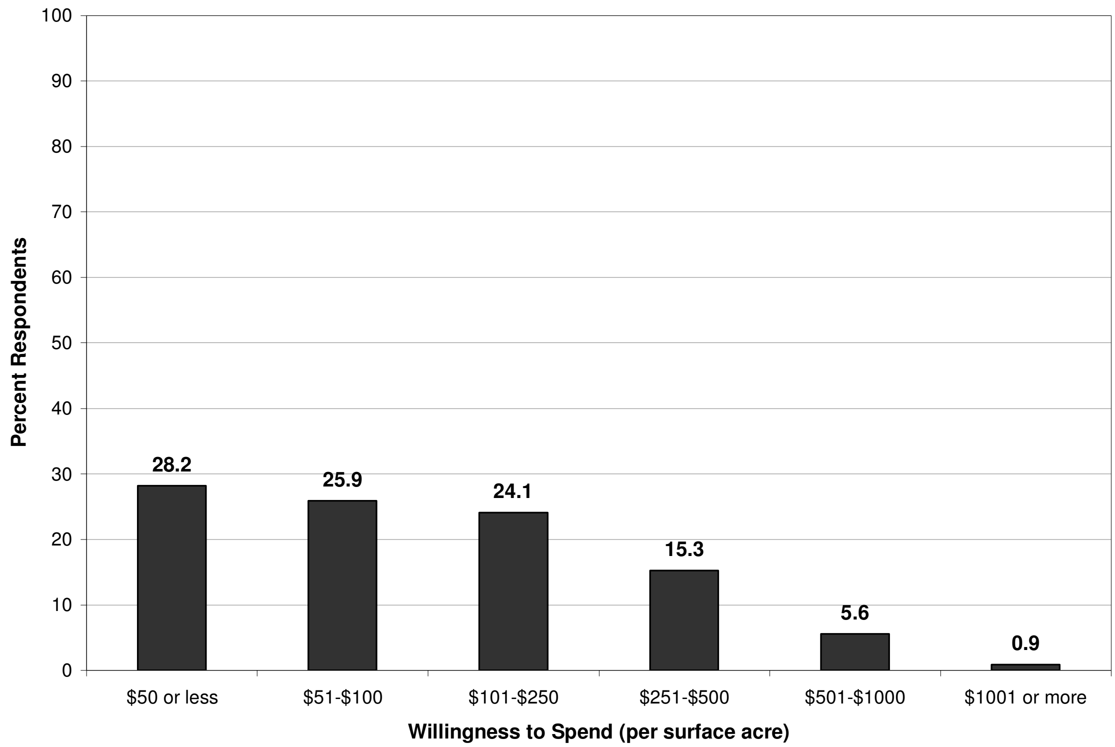

Figure 30. Willingness to spend annually per acre per year (as reported by survey respondents)
**observed chi-squared significance level of less than 0.0005*

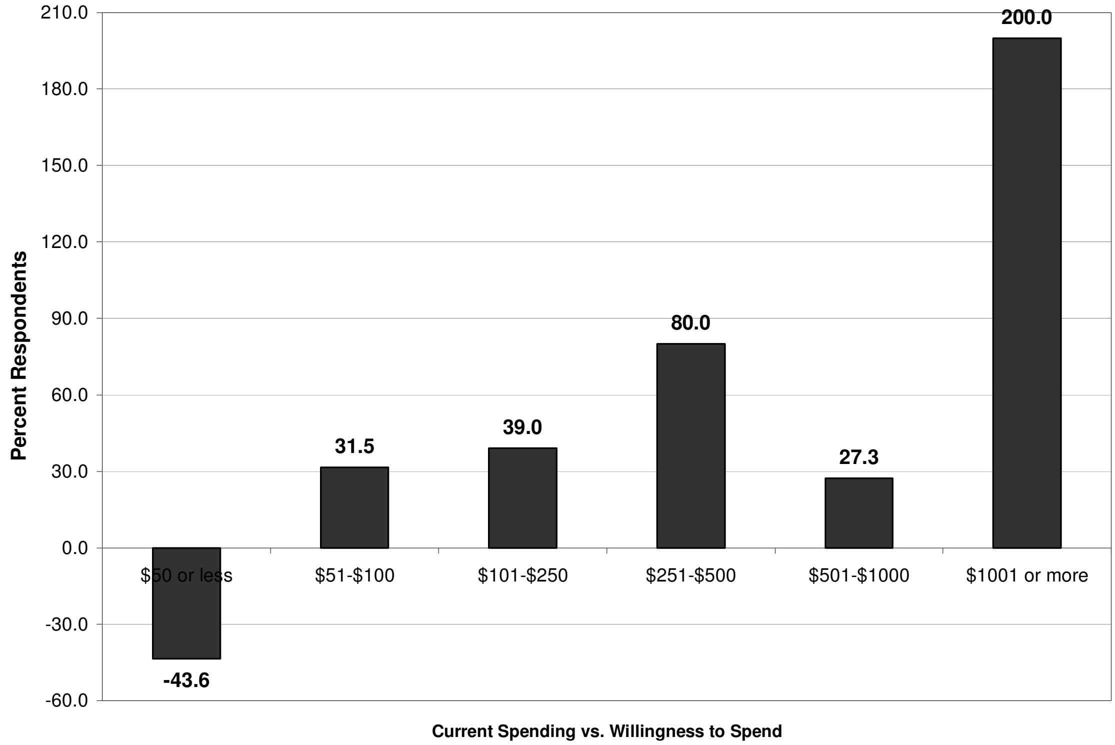

Figure 31. Difference in current spending and willingness to spend (as reported by survey respondents)

27.3% increase at the $501-$1000 level, and 200% increase at the $1001 or more level (Figure 31).

DISCUSSION

Private pond owners in the state of Texas had a number of public and private resources available to them to aid in pond creation and management. These included agency personnel, programs, and printed and online information. Though most information regarding management techniques can be applied to situations containing any number of ponds, most programs and presentations currently in use are tailored to meet the needs of private owners responsible for a small number of ponds. This is supported by the average number of ponds owned by respondents reported as 1.84. In addition, 95% of respondents owned 6 or fewer ponds. Different watersheds produce differing management problems and needs. These include water runoff rates, transport of sediment, and possible pollutants. The majority of pond owners reported a pasture watershed, while all other watersheds were reported no more than 16% of the time.

Pond leaking can be addressed via a number of solutions, depending upon the cause of the leak. Nearly one-third of ponds reportedly had problems with leaking, with the most common cause poor soils (48.6%). Alternately, the least common cause reported was vegetation on the dam. The most commonly encountered general pond problem reported by county Extension agents is excessive aquatic vegetation (Masser 2005). This category does not include algae problems, which was the next most commonly reported problem in the survey. The least commonly reported problems included fish and other wildlife related issues, including stocking, harvest, disease, and pests.

Pond water testing, either by individuals or professionals, is strongly encouraged in order to maintain a healthy pond environment, however, only 15% of pond owners reported having tests performed. The use of well water to fill or supplement (28% of ponds reported) could produce a management problem for pond owners who do not recognize that the difference in water quality between well and surface water requires differing management strategies. Fertilization, a process whose success can be linked to proper water chemistry as determined by testing, was reported by a nearly 50% greater number of respondents than reported testing their pond water. Fertilization without preliminary water testing is not recommended by professionals, as the proper types and doses are based on individual water chemistry characteristics. Such testing can indicate the need for pond liming, a step often necessary before fertilization can be successful. Respondents indicated low occurrence of liming, and both liming and fertilization together were reported only 5% of the time. This would seem to indicate a lack of understanding of natural pond food chains or how they can be enhanced.

Though Rotenone is the only reliable way to rid ponds of unwanted species or start over with a new stocking regimen, only 4% of respondents reported using the chemical. While a number of treatments for suspended sediment problems were reported, more than two-thirds of respondents reported taking no actions to correct the problem.

Despite the fact that county agents and pond owners alike reported that aquatic vegetation was the most common problem faced by pond owners, the same vegetation was considered important to their ponds by a full two-thirds of respondents. The most commonly reported types of vegetation added, aside from fertilization to produce algae, were water lilies, cattails, and duckweed. These are all species which can become very serious management issues in many areas, and are often difficult to eradicate once they inhabit a pond system. Aquatic vegetation was inaccurately thought to be a necessary component for many pond uses, most notably fishing. However, while algae are important to a healthy food web in bass-bluegill systems, rooted aquatic vegetation is not necessary and often detrimental. It seems that attention needs to be directed toward reconciling the inconsistencies involved in pond owners' attitudes surrounding aquatic vegetation.

Nearly half of all respondents reported vegetation problems of each of the following types: filamentous algae (55.6%), submerged vegetation (51.7%) and emergent vegetation (49.1%). Treatments of all three types were reported, with biological the most prevalent (61.2%), followed by chemical (40.6%), and then physical (28.4%). The high percentage of biological control methods used was expected, and is not an unbiased representation of pond owners as a whole, because the sample was selected from a population of applicants for TPWD triploid grass carp permits, the main agent used in biological vegetation control. When ponds were treated, nearly all owners reported self-treatment of their ponds.

Of the twenty species of fish intentionally stocked in ponds, the most common included bass (54.8%), catfish (54.5%), fathead minnows (49.1%), and bluegill (48.8%). All other fish were stocked by less than twenty percent of respondents. The bass-bluegill stocking system is best used in ponds over one surface acre. In ponds smaller than one acre, catfish are the most successful system. More attention is traditionally placed on the bass-bluegill system; however, the suitability of catfish for small ponds should not be overlooked, by both owners and professionals. Whereas bass and bluegill are part of a balanced predator-prey relationship, only two-thirds of pond owners reported stocking both bass and bluegill together. This discrepancy seems to be an indication that pond owners lack an understanding of the importance of balance between bass and bluegill in the predator-prey relationship.

Accidental fish inhabitation of ponds was reported less frequently; the most commonly unwanted species were bullheads, sunfish, and minnows. While only one-third of respondents reported that no accidental inhabitation had occurred, the remaining two-thirds did little to correct the problem, since Rotenone use was reported by only 4% of respondents as mentioned above.

An informal attitude toward fishing goals was evident in the overwhelming 83% of pond owners who desired good general fishing, instead of species specific or trophy fishing. The favored size for fish caught was 2-4 pounds. The bulk of pond fishing was done by respondents, followed by extended family and friends. This is consistent with the nearly 96.8% of pond owners who reported that they had never leased their ponds for fishing. The growing trend toward this behavior is evidenced by the 9.1% who said they had considered leasing.

Fishing frequency needs to be looked at as an indicator of possible balance problems, since the most common fishing frequency was once per month, representing more than one-half of respondents. Not adequately harvesting sufficient numbers of fish can lead to stunting and reports of poor fishing quality, but often the problem is revealed partly by the frequency of fishing reported being too low. Problems with pond balance can also come from harvesting strategies, even if the pond is fished often. More than one-half of respondents reported keeping a select few fish caught (55.0%). The second most popular harvest regime indicated was to release all fish (31.7%). Under-harvesting can cause predator-prey balance problems in short periods of time. Ponds, especially those that are fertilized, stocked, and/or fed, need to be properly harvested. This makes the practice of catch-and-release, which is usually a viable and environmentally responsible option in public waters, a poor choice for private ponds. While the distribution of harvest strategies indicates that a large number of ponds would benefit from appropriate balance checks, only 7.3% of respondents reported ever having paid a private consultant to check pond balance.

In addition to balance problems, fish kills were problematic, with most pond owners citing low dissolved oxygen as the cause (61.8%). Other rarer problems included poor water quality, pesticide runoff, and disease. To treat the disease problem, antibiotics (2.3%) and chemicals (4.5%) were used, but rarely, with most pond owners choosing not to treat disease problems, or even to have a diagnostician check their fish.

Fishing problems most often reported were nuisance animals, including both predator and non-predator pest problems. The most common predators reported were turtles (69.8%), sighted for stealing bait, and wading birds (53.0%), while non-predator pests were less common, and included ducks and geese (27.6%), beavers (17.6%), and nutria (14.2%).

The private sector approach available to pond owners who wish to improve their pond management is to employ a pond consultant. Overall, pond owners indicated that they might be willing to employ a private consultant (58.4%). This coincides with reported annual expenses per acre; 50.0% of respondents reported spending $50 or less per acre per year, but when asked how much they would be willing to spend if it helped reach management goals, spending estimates showed significant increases. When current annual expenditures were compared to the amount pond owners were willing to spend, $50 or less was the only category which showed a percentage decrease (43.6%). All others showed an increased willingness to spend of greater than 25%. The *Bass 101* participant survey (2001) compared to this survey (results in parentheses) indicated willingness to spend was 22% at the $50 or less level (compared to 28.2%), 26% at the $51-$100 level (compared to 25.9%), 24% at the $101-$250 level (compared to 24.1%), 14% at the $251-$500 level (compared to 15.3%), 7% at the $501-$1000 level (compared to 5.6%), and 8% at the $1001 or more level (compared to 0.9%).

The sources from which pond owners got their information were both public and private, and include Natural Resources Conservation Service (NRCS), Texas Cooperative Extension (TCE - formerly Texas Agricultural Extension Service), Texas Parks and Wildlife Department (TPWD), and private contractors. For pond-building advice, the largest percentage used private contractors (21.7%), followed closely by NRCS (19.1%). Recommendations received were reportedly followed better than 80% of the time by three-quarters of pond owners who reported the sources from which they received information. For water testing purposes, Extension testing services were used most frequently (28.0%), followed by private labs (22.8%) and consultants (24.6%). Similar sources were used for fertilization advice, with private consultants most common (32.2%), followed closely by Extension (26.9%). One of the areas of greatest problems, aquatic vegetation, showed treatment advice came predominantly from TPWD (27.4%) and Extension (25.6%), but also notably from retail stores (20.7%) and private consultants (20.4%). In this case, only 67% reported compliance with the advice better than 80%. When stocking fish, the most common recommendations came directly from hatcheries themselves (38.0%) and respondents reported adherence to recommendations at the more than 80% level was 68.7%.

The survey had an overall response rate of 21.3%. While this is low when compared to strictly mail survey response rates, when the proportion of households with internet access is taken into consideration (41.5% in 2000, according to Newberger), this response rate is higher than was expected. This brings up the issue discussed in the second section of the introduction: survey error. As stated previously, non-response bias occurs when respondents differ, in a way that will skew survey results, from non-respondents. There is the potential for non-response bias in this survey more often where treatment methods and economic questions are concerned. Internet response indicates a level of education and economic status that may not be available to all sample members, and has a lower availability in rural settings, where many farm ponds are found. Therefore, the actual use of the more expensive services and products may be slightly overrepresented by this survey. A second source of error due to the use of the internet for the delivery of the survey could be due to the recent trend toward extreme caution where online privacy issues are concerned. The frequent use of biological control agents to control aquatic vegetation has been discussed previously, and is due to the source of the list being the Texas Parks and Wildlife grass carp permit list. These sources of error, however, while affecting some questions' responses, should have little effect on the responses to such questions as problems encountered and pond use.

CONCLUSION

The internet as a source of survey error will continue to decrease as technology becomes more advanced, more widely available, and better trusted. Even so, the internet-based survey worked effectively to dramatically lower the cost of distribution and the workload of data entry when compared to the traditional mail survey. These benefits outweighed the disadvantages caused by survey error due to the new methodology.

The results of this preliminary survey can give direction to professionals in agencies and the private sector in creating programs and information directed at meeting the needs of private pond owners. It appears that respondents currently use few common management recommendations. The most noteworthy departures of pond owners' beliefs and actions from sound management procedures come in the areas of aquatic vegetation and pond balance. These topics have a great deal of research-based literature available to the public, but some common misconceptions may be clouding the issues when they are directly applied to the management of private ponds. Based upon the results of this survey, the development of additional resources in these areas should continue. Efforts should also be put toward ensuring that pond owners properly understand management issues, and toward separating management myth from solid pond management practices.

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APPENDIX A

INTERNET SURVEY MAIN BODY

In order to make sure that each survey has a different identification number and is not counted twice, please enter the following information (No identifiers linking your initials to your responses will be included in any published reports):

Please enter your initials:

Please enter your zipcode:

1. How many pond(s) do you own or manage?

2. What are the physical characteristics of your pond(s)? Please indicate below:

Pond #	Surface Area (in acres)	Maximum Depth (in feet)	Pond Age (in years)
1.			
2.			
3.			
4.			

3. The watershed of the pond is the area that drains water to the pond. What kind of watershed best defines your pond(s)?

- A. PASTURE
- B. FOREST
- C. ROW CROP/FIELDS
- D. NO WATERSHED (PIT POND/DUGOUT)
- E. GRAVEL QUARRY
- F. CREEK-FED

4. Where did you get advice on building your pond(s)? (Please select all that apply)

- A. NRCS (formerly SOIL CONSERVATION SERVICE)
- B. EXTENSION
- C. PROFESSIONAL CONSULTANT
- D. POND CONTRACTOR
- E. NO ADVICE USED (If NO ADVICE USED please skip ahead to Question #5)
- F. Pre-existing
- G. OTHER

Figure A-1. Internet survey in online-format as seen by participants (page 1)

If you did get advice, how closely did you follow their recommendations?

- A. LESS THAN 10%
- B. 10% - 50%
- C. 50% - 80%
- D. MORE THAN 80%

5. Have you had problems with your pond(s) leaking?

- A. YES
- B. NO (If NO, please skip ahead to Question #6)

If yes, what do you think was the cause?

- A. BAD CONSTRUCTION
- B. POOR SOILS
- C. FRACTURED UNDERLYING ROCK
- D. VEGETATION ON THE DAM

6. What are the primary uses for your pond(s)? Please rank according to importance (1 being most important, through least important)

___ FISHING	___ LIVESTOCK WATERING
___ IRRIGATION	___ WILDLIFE ATTRACTION
___ WATER GARDEN	___ OTHER RECREATIONAL
___ OTHER ________	

7. Which of the following problems have you encountered in trying to manage your pond(s)? (Please select all that apply)

- A. UNWANTED FISH SPECIES
- B. FISH KILLS
- C. WATER QUALITY
- D. EXCESSIVE VEGETATION
- E. ALGAE
- F. POOR FISHING ENVIRONMENT (SMALL SIZED FISH)
- G. FISH DISEASES
- H. PREDATORS
- I. OTHER ANIMAL PESTS
- J. POACHING
- K. NONE

Questions #8-13 deal with physical characteristics of your pond (s).

8. Have you had your pond water tested in the last five years?

- ○ A. YES
- ○ B. NO (If NO, please skip ahead to Question #9)

If yes, by whom? (Please select all that apply)

- ☐ A. EXTENSION SOIL/WATER TESTING
- ☐ B. PRIVATE LAB
- ☐ C. PRIVATE CONSULTANT
- ☐ D. LOCAL HEALTH DEPT.
- ☐ E. OTHER ____

9. Do you use well water to fill or supplement your pond(s)?

- ○ A. YES
- ○ B. NO

10. Have you fertilized your pond(s) in the last five years?

- ○ A. YES
- ○ B. NO (If NO, please skip ahead to Question #11)

If you have fertilized, how often?

- ○ A. ONCE PER YEAR
- ○ B. TWICE PER YEAR
- ○ C. ONCE PER MONTH
- ○ D. AS NEEDED

Who recommended this action? (Please select all that apply)

- ☐ A. EXTENSION
- ☐ B. NRCS (formerly SOIL CONSERVATION SERVICE)
- ☐ C. TEXAS PARKS AND WILDLIFE
- ☐ D. PRIVATE CONSULTANT
- ☐ E. FISH HATCHERY

11. Have you limed your pond(s) in the last five years?

- ○ A. YES
- ○ B. NO

12. Have you rotenoned one of your ponds in the last five years?

- ○ A. YES
- ○ B. NO (If NO, please skip ahead to Question #13)

If yes, why?

- ○ A. REMOVE UNWANTED SPECIES
- ○ B. REDUCE OVERPOPULATION
- ○ C. START OVER

13. If you had a problem with muddy water, what did you do about it? (Please select all that apply)

- ☐ A. LIME
- ☐ B. GYPSUM
- ☐ C. ALUM
- ☐ D. NOTHING
- ☐ E. OTHER

Questions #14-19 deal with aquatic vegetation.

14. Do you consider aquatic vegetation important in your pond(s)?

- ○ A. YES
- ○ B. NO

15. What kinds of aquatic vegetation would you prefer? (Please select all that apply)

- ☐ A. ALGAE
- ☐ B. SUBMERGED
- ☐ C. FLOATING
- ☐ D. EMERGENT

16. Have you added any vegetation to the pond(s) in the last five years?

- ○ A. YES
- ○ B. NO (If NO, please skip ahead to Question #17)

If yes, please indicate type:

17. What types of vegetation problems have you had? (Please select all that apply)

- ☐ A. GREEN WATER
- ☐ B. FILAMENTOUS ALGAE (STRINGY MATS)
- ☐ C. SUBMERGED WEEDS
- ☐ D. SHORELINE / EMERGENT WEEDS
- ☐ E. FLOATING WEEDS
- ☐ F. NONE

18. What kind of treatment did you use for vegetation management? (Please select all that apply)

- ☐ A. MECHANICAL (PHYSICAL REMOVAL)
- ☐ B. BIOLOGICAL (GRASS CARP, ETC.)
- ☐ C. CHEMICAL HERBICIDES
- ☐ D. NO TREATMENT (If NO, please skip ahead to #20)
- ☐ E. OTHER

19. Where did you get information for treating your aquatic vegetation problem? (Please select all that apply)

- ☐ A. EXTENSION
- ☐ B. NRCS (formerly SOIL CONSERVATION SERVICE)
- ☐ C. TEXAS PARKS AND WILDLIFE
- ☐ D. PRIVATE CONSULTANT
- ☐ E. FARM / RANCH PRODUCTS STORE
- ☐ F. DID NOT TREAT (If you DID NOT, please skip ahead to Question #20)
- ☐ G. OTHER ______

If you used a consultant or service, how closely did you follow their instructions?

- ○ A. LESS THAN 10%
- ○ B. 10% - 50%
- ○ C. 50% - 80%
- ○ D. MORE THAN 80%

Who treated the problem?

- ○ A. YOURSELF
- ○ B. FARM / RANCH HAND
- ○ C. PRIVATE CONSULTANT
- ○ D. OTHER ______

Questions #20-33 deal with fish and other wildlife in and around your pond area.

20. What fish species have been purposely stocked into the pond(s) in the last five years? (Please select all that apply)

- ☐ A. BASS
- ☐ B. BLUE GILL
- ☐ C. CRAPPIE
- ☐ D. REDEAR SUNFISH
- ☐ E. OTHER SUNFISH (PERCH)
- ☐ F. CHANNEL CAT
- ☐ G. BLUE CAT
- ☐ H. FATHEAD MINNOWS
- ☐ I. GOLDEN SHINER MINNOWS
- ☐ J. SHAD (THREADFIN or GIZZARD)
- ☐ K. TROUT
- ☐ L. GOLDFISH / CARP / KOI
- ☐ M. OTHER ______
- ☐ N. NONE (If NONE, please skip ahead to Question #21)

When stocking your pond(s), from whom did you get recommendations?

- ☐ A. NEIGHBOR
- ☐ B. EXTENSION
- ☐ C. NRCS (formerly SOIL CONSERVATION SERVICE)
- ☐ D. TEXAS PARKS AND WILDLIFE
- ☐ E. PRIVATE CONSULTANT
- ☐ F. FISH HATCHERY
- ☐ G. NO ADVICE
- ☐ H. OTHER ______

How closely did you follow these recommendations?

- A. LESS THAN 10%
- B. 10% - 50%
- C. 51% - 80%
- D. MORE THAN 80%

21. What species have accidentally inhabited your pond(s)? (Please select all that apply)

- A. BASS
- B. BLUEGILL
- C. CRAPPIE
- D. GREEN SUNFISH
- E. OTHER SUNFISH (PERCH)
- F. CATFISH
- G. BULLHEAD / MUD CATS / POLLYWOGS
- H. SHAD
- I. MINNOWS
- J. GOLDFISH
- K. CARP / KOI
- L. OTHER
- M. NONE

If your pond is not at all used for fishing, please skip ahead to Question #29.

22. What is your primary goal for fishing in your pond?

- A. TROPHY BASS
- B. LARGE SUNFISH
- C. CATFISH ONLY
- D. GOOD FISHING IN GENERAL (GOOD SUCCESS)

23. Who does most of the fishing?

- A. YOURSELF AND IMMEDIATE FAMILY
- B. EXTENDED FAMILY
- C. FRIENDS
- D. OTHER

24. How often is your pond(s) fished?

- A. MORE THAN ONCE PER WEEK
- B. ONCE PER WEEK
- C. ONCE PER MONTH
- D. ONCE EVERY SIX MONTHS
- E. ONCE PER YEAR
- F. ALMOST NEVER

25. Recognizing that a-d are appropriate answers, what do you typically do with fish once they have been caught?

- A. KEEP ALL FISH CAUGHT
- B. KEEP ONLY A FEW SELECT FISH
- C. RELEASE ALL FISH
- D. RELEASE ONLY UNDESIRED FISH

26. How often have you leased your pond(s) for fishing or sold fish?

- A. REGULARLY
- B. OFTEN
- C. RARELY
- D. NEVER

If never, have you considered this?

- A. YES
- B. NO

27. What do you consider good fishing for your pond(s)?

- A. CATCHING FISH 1-2 LBS.
- B. CATCHING FISH 2-4 LBS.
- C. CATCHING FISH GREATER THAN 5 LBS.

28. If you reported poor fishing, the problem included: (Please select all that apply)

- A. TOO MANY SMALL BASS
- B. TOO MANY SMALL SUNFISH
- C. UNWANTED SPECIES
- D. NUISANCE ANIMALS (ex. TURTLES STEALING BAIT)
- E. OTHER

29. If you've had fish kills, what was the probable cause?

- A. DISEASE
- B. LOW OXYGEN
- C. POOR WATER QUALITY
- D. PESTICIDE RUNOFF, TOXIC EFFECTS
- E. OTHER

30. Have you used a fish diagnostician to look for a disease in your fish in the last five years?

- A. YES
- B. NO

31. If you had a disease problem, how did you treat it?

- A. ANTIBIOTICS
- B. CHEMICALS (ex. POTASSIUM PERMANGANATE)
- C. DID NOT TREAT
- D. OTHER

32. What predator problems have you encountered in the last five years? (Please select all that apply)

- ☐ A. WADING BIRDS
- ☐ B. CORMORANTS/WATER TURKEYS
- ☐ C. PELICANS
- ☐ D. SNAKES
- ☐ E. TURTLES
- ☐ F. RACCOONS
- ☐ G. OTTERS
- ☐ H. ALLIGATORS
- ☐ I. OTHER ______
- ☐ J. NONE

33. What other animal pests have you had in the last five years? (Please select all that apply)

- ☐ A. NUTRIA
- ☐ B. MUSKRATS
- ☐ C. BEAVERS
- ☐ D. DUCKS/GEESE
- ☐ E. OTHER ______
- ☐ F. NONE

Questions #34-37 will help us to know more about how pond owners try to achieve their management goals. The information you provide will remain strictly confidential and you will not be identified with your answers.

34. Have you ever paid a private pond consultant to check your pond(s)? balance?

- ○ A. YES
- ○ B. NO (If NO, please skip ahead to Question #35)

If yes, how often?

- ○ A. ONCE LIFETIME
- ○ B. 2 - 5 TIMES LIFETIME
- ○ C. ANNUALLY
- ○ D. MORE THAN ONCE PER YEAR

35. Would you be willing to use a private pond consultant if it would help you reach your management goals?

- ○ A. YES
- ○ B. MAYBE
- ○ C. NO

36. What do you think your annual expenses are (per surface acre)?

- A. $50 OR LESS
- B. $51 - $100
- C. $101 - $250
- D. $251 - $500
- E. $501 - $1000
- F. $1001 OR MORE

37. How much would you be willing to spend (per surface acre) if it would help you reach your management goals?

- A. $50 OR LESS
- B. $51 - $100
- C. $101 - $250
- D. $251 - $500
- E. $501 - $1000
- F. $1001 OR MORE

Is there anything else you would like to share with us?

Submit Query

APPENDIX B

RESPONDENT FINAL COMMENTS

Ellipses indicate where personally identifiable information which was included in original comments by respondents has been removed in order to ensure confidentiality. Otherwise, comments appear exactly as they were entered, including typographical errors, spelling errors, and profanities.

1. I would like to know how to control duck weed. I have floated it off and also used chemical. I don't like to use chemicals wHAT IS THE BEST THING TO DO. . .

2. Thanks for taking the interest in pond research. Almost all involved are looking at a profit from our concerns and do not always give the best answers. I will say that the Pond Boss Mag and website are the best I have found. Keep up the good work.

3. I have only been at the new proerty for 6 months. The 8 month old pond has no grass around the banks and the dirt is washing in. The Cat tails are growing and spreading faster than I can pull them or cut them. I was told the 20ft stock tank was lined with clay but after a hard rain the pond will comes up but drops to a certin level after it stops, kinda like only the bottom part was lined. I live in Burleson texas and I have very sandy soil. I want to have a pretty pond with a fountain on my 6ac horse place but need advice and help. . .

4. 40+ year old pond (buildt in the '50's) has filled in quiet a bit, but has never gone dry since purchasing the property in '92. Newer tank (4+ years old) was build during a drought year and stayed dry for almost a year. Has since filled with pasture run off, cows use it, but we did now stock it. There are fish in it, I witnessed a goose(?) getting a catfish (about 4 in.long) out of it. Golden Retriever went after bird and it flew off. I think there a minnows in it, something small and shiney. Both tanks are a brownish kind of color, not clear, but the older tank does have a smell to it when the water level get low in the summer. Both tanks are used by cows, horses, dogs and wildlife.

5. ARE DUCKS CONSIDERED PEST? THE ZIP CODE I ENTERED IS THE LOCATION OF THE TANKS.

6. Are turtles a problem for fish reproduction? What is the best way to catch gar & carp? Will channel catfish reproduce in my pond? Is it OK to have an abundance of small bluegill pearch? Why do I need to lime or fertilize my pond?

7. As previously stated, grass crap are used for vegetation management in this pond. The Texas Parks & Wildlife Commission requires pond owners / managers to obtain a permit and to pay a $2.00 per fish fee in order to buy sterile grass carp. Pond owners / managers view this these requirements as frustrating and an unnecessary expense. The need to introduce only sterile carp is understood but not why a permit and a per fish fee are required. It was not pond owners / managers who introduced fertile carp into Lake Conroe which in turn led to the requirement for sterile carp, a permit and a per fish fee but it is us who is paying for the Lake Conroe mistake. In this matter, the state is not delivering any added value to offset the imposed permit and fee requirements. Good luck with this study and your future endeavors.

8. At the moment i have lost all my fish due to tank drying up as has happened three times now in the last 6 years. Discouraging to have good fish and then watch tank dry up.

9. Can't invest more money until something is done with Cormorant activity in fall & winter.

10. Control of aquatic vegetation has been a major problem for the past three years. Watermeal,Mosquito Fern,and Filamentous Algae have contributed to fish kills in each of the years.

11. cormorants are a severe problem in our area. When stocking fingerling catfish the birds can be devasting to the small fish that cost me 30 to 40 cents a piece.

12. Ducks and geese are not pests. We have had some wonderful duck hunting in the past. I have not hunted there in over 5 years as I have lost the lease.

13. Duckweed is the most pervasive gulf coast problem and you did not even mention it. That is the area that needs some work. I can't afford the current chemical treatments that are available.

14. Find a solution to coon-tail moss.

15. Fish are only 1 year old, but are doing well. In the 1-2 pound range. The only problems I have are the mudcats and the grass growth, but I do have grass carp which should help.

16. Fishing habits need to include catagories for culling fish to promote growth of larger fish. We remove Bass 10 to 15 inches to allow larger fish less competition.

17. Geting quality construction advise very difficult to obtain. Range conservationist with NRCS seems to lack knowledge and skills regarding pond construction. Contractors doing shoddy work.

18. Good luck with your research!

19. Got any suggestions for getting rid of the beavers for good?

20. Grass carp does not seem to help with grass, thus lots of weeds along bank. "Green cotton" foamy stuff an on going problem. Please advise solutions to. . .

21. have problem with otters and beavers that we can not get out of the pond and every time we stock the pond the eat the fish. we have problems with the duckquat- small lilliy pads and can not get the lilley pads out of the pond. please mail me so info on how to get this problems taken care of thanks. oe cude my address is . . .

22. have tried the barley straw attack on algae to a somewhat successful end

23. help!!!!!would like someone to come and assess the problem of hydrella and cattails i belive this tank could really be somethimg special if i could somehow get a handle on this problem....thanks. . .

24. Hi, A few years back, I was having a lot of trouble with chara in my pond. I wrote TAMU for advise and they recommended that I fertilize it. This was supposed to increase the amount of plankton in the water to a point where sunlight wouldn't reach the bottom of the pond and this was supposed to kill the chara and algae. However, the fertilizer had just the opposite effect. The chara and algae went crazy and took over my pond until the first freeze of that year. I know the disclaimer said you wouldn't identify anyone who filled out this survey, but if you need to contact me for any reason, my email address is: . . . I expect nothing from you in return for this survey, if that's what you were referring to in the survey. . .

25. Hope this helps you.

26. Hopefully another neighbor is on your list and will also answer this survey. I am not a fisherman, just live on this lake.

27. How can I elemiate the hydrilla without hurting the fish?

28. HOW DO YOU AEREATE A POND? hOW DO YOU GET OUT UNWANTED CARP.

29. How do you get rid of coontail moss? I have tried chemicals twice which turned out to be temporary. Chemicals were suggested from TAMU or other website. . .

30. HOW MANY CATFISH WOULD 1/2 ACRE POND SUPPORT, WITH BASS AND BLUEGILL, IF FED REGULARLY?

31. HYDRILLA HAS TAKEN OVER THE POND

32. hydrilla is evil

33. I am a soil conservertion contractor & pond consulant.

34. I am in the process of stocking the pond. It was an existing pond. I drained it and had it dug out so it was deeper. Had it tested and applied over 3 tons of AgLime to correct Ph. Plan on stocking it end of December per the recommendation of the hatchery. Have small pond. Extension (Coorporative) recommends catfish only. Friends and hatchery say OK for multi-species.

35. I am looking into potental aquaculture opportunities.

36. I do have predators(ie Herons, Snakes, Turtles, etc) but do not consider them a problem. My pond is primarily for attracting wildlife. My problem with Hydrilla has been managed successfuly with grass carp.

37. I do more work on the pond that is closest to the house (5 acres). That is the only lake that I would spend any money, but I can't get enough vegetation to grow in it.

38. I had an infestation of dollar lilly pads and treated this problem very successfully with a granular herbicide. I am sorry I do not remember the name of the product. It sank to the bottom of the pond and killed the dollar pads at their roots. It lasted one year and I treated it a second time this year. It was quite expensive--$700 for 200 pounds. I will try to get the name of the product and the company I bought it from and respond later this week.

39. I HAVE A BIG PROBLEM WITH THE SPILLWAY WASHING. WAY TOO MUCH WATER. 300 ACRES DRAIN TO THIS TANK

40. I have a grass carp license but have not yet acquired any due to my spillway and a lack of help to restrict it. Any suggestions??? Thanks!

41. I have a windmill that aireates my largest tank- approx 5 to 600 ft long and 50 feet are so wide at the deep end. Air is pumped into the deepest part. I have a green chemical that I spray on the surface for weeds.

42. I have been a subscriber to Pond Boss since it began publication. I wish TA&M would publish periodic information on pond management.

43. I have bushy fragmentous pond weed. I put aquathol on it to knock it down and added four triploid grass carp, and the pondweed still choked out the pond. I am considering deepening the pond, as that area took the longest to be overcome.

44. I have lost several due to low oxg.found out if they slow down on eating,and come to top early in morning they are suffering for air.so I have whipped the problem by circuling water with pump 24 or more hrs.8 ft high

45. I have noticed a white milky substance which I believe to be grey water entering my pond from the creek that feeds it when it rains. I asked the water conservation and pollution folks to look into this but have had no response from local authorities. I fear my expensive KOI may be poisoned. Can you help? . . .

46. I have one pond with several springs thatare alive in the fall and spring. There must be several springs under pond.I need more information on this.The pond is located in a creek bed. . .

47. i hope this helps

48. i hope this will help us to learn more about the under lieing weeds that come in the spring. can't seem to controle them.

49. I just purchased the ranch and so I am new to all of this but I do know that the lake probably needs better management as does the surrounding acreage. Both the lake & land is to be used exclusively for wildlife.

50. I live in . . . where about a dozen homes back up to about a 4 acre pond. All home property lines extend into the pond where we all have a mutual easment. We have never stocked the pond except to put sterile Triloid river carp in about 10 years ago to control weeds, and that worked very well as it is no longer a problem. The pond is fed by runoff from the city streets, so it may go down a foot or two during the summer, then fill up when a storm comes along. We really don't do much to manage it. Over the last 25 years, it has become much more shallow due to silting. Gig Em! . . .

51. I look forward to reading your thesis.

52. I managed the Ponds . . . for about 20yrs. . .

53. I need help to meet my goals

54. I PUT 56 GRASS CARP IN ABOUT 4 YR. AGO. CAN'T TELL THAT IT HELPED. MY PROBLEM IS HYDRILLA. MY 8 AC. POND WAS REAL CLEAR HYDRILLA TOOK OVER. I PLAN ON USING A CHEM. NEX YEAR.

55. I think the cormorant is causing major set-backs by eating purchased fish when . . . is less than a mile away. Too bad they are protected.

56. I thought this a short survey? Not!

57. I wish there were a way to make the water clear enough to see the koi approx 2 feet down without cementing the bottom

58. I wish there were some really good yet inexpensive books with color pictures written for lay people to identify common pond weeds (nuicances) and how to rectify the problem.

59. I would have fenced most of the pond to keep the cattle from breaking down the banks all around the pond. This has caused much of weeds and unwanted growth to flourish.

60. I would like to know how to get in touch with local expetise.

61. I would like to know the outcome of the research...thanks

62. I'm 79 years old now but previouly owned a small catfish farm & sold about 2,500 lbs of fish weekly from 23 one acre ponds for several years. Would have stayed in the business except for the water supply (wells) They failed. The lakes I now have are at my home and do not use them as a comercial operation. I let the local neighbors fish and we average taking 300 lbs per week out of the ponds by fishing.

63. It seems fish Hatcheries have taken over pond management from the Fish and Wildlife Department because the State no longer provides fish through their hatchery program. Providing at lease some fish to private pond owners does not seem like it would be expensive, especially since the City of Wichita Falls puts many, many thousands fish into their ponds that they receive from the State. Also, I think it is a good idea the State have a list of pond owners and send information to them ocassionally to help solve common problems. The State Agricultural Department does this on a monthly basis for people who own farm land.

64. It should be legal to purchase grass carp without a permit as it is in many states.

65. . . .

66. Just would like to know how to get Parrot Feather grass out of the pond. We pumped water out of our creek to fill the pond and got this weed in it and now cant get it out

67. lack of rain fall for extended periods causes many problems.

68. Legalize the killing of water turkeys now! Need help stopping pond leaks thru fractured rock. Injecting drilling mud? There has to be a way that is cost effective.This is the service we need in most of the Hill Country. Thanks

69. looking to get rid of moss problems.I currently have one grass carp and fifteen koi fish.

70. LOSING WATER---NO RAIN

71. Main pond, the larger one while showing large numbers of perch still maintains it's integrity as a good fishing pond. Triploid carp were stocked in it several years ago. Water clarity remains excellent year round.

72. Main problem is no run off water in over 12 months. Now too low to support any fish. First time in 20 years this has occured. Have added supplemental water troughs for wildlife.

73. Mud cats are a big problem for me.

74. My 3 ponds are primarily for cattle. I fish only occasionally. I also enjoy attracting doves for an occasional dove hunt and ducks for an occational duck hunt.

75. My 5ac lake contains all species. The 3ac will be stocked for trophy bass production. The .5 ac is a perch pond and the .25 ac pond is for bait.

76. My biggest concern is what product would be best to control excessive vegetation.

77. My biggest problem has been the distinct lack of rain in our area. Right now, our pond water level is the lowest it has been since moving to this home 9 years ago. There is good run off, but it has been so long since a run off rain, I'm very concerned about our fish making it through the winter. I'll just keep my fingers crossed, I guess.

78. My biggest tank (pond) gets runoff from the field and a County road ditch that I diverted into it. It usually runs over in the winter and dries up in the summer.

The only management problem I had was not knowing how dry it got in Hill County in July and August.

79. My inputs probably do not apply to what you are researching as my ponds are EPDM lined and are ~~6500 gallons each. They are connected with a stream and I use a 9000 gph pump to move water from the lower pond to the upper one via a waterfall with a mechanical/biological filter. I have another pump that pumps water into a bog with a stream returning the water to the lower pond. I have quite a bit of evaporation due to the waterfalls and surface area. I use city water to refill when the level drops more than 2 inches.

80. My lake is located at . . . The gate on the hill past the cattle guard is unlocked. You are welcome to drive in and use this lake as a test plot if you need one. You may call . . .

81. my pond has a spring in it and has never gone dry in30years i have owned it, my only fear is Alcoa strip mining in my area.

82. My pond held water for 6 yrs. then bring leaking from the bottom. Soil agent reviewed also place 10 sacks bayrite(sp)in pond no results

83. My pond is 1.5 acres when full(after big rains) and about 1/2 acre sealed. I have had it (pre-existing) for 8 years. It was dry when I moved in, then had water for 3 years and went dry for awhile and have had water for over 3 years again but is in jeopardy of being dry in a few more weeks without a good rain.

84. My pond is almost overrun during warm months with coontail moss. I get a permit and buy sterile grass carp to try to control the moss. I have not tried chemicals yet. The water is very clear most of the time. We get lots of wading birds, but I figure there's enough small perch to go around. We get lots of ducks, mostly ring necks, in the winter. Deer show up occasionally. The biggest problem is the #@*&!! moss.

85. My pond is lined on one side with cat tails. I have dug them out with a backhoe, but they came back. Any suggestions on how to manage them. They are a taking over the pond and I know the fish like them for shelter, but I don't like them as thick as they are.

86. My pond is very small and likely will not support many fish. I had it stocked with 25 bass (1 to 2 lbs) which were growing until the drought caused low water level - they all died.

87. My pond was built for stocking fish and to lure wildlife. Three years ago my neighbor erected a game-proof fence around his ranch, as a result there was a lost of wildlife at my site. How can the state allow this? The native wildlife of Texas belongs to all of us, yet he is denying me of it. How can I resolve this problem that is growing out of control in Texas. Who can I contact with authority. Thanks! . . .

88. MY POND WAS MADE ON A SLOPING CLAY SOIL NOT BEST SUITED FOR GROWING PINE TREES AND A VERY SMALL POND NEXT TO IT WAS MADE BY DAMMING A GULLY. THIS PROVIDE SOME VARIETY ON MY LAND AND IS A NICE PLACE TO SEE STARS AT NIGHT. YOU DID NOT ASK ABOUT FEEDIND FISH. I USE FLOATING FISH FOOD, BUT ONLY WHEN I GO TO MY FOREST. I LIVE 1 1/2 HOURS AWAY AND ONLY GO ONCE A WEEK OR 1 IN EVERY FEW WEEKS. YOUR SURVEY DID NOT ASK MUCH ABOUT PONDS IN FOREST SETTINGS. YOU DID NOT ASK ABOUT CONSTRUCTION COSTS. IF YOU WOULD LIKE TO VISIT MY POND OR HAVE MORE QUESTIONS EMAIL ME AT . . . YOU DID NOT ASK ABOUT AERIAL PHOTOGRAPHY AND PONDS OR THE SOIL MAPS AND MANUAL IN SITE SELECTION.

89. My pond's primary problem is filamentous agae, and duck weed, and when controlled with chemicals, it causes fish kill due to low oxygen from decaying plants. The algae and duckweed always come back after treatment.

90. Need to have pond dug out deeper again because it has silted to half its original depth but it is too expensive as far as prioties go.

91. need to solve commoramt problem

92. Otters have been some what of a problem on the fish and the beavers have been cutting down some of my trees. They both seem to come and go at times. Contact me if you have any questions or info that will help me. Thanks. . .

93. Our pond is used primarily for aesthetic reasons. We enjoy looking at the water, we enjoy catching a catfish or two for supper, the kids swim in it during the summer. While we have a few snakes, turtles, bullfrogs, ducks and cranes, we enjoy watching those also and do not consider them "predatory pests." We are not real crazy to see cormorants and try to discourage them in a non-lethal way (siccing the dogs on them, etc.) I feed the catfish regularly just because I like to see them come up and eat, not really to raise "big ones." The grass carp do an excellent job of keeping the tank clear of vegetation and are awesome to look at. Good luck on your thesis...Whoop!

94. Our ponds are innundated with cormarants during the winter. These birds eat our forage fish and our bass. They are protected in Texas. If you have any information to the contrary please let me know.

95. Pond Boss magazine and www.pondboss.com have been the most helpful tools I have ever used in pond management.

96. Pond is old and has silted in. Original part built in 71 and expanded about 75. Future plan is to drain and clean out plus add spillway. Also have looked at expanding surface size.

97. Pond is spring fed. Was beautiful until construction fences failed to hold runoff on neighboring land. Pond is on my five acres in city limits of . . . Necessary for the many deer in the area. Please Help!

98. POND IS USE PRIMARILY FOR CONTROLLING EROSION OF PASTURE LAND. SECONDARY USES ARE CATTLE WATERING AND APPEARANCE OF RANCH

99. pond one has bass only.pond two was stocked with channel cat fish only.both ponds were stocked with a variety of food fish.

100. pond treated with copper sulfate rocks as needed (app. once a month in summer)

101. Ponds have 35 acre forest runoff but also spring-fed.

102. Probably should throw this one away. Manage many lakes--own none. . .

103. problem with duckweed,tried sterile carp tempoary fix.

104. Public Entity--City of . . .

105. Question #3: Pond is primarily spring fed.

106. Question 25 should be expanded. For example I remove all crappie regardless of size. Bass suitable for fileting and cooking are kept to meet immediate need. Rest are released. I need more sunfish, red ear etc brim to improve fishing by grandchildren in larger lake. Have been catching brim from smallest tank which is overloaded and moving them to the larger lake. Smaller bass are moved from smaller ponds to largest lake. Grass carp did a great job of cleaning up the moss.

107. Ref. 35 - I was not aware that 'pond consultants'were available and where to locate one in Tyler/Jasper counties.

108. Send info on getting rid of coontail sumbmerged weeds. Contact me at. . .

109. Several questions did not provide answers that were accurate for our pond. Watershed is 1-house per acre housing development (so we get run-off from people's lawns with lots of fertilizer). We do not suppliment our pond water because it is naturally spring-fed. Our biggest problem is underwater plant growth, and algae forming on the surface during spring. Snapping turles and the occasional snake are annoyances. We have had to eradicate beavers twice in 20 years (usually during a drought).

110. Should I remove the grass carp in my pond. They are getting very large, some about 3' long. I do see a need for them in keeping the water clean. Your advice please

111. Size and age of ponds are approxamations

112. Sorry I didn't look up sizes. One is very small. ONe was not retaining water so we fed hay in bottom & cattle tromped around. Now it holds water. One is 'pass through" pond so if river comes up-water passes through, therefore no use to stock. Another is also in flood-prone area. Am thinking of restocking one. Fish not high priority at this time.

113. Texas Highway Dept. is going to build a 4 lane highway next to my lake. I would like to have the botton tested now to insure they do not allow silt into my lake during construction of their highway. . .

114. Thank you.

115. the 2 ponds that are stocked-- the older one has only blue & channel catfish. the 1 1/4 acre pond has only been stocked for 1 yr, with bass and blue gill.

116. The 3 acre pond was built on a bed of sand and has gone totally dry several times due to lack of rain. One of the 1/3 acre ponds leaks due to fractured underlying rock. The fish kills have been due to lack of water.

117. The cattails love it here! That is our biggest management headache.

118. The only vegetation problem I have is controlling the cattails (which requires me to regularly trim them back, which isn't all that easy) and the nasty algae/pond scum that occurs during the heat of the summer when we have little fresh rain. I need to find a reasonable way to manage/control this stuff. I don't want to get rid of the cattails, just control them and I'm guessing the only way is manually.

119. THE POND DRAINS INTO A SLOUGH. THIS SLOUGH IS COVERED WITH WATER HYACINTH AND HYDRALLA. THIS HAS BEEN A CONSTANT PROBLEM TRYING TO CONTROL. WE NEED HELP IN GETTING RID OF THESE TWO AQUATIC PLANTS. SO FAR THE ONLY WAY TO KEEP THE PLANTS IN CHECK IS MANUAL LABOR WHICH MUST BE CONSTANT.

120. The pond has acheived equalibrium.

121. The pond is owned by our homeowners association to irrigate our turf airstrip. The pond is often pulled down a few feet per pumping and refilled with well water. The color is mineral blue/green from the well source. Main problem is vegetation in/around the pond. We designed the area around the pond to keep out surface runoff so we won't get bad grass/weed seed sucked onto the runway's special grass species. We are interested in gunite or pond liner to lay over the sides to take care of the weeds and hard to cut grass along the bank. Our main concern is liability that this "attractive nusiance" has created for the association. This month, we're putting up a 6' high chainlink fence with 3 strand barb wire. Due to the property lines and pond-edge, we will not be able to maintain the grass/weeds along the sides as we historically have, further necessitating the need for gunite or pond liner to keep the vegetation under control. We have not stocked any fish but have wondered if we should. I can be reached at . . . if you have ideas or suggestions. TAHNKS, . . .

122. The ponds are in southern . . . County, Texas.

123. The ponds are primarily intended to attract birds and to provide a home for our domestic ducks.

124. The property owner does not have a computer, and asked me to do this study, I know about the ponds and helped to pull cattails and treat the moss at the surface.

125. This is an existing oxbow lake that is in critical condition overun by duckweeds and hyacinths. Surface is almost completely blocked. Attempts to hire consultants have failed and no feasible suggestions have been made by anyone--including extension service. Would like to talk with someone who could help revive this lake--will not be easy.

126. This pond is one of five at . . .

127. This ponds shoreline owenership is shared between my neighbor and myself. Dam and about 65 feet is on my property and the remainder is on hers.

128. This survey was kinda long, it might impact your study results. Thanks, . . .

129. Unwanted weeds that grow out from the bank to the pond bottom and then up and float on top is the biggest pest I have.

130. used old tires to create structure impoved spawning habitat

131. Water turkeys should be taken off the protected bird list so pond owners can legally kill these fish eating pests.

132. We are a nonprofit Christian training center. Mostly the lake is just for the view. Fishing is just for fun and only occasionally used for fishing. We like the cranes and wild ducks and turtles who use the lake as habitat.

133. We are in a severe drought, and our ponds are all going dry.

134. we can find no effective method to treat Lyngbyia.Tried cornmeal and a variety of chemicals.Have begun planting fish and game friendly plants at the edges hoping to stop the spread of this plant.HELP

135. We don't keep track of what we spend on the pond, but chances are it's more than we think . We spend what we have to, when we have to.

136. we have dockweed problems at present we are filling with well water about one foot and draing it off.this seems to work.done this about four times sofor.still have to do it somemore. if you think we need some help please advise. . .

137. We have had no pond management problems after we got the grass carp. It's a fun thing for our whole family we wouldn't want to change anything.

138. We have only had this property for a year and have only just begun to work with an old pond.

139. We like ducks and do not see why you would call them pests. We have just built a new pond that will be about 10 deep and one acre. So far all we have done is put rye grass around the edge and have not introduced anything. If you would like us to put something in it we can or we can put nothing in it to see what happens. Our plan is to catch bass from the nearby pond and stock it that way. . .

140. we need a lot of rain!

141. We use our ponds for family alone but at one time they were used for cattle. I have retired so no cattle. My BIG problem are the beaver and nutrias. Some man

came and killed them one year and was to come back this year but it is doubtful if he did. These pest are bad. We have a camp house on the large pond where we go to enjoy peace and watch the birds and ducks that inhabit out place and we entertain occasionally.

142. We use to use Kormax, and we were able to control algae and coontail. However, since it worked and was inexpensive, its use was banned. I do not understand why.

143. WHAT TO SELECT TO KILL BRUSH AROUND POND? What is a good maintainence program?

144. Where can I get speicific recommendations to identify and control floating algae, floating seaweed and moss that really interferes with fishing?

145. Where do I get information concerning removal of unwanted vegitation? The grass carp have done no good. . . .

146. Why are rich ranchers allowed to pump vast amounts of water from underground rivers like thePuloxy and Trinty to fill thier ponds so they can look nice year around,and the people who live around them get thier water table drops so low thier ponds go dry???? . . .

147. wind mill filled and maintaind, clear water .see bottom at 12' hydrilla controlled by 20 lb grass carp last of 3 put in 3 -4 years ago fish for fun throw them back. 80 x 80 ft

148. wood like to know how to get rid of the snakes, beaver, turtles and control to weeds, without killing the fish.

149. Would appreciate receiving a summary copy of the survey results.

150. Years ago I tried grass carp, I believe the stocking rate was controlled too tightly. This is the preferred method of control if it will work. There is too much other work on the ranch to be fooling with chemical treatment and I do not hold a applicators license so the chemicals I need are not available to me.

151. Yes and most important: weed control has been a major problem with a weed similar to hydrila. I used expensive chemicals, mechanical withdrawal methods, and followed the state recommended grass carp suggestions- all failed. Last year, I convinced someone to allow me to exceed the state,s recommended rate. What a difference! This is the first year with success, no fish kills, and a clean ponds. For more info, contact me by email. . .

152. YES, ANY POND OWNER WITH VEGETATION PROBLEMS SHOULD CONTACT TPWD FOR A TRIPLOID GRASS CARP PERMIT. I LIKE MINE THEY WORK GREAT. THANKS . . .

153. Yes. My main problem is fish grubs and the fact that the last time I have stocked catfish have produced zero results, or I have never seen even one in the years that follow. Cormorants, I believe raid my pond and deposite the grub parasites. I would shoot them but their too wary. My pond produced great bass and catfish till the cormorants showed up some 15 years ago.

154. You are welcome to come check out my pond if you would like. I've only been here about 7 years and came here from the city...knowing nothing about managing a pond. You can call me at . . .. I live in the . . .

155. you can never have too many pondsyou just get increasing numbers of deer, ducks, egrets ,otter,an ocasional alligator. the main problem is running out of space to put another pond in. i hope you get to spend great amounts of time waist deep in water with your hands spread wide enjoying it all.

156. your survey is a joke i have 14 ponds each is unique. . . .

APPENDIX C

FIRST POSTCARD MAILING TO SAMPLE MEMBERS CHOSEN RANDOMLY FROM TEXAS PARKS AND WILDLIFE DEPARTMENT TRIPLOID GRASS CARP PERMIT APPLICATION LIST

Dear Texans, December 1, 2003

I am writing to ask for your help in a study about the issues facing pond owners and managers in the state of Texas. Results from this study will help state and county Extension Agents to better serve Texans by understanding the characteristics of ponds and needs of pond managers in Texas.

We are using an exciting new format that we hope will be easier and more convenient for you. The survey can be found and completed online at http://wildlife.tamu.edu or http://aquaplant.tamu.edu.

By taking just a few minutes of your valuable time, you can help us learn more about pond issues across the state. If you have any questions or comments about this study, please feel welcome to contact us at the address or phone number on the reverse of the card.

Thank you very much for your help with this important study.

April Schonrock
Graduate Assistant, Texas A&M University
Email: hennebeck@tamu.edu

APPENDIX D

SECOND POSTCARD MAILING TO SAMPLE MEMBERS CHOSEN RANDOMLY FROM TEXAS PARKS AND WILDLIFE DEPARTMENT TRIPLOID GRASS CARP PERMIT APPLICATION LIST

Dear Texans, December 8, 2003

Last week a postcard telling you about our internet survey of pond owners and managers was mailed to you.

If you have already completed the questionnaire we thank you very much. We appreciate your help because with input from Texans like you, we can better understand the state of private ponds in Texas.

If you did not receive the card, or if it was misplaced, please go to http://wildlife.tamu.edu or http://aquaplant.tamu.edu to complete the survey. If you have any additional questions or comments, please feel welcome to contact us.

Sincerely,

April Schonrock
Graduate Assistant, Texas A&M University
Email: hennebeck@tamu.edu

APPENDIX E

INTRODUCTORY PAGE WITH CONSENT FORM SEEN AS THE FIRST PAGE OF THE ONLINE SURVEY

Texas Cooperative EXTENSION The Texas A&M University System

College of Agriculture and Life Sciences TEXAS A&M UNIVERSITY

Survey of Private Pond Owners and Managers

Click on the link at the bottom of the page to begin the survey.

The purpose of this study is to describe private pond management issues and management strategies that are used by pond owners and managers in Texas, and is part of the principal investigator April Schonrock's master's thesis requirements. By agreeing to take part in this study, you will be asked to fill out and submit a survey over the internet. This study should take approximately fifteen minutes. There are no direct benefits or monetary compensation for participating.

This study is confidential; only your initials, not your full name or address, will be asked for on the survey site. Initials will be used only for data collection purposes in order to make sure that no survey is tallied more than once. The records of this study will be kept private. No identifiers linking your initials to your responses will be included in any published reports. Research records will be stored securely and only the principal investigator April Schonrock and advisor Michael Masser will have access to these records. Your decision whether or not to participate will not affect your current or future relations with Texas A&M University or Texas Cooperative Extension. If you choose to take the survey, you are free to refuse to answer any questions that make you uncomfortable, and you may choose not to submit the survey. If you have any questions about this study, contact April Schonrock or Dr. Michael Masser at the Department of Wildlife and Fisheries Science, 312 Nagle Hall, TAMUS 2258, College Station, TX, 77843-2258, phone (979) 845-7473, or send email to hennebeck@tamu.edu.

By clicking 'I Agree' below, you verify that you have read and understood the above information, have received answers to any questions you had, and consent to take part in this study. A copy of this document may be printed for your personal records.

This research study has been reviewed by the Institutional Review Board - Human Subjects in Research, Texas A&M University. For research-related problems, or questions regarding your rights, you may contact the Institutional Review Board through Dr. Michael W. Buckley, Director of Research Compliance, Office of Vice President for Research at (979) 845-8585 (mwbuckley@tamu.edu).

I Agree

APPENDIX F

FINAL PAGE INCLUDING SUCCESSFUL SUBMISSION NOTIFICATION AS SEEN IN THE ONLINE SURVEY

Texas Cooperative EXTENSION The Texas A&M University System

College of Agriculture and Life Sciences TEXAS A&M UNIVERSITY

Your survey has been submitted successfully.

Thank you for taking the time to fill out this survey. With input from pond owners and managers like you, we hope to better understand the state of private ponds in Texas. This study is confidential. The records of this study will be kept private.

Back to the WFSC Extenstion Website

APPENDIX G

NOTIFICATION OF TERMINATION OF THE SURVEY PERIOD

PLACED ONLINE AFTER COMPLETION

Texas Cooperative EXTENSION
The Texas A&M University System
College of Agriculture and Life Sciences
TEXAS A&M UNIVERSITY

Survey of Private Pond Owners and Managers

The survey period has now ended. If you did not get the chance to take the survey, thank you for your willingness to help us better understand the state of private ponds in Texas. For additional questions or comments regarding your specific pond needs, please contact your local county Extension agent. Thank you.

Back to the WFSC Extension Website

VITA

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