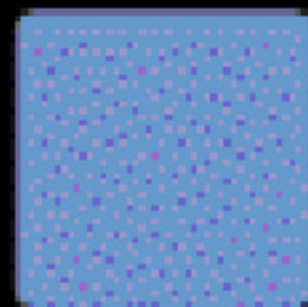
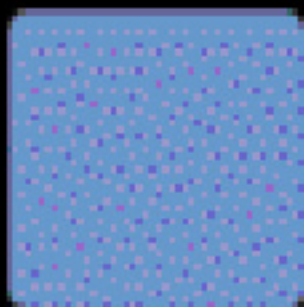
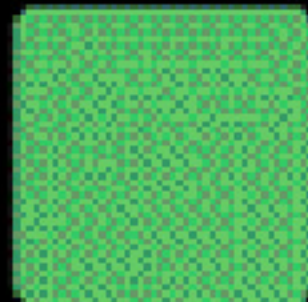
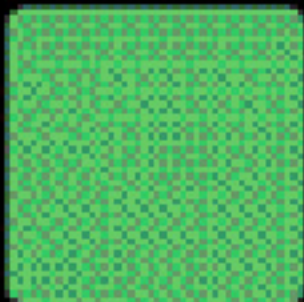




Visitor Learning in Zoos and Aquariums



A Literature
Review

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Dear Colleagues:

Inherent in most zoo and aquarium missions is a desire to change visitor behavior and attitudes, with the aim of creating a more environmentally aware and responsive population. Our institutions hope to increase awareness of conservation and conservation actions and that our visitors will become better stewards of the environment, yet we lack the data to determine the extent to which we are successful.

We're convinced of the value of our exhibits and programs, yet we are hard-pressed to cite specific research when questioned. I'm delighted that the Conservation Education Committee has made visitor research a priority and has commissioned a study to aid AZA member institutions in determining their conservation education effectiveness. We believe that the study results will help AZA and individual institutions demonstrate the value of a zoo/aquarium visit to legislators, funders, the public, and critics, as well as to ourselves.

Visitor Learning in Zoos and Aquariums: A Literature Review, is a valuable first step in helping our institutions understand what we now know about our impact on visitors and identifying where the gaps are in our knowledge. I am pleased to share this document with you and look forward to the next steps of this ambitious and ground-breaking research initiative.

Sincerely,



Sydney J. Butler
Executive Director
American Zoo and Aquarium Association

Preface

Visitor Learning in Zoos and Aquariums: A Literature Review is a product of the Multi-Institutional Visitor Research Project (MIRP), which was commissioned by the Conservation Education Committee of the American Zoo and Aquarium Association (AZA). The project seeks to investigate the overall impact of visits to zoos and aquariums on visitors' conservation-related knowledge, attitudes, affect, and behavior, through comprehensive research at representative zoos and aquariums throughout the United States.

The American Zoo and Aquarium Association strongly supports the Multi-Institutional Visitor Research Project, an important step in better understanding the impact of zoos and aquariums on our visiting publics. Through the work of AZA's Conservation Education Committee, in col-

laboration with the Institute for Learning Innovation, MIRP was conceived and designed to address fundamental questions about our role in conservation, science and education. AZA member institutions are leaders in providing experiences that inspire and inform people about the natural world; these efforts will be made more effective by utilizing the MIRP research findings.

The MIRP team wishes to thank AZA's Conservation Endowment Fund for support of this project, and in particular, Bruce Carr, Ph.D., Director/Roy Disney Chair of Conservation Education for his tireless enthusiasm and support of this initiative. The Institute for Learning Innovation was an integral part of the project as well, and provided wisdom, insight and vast experience in guiding the research design.

Introduction

The American Zoo and Aquarium Association (AZA) has dedicated Conservation Endowment Funds (CEF) to conduct a multi-institutional research project (MIRP) that will investigate the overall impact of visits to zoos and aquariums on visitors' conservation-related knowledge, attitudes, affect, and behavior. With oversight and input from MIRP Co-Principal Investigators and key advisors, the Institute for Learning Innovation is carrying out the following goals:

1. Conducting a literature review;
2. Developing an overall research plan, design and methodologies for conducting a multi-institutional research project or series of projects;
3. As necessary and appropriate, conducting limited pilot testing of some of the proposed methodologies; and,
4. Assisting with the development of a full proposal (or proposals) to fund implementation of the research effort.

This present report outlines the results of the literature review for this proposed area of study.

Overview

In 1972, Robert Sommer wrote in *Natural History*, "What do we learn at the Zoo?" an article discussing the public educational role of zoos (Sommer, 1972). In light of his belief that zoo practices at that time (caged animals at most zoos) perpetuate visitors' misconceptions and erroneous notions of nature, Sommer addressed the need for more systematic inquiry into what visitors learn about animal behavior and environments during a zoo visit. While he did not use the term "conservation," he did suggest that research is greatly needed in this area, stating, "We must learn the extent to which the zoo serves to develop a proper environmental ethic."¹

In the three decades since Sommer wrote this essay, the presentation and treatment of animals by zoos and aquariums has greatly improved, but there is still a tremendous need for visitor research that truly documents the role that zoos and aquariums play in facilitating public understanding of conservation. In a recent overview of a research

study conducted at Zoo Atlanta, Swanagan commented in the literature review that research specifically documenting the impact of conservation messages in zoos, and by extension aquariums, is in its infancy (Swanagan, 2000).

Other researchers have reinforced this idea, stressing the need for research that documents the impact of visits to zoos and aquariums on visitors' conservation knowledge, awareness, affect, and behavior (Churchman & Marcoulides, 1991; Gutierrez de White, 1994; Tilt, 1994; Birney and Matamoros, 1995; Stoinski, Ogden, Gold, and Maple, in press). In particular, Stoinski, et al. suggested a need for research that documents which aspects of zoo experiences result in affective change and which further examine the link between education, conservation attitudes and conservation-related behavioral change, with the hope of ultimately being able to describe the best methods for achieving conservation education goals.

¹ In the context of this article, Sommer's environmental ethic referred to environmental respect and stewardship, in other words, a conservation ethic.

Braus and Champeau (1994) support this idea when describing the results of a national biodiversity education survey conducted by the World Wildlife Fund. This survey assessed the needs, thinking, and practices of educators, and was undertaken before starting the Windows on the Wild national environmental education program, designed to increase the environmental literacy of youth. Zoo and aquarium educators participated in the survey, which not surprisingly revealed that the majority of formal and nonformal educators felt that environmental education should be a priority in their institutions and that more research was needed to understand how to most effectively improve environmental literacy. Ewart and McAvoy (1994) also discussed the role of outdoor education research in the formation of public policy on natural resource management, social issues, and education. They argued that many environmental, social, and educational problems are rooted in the lack of public knowledge about natural resources at a time of heightened and conflicting demands for those resources.

Clearly there is a need for research. Even a recent compilation of doctoral dissertations, theses, and project abstracts in the area of environmental education and environmental communication revealed few studies that had focused on these important questions (Smith & Nicholas, 1996). Part of the need is fueled by a current debate in the field: 1) Are visitors to places like zoos and aquariums interested in and expecting to learn about conservation or are they more interested in only seeing and learning about the animals? and 2) Can learning about wildlife and wild places actually foster more conservation-minded individuals? (Isenhardt, 1996). As this review will demonstrate, the findings are unequivocal and researchers have even suggested that understanding the effect of pet ownership on people's attitudes and relationships with animals may be a useful body of research to

explore (Wells and Hepper, 1995).

However, it is not totally accurate to say that no audience research has been conducted in zoos or aquariums. On the contrary, in the thirty intervening years between Sommer and Swanagan, numerous studies of zoo visitors (and fewer in aquariums) have been conducted. As David Churchman noted, these studies have addressed issues of audience, in terms of visitor demographics and motivations, visitor interactions with zoo programs and staff; the ever-changing purposes of zoo education; the educational components of zoos (libraries, animals, plants, signage, etc.); and visitor studies research (Churchman, 1987). But the vast majority of the studies investigate public perception of animals, with very little attention paid to the overall conservation messages conveyed in most zoos and aquariums. Interestingly, though many of these same studies cited the potential for zoos to positively influence their visitors' conservation knowledge, affect, attitude and behavior, these claims were not substantiated or validated by actual research.

In a similar vein, several AZA proceedings published in the last 15 years were found to include presentations addressing the role of zoos primarily in public conservation education. However, as with the existing research studies, substantive research that supported the statements of many of these authors was not found. Little to no systematic research regarding the impact of visits to individual zoos and aquariums on visitor conservation knowledge, awareness, affect, or behavior has been conducted and presented at conferences and/or subsequently published. Very few studies have investigated these questions across institutions and even fewer have done so for an overall visit.

Individual institutions have also conducted their own internal studies of visitors and exhibitions,² however, the vast majority of these studies have been evaluative in nature, focusing on the

² Most prolific have been the Monterey Bay Aquarium and the Brookfield Zoo, which have conducted many front-end evaluation studies designed to assess visitors' prior knowledge and interests, as well as conducting a number of summative evaluations assessing the impacts of individual exhibitions.

knowledge and interest of visitors in a very specific topic or the effectiveness of a specific exhibition, with few generalizable results. Very few of these studies have broadly investigated the overall impact of visits to an individual institution, let alone across institutions, and this research has rarely been published in scholarly journals or other such forums. Clearly, there is a great need for the multi-institutional study proposed by MIRP.

There are a number of research studies that suggest fruitful directions that this research study might take, as well as studies that suggest potentially interesting methodologies to utilize in the full

research study. This literature review will outline three areas of research with useful information: 1) studies focusing on the prior knowledge, attitudes, affect and behavior (“conservation consciousness”) of visitors to zoos and aquariums, as well as a few about the general public and/or specifically people who do not visit these institutions; 2) studies investigating the impact of a visit to a specific exhibition or overall visit to a zoo or aquarium; and, 3) studies not directly related to zoos and aquariums that utilized interesting methodologies or whose findings might have relevance to the full study.

Studies Focusing on Visitors' Prior Knowledge, Attitude, Affect and Behavior ("Conservation Consciousness")

Numerous front-end or baseline studies have been conducted by various institutions. These studies aim to assess the public's incoming awareness and knowledge of, attitudes toward, and interest in conservation-related ideas or specific topics that are being considered for exhibition development. Some studies reviewed here did not specifically address conservation, however, they were reviewed and included because they suggested an approach that might be useful and which might provide some direction for MIRP.

Some studies have surveyed public interest, awareness and knowledge in the area of conservation and environmental awareness. In 1998, the National Environmental Education and Training Foundation (NEETF) commissioned Roper Starch Worldwide to conduct a survey to help educators, policy makers, business executives and media representatives better understand what Americans know about the environment. The survey of 2004 adults over the age of 18 included an assessment of attitudes and behaviors around environmental issues, as well as the prevalence of several environmental "myths." Overall, the report revealed that environmental knowledge among Americans was quite low. In particular, there were widespread and persistent examples of misinformation regarding environmental issues among all demographic groups. However, despite a lack of knowledge about the issues, most of those surveyed demonstrated great concern for the issues. The survey concluded that increasing the public's awareness of environmental issues, and addressing misconceptions could result in positive influences on their environmental knowledge and behavior.

Another study by Westervelt (1987) examined prevalent beliefs and behaviors of children taken from an analysis of a sample of 3078 fifth- and sixth-graders. The results explored attitudes, knowledge, wildlife preferences, and behaviors and their relationship to attitudes and knowledge.

Results suggested that children had a variety of orientations based on their previous knowledge, attitudes and experience; behaviors were closely tied to knowledge and experience. In particular, urban children lacked much knowledge and experience with wildlife, which seemed to result in naïve views and behaviors. Researchers suggested that knowing about these orientations would be useful in developing a knowledgeable appreciation of the natural world and that there should be a focus on urban children at the elementary level, with the encouragement for them to actively engage in specific activities that benefit the environment. More (1977) reinforced the ideas of focusing on the young elementary and early childhood years by discussing the types of wildlife stories that are present in children's literature and the persistence of childhood perceptions of wildlife and their effect on adult behavior. Focusing a study on families would inform this perspective.

Other studies have investigated visitors' entering knowledge, attitudes and behaviors fairly broadly within the zoo and aquarium field and outside as well. Part One of a study at the Chicago Zoological Society and Lincoln Park Zoological Society examined zoo visitors' preferences for resources and programs, public perceptions of zoos, and when and how often they visit. Part Two of the study examined visitors' and non-visitors' conservation attitudes and knowledge, commitment to animal-related and environmental concerns, and self-reported environmentally responsible behaviors, collectively referred to in the study as "environmental consciousness" (Chicago Zoological Society & Lincoln Park Zoological Society, 1993). Results revealed that visitors with higher income and more formal education felt more empowered to solve environmental problems than people who did not visit zoos (they also tended to have lower incomes and less formal education). The report also suggested that people who actively participated in "nature-sensitive" outdoor activities demonstrated

more knowledge of conservation issues and behaved in more environmentally responsible ways as consumers and volunteers. An important caveat to this study was its finding that regardless of their visiting behavior, few people who said they financially support "conservation organizations" supported zoos as conservation organizations. The conclusion drawn in this study was that few people consciously think of zoos as conservation organizations, suggesting a significant challenge to overcome when considering the impact of zoos on visitors' conservation awareness and knowledge and an area for further focused investigation.

Another study, conducted at the Cleveland Metroparks Zoo, explored long-lasting effects of early zoo visits (Holzer & Scott, 1997). Researchers specifically undertook to determine what benefits zoo visitors seek as adults, what impact the frequency of their childhood visitation with parents has on the benefits they seek as adults when visiting zoos, and what relationship childhood visitation has to adult zoo behavior in general. The findings revealed that visitors seek several benefits when visiting zoos, including "education," such as becoming more aware of environmental problems, becoming more knowledgeable about nature, furthering one's education, and/or learning more about animals. Findings also reinforced previous findings that there is a positive relationship between childhood experiences and adult behavior patterns and leisure activities. The researchers also found that adults who had visited zoos as children with their families were more likely to emphasize the educational benefits of zoos, visit more zoos, and be more committed to zoos.

A conservation baseline study conducted by Jeff Hayward of People, Places & Design Research (1995) at the Monterey Bay Aquarium (MBA), assessed visitors' interest in, attitudes toward, and knowledge of conservation issues related to the overall aquarium. The Aquarium was interested in determining how effectively they were meeting their mission as a conservation organization. Although they did not explicitly explore whether visitors perceived their institution as conservation-oriented, results suggested that visitors did. Four

hundred and fifty groups were interviewed and administered an on-site questionnaire. Results from these questionnaires indicated that most visitors wanted to know more about conservation. In particular, visitors wanted to know how not caring about conservation issues influences the environment, about the problems wildlife faces, and what the average person can do to help. They also wanted to see examples of successful conservation initiatives. Interestingly, most visitors were found to be sympathetic enough to environmental concerns that MBA staff felt that stronger, more explicit conservation messages than were present would be well received by their audience.

A multi-site study (Dunlap & Kellert, 1989) was designed to investigate the impact of informal learning at three zoological parks. Researchers at the Zoological Society of Philadelphia (ZSP), the Sonoran Desert Museum (SDM), and the Sedgwick County Zoo (SCZ) investigated visitor motivations and expectations prior to a visit to one of these institutions. To measure impact, researchers collected data before and after the visit, asking incoming visitors about their motivations and expectations for going to the zoo and applying a variety of methodologies, including interviews and questionnaires. In all three facilities, family enjoyment and the opportunity to see the animals were rated among the most important reasons for visiting. Interestingly, visitors to the SDM were much more likely than visitors to the ZSP and the SCZ to report that the desire "to learn about the animals" and "to learn about wildlife conservation" were reasons to go to the zoo. Attitudinally, visitors to the SDM had a significantly higher rating on the "ecologicistic" and "scientistic" scales (scales that suggest interest in learning about the science and ecology of the animals) than did visitors to the other two zoos. With regards to their perceptions of what zoos had to offer the public, most incoming visitors cited the aesthetic, emotional, and entertainment appeal of zoos. However, more than twice as many visitors to the SCZ than to the ZSP or the SDM supported the statement, "I am impressed by the power and control zoo keepers must exert over their animals to get them to behave properly." In fact, SCZ visitors were most likely to have greater

indifference and fear of animals, and rate significantly higher on the "dominionistic" and "negativistic" scales, designed to assess people's attitudes toward animals. (It is important to note that in subsequent years, some of these scales have been questioned.)

Not all studies have focused specifically on conservation. In 1977, the John G. Shedd Aquarium set out to establish who their average visitors were and what attitudes and awareness they had regarding various aquarium-related issues (Serrell, 1977). While conservation itself was not explicitly examined in the survey, the findings were revealing in a few ways that are pertinent to this review. First, when asked what a trip to an aquarium should be, 60% said it should be an educational experience, although in general, visitors rated education less frequently than recreation as a reason to visit the Aquarium. Second, more than three-quarters of the visitors surveyed felt that the Shedd Aquarium should adopt a leading position in educating the visiting public about ecology and pollution. Many of these people also indicated that they frequently watched conservation-related television programs and therefore felt aware of environmental issues. It was noted, however, that visitors' knowledge of concepts related to aquatic ecology appeared to be minimal. Third, when asked to provide advice on how to improve the visit experience, visitors were most likely to suggest increasing educational activities such as developing more detailed panels, selling information pamphlets, sponsoring educational lectures or films, offering classes and workshops about aquatic ecology, and including more hands-on components in exhibitions.

Many of the front-end studies conducted to date have focused on specific conservation issues such as ocean conservation, elephant conservation, bird conservation, monkeys, etc. (Roper Starch, 1998; Bickford, 1993; Birney, 1991; Carlin & Foster, 1994; Price, Ashmore & McGivern, 1994). Most were in-house or contracted front-end studies, conducted by and/or for zoos and aquariums wishing to assess visitors' awareness of, interest in and knowledge of particular topics being considered for exhibition development. In these cases, visitors'

conservation awareness and interest were investigated within the context of specific exhibit subjects, rather than within the greater context of "environmental conservation."

For example, Carlin and Foster (1994) conducted a front-end evaluation of visitors' background knowledge regarding swamps and wetlands in preparation for the exhibition *The Swamp* at Brookfield Zoo. Findings suggested that many visitors were aware of at least some values of wetlands and the fact that they are being destroyed, but the awareness of the level of destruction was severely lacking and the relationship of wetlands destruction to general conservation issues weak. Also the majority of visitors had naïve understandings of what constituted a wetland or swamp.

In another front-end study, Swanagan investigated the impact of interactive experiences on visitors during Zoo Atlanta's elephant demonstration and "bio-fact" program (Swanagan, 2000). In the course of collecting baseline data, using surveys, petitions and solicitation cards, Swanagan found that Zoo Atlanta visitors arrived with a range of experiences with and knowledge about elephants in particular and conservation more generally. Their knowledge was fairly naïve and superficial.

Despite the specificity of most of these studies, two are particularly interesting because they are multi-site studies, similar to the one being proposed for MIRR. One study was conducted in conjunction with the development of a traveling exhibition about salmon at the California Academy of Sciences, San Francisco. Data were collected at five different locations around the United States: California Academy of Sciences, Utah Museum of Natural History, Field Museum of Natural History, Washington State Historical Society and the American Museum of Natural History. Multiple sites were selected to determine if any regional awareness of salmon and other ocean-related issues was present. A total of 281 museum visitors were interviewed using a questionnaire instrument composed of multiple-choice and open-ended questions. The purpose of the study was to assess

visitors' awareness of, interest in and knowledge of salmon fisheries and related environmental issues such as ecology, habitat, and lifecycle. Results indicated that general knowledge and awareness of these issues did not vary by region, although visitors in California and Washington State were more knowledgeable about salmon and somewhat more interested in learning about them.

The other multi-site study also investigated visitors' perceptions of ocean issues (Bickford, 1993). Conducted for the National Museum of Natural History in the course of developing the Ocean Planet exhibition, it sought to determine the range of information museum visitors possessed about ocean and conservation issues. The multi-site format was used to ascertain whether the levels of ocean-conservation awareness varied by region and by proximity to an ocean coast. Results indicated that knowledge and opinion levels of visitors did not vary by region, and that visitors obtained most of their ocean information through various types of media (print, radio, and television), as had been observed by Serrell (1977). In fact, the range of ocean problems mentioned by visitors were most often those that are routinely covered in the media, such as oil spills and trash-strewn beaches. As a result, many of the ecological concerns raised by visitors related to these short-term issues rather than long-term concerns. Results also showed that regardless of their place of residence, visitors possessed limited awareness of the ways that individuals contribute to and can help to prevent or solve serious problems in the oceans.

Another study was conducted in the course of redefining an institution's goals. Birney and Matamoros (1995) outlined the steps taken in the process of redefining the goals of the Simon Bolivar Zoo in Costa Rica. One crucial step in this process was determining visitors' understanding of wild animals and biodiversity in national park areas. While the study did not specifically address conservation, implications for conservation can be made. The study found that only a third of the visitors understood the relationship between plants and animals in the wild. Furthermore, it became clear during the study that like the Chicago

Zoological Society and Lincoln Park Zoological Society study described earlier, visitors did not explicitly consider zoos to be places for conservation education, although the lack of conservation information in text panels seemed to be partially responsible for this finding.

The issue of whether people who visit zoos and aquariums are similar to people who visit museums has also been a topic of interest in many studies. In one study (Milan & Wourms, 1992; Milan & Wourms, 1993), researchers sought to clarify whether the characteristics of zoo visitors are the same as those of museum visitors to determine how appropriate it is to continue applying research on museum visitors to a zoo. To this end, the authors used museum study techniques to look at visitors' motivations, interests, and expectations regarding the Lila Acheson Wallace World of Birds exhibition at the New York Zoological Park. The study revealed that learning in general and learning about wildlife conservation in particular each rated fifth highest in response to a question visitors were asked about why they were visiting the World of Birds area.

In contrast to the previous study by Birney and Matamoros (1995), the authors also suggested that visitors considered learning about wildlife conservation more important than learning about birds; visitors left the exhibition expressing the desire to know more about wildlife conservation and how to participate in the conservation cause. Interestingly, only 3% of the visitors sampled identified education as a reason for visiting the zoo, with far more indicating that they go to the zoo to have an enjoyable experience. This finding supports Serrell's (1977) observation that visitors rated education less frequently than recreation as a reason to visit the Shedd Aquarium. It also provides increasing evidence that people do not always see learning and enjoyment as dichotomous variables (Falk, Moussouri & Coulson, 1998).

The Institute for Learning Innovation conducted a Conservation Impact Study at the National Aquarium in Baltimore (NAIB) to determine the overall impact of a visit to the Aquarium on the

conservation knowledge, attitudes, and behaviors of the general visitor, both in the short- and long-term (Adelman, Falk & Haley-Goldman, 1999; Adelman, Falk & James, 2000). In order to measure these impacts, Institute researchers first talked to visitors prior to their experience in the Aquarium and found that they were generally more knowledgeable about, more concerned about, and more inclined to be involved in conservation-related issues than the general public. Visitors were also found to have a strong positive attitude toward conservation issues, as well as about the roles and responsibilities that people have to the world around them, both locally and globally. Visitors were particularly cognizant of the connections between conservation issues and their personal lives and could articulate these connections in detail.

In terms of attitude, the vast majority of incoming visitors to NAIB were fairly concerned about a variety of conservation issues, particularly the decline and extinction of plant and animal species, pollution issues worldwide, the degradation and loss of aquatic and coastal habitats, and water quality. NAIB visitors consistently rated environmental issues as slightly more serious than respondents in a national telephone survey (Beldon & Rusonello, 1996), indicating that visitors entering NAIB were generally more concerned about these issues than the national public.

NAIB visitors also perceived themselves as generally active in conservation issues. Consistent with this perception is the fact NAIB visitors were more frequently engaged than the national public in a variety of conservation actions.³ For example, NAIB visitors were found to more frequently avoid using chemicals on their lawns and gardens. On the other hand, while the vast majority of visitors were concerned about multiple conservation issues, most were generally unable to express their concerns in much detail or to relate their concerns to

root causes. Similarly, terms such as 'biodiversity' were not found to be part of visitors' working vocabulary during discussions about conservation-related issues. In addition, although NAIB visitors were generally more knowledgeable about conservation-related issues than the national public, visitors had only a marginal understanding of Chesapeake Bay-related environmental issues, the nearest and very important watershed. Not surprisingly, local area residents (living in Maryland, Northern Virginia, Southern Pennsylvania, and Washington, D.C.) were more aware and had more concern for Chesapeake Bay issues than did people living out of the area. These same findings have been replicated in another Phase 2 study at NAIB (Adelman, Haley-Goldman & Falk, 2001).

Another baseline study conducted by the Institute for Learning Innovation (Adelman, Dierking, Haley-Goldman, Coulson, Adams & Falk, 2001) investigated how visiting Conservation Station at Disney's Animal Kingdom (DAK) influenced visitors' (called "guests" by Disney) conservation-related awareness. To assess the extent of this influence, researchers talked to guests prior to their experience in Conservation Station and found that incoming DAK visitors were generally more knowledgeable about, more concerned about, and more inclined to be involved in conservation-related issues than the general public. Visitors easily identified wildlife conservation both as a term and a concept and were able to articulate multiple thoughts when asked what wildlife conservation meant to them. Specifically, their conceptual understanding was consistent with the meaning of conservation for zoological institutions: the preservation of biodiversity. DAK visitors also appeared to associate overpopulation and environmental destruction issues as the greatest threats to human life more strongly than did the national public: upon entering, most visitors correctly understood that habitat destruction was the greatest threat to wildlife on Earth.

³ Some items from national surveys such as the NEETF/Roper "The National Report Card on Environmental Knowledge, Attitude, and Behaviors" 1998, based on a national random cross-section telephone survey of 2000 adults (18 years old and above) were used for comparison.

Similar to NAIB visitors, DAK guests also entered their Conservation Station experience with strong positive attitudes toward conservation issues and the roles and responsibilities of people's influence on the world around them. Underlying visitors' attitudes toward conservation was their perception and understanding of the connections between conservation issues and their personal lives; nearly all incoming visitors readily perceived such connections. Also, DAK visitors were also consistently more concerned about a variety of environmental issues than the national public: at least half elaborated on other issues they were concerned about, which most commonly included air quality, pollution locally and globally, and global climate change.

Incoming DAK visitors — as NAIB visitors had — perceived themselves as generally active in conservation issues. The vast majority of visitors elaborated

on the general and specific activities they engage in to help animals and the environment. Consistent with this self-reported activism is the fact that DAK visitors were more frequently engaged than the national public in specific conservation actions, including helping to create and improve habitats for fish and wildlife and donating money to environmental organizations. In terms of incoming knowledge, DAK visitors again resembled those visiting NAIB, with the vast majority unable to express their concerns in much detail or relate concerns to root causes. Although visitors were generally more knowledgeable about conservation-related issues than the national public, their knowledge and concerns were fairly superficial. Again, as at NAIB, the term 'biodiversity' was not part of DAK visitors' working vocabulary when talking about conservation-related issues.

Studies Focusing on the Impact of a Visit to a Zoo or Aquarium

As with studies of visitors' entering knowledge and attitudes toward animals and conservation issues, studies investigating the impact of a zoo or aquarium visit on visitors have been relatively uncommon. Most of these studies have focused on visitor change in knowledge, affect, attitude, or behavior (i.e., a change in one or two of these characteristics, rarely all four in one study) as a result of visiting a specific exhibition. Some studies have attempted to assess the overall impact of visits to zoos or aquariums, including a few that assessed long-term impacts (i.e., by interviewing visitors weeks or months after their visit).

Again, like the front-end studies, many of the impact studies have focused on conservation issues presented in specific exhibitions on topics such as ocean conservation, elephant conservation, bird conservation, monkeys, etc. (Roper Starch, 1998; Bickford, 1993; Birney, 1991; Carlin & Foster, 1994; Price, Ashmore & McGivern, 1994). Most were in-house or contracted studies, conducted by and/or for zoos and aquariums to assess changes in visitors' awareness of, interest in and knowledge of particular topics being presented in the exhibition. For example, the Dunlap and Kellert (1989) study outlined in the previous section of this literature review, found that very few visitors — aside from those at the Sonoran Desert Museum — said they were motivated to learn about wildlife conservation. There were also contradictory findings demonstrating the complexity of these issues. For example, visitors responded ambivalently to the idea of information about wildlife conservation being presented when interviewed prior to their visit, but a large proportion of visitors expressed a strong interest in obtaining more information about it after their visit. Even visitors to the Sedgwick County Zoo, who had been found to be somewhat indifferent and afraid of animals utilizing a semantic differential scale, were attracted by the highly naturalistic displays, including the experimental interactive conservation component created for one display, Jungle World.

Doering conducted a study to investigate the impact of the Smithsonian Institution's traveling Tropical Rain Forest exhibition on visitors' pre- and post-knowledge and awareness of rainforest conservation issues (Doering, 1992). Following their visit to the exhibition, visitors were questioned about their prior awareness and knowledge of rainforest issues as garnered from various media sources, whether or not that included the exhibition. Survey questions addressed such issues as the basic message of the exhibition, the complexity of the issues, and what individuals can do to help prevent rainforest destruction.

Overall, the exhibition seemed to reinforce awareness of rainforest conservation issues in individuals with prior knowledge, and effectively introduced the issue to visitors who had no prior knowledge. More specifically, those without prior knowledge who were introduced to the subject by the exhibition perceived the message of the exhibition to be protection and preservation of rainforests. These people were also less cynical about the ability to solve conservation problems. On the other hand, visitors with prior media exposure to the issues came away from the exhibition with the notion that individuals cannot have an impact on the situation. Doering believed that this result reflects the incessantly negative press that rainforest issues most often get in mass media outlets. Doering felt that the study demonstrated that exhibitions about environmental issues can achieve educational goals most effectively by providing information that reinforces a visitor's prior experience with a topic. Furthermore, exhibitions on environmental topics also appear to provide a valuable introduction for visitors who are less familiar with the issues at hand. The data analysis strategies used in this study are particularly important for the MIRP study, suggesting the need to be open to a variety of outcomes and potential analyses that allow the data to be analyzed strategically. For example, discriminate analysis could be used to analyze different sets of data depending on the dis-

tinguishing characteristics of visitors, such as knowledge or interest in conservation.

Hayward conducted a summative evaluation of Fishing for Solutions at the Monterey Bay Aquarium (1998) to assess cognitive and affective impacts, among other things, of an exhibition about the problems surrounding overfishing and the need to conserve fish stocks. Exit interviews were conducted with 343 visitors, with an additional 160 interviews conducted at specific exhibits (40 visitors at each of 4 exhibits). Results revealed that 95 percent of the visitors recognized that a conservation-related message was presented in the exhibition. Of those, 73% understood one or more of the key messages and an additional 22% recognized that the exhibition was about conservation, even if they could not articulate any of the main messages specifically. Only 5% had little or no awareness of any main message or conservation theme. In addition, to test the tone and balance of the messages, visitors were asked how they felt about the exhibition and then shown a list of descriptive words (e.g. "depressed," "overwhelmed" etc.). To determine whether they understood the main message, visitors were asked to look at a list of conservation problems and solutions to identify which they believed were discussed in the exhibition. Visitors to the exhibition seemed fairly representative of the Monterey Bay Aquarium's audience, suggesting that the exhibition was not just attracting an environmentally-oriented group of visitors. At the same time, visitors who were reportedly environmentally-active or -sympathetic (69%) were more receptive and appreciative of the exhibition than were visitors who indicated they were neutral or not very sympathetic (31%) towards environmental issues. Researchers concluded that solutions to environmental problems needed to be more numerous and more explicitly presented to the public. As discussed in the previous Doering study (1992), these findings suggest that analyzing different sets of data depending on the distinguishing characteristics of visitors, such as knowledge or interest in conservation will potentially be important.

Swanagan (2000), discussed earlier in the context of front-end studies, investigated the impact of

interactive experiences on visitors during Zoo Atlanta's elephant demonstration and "bio-fact" program. He hypothesized that visitors involved in these more interactive experiences would be more inclined to actively support elephant conservation than those visitors who only viewed the elephant and read text panels. He found that the elephant exhibition did enhance visitors' knowledge about elephants and their conservation status and that visitors who had a more active experience with the elephants (seeing a demonstration and bio-fact program) were more likely to support conservation efforts than visitors who had a more passive experience. The author acknowledged the difficulties inherent in attempting to measure the general public's post-visit "consumer behavior" and tried to utilize several data collection techniques, including exit surveys, petitions, and solicitation cards. Based on the results, Swanagan recommended techniques for improving the effectiveness of an educational experience, emphasizing affective and "quasi-formal" programs for organized groups, and live animal "shows" for the general visitor, rather than knowledge-based techniques (text panels, slide shows only).

Like the summative evaluation of Fishing for Solutions, the summative evaluation of the immersion exhibition, The Swamp, whose front-end study was discussed in the previous section, sought to determine how well visitors understood that the exhibition was about biodiversity and conservation, the big ideas of the exhibition (Saunders & Stuart-Perry, 1997). The goals of The Swamp exhibition were: 1) to help visitors understand the importance of natural systems and a healthy environment for human survival, and 2) to empower visitors to take steps to preserve the natural world. Researchers observed and recorded the attracting and holding power of exhibit elements, as well as the frequency and quality of social behaviors. The study investigated the immediate impact (i.e. upon leaving the exhibition) of this exhibit on visitor knowledge, attitudes, and behavior toward ecosystems and their conservation. Researchers used tracking, entry and exit interviews, and a card sorting technique to collect data on visitors' knowledge, attitude, and intended behavior change resulting from a visit to The Swamp.

Results of the study revealed that alligators and otters were the most attractive to visitors. Also, nearly 40% of the visitors attended to the docent station (when it was open). Information-based exhibits, deemed of great importance because of the “messages” they conveyed regarding wetlands preservation, were attended to by a much smaller percentage of visitors than other elements in the exhibition. Results also implied that there may have been an affective impact, but the data were not statistically significant. Researchers suggested that a more focused study of affective impact was probably needed to ascertain the true affective impact (and any subsequent behavioral changes) of a visit to a zoo or an aquarium. Using the behavioral change models of Azjen & Fishbein (1980) and Hines, et. al. (1987), a card-sorting technique was developed and pioneered during this study, which was intended to identify behavioral changes over the course of a year. Results using this technique suggested that it was a viable approach to collecting such data and that behavioral change is a complex combination of knowledge, attitude, beliefs and values.

The Conservation Phase II summative evaluation study followed the 1995 Conservation Baseline study discussed in the previous section, which was conducted before the Outer Bay Wing exhibition at the Monterey Bay Aquarium opened. It was conducted to determine whether visiting the new Outer Bay wing increased visitors’ conservation awareness, attitudes, knowledge and interest levels, and whether visitors used the new conservation exhibits there (Hayward, 1997). More than 400 visitors were randomly selected and interviewed about the Outer Bay Wing. The results of these interviews indicated that the new exhibition, and one exhibit in particular, produced a significant increase in visitors’ conservation awareness and knowledge, that visitors’ attitudes towards conservation did not change upon seeing the exhibition, and that, as was found in the 1995 baseline study, a majority of visitors in the Phase II study were interested in seeing more in exhibitions about conservation. Overall, results indicated that visitors to the aquarium were sympathetic to conservation issues, and that exhibits about conservation can

result in worthwhile impacts. Also, even though most visitors could define conservation, the findings suggested that visitors’ personal definitions of the word ‘conservation’ did not always match what was being presented in the exhibition itself. The researchers acknowledged that, although this was not a major problem, it underscored the need to think about the issues and the language from the visitors’ point of view, as well as from the institution’s perspective.

In 1998 Hayward conducted a follow-up study, Conservation Phase 3: Analysis of visitors’ perceptions about conservation after they return home from the Monterey Bay Aquarium, designed to assess visitors’ awareness and interest in the interpretation of environmental conservation at the Monterey Bay Aquarium. It assessed visitors’ perceptions of conservation interpretation at the aquarium when two different conservation-themed exhibits—Ocean Travelers and Fishing for Solutions—were available for viewing. All data were collected via phone surveys with 350 visitors who were screened to select those who had seen at least one of the conservation exhibitions (Ocean Travelers). The resulting names (approx. 550) were forwarded to a market research firm; among visitors who answered the phone when called (in three attempts) over 95% were interviewed. The two major research questions were: (1) Do people recall anything about conservation topics after their visit to the aquarium? and (2) What is the impact of seeing two exhibitions on marine conservation issues?

In terms of their recall of conservation topics, while people had vivid memories of the aquarium, based on powerful visual experiences involving jellies, otters, kelp forest, as well as hands-on experiences at touch pools, conservation messages were not recalled as clearly as animals were. It is notable however, that about two-thirds of the visitors who saw at least one conservation exhibition could recall something specific, several weeks later, about conservation at the aquarium. This recall means that (a) visitors associated the aquarium with conservation messages, and (b) the visit was having an impact after people go home, either by reminding

dignified, unhappy, unnatural, tame, and dependent on their keepers when caged or in semi-natural settings. These findings prompted the authors to suggest that displaying animals in more natural settings "will enhance the public's full appreciation of our fast disappearing wildlife and contribute support to conservation efforts."

Focusing on the relationship between visitors' perceptions of animals and conservation, Churchman & Marcoulides discussed the need to better understand how visitors feel about animals in zoo exhibits and, more importantly, how best to assess those feelings (Churchman & Marcoulides, 1991). Applying the work and techniques of perceptual psychologists, J. A. Russell and G. Pratt, the researchers asked visitors to rate how accurately each of eight terms-arousing, sleepy, pleasant, unpleasant, exciting, gloomy, distressing, and relaxing-described selected zoo exhibits and their animals at the Melbourne Royal Zoological Garden. The exhibits selected for the study included fenced, grassy enclosures, cages, and naturalistic settings and the authors' expectations were that the instrument would not distinguish among exhibit types, resulting in all exhibits rated as exciting/pleasant/relaxing. The findings were unexpected: all ratings fell in the arousing/distressing/unpleasant categories. Further analysis revealed that while the instrument used was highly reliable, there was some doubt cast on its validity (e.g., when isolating certain factors, there was evidence to suggest that positive perceptions of animals were more likely when active animals could be viewed up close). The authors conclude that Russell and Pratt's approach to assessing the affective quality of places has great potential for zoos, but that further research is needed to understand and describe this type of response. Although the researchers suggested that there may be a correlation between zoo setting and visitors' feelings toward the animals in that setting, they were more concerned with devising an instrument that would accurately describe zoo visitors' affective responses. As a result, the findings were not conclusive.

However, in an experimental study, Price, Ashmore, and McGivern (1994) assessed visitors'

reactions to two types of primate exhibitions to determine their potential to enhance visitors' interest, knowledge, enjoyment, and support of conservation education. Specifically, visitors' reactions to a free-ranging group of tamarins were compared to their reactions to caged tamarins. The results showed that visitors were more likely to stay and watch the free-ranging group of tamarins. In addition, visitors felt the free-ranging tamarins were better off than the caged tamarins, and thought they could learn more from the free-ranging tamarins than those placed in cages. Although the impact that the two types of exhibits might have on conservation education was not explicitly assessed in the study, the researchers concluded that more naturalistic zoo exhibits would not only benefit the animals, but would also benefit public understanding of conservation issues. Ogden, Linburg, & Maple (1993) observed similar effects when ecologically relevant sounds were provided to zoo visitors. Clearly there is a need to study these factors further.

A research study underway at the New England Aquarium, which is experimenting with different levels of visitor engagement, should offer interesting insights in this area (Goldowsky, 2000). The study is examining the impact of interactive components and live animal exhibits on both visitors and animals. Specifically, the study is exploring changes in visitors' engagement at selected penguin exhibits under different experimental conditions. These experimental conditions alter the nature of the interactivity available to visitors. The impact of these varying degrees of freedom to interact with animals will be assessed in terms of the attracting and holding power of each experimental condition. Naturalistic observations of group interactions and visitors' conversations are being recorded to more thoroughly assess the impact of the variations in design and experimental conditions. Clearly an emotional connected-ness to the animals is one factor that should be examined here.

Only one of the impact studies reviewed involved multiple sites, which was a study conducted for the Alliance for Marine Mammal Parks and Aquariums. The study was designed to inform the Alliance of the opinions and experiences of

their visitors to determine if its members play a role in educating the public about conserving and protecting marine mammals in their habitats (Roper Starch, 1998). Using intercept interviews as the primary data collection technique, Roper Starch found that a majority of 801 visitors to the four institutions, which included a mix of traditional aquariums and entertainment venues,⁴ felt that their visit was highly educational, as well as enjoyable (97% of the visitors characterized their visit as being both enjoyable and educational). There were no significant differences between the sites. Visitors valued interaction with animals and seeing live animals most highly as “educational tools.” Visitors believed they learned about marine mammal behavior, what marine mammals eat, as well as conservation-related issues such as the impact of pollution on marine mammals and ways people can help to preserve wild marine mammals and their habitats.

Ninety-one percent of the visitors who were surveyed agreed with the statement: “I have become more concerned about the importance of the preservation/conservation of marine animals as a result of my visit here today.” (p. 5). While this result was promising, the study was strictly an on-site survey and did not include a follow-up component so long term learning gains cannot be confirmed.⁵ Although there is need for follow-up studies that document long-term impacts, the results of this study indicate that a visit to an aquarium has the potential to significantly influence visitor knowledge, attitudes, and behavior in a positive way.

Long-term follow-up studies assessing impact are rare, however, there are a few that have focused on specific exhibitions. Bielick and Karns (1998) conducted one study of the Think Tank exhibition

at the National Zoo. Specifically, the study was aimed at answering two questions: (1) Did the exhibition add to visitor’s scientific knowledge? (2) Did the experience increase visitors’ respect for animals in general? While the objective did not apply to understanding or communication of conservation messages per se, encouraging respect for animals is arguably one important aspect of fostering a conservation conscious visitor.

The researchers interviewed visitors to Think Tank both before and after viewing the exhibition. Thirteen months later, half of these visitors were surveyed again. The follow-up component suggested that visitors’ knowledge of animal cognition acquired from the exhibition did not significantly change over the course of the year, with no appreciable decline in the number of visitors who could reasonably answer questions about animal learning. These results are encouraging for two reasons. First, they indicate that long-lasting and robust learning outcomes are possible within a zoo setting. And second, they demonstrate the value and validity of conducting long-term follow-up studies of zoo visitors.

Another study with a long-term component examined the influence of a specific exhibition in altering the awareness, beliefs and behaviors of visitors towards plant conservation, specifically their own “gardening behavior” (Taylor, 1993). The study, conducted in the Chelsea Physic Garden in England, analyzed the interview responses of visitors who had just entered the Garden, visitors who had just finished their visit, and a sub-set of these visitors who responded to a questionnaire mailed to them one to six months after their visit. Consistent with the findings of many of the other studies mentioned in this review, visitors to the

⁴ Mystic Aquarium, Indianapolis Zoological Society, Miami Seaquarium/Dolphin Research Center, and Sea World of California.

⁵ In their report for the Alliance, Roper Starch noted a survey that they conducted in 1997 which indicated some discordance between what visitors who were surveyed said they would do, and what the known public conservation participation behaviors are: One in three Alliance visitors said they were moved to action as a result of their visit, while the national average is less than one in ten citizens who actively participate in conservation activities or environmental causes.

Garden were found to already possess positive attitudes towards the environment. Pre- and post-visit interviews also indicated high levels of agreement with pro-conservation statements. In addition, the majority of the total visitors to the Garden were found to be more active in conservation-related behavior (e.g., composting) than was the population of Britain. The long-term impact of visiting the Garden was particularly interesting, with the majority of those who saw the exhibition recalling information from the displays, and almost one-quarter reporting that they had changed how they garden as a result of seeing the exhibition. In addition to the exhibition these visitors also mentioned other sources that influenced their attitudes and behavior in their own gardens, including books, television, radio, and magazines.

Schnackenberg (1997) conducted preliminary research at the Phoenix Zoo to ascertain the effectiveness of exhibitions, educational activities and/or conservation programs. Both on-site and follow-up components were included in the study, and recommendations were made on how to improve the effectiveness of exhibitions in a zoo setting, including creating immersive experiences, adding emotional qualities to exhibitions and using skilled facilitators to engage visitors in meaningful conversations.

Only a few studies have investigated the long-term impact of an overall zoo and aquarium experience. One study, the Conservation Impact Study at the National Aquarium at Baltimore (NAIB) described earlier, was conducted by the Institute for Learning Innovation (Adelman, & Falk, 1999; Adelman, Falk, & James, 2000, Adelman, Haley-Goldman & Falk, 2001). Findings suggested that a visit to the National Aquarium positively influenced and enriched visitors' conservation-related experience and awareness, both in the short- and long-term. After their experience at the Aquarium, 93% of the visitors came away with the fundamental conservation message communicated by the NAIB. Upon leaving the Aquarium, most visitors readily provided multiple examples of things at the aquarium that they associated with conservation, such as the dolphin show, the rainforest exhibit, and the Atlantic coral

reef tank. Interestingly, many of the visitors did not engage with specific exhibit components with strong direct conservation messages but they were able to readily identify conservation as an underlying theme of the Aquarium. These findings demonstrate the challenge of measuring and attributing impact and reinforce that these experiences are much more than interactions with exhibitions alone. Much of what visitors take away from such experiences relates to their prior knowledge and experience and their understanding of the conservation mission of the institution before they ever visit. For visitors who understand the institution's overall conservation mission it may even be irrelevant that there are specific exhibitions on conservation, since they perceive the overall message to be about conservation. The complexity of such research efforts, particularly the relationship between changing awareness and attitudes and subsequent behavior change warrants further investigation.

The NAIB visit appeared to focus visitors' conservation-related thoughts, while also broadening the richness of their understanding of conservation. For instance, before entering the NAIB, visitors most commonly talked about conservation in terms of natural resources, animals or specific species, and activities that people can and should engage in to help out with conservation issues. However, upon exiting, visitors most commonly talked about conservation with greater emotion and in terms of the complex interconnections between animals and the environment, and humans and the environment, as well as the need to balance the co-existence of people and nature.

The Institute also found that changes in NAIB visitors' conservation knowledge, understanding and interests by and large persisted over several months. Not only did the NAIB experience increase visitors' general knowledge related to topics addressed at NAIB, but it provoked a greater sense of awareness and appreciation for conservation issues generally. Researchers also found that the connections between people's own lives and conservation issues strengthened over time. For instance, after six to eight weeks, many visitors also talked about connections they had made between

their recent visit and their personal and family lives or things they had seen on TV or in the media. Visitors continued to discuss conservation in terms of complex interconnections between animals and their environment and humans and the environment, mentioning also the need to balance the co-existence of people and nature. Visitors were also more likely to relate conservation issues to social/political/cultural/economic factors and root causes, such as overpopulation, than upon entering the NAIB. Finally, the NAIB experience inspired or motivated visitors to go to other aquaria, zoos, museums, and parks. However, the long-term assessment revealed that there was little increase in conservation action. In fact, in the absence of reinforcing experiences, general enthusiasm/emotional commitment for conservation-related experiences inspired during the NAIB visit, generally waned back to original levels observed before entering the NAIB, demonstrating the complexity of moving visitors from intended conservation action to actualized action.

A more in-depth Phase 2 study at NAIB (Adelman, Haley-Goldman & Falk, 2001) adds some more detail and reinforces the complexity of measuring impact in such settings. This second study was particularly effective at further documenting a variety of subtle, but meaningful impacts on NAIB visitors' conservation understanding, attitudes, and behaviors. Long-term impacts on visitors emerged in four major categories in descending order of intensity: 1) heightened awareness of NAIB as a conservation organization; 2) a continued connection to and reflection of the NAIB experience by visitors as much as six months later; 3) changes in conservation attitudes and associations, particularly concerns about increasing development and urban sprawl and how it affects the local area's watershed; and, 4) modest changes in conservation behavior for a small group of visitors, such as connecting their NAIB experience directly to a new effort to recycle or eat sustainably harvested fish.⁶

⁶ It must be stated that part of the "NAIB experience" was this investigation. Hence, visitor behaviors could have also been influenced by interactions with Institute researchers.

This study is useful because it expands our notions of possible impacts of visits to aquariums. In this study, although visitors did not enter understanding that the NAIB was a conservation-related institution, the NAIB experience clearly conveyed a mission of stewardship to visitors and this understanding of the mission persisted over time. Also, visitors often are unable to articulate what knowledge they learned specifically and instead comment they "were more aware" after seeing an exhibition. New approaches developed for this study, including extensive specific probing coupled with a more sensitive indicator of possible actions, provided greater insight into visitors' perception of "awareness." Not only did they talk to others about the experience, but the experience also influenced what they watched on television and which articles in newspapers or magazines they read. These experiences in visitors' day-to-day lives after the visit seemed to raise their conservation awareness, so that they were able to talk about very specific issues like the effects of development on the local watershed. And it was promising to see at least modest changes in some visitors' behaviors, given that no part of the NAIB experience was specifically crafted to affect such changes. It also suggests that being more explicit about how one could change behavior might result in this impact for a larger percentage of visitors.

The Baseline Impact Study conducted at Disney's Animal Kingdom (DAK)'s Conservation Station (Adelman, Dierking, Haley-Goldman, Coulson & Adams, 2001) similarly found that visitors' conservation-related experience and awareness was enriched and positively influenced as a result of their experience there, both in the short- and long-term. DAK guests to Conservation Station clearly absorbed the fundamental conservation message of Conservation Station and felt that the visit related to later thoughts and attitudes, which persisted over time. In addition, visitors were prompted to think about the importance of wildlife and they felt empowered to believe there

were things they could now do in their own lives to help wildlife and the environment. After three months, visitors more strongly appreciated their experience as an opportunity to have a very personal experience with animals and to think about the importance of wildlife in general much more. Visitors also readily connected their Conservation Station visit to subsequent experiences over time. Visitors most commonly mentioned specific actions (e.g. picking up garbage, composting, volunteering, putting up a birdfeeder, planting trees) inspired by their visit, as well as visits to other places, such as zoos, nature centers, parks, and local habitats. Pre-visit interviews had shown that these were not activities that they had engaged in frequently prior to the visit.

In terms of DAK visitors' understanding and awareness of conservation issues in their lives, visitors immediately exiting from Conservation Station used more words and ideas, as well as specific terminology, to articulate their thoughts about conservation than they did when they entered Conservation Station. After three months, visitors were more articulate, detailed, and passionate when talking about conservation issues, demonstrating a greater depth and richness of understanding over time. The Conservation Station experience reinforced visitors' understanding of wildlife conservation issues in general, and enriched visitors' understanding of and personal connections to their own backyard habitats in particular. Over time, however, the initial increase in concern about specific wildlife conservation issues did not persist.

The Institute used the Stage Model of Behavioral Change (Prochaska & DiClemente, 1986; Prochaska, DiClemente & Norcross, 1992; Prochaska, Redding, Harlow, Rossi, & Velicer, 1994) developed by James Prochaska and his colleagues, working not in the area of zoos and aquar-

iums, but in the area of public health. The model suggests that messages aimed at changing people's ideas and behaviors, in this case, ideas and behaviors about conservation, generally only work when someone is ready to be influenced and that there are five discrete stages of awareness and receptivity to any behavioral change. The model was modified to assess the degree to which the Conservation Station experience influenced visitors' short-term interest and involvement in conservation-related activities. Analysis revealed significant changes in both visitors' interest in and involvement with conservation-related activities over time. The use of the more detailed stage model also revealed that impacts were not evenly distributed across all visitors, supporting the hypothesis that there was great variability in the incoming level of activism among visitors, and that this variability affected consequent outcomes.

The DAK Baseline Impact Study also suggested that even the modified Prochaska Stage Model would need further modification to be sensitive enough to subtle changes in environmental activism, a complex function of interest, knowledge, experience, concern, and commitment. Currently the five stages are discrete enough to discern changes in more definable behavior such as smoking or drug abuse. Modifying the Prochaska Model so that the stages have more fine-grained levels would allow it to be used to more sensitively document subtle changes in visitors' attitudes, interest, and concerns. Disney's Animal Kingdom and the Institute are now planning a five-year research effort to do just that.

Other Studies Using Methodologies or Generating Findings of Relevance to the Project

There were a few studies uncovered during the literature search that did not deal directly with conservation or were not conducted in zoos or aquariums. However, either their methodology or their findings seemed relevant to this study so they have been included in the review. One such front-end study assessed visitors' expectations, knowledge, and interests regarding the subject of reproduction in preparation for the development of an exhibition called Mating Games at the Monterey Bay Aquarium (Hayward, 1992). The study explored visitors' comfort with the subject, including sensitive topics and terms, as well as the relationship between the theme and human population dynamics. Results of the study are revealing and suggest issues that the MIRP team probably needs to consider in the design of this study. In particular, different types of visitors (e.g. families versus all-adult groups or knowledgeable vs. less knowledgeable visitors) perceived the topic in different ways, and the audience was found to be more knowledgeable than expected, which suggested that a range of levels of presentation was essential to a successful exhibition. In terms of the design and, in particular, the data analysis strategies for the MIRP study, these findings are important. They suggest the need to be open to a variety of outcomes and potential analyses that allow the data to be analyzed more strategically (e.g. using discriminate analysis to analyze different sets of data depending on identified distinguishing characteristics of visitors, such as knowledge or interest in conservation).

Jeffery and Wandersee (1996) conducted a study that also investigated questions about the long-term effects and emotional quality of a specific exhibition. The research study sought to answer these questions: Which interactive displays in the Living in Water exhibition were most memorable to families? What aspects of these displays seemed to increase learning in families? and what types of knowledge presented in the exhibits were most

memorable? Methodology included an on-site and a follow-up component in which visitors were contacted two months after their visit and interviewed by telephone. Results revealed a relationship between exhibit design and the type and quality of visitors' memories. Results also suggested that visitors' affective responses to exhibit elements influenced the level of an exhibit's impact. The authors concluded that developing exhibitions that evoke emotion and contain interactive elements closely related to the concept one wishes to communicate, are probably the most successful.

Another follow-up study not directly related to conservation was conducted by Hayward and Hart (1997) on Life Over Time (LOT), an exhibition about evolution, at The Field Museum in Chicago. More than 350 visitors to the LOT exhibition were contacted via telephone or written questionnaire between 2 months and 9 months after their visit to the museum. Results revealed that visitors recalled many aspects of the exhibition and could even articulate information they had learned from the exhibition. Two-thirds to three-quarters of the visitors who were contacted had thought about their experience and talked about it with others long after their visit to the museum. The exhibition also influenced visitors' attitudes and interest in the subject matter. Thirty-five percent of follow-up responses suggested some aspect of reinforcing interest or altering behavior, such as the exhibition encouraging visitors to purchase books or conduct their own investigation of the subject matter. Overall, this study revealed that visits to the Field Museum, in general, and to a particular exhibition specifically, were very memorable and can alter behavior and attitudes toward a subject. The authors recommended that further and perhaps longer-term follow-up studies be conducted to assess the integrity of these memories and the robustness of the impacts on visitors.

Conclusions and Implications for the Project

In summary, the literature review suggests the following:

- Although zoos and aquariums have long been concerned with measuring their impact, little actual research assessing impact has been conducted.
- There is quite a bit of zoo and aquarium educational research that at least superficially describes the interests, knowledge and beliefs of the visiting public. The research dates back about three decades. More recent research suggests that the public is keenly interested in animals, moderately knowledgeable and concerned about conservation, and slightly more active in these areas than the general public. For the most part, findings also suggest that the public does not come to zoos and aquariums specifically to learn more about conservation-related issues, although they are willing to do so as long as it is in the context of seeing animals.
- The majority of the studies conducted to date have investigated public perception of animals, with very little attention paid to the overall conservation messages conveyed. Interestingly though many of these studies cite the potential for positively influencing visitors' conservation knowledge, affect, attitude and behavior, these claims are rarely substantiated or validated by actual research.
- In a similar vein, several AZA proceedings published in the last 15 years were found to include presentations addressing the role of zoos in public conservation education. However, substantive research that supported the statements of many of these authors was not found. Little to no systematic research regarding the impact of visits to individual zoos and aquariums on visitors' conservation knowledge, awareness, affect, or behavior has been conducted and presented at conferences and/or subsequently published. Very few studies have investigated these questions across institutions and even fewer have done so for an overall visit.
- Even a recent compilation of doctoral dissertations, theses, and project abstracts in the area of environmental education and communication revealed few studies that had focused on these important questions.
- Individual institutions have conducted internal studies of visitors and exhibitions, however, the majority of these studies have been evaluative in nature, focusing on the knowledge and interest of visitors in a very specific topic or the effectiveness of a specific exhibition, with few generalizable results. Few of these studies have broadly investigated the overall impact of visits to an individual institution, let alone across institutions, and this research has been published only rarely in scholarly journals or other such forums.
- Given limited data from a few recent investigations, the field also knows that zoos and aquariums do successfully communicate a conservation message to the public, however, that message is often subtle, short-term and generally difficult to attribute to specific experiences or even specific institutions. Current research provides the most information on changes in visitors' knowledge and then their behavior; very few insights can be provided about the overall impact of zoo and aquarium experiences upon visitors' deeply held beliefs and values about animals and conservation.

It is widely understood that the past few decades have witnessed a revolution in the ways that zoos and aquariums present their collections. There

have also been significant changes in the perceptions of zoo and aquarium professionals about why zoos and aquariums exist. The public has also changed over this same time frame; previously they were eager to attend zoos and aquariums in order to see creatures they had never seen before. Now, due to widespread media presentation of nature and a growing eco-tourism market, the vast majority see animals they already have some familiarity with and know something about, but are seeing them in a different way. At the same time, a significant gap currently exists between what zoo and aquarium professionals believe zoos and aquariums are

designed to accomplish and what the public thinks they are for. Professionals think more in terms of conservation and the public thinks primarily in terms of seeing animals, although results in some new studies are equivocal. Certainly, this literature review suggests that there is a great need for the study or series of studies proposed by MIRP. This research effort will need to address two major challenges: 1) what are the current educational impacts of AZA zoos and aquariums and 2) how can AZA zoos and aquariums more effectively communicate their conservation-related messages to the public.

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