

# ADVANCING CONSERVATION THROUGH EMPATHY FOR WILDLIFE NETWORK

THE IMPLEMENTATION OF  
EMPATHY PRACTICES



JANUARY 2024



ADVANCING  
CONSERVATION  
THROUGH  
**EMPATHY FOR  
WILDLIFE**



WOODLAND  
PARK ZOO

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# DEFINITIONS

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Throughout this report, the terms and phrases below are defined as follows:

**Advancing Conservation through Empathy for Wildlife (ACE for Wildlife) Network:** A network of US-based zoos and aquariums accredited by the Association of Zoos and Aquariums (AZA) that creates and shares effective practices to foster empathy for animals and people, leading to conservation actions. Also referred to as the *Network*.

**Advancing Empathy Initiative staff:** The staff at Woodland Park Zoo responsible for the day-to-day maintenance and facilitation of the ACE for Wildlife Network and the Building Organizational Capacity to Foster Empathy for Wildlife Granting Program.

**Affiliate:** At the time of this evaluation, individuals not employed by an ACE for Wildlife Network Partner Organization but still engaged with the Network. These can include volunteers, consultants, and interested individuals both within and outside the current 7-state region (Alaska, Idaho, Minnesota, Montana, North Dakota, Washington, Wisconsin).

**Building Organizational Capacity to Foster Empathy for Wildlife Granting Program:** Granting program facilitated by Woodland Park Zoo to support AZA-accredited zoos and aquariums in a 7-state region (Alaska, Idaho, Minnesota, Montana, North Dakota, Washington, Wisconsin) in their efforts to plan, build, and/or expand programs aimed at advancing empathy for animals and wildlife. Granting region set by the same funder that funds the ACE for Wildlife Network. Also referred to as the *Granting Program*.

**Capacity Building Grant:** Funds distributed through the Building Organizational Capacity to Foster Empathy for Wildlife Granting Program.

**Critical anthropomorphism:** The use of anthropomorphism when it is scientifically supported and productive to simplify complicated behaviors into more understandable terms, explored further in [“Anthropomorphism’s Role in Fostering Empathy for Wildlife and Advancing Conservation”](#) (Burnet et al., 2024).

**Effective empathy practices:** The empathy practices outlined in the Seattle Aquarium’s [“Best Practices in Developing Empathy Towards Wildlife,”](#) published in 2019. These practices include framing, modeling, increasing knowledge, providing experiences, practice, and activating imagination.

**Empathy:** A stimulated emotional state that relies on the ability to perceive, understand, and care about the experiences or perspectives of another person or animal.

**Empathy-related practice:** Practices related to empathy that may be utilized in exhibit signage and programs at zoos or aquariums. The list of practices was developed by the Measuring Empathy: Collaborative Assessment Project (MECAP) and make up one half of the observation tool used for this evaluation. Individual practices are organized into nine broader categories. Also referred to as *empathy practices* and *practices*.

**Exhibit:** The interpretive elements associated with an animal habitat.

**Expression of empathy:** Behaviors related to empathy or connected emotions that may be displayed by zoo or aquarium visitors at exhibits and during programs. The list of behaviors was developed by MECAP and make up one half of the observation tool used for this evaluation. Individual behaviors are organized into eleven broader categories. Also referred to as *empathy-related behaviors* and *empathy behaviors*.

**Member:** Individual staff employed by ACE for Wildlife Network Partner Organizations.

**Partner Organization:** Zoos and aquariums accredited by the Association for Zoos and Aquariums in a 7-state region (Alaska, Idaho, Minnesota, Montana, North Dakota, Washington, and Wisconsin) that made up the ACE for Wildlife Network at the time this evaluation was conducted.

# EXECUTIVE SUMMARY

In 2019, Woodland Park Zoo (WPZ) launched the Advancing Conservation through Empathy for Wildlife (ACE for Wildlife) Network and then piloted the Building Organizational Capacity to Foster Empathy for Wildlife Granting Program (the Granting Program) in 2020 to help other zoos and aquariums develop, utilize, and evaluate empathy for wildlife as a strategy for conservation education. These two integral components now make up the Advancing Empathy Initiative (AEI), which is staffed by WPZ and collectively aims to enhance the capacity for empathy work among participating organizations.

This evaluation was conducted by the internal evaluation team at WPZ from 2021 through 2023 to gain insights into the implementation of empathy practices across the Network. The observations conducted at each ACE for Wildlife Network Partner Organization are one part of the larger AEI evaluation plan and are a continuation of long-term evaluation and monitoring activities. By observing visitors, exhibit signage, program presenters and audiences at each of the 20 Partner Organizations, AEI staff members at WPZ intended to answer the following questions posed in the program's initial evaluation plan.

## Driving Questions

- To what extent are empathy practices being incorporated into an organization's work, and how?
- To what extent are empathy practices being used by Network Members and Grantees?
  - Which departments and professional roles are engaging with empathy practices, and through which type of programmatic medium (e.g., signage)?
- What perceived value and barriers does using these practices have in nurturing empathy?

## Methods

To comprehensively address the driving questions of this evaluation, AEI staff employed a dual-method approach. First, AEI staff conducted observations using the *Expressions of Empathy* and *Empathy Practices Observational Framework* (the *Observation Framework*). This framework consists of four distinct instruments to systematically observe and record both participant expressions of empathy during (1) facilitated programs and (2) casual exhibit experiences as well as the utilization of empathy practices in (3) program facilitation and (4) exhibit signage. In total, AEI staff observed 25 program audiences, 59 program presenters, 552 visitors and 166 exhibits. Second, a self-report survey was administered to Network Members and Affiliates, eliciting their insights on the empathy practices employed within their roles and the types of programs in which these practices were implemented. Combining these observational and self-report methods generated a more comprehensive picture of the prevalence, implementation and effectiveness of empathy practices across the Network.

## Key Findings: Use of Empathy Related-Practices

**Program presenters utilized more empathy-related practices than exhibit signage.** On average, exhibits utilized 7.9 unique practices included in the observation tool (Table 4) whereas program presenters utilized 14.4 practices, covering an average of 4.8 and 7 categories of practices respectively. Several factors may explain this difference including barriers to updating signage with empathy language, incorporation of ambassador animals in programs, and program presenters' expertise in building connections between audiences and animals. It is also important to note that a higher number of practices is not a direct indicator of quality or ability to elicit empathetic responses.

**Even brief programs incorporated a wide variety of empathy-related practices.** While the number of practices utilized by program presenters is significantly correlated with the length of the program, the number of categories covered is not, demonstrating that presenters are able to incorporate a variety of strategies for inspiring empathy regardless of program length.

**Informing about animals' needs was the most frequently observed category of practices in both exhibits and programs.** 83% of observed exhibits and 100% of observed programs included at least one practice from this category. This observation underscores the fact that informing visitors about the animals in their care is a strength of interpretation at Partner Organizations. It is also an indicator that empathy trainings utilized at these organizations may not need to dedicate much time to this topic and could focus more on integrating empathy-oriented language into how information about animals is provided.

**Exhibit signage was more likely to highlight conflict between people and wildlife than to include conservation or caring actions visitors could take.** Partner Organizations included vague or specific mentions of human-wildlife conflict in 72% of exhibits compared to 53% which included caring or conservation actions. One of the ACE for Wildlife Network's primary goals is to leverage empathy for wildlife to inspire conservation behavior, so incorporating additional conservation messaging in exhibits is a key area for growth.

**Empathy-related practices are not implemented consistently for all types of animals.** Exhibits and programs featuring marine invertebrates were less likely to encourage focused observation, inform about animals' needs, introduce conservation or caring actions, reinforce that animals are individuals, and draw comparisons between animals and people or other animals. Given that these animals are already considered more challenging to empathize with, zoos and aquariums have an opportunity to increase their use of empathy practices when interpreting about them.

**Partner Organizations varied in both number and type of empathy practices being implemented.** The variation in strengths across the Network creates an opportunity for Partner Organizations to collaborate and learn from each other, building their own use of empathy practices based on each other's work.

**Most Network Members frequently utilize empathy-related practices in their work, and they do so in a wide variety of settings.** 98% of Members self-reported using empathy-related practices in the last year, and over 75% reported doing so very or extremely frequently. Most often, respondents reported using empathy practices in public programs (69%), followed by school or classroom programs (48%), exhibits or signs (42%), and social media or marketing (33%). The most frequently used empathy-related practices were *using the animal's name and pronouns* (98%); *discussing how zoos and aquariums foster animal wellbeing* (94%); *talking about animals as unique individuals with needs, relationships, and preferences* (93%); and *highlighting animals' personality traits* (92%).

## Key Findings: Expressions of Empathy

**Attending zoo or aquarium programs led to more outward expressions of empathy and related emotions than viewing exhibits.** Program audiences were observed engaging in an average of about 14 empathy-related behaviors compared to four for exhibit visitors. This may in part be due to differences in the ability of the Observation Framework to capture empathy-related behaviors in these two settings, but is still indicative that there are notable differences in how visitors express empathy in response to programs and exhibits.

**Visitors and audiences most frequently demonstrated interest or curiosity toward animals and recognized animals as individuals with agency.** The frequency with which these behaviors were observed indicates that zoo and aquarium visitors experience foundational positive emotions toward animals, which can be linked to empathy, during their time at these institutions.

**Expressions of empathy increased with both exhibit stay time and program length.** While significant, the strength of these relationships was relatively weak, so it cannot be concluded that longer programs and exhibit stay times inspire more empathy. Based on this finding, time should be considered a relevant factor when designing empathy-inspiring exhibits and programs, but it should be balanced with other factors.

**Visitors and audiences were more likely to engage in several forms of empathy-related behavior when exhibits and programs invited perspective-taking or included behavioral expectations.** Specifically, these two practices were positively related to understanding animals' needs, ability to take animals' perspectives, interest or curiosity toward animals, and desire to help animals. The frequent connection between these practices and behaviors is a strong indicator that implementing them is, at least to some extent, an effective way to encourage visitors and audiences to have empathy for wildlife.

**Expressions of empathy were not dependent on animal type.** Across both exhibits and programs, the number and type of empathy expressions observed were not consistently related to the type of animal being presented, contradicting prior work exploring the relationship of empathy to animal characteristics.

## Limitations

The nature and scope of this evaluation imposed limitations on the data that could be collected and the conclusions that can be drawn. These limitations include:

- The Observation Framework's shortcomings in capturing nonverbal expressions of empathy;
- Lower numbers of visitors and program offerings at some sites due to the timing of the AEI staff's visits;
- The spread of observations over a two-year period;
- Differences in which exhibits and programs were available to observe at each site, introducing potentially confounding variables;
- Failure to reassess interrater agreement between observers throughout the evaluation period; and
- Potential human error in data entry.

## Recommendations

As organizations update their exhibits over time, they should **incorporate additional empathy-related practices**. Potential practices to prioritize are reinforcing that animals are individuals by including their names and other unique information that visitors have been shown to be most interested in (Fraser et al., 2009) and inviting perspective-taking which was positively related to multiple forms of empathy-related behavior.

As additional empathy practices are incorporated, it should be done with a **focus on quality rather than quantity**, as the number of empathy practices used in signage was not shown to increase visitors' expressions of empathy.

**Empathy trainings aimed at staff and volunteers should shift their focus to practices that are used less frequently**, especially those that may be more strongly linked to audience expressions of empathy such as inviting perspective-taking.

**Increase opportunities for visitors to engage with zoo and aquarium staff and interpretive volunteers** through programs or at exhibits themselves as visitors may experience increased empathy for animals when engaging with live interpretation compared to static signage.

## Questions for Future Evaluation

**What feelings of empathy beyond those that are verbalized or indicated through behavior, if any, are elicited by exhibits and programs in zoos and aquariums?** To what extent, if at all, are these affected by the intentional use of empathy practices?

**To what extent, if at all, does the use of empathy practices affect the efficacy of existing conservation messaging in exhibits and programs?** Does the use of empathy practices affect zoo and aquarium visitors' willingness to engage in conservation or caring actions?

**Is there a significant difference in how exhibits and programs impact expressions or feelings of empathy for animals when potentially confounding variables are controlled?** Do individuals who both attend programs and observe exhibits express or experience more empathy than those who do only one or the other?

**What factors influence how zoos and aquariums incorporate empathy practices into exhibits and programs?** Do these factors affect which types of empathy practices are incorporated?

**To what extent, if at all, does the type of animal featured in an exhibit or program impact visitors' and audiences' empathetic responses when all other variables are controlled?**

**Do the target audience age and program type influence programs' efficacy at eliciting feelings and expressions of empathy?**

**What impacts, if any, does inviting perspective-taking have on empathy-related behaviors and/or feelings of empathy for animals?**

# INTRODUCTION

## Background to the Advancing Empathy Initiative

Empathy, defined as a stimulated emotional state that relies on the ability to perceive, understand, and care about the experiences or perspectives of another person or animal, holds a substantial influence on human-animal connections. Recognized interpretive practices have been established to foster empathy for animals (Young et al., 2018, Minarchek et al., 2021), which include framing, modeling, increasing knowledge, providing experiences, practice inviting perspective-taking, and activating imagination. Research also indicates that empathy can serve as a driver for conservation action by linking individuals' concerns for animal well-being to the imperative of safeguarding a healthy environment (Luebke, 2018).

Woodland Park Zoo (WPZ) has been a dedicated proponent of fostering empathy for animals since 2015, as exemplified by its history of leadership in exploring the role of empathy towards wildlife. In 2019, WPZ launched the Advancing Conservation through Empathy for Wildlife (ACE for Wildlife) Network and then piloted the Building Organizational Capacity to Foster Empathy for Wildlife Grant Program (the Granting Program) in 2020 to help other zoos and aquariums develop, utilize, and evaluate empathy for wildlife as a strategy for conservation education as well. These two integral components now make up the Advancing Empathy Initiative (AEI), which is staffed by WPZ and collectively aims to enhance the capacity for empathy work among participating organizations.

During this evaluation, the ACE for Wildlife Network was comprised of 20 Association of Zoos and Aquariums (AZA) accredited institutions from a specific seven-state region in the United States, including Alaska, Idaho, Minnesota, Montana, North Dakota, Washington, and Wisconsin (Table 1). These institutions are referred to as Partner Organizations and their staff are Network Members. Since these site visits, the Network has

expanded to include additional AZA institutions in the US as well as individual Affiliates worldwide. The Network's purpose is to bring together motivated professionals to strengthen how accredited institutions create, use and evaluate practices to foster empathy for wildlife and people, leading to conservation action. Since its founding, the Network has developed and disseminated a variety of resources to support the use of empathy practices (Table 4) at Partner Organizations, including a training toolkit focused on the aquariums and a conservation action toolkit.

Table 1. ACE for Wildlife Network Partner Organizations at the time of data collection

Organization	Location	Site Visit Dates
Alaska SeaLife Center	Seward, AK	May 2023
Como Park Zoo & Conservatory	Saint Paul, MN	June 2022
Dakota Zoo	Bismarck, ND	September 2022
Grizzly & Wolf Discovery Center	West Yellowstone, MT	May 2023
Henry Vilas Zoo	Madison, WI	May 2022
Idaho Falls Zoo	Idaho Falls, ID	May 2023
International Crane Foundation	Baraboo, WI	May 2022
Lake Superior Zoo	Duluth, MN	June 2022
Minnesota Zoo	Apple Valley, MN	June 2022
Northeastern Wisconsin (NEW) Zoo & Adventure Park	Green Bay, WI	March 2023
Northwest Trek Wildlife Park	Eatonville, WA	June 2022
Point Defiance Zoo & Aquarium	Tacoma, WA	April 2022, June 2022
Racine Zoo	Racine, WI	May 2022
Red River Zoo	Fargo, ND	September 2022
Roosevelt Park Zoo	Minot, ND	September 2022
Seattle Aquarium	Seattle, WA	May 2022
Woodland Park Zoo	Seattle, WA	July-September 2022
Zoo Boise	Boise, ID	April 2022
Zoological Society of Milwaukee	Milwaukee, WI	March 2023
ZooMontana	Billings, MT	April 2022

The Building Organizational Capacity to Foster Empathy for Wildlife Granting Program (Granting Program) supports AZA-accredited organizations in the seven-state region in their efforts to plan, build, and/or expand programs aimed at advancing empathy for animals and wildlife. The Granting Program offers two tiers of grants, distinguished by project length, amount awarded, and expectations for learning and sustainability to accommodate different project types. These grants also emphasize the development of internal evaluation mechanisms, thereby augmenting the understanding and measurement of empathy-related efforts. From 2021-2023, across three rounds of funding, the Granting Program funded 36 projects at all 19 eligible organizations totaling \$3.6m.

In addition to the two opportunities provided by the ACE for Wildlife Network and Granting Program, involved organizations may also develop and enhance their understanding of empathy practices through further pathways. For example, regional collaborations, community partnerships, and engagements with research organizations independently exploring empathy contribute to the broader landscape of capacity building. These pathways underscore the dynamic nature of empathy development, acknowledging that growth in this realm can stem from a variety of sources.

## Evaluation Purpose

This evaluation was conducted by the internal evaluation team at Woodland Park Zoo (WPZ) from 2021 through 2023 to gain insights into the implementation of empathy practices across the Network. During this time, the ACE for Wildlife Network continued to evolve, adding more Members, expanding to include Affiliates from outside the initial Partner Organizations, and establishing governing committees and greater structural cohesion. Grant funding was also awarded to all 19 eligible organizations in the seven-state region during this evaluation period, further enhancing the dynamic nature of the Advancing Empathy Initiative. This evolving context

is essential to consider as this evaluation explores the use of empathy practices across the 20 Partner Organizations, understanding that the system being evaluated was rapidly changing and adapting while data was being collected and analyzed.

The overarching goals of this evaluation encompass a thorough exploration of the regional landscape of empathy practices, their effective implementation, perceived value, and potential barriers faced by organizations in utilizing empathy practices. The observations conducted at each ACE for Wildlife Network Partner Organization are one part of the larger Advancing Empathy for Wildlife Evaluation Plan and are a continuation of long-term evaluation and monitoring activities of the Advancing Empathy Initiative at WPZ. By observing visitors, exhibit signage, program presenters, and audiences at each of the 20 Partner Organizations, Advancing Empathy Initiative staff members at WPZ intended to answer the following questions posed in the program's initial evaluation plan.

**Driving Questions:** The driving questions that guide this evaluation pertain to the empathy practices integrated by Partner Organizations and their Members:

- To what extent are empathy practices being incorporated into an organization's work, and how?
- To what extent are empathy practices being used by Network Members and Grantees?
  - Which departments and professional roles are engaging with empathy practices, and through which type of programmatic medium (e.g., signage)?
- What perceived value and barriers does using these practices have in nurturing empathy?

This evaluation aims to present the current snapshot or prevalence of "effective empathy practices" within AZA-accredited zoos and aquariums in the seven-state region. In addition to gathering data on the use of empathy practices, the site observations gathered information to advance the Network's implementation of empathy practices in zoos and

aquariums and understanding of how visitors demonstrate empathy for animals during their visits. Establishing this knowledge base of how empathy practices are utilized in the Network and identifying strengths and growth opportunities will enable the AEI team to effectively support efforts to implement empathy practices and inspire empathy among visitors going forward. The data from these observations will also serve as a baseline record for how Partners utilize empathy practices, therefore allowing the team to track the spread of these practices through future data collection strategies. Monitoring changes in use of empathy practices across the Network compared to this baseline data is one way to increase understanding of the impact of the ACE for Wildlife Network.

## Positionality

As in any evaluation, the unique backgrounds of the individuals involved in collecting, analyzing, and reporting the information included in this report informed what was observed and what conclusions were drawn. The observation data included in this evaluation was gathered by a total of seven individuals, three of whom were present and conducted observations at 20 sites. All observers were members of Woodland Park Zoo's staff, and three were previously employees or volunteers at other Partner Organizations including Seattle Aquarium and ZooMontana. Three of these individuals also serve as the backbone team for the Advancing Empathy Initiative, which could have introduced bias toward observing desired practices and behaviors. Of these observers, six identify as cisgender women and one as nonbinary and transmasculine. All observers also had prior experience collecting observational data on people or animals. The interpretation of observational data in this report primarily comes from the perspective of a White, Jewish, queer and transmasculine individual with prior experience collecting, analyzing, and interpreting data about pro-environmental attitudes and behaviors in parks and teaching science in informal environments. The evaluation plan and majority of the data collection were already complete before this individual became involved in the project.

## Methods

The ability to measure and understand empathy, particularly in the context of human-animal interactions, is of paramount importance for researchers and zoo and aquarium educators alike. Empathy, as a multidimensional construct, has gained significant attention in the field of zoos and aquariums due to its profound implications for promoting positive relationships between humans and animals. To comprehensively address the evaluation questions regarding the prevalence and implementation of empathy practices within zoos and aquariums, AEI staff employed a dual-method approach. First, AEI staff conducted observations using the Expressions of Empathy and Empathy Practices Observational Framework (the Observation Framework). This framework consists of four distinct instruments, to systematically observe and record both participant expressions of empathy during (1) facilitated programs and (2) casual exhibit experiences as well as the utilization of empathy practices in (3) program facilitation and (4) exhibit signage. Table 2 shows how the types of practices included in the Observation Framework relate to the effective empathy practices outlined in the Seattle Aquarium's "Best Practices in Developing Empathy Towards Wildlife."

Second, a self-report survey was administered to Network Members and Affiliates in Fall 2023, eliciting their insights on the empathy practices employed within their roles and the types of programs in which these practices were implemented. Combining these observational and self-report methods generates a more comprehensive picture of the prevalence, implementation, and effectiveness of empathy practices across the Network. The following sections provide more detailed information about these two methodologies.

### Empathy Expressions & Practices Observational Tool

The Observation Framework served as a comprehensive tool for systematically observing and measuring the presence of participants' verbal and non-verbal behavioral indicators of empathy towards animals, and the implementation of effective empathy practices. This framework has

been crafted to capture and quantify the dynamics of empathy in various contexts, ranging from facilitated educational programs to casual exhibit experiences. Empathy is rooted in the capacity to perceive, understand, and care about the experiences and perspectives of other individuals, and has a transformative impact on fostering compassion, respect, and positive behaviors towards animals. Observational studies involve directly observing an individual's interactions with animals, facilitators, or content. This can include assessing how individuals respond to animals' behavior, their

non-verbal cues, and expressions when interacting with animals. Observational studies can provide valuable insights into behavioral aspects of empathy.

Prior to data collection at Partner Organizations, AEI staff were instructed on how to utilize the Observation Framework and conducted test observations of visitors at Woodland Park Zoo and videos of animal programs. Interrater agreement was assessed for these observations to ensure observers noted behaviors and practices consistently.

Table 2. Foundational effective empathy practices and related practice categories included in the Observation Framework

Foundational Effective Empathy Practice	Definition	Related Categories in Observation Framework
Framing	These practices emphasize the significance of framing conversations about animals with language that encouraged empathy. Educators are encouraged to use pronouns and names, creating a more personal connection with the animals. It also highlights the importance of acknowledging the animals' unique experiences and intentions.	<ul style="list-style-type: none"> <li>• Reinforcing that animals are individuals</li> <li>• Reinforcing that animals have relationships</li> <li>• Reinforcing that animals have their own agency</li> </ul>
Modeling	Acknowledging the role of valued adults and teachers in fostering empathy, this practice stresses the importance of modeling empathetic behaviors. It recognizes the challenge of developing relationships in informal settings and encourages empowering parents and caregivers as moral role models.	<ul style="list-style-type: none"> <li>• Including expectations for visitor behavior around animals</li> <li>• Reinforcing that animals have their own agency</li> </ul>
Increasing Knowledge	These practices underline the importance of sharing information about animals' needs, experiences, behavior, and life history to enhance empathy. Comparing and contrasting animal experiences with human experiences is a key aspect.	<ul style="list-style-type: none"> <li>• Informing about the animals' needs</li> <li>• Highlighting similarities and differences between animals and people</li> </ul>
Providing Experiences	Direct interaction with animals is seen as pivotal for nurturing empathy. The practice emphasizes that more powerful interactions occur when animals appear to choose to interact with guests through their own agency.	<ul style="list-style-type: none"> <li>• Encouraging focused observation</li> </ul>
Practice	Providing opportunities for people to practice empathy and receive positive feedback is a key element. Emphasizing that practice builds self-efficacy and belief in the ability to feel empathy.	<ul style="list-style-type: none"> <li>• Including appropriate conservation or caring action</li> </ul>
Activating Imagination	Activating the imagination is essential for understanding the perspective of another. This involves perspective-taking dialog, mimicry, role-playing, and storytelling.	<ul style="list-style-type: none"> <li>• Inviting perspective-taking</li> </ul>

Table 3. *Empathy-related behaviors included in the Observation Framework for exhibit visitors and program audiences*

Category	Behavior
Able to take perspective of animals	<ul style="list-style-type: none"> <li>• Predicts or speaks to animal's state or emotion</li> <li>• Provides reasonable explanation for prediction of emotion</li> <li>• Mimics the behavior of an animal</li> <li>• Describes emotion/implies emotion, but doesn't state emotion outright</li> <li>• Speaks on behalf of the animal</li> </ul>
Caregivers support positive behavior and attitudes	<ul style="list-style-type: none"> <li>• Caregiver uses pronouns/animal's name</li> <li>• Caregiver calls animal by "it"*</li> <li>• Caregiver models gentle touch</li> <li>• Caregiver reinforces positive behavior around animal</li> <li>• Caregiver talks about animal's emotional state</li> <li>• Caregiver bringing awareness of animals' agency</li> </ul>
Connection between the animals and own lived experiences	<ul style="list-style-type: none"> <li>• Connecting animal to own domestic pets/favorite animals</li> <li>• Describes and relates to animals in terms of family roles</li> <li>• Comparing animals and/or animals' habitat to own home/experiences</li> </ul>
Engages in direct action to help animal	<ul style="list-style-type: none"> <li>• Provides care for an animal directly</li> <li>• Protects or reduces danger to animal</li> </ul>
Has appreciation/respect for animal	<ul style="list-style-type: none"> <li>• Verbalizes appreciation, gratitude, or love for animal</li> <li>• Verbalizes fear, or dislike for animal*</li> <li>• Shows non-verbal appreciation/love towards animal</li> <li>• Verbalizes positive feelings about animal's characteristics</li> </ul>
Has compassionate concern for animals	<ul style="list-style-type: none"> <li>• Shows concern for the direct well-being of an animal</li> <li>• Expresses way to contribute to animal's direct well-being</li> </ul>
Has interest or curiosity toward animal	<ul style="list-style-type: none"> <li>• Observes animal closely</li> <li>• Verbalizes observations of animal</li> <li>• Verbalizes positive observation of animal habitat/exhibit</li> <li>• Verbalizes negative observation of animal habitat/exhibit elements</li> <li>• Seeks information about animal</li> <li>• Wants to observe longer or for second time</li> </ul>
Recognizes animal as individual with own agency	<ul style="list-style-type: none"> <li>• Comments on animal's independent movements</li> <li>• Uses pronouns/personal name of animal</li> <li>• Calls animal by "it"*</li> <li>• Greets or says goodbye to animal verbally or physically</li> </ul>
Shows positive behavior toward animals	<ul style="list-style-type: none"> <li>• Touches animal gently on their own</li> <li>• Touches animal gently with help from caregiver</li> <li>• Self-regulates behavior to make animal feel safe or calm</li> <li>• Adjusts or corrects own behavior to support the comfort of the animal</li> <li>• Corrects behavior of others to support the comfort of the animal</li> </ul>
Understands needs of an animal	<ul style="list-style-type: none"> <li>• Talks about animal's basic needs</li> <li>• Talks about additional animal needs</li> <li>• Compares or contrasts self to animal</li> <li>• Compares or contrasts others to animal</li> </ul>
Wants to help animals	<ul style="list-style-type: none"> <li>• Wants to take action to directly help an animal</li> <li>• Wants to take action to help animals in general</li> <li>• Mentions way they can help animal</li> <li>• Shares with others actions they can help animal</li> </ul>

\*negative behaviors included in the Observation Framework but not indicative of empathy for animals

Table 4. Empathy-related practices included in the Observation Framework for exhibit signage and presenters

Category	Practice
Encourage focused observation of animal	<ul style="list-style-type: none"> <li>• Prompts focused observation of animal's physical characteristics</li> <li>• Prompted focused observation of animal's behavior/movement</li> <li>• Draws connection between animal's behavior and interpretation of animal's emotional experience</li> <li>• Asks open-ended questions about audience's observations</li> </ul>
Include appropriate conservation or caring action	<ul style="list-style-type: none"> <li>• Includes specific way for visitors to help/care for animals</li> <li>• Includes vague mention of how to help animals</li> <li>• Includes mention/picture of human-wildlife conflict</li> <li>• Asks open-ended question about ways people can help animals</li> <li>• Visitors or audiences practice caring behavior</li> </ul>
Include expectations for audience behavior around animals	<ul style="list-style-type: none"> <li>• Draws connection of audience behavior to animal's comfort/safety</li> <li>• Reinforces good visitor/audience behavior</li> </ul>
Inform about animals' needs	<ul style="list-style-type: none"> <li>• Informs about animals' basic (survival) needs</li> <li>• Informs about secondary needs of individual (to thrive at the zoo)</li> <li>• Informs about secondary needs of species (to thrive in natural habitat)</li> </ul>
Invite perspective-taking of animal	<ul style="list-style-type: none"> <li>• Uses role playing/mimicry/physical movement</li> <li>• Draws attention to the animal's perspective</li> <li>• Asks open-ended questions about animal's behavior</li> <li>• Prompts visitors to take animal's perspective</li> </ul>
Highlight similarities and differences between animals and people	<ul style="list-style-type: none"> <li>• Compares or contrasts animal to other animal's or people's basic needs</li> <li>• Compares or contrasts animals to other animals' or people's physical characteristics, age, etc.</li> <li>• Compares or contrasts animal to other animal's or people's secondary needs</li> </ul>
Reinforce that animals are individuals	<ul style="list-style-type: none"> <li>• Always uses animal's name and/or pronouns</li> <li>• Highlights unique personality trait or individual story for each individual animal</li> </ul>
Reinforce that animals have relationships	<ul style="list-style-type: none"> <li>• Interactions with other animal/person is observed</li> <li>• Relationship between animals or animal/handler is highlighted</li> </ul>
Reinforce that animals have their own agency	<ul style="list-style-type: none"> <li>• Draws attention to animal movements not being physically controlled</li> <li>• Draws attention to animal making choices and own decisions</li> <li>• Animal movements are not physically controlled</li> <li>• Animals make own decisions and act by choice</li> </ul>

## Sample Description

Advancing Empathy Initiative staff conducted observations at each of the 20 Partner Organizations between April 2022 and May 2023. The majority of observations occurred in the months of March through June to avoid winter closures at some sites as well as the busy summer season when Partner Organizations may have been unable to accommodate a site visit. At each site, AEI staff aimed to observe at least one program presenter, one program audience, visitors and signage at four animal exhibits\*, and four additional

sets of exhibit signage. However, this was not always possible due to scheduling constraints and variation in the number of exhibits at each site. In total, AEI staff observed 25 program audiences, 59 program presenters, 552 visitors, and 166 exhibits (see Appendix B for number of observations at each site). Tables 5, 6, and 7 break down the number of observations by audience, group, and animal type.

The programs and audiences AEI staff observed varied based on each organization's unique offerings. Observed programs included in-person and virtual

\*Throughout this report, "exhibits" refers to the interpretive elements associated with animals' habitats.

programs for pre-K and grade school children, keeper talks, amphitheater presentations, behind-the-scenes tours, and animal encounters. Of the 59 programs where presenters were observed, the majority (37) were delivered to audiences of general zoo visitors, and an additional 10 were delivered to grade school groups, seven to preschool groups or pre-K children and their caregivers, three to Advancing Empathy Initiative staff, one to a private group of adults, and one to a virtual audience of social media followers. Due to

scheduling and capacity constraints, audiences were not observed at every program. Of the 25 program audience observations, 12 were of general zoo visitors, 7 were of grade school groups, 5 were of preschool groups or pre-K children and caregivers, and one was of a private group of adults. These programs featured a variety of animals including 27 with mammals, 13 with birds, nine with reptiles, five with terrestrial invertebrates, and one with an amphibian. Not every program included live animals, and several included multiple types of animals.

Table 5. Number of observations of each type of program audience

Type of Program Audience	Program Presenter Observations	Program Audience Observations
General zoo visitors	37	12
Grade school groups	10	7
Pre-K	7	5
Private adult groups	4	1
Virtual	1	0

Table 6. Number of observations of each type of visitor group

Type of Visitor Group	Exhibit Visitor Observations
Adults	156
Mixed-Age	368
Solo Visitor	28

Table 7. Number of observations for each type of animal

Type of Animal	Exhibit Signage Observations	Program Presenter Observations	Exhibit Visitor Observations	Program Audience Observations
Amphibian	3	1	0	0
Bird	36	13	74	5
Fish	8	2	18	1
Mammal	114	26	424	10
Marine Invertebrate	8	0	23	0
Reptile	13	9	45	5
Terrestrial Invertebrate	5	5	11	3

# LEARNINGS

## Use of Empathy-Related Practices

### Empathy Practices in Exhibit Signage

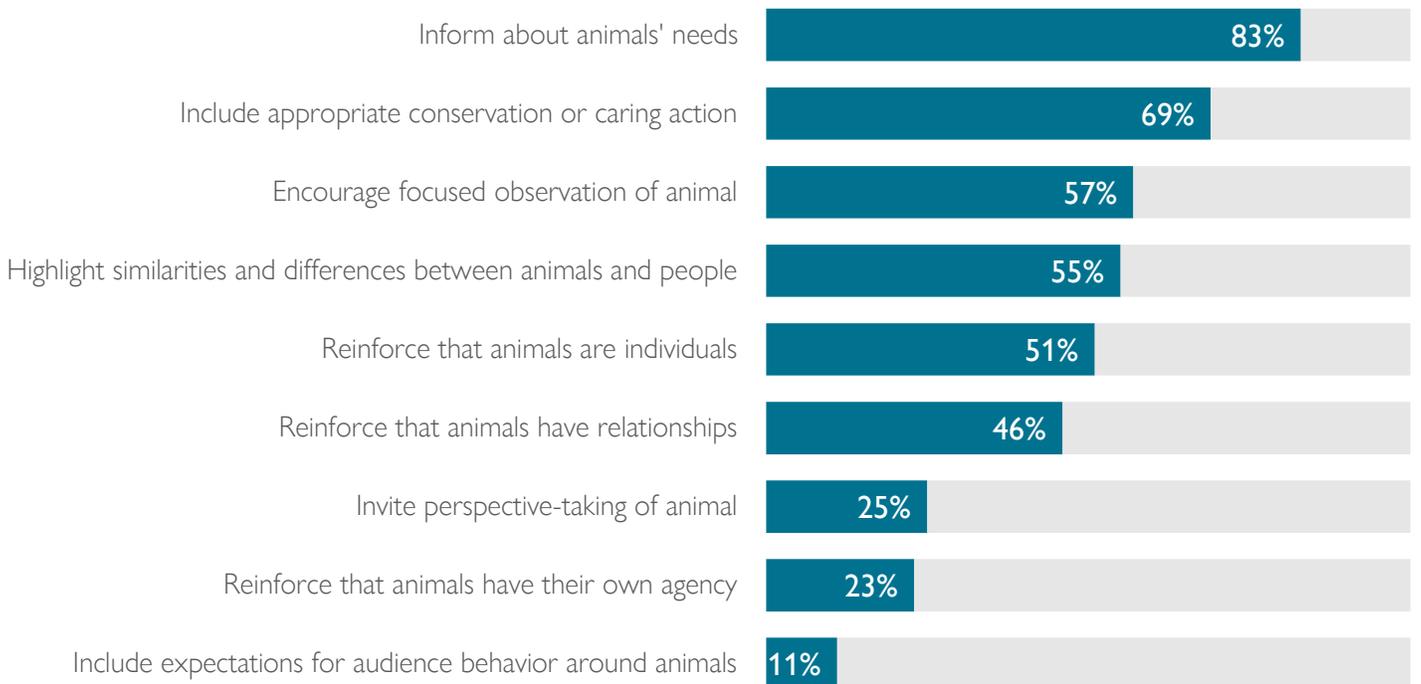
Across all observations of signage in 166 exhibits, the total number and types of practices used in each exhibit varied widely. On average, exhibits utilized 7.9 unique practices out of the 30 included in the Observation Framework, ranging from as few as one practice (observed in signage about plants) up to a maximum of 22 practices (observed at Minnesota Zoo's Russia's Grizzly Coast Exhibit). The majority of exhibits included 10 practices or less.

It is important to note that a higher number of practices is not a direct indicator of the quality of an exhibit or its ability to elicit empathetic responses from visitors, and implementing all 30 practices should not be considered a goal. As evidenced by the significant positive relationship between the number of signs in an exhibit and the number of empathy practices observed, utilizing more practices often requires adding additional text or signage elements. Maximizing the use of empathy practices in signage may thus reduce the overall efficacy of signage, as visitors have been shown to read smaller proportions of signage text as the total number of

of words increases (Thompson & Bitgood, 1988). Notably, however, exhibit signage covered an average of only 4.8 of the nine categories of practices (Table 4), with roughly 50% using practices from five or fewer categories. While simply utilizing more practices may not be a meaningful goal, incorporating a greater variety of practices is an important aim for all Partner Organizations as different types of practices are more closely linked to different empathy-related behaviors.

Overall, the most frequently utilized category of empathy practices by a large margin was *informing about animals' needs*, which was observed in 95% of all exhibits. This category includes practices such as informing about animals' basic needs for survival as well as their secondary needs to thrive in the wild or at the zoo or aquarium. The prevalence of this category in signage is consistent with the fact that one of the main purposes of zoo and aquarium signage has historically been to communicate natural history information about the animals in their care. Additionally, practices within this category are included in the AZA's recommendations for information to include in exhibit signage which Partner Organizations may prioritize.

Figure 1. Frequency of each category of empathy-related practices observed in exhibit signage



n=166

With respect to individual practices, *informing about animals' basic needs* was the most frequently utilized with over 90% of exhibits including it. *Informing about animals' secondary needs in their natural habitats* was also among the top five most frequently utilized practices, observed in 60% of exhibits. Again, these observations reflect Partner Organizations' relative strength at providing basic information about the animals in their care and adherence to the AZA guidelines for information to include in exhibit signage. Within the most frequently utilized practices, there is a marked difference in frequency between the top practice, *informing about animals' basic needs*, and all other practices. Between this practice and the second most frequently used practice, there is a nearly 20% gap in frequency, and that gap widens to nearly 40% between it and the fifth most frequently utilized practice. These gaps indicate that empathy-related practices are not yet being widely implemented as standard interpretive signage practices.

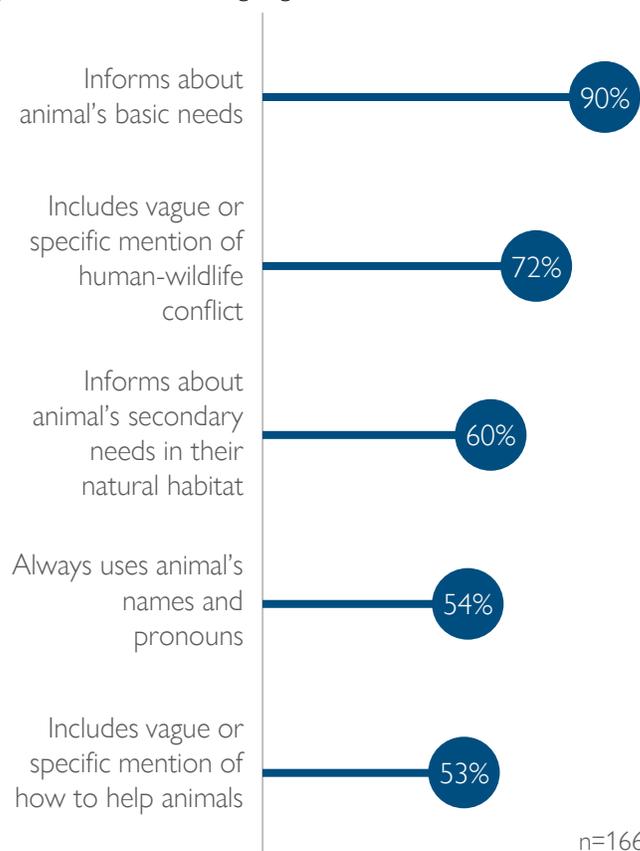
After *informing about animals' needs*, the next most frequently observed category of practices was *including appropriate caring or conservation actions*, seen in 78% of exhibits, which could include *vague or specific mention of human-wildlife conflict* and/or *conservation or caring actions*. The frequency of this empathy practice in exhibit signage stresses the need for further evaluation and research on the link between empathy and conservation behavior, particularly focused on the extent to which the use of empathy practices can increase the efficacy of conservation messaging. Improved understanding will reduce the amount of signage content that needs to be rewritten, alleviating some of the challenges associated with updating exhibits and empowering zoos and aquariums to build on the strengths of existing signage.

One of the ACE for Wildlife Network's primary goals is to leverage empathy for wildlife to inspire conservation behavior, and educating visitors about actions they can take is an important aspect of that work. Within the category of *including caring or*

*conservation actions*, there was some disparity in how individual practices were implemented that is inconsistent with this objective. *Including specific or vague mentions of human-wildlife conflict* appeared in 72% of exhibits, making it the second most frequently implemented practice overall. On the other hand, Partner Organizations *included caring or conservation actions* visitors could take in just over half of the observed exhibits (53%). Based on the discrepancy between informing about conflict and informing about actions, there is clear room for improvement in how Partner Organizations incorporate conservation messaging.

Partner Organizations are at different stages in their adoption of empathy practices and take different approaches to creating exhibit signage. This is reflected in the categories of empathy practices that different Partner Organization utilize. Just over 50% of exhibits utilized strategies to *reinforce that animals are individuals*, and the vast majority of those did so by *referring to animals using their names and pronouns*.

Figure 2. Most frequently observed empathy-related practices in exhibit signage



n=166

At four organizations (International Crane Foundation, Lake Superior Zoo, Roosevelt Park Zoo, and ZooMontana), all observed exhibits incorporated at least one practice that reinforces that animals are individuals, whereas the majority of organizations (12) did so in 50% or fewer of observed exhibits. Notably, two of the organizations that reinforced that animals are individuals in all the observed exhibits had used Capacity Building Grant funds to update their signage to include this type of information. Additionally, one of these organizations (ZooMontana) was the only instance in which all observed exhibits *reinforced that animals have relationships with people or other animals*, a category of practices used in just under 50% of observed exhibits across all organizations.

Based on this evaluation, the two largest potential areas for improvement in exhibit signage are *inviting perspective-taking* and *reinforcing that animals have agency*, each of which was included in roughly one quarter of exhibits. These practices are more nuanced than some others and may be more directly linked to empathy for animals and associated attitudes such as perception of animal welfare. Statistical analysis of observations of visitors' and audiences' expressions of empathy paired to observations of practices used in corresponding exhibits and programs revealed significant, positive relationships between *inviting perspective-taking* and multiple observed empathy-related behaviors including *understanding animals' needs*, *ability to take animals' perspectives*, *interest or curiosity towards animals*, and *desire to help animals*. *Inviting perspective-taking* was one of few empathy-related practices significantly linked to expressions of empathy (explored further in Section 4.2.6 *Relationship of Expressions of Empathy to Empathy-Related Practices Used*), indicating that this may be a particularly powerful tool for inspiring empathy for animals. Similarly, *reinforcing that animals have agency* was shown to be significantly correlated with *desire to help animals* and *positive behavior toward animals*, two of the least-frequently observed empathy behaviors. Though further study is needed to

confirm and explore the nature and strength of these relationships, the results of this evaluation suggest that increasing the use of these two practices in signage may increase multiple forms of visitors' expressions of empathy toward animals.

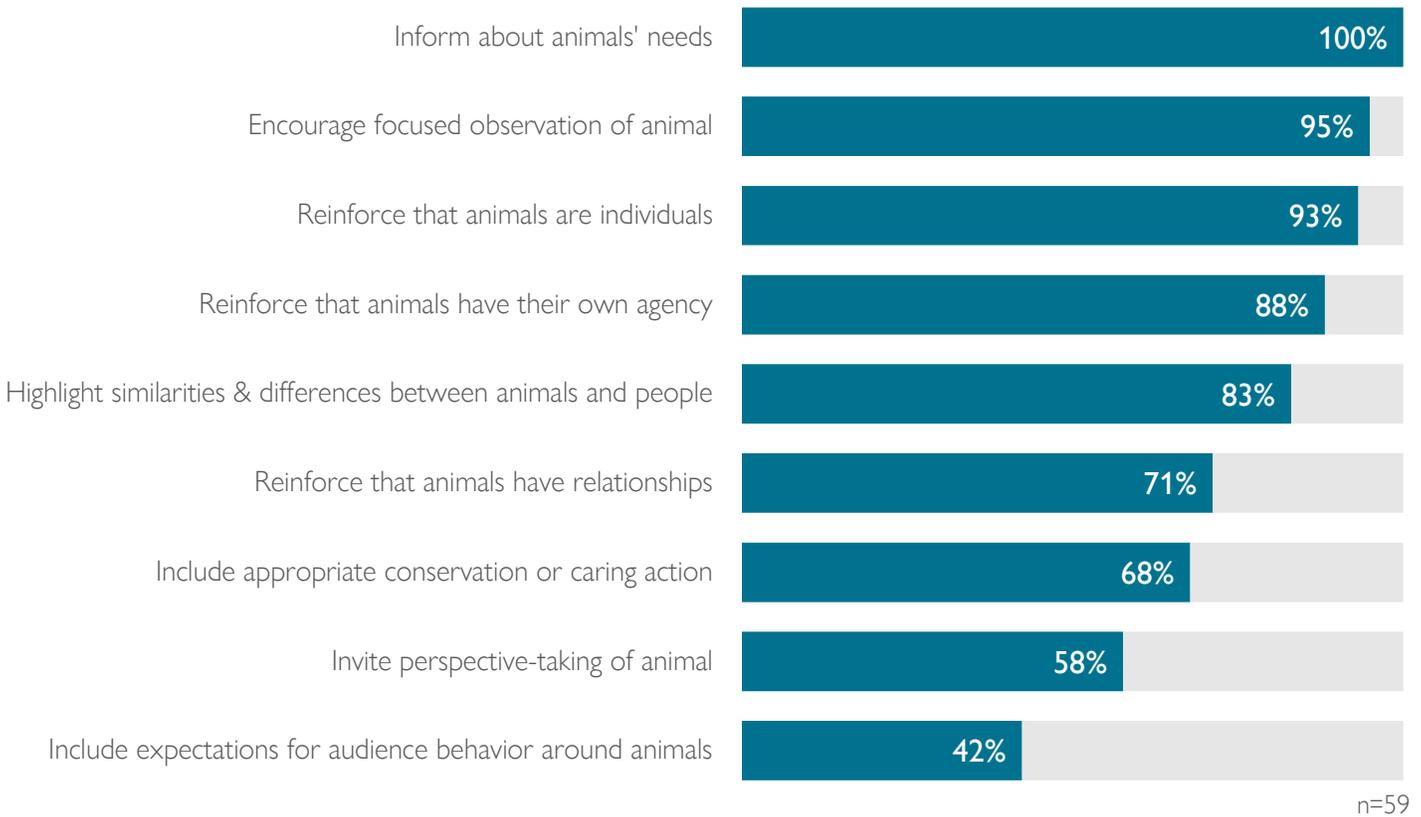
### Empathy Practices in Programs

Across all Partner Organizations, AEI staff observed a total of 59 program presenters including amphitheater presentations, behind-the-scenes tours and experiences, grade school classes and field trips, and preschool programs. On average, program presenters utilized 14.4 practices across seven of the nine total categories, nearly double the mean number of practices and categories utilized in exhibit signage, 7.9 and 4.8, respectively. This is indicative of zoo and aquarium staff's relative strength in incorporating empathy into their programs. While the number of practices utilized by program presenters is significantly correlated with the length of the program, the number of categories covered is not, demonstrating that presenters are able to include a wide variety of strategies for inspiring empathy into even relatively brief programs.

Just as in exhibit signage, the most frequently observed category of empathy-related practices used by program presenters was *informing about animals' needs*, which occurred in all 59 observed programs. Within this category, *informing about animals' basic needs* was the most frequently utilized individual practice (occurring in 90% of programs), mirroring the frequency at which it was observed in exhibit signage. This observation underscores the fact that informing visitors about the animals in their care is an interpretive strength at Partner Organizations and is part of standard practice in both programs and exhibits. It is also an indicator that empathy trainings utilized at these organizations may not need to cover this topic and could focus instead on integrating empathy-oriented language into how information about animals is provided.

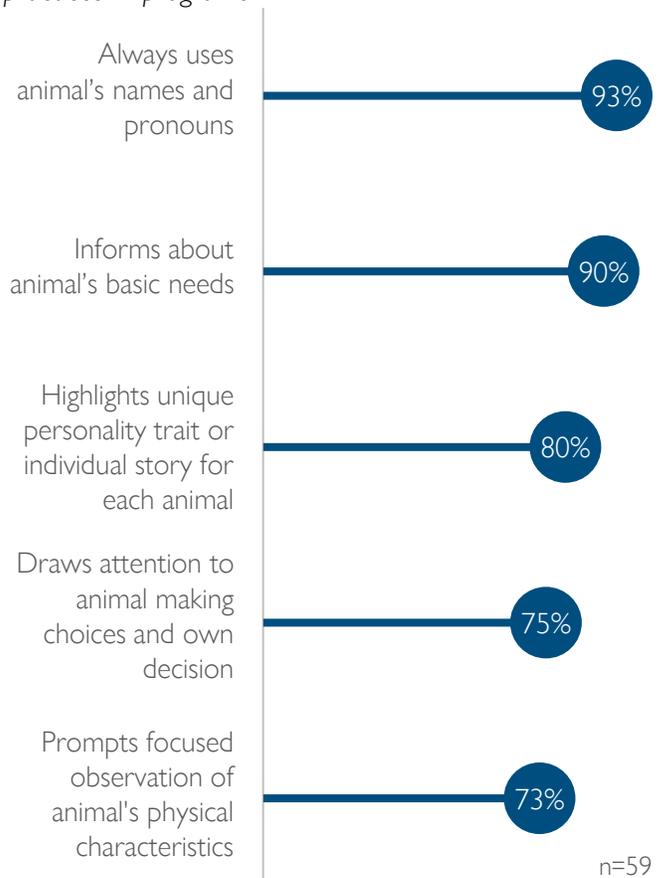
In contrast to exhibit signage, program presenters frequently utilized practices from several other categories, including more nuanced strategies for

Figure 3. Frequency of each category of empathy-related practices observed in programs



inspiring empathy for animals like *reinforcing that animals are individuals (93%), reinforcing that animals have agency (88%), and highlighting similarities and differences between animals and people or other animals (83%)*. Notably, the sharp drop in frequency between *informing about animals' basic needs* and other top practices observed in exhibit signage is not replicated in program presenter observations. Several of the most frequently observed practices in programs were not related to informing about animals' needs, and the top practice used by presenters was *referring to animals using their names and pronouns*, seen in 93% of programs. Also, among the top five most frequently observed practices were: *telling unique stories about animals (80%), drawing attention to animals making decisions and acting by choice (75%), and encouraging focused observation of animals' physical characteristics (73%)*. The more even distribution of practices used in programs may indicate that presenters either more naturally or more intentionally incorporate empathy into their programs. This difference will be explored further in the following section.

Figure 4. Most frequently observed empathy-related practices in programs



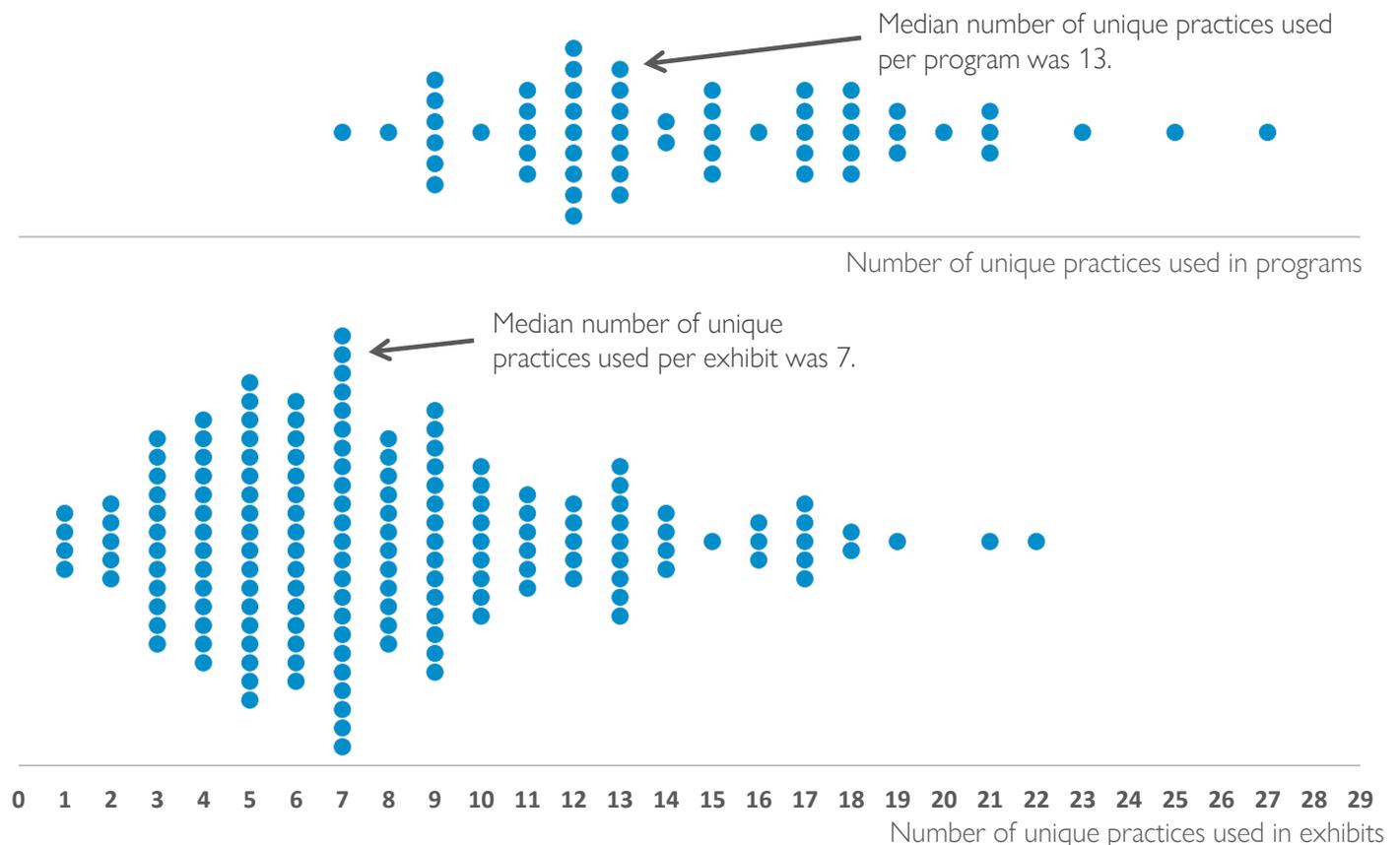
## Differences between Exhibit Signage and Programs

Several factors may explain the differences in the use of empathy practices between program presenters and exhibit signage. Interpretive and educational programs can be adapted to include empathy practices more easily than signage, which must go through design, manufacturing, and installation processes that take time and money. Prioritizing updating signage with empathy practices may not be possible or realistic for all zoos and aquariums at this time, especially considering the financial impacts of the COVID-19 pandemic. Additionally, many of the observed programs featured ambassador animals and were designed to give visitors an opportunity to closely observe and engage with animals, better positioning presenters to utilize several empathy-related practices. Ambassador animals in these programs are also given the opportunity to demonstrate agency in ways that program presenters can easily highlight, while exhibit signage may be more limited in what

behaviors they can draw attention to. Lastly and most crucially, zoo and aquarium professionals draw on a specialized set of knowledge, skills, and experience each time they present, adapting to feedback from audiences and utilizing intentional strategies to help build connections between visitors and animals. While static interpretive signage can incorporate a variety of empathy-related practices, it cannot fully replicate or replace the work done by program presenters to respond and connect to the animals and their audiences in real time.

There are multiple pathways for zoos and aquariums to address the discrepancies in the implementation of empathy practices between exhibit signage and programs. One approach would be to update existing exhibit signage to increase the use of empathy practices, especially more complex practices like reinforcing individuality and agency and inviting perspective-taking. However, this alone is unlikely to result in substantial increases in visitors' feelings of empathy for animals as many zoo and aquarium visitors minimally engage with interpretive signage (Roe et al., 2015).

Figure 5. Number of unique empathy practices used in exhibit signage and programs

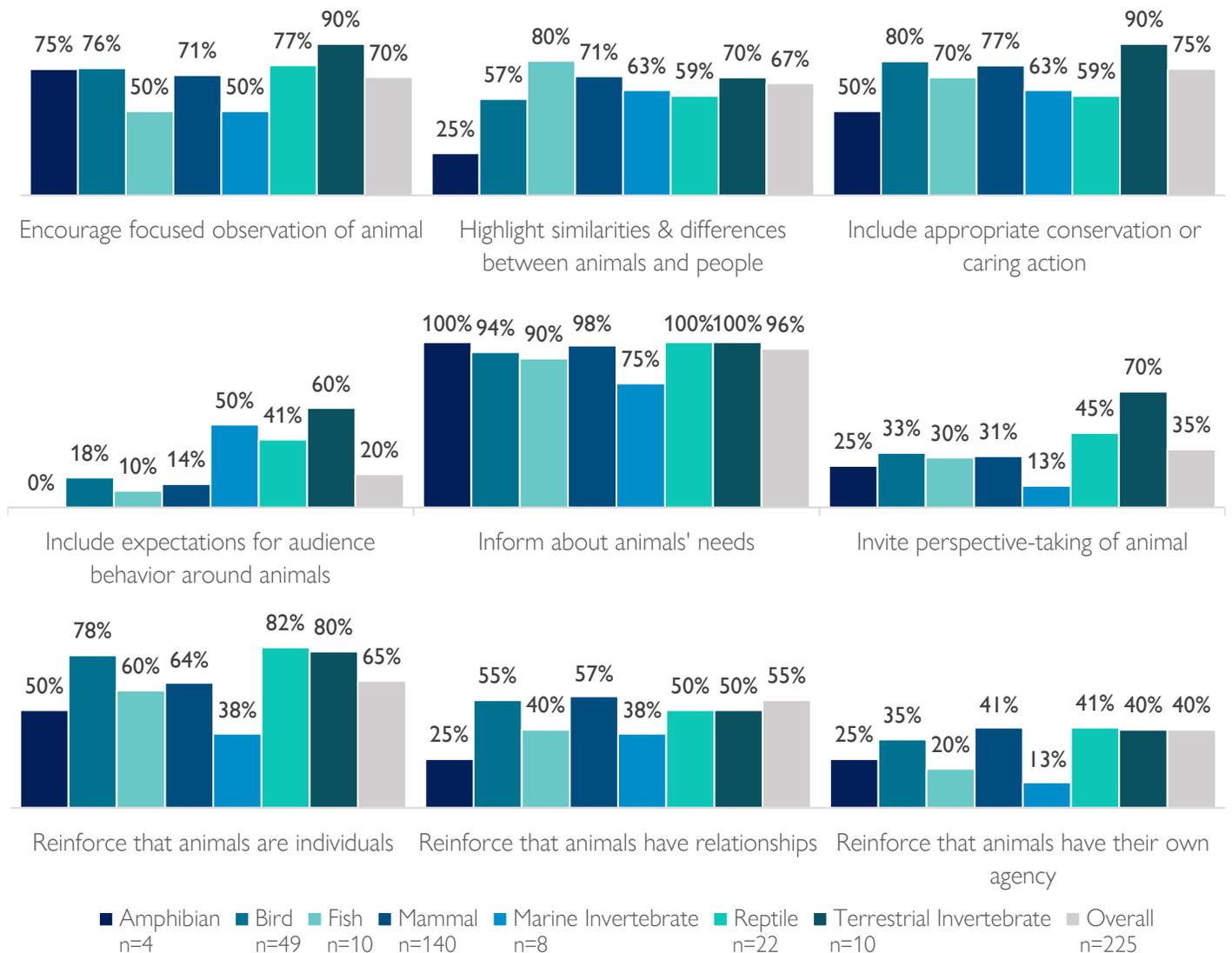


## Relationship between Empathy Practices Used and Type of Animal

Based on analysis of program and exhibit observations combined, empathy-related practices were not implemented equivalently across all taxa of animals. The average number of practices utilized in signage and programs combined ranges from a minimum of 6.1 for marine invertebrates to a maximum of 14.1 for insects and other terrestrial invertebrates. Additionally, comparison of the use of each category of practices across subgroupings of animals revealed significant differences in how zoos and aquariums implemented empathy practices for certain animals. Most notably, exhibits and programs featuring marine invertebrates, primarily touch tanks, were less likely to *encourage focused observation*, *inform about animals' needs*, *introduce conservation or*

*caring actions*, *reinforce that animals are individuals*, and *draw comparisons between animals and people or other animals* compared to the reference group, mammals, though the sample size for this group was small. This pattern may reflect a bias in how people view and experience empathy toward animals that are dissimilar to humans (Myers, 2007). These differences may also be explained by differences in interpretive styles implemented at tactile exhibits like touch tanks. For example, zoos and aquariums may include less signage in these spaces and focus on having interpretive staff or volunteers present to facilitate the experience. Given that these animals are already considered more challenging to empathize with, zoos and aquariums have an opportunity and an obligation to increase their use of empathy practices when interpreting about them.

Figure 6. Frequency of use of empathy practice categories by type of animal



Promisingly, however, exhibits and programs did not demonstrate a consistent, significant tendency to include more empathy practices for mammals than for other groupings of animals. This trend carries over when animals are broken down into smaller categories, with primates used as the reference group due to their similarity to people and the perception that they are the easiest animals to empathize with as a result. Data from this evaluation does not indicate a bias in interpretation in favor of mammals or primates more specifically, as demonstrated by the fact that programs and exhibits do not consistently use empathy-related practices more frequently for these animals. In fact, multiple practices were significantly more likely to be used for other groups and subgroups of animals. For example, exhibits and programs encouraged focused observation of reptiles and terrestrial invertebrates significantly more frequently than they did for mammals and reinforced that animals have relationships significantly more frequently for carnivora (excluding marine mammals), insects, general land mammals, marine mammals, penguins, and reptiles and amphibians than they did for primates (Appendix B). This kind of variation in practices used for different types of animals is a strength as there is no one-size-fits-all approach to inspiring empathy for animals, and the practices used should depend on the species and individual animal.

### Relationship of Empathy Practices Used to Type of Audience

The number and type of empathy-related practices used in programs does not appear to vary strongly based on the type of audience the program catered to, but analysis in this area was limited by the low number of programs observed and the uneven representation of audience types. The only notable exception to this finding is that programs targeted at pre-K and grade school children were more likely to invite perspective-taking. In programs for these two age groups combined, 93% of presenters encouraged audiences to take animals' perspectives, compared to only 55% of presenters across all

other programs combined. This reflects a potential greater willingness to encourage perspective-taking behaviors like mimicry and asking questions about how animals might think or feel when working with young children. Yet, perspective-taking is a powerful tool for inspiring empathy across all ages (Schulz, 2000) and does not need to be limited to children's programs.

### Variation in Empathy Practices Used across Partner Organizations

The number and type of empathy practices being implemented varied depending on the institution and exhibits or programs being observed. Across sites, the median (midpoint) number of practices used in exhibits and programs combined ranged from 5.5 to 16, and the mean (average) ranged from 5.5 to 13.6. Among individual exhibits and programs, the maximum number of practices used occurred in NEW Zoo's penguin encounter program, which included 27 unique practices. Across exhibits alone, Minnesota Zoo's Russia's Grizzly Coast exhibit utilized the most empathy practices, with 22.

Beyond the number of practices implemented, Partner Organizations varied in the frequency with which they utilized each of the nine categories of practices. *Informing about animals' needs* was a strength across all sites, appearing in 78% of exhibits and programs or more at each site and 60% of sites using it in every exhibit and program observed. For most categories, frequency of use was much more site-dependent. This variation was most pronounced when it came to reinforcing that animals have relationships and reinforcing that animals are individuals. At ZooMontana in particular, 90% of observed exhibits and programs used practices that reinforce that animals have relationships, and 100% reinforced that animals are individuals. On the other hand, at some sites, as few as 18% of exhibits and programs reinforced that animals have relationships and as few as 30% reinforced individuality. Similar patterns in use across sites exist for *highlighting similarities and*

*differences between animals and people or other animals and reinforcing that animals have agency.* Based on these differences, it is clear that Partner Organizations do not all approach incorporating empathy into their interpretation and education efforts in the same way and may prioritize different practices based on external factors. Additionally, this finding reinforces the fact that Partner Organizations are at different stages in the process of infusing empathy into their work as each site faces its own unique capacity and organizational challenges. The variation in strengths across the Network also creates an opportunity for Partner Organizations to collaborate and learn from each other, building their own use of empathy practices based on each other's work. Additional notable findings and strengths for each site can be found in the individual site summaries in Appendix A.

### Self-Reported Use of Empathy Practices

In addition to observational data on the use of empathy practices collected during visits to each Partner Organization, staff at these organizations were asked to self-report their use of empathy practices over the past 12 months in the Fall 2023 ACE for Wildlife Network Member and Affiliate Survey. Of the 88 survey respondents employed at Partner Organizations, 98% said they used empathy-related practices in their work. The self-reported use of empathy-related practices was not strongly correlated to any respondent characteristics including individuals' roles at their organizations, perceived investment from organizational leadership, presence on Network committees, and participation in empathy trainings. While not statistically significant, respondents in evaluation roles and those with lower perceived institutional investment were slightly less likely to report having used empathy-related practices. On the other hand, respondents who serve on Network committees and those who had attended an empathy training in the past year were slightly more likely to report having used practices.

Respondents who reported using empathy-related practices were also asked how frequently they did

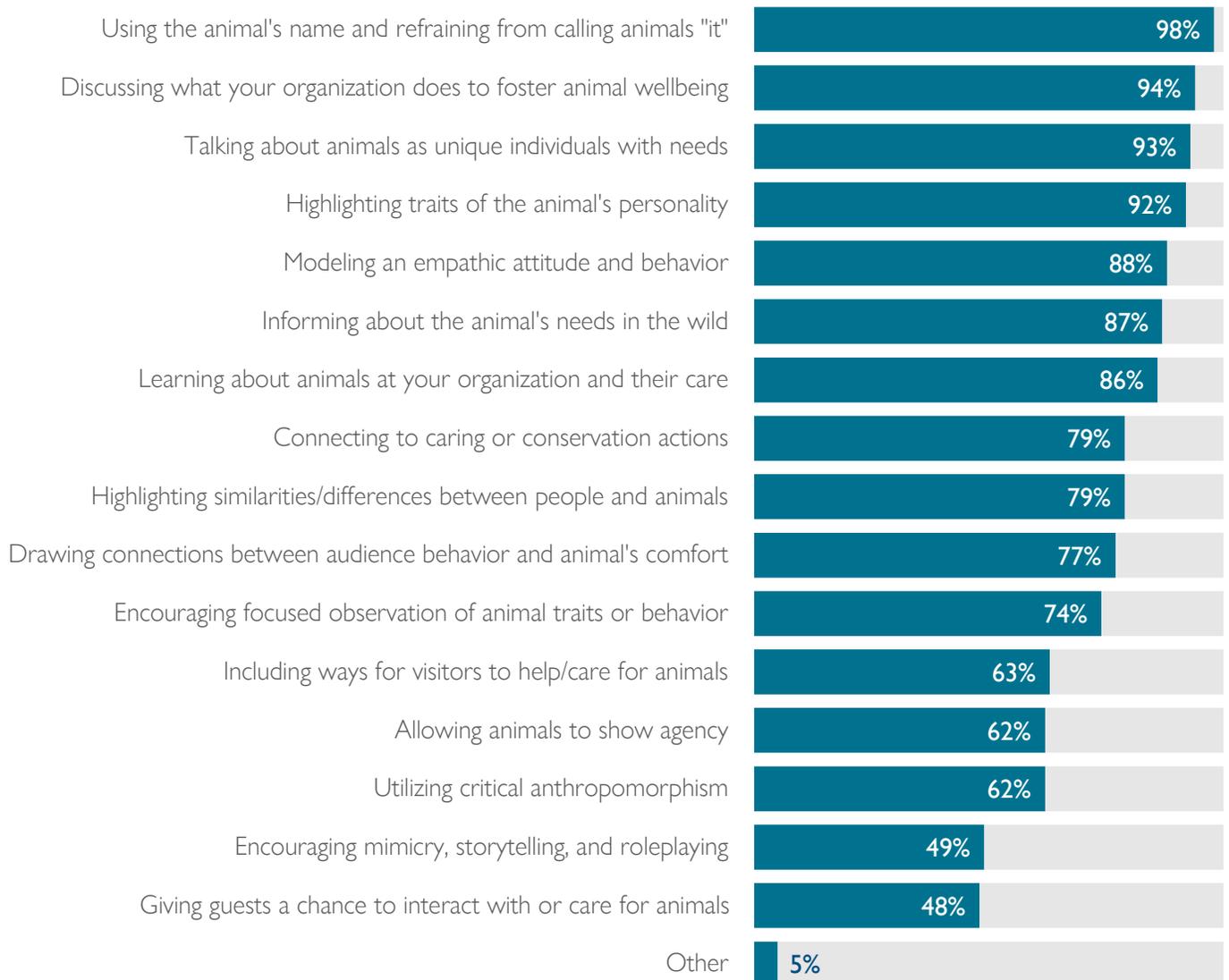
so. Among 86 respondents at Partner Organizations, 43% said they utilized these practices extremely frequently, and another 36% said they did so very frequently. While most of the additional factors again did not play a significant role in how frequently individuals reported using empathy practices, those who reported participating in empathy trainings in the past year were significantly more likely to say they used empathy-related practices extremely frequently. Most often, respondents reported using empathy practices in public programs (69%), followed by school or classroom programs (48%), exhibits or signs (42%), and social media or marketing (33%). Respondents also reported using empathy practices in a number of other settings including camps, tours, staff and volunteer trainings, developing educational resources, personal communication, evaluation design, and grant writing, reflecting how empathy has become infused into multiple aspects of zoo and aquarium work.

In addition to the frequency and settings with which empathy practices were used, survey participants were asked which specific empathy-related practices they utilized in their work. A list of 17 practices was created, derived from multiple familiar resources including the Seattle Aquarium's *Best Practices in Developing Empathy toward Wildlife*, Woodland Park Zoo's empathy bridge, and the Observation Framework (Figure 7). Among these, participants at Partner Organizations selected a median of 13 practices. According to this self-report data, the most frequently used empathy-related practices were *using the animal's name and pronouns* (98%); *discussing how zoos and aquariums foster animal wellbeing* (94%); *talking about animals as unique individuals with needs, relationships, and preferences* (93%); and *highlighting animals' personality traits* (92%). Of these, three are categorized as *reinforcing that animals are individuals* in the Observation Framework. Discussing how zoos and aquariums foster animal wellbeing would be categorized as *informing about animals' needs*. Together, these were two of the most frequently observed categories of practices observed in programs.

In contrast, the least frequently reported practices were *encouraging mimicry, storytelling, and roleplaying* (49%) and *giving guests a chance to interact with or care for animals when appropriate* (48%). It is unsurprising that giving visitors opportunities to interact with animals directly was the least frequently reported behavior, as doing so is outside of the scope of many zoo and aquarium employees' jobs, and many organizations have changed their approaches to offering close encounters with animals in order to prioritize animals' wellbeing and ability to exercise agency. Additionally, encouraging roleplay and mimicry was not observed frequently in exhibit signage or programs overall, although it was used more frequently in programs targeted at young children.

Interestingly, individuals who reported engaging in empathy trainings in the past year were significantly more likely to say they had used five specific practices: *allowing animals to show agency, utilizing critical anthropomorphism* (see Definitions), *highlighting similarities and differences between people and animals, encouraging focused observation of animal traits or behavior, and modeling an empathetic attitude and behavior*. Several of these practices are more nuanced techniques for inspiring empathy for animals, so their increased use among people who have undergone recent empathy trainings is a positive indicator of the trainings' efficacy.

Figure 7. Network Members' self-reported use of empathy-related practices



n=86

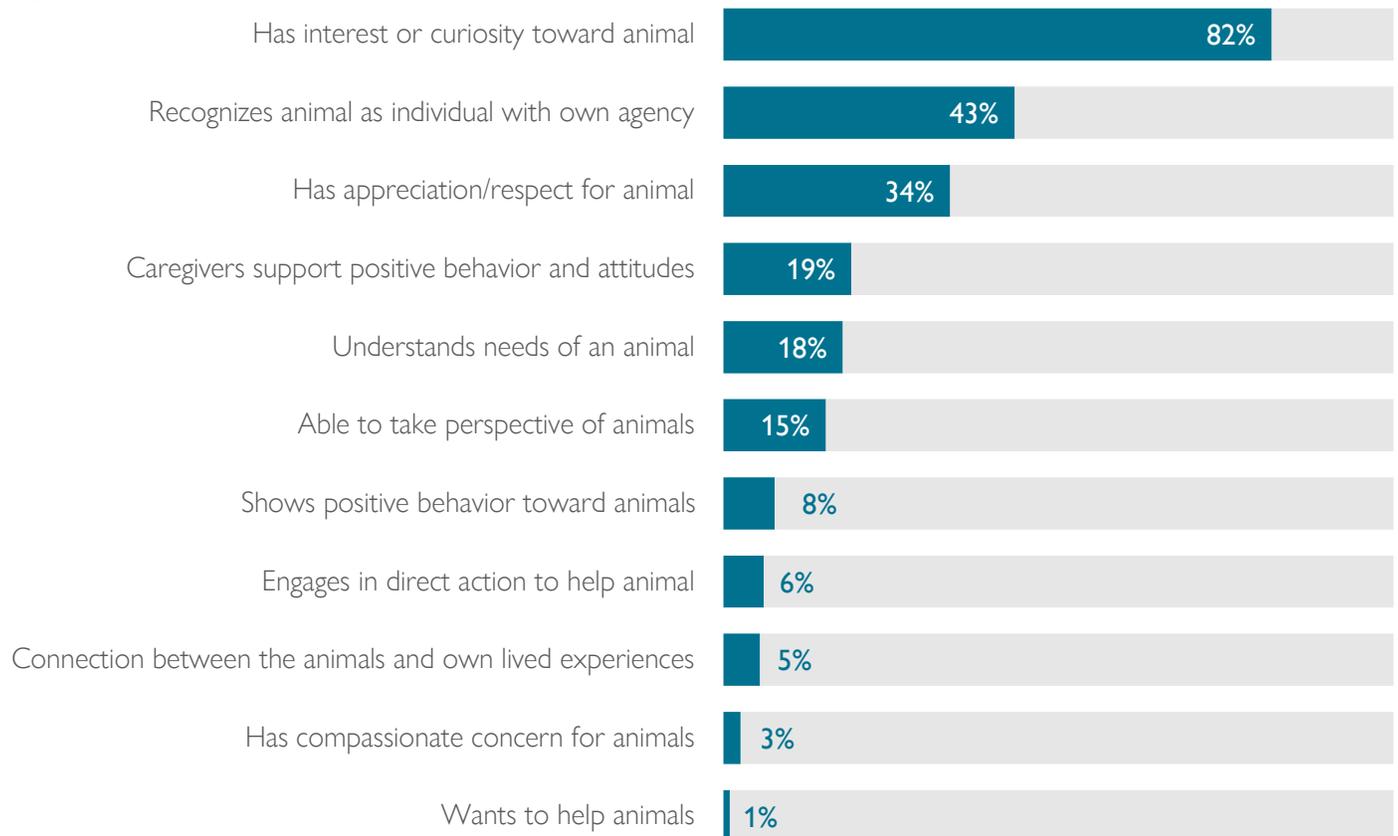
## Expressions of Empathy

### Expressions of Empathy by Exhibit Visitors

Across all 20 Partner Organizations, AEI staff observed a total of 552 individual visitors at exhibits. The number of empathy-related behaviors observed ranged from as few as zero to as many as 19 out of a possible total of 47, excluding three negative behaviors which were included in the Observation Framework, but are not indicators of empathy for animals. The majority of visitors (75%) engaged in six behaviors or fewer, and the overall median number of observed behaviors was four. Just as with observations of practices, higher numbers of behaviors observed is not an indicator of the degree to which visitors experienced empathy for animals at an exhibit, as the Observation Framework focused primarily on verbal expressions of empathy and thus could not fully capture visitors' internal emotional experiences. Still, the median of four behaviors leaves substantial room for growth. As Partner Organizations incorporate more empathy in their work, an increase from this baseline measure should occur as well.

The Observation Framework organized empathy-related behaviors into 11 different categories (Table 3), and visitors typically engaged in behaviors from four or fewer. Among these categories, visitors most frequently demonstrated *interest or curiosity toward animals* which included *observing animals closely, verbalizing observations of the animal or their habitat, seeking information about the animal, and expressing a desire to observe longer or for a second time*. 82% of visitors engaged in one or more behaviors from this category, nearly 40% more than any other behavior category. Within this category, *observing animals closely* and *verbalizing observations of animals* were the most frequently observed, and the most frequently observed behaviors overall, appearing in 62% and 54% of observations, respectively. The frequency with which these behaviors were observed provides a sense of how often visitors go beyond brief, passive observation and engage more deeply with animals, an important condition for developing empathy.

Figure 8. Frequency of categories of empathy-related behaviors observed in exhibit visitors



n=552

## Expressions of Empathy by Program Audiences

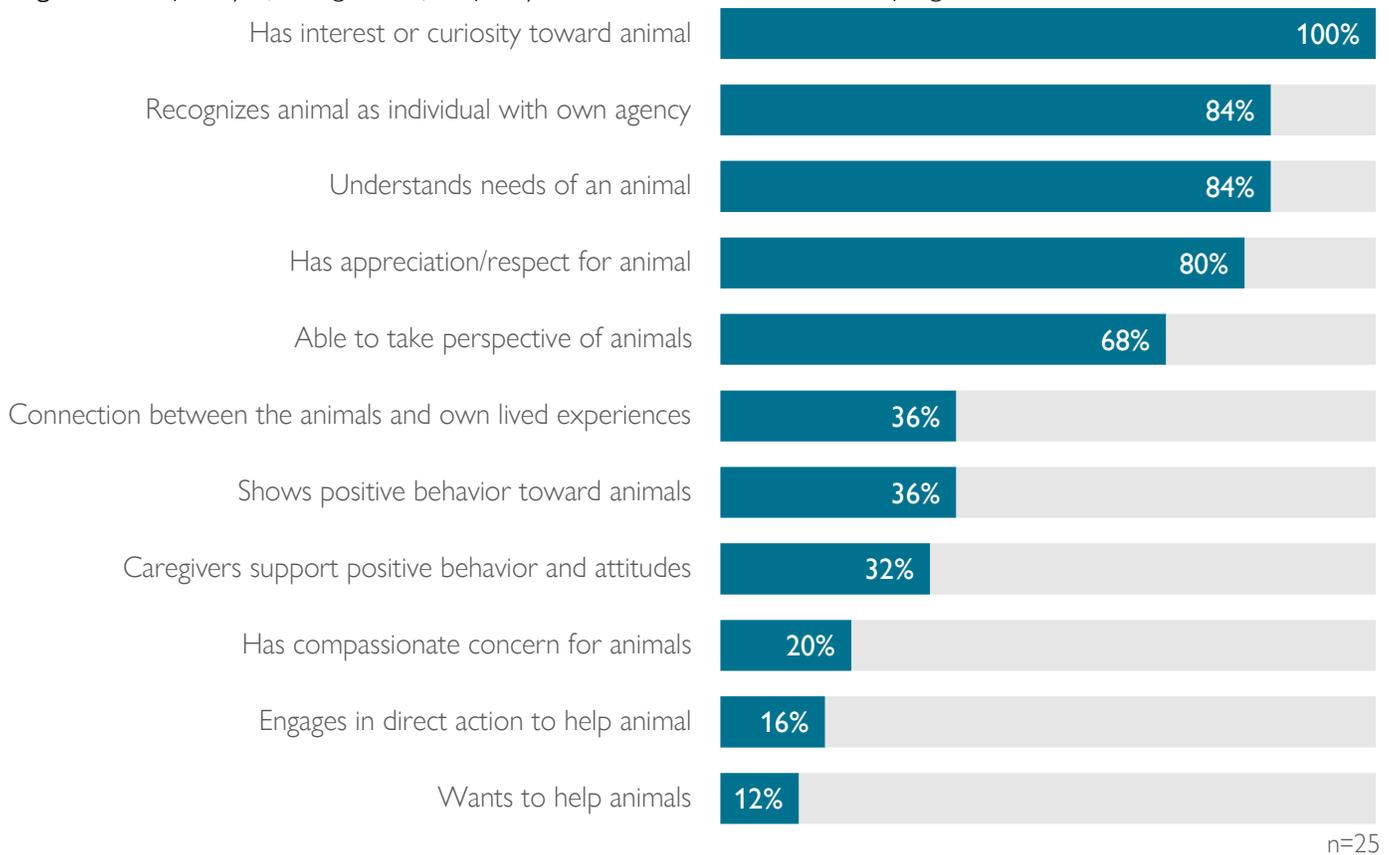
After *interest or curiosity toward animals*, the next most frequently observed behavior categories were *recognizing that animals are individuals* (43%) and *demonstrating appreciation or respect for animals* (34%). The majority of observations in which visitors recognized animals as individuals with agency included the *use of animals' names and pronouns*. Just as including animals' names and pronouns is a fundamental empathy practice in exhibits and programs, visitors addressing animals as individuals in this way represents a basic step away from the objectification of animals and toward a more empathetic mindset. Similarly, the relatively high frequency with which visitors demonstrated appreciation or respect for animals is an indicator of positive attitudes toward animals, which are considered precursors to empathy. Altogether, the most prevalent observed visitor behaviors demonstrate that many zoo and aquarium visitors already experience foundational positive emotions toward animals, which these institutions can leverage to build empathic connections and encourage conservation behavior.

On the other hand, less frequently observed visitor behaviors point to potential gaps in how Partner Organizations facilitate empathy and desire to engage in conservation or caring behavior through exhibits. Across all exhibit visitors, the least frequently observed behavior categories were *demonstrating compassionate concern for animals* (2.6%) and *wanting to help animals* (0.9%). Because these categories primarily relate to visitors' internal attitudes toward animals, the actual frequency with which visitors experienced these feelings may not be accurately represented by the results of these observations. While further evaluation may explore these attitudes in greater depth, it is still important to note how infrequently visitors expressed their understanding of or desire to engage in actions to help animals in the wild, especially considering that over three quarters of exhibits included information about human-wildlife conflict and/or conservation actions. Investigating if and how zoos and aquariums can influence visitors' conservation behavioral intentions is a key topic of interest for the field, and this evaluation reinforces its necessity.

Across all 20 Partner Organizations, AEI staff observed a total of 25 program audiences, combining concurrent observations of different subsets of a program audience into one observation. The number of unique empathy-related behaviors observed per audience was relatively evenly distributed between a minimum of five and a maximum of 24, with a median of 14 and a mean of 13.76. The median number of behaviors observed in program audiences was over three times higher than the median number of behaviors observed in exhibit visitors. This may in part be due to differences in the ability of the Observation Framework to capture empathy-related behaviors in these two settings, as programs often allow for more verbal and physical expressions of empathy through features like open-ended questions or prompted biomimicry. Still, the difference indicates that attending zoo or aquarium programs led to more outward expressions of empathy and related emotions than viewing exhibits. Further investigation into the impact of exhibits and programs on feelings of empathy is needed to more accurately assess the degree to which programs elicit more empathy than exhibits, if at all. As a preliminary finding, however, this difference reinforces the value of ensuring visitors have access to live programs, based on differences in the use of empathy-related practices in exhibit signage and programs.

In general, program audiences engaged in the 11 categories of empathy behaviors at similar relative frequencies as exhibit visitors. As with exhibit visitors, the most commonly observed category of behaviors among program audiences was *demonstrating interest or curiosity toward animals*, seen in all 25 audiences observed. Additionally, 84% of audiences recognized animals as individuals with agency, and 80% demonstrated appreciation or respect for animals. This result reinforces the finding from observations of exhibit visitors that zoo and aquarium visitors experience foundational positive emotions toward animals which can be linked to empathy during their time at these institutions.

Figure 9. Frequency of categories of empathy-related behaviors observed in program audiences



Program audiences were much more likely to engage in certain empathy-related behaviors than exhibit visitors. For instance, program audiences frequently demonstrated *understanding of animals' needs* (84%) and *the ability to take animals' perspectives* (68%), which may be the result of practices utilized by program presenters that prompt audiences to consider animals needs and perspectives. Program audiences were also more likely to *show positive behavior toward animals* and *engage in direct action to help animals* than exhibit visitors, with 36% and 16% of audiences engaging in these behaviors, respectively. This is likely because many of the observed programs featured ambassador animals and offered audiences opportunities to directly interact with animals in ways that cannot be replicated in exhibits. Again, these differences between program audiences and exhibit visitors underscore the value of zoo and aquarium programs as empathy-inspiring experiences.

Due to small sample sizes, it cannot be determined to what extent, if at all, the age of audience and type of program influenced expressions of empathy. This relationship remains a topic of interest for future research and evaluation.

### Relationship of Expressions of Empathy to Visitor Group Type

For each observed visitor, AEI staff recorded whether they were on their own, with other adults, or with a mix of adults and children. The majority (66%) of observed visitors were in mixed age groups, with another 28% in groups of adults. Solo visitors were relatively rare, making up just 5% of observations. There was no significant difference in the mean number of empathy behaviors observed between mixed age groups and adult groups, 3.9 and 3.7 respectively, but both were significantly higher than the mean number of behaviors observed for solo visitors, 1.8. This difference does not necessarily mean that people experience less empathy for animals when viewing exhibits alone, as the majority of expressions of empathy included in

the Observation Framework were verbal and thus less likely to be observed when visitors did not have other people to converse with.

The frequency of each category of behaviors between adult and mixed age groups was also analyzed for significant differences. Solo visitors were left out of this analysis as the statistical power was limited by the low number of observations. Between adult and mixed age groups, only one model was statistically significant: *caregiver support*, which was significantly more likely to be present in mixed age groups and absent in adult groups. This category of behavior primarily includes actions adult caregivers took during observations where the focal subjects were children, so it follows that these behaviors would be observed less frequently in adult groups. Other than this, no behaviors had statistically significant differences between mixed age groups and adult groups, indicating that, at least in regard to what was captured using this evaluation's observation protocol, empathy behaviors are not strongly linked to group type.

### Relationship of Expressions of Empathy to Exhibit Stay Time and Program Length

The number of unique behaviors and categories of behaviors observed increased significantly with the length of visitors' exhibit stay times and program length. While significant ( $p < 0.01$  and  $p < 0.0001$  respectively), these relationships were relatively weak. From this, it can be concluded that the number of different behaviors visitors and audiences engage in increases somewhat with time. However, this is not a strong indication that longer programs or exhibit stay times inspire more empathy. Additionally, there is likely an upper limit on both program length and exhibit stay time past which visitors and audiences will not continue to engage in additional empathy-related behaviors. As such, time should be considered a relevant factor when designing empathy-inspiring exhibits and programs, but it should be balanced with other factors tied to empathy and accomplishing the experience's overall interpretive goals.

### Relationship of Expressions of Empathy to Empathy-Related Practices Used

Based on multiple linear regression analyses of observation data collected across all sites, there are some significant though relatively weak to moderate relationships between specific categories of empathy-related practices and behaviors. In particular, *including expectations for visitor and audience behavior* and *inviting perspective-taking* were positively related to several behaviors including *understanding animals' needs*, *ability to take animals' perspectives*, *interest or curiosity toward animals*, and *desire to help animals*. Additionally, *including behavior expectations* was positively related to showing *positive behavior toward animals*. The frequent connection between these practices and multiple empathy-related behaviors is a strong indicator that implementing them is at least to some extent an effective way to encourage visitors and audiences to have empathy for wildlife. While setting behavior expectations is primarily a programmatic element where presenters often need to communicate these expectations for the safety of the audience and animals present, inviting perspective-taking is a tactic that can be utilized in both programs and exhibit signage. Based on these results, including opportunities to take animals' perspectives could be considered a priority in designing exhibits and programs intended to encourage empathy-related behaviors.

Although there were no other clear patterns of practices that inspired many empathy-related behaviors, there were additional significant relationships. Consistent with existing literature on critical anthropomorphism (Burnet et al. 2024), *including comparisons of animals to people or other animals* was positively related to *understanding animals' needs* and *ability to take animals' perspectives*, demonstrating that relating animals' characteristics and behaviors to familiar analogs may enhance people's ability to understand and empathize with them. In addition, *encouraging focused observation* was positively related to *interest or curiosity toward animals*, reinforcing that showing animals have agency was positively related to desire

to help animals, and reinforcing that animals are individuals was positively related to showing positive behavior toward animals. Beyond these links between specific practices and behaviors, there was a moderately positive significant ( $p < 0.0001$ ) relationship between the number of practices implemented and the number of behaviors visitors and audiences demonstrated. All these relationships point to the potential efficacy of empathy-related practices in exhibits and programs, but additional evaluation or research in which potentially confounding variables are controlled for is needed to more accurately determine the nature and strength of the connection.

One factor that did not yield significant results was the use of regulatory signs that communicate behavior expectations (e.g., “Do not tap on the glass,” “No feeding the animals,” etc.). Few statistical models found any relationship between observed behaviors and the presence or absence of regulatory signs. Those that did explained less than 2% of the variance in behavior. This finding does not indicate that regulatory signage is not effective or necessary, only that it is not a predictor of empathetic behavior toward animals.

### Relationship of Expressions of Empathy to Type of Animal

Unlike with exhibit and program practices, comparison of empathy behaviors across animal groupings of interest did not reveal consistent, significant differences in behavior toward any type of animal. Only one category of empathy-related behaviors, *shows positive behavior towards animals*, revealed any significant differences, appearing more frequently at exhibits and programs featuring terrestrial invertebrates, marine invertebrates, fish, reptiles, and mixed types of animals than at exhibits and programs featuring mammals. The differences in frequencies between these can likely be attributed to differences in the specific exhibits and programs observed and the behaviors included in this category rather than to differences in visitors' and audiences' attitudes toward these types of animals. Several of the behaviors in this category relate

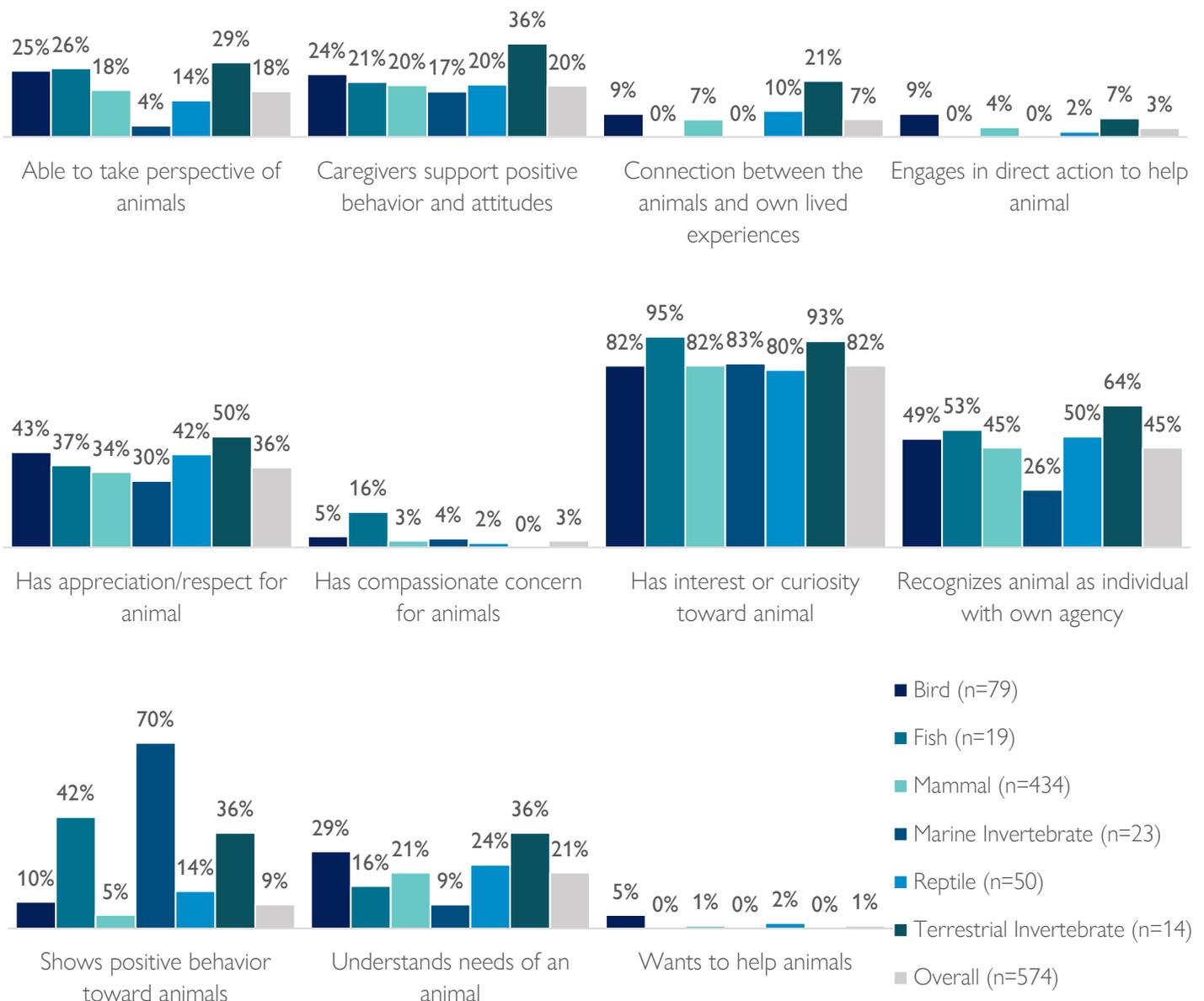
specifically to touching animals and regulating behavior when interacting with them. Opportunities to directly engage with animals in this manner varied between animals. Most exhibits featuring marine invertebrates and programs featuring terrestrial invertebrates offered touch opportunities, inflating the frequency with which positive behaviors towards animals were observed for these animals. In contrast, many more observations were conducted at exhibits and programs featuring mammals, and the majority did not include opportunities for this kind of direct engagement as doing so would not be appropriate or safe.

Although the frequencies of specific behavior categories generally did not differ significantly across types of animals present, the number of unique behaviors observed did. The mean number of behaviors observed varied significantly ( $p < 0.01$ ) between the six larger categories of animals in observations of exhibit visitors and program audiences combined. Contrary to what existing research and conventional wisdom would predict, visitors and audiences demonstrated the lowest mean number of behaviors at exhibits and programs featuring mammals (4.1) and the highest mean number of behaviors at exhibits and programs featuring terrestrial invertebrates (7.9). Excluding terrestrial invertebrates, however, the mean number of observed behaviors does not differ significantly between the remaining animal categories. As noted previously, the relatively high number of behaviors demonstrated toward terrestrial invertebrates may be attributed more to the types of behaviors encouraged at exhibits and programs featuring these animals, as well as the relatively low number of observations in this category, rather than by differences in visitors' underlying attitudes toward these animals. Still, the lack of significant differences in how visitors and program audiences behaved in response to different animal types conflicts with prior work exploring the relationship of empathy to animal characteristics (e.g., Myers, 2007; Westbury & Newman, 2008). Based on the current understanding of empathy for non-human animals, significantly more empathetic behaviors and higher

frequencies of behavior categories directed toward mammals as compared to all other groups of animals would be expected. Several factors may explain this divergence from expectations. First, it is possible that the differences in people's ability to empathize with animals that are dissimilar to them are less pronounced than previously thought. It is also possible that these differences are not as prominent among zoo and aquarium visitors who are more likely to have positive attitudes toward animals than the general public (Clayton et al., 2014).

Furthermore, animal activity levels are known to impact experiences of empathy (Myers, 2007), and animals like fish and birds may have been more active during visitor observations than large mammals like big cats, which are often less active during much of the day. Whatever the underlying cause may be, the divergence from expectations in how visitors demonstrated empathy toward different animals is a key point of interest in the results of this evaluation and an important subject for future research and evaluation.

Figure 10. Frequency of empathy-related behavior categories by type of animal



## Additional Findings

### Exhibit Stay Time

In addition to empathy-related behaviors, observers also tracked how long visitors spent at each exhibit. On average, visitors spent 2 minutes and 13 seconds at each exhibit, and 75% of visitors spent 2 minutes and 45 seconds or less per exhibit. The longest individual exhibit stay time occurred at Racine Zoo's Barnyard Safari goat brushing area, where one group spent 16 minutes and 13 seconds, and the longest average exhibit stay time occurred at Grizzly & Wolf Discovery Center's bear habitat, where visitors spent an average of 8 minutes and 23 seconds.

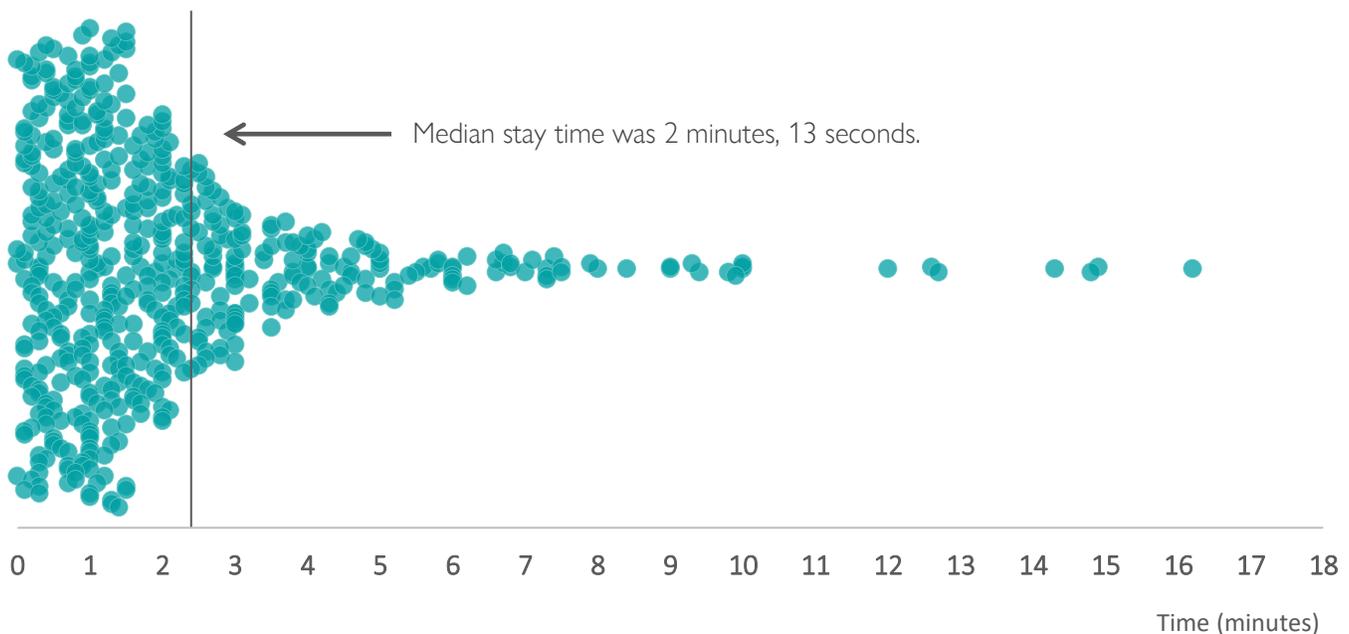
Intuitively, domestic barn exhibits and touch tank exhibits that allowed visitors to interact with animals directly tended to have longer stay times as compared to non-touch exhibits. While exhibits that offer a touch opportunity had an average stay time of 3 minutes and 50 seconds, non-touch exhibits averaged only 2 minutes and 2 seconds per group, a statistically significant difference. Zoos and aquariums can capitalize on these exhibits' longer stay times as empathy-building opportunities by infusing additional empathy-related practices into these spaces. For example, several domestic barn

exhibits invited visitors to brush or feed animals, providing opportunities to directly engage in caring behaviors, one of the least frequently observed practices utilized in exhibits. Additionally, interpretive staff and signage at touch tanks can leverage visitors' attention to emphasize that the marine invertebrates in these exhibits are individuals. This approach can support visitors in understanding these animals' perspectives and experiences, prompting them to behave respectfully toward them.

## LIMITATIONS

The nature and scope of this evaluation imposed a number of limitations on the data that could be collected and the conclusions that can be drawn. Most significantly, the Observation Framework used for program audiences and exhibit visitors was limited in its ability to capture feelings of empathy that were not verbalized or tied to specific notable behaviors. Since the outset of this evaluation, additional tools have been developed for observing nonverbal indicators of empathy. Future iterations of this work will likely incorporate those strategies or include additional data collection methods such as

Figure 11. Exhibit stay time for each observed visitor



surveying or interviewing visitors to supplement this shortcoming of the existing Observation Framework.

The timing of visits to each Partner Organization was also a limiting factor on data collection. In order to prevent imposing a burden on staff at Partner Organizations during the busy summer season, and considering winter closures at some sites, on-site observations were conducted during the Spring and Fall, outside of the peak visitation period for most zoos and aquariums. As a result, the number of visitors present and programs offered was sometimes limited, affecting the quantity of observations that could be collected. Conducting site visits during these limited periods also resulted in observations being conducted over a period of two years. During this time, organizations may have updated signage and programs to include additional practices which could only have been captured in observations conducted toward the end of this period.

In addition to differences in the timing of visits, many other factors varied across the 20 Partner Organizations that may have impacted the observations. Variables such as the species of animals present at each site, exhibit closures, weather, and number of visitors present could not be controlled for. Due to this variation, the ability to make generalizations based on this data is limited.

While interrater agreement was assessed when the core team of observers was first trained to use the Observation Framework, it was not reevaluated at any subsequent point in the process of collecting data. In addition, staff turnover during the evaluation period resulted in changes to who collected data, and, although new observers received training on using the protocol, their use of the protocol was not directly checked against the core team's. Therefore, differences in how individual observers noted behaviors and practices may have arisen over time. For similar reasons, analysis of observation data from each site was limited to only include the presence or absence of practices or behaviors in each observation due to inconsistencies in how

frequency was recorded. This limited what types of analysis could be used with the data and what conclusions can be drawn based on it.

Finally, data was manually entered from paper observation sheets, and there is always potential for human error through that process. Multiple rounds of cleaning the database and cross-checking sources of confusion against the physical observation sheets, notes recorded from each site, and observers' recollection of what was observed likely caught and resolved the majority of errors introduced through manual data entry, but some may remain. In addition, a small amount of observational data was lost due to loss of physical observation sheets.

## RECOMMENDATIONS

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Although there are limitations to the extent to which findings from this evaluation can be generalized, its results point to several recommendations for zoos and aquariums. For instance, observations of exhibit signage revealed significant gaps in which empathy-related practices are currently being utilized. As organizations update their exhibits over time, they should incorporate additional empathy-related practices such as reinforcing that animals are individuals by including their names and other unique information about their appearance, personalities, and histories that visitors have been shown to be most interested in (Fraser et al., 2009). As additional empathy practices are incorporated, it should be done with a focus on quality rather than quantity as the number of empathy practices used in signage was not shown to increase visitors' expressions of empathy.

In addition to signage, observations of program presenters suggest that some empathy practices (e.g., *informing about animals' needs*) are used more often than others. Based on this finding, empathy trainings aimed at staff and volunteers may be made more impactful by shifting their focus to practices that are used less frequently, especially those that may be more strongly linked to audience

## TOPICS FOR FUTURE EVALUATION

expressions of empathy such as inviting perspective-taking. This recommendation is supported by the fact that individuals who self-reported attending an empathy training in the last year were more likely to report utilizing more nuanced empathy practices, indicating that these trainings can effectively advance individuals' understanding of empathy and ability to incorporate it into their work.

The results of this evaluation also indicate that live interpretation may have a greater impact on visitors' experiences of empathy for animals than engaging with exhibits. Increasing opportunities for visitors to engage with zoo and aquarium staff and interpretive volunteers through programs or at exhibits themselves may thus increase visitors' experiences of empathy for animals. This recommendation is reinforced by prior research which has demonstrated that visitors who speak to educational staff and volunteers engage more deeply with animals and exhibits than those who do not (Pavitt & Moss, 2019). Increasing visitors' access to programs can take many forms and is not limited to structured, longform presentations, as evidenced by the fact that shorter programs were just as successful at incorporating a breadth of types of empathy practices as longer ones.

Lessons learned from conducting this evaluation also highlight areas for improvement in future evaluation of empathy practices and behaviors in zoos and aquariums. Most critically, future work should aim to control or record external variables that may impact expressions of empathy toward animals such as animal activity level. Additionally, variation in how observations are recorded could be limited by transitioning from a paper observation tool to a digital version. Doing so would also reduce data loss and human error introduced through data entry related to the use of a paper observation tool. Finally, observations of empathy expressions should be supplemented by self-report data where possible to capture a more complete picture of how zoo and aquarium visitors experience empathy in response to exhibits and programs.

As a primarily exploratory, baseline evaluation, this work revealed a number of opportunities for future evaluation and research into the use of empathy practices at Partner Organizations and in zoos and aquariums at large. The following list summarizes the key questions for further exploration identified through this evaluation:

- ? What feelings of empathy beyond those that are verbalized or indicated through behavior, if any, are elicited by exhibits and programs in zoos and aquariums? To what extent, if at all, are these affected by the intentional use of empathy practices?
- ? To what extent, if at all, does the use of empathy practices affect the efficacy of existing conservation messaging in exhibits and programs? Does the use of empathy practices affect zoo and aquarium visitors' willingness to engage in conservation or caring actions?
- ? Is there a significant difference in how exhibits and programs impact expressions or feelings of empathy for animals when potentially confounding variables such as type of animal, animal activity, and touch opportunities are controlled? Do individuals who both attend programs and observe exhibits express or experience more empathy than those who do only one or the other?
- ? Which factors influence how zoos and aquariums incorporate empathy practices into exhibits and programs? Do these factors affect which types of empathy practices are incorporated?
- ? To what extent, if at all, does the type of animal featured in an exhibit or program impact visitors' and audiences' empathetic responses when all other variables are controlled?
- ? Do the target audience age and program type influence programs' efficacy at eliciting feelings and expressions of empathy?
- ? What impacts, if any, does inviting perspective-taking have on empathy-related behaviors and/or feelings of empathy for animals?

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# Appendix A: Individual Site Summaries

## INTRODUCTION

The Advancing Empathy Initiatives (AEI) staff from Woodland Park Zoo visited the 20 ACE for Wildlife Network Partner Organizations from April 2022-May 2023. These site visits served several different purposes, including:

- Strengthening connections between AEI staff and Partner Organization staff;
- Meeting with Partner Organization staff to provide training/answer questions, understand additional resource needs, and gain insight into their existing empathy initiatives;
- As relevant, holding Capacity Building Grant check-ins regarding grant activities, budget, and evaluation; and
- Conducting several observations in support of WPZ's Advancing Empathy for Wildlife Program Evaluation Plan.

Across all sites, AEI staff collected the following observational data:



### Use of Empathy Practices in Signage

1 observation = all signs in an exhibit\*  
n=166



### Use of Empathy Practices by Program Presenters

1 observation = 1 presenter/program  
n=59



### Expressions of Empathy by Exhibit Visitors

1 observation = 1 group of visitors  
n=552

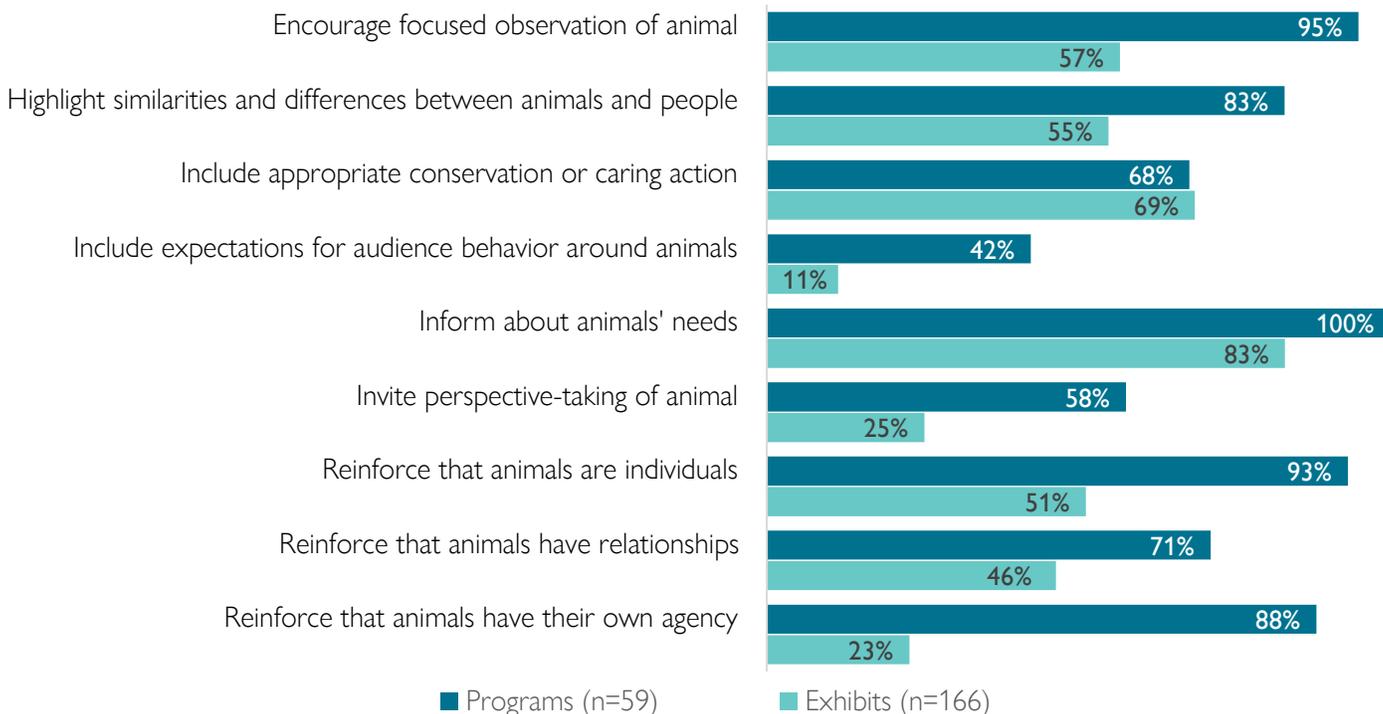


### Expressions of Empathy by Program Audiences

1 observation = 1 audience/program  
n=25

\*"Exhibits" refers to the interpretive elements used at or around animals' habitats.

## Use of Empathy Practices Across All Partner Organizations



The following pages serve as summaries of the observations conducted each site.

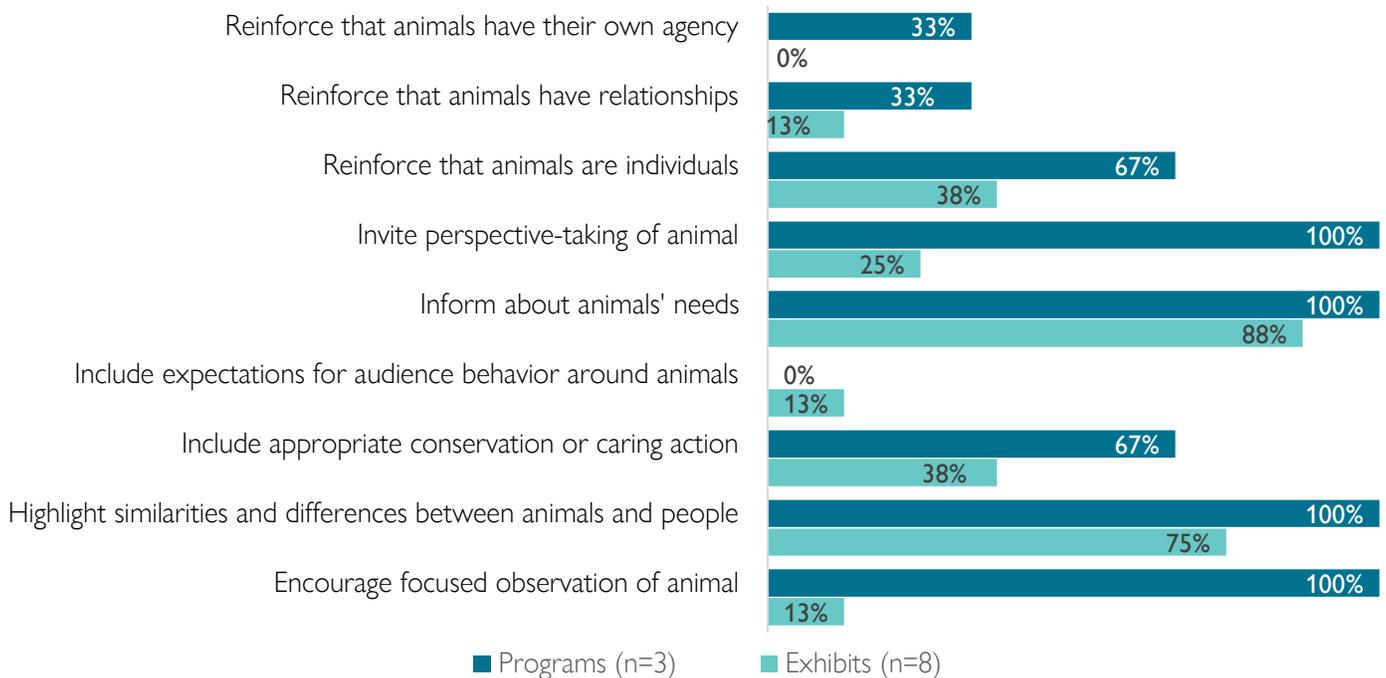
# ALASKA SEALIFE CENTER

## Visit Background:

Located in Seward, AK, the Alaska SeaLife Center is a public aquarium and marine research center as well as the only permanent marine mammal rescue and rehabilitation facility in the state.

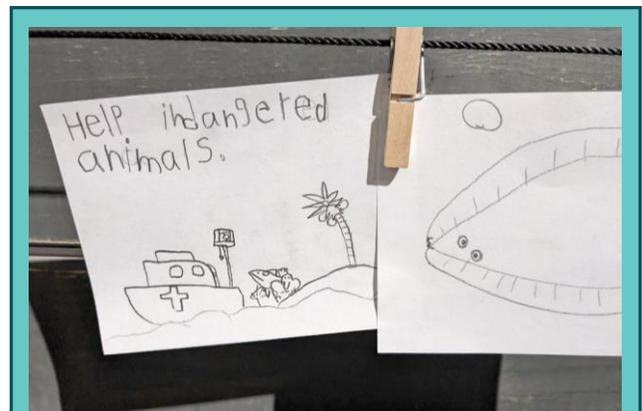
AEI staff visited the Alaska SeaLife Center on May 18, 2023. AEI staff conducted signage observations at the aviary, seals, Steller sea lion, moon jellies, salmon, skates, and giant Pacific octopus exhibits and presenter observations during two grade school Nocturne Programs and the Sneak Peak Wildlife Response program. AEI staff's visit occurred at the beginning of cruise ship season, when Alaska SeaLife Center has an influx of visitors from out of state.

## Use of Empathy Practices at Alaska SeaLife Center



## Highlights:

- In *Seashore Survivors*, a class offered as part of an overnight school program, the presenter included all forms of inviting perspective taking on the observation sheet. This was one of the rare instances of a program or exhibit encouraging visitors to take the perspectives of invertebrates, which are considered especially challenging to empathize with due to their lack of similarities with humans.
- Visitors in the aviary were observed engaging in 16 unique empathy behaviors, the most of any exhibit featuring flighted birds and the second most of any exhibit not featuring mammals. One potential contributing factor to this observation is the exhibit's immersive design which allowed for visitors to engage with shorebirds up close.



An interactive display prompts visitors to share their thoughts on how people can work together to save oceans.

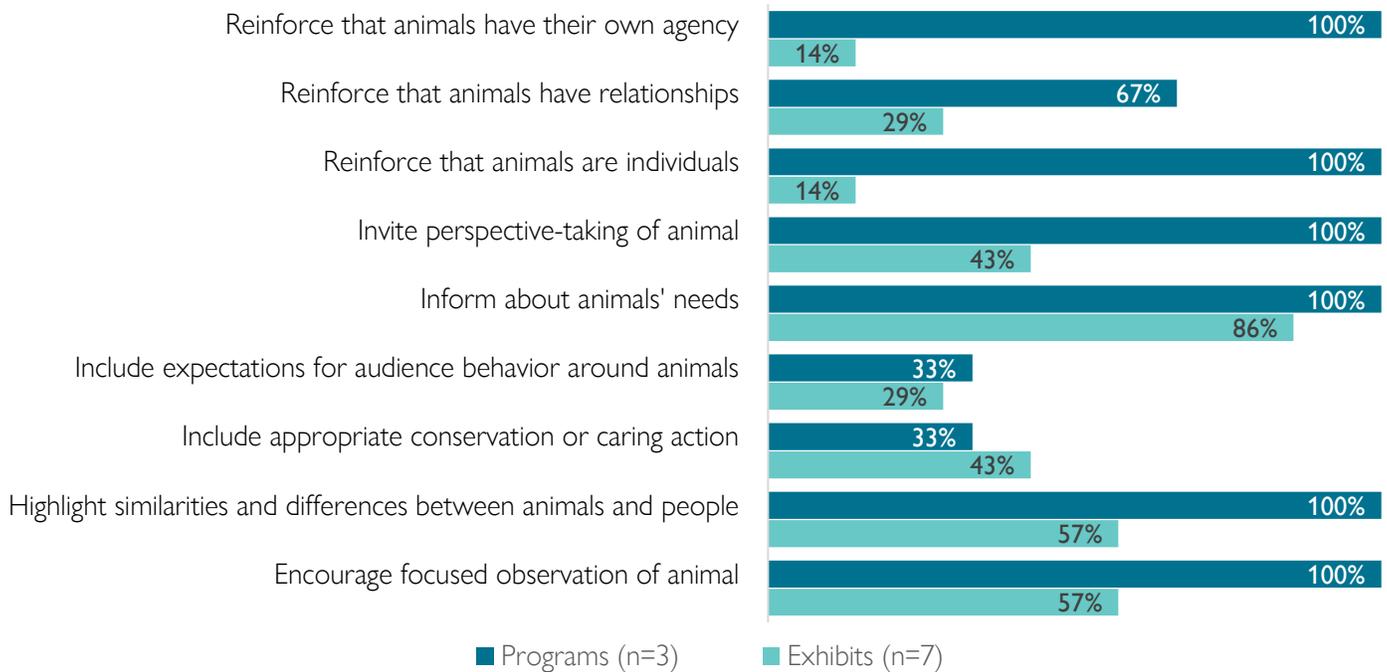
# COMO PARK ZOO & CONSERVATORY

## Visit Background:

Como Park Zoo & Conservatory is a city-owned park, zoo, and conservatory in Saint Paul, Minnesota. Both the zoo and conservatory gardens are open year-round and offer free admission.

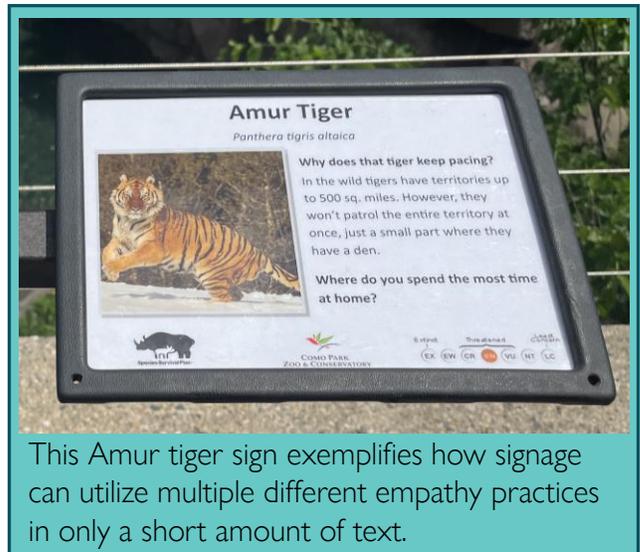
AEI staff members visited Como Park Zoo & Conservatory on June 9, 2022 and observed exhibit signage at the Amur tiger, big cats, cougar, Galapagos tortoise, giraffe, gray wolf, and Sumatran orangutan habitats. Additionally, AEI staff observed presenters' use of empathy-related practices during the big cat keeper talk, a practice keeper talk for the golden-headed lion tamarins, and the "SPIRE Sparky Show" featuring Sparky the sea lion, a signature program of the zoo. Notably, staff members from the AEI's funder were present during this visit, which may have impacted the observations.

## Use of Empathy Practices at Como Park Zoo & Conservatory



## Highlights:

- Exhibit signage observed at Como Park Zoo & Conservatory invites visitors to take animals' perspectives more frequently than signage observed at all but two other Network Partners.
- Program presenters for the Big Cat and Golden Headed Lion Tamarin talks incorporated many empathy-related practices and categories of practices into relatively short programs. In 15 minutes, the Golden Headed Lion Tamarin talk included 17 practices and eight categories, above the overall averages of 14 practices and seven categories.



This Amur tiger sign exemplifies how signage can utilize multiple different empathy practices in only a short amount of text.

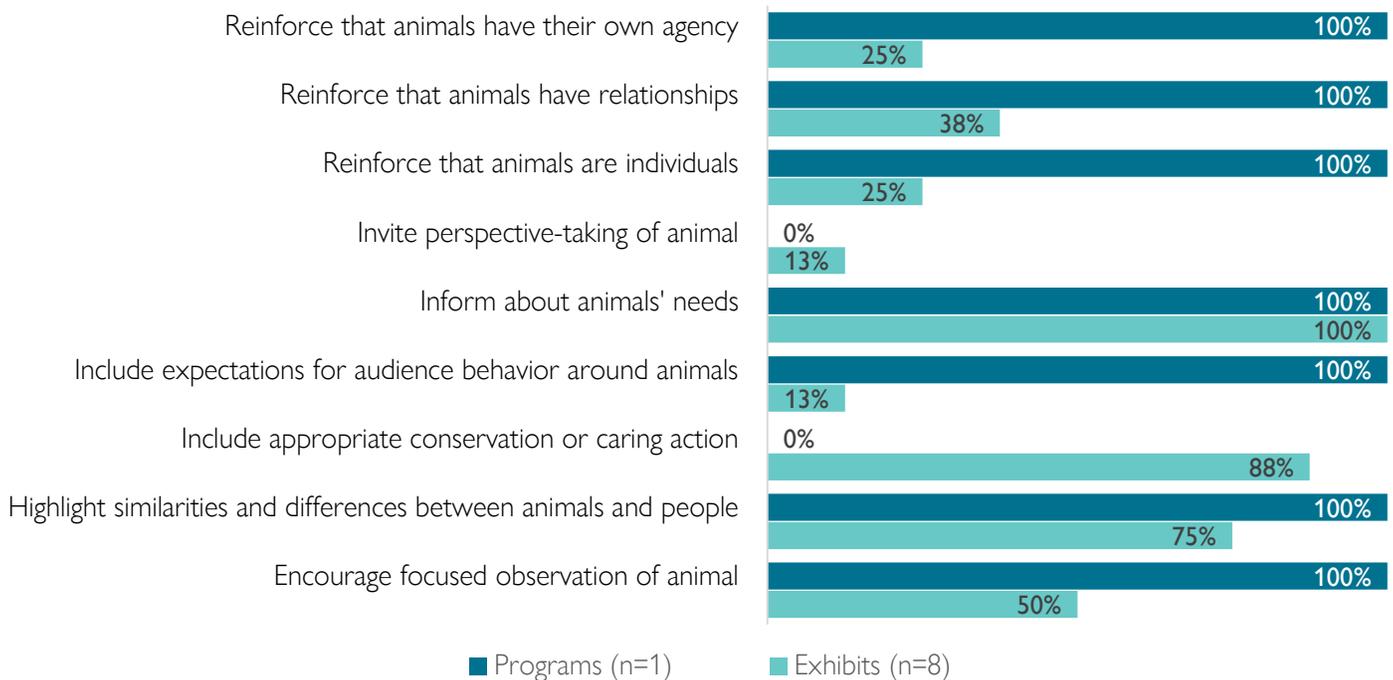
# DAKOTA ZOO

## Visit Background:

Home to 600 animals representing 125 species, Dakota Zoo in Bismarck, North Dakota is one of three AZA-accredited institutions in the state. Unlike most zoos and aquariums, it is fully self-supportive, operating on money raised through admissions, concessions, memberships, donations, and its adopt an animal program.

AEI staff visited Dakota Zoo on September 25, 2022 and observed signage at the African penguin, corn snake, Discovery Barn/honeybee, llama, Pallas cat, primate, puma, and rabbit/chicken exhibits as well as the tiger keeper talk.

## Use of Empathy Practices at Dakota Zoo



## Highlights:

- Honeybee signage in Dakota Zoo's Discovery Center included 16 different empathy practices, the most of any exhibit not featuring mammals.
- 100% of visitors observed at Dakota Zoo demonstrated interest or curiosity toward animals, the highest frequency for this category out of any site.

Signage for wildlife native to North Dakota features written and recorded translations of animals' names into the languages of several Indigenous nations that share geography with the state.



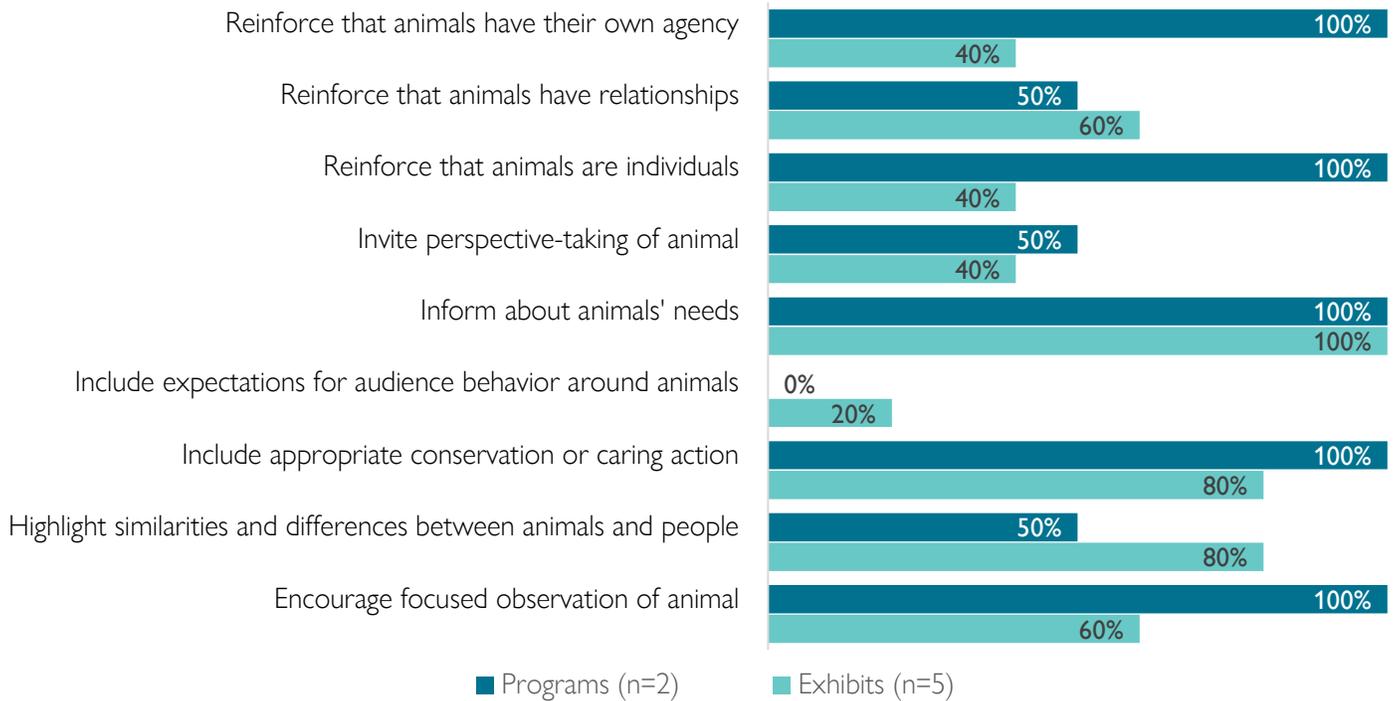
# GRIZZLY & WOLF DISCOVERY CENTER

## Visit Background:

Grizzly & Wolf Discovery Center (GWDC) is a wildlife park and educational facility located in West Yellowstone, Montana, just outside of Yellowstone National Park. GWDC offers visitors to the area an opportunity to observe and learn about grizzly bears, gray wolves, and other local wildlife.

AEI staff visited GWDC on May 2 and 3, 2023 and observed the grizzly bear, gray wolf, ground squirrel, river otter, and riparian ecosystem exhibits as well as the Wolf Pack Chat and grizzly bear container testing programs. A temporary closure of GWDC's aviary prevented additional exhibit observations.

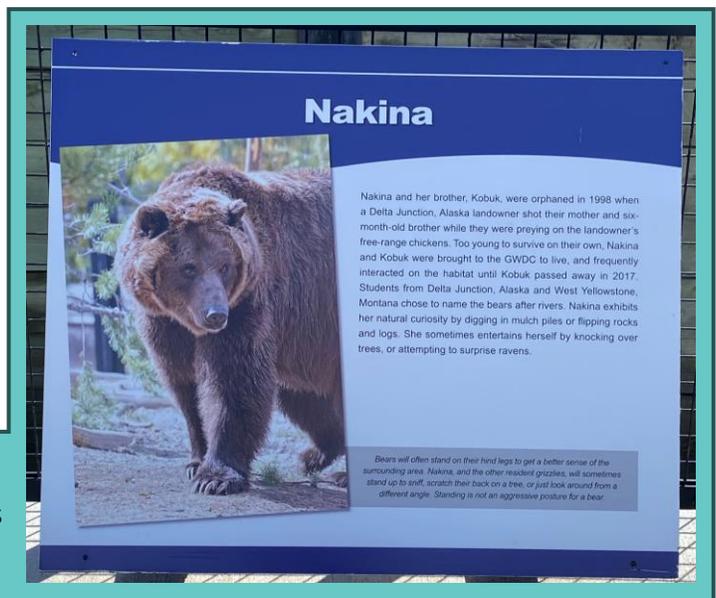
## Use of Empathy Practices at Grizzly & Wolf Discovery Center



## Highlights:

- Signage at GWDC's bear habitat was one of only seven exhibits across all sites to utilize practices from all nine of the categories in the Observation Framework.
- GWDC's bear habitat had the highest average stay time of any observed exhibit, with visitors spending an average of 8 minutes and 23 seconds there.

Each bear at GWDC has a sign sharing the story of how they came to live there as well as details about their personalities or behaviors.





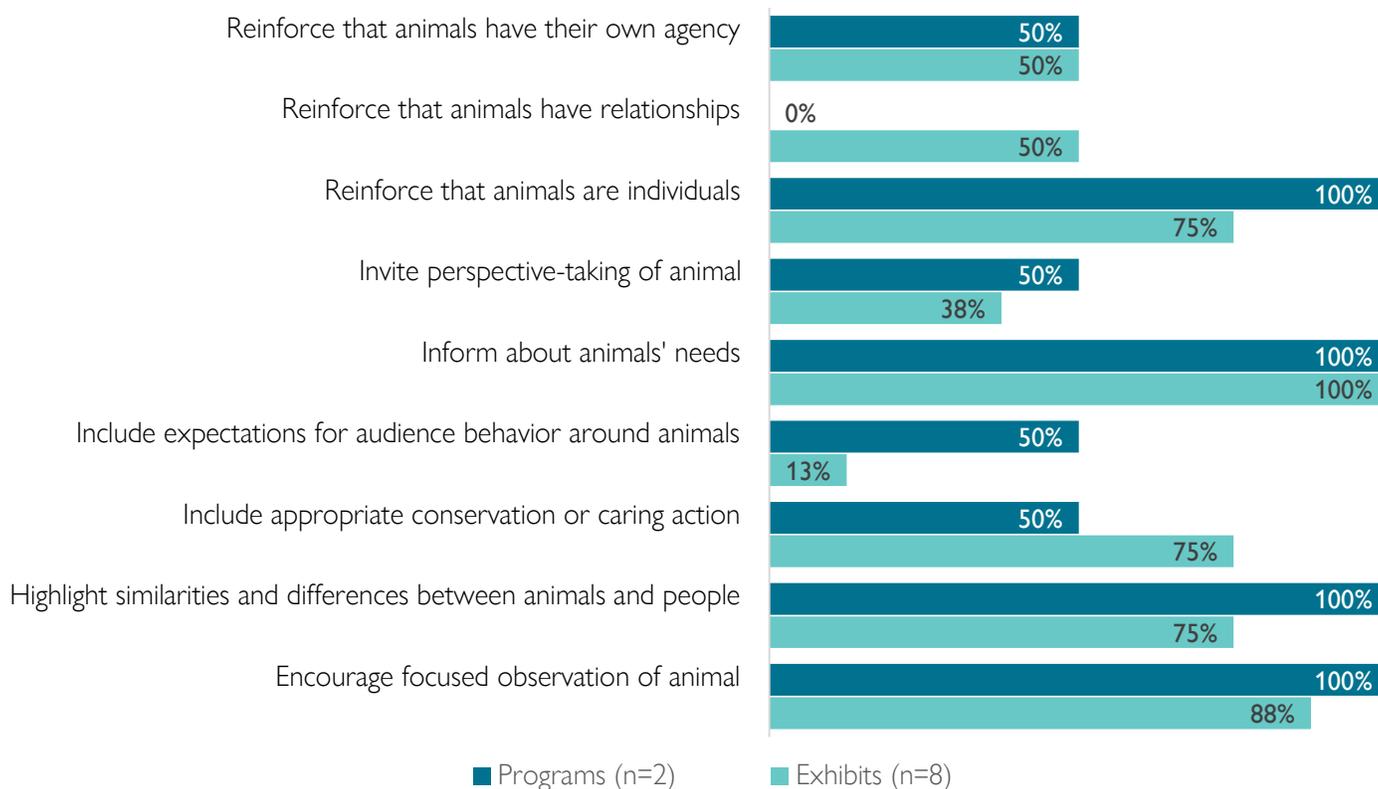
# HENRY VILAS ZOO

## Visit Background:

Henry Vilas Zoo is a free-admission, community-supported zoo located in Madison, Wisconsin.

AEI staff visited Henry Vilas Zoo on May 11, 2022 and observed signage at the American badger, American bison, capybara, harbor seal, orangutan, polar bear, sandhill crane, and southern white rhinoceros exhibits as well as the zoo's Critter Connection and Stroller Safari programs.

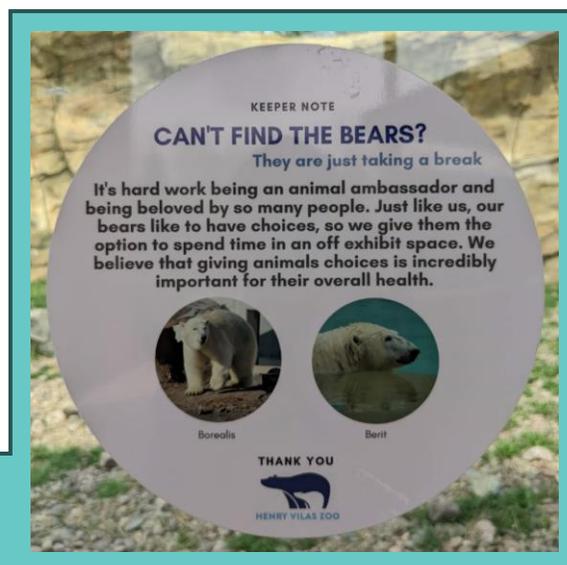
## Use of Empathy Practices at Henry Vilas Zoo



## Highlights:

- Signage at Henry Vilas Zoo encouraged focused observation of animals and, along with Point Defiance Zoo & Aquarium, reinforced that animals have their own agency most frequently out of all Partner Organizations.
- Henry Vilas Zoo's polar bear exhibit was among the top five observed exhibits in terms of number of empathy practices utilized with 18. Additionally, it was one of few exhibits to utilize practices from all 9 categories included in the Observation Framework.

This polar bear sign draws attention to the bears' freedom to choose to be in an off exhibit space.





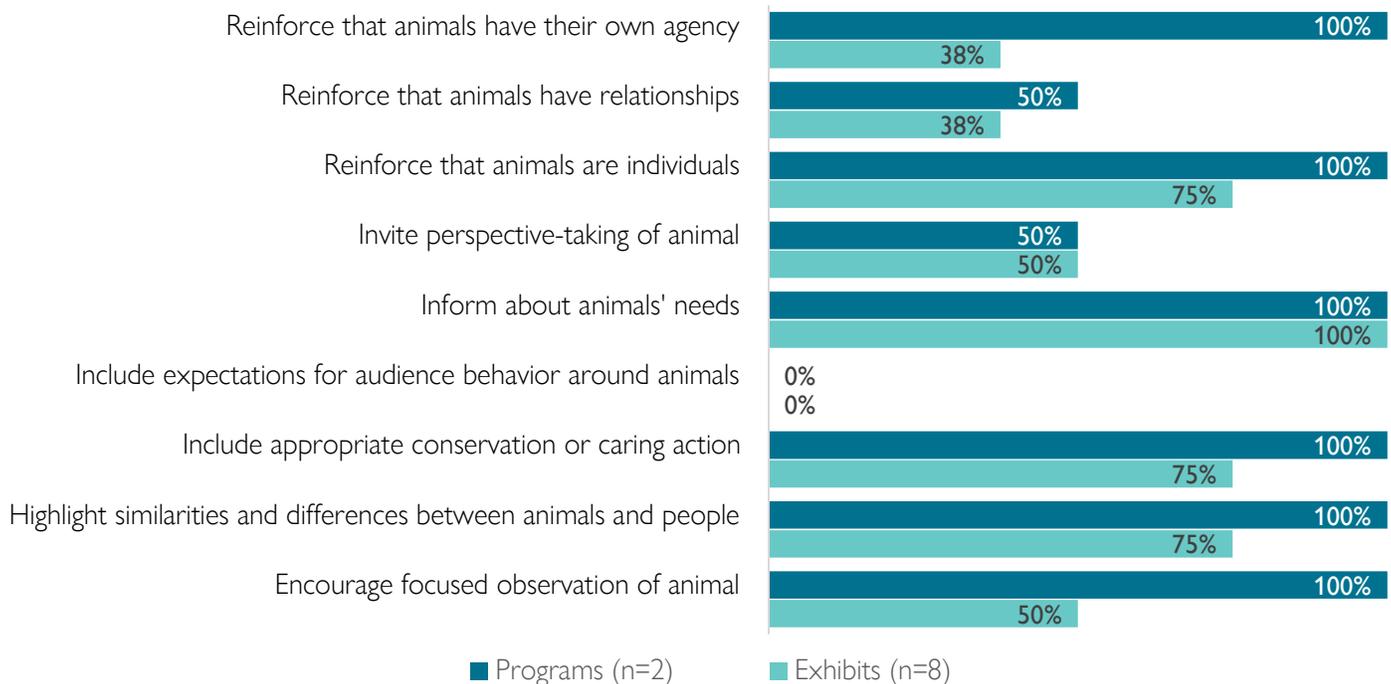
# IDAHO FALLS ZOO

## Visit Background:

Nicknamed the “Best Little Zoo in the West,” the Idaho Falls Zoo in Idaho Falls, Idaho is a city-operated zoo with over 300 animals in its care, primarily representing species from outside North America.

AEI staff visited Idaho Falls Zoo on May 4, 2023 and observed signs in the African penguin, Aldabra tortoise, Amur tiger, Chilean flamingo, lion, North American river otter, sloth bear, and white handed gibbon exhibits as well as the Zoo Tots pre-K program and the tawny frogmouth keeper talk. In addition to physical signs, observations at this site include digital content accessible through QR codes at each exhibit.

## Use of Empathy Practices at Idaho Falls Zoo



## Highlights:

- Signage at Idaho Falls Zoo demonstrated the most frequent use of perspective-taking practices out of all Partner Organizations.
- Additionally, signage reinforced that animals are individuals by using names and pronouns other than “it” or sharing unique stories about animals more frequently than the majority of sites.

With support from a Capacity Building Grant, Idaho Falls Zoo added QR codes on exhibit signs that direct visitors to digital content, which has been intentionally designed to include empathy practices and can be updated more readily than physical signage.



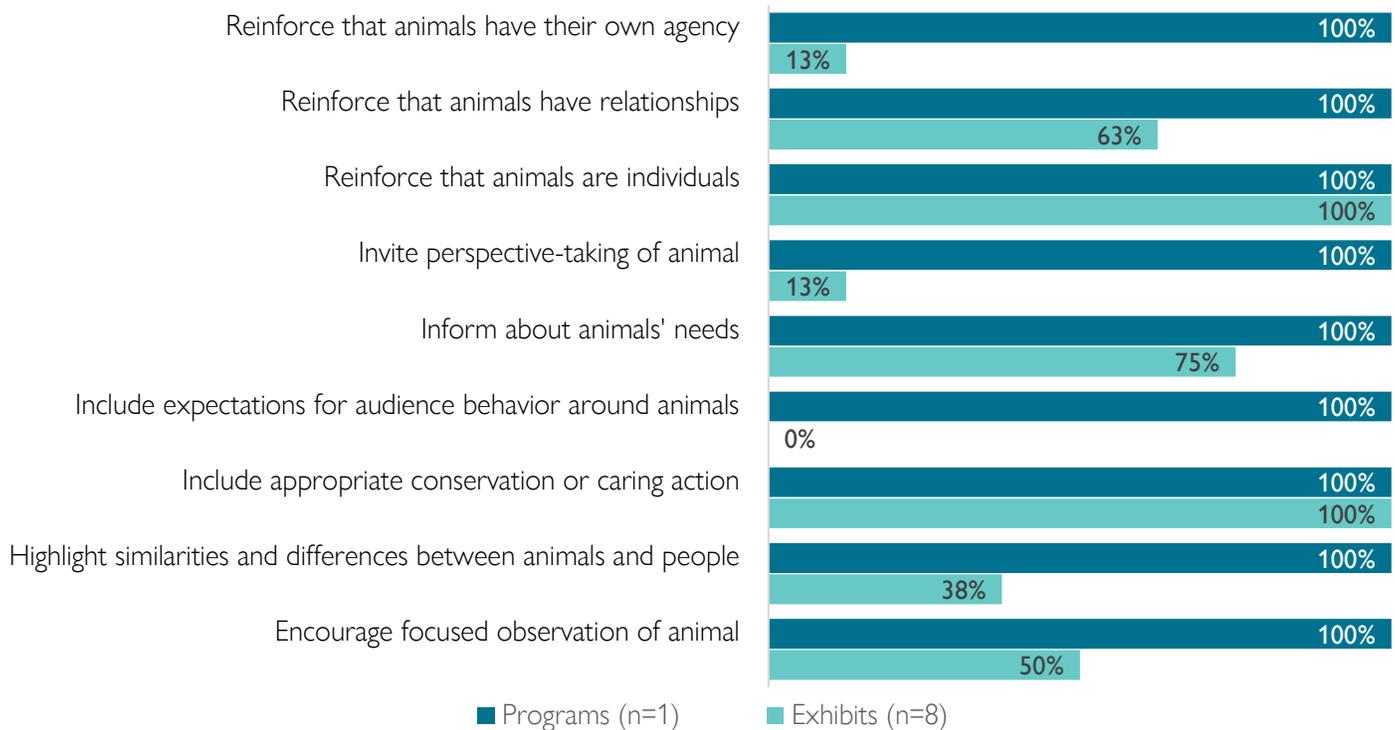
# INTERNATIONAL CRANE FOUNDATION

## Visit Background:

The International Crane Foundation is a non-profit conservation organization that works globally to conserve cranes and the environments they depend on. Its headquarters in Baraboo, Wisconsin is the only place in the world that houses all 15 crane species.

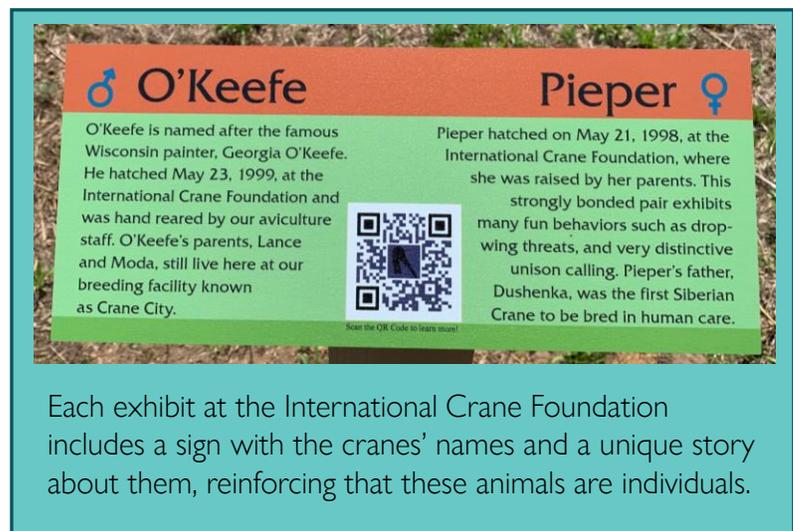
AEI staff visited the International Crane Foundation on May 12, 2022 and observed the black crowned crane, blue crane, broga and black necked crane, demoiselle crane, grey crowned crane, red crowned crane, sarus crane, and Siberian crane exhibits as well as a field trip program.

## Use of Empathy Practices at International Crane Foundation



## Highlights:

- The International Crane Foundation was one of only five sites at which every observed exhibit included appropriate conservation or caring actions or information about human-wildlife conflict.
- On average, International Crane Foundation visitors spent 3 minutes and 23 at each exhibit, more than at any other Partner Organization.
- The International Crane Foundation's field trip included practices from each of the nine categories.



Each exhibit at the International Crane Foundation includes a sign with the cranes' names and a unique story about them, reinforcing that these animals are individuals.

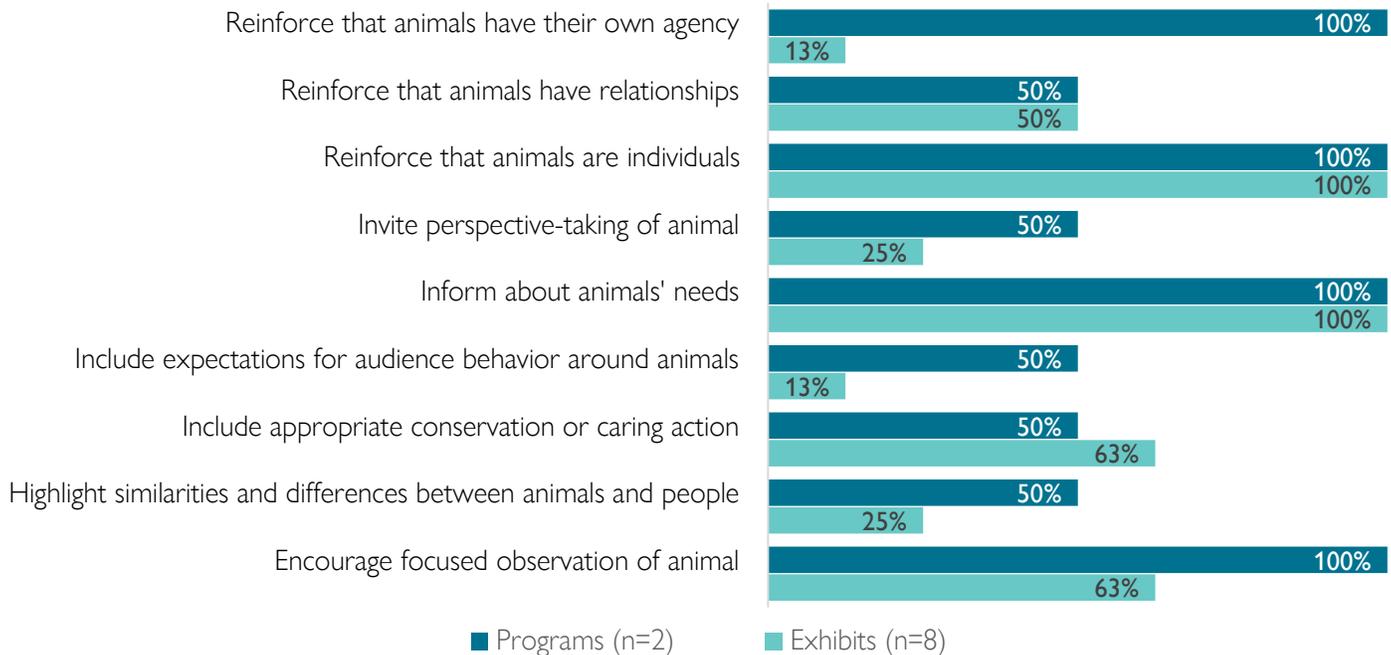
# LAKE SUPERIOR ZOO

## Visit Background:

Located in Duluth, Minnesota, Lake Superior Zoo is the only zoo serving northeastern Minnesota and northwestern Wisconsin and is the smallest zoo in the ACE for Wildlife Network at six acres.

AEI staff visited Lake Superior Zoo on June 8, 2022 and observed signage at the Alaska coastal brown bear, Amur tiger, Angolan colobus, barnyard, box turtle and quail, gray wolf, kookaburra and green iguana, and North American river otter exhibits as well as a preschool animal encounter. Additionally, AEI staff observed a presenter during a virtual birthday celebration for Eugene the axolotl.

## Use of Empathy Practices at Lake Superior Zoo



## Highlights:

- All exhibits at Lake Superior Zoo reinforced that animals are individuals by including names, pronouns other than “it,” and/or unique stories about the animals in their care.

Lake Superior Zoo utilizes signs produced and made freely available by the Paly Foundation's NatureExhibits project. This example features a conservation success story and examples of conservation actions visitors can take to help wolves.





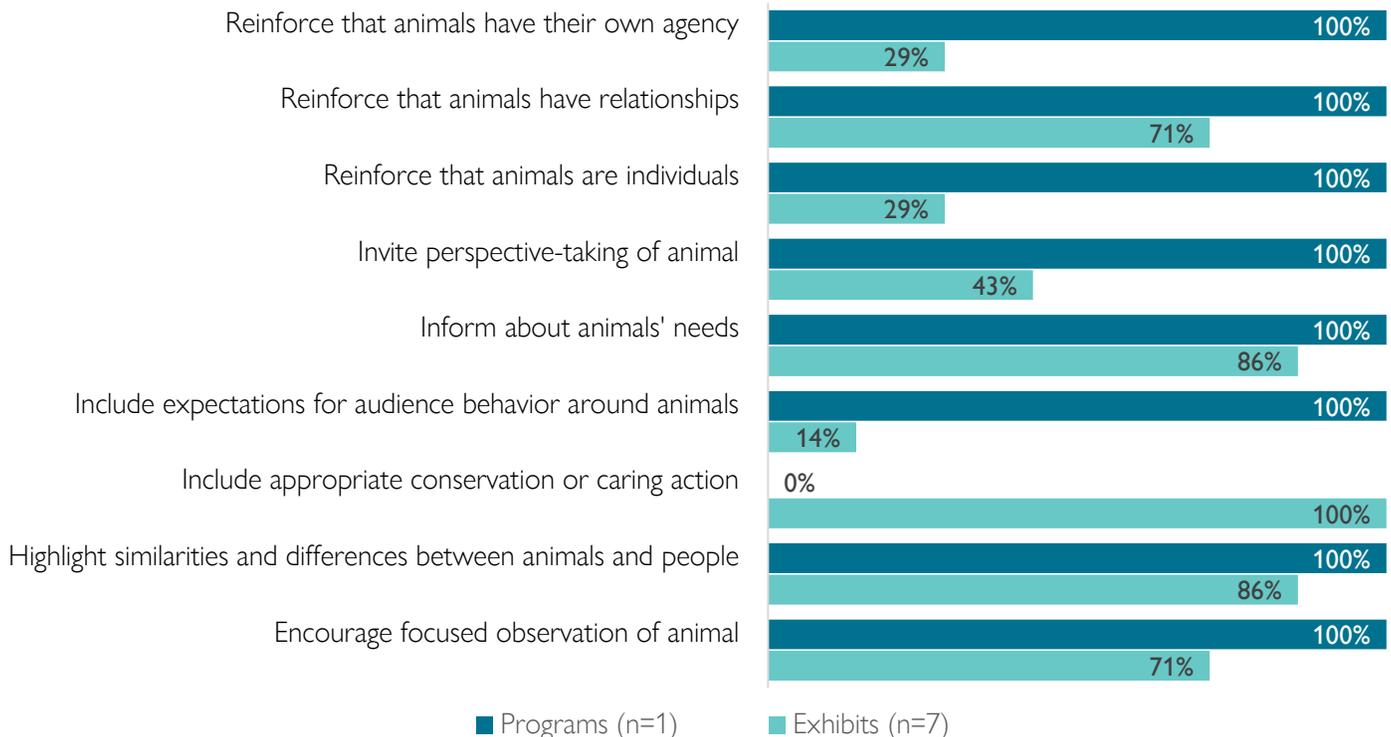
# MINNESOTA ZOO

## Visit Background:

Home to over 4,500 animals, the Minnesota Zoo in Apple Valley, Minnesota is one of the largest zoos in the ACE for Wildlife Network and is unique in that it is a state-run institution.

AEI staff visited the Minnesota Zoo on June 10, 2022 and observed signage in the monk seal, moose, freshwater mussel, Russia's Grizzly Coast, shark touch tank, snow monkey, and Tiger Base Camp exhibits in addition to a virtual reptile program.

## Use of Empathy Practices at Minnesota Zoo



## Highlights:

- All exhibits at the Minnesota Zoo included appropriate conservation or caring actions and/or information about human-wildlife conflict.
- Signage in the Russia's Grizzly Coast exhibit utilized 22 empathy practices, more than any other observed exhibit. This exhibit also included practices from all nine of the categories in the Observation Framework.
- The Minnesota Zoo's signage drew attention to animals' perspectives and highlighted similarities in people and animals' characteristics more frequently than any other site.



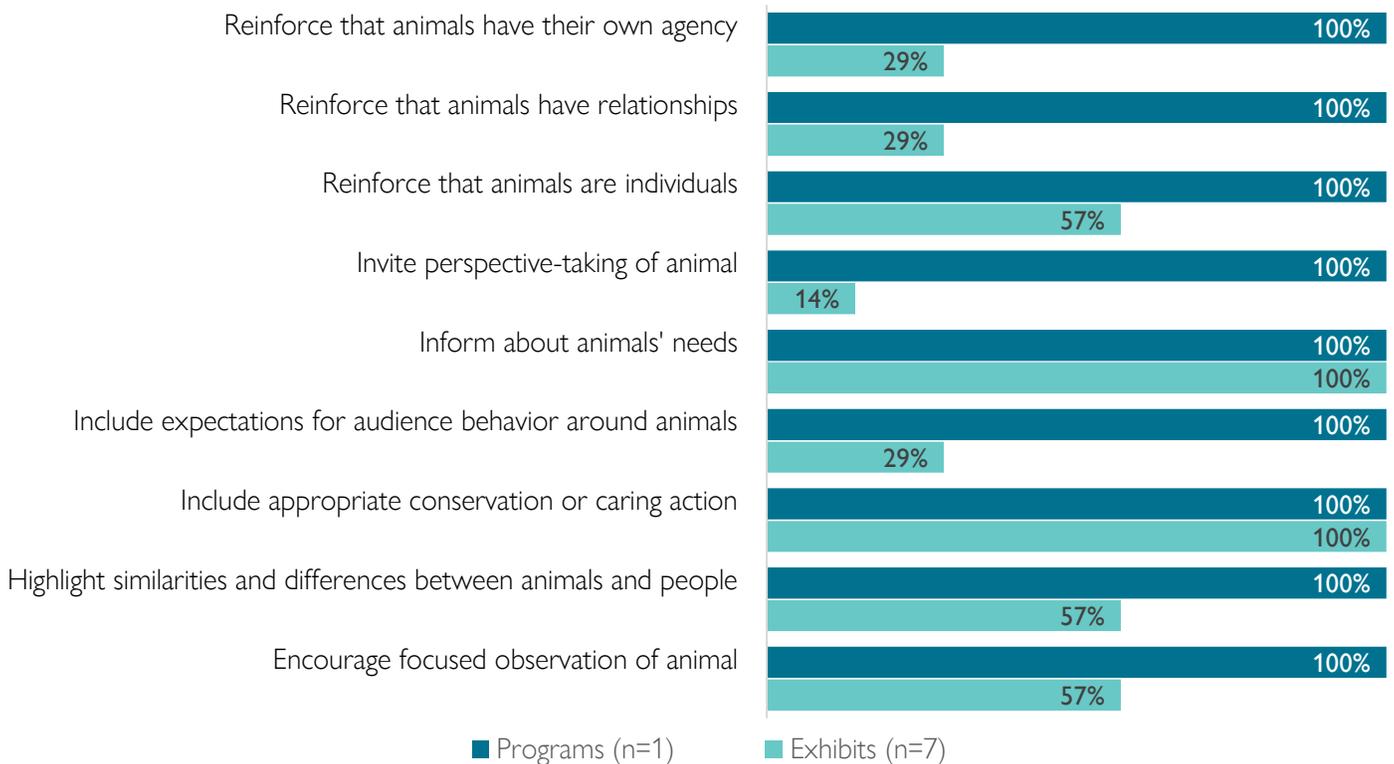
# NEW ZOO & ADVENTURE PARK

## Visit Background:

The Northeastern Wisconsin (NEW) Zoo is a county-operated zoo located in Green Bay, Wisconsin.

AEI staff visited NEW Zoo on March 7, 2023 and observed signage at the bison, black bear, farm barn, lion, prairie dog and badger, raccoon, and red wolf exhibits as well as the presenter of a private penguin encounter program.

## Use of Empathy Practices at NEW Zoo



## Highlights:

- Signage at NEW Zoo communicated expectations for visitor behavior more frequently than any other site.
- Every observed exhibit at NEW Zoo included appropriate conservation or caring actions and/or information about human-wildlife conflict.
- The lion exhibit at NEW Zoo included 21 unique empathy practices, the second most out of any observed exhibit across all sites.
- The audience of NEW Zoo's penguin encounter engaged in more empathy behaviors than any other observed audience, and the presenter of this program utilized practices from all nine categories of behaviors in the Observation Framework.

**Animal Under Medical Care**

Helen was a wild badger that was hit by a car. The accident caused vision loss and permanent neurological damage that meant she couldn't be released back into the wild. You'll notice that Helen often "spins" when walking around her habitat. The spinning is a normal part of her behavior that stems from the accident. Rest assured, Helen is monitored closely and gets around quite well, despite the way she goes in circles!

This sign tells a unique story about Helen the badger and assures visitors of her welfare.

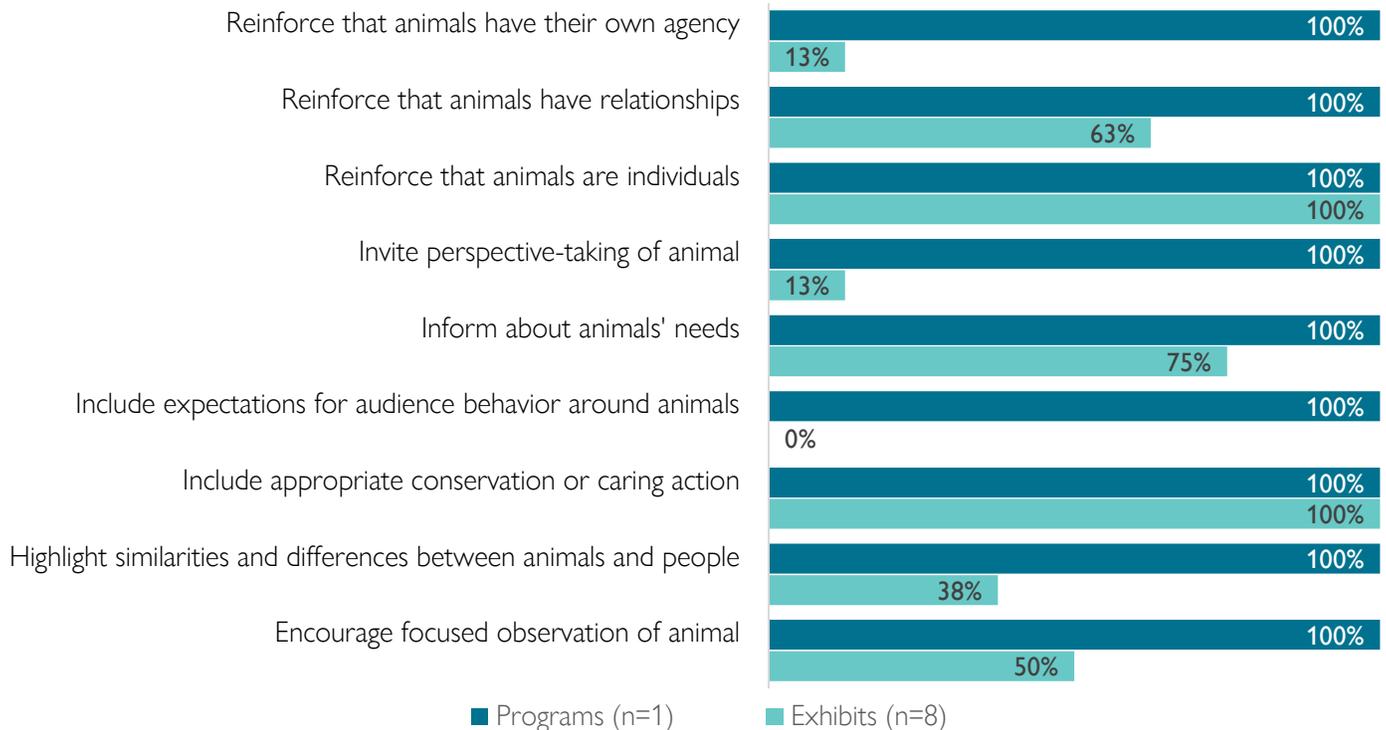
# NORTHWEST TREK WILDLIFE PARK

## Visit Background:

Northwest Trek Wildlife Park is a 723-acre wildlife park in Eatonville, Washington which features both animal habitat exhibits and a 435-acre free roam area, through which visitors can take a guided tour in their own vehicles or on one of the park's trams.

AEI staff visited Northwest Trek on June 23, 2022 and observed signage at the black bear, bobcat, Canada lynx, eagle, gray wolf, North American river otter, raccoon, and red fox exhibit as well as a badger keeper talk and the Wild Drive tour.

## Use of Empathy Practices at Northwest Trek Wildlife Park



## Highlights:

- To adapt to the COVID-19 pandemic, Northwest Trek started the Wild Drive program, allowing visitors to drive personal vehicles through the free-roam area with a radio-based audio tour. This program still operates as an accessible alternative to their tram tours, allowing visitors to have the rare opportunity to observe animals up close outside of exhibit spaces.

Signage at Northwest Trek educates visitors on how to coexist peacefully with bears.



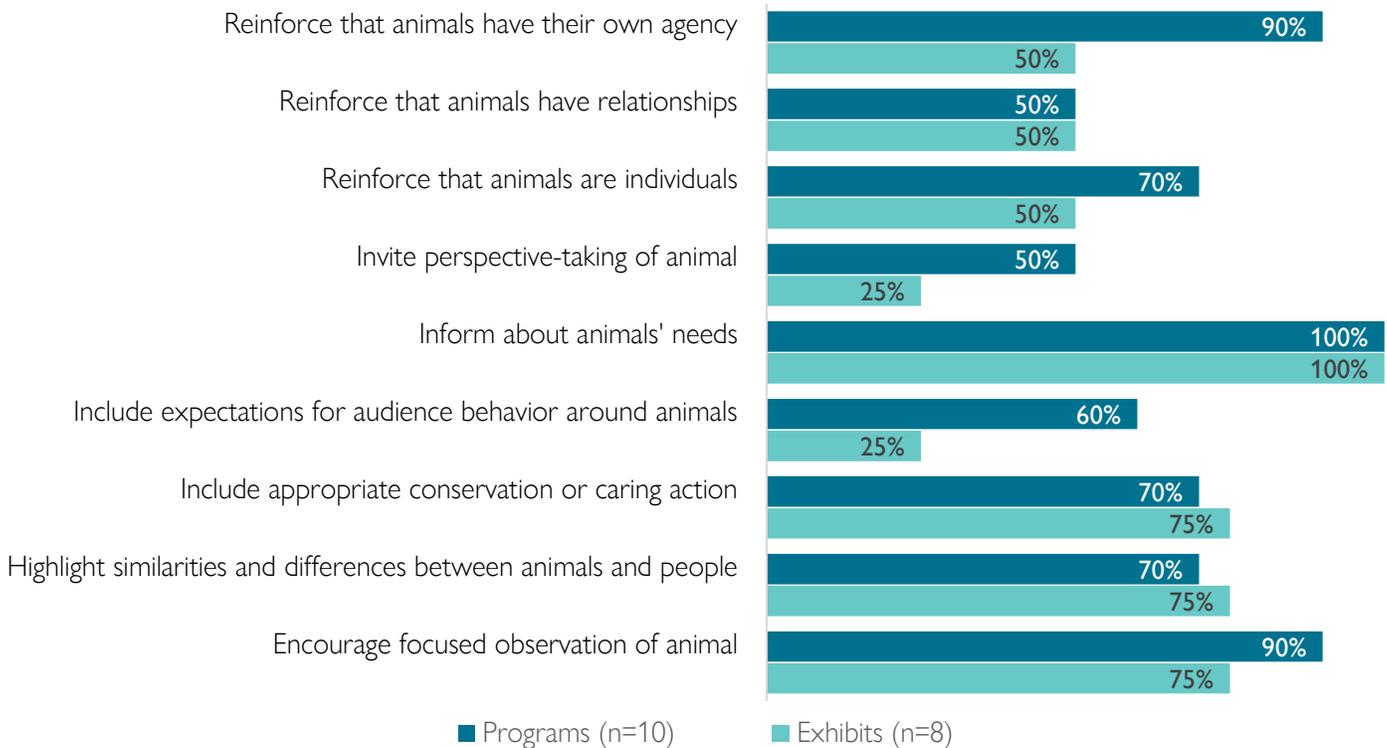
# POINT DEFIANCE ZOO & AQUARIUM

## Visit Background:

Point Defiance Zoo & Aquarium (PDZA) in Tacoma, Washington is the Pacific Northwest's only combined zoo and aquarium. It is the sister zoo of Northwest Trek Wildlife Park, and both are operated by Metro Parks Tacoma.

AEI staff visited PDZA on June 21, 2022 and observed signage at the Asian elephant, California sea lion and harbor seal, clouded leopard, goat, meerkat, mole rat, red wolf, and touch tank exhibits. Additionally, program presenters were observed during Critter Corner, Bugs Alive!, Wild Wonders, and the elephant and red wolf keeper talks. On April 25, 2022, AEI staff also observed two Wildlife Champions programs at a partner school.

## Use of Empathy Practices at Point Defiance Zoo & Aquarium



## Highlights:

- Along with Henry Vilas Zoo, PDZA's exhibit signage reinforced that animals have agency the most frequently out of all Partner Organizations.
- PDZA's exhibits utilized the highest median number of empathy practices (10.5) and the second highest mean number of practices (10) of all sites.
- Both the Critter Corner and 4<sup>th</sup> grade Wildlife Champions programs utilized practices from all nine of the categories in the Observation Framework.



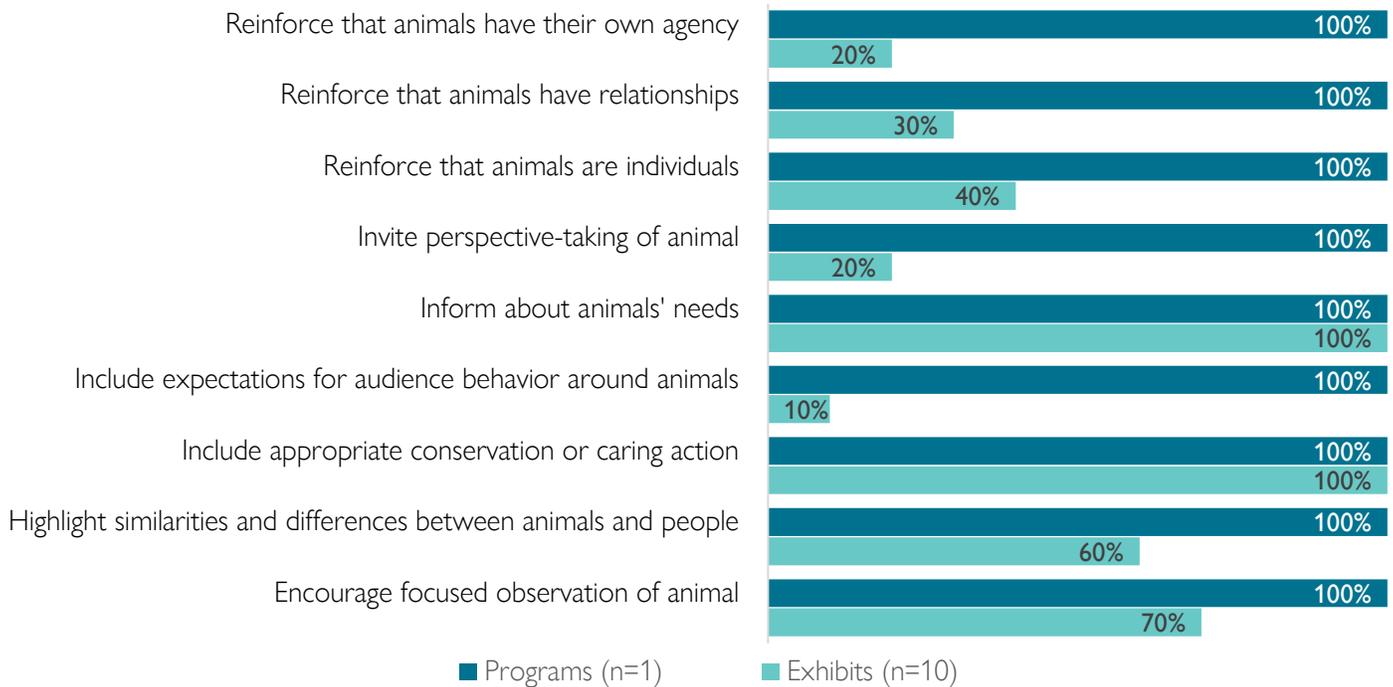
# RACINE ZOO

## Visit Background:

Located in Racine, Wisconsin, the Racine Zoo is home to approximately 75 different animal species and over 300 individuals, including both native Wisconsin wildlife and species from around the world.

AEI staff visited the Racine Zoo on May 10, 2022 and observed signage at the Andean bear, bald eagle, Barnyard Safari, big cat, Canada lynx, giraffe, hawk and owl, orangutan, and white handed gibbon exhibits as well as in the zoo's Discovery Center. Additionally, AEI staff observed a recording of "What's Around the Riverbend?," a preschool program offered at the zoo.

## Use of Empathy Practices at Racine Zoo



## Highlights:

- Every observed exhibit at the Racine Zoo included appropriate conservation or caring actions and/or information about human-wildlife conflict.
- The longest observed exhibit stay time across all sites occurred at the Racine Zoo's Barnyard Safari exhibit where one group spent over 16 minutes. One of the draws of this exhibit is the opportunity to brush goats, giving visitors the chance to directly engage in caring behaviors toward the animals.



Orangutan exhibit signage informs visitors of relevant conservation actions they can take.



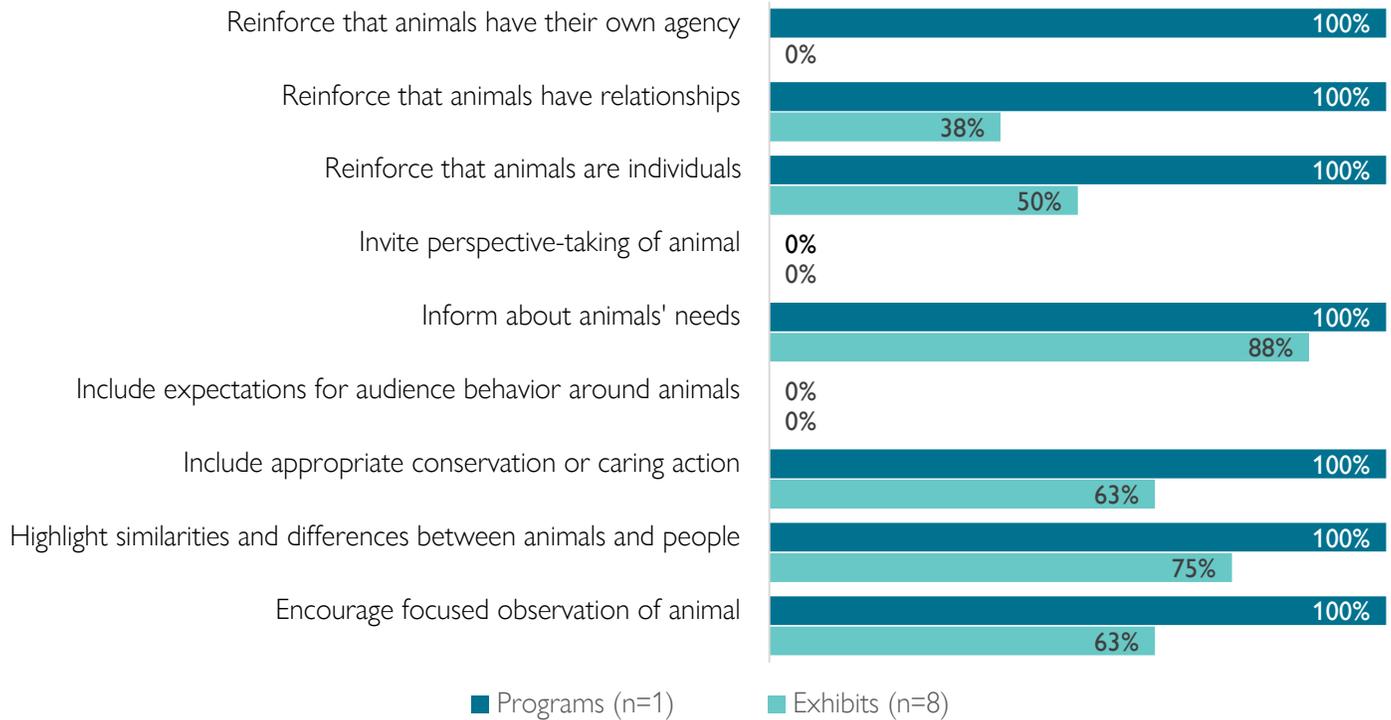
# RED RIVER ZOO

## Visit Background:

Red River Zoo is a privately-funded zoo in Fargo, North Dakota and is home to 89 animal species, with a focus on species from the world's colder climates.

AEI staff visited Red River Zoo on September 23, 2022 and observed signage at the Chinese red panda and koi, domestic barn, North American river otter, raven, Sichuan takin, Virginia opossum, white-tailed deer, and wolf barn exhibits as well as the presenter of the camel keeper talk.

## Use of Empathy Practices at Red River Zoo



## Highlights:

- The camel keeper talk incorporated twelve different empathy practices into a brief, 10-minute presentation, making it among the most empathy-dense presentations observed across all sites.

Viewing windows give visitors a glimpse into animal care facilities at Red River Zoo.



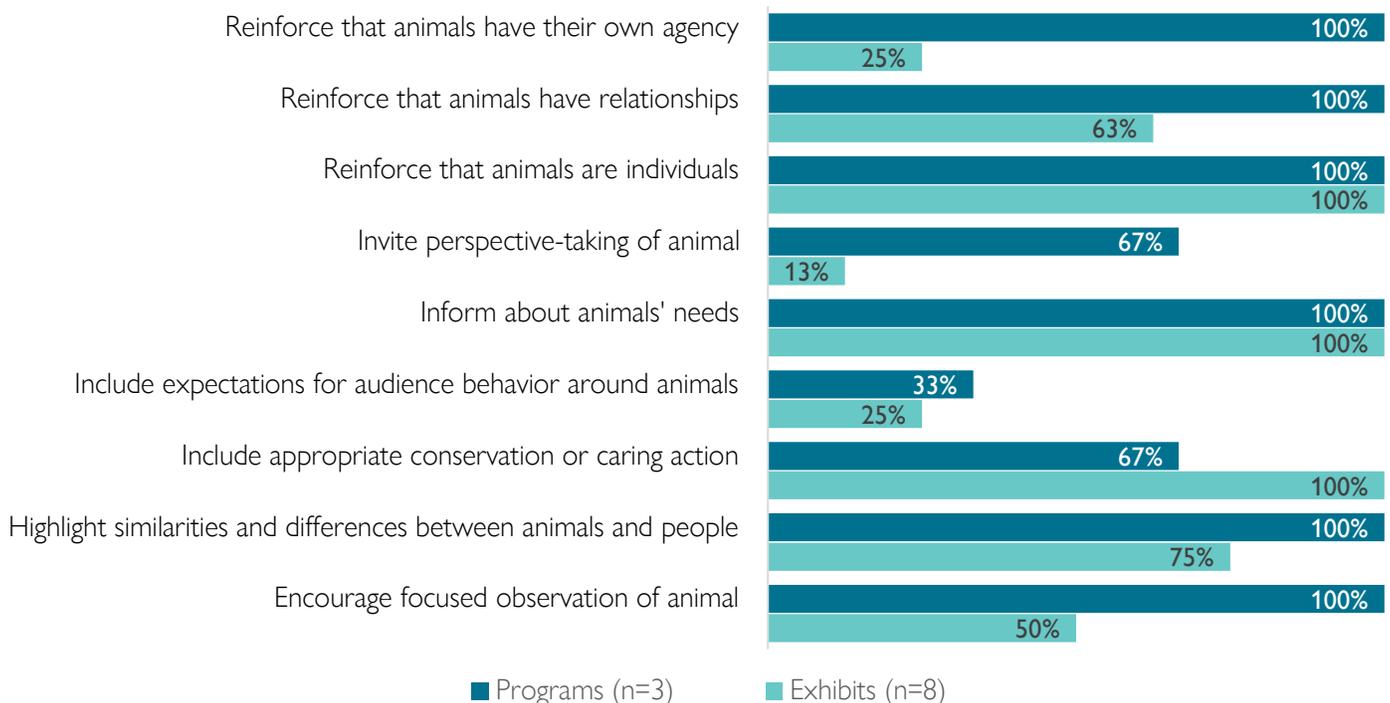
# ROOSEVELT PARK ZOO

## Visit Background:

Managed by Minot Park District, Roosevelt Park Zoo in Minot, North Dakota is the state's oldest zoo and is home to 135 animals representing 68 species.

AEI staff visited Roosevelt Park Zoo on September 26, 2023 and observed signage at the African lion, bald eagle, bison, bobcat, okapi, southern ground hornbill, and West African crowned crane exhibits as well as in the Discovery Barn. Additionally, AEI staff observed a bobcat enrichment program, a sloth feeding program, and the "Home Sweet Habitat" preschool program.

## Use of Empathy Practices at Roosevelt Park Zoo



## Highlights:

- All observed exhibits at Roosevelt Park Zoo included appropriate conservation or caring actions and/or information about human-wildlife conflict.
- All observed exhibits at Roosevelt Park Zoo also reinforced that animals are individuals by including their names, pronouns other than "it," and unique stories about them.
- On average, exhibits at Roosevelt Park Zoo included more empathy practices than any other site with a mean of 11.25 per exhibit.
- The bobcat enrichment program was the most empathy-dense program across all sites, utilizing 12 unique practices in just 5 minutes.



One example of a sign, created through a Capacity Building Grant, which reinforces that an animal is an individual using multiple practices.



# SEATTLE AQUARIUM

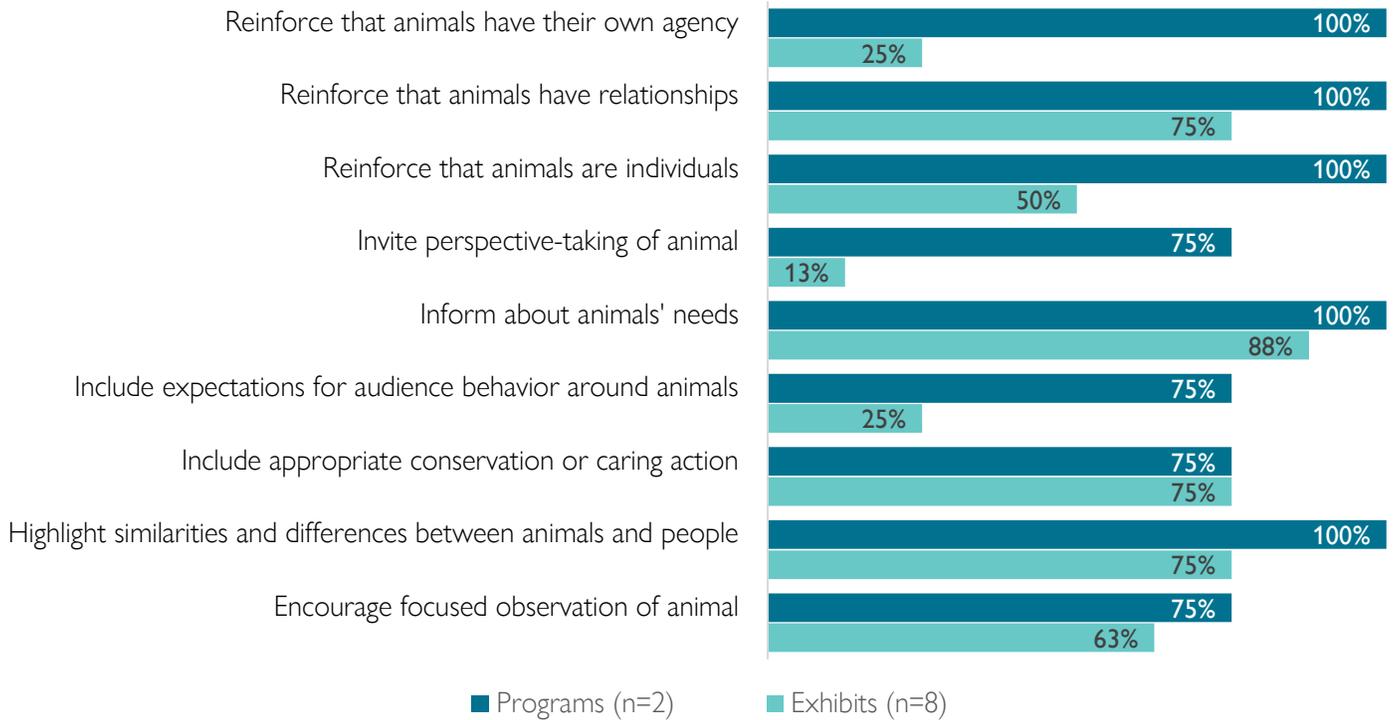
## Visit Background:

The Seattle Aquarium in Seattle, Washington is one of the largest aquariums in the United States (by attendance) and features a wide variety of fish as well as marine birds, mammals, and invertebrates.

AEI staff visited the Seattle Aquarium on May 6, 2022 and observed signage in the northern fur seal, ocean oddities, octopus, salmon, sea cliffs, sea otter, touch tank, and underwater dome exhibits.

Additionally, AEI staff observed presenters during the “Catastrophe by the Sea” puppet show and the “Window on Washington Waters” dive show.

## Use of Empathy Practices at Seattle Aquarium



## Highlights:

- The octopus exhibit, “Catastrophe by the Sea” puppet show, and “Window on Washington Waters” dive show all included practices from all nine categories in the Observation Framework, which is particularly notable as all three focus on animals that can be considered more challenging to empathize with.
- The “Catastrophe by the Sea” puppet show utilized 24 unique empathy practices, the third most out of all observed programs.



Funded by a Capacity Building Grant, the Seattle Aquarium’s new seal haulout area allows visitors to get a closer look at how fur seals participate in their own care.

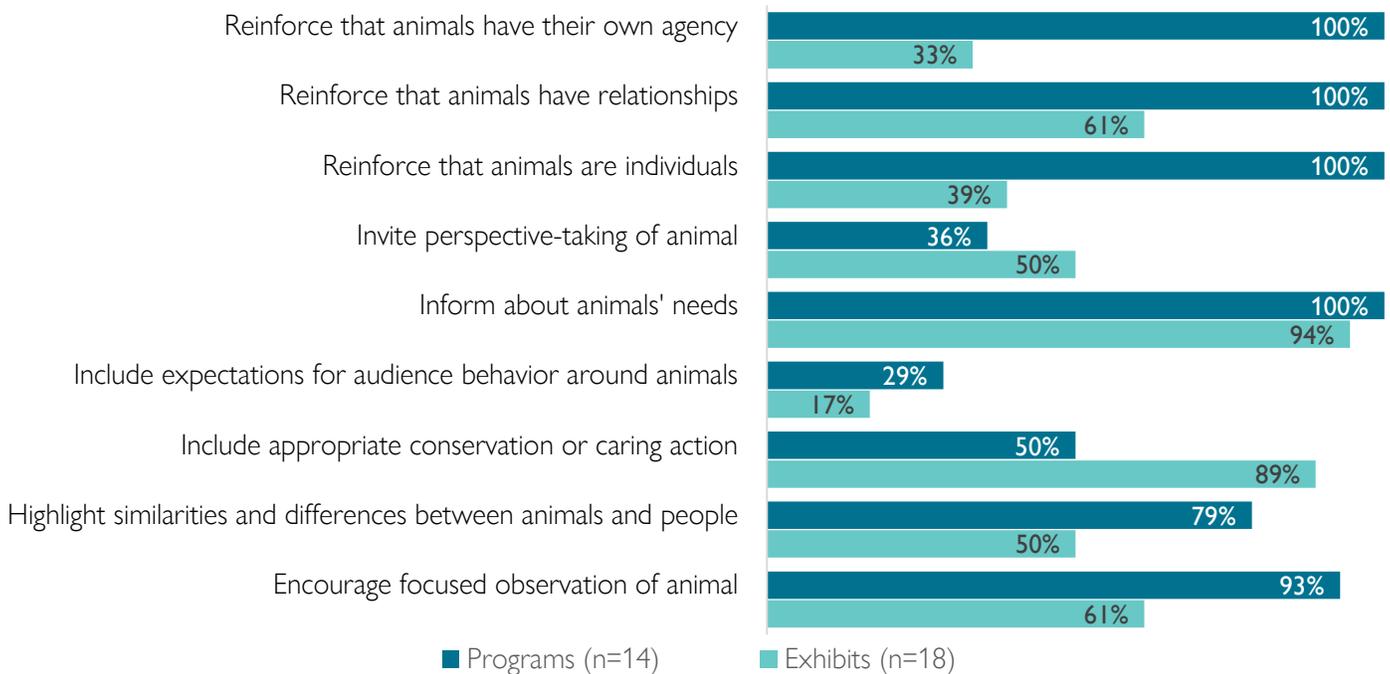
# WOODLAND PARK ZOO

## Visit Background:

Located in Seattle, Washington, Woodland Park Zoo is home to more than 800 animals across 250 species and acts as the backbone organization of the ACE for Wildlife Network and facilitator of the Capacity Building Grant Program..

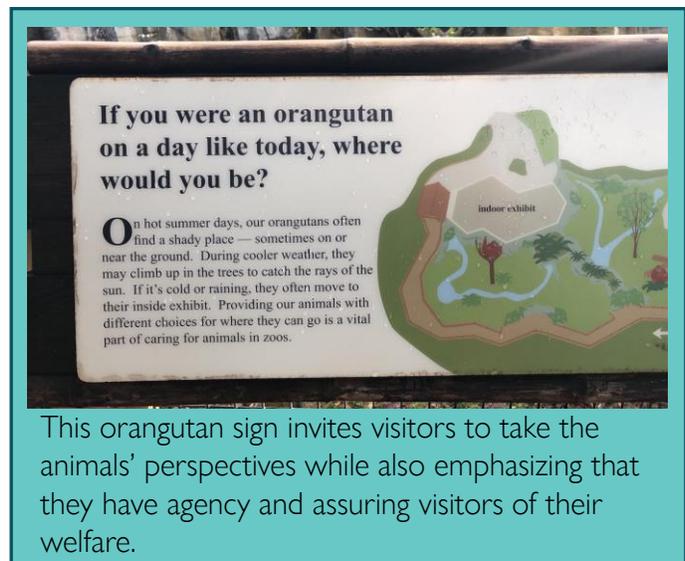
AEI staff are all based at Woodland Park Zoo, so observations took place on multiple dates in August and September of 2022 and included more exhibits and programs than other sites. AEI staff observed signage at the Banyan Wilds, Chilean flamingo, contact yard, French langur, gorilla, gray wolf, grizzly bear, jaguar, orangutan, Partula snail, python, rhinoceros, siamang, tapir, and tiger exhibits as well as presenters at 14 programs, primarily keeper talks and amphitheater shows.

## Use of Empathy Practices at Woodland Park Zoo



## Highlights:

- Two of Woodland Park Zoo's programs utilized among the top five most empathy practices: the wildlife theater program and rhino keeper talk, each of which included 22 practices.
- The rhino and Asian brown tortoise keeper talks as well as the orangutan exhibit at Woodland Park Zoo all included empathy practices from each of the nine categories.
- Along with Idaho Falls Zoo, Woodland Park Zoo exhibits invited perspective-taking of animals more frequently than observed exhibits at any other site.



This orangutan sign invites visitors to take the animals' perspectives while also emphasizing that they have agency and assuring visitors of their welfare.



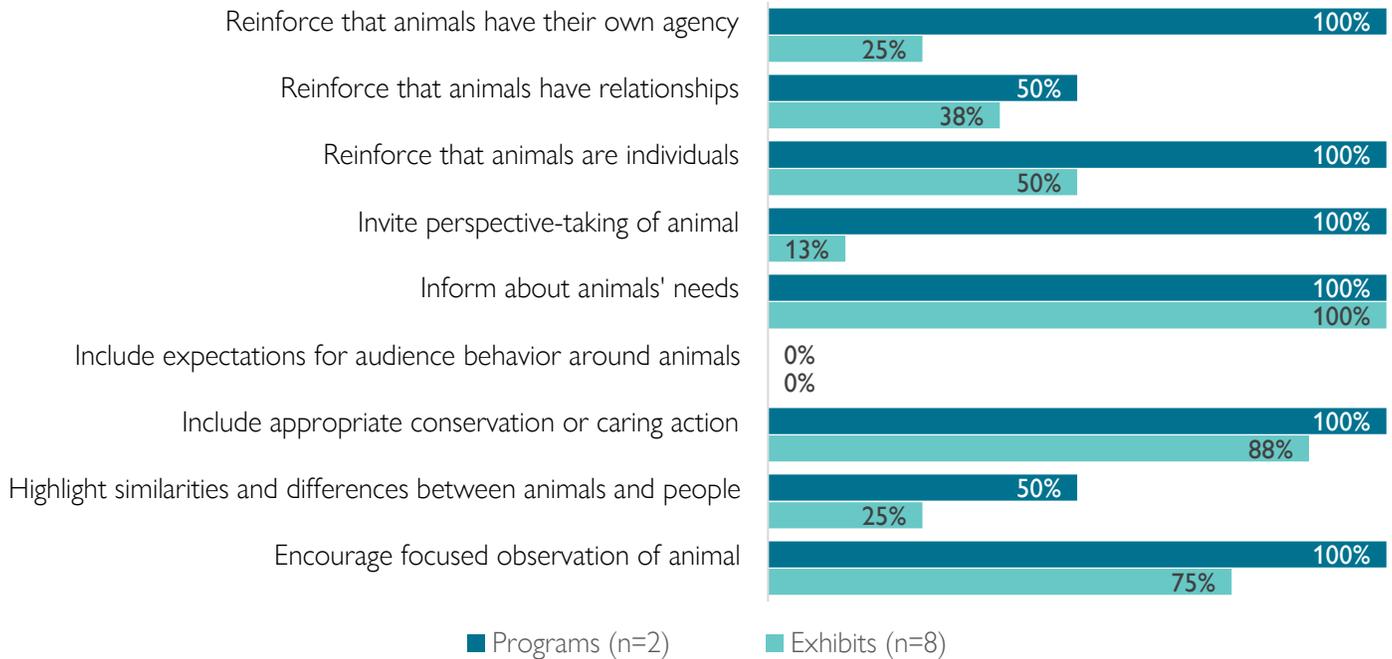
# ZOO BOISE

## Visit Background:

Zoo Boise is a city-operated zoo in Boise, Idaho that is home to over 300 animals from 100 species and includes a new expansion focusing specifically on the wildlife of Gorongosa National Park in Mozambique.

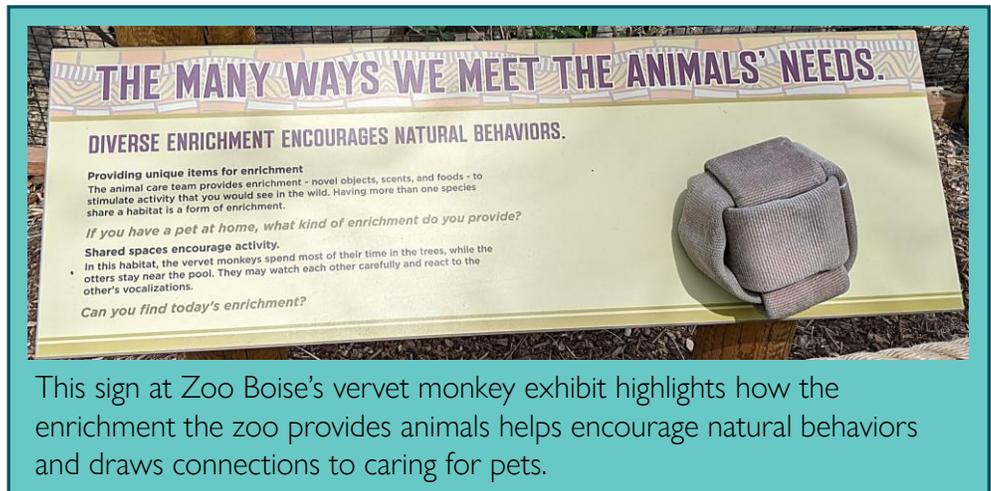
AEI staff visited Zoo Boise on April 21, 2022 and observed signage at the Amur tiger, penguin, rainforest, sand cats, vervet monkey and spotted-necked otter, and warthog exhibits as well as the small terrariums and Slattery Family Baboon House within the E.O. Wilson Building. Observations were also conducted during of the Nile crocodile talk and Wild Dog Discover Station.

## Use of Empathy Practices at Zoo Boise



## Highlights:

- On average, Zoo Boise's visitors engaged in the highest number of empathy behaviors across all sites, with a mean of 5.5 individual behaviors observed.



This sign at Zoo Boise's vervet monkey exhibit highlights how the enrichment the zoo provides animals helps encourage natural behaviors and draws connections to caring for pets.

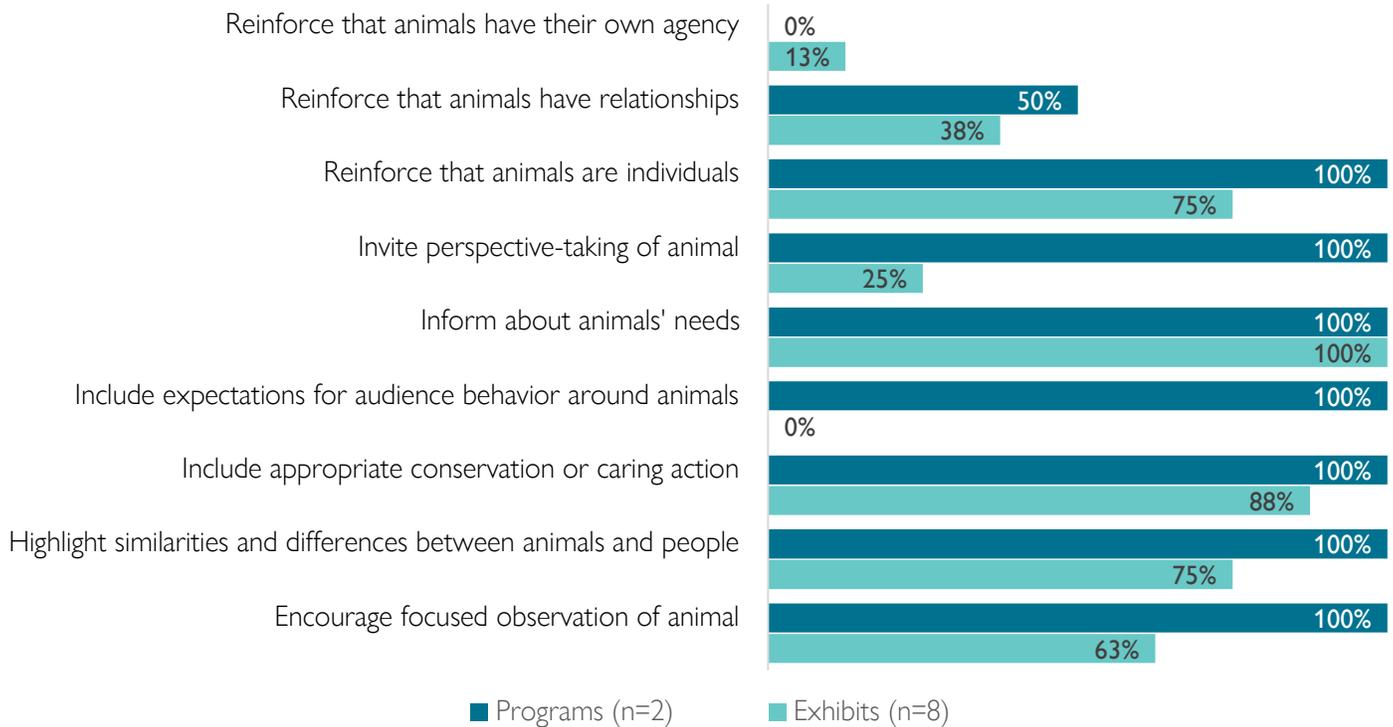
# ZOOLOGICAL SOCIETY OF MILWAUKEE

## Visit Background:

The Zoological Society of Milwaukee (ZSM) supports the Milwaukee County Zoo in Milwaukee, Wisconsin, which houses over 2,100 animals from 330 species.

AEI staff visited ZSM on March 8, 2023 and observed signage in the Amur tiger, Chinese alligator, elephant, giraffe, grey crowned crane, grizzly bear, lion, and western lowland gorilla exhibits as well as the presenters of the animal adaptations and elephant classes.

## Use of Empathy Practices at Zoological Society of Milwaukee



## Highlights:

- ZSM's animal adaptations class utilized 21 unique empathy practices, among the most out of all observed programs, including all forms of inviting perspective-taking and reinforcing that animals are individuals and have relationships in the Observation Framework. This is particularly notable as the program highlighted Madagascar Hissing Cockroaches, a much-maligned animal.

ZSM gives visitors a chance to engage in conservation action by providing e-waste bins for old cell phones.



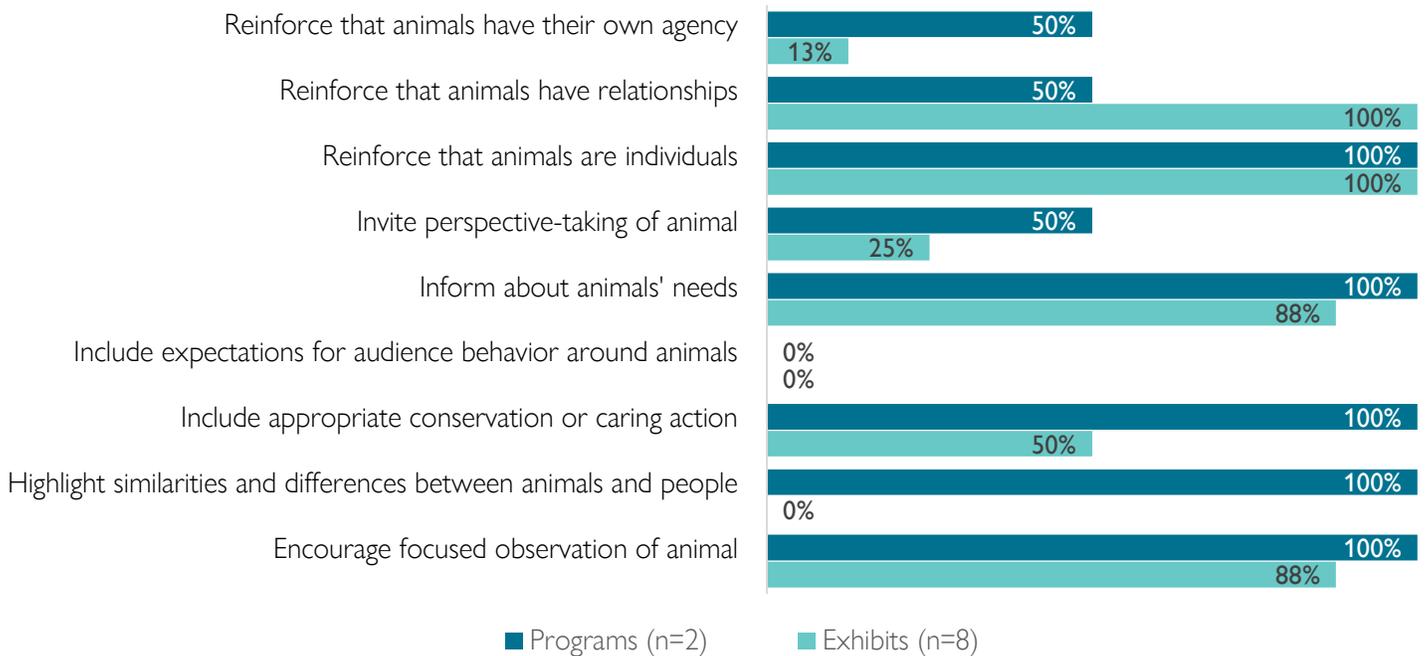
# ZOOMONTANA

## Visit Background:

ZooMontana is a privately-funded zoological and botanical garden located in Billings, Montana and focuses on native Montana and Rocky Mountain wildlife as well as other cold climate animals.

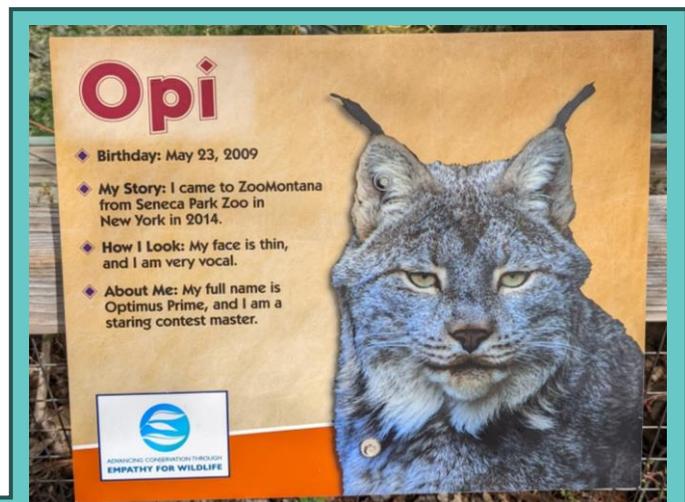
AEI staff visited ZooMontana on April 28 and 30, 2022 and observed signage at the American bison, bald eagle, Canada lynx, Colombian red tailed boa, goat, grizzly bear, wolverine, and wolf exhibits in addition to observing the frog jump and owl keeper talk presenters.

## Use of Empathy Practices at ZooMontana



## Highlights:

- Along with Henry Vilas Zoo, ZooMontana’s exhibit signage encouraged focused observation of animals’ characteristics and behaviors more frequently than all other sites.
- Every exhibit at ZooMontana reinforced that animals are individuals and that they have relationships. ZooMontana was the only site at which all exhibits highlighted the relationships animals have with other animals and with people.



With funding from a Capacity Building Grant, ZooMontana added signs with the names, identifying features, and unique stories of many of the animals in their care.

## Appendix B: Statistics

Multiple statistical methodologies were employed in the analysis of the data included in this evaluation including simple linear regression, multiple linear regression, and analysis of variance (ANOVA).

### Linear Regression

Linear regression analysis was utilized to investigate relationships between potential dependent (DV) and independent variables (IV) in the observation data. The following tables summarize the regressions included in this report.

#### DV: Number of Empathy-Related Practices Utilized

Table 1. *Number of unique empathy-related practices utilized in exhibit signage regressed on number of signs in exhibit.*

Regression Statistic	Value
Multiple R	0.567
R <sup>2</sup>	0.322
Standard error	3.543
Observations	166
Correlation coefficient	0.566
Intercept	5.106
p-value	<0.0001

Table 2. *Number of unique empathy-related practices utilized in programs regressed on program length (in minutes).*

Regression Statistic	Value
Multiple R	0.373
R <sup>2</sup>	0.139
Standard error	4.063
Observations	59
Correlation coefficient	0.094
Intercept	11.819
p-value	<0.01

#### DV: Number of Categories of Empathy-Related Practices Utilized

Table 3. *Number of categories of empathy-related practices utilized regressed on number of signs in exhibit.*

Regression Statistic	Value
Multiple R	0.478
R <sup>2</sup>	0.229
Standard error	1.726
Observations	166
Correlation coefficient	0.218
Intercept	3.527
p-value	<0.0001

Table 4. Number of categories of empathy-related practices utilized regressed on program length (in minutes).

Regression Statistic	Value
Multiple R	0.168546
R <sup>2</sup>	0.028408
Standard error	1.258944
Observations	59
Correlation coefficient	0.012385
Intercept	6.632903
p-value	>0.1 (0.202)

#### DV: Number of Empathy-Related Behaviors Observed

Table 5. Number of empathy-related behaviors observed regressed on exhibit stay time (in minutes).

Regression Statistic	Value
Multiple R	0.478
R <sup>2</sup>	0.229
Standard error	1.726
Observations	166
Correlation coefficient	0.218
Intercept	3.527
p-value	<0.0001

Table 6. Number of empathy-related behaviors observed regressed on program length (in minutes).

Regression Statistic	Value
Multiple R	0.579
R <sup>2</sup>	0.335
Standard error	5.010
Observations	25
Correlation coefficient	0.209
Intercept	7.471
p-value	<0.01

Table 7. Number of empathy-related behaviors observed regressed on number of practices utilized in exhibits.

Regression Statistic	Value
Multiple R	0.144
R <sup>2</sup>	0.021
Standard error	2.977
Observations	524
Correlation coefficient	0.086
Intercept	3.051
p-value	<0.001

Table 8. Number of empathy-related behaviors observed regressed on number of practices utilized in programs.

Regression Statistic	Value
Multiple R	0.283
R <sup>2</sup>	0.080
Standard error	5.893
Observations	25
Correlation coefficient	0.397
Intercept	6.889
p-value	>0.1 (0.170)

Table 9. Number of empathy-related behaviors observed regressed on number of practices utilized in both exhibits and programs.

Regression Statistic	Value
Multiple R	0.290
R <sup>2</sup>	0.084
Standard error	3.644
Observations	549
Correlation coefficient	0.209
Intercept	2.270
p-value	<0.0001

### DV: Number of Categories of Empathy-Related Behaviors Observed

Table 10. Number of categories of empathy-related behaviors observed regressed on exhibit stay time (in minutes).

Regression Statistic	Value
Multiple R	0.516
R <sup>2</sup>	0.266
Standard error	1.327
Observations	547
Correlation coefficient	0.342
Intercept	1.625
p-value	<0.0001

Table 11. Number of categories of empathy-related behaviors observed regressed on program length (in minutes).

Regression Statistic	Value
Multiple R	0.399
R <sup>2</sup>	0.159
Standard error	1.793
Observations	25
Correlation coefficient	0.046
Intercept	4.420
p-value	<0.1

## Multiple Linear Regression

Observation data of behaviors (program audiences, exhibit visitors) and practices (program presenters, exhibit signage) were paired by institution and activity/exhibit names. Behaviors and practices were grouped into categories each consisting of two to six variables. The percentage of variables observed in each category were calculated per observation (multiple observations of the same signage or audience were combined).

Data analyzed by multiple linear regression to look for relationships between:

- Percentage of observed behaviors by category (Dependent Variable) and presence/absence of regulatory signs (Independent Variable)
- Percentage of observed behaviors or practices by category (DV) and animal taxa (IV)
  - Investigated with two sets of taxonomic groupings, one with broader categories and another with narrower categories.
  - Both groupings produced similar findings, so the narrower categories are presented here since they provide more specific results.
- Percentage of observed behaviors by category (DV) and percentage of practices employed by category (IV).

Considering the number of tests run, the  $p$ -values of each set of tests were adjusted using the Benjamini & Hochberg method. The results reported here are the ones that remained significant with the overall model ( $p_{\text{adj}} < 0.05$ ) and explained at least 10% of the variance in the independent variable ( $R_{\text{adj}}^2 \geq 0.10$ ).

Shortcomings: Using percentages of coverage for categories that have fewer than 10 variables each is not strictly a continuous measure. A deeper analysis might consider techniques more aligned to presence/absence data.

Models will be reported with the dependent variable listed at the top of each column, and the independent variables in each row. The body includes the unstandardized regression coefficients (in the units of percentage of category covered), asterisks indicating the statistical significance of that coefficient, and in parentheses the low and high end of the 95% confidence interval for the coefficient.

At the bottom of each column, we report the number of complete paired observations ( $N$ ) and  $R_{\text{adj}}^2$ .

### DV: Behavior ~ IV: Regulatory Signs Present

Few statistical models found any relationship between observed behaviors and the presence/absence of regulatory signs. Those few that did all explained less than 2% of the variance in behavior.

### DV: Behavior ~ IV: Animal Group (Broad)

Table 13. Behaviors “Shows positive behavior toward animals” (Positive Behavior) regressed on animal taxa.

Animal Group	Positive Behavior	
Mammals (Intercept)	0.01 *	(0.00, 0.02)
Birds	-0.00	(-0.03, 0.02)
Fish	0.09 ***	(0.06, 0.12)
Marine Invert.	0.14 ***	(0.11, 0.17)
Mixed	0.03 **	(0.01, 0.06)
Reptiles	0.03 *	(0.00, 0.07)
Terrestrial Invert.	0.24 ***	(0.17, 0.31)
N	519	
R <sup>2</sup> <sub>adj</sub>	0.23	

\*\*\* p < 0.001; \*\* p < 0.01; \* p < 0.05.

### DV: Behavior ~ IV: Animal Group (Narrow)

Table 14. Behaviors “Shows positive behavior toward animals” (Positive Behavior) and “Engages in direct action to help animal” (Engage Action) regressed on animal taxa.

Animal Group	Positive Behavior		Engage Action	
Primates (Intercept)	0.01	(-0.02, 0.03)	0.00	(-0.02, 0.02)
Birds of Prey	-0.01	(-0.07, 0.06)	0.00	(-0.06, 0.06)
Bony Fish	-0.01	(-0.05, 0.04)	0.00	(-0.05, 0.05)
Carnivora	-0.00	(-0.03, 0.02)	0.00	(-0.03, 0.03)
Cartilaginous Fish	0.19 ***	(0.15, 0.24)	0.00	(-0.05, 0.05)
Colorful Birds	-0.01	(-0.09, 0.08)	0.00	(-0.09, 0.09)
Cranes	-0.01	(-0.05, 0.04)	0.00	(-0.05, 0.05)
Domesticated	0.11 ***	(0.07, 0.16)	0.21 ***	(0.16, 0.26)
Echinoderm	0.14 ***	(0.09, 0.19)	0.00	(-0.05, 0.05)
Insect	0.26 ***	(0.18, 0.34)	0.33 ***	(0.25, 0.42)
Land Mammal	0.00	(-0.02, 0.03)	0.00	(-0.03, 0.03)
Marine Mammal	-0.00	(-0.03, 0.02)	0.00	(-0.03, 0.03)
Mixed	0.05 ***	(0.02, 0.08)	0.03	(-0.00, 0.06)
Penguins	0.01	(-0.03, 0.05)	0.03	(-0.01, 0.07)
Reptiles & Amphibians	0.04	(-0.00, 0.08)	0.03	(-0.01, 0.07)
N	519		522	
R <sup>2</sup> <sub>adj</sub>	0.27		0.21	

\*\*\* p < 0.001; \*\* p < 0.01; \* p < 0.05.

## DV: Behavior ~ IV: Animal Group (Broad)

Table 15. Practices “Expectations for audience behavior around animals” (Behavior Expectations) and “Encourage focused observation of animal” (Encourage Observation) regressed on animal taxa.

Animal Group	Behavior Expectations		Encourage Observation	
Mammals (Intercept)	0.09 ***	(0.07, 0.12)	0.39 ***	(0.36, 0.42)
Birds	-0.04	(-0.11, 0.04)	-0.07	(-0.16, 0.03)
Fish	-0.04	(-0.15, 0.07)	-0.32 ***	(-0.45, -0.18)
Marine Invert.	0.56 ***	(0.46, 0.66)	-0.31 ***	(-0.44, -0.19)
Mixed	0.09 *	(0.01, 0.16)	-0.06	(-0.14, 0.03)
Reptiles	0.04	(-0.08, 0.15)	0.19 **	(0.05, 0.32)
Terrestrial Invert.	0.78 ***	(0.54, 1.03)	0.42 **	(0.13, 0.71)
N	526		526	
R <sup>2</sup> <sub>adj</sub>	0.22		0.10	

\*\*\* p < 0.001; \*\* p < 0.01; \* p < 0.05.

Table 16. Practices “Inform about animals’ needs” (Inform About Needs) regressed on animal taxa.

Animal Group	Inform About Needs	
Mammals (Intercept)	0.73 ***	(0.71, 0.76)
Birds	-0.16 ***	(-0.24, -0.09)
Fish	-0.37 ***	(-0.47, -0.26)
Marine Invert.	-0.63 ***	(-0.73, -0.53)
Mixed	-0.10 **	(-0.17, -0.03)
Reptiles	-0.14 *	(-0.24, -0.03)
Terrestrial Invert.	0.27 *	(0.03, 0.50)
N	526	
R <sup>2</sup> <sub>adj</sub>	0.28	

\*\*\* p < 0.001; \*\* p < 0.01; \* p < 0.05.

Table 17. Practices “Reinforce that animals are individuals” (Reinforce Individuality) and “Reinforce that animals have relationships” (Reinforce Relationships) regressed on animal taxa.

Animal Group	Reinforce Individuality		Reinforce Relationships	
Mammals (Intercept)	0.61 ***	(0.57, 0.66)	0.53 ***	(0.49, 0.58)
Birds	0.01	(-0.12, 0.14)	-0.10	(-0.23, 0.03)
Fish	-0.51 ***	(-0.70, -0.32)	-0.43 ***	(-0.62, -0.25)
Marine Invert.	-0.61 ***	(-0.79, -0.44)	-0.53 ***	(-0.71, -0.36)
Mixed	-0.05	(-0.18, 0.08)	-0.31 ***	(-0.44, -0.19)
Reptiles	0.12	(-0.07, 0.32)	0.39 ***	(0.20, 0.58)
Terrestrial Invert.	0.14	(-0.28, 0.55)	-0.03	(-0.44, 0.37)
N	526		526	
R <sup>2</sup> <sub>adj</sub>	0.12		0.15	

\*\*\* p < 0.001; \*\* p < 0.01; \* p < 0.05.

### DV: Practices ~ IV: Animal Group (Narrow)

Table 18. Practices “Expectations for audience behavior around animals” (Behavior Expectations) and “Encourage Focused observation of animal” (Encourage Observation) regressed on animal taxa.

Animal Group	Behavior Expectations		Encourage Observation	
Primates (Intercept)	0.11 *	(0.02, 0.19)	0.27 ***	(0.18, 0.36)
Birds of Prey	0.03	(-0.18, 0.24)	0.30 **	(0.07, 0.53)
Bony Fish	-0.01	(-0.19, 0.17)	-0.12	(-0.32, 0.08)
Carnivora	0.03	(-0.06, 0.13)	0.19 ***	(0.09, 0.29)
Cartilaginous Fish	-0.11	(-0.29, 0.07)	-0.27 **	(-0.47, -0.07)
Colorful Birds	-0.11	(-0.41, 0.20)	0.48 **	(0.15, 0.81)
Cranes	-0.06	(-0.24, 0.11)	-0.11	(-0.30, 0.08)
Domesticated	0.31 ***	(0.14, 0.48)	-0.10	(-0.29, 0.08)
Echinoderm	0.39 ***	(0.22, 0.57)	-0.27 **	(-0.46, -0.08)
Insect	0.89 ***	(0.59, 1.20)	0.65 ***	(0.31, 0.98)
Land Mammal	-0.02	(-0.13, 0.08)	0.11	(-0.00, 0.23)
Marine Mammal	-0.11 *	(-0.21, -0.01)	0.05	(-0.06, 0.16)
Mixed	0.09	(-0.01, 0.20)	0.02	(-0.09, 0.13)
Penguins	-0.05	(-0.20, 0.10)	0.10	(-0.07, 0.26)
Reptiles & Amphibians	0.02	(-0.12, 0.17)	0.31 ***	(0.15, 0.47)
<i>N</i>	526		526	
$R^2_{adj}$	0.15		0.16	

\*\*\*  $p < 0.001$ ; \*\*  $p < 0.01$ ; \*  $p < 0.05$ .

Table 19. Practices “Inform about animals’ needs” (Inform About Needs) and “Include appropriate conservation or caring action” (Conservation Caring Action) regressed on animal taxa.

Animal Group	Inform About Needs		Conservation Caring Action	
Primates (Intercept)	0.65 ***	(0.58, 0.72)	0.30 ***	(0.22, 0.38)
Birds of Prey	-0.22 *	(-0.40, -0.04)	-0.02	(-0.22, 0.18)
Bony Fish	0.08	(-0.07, 0.24)	-0.26 **	(-0.44, -0.09)
Carnivora	0.05	(-0.03, 0.13)	0.06	(-0.03, 0.15)
Cartilaginous Fish	-0.65 ***	(-0.81, -0.49)	0.10	(-0.08, 0.27)
Colorful Birds	0.02	(-0.25, 0.29)	0.10	(-0.19, 0.39)
Cranes	-0.07	(-0.23, 0.08)	0.06	(-0.11, 0.23)
Domesticated	-0.04	(-0.19, 0.11)	0.03	(-0.13, 0.19)
Echinoderm	-0.65 ***	(-0.80, -0.50)	-0.30 ***	(-0.47, -0.14)
Insect	0.35 *	(0.08, 0.62)	0.10	(-0.19, 0.39)
Land Mammal	0.18 ***	(0.09, 0.28)	0.17 **	(0.07, 0.27)
Marine Mammal	0.13 **	(0.04, 0.22)	0.01	(-0.09, 0.11)
Mixed	-0.12 *	(-0.21, -0.02)	-0.05	(-0.15, 0.04)
Penguins	0.04	(-0.09, 0.17)	0.13	(-0.01, 0.28)
Reptiles & Amphibians	-0.05	(-0.18, 0.07)	-0.07	(-0.21, 0.07)
<i>N</i>	526		526	
$R^2_{adj}$	0.34		0.10	

\*\*\*  $p < 0.001$ ; \*\*  $p < 0.01$ ; \*  $p < 0.05$ .

Table 20. Practices “Reinforce that animals are individuals” (Reinforce Individuality) and “Reinforce that animals have relationships” (Reinforce Relationships) regressed on animal taxa.

Animal Group	Reinforce Individuality		Reinforce Relationships	
Primates (Intercept)	0.65 ***	(0.51, 0.78)	0.19 **	(0.06, 0.31)
Birds of Prey	-0.01	(-0.34, 0.33)	0.10	(-0.22, 0.41)
Bony Fish	-0.45 **	(-0.74, -0.16)	0.01	(-0.26, 0.28)
Carnivora	-0.07	(-0.22, 0.08)	0.33 ***	(0.19, 0.47)
Cartilaginous Fish	-0.65 ***	(-0.94, -0.36)	-0.19	(-0.46, 0.08)
Colorful Birds	-0.65 *	(-1.14, -0.16)	0.31	(-0.14, 0.76)
Cranes	0.35 *	(0.07, 0.63)	0.13	(-0.13, 0.39)
Domesticated	-0.11	(-0.38, 0.17)	0.23	(-0.02, 0.48)
Echinoderm	-0.65 ***	(-0.93, -0.37)	-0.19	(-0.45, 0.07)
Insect	0.02	(-0.48, 0.51)	0.48 *	(0.02, 0.93)
Land Mammal	0.13	(-0.04, 0.30)	0.58 ***	(0.43, 0.74)
Marine Mammal	-0.14	(-0.31, 0.02)	0.37 ***	(0.22, 0.52)
Mixed	-0.19 *	(-0.35, -0.02)	-0.03	(-0.19, 0.12)
Penguins	0.06	(-0.18, 0.30)	0.52 ***	(0.30, 0.74)
Reptiles & Amphibians	0.09	(-0.14, 0.32)	0.73 ***	(0.52, 0.95)
<i>N</i>	526		526	
$R^2_{adj}$	0.13		0.25	

\*\*\*  $p < 0.001$ ; \*\*  $p < 0.01$ ; \*  $p < 0.05$ .

Table 21. Practices “Similarities and differences between animals and people” (Comparison To People) and “Invite Perspective-taking of animal” (Invite Perspective) regressed on animal taxa.

Animal Group	Comparison To People		Invite Perspective	
(Intercept)	0.19 ***	(0.14, 0.25)	0.00	(-0.06, 0.06)
Birds of Prey	0.09	(-0.05, 0.23)	0.14 *	(0.00, 0.28)
Bony Fish	-0.09	(-0.22, 0.03)	0.10	(-0.02, 0.22)
Carnivora	0.07 *	(0.01, 0.13)	0.15 ***	(0.09, 0.21)
Cartilaginous Fish	-0.19 **	(-0.32, -0.07)	0.25 ***	(0.13, 0.37)
Colorful Birds	-0.03	(-0.23, 0.18)	0.25 *	(0.05, 0.45)
Cranes	-0.07	(-0.19, 0.04)	0.02	(-0.09, 0.14)
Domesticated	-0.01	(-0.13, 0.10)	0.00	(-0.11, 0.11)
Echinoderm	-0.19 **	(-0.31, -0.08)	0.00	(-0.12, 0.12)
Insect	0.08	(-0.12, 0.29)	0.83 ***	(0.63, 1.04)
Land Mammal	0.05	(-0.02, 0.12)	0.19 ***	(0.12, 0.26)
Marine Mammal	0.06	(-0.00, 0.13)	0.12 ***	(0.05, 0.19)
Mixed	-0.05	(-0.12, 0.02)	0.06	(-0.01, 0.13)
Penguins	0.10 *	(0.00, 0.20)	0.21 ***	(0.11, 0.31)
Reptiles & Amphibians	-0.04	(-0.13, 0.06)	0.17 ***	(0.08, 0.27)
<i>N</i>	526		526	
$R^2_{adj}$	0.11		0.17	

\*\*\*  $p < 0.001$ ; \*\*  $p < 0.01$ ; \*  $p < 0.05$ .

## DV: Behavior ~ IV: Practices categories

For the regression models predicting percentage of behavior categories covered (DV) from percentages of the various practices categories covered (IVs), collinearity arose between the independent variables. Should these categories be used again, a deeper investigation into the relationships between these variables could be useful.

The full set of potential independent variables is:

Table 22. Practices categories used as independent variables and the shortened names used to refer to them in subsequent tables.

Practices Category	Short Name
Expectations for audience behavior around animals	Behavior Expectations
Similarities and differences between animals and people	Comparison to People
Include appropriate conservation or caring action	Conservation Caring Action
Encourage focused observation of animal	Encourage Observation
Inform about animals' needs	Inform About Needs
Invite Perspective-taking of animal	Invite Perspective
Reinforce that animals have their own agency	Reinforce Agency
Reinforce that animals are individuals	Reinforce Individuality
Reinforce that animals have relationships	Reinforce Relationships

For the purposes of this analysis, we followed an iterative approach to trim the model to a stable subset of IVs. We began each analysis with all available practices as predictors, then iteratively trimmed the IV with the largest  $p$ -value above 0.05 until we arrived at a set with only statistically significant predictors. Then, each trimmed IV was reintroduced one by one to ensure they were still non-significant, and if they were then they were added back in the model.

Table 23. Behaviors “Understands needs of an animal” (Understands Needs) and “Able to take perspective of animals” (Take Perspective) regressed on Practices categories.

	Understands Needs		Take Perspective	
(Intercept)	0.00	(-0.01, 0.02)	0.00	(-0.01, 0.02)
Behavior Expectations	0.06 **	(0.02, 0.10)	0.05 **	(0.02, 0.08)
Comparison to People	0.13 ***	(0.08, 0.19)	0.08 ***	(0.03, 0.12)
Invite Perspective	0.15 ***	(0.10, 0.21)	0.13 ***	(0.08, 0.17)
$N$	541		541	
$R^2_{adj}$	0.15		0.13	

\*\*\*  $p < 0.001$ ; \*\*  $p < 0.01$ ; \*  $p < 0.05$ .

Table 24. Behavior “Shows positive behavior toward animals” (Positive Behavior) regressed on Practices categories.

	Positive Behavior	
(Intercept)	0.03	(-0.19, 0.25)
Behavior Expectations	0.22 **	(0.07, 0.37)
Reinforce Individuality	0.21 *	(0.01, 0.42)
Reinforce Agency	-0.48 **	(-0.82, -0.15)
$N$	25	
$R^2_{adj}$	0.42	

\*\*\*  $p < 0.001$ ; \*\*  $p < 0.01$ ; \*  $p < 0.05$ .

## ANOVA

One-way analysis of variance (ANOVA) was performed to investigate differences in the mean number of unique empathy-related practices used or behaviors observed among observations of different types of visitor groups, animals, and exhibit styles.

Table 25. ANOVA for number of unique empathy-related behaviors observed in each type of exhibit visitor group

Groups	Observations	Average	Variance
Adult	156	3.872	9.390
Mixed Age	362	4.047	8.604
Solo	28	1.786	3.063

Source of variation	Sum of squares	Degrees of freedom	Mean sum of squares	F-value	P-value	F critical value
Between Groups	132.910	2	66.455	7.770	<0.001	3.012
Within Groups	4644.352	543	8.553			

Table 26. ANOVA for number of unique empathy-related behaviors observed in program audiences and exhibit visitors for each type of animal

Groups	Observations	Average	Variance
Bird	80	5.175	21.285
Fish	19	4.737	9.094
Mammal	438	4.107	11.117
Marine Invertebrate	23	4.609	14.431
Reptile	51	5.137	25.001
Terrestrial Invertebrate	14	7.929	29.610

Source of variation	Sum of squares	Degrees of freedom	Mean sum of squares	F-value	P-value	F critical value
Between Groups	289.125	5	57.825	4.135	<0.001	2.229
Within Groups	8655.637	619	13.983			

Table 27. ANOVA for number of unique empathy-related behaviors observed in program audiences and exhibit visitors for each animal type, excluding terrestrial invertebrates

Groups	Observations	Average	Variance
Bird	80	5.175	21.285
Fish	19	4.737	9.094
Mammal	438	4.107	11.117
Marine Invertebrate	23	4.609	14.431
Reptile	51	5.137	25.001

Source of variation	Sum of squares	Degrees of freedom	Mean sum of squares	F-value	P-value	F critical value
Between Groups	115.956	4	28.989	2.124	0.076	2.387
Within Groups	8270.708	606	13.648			

Table 28. ANOVA for number of unique empathy-related behaviors observed in program audiences and exhibit visitors for terrestrial invertebrates and mammals only

Groups	Observations	Average	Variance
Terrestrial Invertebrate	15	7.929	27.495
Mammal	439	4.107	11.091

Source of variation	Sum of squares	Degrees of freedom	Mean sum of squares	F-value	P-value	F critical value
Between Groups	211.794	1	211.794	18.259	<0.0001	3.862
Within Groups	5242.885	452	11.599			

Table 29. ANOVA for number of unique empathy-related behaviors observed at exhibits with and without touch opportunities

Groups	Observations	Average	Variance
Touch exhibit	65	3.844	12.212
Non-touch exhibit	470	2.036	4.198

Source of variation	Sum of squares	Degrees of freedom	Mean sum of squares	F-value	P-value	F critical value
Between Groups	186.594	1	186.594	36.161	<0.0001	3.859
Within Groups	2750.307	533	5.160			

Table 30. ANOVA for number of unique empathy-related practices used in programs and exhibit signage for each type of animal

Groups	Observations	Average	Variance
Amphibian	4	7.250	31.583
Bird	46	9.913	28.303
Fish	9	7.556	32.778
Mammal	138	9.486	22.996
Marine Invertebrate	8	6.125	17.268
Reptile	22	10.500	36.262
Terrestrial Invertebrate	10	14.100	40.544

Source of variation	Sum of squares	Degrees of freedom	Mean sum of squares	F-value	P-value	F critical value
Between Groups	382.693	6	63.782	2.433	<0.1	2.138
Within Groups	6028.370	230	26.210			

## Appendix C: Evaluation Plan

This evaluation was completed as a part of the *Advancing Empathy for Wildlife Program Evaluation Plan*, a joint initiative by the Advancing Empathy Initiative staff at Woodland Park Zoo and its external evaluation partner, Catalyze Evaluation. The full evaluation plan and related resources can be accessed via the ACE for Wildlife Network website at: [aceforwildlife.org/resource/advancing-empathy-for-wildlife-program-evaluation-plan/](https://aceforwildlife.org/resource/advancing-empathy-for-wildlife-program-evaluation-plan/)

## Appendix D: Observation Framework

Observational data included in this evaluation was conducted utilizing the *Expressions of Empathy and Related Emotions towards Animals: Observational Framework and Code Sheet* created as part of the Measuring Empathy: Collaborative Assessment Project, a partnership between Woodland Park Zoo, Point Defiance Zoo & Aquarium, and Seattle Aquarium that developed tools for measuring empathy towards animals in zoos and aquariums. The full observation framework can be accessed at:

[aceforwildlife.org/resource/expressions-of-empathy-related-emotions-towards-animals-observational-framework-and-code-sheet/](https://aceforwildlife.org/resource/expressions-of-empathy-related-emotions-towards-animals-observational-framework-and-code-sheet/)