Interpretive Sign Use Within The City of Fort Collins Natural Areas

A Focus on Repeat Visitors

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Introduction

This report is the result of a 1-year research initiative contracted by the City of Fort Collins Natural Areas Program in conjunction with Colorado State University. A large repeat visitor population within the natural areas led to a joint interest in how this population interacts and learns from interpretive signs. The purpose of this report is to better understand how repeat visitors at the City of Fort Collins Natural Areas interact with knowledge based interpretive signs, the cognitive results of these interactions, and how these interactions can be improved to facilitate further learning.

Please note that this research was conducted under a framework of free choice learning. Though the interpretive signs contribute to the overall learning that occurs, they in no way encompass the entirety of knowledge gained. Through proper design and use, interpretive signs may be used to contribute a piece to this learning to instill environmental knowledge to the community.

The recommendations given within this report are from a visitor perspective. Logistics such as cost, time, and availability of resources are not taken into full account. If and how these recommendations are to be met is left to the discretion of the natural area managers. This report serves as a perspective to include in further decision making which involves the use of interpretive signs for public education.

Context

This report combines aspects of free choice learning, repeat visitors, and interpretive sign design to achieve a better understanding of how repeat visitors interact and learn from interpretive signs.

Free Choice Learning

Free choice learning allows visitors to learn through their own motivation and interest and is often self-paced, voluntary, and non-sequential (Falk, 2005). As the title suggests, visitors have a choice in what they want to learn without anticipation of reward or threat of punishment. It is the learning common to museums, arboretums, aquariums, and natural areas. When viewed in this way, learning is highly idiosyncratic and involves the visitor's motivations, interests, prior knowledge, and experience (Falk & Dierking, 2002). Accounting for this large variety in visitors through relatively few interpretive signs can be challenging. Though seen as effective, as it is visitor driven and inquiry based, little is known about the effectiveness of free choice learning in an environment with repeat visitors.

Repeat Visitors

Traditional studies of interpretive sign education do not account for repeat visitors, though many community based natural areas host a large number of this type of visitor. Studies conducted at Fort Collins Natural Areas reveal a high repetitive visitor population. Of the estimated 3.7 million annual visitors, 95% are repeat visitors (Corona Research, 2006). Evidence shows repeated exposure to communication messages aids in learning (e.g., Cacioppo & Petty, 1989; Stang, 1975; Taylor, 1958), however, this may not hold true for repeat visitors in a free choice learning environment. A visitor must be exposed to and give attention to an interpretive sign to learn from it (McGuire, 1976). Visitors are exposed to trail-side signs by passing them on a trail whether hiking, biking, or running. However, attention is not given to a sign until the visitor stops to view it. Many of the visitors in this study have visited the natural areas multiple times.

Therefore, they have been exposed to the educational messages on the interpretive signs numerous times. Theory suggests that increased exposure and attention to the same information will eventually lead to boredom and possible avoidance (i.e., Cacioppo & Petty, 1979; Stang, 1973; Berlyne, 1970). If this were true, then interpretive signs would be poor choice for educating a population of repeat visitors. However, the interaction that occurs is more complex and is influenced by interpretive sign design.

Interpretive Signs

Interpretive signs have been shown to be important tools in increasing visitor knowledge at natural areas (Cole et al., 1997; Hughes & Morrison-Saunders, 2002). Certain features of interpretive signs are linked to the amount of time visitors attend to signs (Wells & Smith, 2000). Studies show the time spent attending to a sign or exhibit is positively related to the amount of learning and interest that occurs (Barnard, 1980; Birney, 1988; Cole et al., 1997; Cone & Kendall, 1978; DeMouthe, 1989; Saunders et al., 1999). It is therefore assumed that features that increase attention time also increase knowledge gain.

Studies show increased attention time by the use of interactive, hands-on exhibits and signs (e.g., Arndt et al., 1993; Ayres & Melear, 1998; Borun & Adams, 1992; Borun et al., 1993; Derwin & Piper, 1988; Eason & Linn, 1976; Hayward & Brydon-Miller, 1984; Koran et al., 1986; Liu & Wheat, 1995; Ottinger, 1993; Wright, 1980). Signs that contain multisensory features and engage the senses of hearing, smell, and touch may increase attention (Bitgood, 2000). Larger type size increased the amount of reading by visitors (Thompson & Bitgood, 1988). Serrel (1996) suggests shorter labels and chunking information into short paragraphs of 25 to 75 words increase reading by visitors. She also suggests a combination of words and images, rather than

all text, makes signs more meaningful and memorable (Serrel, 1996). Signs which include questions particularly seem to encourage learning (Arndt et. al., 1993; Greenglass, 1986; Hirshi & Screven, 1988; Litwak, 1996). (For more comprehensive interpretive sign features see Wandersee & Clary, 2007). This study examines how these features may influence repeat visitors' attention.

Methods

The study sites were two City of Fort Collins Natural Areas: Cathy Fromme Prairie and Coyote Ridge. These areas were chosen for many reasons. First, signs at both areas were created by the same designer, giving some congruence to the subject of study. Second, these areas are located adjacent to each other, having close proximity, and similar populations of visitors. Finally, the trail's shape and length, physical environment, and ecological knowledge featured on the signs are very similar in these two areas. The participants of this study consisted of hikers, walkers, runners, and cyclists from the trails at Cathy Fromme Prairie and Coyote Ridge.

Observations

Observations were conducted by trained City Natural Program volunteers at various times throughout the months of October and November, 2008. Volunteers observed 455 visitors (See Table 1). Times and dates of the observations were kept flexible for the benefit of the volunteers. Volunteers recorded visitor's attention to interpretive signs, time spent reading, and types of interactions with the signs using an observation form (See Appendix A). They also recorded characteristics of each group; group size, visitor age, and activity types such as biking, running, or hiking.

Observational data were compiled and compared using descriptive statistical techniques such as averages and frequency of occurrence measures. The data were displayed in charts, tables, and graphs comparing group size and activity type to interpretive sign usage (See Appendix B).

Data regarding frequency and duration of time spent at signs were converted into attracting power and holding power measures using the following formulas (Bitgood, 2000). Attracting Power and Holding Power scores were used to identify signs deemed favorable by visitors.

$$\textbf{Attracting Power} = \frac{\text{number of participants who stopped at a sign}}{\text{total number of participants who passed by the sign}} \times 100$$

$$\textbf{Holding Power} = \frac{\text{average time spent by participants reading a sign}}{\text{time needed to fully comprehend the sign}}$$

Semi-Structured Interviews

We gave 46 interviews to adult visitors who were exiting the trails and agreed to participate in the study (See Table 2). Interviews took place during weekend afternoons of October and November, 2008 due to the high frequency of visitors to natural areas during those times (Corona Research, 2006). We conducted and audio recorded semi-structured interviews at both sites using the attached interview forms (See Appendix C). Interview topics included frequency of visits, use of interpretive signs, learning, and favorable signs and features. Small color pictures of the interpretive signs (See Appendix D) were used to aid visitor recall of interpretive signs.

Table 1 Observation demographics by natural area

	Cathy Fromme Prairie (n)	%	Coyote Ridge (n)	%	Total (n)	%
Total Visitors	278	59	197	41	475	100
Activity Type						
Walking	163	59	98	50	261	55
Biking	92	33	72	37	164	35
Running	16	6	14	7	30	6
Other	7	2	3	1	10	2
Equestrian	0	0	10	5	10	2
Age						
Adult	246	88	181	92	427	90
Child	25	9	9	5	34	7
Teenager	7	3	7	3	14	3

Table 2 Interview demographics by natural area

	Cathy Fromme Prairie (n)	%	Coyote Ridge (n)	%	Total (n)	%
Total Visitors	20	43	26	57	46	100
Repeat Visitors	15	75	21	81	36	78
Gender						
Female	8	53	10	48	18	50
Male	7	47	11	52	18	50
Activity Type						
Walking	10	67	8	38	18	50
Biking	3	20	12	57	15	42
Running	2	13	1	5	3	8

We transcribed, coded, and analyzed interview data using NVivo qualitative software to identify repeat visitors' interpretive sign use and favorable sign features. For a complete list of referenced codes see Appendix E.

Knowledge Tests

To assess learning, we administered knowledge tests to the same visitors after the interviews. The knowledge tests consisted of multiple choice, true or false, and short answer questions related to information on the interpretive signs (See Appendix F).

Findings

Findings have been constructed from the multiple data sources of this study. In many instances coded interview data has been combined with survey scores and observations to create a complete picture of the study sites. I selected multiple quotes from interview transcripts to illustrate certain themes and represent the larger dataset of similar ideas, thoughts, and feelings of the visitors.

How Repeat Visitors Differ From First Time Visitors

Data reveals interesting differences in how repeat visitors and first time visitors interact and possibly learn from interpretive signs. A greater percentage of repeat visitors (97%) looked at interpretive signs at some point in time than first time visitors (80%). However, statements given in interviews from repeat visitors illustrate an interesting viewing pattern. It seems that though, some repeat visitors still view the signs,

"The signs are definitely something we stop and look at repeatedly. I mean, maybe not the same one, and we're not out here to study, so even if you do look at the same one, you maybe see something different, you know the second, third, fourth time around". - Walker from Coyote Ridge

eventually, they stop viewing interpretive signs.

"I've probably looked at [the signs] once or twice years ago when I started coming here and I haven't looked at [them] since". - Walker from Cathy Fromme Prairie

Repeat visitors most often indicated past reading but not present reading (28%), followed by past reading and continued reading (22%), and no reading has ever occurred (6%). Where most first time visitors read the interpretive signs, repeat visitors tend to either continue to read the interpretive signs on most visits or cease to read interpretive signs.

Table 3 Interpretive sign viewing attributes of repeat and first time visitors

	First Time Visitors (n= 10)	(%)	Repeat Visitors (n= 36)	(%)
Viewed Interpretive Signs	8	80	35	97
Average Test Scores		77		65
Statements of Learning	18	1.8	32	89

Average test scores as well as number of statements given in interviews which pertain to learning illustrate an interesting difference in the knowledge gain that may have occurred (See Table 3). First time visitors had higher test scores on average and gave more statements of learning from the signs per person than repeat visitors.

Activity Types: Running, Biking, and Walking

Activity type may influence attentiveness to and learning from interpretive signs. In fact, the activity that a visitor was engaged in seems to dictate attentiveness to signs more than frequency of visit. Of 24 coded reasons why repeat visitors did not read the interpretive signs most

pertained to activities of biking (7), general exercise (4), and running (2). Other reasons for not reading the interpretive signs included simply being outside and not having time. Possessing prior knowledge comprised of only two visitor responses.

"I just usually come out here for exercise and I'll just glance at the signs".   - Walker at Cathy Fromme Prairie

Observational data show a similar pattern in repeat visitors who are engaged in exercise (See Table 4). More walkers attended interpretive signs than both bikers and runners.

Table 4 Observation incidents comparing activity type to sign attentiveness

Visitor Activity Type	Total (n)	Attended to any signs (n)	%	Did not attend to any signs (n)	%
Walking	260	99	38	161	62
Biking	164	19	12	145	88
Running	31	6	19	25	81
Total	455	124	27	331	73

Because attentiveness to interpretive signs is linked to learning, an increase in average test scores and statements of learning from walking visitors was expected. The difficulty of reading while biking or running may explain the slightly higher learning scores achieved by walkers (Table 5).

Table 5 Repeat visitor activities compared with knowledge scores

Repeat Visitor Activity Type	(n)	Average Test Scores	Average Number per Person of Statements Coded as 'Learning From Signs'
Walking	18	66.6	1.1
Biking	15	60.5	0.6
Running	3	59.3	0.7
Total	36	64.9	0.9

Effective Sign Design

Effective design of interpretive signs begins with sign placement. Respondents gave 27 reasons for reading interpretive signs. The most frequent reason for reading was 'location'. Visitors perceived signs positioned at the top of ridges, near turns, or by benches as inviting to a learning experience.

"We stop up there. Most people are going to stop at the top of any ridge to catch their breath, so those are good places because we're waiting for each other and you can play with everything up there or if there's signs you can read them and get some information". - Mountain Biker at Coyote Ridge

Signs placed on side trails (such as trails leading to the Raptor Observatory and the Cabin Loop) were not effective because visitors rarely visited these area. Of the 46 visitors in the interview study, half (23) had never visited a side trail leading to an interpretive area. This lack of visitation may be due to an absence of direction.

"It's the way it's set up you know you either go that way or this way and I think people are trying to figure out where the trail is, that's one bad thing, I sort of wish they had a better thing that says trail here and how far it is…" - Walker at Cathy Fromme Prairie

Four signs from both study sites were identified as *model* signs (See Table 6). These signs were recognized by measures of attracting power, holding power, and referenced interview statements. For a complete list of measures for each sign within the study see Appendix G - I.

Of 77 visitor references to favorable sign features, the largest percentage was for three dimensional objects on the signs (14 times). Other three dimensional objects referenced pertained to a specific snake found on 'Prairie Survival- Go Underground' (5). Pictures were referenced abundantly. Eight referenced wildlife in general. Seven coded statements referred to the picture depicting prairie dog tunnels in 'A House in a Town'. Pictures of birds were coded

high on the list with six references. Pictures in general, coyotes, prairie dogs, and sign titles all received five references.   Certain patterns emerge from the data pertaining to interpretive sign design. Three dimensional objects seem to be favorable sign features. Pictures of local wildlife are particularly popular.   Also, a title with large print size is a positive feature.

Recommendations

The findings from this study suggest certain design protocol for The City of Fort Collins Natural Areas in order to increase attention to and learning from interpretive signs.   These recommendations take into account the high population of repeat visitors as well as those involved in exercise.   Some of the recommendations are presently being followed at Coyote Ridge and Cathy Fromme Prairie and are merely a statement of what is working and should not be changed but employed in other natural areas.

Sign Placement

Interpretive signs should be placed in natural rest stops along the trail such as the top of ridges, near benches, or along curves where participants might slow down or rest long enough to interact with them. Signs should not be placed on side trails due to lack of exposure to most visitors. If an interpretive side trail must be used it should be clearly labeled with directions for the visitor, as many visitors were confused to the whereabouts of the Cabin Loop and Raptor Observatory in this study.

Table 6 Attributes of favorable interpretive signs

Interpretive Signs		Observation Data			Interview Data	
		Participants Attending to Sign (n)	Attracting Power %	Holding Power	Frequency Referenced as Memorable %	Times Referenced for Learning or as Favorable
Cathy Fromme Prairie	"Raptors Feast on Prairie Dogs"	12	65.0	0.38	20	4
	"A House in a Town"	11	71.8	1.03	53	9
	"Prairie Dog Towns are Busy Places"	7	12.8	0.51	20	5
	"Prairie Dogs are Part of the Prairie"	7	10.8	0.57	40	5
Coyote Ridge	"Prairie Survival – Go Underground"	6	32.2	0.81	33	8
	"This Land – Once a Sea"	4	28.2	0.46	24	8
	"Rare Plant Sanctuary"	2	100	7.07	48	6
	"More to Explore at Coyote Ridge"	2	77.8	0.62	29	5

Sign Design

The interpretive signs at Coyote Ridge and Cathy Fromme Prairie followed most of the existing literature in appropriate design such as appropriate word count, chunking of text, color, and an integration of pictures and text. They are well designed signs for the areas. This study aided in the recognition of additional interpretive signs features that repeat visitors found favorable. An ideal interpretive sign would include a three dimensional object, have a picture of local wildlife, and have a large text, descriptive title. Frequently, visitors engaged in exercise only glance at the interpretive signs. If the title is large enough, and conveys a complete educational message, the visitors may still learn at a glance.

Visitor Recommendations

Most interviewed participants were satisfied with the interpretive signs at both natural areas. However, a few visitors gave suggestions for additional improvement. The most frequently given recommendation by visitors were for detailed trail maps of the area with mileage markers. They also suggested larger titles to add to the readability of signs by runners and bikers. Mountain bikers suggested difficulty ratings be given to biking trails in natural areas as well as more warning signs regarding rattle snakes.

Conclusion

Most visitors whether repeat or first time, had gained some knowledge from interpretive signs and nearly all the visitors interviewed had attended to interpretive signs at some point. Therefore, I conclude that the use of interpretive signs for the purpose of education should be continued on the City of Fort Collins Natural Area trails. The use of interpretive signs allows for free choice

learning to occur at the discretion of the participant. Even if they are not personally motivated to learn, visitors enjoy the presence of the signs as a possible platform for learning. By following the recommendations in this report, this platform of learning is stretched to encompass a greater variety of participants. With the choice to learn made easy, perhaps more visitors will begin to envision these areas as not only a place to recreate, but also to learn.

After the presentation of this report to the City of Fort Collins Natural Areas Program Office and associated stakeholders, additional analysis was required in order to answer some of the questions that arose. These questions typically focused on the specific visitor learning but also included queries regarding bulletin board use and interpretive side trail visitation. The resulting analysis can be found in table form in Addendums I, II, and III.