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VISITOR USE OF STATE FISH HATCHERIES: A POTENTIAL FOR
EDUCATION

THE UNIVERSITY OF ARIZONA

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VISITOR USE OF STATE FISH HATCHERIES:
A POTENTIAL FOR EDUCATION

By
David Edward Autore

A Thesis submitted to the Faculty of the
SCHOOL OF RENEWABLE NATURAL RESOURCES
In Partial Fulfillment of the Requirements
For the Degree of
MASTER OF SCIENCE
WITH A MAJOR IN RENEWABLE NATURAL RESOURCE STUDIES
In the Graduate College
THE UNIVERSITY OF ARIZONA

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ABSTRACT

Education of the public can be a very important part of a successful wildlife management agency's overall strategy, however its potential is often overlooked. With funding usually lacking in sufficient quantities, efforts must be made to make the best use of time and money spent on education. People seem to be readily drawn to fish hatcheries, therefore a potential exists to reach a large audience, with minimal expenditure. To design an interpretive program to effectively reach this audience, data is needed about these people. This study was designed to collect this information. Knowledge and attitudes of visitors was assessed, in addition to collecting basic demographic data, and likes and dislikes of the public. From this information, it appears that hatcheries are a suitable location to utilize interpretation. This study concludes with recommendations of how to best design such a program at Arizona's state fish hatcheries.

INTRODUCTION

Many studies have shown a trend of increasing participation in outdoor-recreational activities over the past two decades (Bureau of Outdoor Recreation 1972, USFWS 1977, USFWS & Bureau of the Census 1982). Of the wide variety of wildlife related activities, fishing ranks among the most popular. It is a sport whose participants come from every age, economic, and social group. Of all the fishes available to fishermen in this country, those of the family salmonidae certainly rank high in popularity. In an Arizona angler preference study, 75% of those surveyed listed trout as one of their three preferred fish (Swanson and Stephenson 1982). Historically trout were not widespread in Arizona, being found only in the White Mountains and in scattered drainages along the Mogollon Rim (Minckley 1973). Today, however, trout can be found in almost every water in the state which is cold enough to support them. This has been made possible by a system of cold water hatcheries operated by the Arizona Game and Fish Department and the U. S. Fish and Wildlife Service. With the high popularity of trout and the high interest in outdoor recreational activities as a whole, it is not surprizing that fish hatcheries are popular with the fishing

public. High visitor use of hatcheries is not only recognized for state hatcheries here in Arizona (Sprague 1982), but also at many federal facilities (USFWS 1979).

Most kinds of animals are interesting to people, especially when found in the numbers that can be seen at hatcheries. Therefore, it is not surprising that trout hatcheries would also be popular tourist spots with the nonfishing segment of the public. Because of the need to be located near cold water, most of the hatcheries are close to areas of high camping and sightseeing use. Richards et al. (1977) and Richards and King (1977) described recreational visitors to the Mogollon Rim area, the White Mountains, Oak Creek Canyon and the Prescott vicinity. A large proportion of visitors to these areas come from the Phoenix Metropolitan area. This can readily be seen by observing summer weekend traffic and use of U. S. Forest Service campgrounds in any of these areas.

When this study began in 1983, The Arizona Game and Fish Department was operating four trout hatcheries. In addition, two satellite facilities were maintained for warm-water and endangered/threatened fish propagation, and in 1984 an older hatchery was renovated for use as a holding facility. Although no formal studies have been conducted, managers at the three larger hatcheries, Canyon Creek, Page Springs and Tonto Creek, have estimated annual visitor use to number in the tens of thousands for the entire hatchery

system (Okomoto 1983, Sturgeon 1983, Sprague 1982). The managers reported not only large numbers of visitors, but also a high level of interest, as evidenced by their time spent answering visitors' questions. Yet up to this time, little had been done at any of the facilities to provide the public with information about the hatcheries, the Game and Fish Department, or natural resources in general.

The newest of the hatcheries, Canyon Creek, has a self-guided trail booklet, but it is aimed at identifying hatchery facilities with little attempt at adding further information or interpretation. Page Springs has recently produced a brochure which gives the hatchery's history and briefly explains fish culture, but it is only the first step in educating the public.

There are many other reasons to develop educational/interpretive programs at hatcheries: Protection of resources by creating more informed resource users; increasing the public's awareness of agency goals and policies; and showing the various user groups how their money is being spent. Programs to accomplish these goals are only now beginning to be given the priority which they deserve by state wildlife management agencies. In light of this, it is best to concentrate efforts where the public is already concentrated, such as at fish hatcheries and wildlife refuges. There is considerable public interest in hatcheries, as evidenced by the large numbers of people

who visit them, in spite of the lack of formal visitor-oriented programs or facilities.

Perhaps the greatest potential benefit of promoting increased interpretation at hatcheries is the diverse publics that could be reached through such programs. In the past, wildlife agencies had one primary constituency, hunters and fishermen, but as the public's interests in wildlife have changed, serious problems for wildlife managers have been created (Shaw 1974): "Public wildlife agencies are faced with the prospect of declining public support and operating revenue if the current trends in hunting participation continue. At the same time, they must deal with increasing criticism for the overwhelming orientation toward the interests of just one group, the license-purchasing hunters."

In a later work, Shaw (1975) goes on to say: "In recent years, there have been two important developments in American attitudes toward wildlife. One involves the increasing concern for nonconsumptive wildlife values. The other is the growing criticism of traditional consumptive wildlife uses. Both of these developments have important implications for wildlife policy formulation."

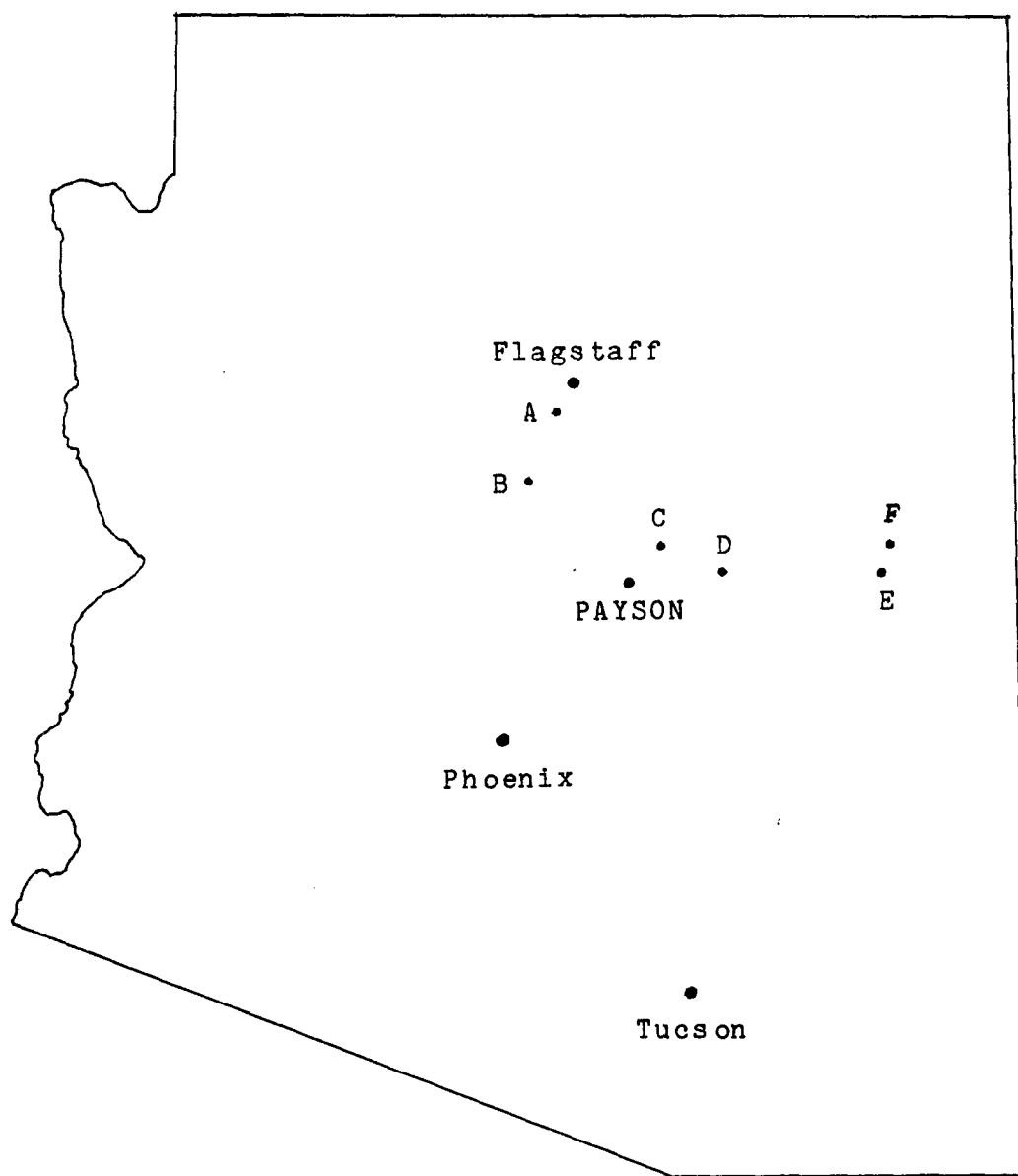
In studying public opinions, three primary groups can usually be identified: Those taking a stand for a particular issue, those against it, and those who are uncommitted. At places such as fish hatcheries, the

opportunity exists for an agency to broaden it's influence and base of public support by reaching out to that large uncommitted group. In discussing the idea of increasing interpretive efforts with the staff at some of Arizona's facilities, recognition of it's potential was usually readily gained. However, most saw only the short term benefits, such as saving staff time by answering visitor questions with signs and brochures, or reducing problems with people getting on raceway walls or kids throwing rocks to the fish. In a broader sense, the potential exists for the agency to reach a diverse segment of the public, and hopefully influence them toward some desired set of goals.

To design a program that will effectively reach the greatest number of people, data should be collected to get a better idea of actual visitor numbers and their temporal distribution (seasonal and daily). This data will help determine whether and how to allocate funds to better accommodate the existing visitor usage. Additionally, before any education or interpretation programs are designed, information is needed that will delineate the various user groups. Some of the questions that need to be answered include: Number of visitors and group size, time of day and amount of time spent, type of groups (individuals, family, school, etc.), age groups, most and least interesting features at the hatcheries, knowledge and attitudes toward various resource issues, and wildlife

oriented activities participated in by these people. Information from these questions could be used to determine the most suitable method for disseminating information, including program type, length and layout. It would also enable the subject matter to be directed at a proper level so that it is interesting and informative to the majority of visitors.

The primary objectives of this study are: 1. Determine number, composition and distribution of visitors at three trout hatcheries operated by the Arizona Game and Fish Department (Canyon Creek, Page Springs and Tonto Creek); 2. Assess visitor attitudes and knowledge of fishery management, the Game and Fish Department, and general ecology; and 3. Make recommendations for the development of public education/interpretation programs at state fish hatcheries.



- | | |
|---------------------------------|-------------------------|
| A - Sterling Springs | D - Canyon Creek |
| B - Page Springs, Bubbling Pond | E - Pinetop Office Site |
| C - Tonto Creek | F - Silver Creek |

Figure 1. Location of Arizona Game and Fish Department Hatcheries

REVIEW OF LITERATURE

Visitor Use of Hatcheries and Refuges

Although no studies of visitation at hatcheries could be found, some state and federal hatcheries have recognized the interest shown by the public. In 1983, the Michigan Department of Natural Resources completed a \$5 million renovation of the Wolf Lake State Fish Hatchery. Included in the remodeling was an extensive interpretive program, complete with brochure, visitor center, and display pond (Lincoln 1983, Michigan DNR 1983). In 1972, an estimated 31,000 visitors made use of a self-guided tour through the Garrison Dam National Fish Hatchery, North Dakota (USFWS 1977). In 1978 the Spearfish Fisheries Center in South Dakota was declared a National Historic Site and was visited by over 200,000 people (USFWS 1978). Some facilities have been planned and constructed with great attention to the public. One example is the Capilano National Fish Hatchery near Vancouver, British Columbia, which annually receives approximately 300,000 visitors (MacKinnon 1983).

The educational potential of wildlife refuges seems to have been developed to a much greater extent than that of hatcheries. The National Wildlife Refuge system was visited

by an estimated 30 million people in 1979 (USFWS 1982a). Annual visitor use at each refuge varies greatly for many different reasons, including climate, wildlife species available for viewing, and proximity to urban areas. In 1982, DeSoto National Wildlife Refuge recorded nearly a quarter of a million people touring its new visitor center (USFWS 1982b). Visitor accommodations are highly varied among the various refuges. They range from simple brochures, to handicapped interpretive trails and new, modern visitor centers. Two refuges have even been set aside with environmental education as their primary program (San Francisco Bay NWR, and Tinicum National Environmental Center, Philadelphia). In addition, the U. S. Fish and Wildlife Service has encouraged use of refuge lands by schools and other groups by the publication of such materials as "Face to Face" (USFWS 1980) and "Educational Use of Public Lands, a Course for Resource Managers" (USFWS 1980).

Whereas the only data available dealing with hatchery visitors lists numerical estimates of use, more work has been done on wildlife refuges. Houck (1949) presented criteria for establishing wildlife education programs on state and national wildlife refuges. More recent studies include a design for measuring public usage at the Crab Orchard NWR in Illinois (McCurdy 1970) and one assessing the impacts of visitors upon wildlife at Bosque

del Apache NWR in New Mexico (Cooper 1982).

Interpretation

Resource management agency programs intended primarily to affect public knowledge, attitudes and perceptions fall under a wide variety of titles. Throughout the past 100 years, agency programs have continually evolved with changes in public demands and agency goals. Good discussions of the evolution of various public programs can be found in Ford (1981), Baldwin (1979), Sharp (1976), and McInnis and Albrecht (1975).

Programs can be found under the titles of information, education, conservation education, outdoor education, environmental education and interpretation. The differences between some of the various program types is only a matter of semantics, while there may be great differences between others. The primary difference between conservation education and environmental education is that of content area, and less one of style, so further discussion of these terms is not necessary here.

Information programs are generally thought of as those which stress dissemination of facts, while "educational" programs stress the learning of concepts. It is on this idea that much of educational theory is based (Grambs and Carr 1983). Baldwin (1979) states: "Unfortunately, most programs have fallen into the trap of

becoming too informational in nature and not educational. We, as a profession, have inundated the public with facts and figures rather than supplying them with the basic concepts and relationships about wildlife. This information over education syndrome is now coming back to haunt us."

Hernbrode's (1974) opinion further stresses the importance of conceptual thinking, and the importance of wildlife education:

The American public has no comprehension of the basic concepts of wildlife conservation. Not one out of a hundred understands that wildlife is a product of it's habitat - or what habitat is. And, because they have no basic knowledge of these "facts of life," this public is easily mislead by emotional, illogical or even deliberately misleading presentations . . . of the wildlife charlatans. It's time to change - it's time to take another look at our educational process.

Baldwin and Hernbrode are not implying that factual, informational material should never be presented to the public, but that it should not be the only method of communication. Material which is primarily informational in nature is frequently needed to illustrate concepts, and give examples. However, it's use should be the means to an end, not just the end product. A list of facts is just that, a list of facts, unless they are coordinated to teach chosen concepts.

Interpretation is probably the least understood of the basic program types by those not directly involved with it. Sharp (1976) lists three objectives of interpretation:

1. To assist the visitor in developing a keener awareness, appreciation, and understanding of the area he or she is visiting,
2. Accomplish management goals,
3. Promote public understanding of an agency and it's programs.

Each of the objectives can probably best be satisfied through the teaching and learning of concepts. Therefore interpretation is more closely related to education; it is education performed under special circumstances.

Interpretative programs can be designed to convey virtually any message a resource manager might wish. Guidebooks of many varieties have been written on this subject. They range from the philosophical approach of Tilden's "Interpreting Our Heritage" (1977) to the "how-to" approach of Grater's "The Interpreters Handbook" (1976). A more extensive guidebook which covers interpretation at many levels is Sharpe's "Interpreting The Environment" (1976).

Education and Attitude Change

The underlying assumption of interpretive programs, other than those designed purely for entertainment value, is that the information gained will result in attitude or perception changes. Rettie (1968) states: "The most noble goal of conservation education is to prepare the citizenry at large with a background of knowledge and a basic system of values capable of understanding and forming intelligent

opinions on conservation issues when they are raised." Sharp (1976) lists eleven benefits which interpretation may provide, including:

Interpretation makes visitors aware of their place in the total environment and gives them a better understanding of the complexities of coexisting with the environment

Interpretation informs the public and an informed public may make wiser decisions on matters related to natural resource management

Interpretation may motivate the public to take action to protect their environment in a sensible and logical way

Although the relationship is sometimes unclear, the literature generally supports the idea that a change in knowledge will affect a change in attitudes. In studying secondary and college students, George (1966) found a correlation between level of conservation knowledge and attitudes. Also working with secondary students, Cohen (1973) found that those with a greater level of environmental knowledge had different attitudes than those with a lower level of knowledge. He also found that those with more information were more willing to express their attitudes, and that this willingness of expression is the more important of the two conclusions.

In studying the impact of exposure to information upon visitors in a fragile wildlife viewing area, Hill (1983) concluded that signs and brochures had a significant impact upon awareness of human activities which disturbed

wildlife.

The literature also contains studies of a more specific nature, but ones from which we can make more general conclusions. Young (1980) found that information about wilderness resulted in a more favorable opinion about that issue, especially among those whose present level of knowledge was relatively low. He concluded: "In general, environmental education might be expected to increase the positivity of people's attitudes toward environmental issues." Stankey (1976) concluded that persons with little understanding about fire ecology were more likely to support stringent suppression statements than those who were better informed. Witter (1982) showed that information could change attitudes toward snakes, and Ramsey and Rickson (1976) found that increased knowledge lead to favorable attitudes toward pollution abatement. However, they also concluded that knowledge would lead to moderate, rather than extreme positions.

In dealing with a specific set of attitudes, those toward agency policies, Kiely-Brocato (1979) states:

Ideally, an interpretive message designed to increase visitor attitudes should state agency policy or action and explain the benefits or positive consequences of the practice. However, when many visitors already favorably evaluate a practice, simply statement of agency policy or action may result in an increase in the percentage of positive attitude scores. As the number of persons favoring a policy or action decreases, it becomes necessary to also explain the positive consequences or benefits of the practices.

Although the literature generally supports the idea that increasing knowledge will have an effect on attitudes, not all studies show this attitude change as what would be considered positive in the eyes of resource managers. Tichenor et al. (1971) found that the most highly informed persons were often times more opposed to controlling pollution than those with less knowledge.

Research has also been conducted to determine the influences which effect initial attitude formation. George (1966) found that age, education and sex all significantly effected conservation attitudes. He also found a large correlation between extra-curricular activities of an environmental nature and attitudes. Kellert (1976) found that formation of attitudes toward animals was most highly influenced by childhood environment. Kellert developed a ten-part attitude typology. The ten attitudes were referred to as the naturalistic, ecologicistic, humanistic, moralistic, scientistic, aesthetic, utilitarian, dominionistic negativistic and neutralistic attitudes. Many of these varied greatly depending on size of local population, age, sex, education, occupation and income. In studying a specific set of attitudes, those toward hunting, Shaw (1974) found that a person's early social environment was an important factor in attitude formation.

What can be concluded from literature dealing with environmental attitudes is that change can be affected by

increasing a person's knowledge. However, it can also be inferred that the difficulty in creating this change will depend upon factors responsible for the initial formation of the attitudes.

Data Collection Techniques

Mahaffey (1968), in discussing effective interpretation, described a need to investigate the visitor, his awareness and his level of understanding. Sharp (1976) said: "It is the visitor characteristics that establish the level and content of the interpretive message." Two primary types of data helpful to planners include visitor use data (numbers, and temporal and spacial distribution) and visitor knowledge, attitudes and typology.

Visitor use data may be collected in a wide variety of methods. Use of electric and pneumatic traffic counters was described by McCurdy (1970) and by Wagar and Thalheimer (1969). These would be suitable at a hatchery or refuge where most or all of the visitors arrived by motor vehicle. McCurdy (1970) also described methodology for sample counts by observation, as did Wagar (1964). However, data collection by observation is costly and manpower intensive, therefore it might not be well suited for use by facilities with small staffs. A less costly method of data collection is through the use of self-registration or self-administered questionnaires. Kovacs (1971), and Wagar (1969), discussed

use of these methods at developed recreation sites. These techniques are also commonly used in remote areas, such as at trailheads. Lucas (1983), Wenger (1964) and Wenger and Gregerson (1964) all discussed use of trail register information, with the latter two including good analysis of factors influencing effectiveness. Potential problems include nonresponse, variation in accuracy, and question or sign wording.

Visitor knowledge, attitudes and typology may be assessed using a variety of survey methods. These can be grouped into two main types: Interview and questionnaire. Each method has it's advantages and disadvantages. These have been concisely summarized by Fillion (1980). Interviews are usually the more manpower consumptive of the two and may be subject to interviewer bias. On the other hand, questionnaires are affected by nonresponse, recall bias, question wording and question burden. Interviews may be conducted in person or by phone; questionnaires may be handed out, self-administered or distributed by mail. Each of these methods have been described by several researchers. In addition to interview and questionnaire, Selltitz et al. (1976) also describe observational and indirect methods. Dillman (1978) provides a very complete explanation of mail and telephone surveys, and information directly related to resource management issues is contained in Fillion (1980). Other references can be found in Potter et al. (1972).

METHODS

Description of Study Sites

Page Springs Hatchery

Started as a private hatchery in the 1920's, Page Springs was purchased by the Arizona Game and Fish Department in 1938. An addition, the Bubbling Pond Hatchery, was aquired in 1954. Both facilities are operated jointly. Located on Forest Route 134 (Coconino National Forest), the hatchery complex is bisected by Oak Creek. Page Springs lies at an elevation of 3500 feet. The local vegetative communities consist primarily of Semidesert Grassland and Great Basin Conifer Woodland (Brown and Lowe 1980), while the riparian community along the creek is dominated by cottonwood sp. and sycamore sp. Daytime summer temperatures commonly reach the mid 90's, while winter temperatures are in the 50's; light snow may be present in some years.

Page Springs is a "cold water" facility, producing primarily rainbow trout, while the Bubbling Pond Hatchery is a "warm water" operation, raising channel catfish and various endangered native fishes. Fish from this complex are primarily stocked in the northwest part of the state in summer, and in southern Arizona during winter months. This

complex, being the largest of the Game and Fish Department's hatcheries, requires ten to twelve employees to operate.

Page Springs is located on a paved road, situated within a two hour drive of the Phoenix metropolitan area, and close to the retirement community near Sedona. Page Springs receives visitors throughout the year, the majority of whom are on day trips, or are coming from or going to the Forest Service recreation areas north in Oak Creek Canyon. The only camping accommodations within ten miles of the facility are private, and some of these are available to members only. Visitor facilities at Page Springs include a 4' X 6' map of the grounds, a set of cast plastic blocks which show fry development, a guest register, two picnic tables, two coin-operated fish feed dispensers, bathrooms, and a brochure. Although no on-site visitor facilities are located at the nearby Bubbling Ponds hatchery, the brochure distributed at Page Springs includes some information about this facility.

Tonto Creek Hatchery

Tonto Creek Hatchery is one of the state's oldest hatcheries, with most of the original structures being built by the Work Projects Administration in the early 1930's. The hatchery is located near the headwaters of Tonto Creek, at the base of the Mogollon Rim. It is reached by going to the end of Forest Road 289, about 4.5 miles north of Kohl's

Ranch (about 20 miles northeast of Payson). The hatchery itself is situated on property owned by Tonto National Forest, under a long-term use agreement with the Game and Fish Department.

Elevation at the hatchery is 6300 feet. Surrounding vegetation is the Petrane Montane Conifer Forest type (Brown and Lowe 1980). Daytime summer temperatures usually are near 90 degrees, with afternoon thunderstorms a common occurrence. Winter conditions are not conducive to visitor use; temperatures may stay very low and snow may force road closure.

Tonto Creek Hatchery is a cold water facility, raising rainbow, brown and brook trout. It produces "catchables" for summer stocking, and "fingerlings" for fall. The rainbows go to rim lakes, rivers and streams near the hatchery, while the brown and brook trout also go to the eastern Mogollon Rim area and the White Mountains. The facility's normal staff is four employees, with a college student intern added during most years for the summer stocking period.

The lakes and forests of the Mogollon Rim are very popular summer destinations for Phoenix Metropolitan area residents. Four large Forest Service campgrounds are within ten miles of the hatchery, and many other forest areas along roads and streams are well used as camping sites. There are almost always visitors at the hatchery during summer

daylight hours. Spring and fall use is still high if the weather is good, but during winter months visitors are uncommon. Before the start of this study, there were no visitor facilities other than a parking area. The staff has recently added an entrance sign, and a small sign at each of the five ponds to identify fish species and number.

Canyon Creek Hatchery

Canyon Creek is the newest of the Game and Fish Department's hatcheries, being completed in 1972. It is also the most remote, as ten miles of sometimes very difficult dirt roads must be traversed to reach it (State Route 288 and Forest Road 33). All electricity is generated on-site and outside communication is by radio only. The hatchery site is similar to that of Tonto Creek, being on a lease with Tonto National Forest. It lies at the base of the Mogollon Rim, just south of Canyon Creek's Headwaters. The site sets at an elevation of 6600 feet, with surrounding vegetation dominated by the Petran Montane Conifer forest (Brown and Lowe 1980). Weather conditions are similar to those at Tonto Creek, with winter road conditions being worsened by heavy rains or snow.

Canyon Creek is a cold water hatchery, raising primarily rainbow trout. In addition to hatching and raising fish, in recent years the hatchery has been maintaining broodstock. Fish are raised to catchables for

summer stocking in the eastern rim area, or as fingerlings for the fall. The facility has a staff of four, with a college student intern added for the summer.

There are two undeveloped Forest Service campgrounds that are situated within a 1/4 mile of the hatchery. Until recent years the area received little visitor use. With all of the popular campgrounds near Tonto Creek and at the rim lakes being full nearly every summer weekend, campers have spilled out to less used areas. The manager at Canyon Creek reports a steady increase in visitors to the area since the hatchery's opening (Sturgeon 1983). Almost all usage occurs in summer months, with a scattering in spring and fall, and winter visitors very uncommon. Facilities for visitors include a small room with pictures, a few small signs scattered about the hatchery, and a simple self-guided tour brochure, which follows numbered posts placed on the hatchery grounds.

Estimate of Visitor Numbers

Visitation estimates at the three hatcheries were made by double sampling the guest books. On days on which surveying was done, records were kept of number of people visiting and number of groups signing guest book. To get an actual response rate the actual number of signatures was checked at the end of each day. This was done because it was found that there might be more than one entry per group,

while other groups would appear to be signing, but did not actually do so. The response rate for each hatchery was then multiplied by the average number per group and then by the number of entries for the year.

Visitors' On-Site Activities and Behaviors

To aid in determining what did and did not interest visitors, 30 groups at each hatchery were observed. Information recorded included parts of hatchery visited, signs read, visitor/employee interactions, time spent at various places and general direction taken by each group in touring the facilities. Some of this information was then put onto simplified hatchery maps to illustrate visitor use patterns.

Survey

Instrument Construction

In designing the survey instrument, three types of data were sought: Knowledge and attitudes about fish and wildlife, demographic data, and opinions about each hatchery. To reduce surveyor bias, much of the data was collected using a questionnaire (Appendix A) made mostly of closed ended questions. A wide variety of question types were utilized, including checking appropriate categories, rating feelings on a given issue, agreement/disagreement to statements, true/false and fill-in blanks. Some of the

questions used were selected from other surveys so that comparisons could be made to their population sample. Those studies used were Shaw et al. (1978), which looked at "nonhunting wildlife enthusiasts," and Shaw (1975), which compared hunters, anti-hunters, and a neutral group. Other studies were reviewed to find questions to measure knowledge. Since few questions were found which dealt with the desired topics, a list of questions was written. This list was revised many times, and reduced to a workable size. The goal was to collect a set of questions that would measure knowledge about Game and Fish Department operations, basic ecology, and fish and wildlife management, in addition to collecting opinions about possible human/wildlife conflicts and management alternatives.

After completing the questionnaire portion of the survey, visitors were asked a set of additional questions in a personal interview format. These items were broad open-ended questions which visitors tended to answer too simply on the self-administered instrument. Also included were questions which people often avoided, such as age and income.

Questionnaire Pretesting

The survey instrument was tested in two steps. At it's early stages, the questionnaire was reviewed by students and professors at the University of Arizona, in addition to the Arizona Game and Fish Department's regional

staff in Tucson. Especially important at this step was obtaining complete agreement among resource management professionals on answers to true/false items designed to assess knowledge. Once a workable set of questions was decided upon, a form ready for pretesting on the intended population was prepared. In June of 1983, fifteen groups at each of the three hatcheries were surveyed. Any difficulties in reading, and questions about what was wanted on particular items were noted. After completing the questionnaire, visitors were told that the survey was being tested and asked for any comments on wording and instructions. Using results from the pretesting, the final survey instrument was constructed.

Sampling Scheme and Survey Administration.

Signatures in previous year's guest books were tabulated to determine seasonal visitor distribution. From this data, representative sampling periods were chosen for each hatchery, during each season (Summer = June, July, August; Fall = September, October, November; Winter = December, January, February; Spring = March, April, May). Since so few people visit Canyon Creek other than in the Summer, this was the only season surveyed there. Likewise, survey data from Tonto Creek was not collected for Winter months. Page Springs is visited throughout the year, so survey data was collected for all four seasons. The actual

surveying was done in four-day blocks, with the number of groups sampled on weekday and weekend days being in proportion to use estimates from past year's guest books. Data was collected until 50 groups had been surveyed at each hatchery, in each season. The sample was distributed as follows: Page Springs, 200; Tonto Creek, 150; Canyon Creek, 50; Total sample = 400 groups.

The actual selection of groups to be surveyed was done by approaching the next group to leave after a survey was completed. Because of the length of time necessary for the survey (15 - 25 minutes), groups would frequently leave while I was busy with another group. I made the assumption that during busy times, a group's arrival or departure, in relation to that of another group, was random.

The selection of next group to leave, rather than next to arrive was made for two reasons: First, some groups (birders, hikers) might stay for a long time, precluding the surveying of other groups while waiting (however, these groups would have an equal chance of being selected upon their departure). Secondly, although visitors may pick up information at the facilities that would influence responses to the knowledge questions, I would not be able to elicit opinions of impressions about the hatcheries if visitors were surveyed prior to exposure.

One probable point of bias exists with regards to attitudes about wildlife management and level of knowledge.

During pre-testing it was found that when the questionnaire was given to a randomly chosen individual in a group, it would often be given to, or taken by, another individual. This was usually done under the pretense of "He/she knows more about it than I do" or "He/she is the fisherman in the family." Since this was so commonly done in pre-testing, in the actual survey, the groups were asked if any one person in the group would like to fill out the questionnaire, or if they would like to work on it as a group. In either case, only one questionnaire was completed per group. The exact effect of this on the survey results are not known, however, I hypothesize that it slants the responses toward the higher end of the knowledge scale on those types of questions.

Data Analysis

The data obtained from this questionnaire was tabulated through the use of the Statistical Package for the Social Sciences (SPSS) computer programming package (Nie, et al. 1975).

RESULTS

Patterns of Visitation

Visitor use, as estimated from guest books, is reported in Table 2 (See also Appendix B). As expected, Summer was the most popular season at each of the facilities. The combined total number of visitors for June 1983 through May 1984 was over 58,000.

Over 80 percent of all hatchery visitors arrived between 9 and 3 PM. Arrival of visitors was fairly evenly spread across the major portion of the day at Tonto Creek and Canyon Creek (Figure 3), while visitors at Page Springs tended to favor afternoon hours, especially in the Fall, Winter and Spring. Each hatchery had a small number of visitors prior to 9 AM. At Page Springs the early arrivers were usually birders; at Canyon Creek they were fishermen passing through or kids (without parental supervision) from the nearby campgrounds; and at Tonto Creek they were frequently campers from nearby camping areas. Once at the hatcheries, about 54 percent of the people would stay for 15 to 30 minutes, and another 26 percent would stay an additional 15 minutes (Figure 4).

--- Canyon Creek

— Page Springs

--- Tonto Creek

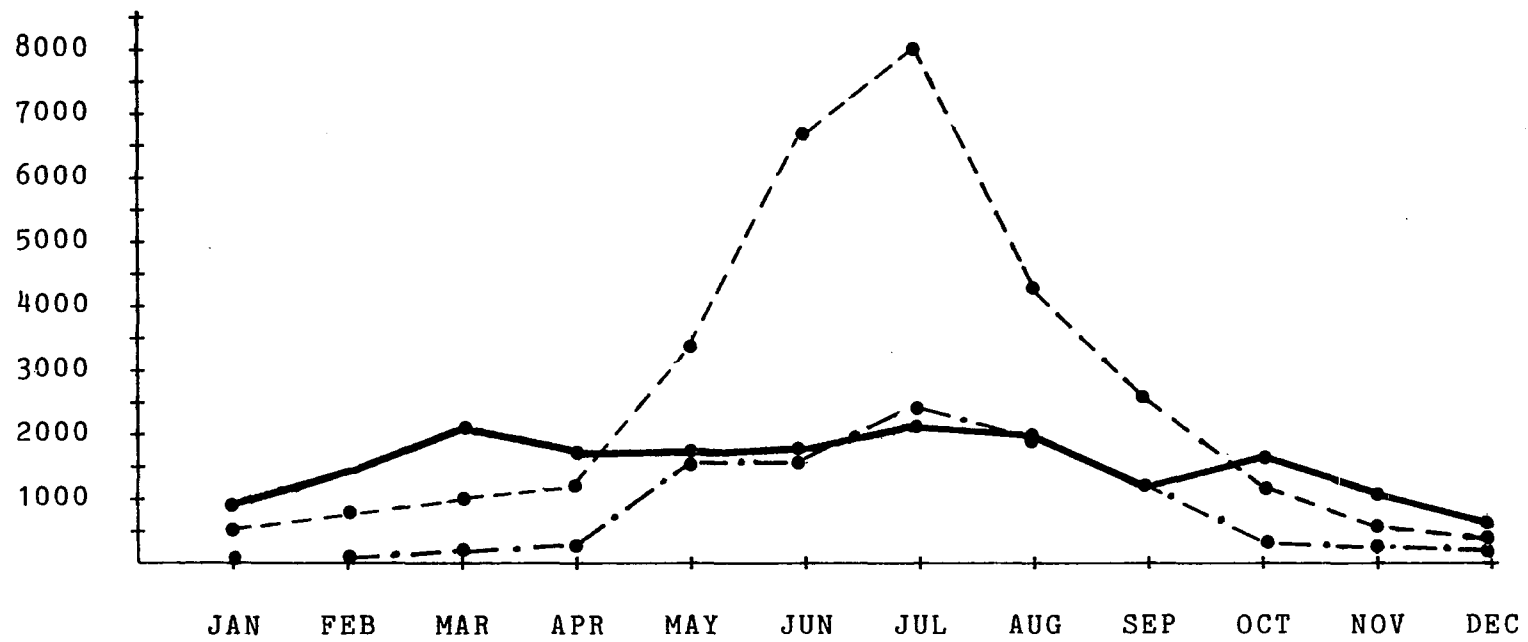


Figure 2. Estimated monthly visitation at fish hatcheries, 1983 - 1984.

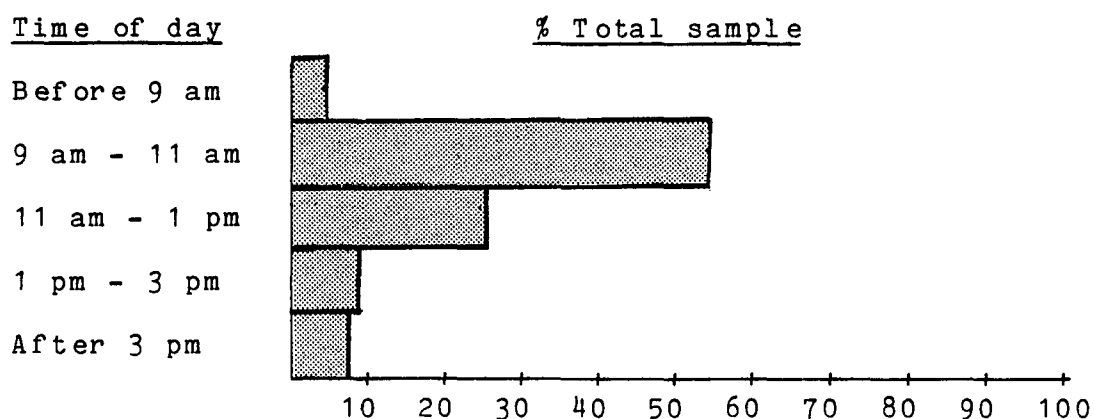


Figure 3. Daily visitation pattern at fish hatcheries.

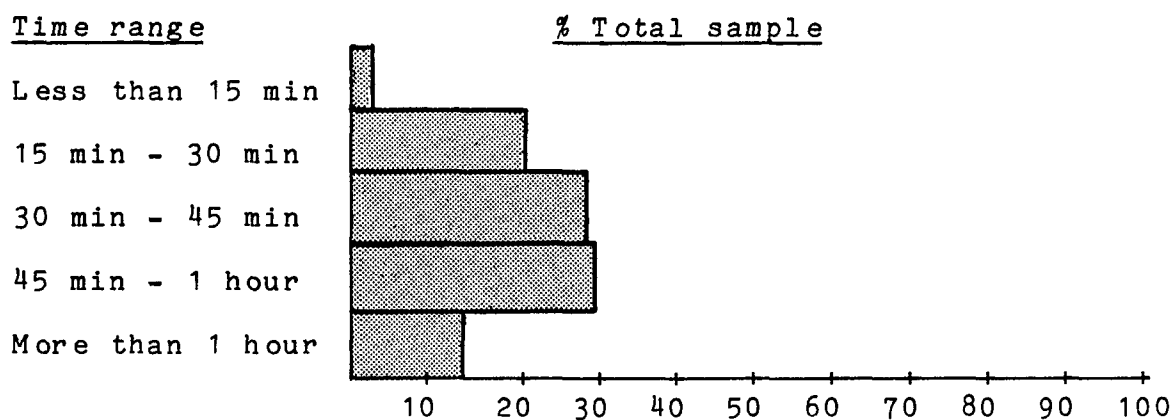


Figure 4. Length of stay at fish hatcheries.

Visitors' On-Site Activities

It is not surprising that the things which the greatest number of visitors found to be most interesting were related to fish culture. Visitors commented on other things by saying that they were interesting, but it was these items that questions were asked about most (especially from visitors who were not surveyed, but approached me to talk). Natural amenities ranked next in order of interest. Most comments about birds came from Page Springs, which has gained a reputation among birdwatchers. Northern Arizona Audubon Society has reported over 100 species being observed on the hatchery grounds. The facility is a popular spot for birdwatchers as well as a common destination for ornithology field trips from Northern Arizona University.

Large fish seemed to be especially attractive to visitors. Nearly all of the people at Canyon Creek would stop by the raceways which held brood fish. At the other two facilities the large numbers of "catchable" trout caught much attention. At Page Springs the large central pond is of interest not only because of the large numbers of fish, but also due to the presence of coin-operated fish feed dispensers. Many visitors said that they came here especially to allow their kids or out-of-town guests to feed the fish.

The water system was of interest to many visitors. Questions were asked about temperature, quantity, source and whether or not it was pumped through the systems. The survey was also very interesting to some people, so much so that they would stay 15 to 20 minutes after the interview to ask questions. Some people said they liked the fact that I would take the time to talk to them. Another area of interest was the loading of fish. Visitors who were on the grounds when this was done would almost always be attracted to it. In addition, questions were frequently asked about other aspects of stocking.

To some people, the physical aspects of the hatcheries were most appealing. This included comments about the ponds, raceways and overall layout of the facilities. Other people commented about the informational signs, especially the display at Page Springs, which has cast plastic blocks showing the development of fish fry. Whereas the largest fish were most interesting to some visitors, others liked the smallest fish. As these are kept in the hatchery buildings at Tonto Creek and Canyon Creek, these buildings were also popular.

To some visitors, the mere fact that the Department raised fish was most interesting. Some people became intrigued by the behavior of the fish and would ask about fish jumping up into the inlet streams or about the reactions of the fish to motions made over the water or of a

person walking by a pond.

In addition to direct comments, information about visitor interests was gotten by observing where they spent time while at each facility, and is reported in Figures 5, 6, and 7.

Table 1. Aspects of hatcheries most liked by visitors.

	<u>% Total sample</u>
Topics dealing with raising of fish - sizes of fish, numbers, production time, age at various sizes, treatment of diseases	39.8
Birds, access for birders, wildlife, scenery, weather	11.8
Brood fish, other big fish (catchables)	8.9
Everything, feeding fish, showing fish to kids	8.7
Water source, water system	6.3
Interview, myself, what survey showed them that they didn't know	6.1
Loading fish, where stocked and how	4.6
Raceways, ponds, layout of facilities	4.1
Signs	3.2
Hatchery building, little fish	3.0
That Game & Fish Department raises fish, friendliness of employees	2.4
Touchiness of fish, fish jumping	2.0

Just as visitors found many things they liked about the hatcheries, they also expressed dislikes for a variety of reasons (Table 2). Almost 50 percent of the comments were requests for various visitor services. About 37 percent asked specifically for more information. Requests were diverse, and ranged from asking for small signs to asking for programs "just like at the big parks." Virtually all methods of interpretation were mentioned including signs, tours, movies, brochures and tape recordings. A few visitors at Page Springs who recognized the cost of adding an employee just to answer questions, suggested using docents (volunteers). Also requested often were such things as restrooms, directional signs, drinking water and maps. Many visitors become easily lost in the area near Tonto Creek and Canyon Creek hatcheries. Whenever surveying, I would keep a set of Forest Service maps handy. Upon showing them to people, most commented that they were unaware of the maps' existence, and almost without exception would ask if we could sell them one.

Although the survey subjects did bring up a wide variety of dislikes, 20 percent could not think of anything to change or had specifically said not to change anything.

Some of the improvements requested seemed to be related to time of the year. People would want to see bigger fish when only fingerlings were at the facility, or would want to see fry at a time when the fish were bigger.

Suggestions were made to keep some larger fish throughout the year in a special pond or aquarium. During Michigan's Wolf Lake Hatchery renovation, a display pond was constructed, along with a display of whole freeze-dried specimens. In addition to having different sizes available at different times, some visitors would like to see the Department raise other species of fish, and grow more and bigger ones.

Some of the comments might be classified as concerns or complaints. These included seeing too many dead fish, complaints about Tonto's road, and the Yellow Grub problem which affected Page Springs. Other complaints included a potential safety hazard around the ponds, and the cutting and burning of vegetation at Page Springs.

On a more positive note, some people thought there should be a way in which they could help support hatchery programs. Suggestions were made for collection boxes, pay fishing ponds (for kids) and pay feeders (visitors at Tonto Creek and Canyon Creek frequently asked if they could feed the fish).

Table 2. Aspects of hatcheries liked least by visitors.

	<u>% Total sample</u>
Lack of information, signs, brochures; suggested using slide programs, docents, tape recordings, self-guided tours	37.4
Nothing, don't change anything	19.8
Add better visitor accomodations; suggestions included road signs, restrooms, drinking water, picnic tables, and selling Forest Service maps	12.1
Want to see big fish, want to see eggs and fry, add aquariums	9.5
Empty ponds, algae in raceways, dead fish, bad roads, yellow grub	8.0
Should be growing more and bigger fish, add other species of fish	5.4
Add pay feeders and pay fishing ponds	3.4
Should charge admission or have method to collect donation	2.1
Cutting and burning vegetation, cows on property, shooting birds	1.8
Safety hazards around water	0.5

Some of the observations made throughout the study are included in Table 3. A group was recorded as using any of the visitor accommodations if at least one person in the group did so. One interesting note in regards to the large sign is that repeat visitors may be less apt to make use of any information provided. When asked if they had read the large sign, a few visitors said that had not looked because they "saw it last year." Since this was a time when the new signs were up for less than one month, one wonders what caused this response. Are some people so used to visiting a certain hatchery that they assume they know that nothing could have changed since their last visit? Or are some visitors so used to seeing interpretive programs at parks and monuments that they assume they have seen this one too?

Table 3. Percent of visitors using various hatchery facilities.

	<u>% Total Sample</u>
Read large display showing layout of hatchery	
Canyon Creek	34.0
Page Springs	58.5
Tonto Creek	60.4
Read small signs - Canyon Creek	47.0
Pick up brochure - Canyon Creek	48.0
Use restrooms - Page Springs	25.0

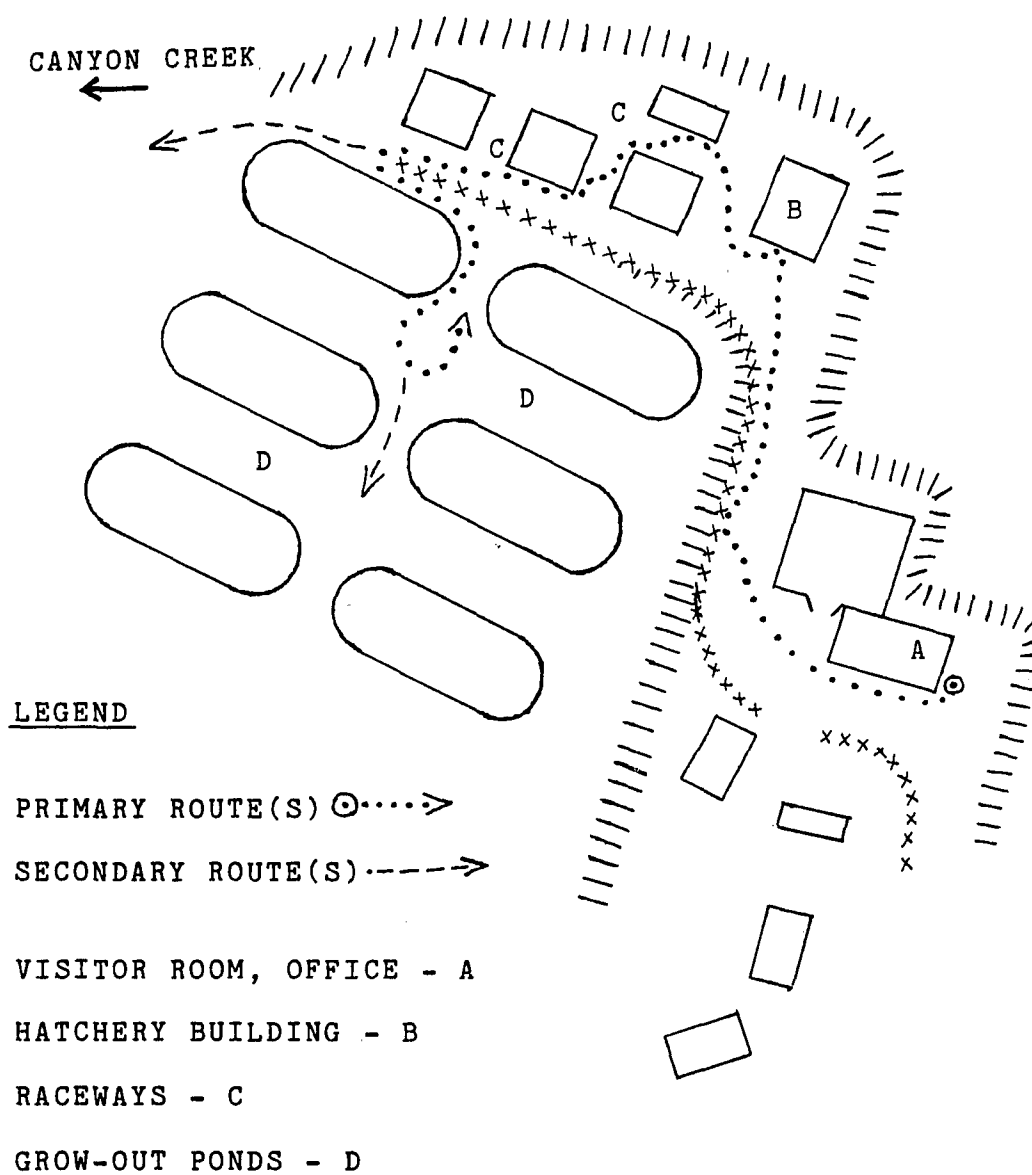


Figure 5. Routes Most Commonly Taken by Visitors in Viewing Canyon Creek Fish Hatchery

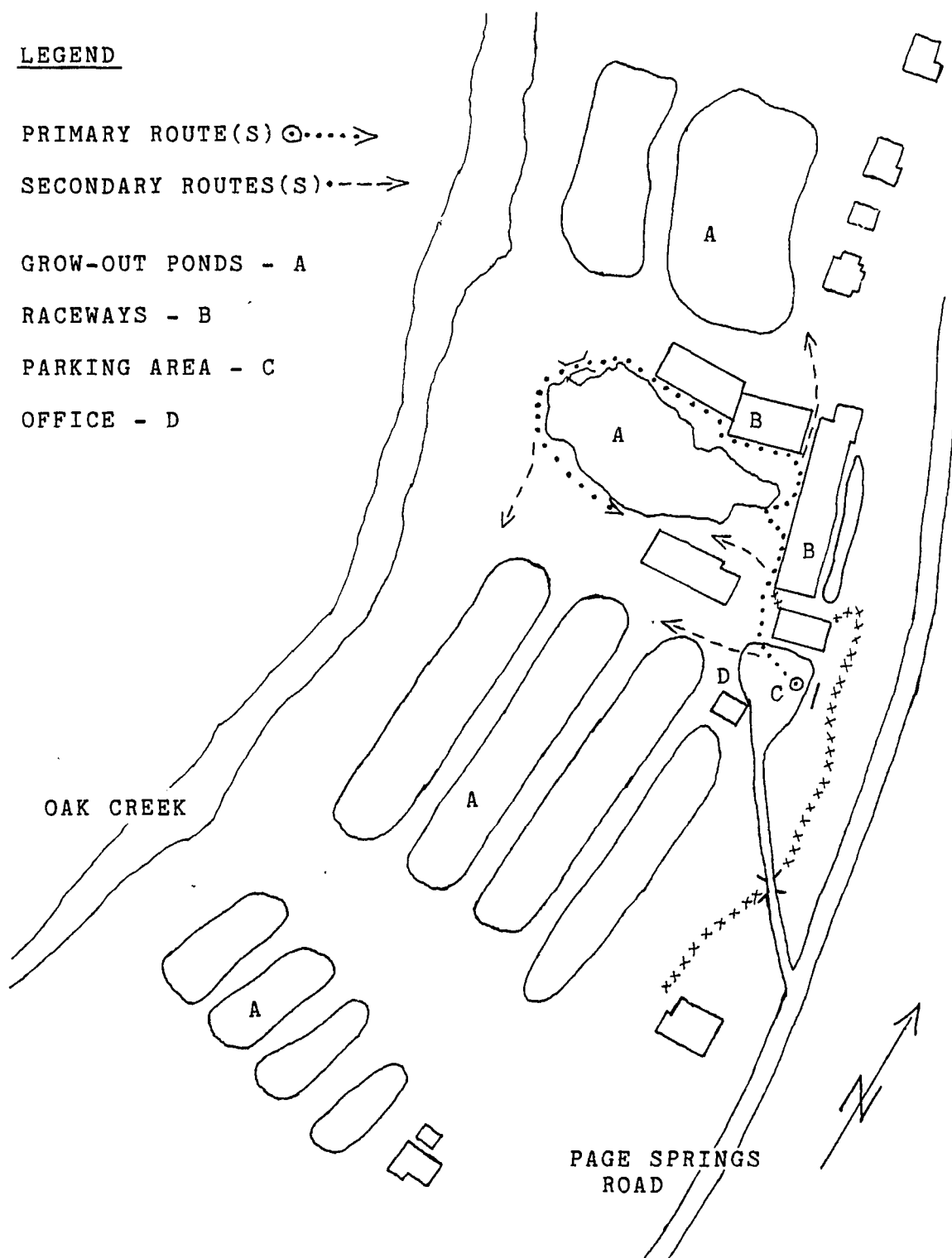


Figure 6. Routes Most Commonly Taken by Visitors in Viewing Page Springs Fish Hatchery

LEGEND

PRIMARY ROUTE(S) ⊙.....>

SECONDARY ROUTE(S) - - - - ->

HATCHERY BUILDING - A

GROW-OUT PONDS - B

RACEWAYS - C

PARKING AREA - D

OFFICE - E

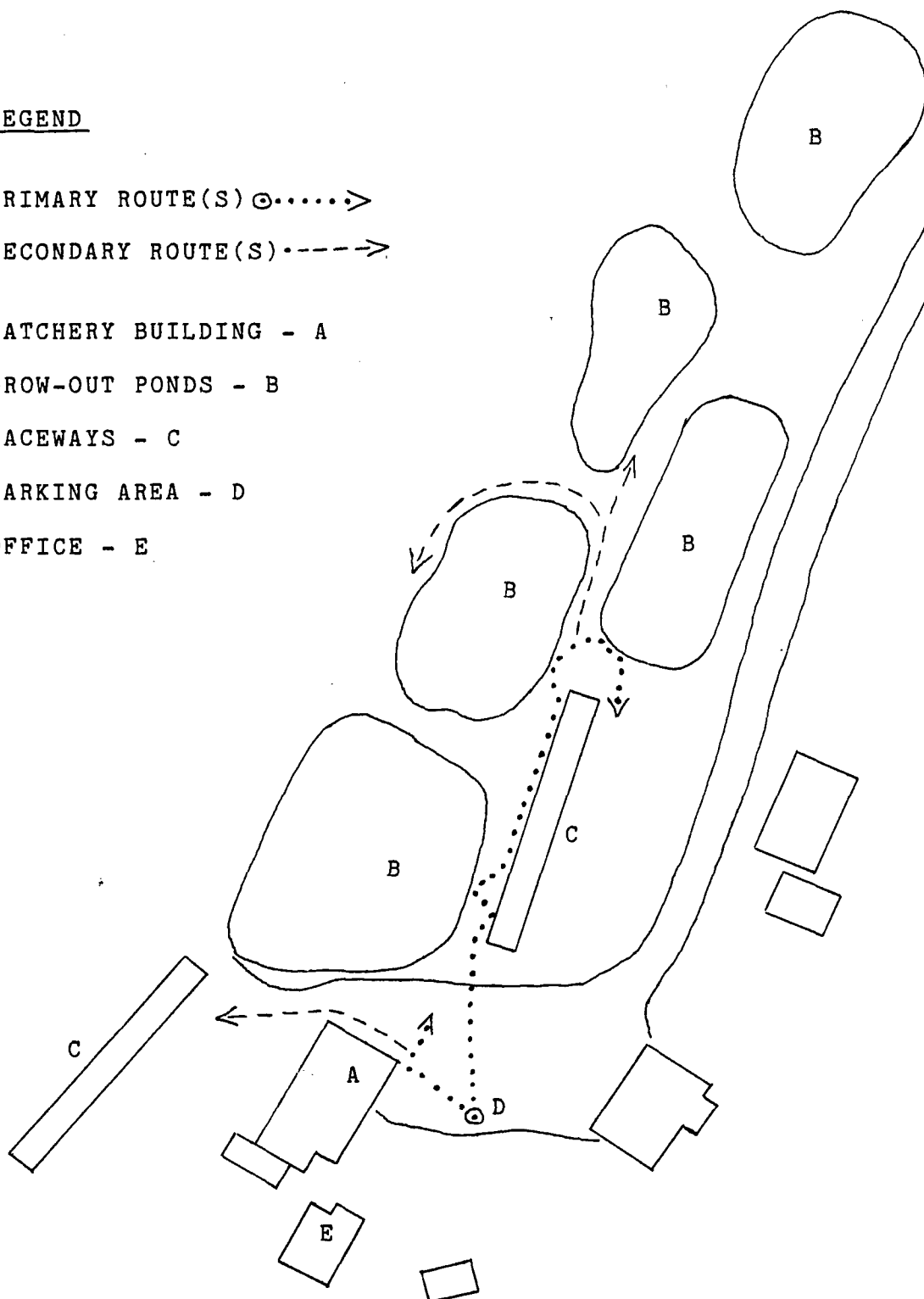


Figure 7. Routes Most Commonly Taken by Visitors in Viewing Tonto Creek Fish Hatchery

Demographic Characteristics of Hatchery Visitors

The Age distribution of visitors to the three hatcheries is reported in Table 4. Some notable exceptions exist between the facilities. Over 25 percent of Page Spring's visitors are in the 60+ age bracket. Many of these people are from nearby communities having a large proportion of retirees, including Sedona, Cottonwood and Camp Verde. The age groups at Tonto Creek and Canyon Creek are similar in that they both represent a large number of family type and age groups. One major difference is the large number in the 10 to 19 year category at Tonto Creek. Much of this is due to the facility's location near two scout camps and a large church camp. The Baptist church camp, which is approximately 1.5 miles south of the hatchery, is annually used by about 3000 5th and 6th grade students from Mesa Public Schools (Box 1984). Most of the class groups stay at the camp for two to three days, and will hike up to the hatchery as a group. The number of school groups does not appear high on Table 4, however the average school group at Tonto Hatchery is about 60 students.

In addition to an apparent difference in proportion of school groups, the number of tours may be underestimated. The staff at Page Springs (Sprague 1982) reports a large number of bus tours stopping at the hatchery, especially in

Winter months.

Generally speaking, hatchery visitors are Arizona residents, over 60 percent of whom come from urban areas (Table 4). Over 70 percent of the group leaders have had at least some college education. About 61 percent of the visitors consider themselves to be fishermen, and 64 percent said that they either fish or hunt (Table 5). Surprisingly, 24 percent of non-hunters/fishermen had held an Arizona hunting, fishing, trapping, combination or pioneer license in the past two years (Table 6). However actual number of hunters or fishermen may have been underestimated since the question asked for wildlife-related activities in which they "actively" participated.

When asked about the main purpose of their trip or outing, the responses seemed to be related to the hatchery location and group type (Table 7). At Canyon Creek, which is secluded and has nearby campgrounds, nearly half of the visitors came primarily to camp or fish. At Page Springs, where there are fewer close-by camping areas and more elderly visitors, almost 70 percent of the people were sightseeing or came specifically to see the hatchery. Overall, about 22 percent said they were on an outing specifically to see the hatcheries, and nearly half of the visitors had been to the hatcheries previously.

Table 4. Socio-Demographic characteristics of hatchery visitors.

Characteristic	Class	%
Age	0 - 10 years	17.0
	10 - 19	17.0
	20 - 29	15.0
	30 - 39	20.0
	40 - 49	9.0
	50 - 59	7.0
	over 59	15.0
Type of group	Friends or alone	33.3
	Family	62.0
	Youth group	2.0
	School	2.0
	Club	0.5
	Tour	0.2
Group size	Canyon Creek Hatchery	4.1
	Page Springs Hatchery	3.3
	Tonto Creek Hatchery	3.7
Population of area of residence	Large city (over 100,000)	33.8
	Suburb	22.3
	Medium city (100,000 - 500,000)	7.5
	Small city (25,000 - 100,000)	11.5
	Small town	18.8
	Rural area	6.0
Highest level of education attained by primary respondent	Grade school	1.0
	Some high school	4.3
	High school graduate	15.4
	Some college	31.2
	College graduate	17.6
	Some graduate school	7.6
	Graduate degree	14.6
	Technical school	7.8

Table 4, Continued

<u>Characteristic</u>	<u>Class</u>	<u>%</u>
Residency (of primary respondent)	Arizona	87.7
	Other	12.3
Sex	Male	54.0
	Female	46.0
Household income	Under \$9,999	1.5
	\$10,000 - \$19,999	22.0
	\$20,000 - \$29,999	34.7
	Over \$30,000	36.2
	College student	1.0
	Non-response	4.6

Table 5. Percent of visitors who reported participating in selected wildlife-related activities.

<u>Wildlife- related activities</u>	<u>Visitors who hunt or fish</u>	<u>Visitors who don't hunt or fish</u>	<u>% Total sample</u>
Fishing	95.3	0.0	60.7
Birdwatching	11.8	13.9	12.5
Hunting	44.7	0.0	28.5
Photography	21.2	21.5	21.3
Nature walk	37.6	80.6	53.1
Other	2.0	2.8	2.3

Table 6. Percent of primary respondents who had held an Arizona resident hunting, fishing, combination, trapping, or Pioneer License in previous two years.

	<u>Visitors who hunt or fish</u>	<u>Visitors who don't hunt or fish</u>	<u>% Total sample</u>
Yes	78.4	24.1	58.9
No	21.6	75.9	41.1

Table 7. Primary purpose of visitors' current trip.

<u>Purpose</u>	<u>Canyon Creek</u>	<u>Page Springs</u>	<u>Tonto Creek</u>	<u>% Total sample</u>
Camping	40.0	10.0	17.7	16.6
Fishing	15.0	8.3	15.6	11.9
Hiking	3.3	3.3	7.8	5.1
Sightseeing	20.0	41.9	29.7	34.5
Picnic	8.3	2.5	4.2	3.8
Visit hatchery	13.3	27.0	19.8	22.4
Other *	0.0	7.0	5.2	5.7

* Birding was the most frequent response for purpose in this category.

Attitudes and Knowledge of Hatchery Visitors

Visitors were asked to rate perceived seriousness of a variety of potential threats to wildlife (Table 8). The order of threats, when ranked, does not change between consumptive and non-consumptive users. Although loss of habitat is generally considered the most universal threat to wildlife today, it gets little attention in media coverage. Conversely, while various types of pollution do cause problems, pollution is usually highly visible in the media. Therefore it is not surprising that pollution was rated as the top threat. One interesting item was that predation was considered such a threat by all groups.

In addition to rank order, there is also little difference in mean response to most of the threats. The notable exceptions being sport hunting and commercial trapping, where fishermen and hunters rated both as less serious than did the non-fishing and hunting group. One surprising difference was that all-terrain vehicles were deemed less threatening by the non-fishing and hunting group.

Table 8. Visitor's attitudes about potential threats to wildlife.

<u>Threat</u>	<u>Mean score of total sample *</u>
Pollution	1.70
Loss of habitat	1.97
Illegal hunting	2.30
Predators	2.46
Commercial trapping	3.21
Unsound wildlife management practices	3.37
Sport hunting	4.03
All terrain vehicles	4.41

* Visitors were asked to rate potential threats to wildlife on a scale of 1 to 5, with 1 being most serious.

Responses to a number of questions (Table 9) showed an overall approval of current wildlife management and management agencies. The majority of visitors (77 percent), and even those who do not hunt or fish (65 percent), felt that hunting is essential in the management of some wildlife. There was also a very one-sided response to the idea of banning hunting (87 percent against). Although there is support for current agency priorities, there is also a great deal of indecision. Nearly half (46 percent, 48 percent) feel that the game animal/nongame animal balance of management efforts is appropriate, but 49 percent of non-fishermen/hunters were undecided. However, while there is approval of current programs, both the consumptive and nonconsumptive users felt that provisions should be made for nonconsumptive users to have more policy and financial input.

Table 9. Visitors' attitudes about wildlife management.

D = Disagree U = Undecided A = Agree				
F & H = Fishermen and hunters				
NF/H = Non-fishermen/hunters				
Total = Total sample				
	Percent response *			
	D	U	A	Group
Hunting is essential to prevent to prevent overpopulation of some types of wildlife.	11	5	84	F & H
	25	10	65	NF/H
	16	7	77	Total
Hunters should not be expected to pay the major part of nongame management costs.	29	18	54	F & H
	44	17	39	NF/H
	34	17	49	Total
Nonhunting wildlife enthusiasts do not have an acceptable way to help pay the costs of management of nongame animals by government agencies.	18	25	57	F & H
	24	23	53	NF/H
	20	24	56	Total
A good way for government to help wildlife is to ban hunting.	92	5	3	F & H
	78	13	9	NF/H
	87	8	5	Total
Wildlife management as currently practiced by government agencies has a good balance between game and nongame management.	13	36	51	F & H
	14	49	37	NF/H
	13	41	46	Total
Nongame animals are neglected by government wildlife management agencies.	52	31	17	F & H
	42	30	28	NF/H
	48	31	21	Total
Wildlife management as we know it today benefits mostly the hunter.	70	11	19	F & H
	55	15	30	NF/H
	65	12	23	Total
Nonhunting wildlife enthusiasts should have a say in government wildlife management agencies equal to the say hunters now have.	34	14	52	F & H
	13	10	77	NF/H
	26	13	61	Total

* Percents are rounded to the nearest whole number.

The first group of true/false "knowledge" questions in the set (Tables 10 and 11) dealt with fish. Responses were compared between fishing/ hunting participants and non-participants. The fishermen and hunters had a higher percent of questions correct, but the differences on many individual questions were less or reversed. The questions about rainbow trout being native, and the Native or Arizona trout being endangered were testing background knowledge. Overall, the majority of visitors did not answer correctly on these, and quite a few admitted to not knowing. The other questions in this set required some use of knowledge, not just recognition. These questions dealt with the Game and Fish Department and basic ecological principles. Some items were very straight-forward, and most respondents answered these correctly, while on other questions more ecological knowledge is required to respond correctly.

Table 10. Responses to question asking purpose of trout stocking in Arizona.

Trout stocking in Arizona's central and northern waters is most often required because:

	Percent response *		
	Hunt or fish	Don't hunt or fish	Total sample
Trout don't reproduce in the wild in Arizona	14	9	12
Fishermen catch more fish than can be naturally produced (**)	62	51	58
Low fish populations due to to water pollution	7	8	8
Undecided or don't know	18	31	23

* Percents are rounded to the nearest whole number.

** Denotes correct answer as decided by a consensus of wildlife biologists.

Table 11. Responses to questions designed to assess visitors' knowledge about resources and resource management.

T = True	F & H = Fishermen and hunters
F = False	NF/H = Non-fishermen/hunters
U = Undecided	Total = Total samples

	Percent response			
	T	F	U	Group
The rainbow trout that are stocked by the Game and Fish Department are a native Arizona species. (F*)	24	44	32	F & H
	19	37	44	NF/H
	22	41	36	Total
Hatchery trout are capable of surviving in lakes and streams as well as fish naturally raised there. (F*)	77	16	8	F & H
	75	15	14	NF/H
	75	15	10	Total
Raising trout in a hatchery is basically "fish farming." It's main purpose is raising fish to be caught. (T*)	80	14	6	F & H
	74	18	8	NF/H
	78	16	7	Total
If trout stocking is stopped, the ecological balance of Arizona's lakes and streams will be destroyed. (F*)	61	24	15	F & H
	47	27	26	NF/H
	56	25	19	Total
Disturbances of the land (agriculture, tree harvesting, road construction) are very likely to harm the water quality of lakes and streams and their ability to support fish. (T*)	80	10	11	F & H
	83	10	7	NF/H
	81	10	9	Total
The species called the Native or Arizona trout is on the Federal Threatened and Endangered Species list. (T*)	35	13	52	F & H
	26	6	68	NF/H
	32	10	58	Total
The Arizona Game and Fish Department is required by law to manage all of the state's wildlife, including all hunted and nonhunted species. (T*)	72	9	19	F & H
	60	8	31	NF/H
	68	9	24	Total

Table 11, Continued

	Percent response			
	T	F	U	Group
The Arizona Game and Fish Department receives no general fund tax dollars. (T*)	38	23	38	F & H
	25	33	42	NF/H
	34	27	40	Total
Final decisions on wildlife matters in Arizona rest with the Game and Fish Commission (appointed by the Governor), not the Game and Fish Department. (T*)	45	10	45	F & H
	43	5	52	NF/H
	44	8	48	Total
If it were not for sport hunters, there would still be plenty of wildlife. (F*)	14	76	10	F & H
	20	70	10	NF/H
	16	74	10	Total
Hunters and fishermen contribute more money toward wildlife protection and habitat improvement than any other wildlife interest group. (T*)	87	7	6	F & H
	64	17	15	NF/H
	80	11	10	Total
In recent years, sport hunting has nearly eliminated several species of wildlife in North America. (F*)	31	57	12	F & H
	43	40	17	NF/H
	35	51	14	Total
Predator control is usually a very effective technique for increasing populations of game animals. (F*)	57	28	16	F & H
	40	43	17	NF/H
	51	33	17	Total
For every bird that survives to reproduce in the wild, there are many others that die due to starvation, freezing, diseases, etc. (T*)	88	5	7	F & H
	86	6	8	NF/H
	88	5	8	Total
Wildlife is a renewable resource. (T*)	66	28	7	F & H
	60	31	9	NF/H
	64	29	8	Total
Loss of habitat does not affect animal populations. (F*)	3	93	4	F & H
	3	97	1	NF/H
	3	95	3	Total

Table 11, Continued

	Percent response			
	T	F	U	Group
A population increase of one species may have a definite impact on other species living in the same area. (T*)	93	2	5	F & H
	98	1	1	NF/H
	95	2	3	Total
Everything a person does has an effect on the environment. (T*)	88	7	5	F & H
	92	8	1	NF/H
	90	7	4	Total
Forest fires are always bad for wildlife. (F*)	46	49	6	F & H
	46	50	4	NF/H
	46	50	5	Total

* Denotes correct answer as decided by a consensus of
wildlife biologists.

DISCUSSION

The Need for Education and Interpretation

Many authors have presented various reasons for implementing natural resource related interpretive programs. These include:

- Enhancement of visitor experiences;
- Accomplishing management goals;
- Helping people to understand the environment and the consequences of their actions;
- Promoting public understanding of an agency and its programs.

Before discussing any of these reasons, it is important to establish the place of the public in natural resource management. Fillion (1984) presented a diagram of current wildlife management interactions, which he titled "The Wildlife Management Complex" (Figure 8).

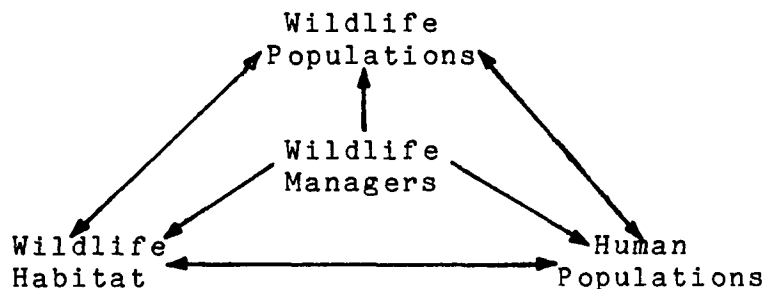


Figure 8. The wildlife management complex (Fillion 1984).

"The complex suggests that approximately 1/3 of the management issues are human related. This is somewhat optimistic. In my experience in North America I have found that considerably more than 1/3 of the problems wildlife managers have are caused by humans, whereas considerably fewer than 1/3 of the resources available to management are spent on human related research." (Filion 1984)

Filion suggests a new way to view the relationships between the elements of the complex: (Figure 9).

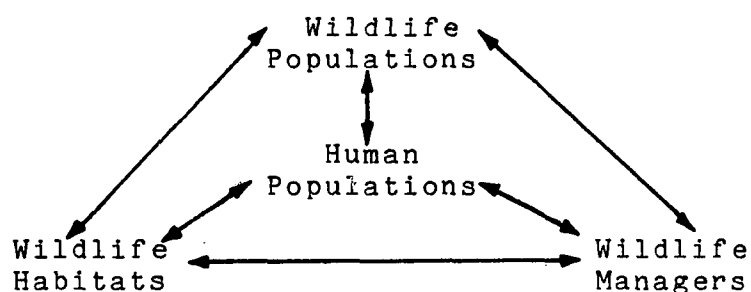


Figure 9. The wildlife utilization scheme (from Filion 1984).

"This strategy acknowledges the numerous types of benefits that accrue to humans from wildlife-related resources and recognizes the nature and complexity of the human-related management issues." (Filion 1984)

The importance of communicating with the public has also been stressed by other authors: "More and more biologists and natural resource managers are recognizing that wildlife conservation stems from effective

communication with people as much as application of biological techniques." (Witter 1982)

While it is a noble goal to think of a wildlife manager's primary function being to benefit wildlife, in reality, much management of game species is done to benefit humans. Whether to provide consumptive or nonconsumptive benefits, the management of wildlife is largely aimed at satisfying the public. Should it not be the case then, that the help of the public should be utilized at every opportunity? Hernbrode (1974), in speaking of educators, said: "You'll find they are surprisingly like ourselves - underpaid, unappreciated, frustrated and convinced that everyone knows more about their business than they do." This last point became readily apparent over the year of the survey. Hatchery visitors were not at all shy in expressing their views of current fishing and game animal programs, and in giving suggestions to remedy the "problems." Unfortunately, many of their proposed "solutions" would send a chill through any professional wildlife manager.

Many of the ideas held by visitors were the result of misinformation, while others were ideas which may hold true in other parts of the country, but not here. However, most misunderstandings seemed to come from a lack of any information concerning how or why the agency carries out management programs. Of the reasons given for interpretation, the promotion of public understanding of the

agency and its programs will probably be the most easily accepted by many wildlife professionals. In looking at the questions dealing directly with operation of the Arizona Game and Fish Department, a large number of people were not able to correctly identify the funding source or the decision-making body of wildlife management in this state (Table 11).

There was also a high degree of uncertainty about the status of Arizona Trout. The Department has had an ongoing program to reintroduce these fish to parts of their historic range, yet even much of the fishing public is unaware of these actions. With this program, the Department has an opportunity to gain the support of a diverse audience. The Native or Arizona Trout is a fish which if brought back in sufficient numbers, would surely provide for a unique fishing opportunity. Additionally, nonconsumptive wildlife enthusiasts would also be interested in knowing that the Department is actively working to save threatened and endangered animals. In Kellert's survey of American attitudes toward wildlife (1979), 71 percent of the respondents said that they would be in favor of protecting endangered trout, even at added economic costs.

Another area in which added exposure would benefit the Department is in the promotion of existing services of the Information and Education Division. Very few hatchery visitors knew that the Game and Fish Department produced a

monthly newspaper, Wildlife Views, or a free weekly information bulletin; and no more than a handful of people had heard of the Department's weekly statewide radio programs.

A topic always of concern to the public is money, and with a government agency that is not supported by taxes, this is especially true. In the year prior to beginning this study, license fees were raised. Some people commented that the Department should not have to raise prices, when "they could just ask for, and get, all they wanted from the legislature." Yet upon hearing an explanation of the actual sources of Department revenue, these people were much more ammenable to paying higher fees. This then is a topic in which the Game and Fish Department might definitely benefit from increased information to the public. This topic is especially relevant as at the time of writing this paper, as a new surcharge was added to fishing and hunting licenses to cover renovation of the state's hatcheries. This action is sure to draw some complaints, but with the rapidly rising population in Arizona, this renovation is sorely needed. There will eventually be a limit to what can be produced and stocked, so other actions may be neccessary in the future. One possibility is a program like Missouri's (Hicks, et al. 1983). By creating special zones for catch and release, trophy or other types of fishing, pressure on the resource can be better controlled. The success of a program like

this would lie in a well conceived educational program.

An important reason set forth for implementing interpretive programs is to help the public to understand the environment and the consequences of their actions. From the true/false questions in this survey (Tables 10 and 11), it appears that at least some segments of the public have a fairly good grasp of some very basic concepts. Yet at the same time, many of the visitors did not seem to be able to apply these concepts in specific situations. An example of this would be the questions dealing with habitat and effects on the environment. Most people were able to agree with a straight forward item such as "A population increase of one species may have a definite impact on other species living in the same area." Yet after responding to a question such as that, many visitors would then proceed to complain about "why there aren't as many deer as there was back when . . ." It appears that much of the public does not really comprehend the impacts of Arizona's population growth on the state's wildlife. In the set of attitude questions which asked visitors to rate threats to wildlife (Table 8), habitat loss was deemed serious, but less so than pollution. Although pollution is a serious problem in some areas, its perceived importance is probably due to the exposure given by the media. Most biologists would agree that the greatest threat, especially to the larger animal species, is habitat loss.

Again, it should be pointed out that responses on this survey, are most likely biased toward the higher end of the knowledge scale. With this considered, the need to educate the general public seems even more important. There is certainly no consensus as to whether interpretation definitely affects visitor attitudes, but Hill (1983) did conclude that an interpretive program could increase public awareness:

If the goal of educating resource users is to alleviate problems, then increasing visitors' awareness of those problems may be an important first step. The interaction between awareness and behavior is complicated, but it is hoped that increased awareness will lead to behavior changes that will make the job of managing resource users easier.

The last of the reasons given for interpretive programs is to enhance visitor experiences. This survey shows that people are interested in visiting hatcheries, and for the most part, they enjoyed their visit. However, a large proportion of these visitors also expressed a desire to find out more about what they had seen. When asked about needed improvements, 37 percent asked for more information (Table 2.) Results of other surveys have also pointed out a desire by the public for more information/education programs. A surveyor in Missouri (Witter et al. 1980) found that 61 percent of respondents said they would be likely to visit a nature center offering exhibits on fish, wildlife and forests. The analysis of that study later went on to

say: "The survey substantiated the findings of the public meetings which showed high interest in conservation education, outdoor skills training and nature interpretation." In Kellert's survey of American attitudes toward wildlife (1979), three out of four people thought that it was worthwhile for the government to spend time and money on trying to educate the public about wildlife.

Fish Hatcheries as Sites for Interpretation

There seems to be an inherent public interest in hatcheries, refuges and other places which involve natural resources. At Page Springs many visitors commented on a need to "have something like over there at the Monument" (in reference to nearby Montezuma Castle National Monument). Programs at units of the National Park System are well known and popular with the public, but few other natural resource management agencies have done much to utilize the potential that lies in this method of communication. Hatcheries are a natural spot for interpretation, as shown by successful programs at places like Capilano NFH, Vancouver, B.C., and Wolf Lake SFH, Michigan.

At the three Arizona Game and Fish Department hatcheries surveyed in this study, many factors were identified which showed their popularity with the public. Total estimated annual visitation was over 58,000 (Figure 2), with almost half being repeat visitors (Table 12).

Table 12. Percent of primary respondents who were repeat visitors (at least one previous visit).

	<u>Canyon Creek</u>	<u>Page Springs</u>	<u>Tonto Creek</u>	<u>% Total sample</u>
Yes	40.0	53.3	44.0	48.1
No	60.0	47.7	66.0	51.9

Table 13. Visitors' source of information for finding hatcheries.

<u>Source</u>	<u>% Total sample</u>
Friends or relatives	45.2
Newspaper or magazine	2.5
Road sign	29.9
Map	8.0
Other *	14.4

* The most frequent responses in this category were such statements as: "I just always knew it was there."

After they had seen the hatchery, many people told others (Table 13, 43 percent had heard about the hatcheries from friends or relatives). Many visitors liked the hatcheries so well, that they would bring out-of-town visitors with them. The second highest source of information about the facilities came from road signs. Many people said that they had not planned on visiting, but saw a road sign and thought it would be interesting.

Overall, hatchery visitors are a very diverse group of people. Though generally well educated, a broad spectrum is represented (Table 4). There is a wide range of ages represented, as well as group types, although families predominate. The hatchery visitors generally come from cities of 100,000+ and represent a range of economic backgrounds. There were differences, but there were also many similarities shown in the wildlife related activities which visitors participated in (Table 5). It is not surprising that a large proportion fish (60 percent) or hunt (29 percent) (combined total was 65 percent), and this was the basis for determining the consumptive/nonconsumptive user breakdown. By not participating in hunting or fishing, a person was considered to be a nonconsumptive wildlife user, however, many consumptive users also participated in other activities.

By implementing an interpretive program at some of it's hatcheries, the Game and Fish Department would be able

to reach an audience that today is largely ignored. State wildlife agencies can no longer ignore the nonconsumptive wildlife user. Shaw's comments (1975) in the introduction of this paper pointed out a shift in American attitudes and values toward wildlife. Agencies need to reach out to individuals who are uncommitted in their attitudes, to gain political support. The attitudes of the nonconsumptive group in this survey did not point out any great deal of support for current management practices, but at the same time, they were not against them (Table 9). In addition, a hatchery interpretive program could reach a large number of the Department's "normal" constituency, both as an educational and as a public relations tool.

From the visitors' standpoint, an interpretive program would satisfy an existing demand. The hatcheries are inherently interesting and nearly every visitor was able to come up with a whole array of questions about the facilities and their operation.

Recommendations for an Interpretive Program

To properly design an effective program, the first thing to be considered is the message that is to be conveyed. Next, the target audience(s) must be specified. There are a wide variety of methods of interpreting a message, and some work better with different types of information and audience. Therefore, it is necessary to

identify the message and audience before a delivery technique is chosen.

In designing a program to satisfy some of the reasons presented for interpretation, different types of content information will be needed. When teaching about the environment, agencies should strive to teach the same basic concepts. To this end, many environmental education books have included curriculum frameworks about which programs may be designed. One of the most complete, and also one of the best at recognizing human/wildlife interactions is found in Project WILD (WREEC 1983). Others which might be considered include the U.S. Forest Service Scope And Sequence For Conservation And The School Curriculum (Ford 1981) and that found in Arizona Wildlife, An Elementary Teacher's Activity Guide (Kennedy, 1976).

Some of the other reasons for interpretation dealt with agency management goals, policies and image. Content area for these subjects must come from the agency itself, but much direction can be obtained by assessing areas of public misunderstanding. Questions in this survey pointed out a lack of information about financing and the decision making process. Another source of information could be questions received by phone at Department offices.

An additional concern in determining content for an interpretive program is public interest. Wagar (1974) stated: "Too often, however, we become so concerned with

the payoff to ourselves that we overlook the payoff for our visitors. As a result, we often concentrate on what we want people to know rather than why they would enjoy knowing it." With this in mind, visitors were asked what most and least interested them at the hatcheries (Table 2 and 3). With some creative writing, the public's interests can be combined in an effective way with the agencies' message. As an example, one question people frequently asked was what was being fed to the fish. This could be answered with an explanation of hatchery feeds and a comparison to natural foods, thus introducing the concept of food chains. Another example would be tying together the concept of adaptation to transporting and stocking of fish.

Wagar (1974, 1976) pointed out three major steps which are crucial to effective communication: 1. Clear objectives that define what is to be accomplished; 2. Messages that attract and hold attention; and 3. Evaluation to show how well the objectives are being achieved. With the objectives then set (what the message is), an appropriate delivery technique must be chosen. Types and combinations of techniques have been described by many authors, a few of which were mentioned in the Review Of Literature.

Wagar (1974) said that to maintain greatest interest, interpretation must be dynamic, rewarding and easy on the visitor. In a study of visitor centers, visitor

interest was highest where sound and motion were included, and was lowest for inert displays of mounted photos and written labels. While in most circumstances person-to-person interpretation would be best, in a situation such as small to medium sized fish hatcheries, budget and manpower restrictions would preclude this. In the absence of live interpretation, recorded sound can be effective because it allows the presentation of detailed information with lessened visitor fatigue. Cassette tape players have been successfully used, however they would require a person available to distribute and collect them. Video tape or slide programs are another alternative. These would require a special room, which is already available at Canyon Creek, and could be included in upcoming renovations at other facilities.

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

This study was designed to evaluate public usage of Arizona's state fish hatcheries and determine the potential for interpretive programs. Although not generally thought of as recreational sites, Arizona's hatcheries were visited by an estimated 58,000 people in the year from June 1983 to May 1984. It is not unexpected that a large proportion of the visitors are part of the Game and Fish Department's traditional constituency (65 percent hunt or fish), but there are also a good number of visitors who do not hunt or fish. Shaw (1974, 1975) spoke of the changing attitudes and values of the public toward wildlife and the need for agencies to recognize this change. Kellert (1979) and Shaw (1974) both found differences in knowledge about wildlife between consumptive and nonconsumptive users. The results of this study also show that fishermen and hunters knew more about fish, wildlife and management than did nonconsumptive users. However, there was little difference between groups in response to general ecology questions. Overall, the hatchery visitors did well when presented with very straight forward questions about impacts on the environment, but had problems with applying these concepts to various

applications.

In evaluating visitor attitudes it was found that the nonconsumptive users are generally not opposed to consumptive uses. Yet at the same time, they are also not strongly in favor of current management practices.

At Arizona's state fish hatcheries there exists a great potential for interpretive programs. Hatcheries are popular with a large number of people, most of whom have a desire to learn more while visiting. By implementing a program, the Game and Fish Department would show the visitors that they are concerned with satisfying the public. At the same time, the Department could benefit by being able to promote an understanding of itself, its policies and programs. The potential not only exists to reach an audience that it is familiar with, but also one which it needs to gain more support from (the nonconsumptive wildlife enthusiasts).

A variety of techniques are available to interpret a given message, but many cost too much or require unavailable manpower for use in this situation. At the time of this writing, planning was starting for the renovation of the state hatchery facilities. Of the three included in this study, Canyon Creek will receive no major changes, so implementation of a program could begin at this time. At Page Springs and Tonto Creek, major structural changes will be made, so no actual construction of any type of signs or

displays should be undertaken. Now is the time, though, to begin planning so that if any special accommodations are needed, they can be included in the overall rebuilding program.

Recommendations

Of the many types of media available, some forms would be better suited to use at the hatcheries than others. The ideal program to reach the maximum audience would include a variety of teaching methods, however funding limitations usually preclude the creation of such programs. With this in mind, the following is a prioritized list of options which would be well suited to the situation at Arizona's State fish hatcheries:

Table 14. Recommended options for hatchery interpretation

1. An automated slide or video program explaining the how and why of fish culture.
 2. A self-guided tour of the facility, composed of a series of signs and/or displays, with an accompanying brochure.
 3. Use of student interns or volunteers to interpret hatchery operation to visitors during peak use periods
 4. Secondary brochures, signs or guided tours to further interpret the natural features found on the hatchery sites
-

By implementing the first two of these recommendations, the majority of hatchery visitors would be reached. Unfortunately, the potential for vandalism must be taken into account, so the slide or video program should probably be set up to project out from a locked room. The visitor's room at Canyon Creek adjoins the office, so the placement of a heavy window between the two rooms would allow for this. The picture could then be transmitted onto a rear projection screen mounted behind the window. A similar arrangement could be built at the other two facilities, or a window could be placed so that it faces out onto a covered ramada. During busy days the program could be set on a timer, (with start times posted), and in other seasons it could be set up with a visitor operated starting button.

In addition to a slide or video presentation, a self-guided tour could be constructed that complements the first program. Display or brochure statements would be written to refer back to the media program. In addition, questions could be asked about forthcoming stations (and answered there) to give the visitors a sense of reward for the knowledge gained. A tour of this type should be accompanied by a brochure. Hill (1983) said that although some visitors did not read the materials at the place handed out, many would take them home to read later.

By using the combination of these two methods, it

should be possible to reach a large audience, for minimal initial and maintenance costs. Yet as with any type of program, its effectiveness can only be estimated until it is in place and being used. The logical next step, once an on-site program is in place, would be to conduct a study to evaluate use of the materials and any knowledge changes as a result of the program.

In final conclusion, it will be difficult for biologists and managers who are working with specific fish and wildlife programs to commit part of their already strained resources toward education of the public, yet that is what is sorely needed. Kellert (1980), in evaluating contemporary trends in American perceptions of wildlife, summarized this need by saying:

This is an age of some confusion and transition in contemporary wildlife values. A long and difficult effort appears to lie ahead before one can expect sufficient broad based concern for wildlife to support needed programs in protection and restoration. Nevertheless, a bedrock of affection and concern are present, no matter how naively manifested. The transformation of this fundamental interest to a more ecological and appreciative basis represents the challenge and anxiety of the wildlife management profession today. It will require much patience, empathy and tolerance, and a willingness to be involved with many different kinds of people. The challenge is great, but so are the stakes, and the future well-being of our wildlife resources may depend on the outcome.

APPENDIX A

STATE FISH HATCHERY VISITATION STUDY
SURVEY INSTRUMENT

P T C _____ # _____

UNIVERSITY OF ARIZONA
SCHOOL OF RENEWABLE NATURAL RESOURCES
1983 - 1984 STATE FISH HATCHERY VISITATION STUDY

1. How did you first find out that the Game and Fish Department operated a fish hatchery here? (check only one)
-] _____ Friends or relatives _____ Road sign
_____ Newspaper or magazine _____ Map
_____ Other (please describe) _____
2. Have you visited this facility before? _____ Yes _____ No
-] _____
3. How much time did you spend here today?
-] _____ Less than 15 minutes _____ 45 minutes to 1 hour
_____ 15 - 30 minutes _____ More than 1 hour
_____ 30 - 45 minutes
4. Did you talk with any Game and Fish Department employees here today (other than this survey)?
-] _____ Yes _____ No
5. What is the main purpose of this trip or outing? (check only one)
-] _____ Camping _____ Driving and sightseeing
_____ Fishing _____ Picnicking
_____ Hiking _____ To visit this hatchery
_____ Other (please describe) _____

6. Are you here with: ☐ Friends or alone ☐ Family members
 ☐ Scout group ☐ School group ☐ Tour group
 ☐ Club ☐ Other (please describe) _____

7. Where did you stay last night?

] ☐ Campground —> name of campground: _____
] ☐ Camped out but not in campground —> where? _____
 ☐ Motel or resort —> where? _____
 ☐ Friends or relatives living in area
 ☐ Vacation home
 ☐ Home

8. Where do you plan to stay tonight?

] ☐ Campground —> name of campground: _____
] ☐ Camp out but not in campground —> where? _____
 ☐ Motel or resort —> where? _____
 ☐ Friends or relatives in area
 ☐ Vacation home
 ☐ Home

9. In which of the following wildlife oriented activities do you consider yourself to be an active participant?

] ☐ Fishing ☐ Nature photography
] ☐ Birdwatching ☐ Nature walking, observation/study
] ☐ Hunting ☐ Other (please describe) _____

10. Have you held an Arizona resident hunting, fishing, combination, trapping, or pioneer license in the past two years?

] ☐ Yes ☐ No

11. The following is a list of some possible threats to North America's fish and wildlife populations. Using the following scale, please rate how serious you consider each of these threats to wildlife in general today. (indicate a rating 1 - 5 for each blank)

Scale:	extremely serious 1	quite serious 2	moderately serious 3	slightly serious 4	not serious 5
--------	---------------------------	-----------------------	----------------------------	--------------------------	---------------------

- | | | |
|---|-------|--|
|] | _____ | Pollution |
|] | _____ | Legal sport hunting |
|] | _____ | Illegal hunting |
|] | _____ | Loss of habitat (shelter, food, etc. that animals need to survive) to human developments |
|] | _____ | Unsound wildlife management practices |
|] | _____ | Predation by other animals |
|] | _____ | All terrain vehicles (dirt bikes, four wheel drive trucks) |
|] | _____ | Commercial trapping |

12. Using the following scale, circle the letter that best represents your feelings about each of the following statements:

DS = Disagree strongly
 D = Disagree
 U = Undecided
 A = Agree
 AS = Agree strongly

- | | | | | | | |
|---|--|----|---|---|---|----|
|] | Hunting is essential to prevent overpopulation of some types of wildlife. | DS | D | U | A | AS |
|] | Hunters should not be expected to pay the major part of nongame management costs. | DS | D | U | A | AS |
|] | Nonhunting wildlife enthusiasts do not have an acceptable way to help pay the costs of management of nongame animals by government agencies. | DS | D | U | A | AS |
|] | A good way for government to help wildlife is to ban hunting. | DS | D | U | A | AS |

- | | | |
|---|---|-------------|
|] | Wildlife management as currently practiced by government agencies has a good balance between game and nongame management. | DS D U A AS |
|] | Nongame animals are neglected by government wildlife management agencies. | DS D U A AS |
|] | Wildlife management as we know it today benefits mostly the hunter. | DS D U A AS |
|] | Nonhunting wildlife enthusiasts should have a say in government wildlife management agencies equal to the say hunters now have. | DS D U A AS |

13. Trout stocking in Arizona's central and northern waters is most often required because: (check only one)

- | | |
|---|---|
|] | <input type="checkbox"/> Trout don't reproduce in the wild in Arizona |
| | <input type="checkbox"/> Fishermen catch more fish than can be naturally produced |
| | <input type="checkbox"/> Low fish populations due to water pollution |
| | <input type="checkbox"/> Undecided or don't know |

14. Please indicate how you feel about the following statements.
If you feel it is:

True, mark a "T"

False, mark an "F"

If you are undecided or don't know, mark a "U"

- | | |
|---|---|
|] | <input type="checkbox"/> The rainbow trout that are stocked by the Game and Fish Department are a native Arizona species. |
|] | <input type="checkbox"/> Hatchery trout are capable of surviving in lakes and streams as well as fish naturally raised there. |
|] | <input type="checkbox"/> Raising trout in a hatchery is basically "fish farming." It's main purpose is raising fish to be caught. |
|] | <input type="checkbox"/> If trout stocking is stopped, the ecological balance of Arizona's lakes and streams will be destroyed. |
|] | <input type="checkbox"/> Disturbances of the land (agriculture, tree harvesting, road construction) are very likely to harm the water quality of lakes and streams and their ability to support fish. |
|] | <input type="checkbox"/> The species called the Native or Arizona trout is on the Federal Threatened and Endangered Species list. |

15. Please indicate how you feel about the following statements:
(use "T", "F" or "U")

-] ___ The Arizona Game and Fish Department is required by law to manage all of the state's wildlife, including all hunted and nonhunted species.
-] ___ The Arizona Game and Fish Department receives no general fund tax dollars.
-] ___ Final decisions on wildlife matters in Arizona rest with the Game and Fish Commission (appointed by the Governor), not the Game and Fish Department.
-] ___ If it were not for sport hunters, there would still be plenty of wildlife.
-] ___ Hunters and fishermen contribute more money toward wildlife protection and habitat improvement than any other wildlife interest group.
-] ___ In recent years, sport hunting has nearly eliminated several species of wildlife in North America.
-] ___ Predator control is usually a very effective technique for increasing populations of game animals.

16. Please indicate how you feel about the following statements:
(use "T", "F" or "U")

-] ___ For every bird that survives to reproduce in the wild, there are many others that die due to starvation, freezing, diseases, etc.
-] ___ Wildlife is a renewable resource.
-] ___ Loss of habitat does not affect animal populations.
-] ___ A population increase of one species may have a definite impact on other species living in the same area.
-] ___ Everything a person does has an effect on the environment.
-] ___ Forest fires are always bad for wildlife.

17. Are you an Arizona resident? ☐ Yes ☐ No
]
] If not a resident, what state or country do you live in? _____

] If not a resident, do you stay here for the winter? ☐ Yes ☐ No
18. What is the size of the city or town in which you presently live?
] ☐ Large city (more than 500,000) ☐ Small town or village
 ☐ Medium city (100,000 to 500,000) ☐ Rural area (farm, etc.)
 ☐ Suburb of medium or large city
 ☐ Small city (25,000 to 100,000)
19. What city or town do you presently live in? _____
]
20. How many weeks of vacation do you have each year? (write "retired" if
 this applies)
] _____
21. What is the highest level of education completed by yourself?
] ☐ Grade school ☐ Some high school ☐ High school graduate
 ☐ Some college ☐ College graduate ☐ Some graduate school
 ☐ Graduate degree completed ☐ Technical or trade school

Thank you for completing this part of the survey!
 Please return this form to the surveyor, who has
 just a few more brief questions for you.

Code # _____

22. What did you find most interesting at the hatchery today? _____
| _____
23. Did you see anything that you disliked here, or thought could have been added or done better? _____
| _____
24. Did you pick up the hatchery brochure? ____ Yes ____ No
|
25. Did you read the large sign? ____ Yes ____ No
|
26. Did you sign the guest book? ____ Yes ____ No
|
27. Did you read the small signs on the raceways and in the buildings?
(Canyon Creek only) ____ Yes ____ No
|
28. Did you go into the visitor's room? ____ Yes ____ No
|
29. Did you contribute to any animal or conservation organizations within
the last two years? ____ Yes ____ No
|
| If yes, which organizations were they? _____
| _____
30. Did you know about the Arizona State Income Tax Checkoff for Nongame
Wildlife Conservation? ____ Yes ____ No
|

31. If yes, did you donate to this fund using the checkoff?
] ☐ Yes ☐ No

32. If yes, how did you first hear about the checkoff? ☐ Newspaper
] ☐ TV ☐ Radio ☐ Tax preparer ☐ Friends or relatives
 ☐ Bumper stickers ☐ On tax form ☐ Other _____

33. Did you prepare your own state taxes last tax season?
] ☐ Yes ☐ No

34. May I ask your age? _____ What are the ages of the others in your
] group?

35. Was the total income of your household last year before taxes and other
 deductions:
] under 10,000 \$10,000 - 20,000 \$20,000- 30,000 over \$30,000

36. Do you have any other questions or comments concerning either part of
 this survey or anything else you've seen here today?

] Number in group: _____

] Number of each sex in group: _____ Male _____ Female

]

APPENDIX B

ESTIMATE OF MONTHLY VISITATION,* JUNE 1983 - MAY 1984

		<u>Canyon Creek</u>	<u>Page Springs</u>	<u>Tonto Creek</u>
Response rate		20%	33%	28%
Average group size		4.1	3.3	3.7
SUMMER	% of year	60.8	31.9	60.5
	June	1558	1690	6630
	July	2295	2150	7920
	August	1845	1940	4355
FALL	% of year	17.8	21.9	14.0
	September	1210	1240	2640
	October	310	1650	1190
	November	145	1080	555
WINTER	% of year	0.8	15.9	5.7
	December	0	630	345
	January	0	890	660
	February	80	1360	780

		<u>CANYON CREEK</u>	<u>PAGE SPRINGS</u>	<u>TONTO CREEK</u>
SPRING	% of year	20.6	30.2	19.8
	March	165	2040	1005
	April	245	1730	1900
	May	1525	1700	3300
TOTAL 58,760		9380	18100	31280

* Numbers rounded to nearest fifth whole number.

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