



# Exploring Nature Connection Through Research: An Overview of Current Research Projects at The Meadows Center for Water and the Environment

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## Session Outcomes

- Learn of three different innovative research studies related to environmental learning and nature connection
- Learn about incorporating mindfulness activities into environmental programming and interpretation
- Understand The Meadows Center's initiatives to make data sets and research support available to other educational researchers

# OUR MISSION

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Inspiring research, innovation, and leadership that ensures clean, abundant water for the environment and all humanity.

# OUR VISION

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A world where all people understand and embrace the value of water and environmental stewardship.



# OUR PILLARS

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We fulfill our mission by integrating activities across four pillars of action in powerful ways. Our work in each of these pillars begins at Spring Lake – one of the largest artesian springs in the world – and ripples outward across Texas and beyond.



**STEWARDSHIP**  
Cultivating a Stewardship Ethic



**LEADERSHIP**  
Transforming Knowledge into Action



**EDUCATION**  
Encouraging Life-Long Learning



**RESEARCH**  
Conducting Solutions-Focused Research



## Spring Lake Education Program

The Meadows Center engages more than 125,000 people each year in environmental education and outdoor learning activities at Spring Lake and elsewhere. Our programs engage people of all ages, teach them about Spring Lake and the importance of water to all living things, and inspire them to become stewards of our natural resources.

# FY 2018 Attendance

<b>Total Attendance to Spring Lake</b>	<b>106,027*</b>
<b>Public Glass-bottom Boat</b>	57,250
<b>Group Tours</b>	27,515
<b>University Groups</b>	6,628
<b>Special Events</b>	9,660
<b>Scuba</b>	4,050
<b>SUP and Kayak Tours</b>	924

\*paid attendance

# Field Trip Evaluations

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- 100% of teachers felt this field trip helped them with their curriculum goals.
- 100% of teachers said they would come on a field trip again
- 72% of students indicated they have improved their water conservation habits.



# The Meadows Center Strategic Plan

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Goal 1: Strengthen The Meadows Center's research program and the infrastructure platform that supports Texas State's research community.

**Interpretive and Experiential STEM Education:** The Meadows Center provides a living laboratory for researching the efficacy and impact of experiential educational programs and techniques.

- Work in partnerships with different departments on campus
- Support projects that will get published in a peer-reviewed journal
- Get grants to support and expand research





# Spring Lake Education Programs Action Plan

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Spring Lake Education Program inspires and empowers people of all ages to discover, understand, and be a steward of their natural environment and water resources through educational and recreational experiences.



1. Educational Programs
2. Interpretive Guide  
Internship Program
3. Data Hub

# Children's Experience of Nature Through Maps (Maleki, Warren, Hagelman, Navarro, 2018)

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**Purpose:** The purpose of this study was to examine K-12 school children's expressions of nature through map-making following a field trip learning experience.

**Researchers:** The Meadows Center and the Texas State University Geography Department

**Participants:** K-12 school children participating in a field trip at The Meadows Center



# Research Questions

How do children represent their experiences following their field trip?

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Q1: What are the most common natural and anthropogenic elements in children's maps?

Q2: What cartographic features do children use in their maps?

Q3: What are the qualitative differences in the ways children described their maps?





## Data:

- A total of 765 maps
- Collected from 7/5/2017 to 12/15/2017

## Analysis:

- Visual content analysis (Rose, 2016)
- Frequency analysis and chi-square statistical test of goodness-of-fit ( $\alpha = 0.05$ )
- Content analysis of written descriptions

## Coding Map Contents

**Natural  
Environment**

**Built  
Environment**

**People**

**Cartographic  
Convention**

**Text**

**Chronological  
Setting**

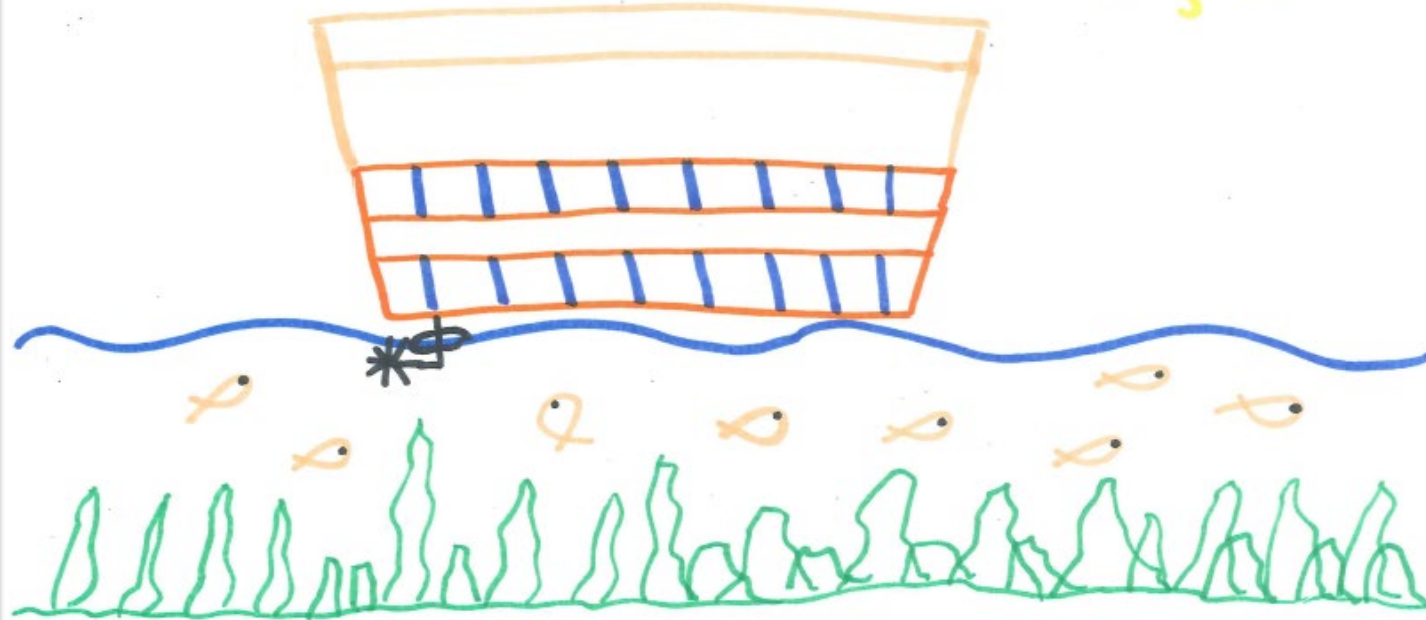
**Perspective**

**Color**

# Example of maps (Natural Environment)

Teacher name  
School name

Draw a map of your field trip today



# Example of maps (Built Environment)

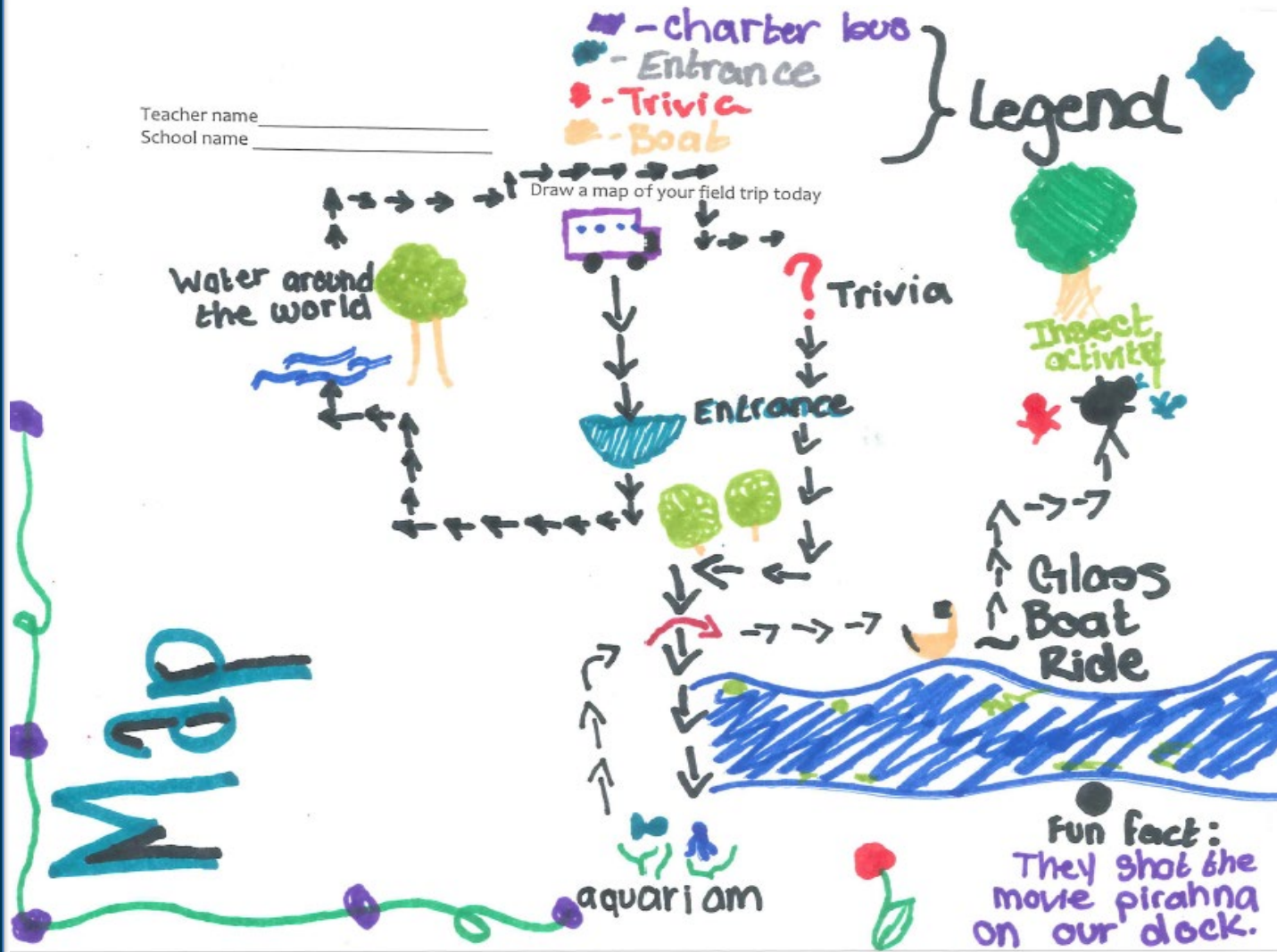
Teacher name \_\_\_\_\_  
School name \_\_\_\_\_

Draw a map of your field trip today



# Example of maps

(Elements of Cartographic Features)





# Example of maps (Elements of Cartographic Features)

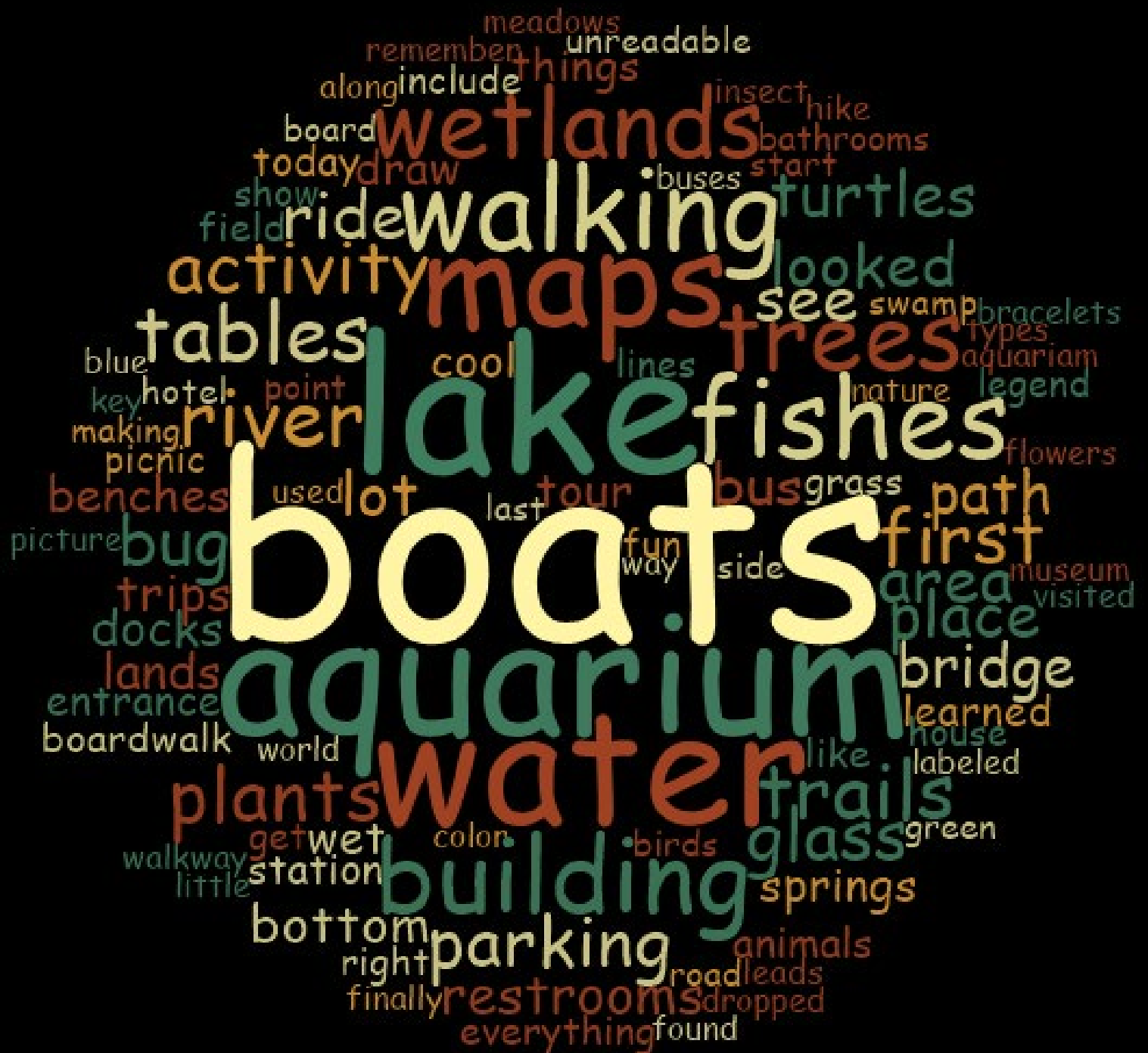


Example  
of maps:  
Negative  
feelings



# Results: Frequencies and Elements

Natural Environment	N	%	Built Environment	N	%
Non-human living					
Flora <i>Chi Square = 2.31 (P = 0.128)</i>	402	52.8%	Boats <i>Chi Square = 46.3 (P = 0.000)</i>	475	62.3%
Fauna <i>Chi Square = 99.9 (P = 0.000)</i>	243	31.9%	Trails <i>Chi Square = 51.4 (P = 0.000)</i>	480	63.0%
Non-living elements			Buildings <i>Chi Square = 185.5 (P = 0.000)</i>	569	74.7%
Sun <i>Chi Square = 599.7 (P = 0.000)</i>	43	5.6%	Roads <i>Chi Square = 292.3 (P = 0.000)</i>	145	19.0%
Other sky elements <i>Chi Square = 691.7 (P = 0.000)</i>	18	2.4%	Vehicles <i>Chi Square = 365.8 (P = 0.000)</i>	117	15.4%
Water <i>Chi Square = 472.4 (P = 0.000)</i>	681	89.4%	People <i>Chi Square = 435.4 (P = 0.000)</i>	93	12.2%



# Conclusions and the Future

- Anthropogenic elements seemed to be dominant (further analysis needed)
- Limited use of cartographic elements
- Written descriptions offer context to the maps

This database is made up of \_\_\_\_\_ maps, the LARGEST database of kids maps ever.

Our future goal is to have this available to outside researchers to use for their own research.



# Connecting Interest in and Awareness of the Environment with an Informal Experience

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The purpose of our study is to test the effect of participation in an informal learning environment on college student's interest in science.

The specific research question is: To what extent does participation in an informal science fieldtrip enhance interest in science, interest in STEM careers, and environmental awareness?



# Background

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- There is a need for people entering STEM careers
- Students rate colleges as reliable sources of information (Waliczek and Williamson, 2017)
- Informal learning experiences are linked to improved retention of science knowledge, positive attitudes towards science and environmental learning, and increased interest in science (Boyce, Mishra, Halverson, and Thomas, 2014)
- Underlying assumption is that people who have opportunities to participate in informal science will be more likely to develop an interest in and awareness of science and more likely to pursue a career in STEM





# Methodology

- Captive audience: The Glass-bottom boats are a requirement for all University Seminar students
- Collect data through an online questionnaire online at the beginning of the semester and directly after the scheduled field trip



# Career Interest Questionnaire

## Part 1

**Instructions:** Select one level of agreement for each statement to indicate how you feel.  
SD = Strongly Disagree, D = Disagree, U = Undecided, A = Agree, SA = Strongly Agree

	SD	D	U	A	SA
1. I would like to have a career in science.	①	②	③	④	⑤
2. My family is interested in the science courses I take.	①	②	③	④	⑤
3. I would enjoy a career in science.	①	②	③	④	⑤
4. My family has encouraged me to study science.	①	②	③	④	⑤

## Part 2

	SD	D	U	A	SA
5. I will make it into a good college and major in an area needed for a career in science.	①	②	③	④	⑤
6. I will graduate with a college degree in a major area needed for a career in science.	①	②	③	④	⑤
7. I will have a successful professional career and make substantial scientific contributions.	①	②	③	④	⑤
8. I will get a job in a science-related area.	①	②	③	④	⑤
9. Some day when I tell others about my career, they will respect me for doing scientific work.	①	②	③	④	⑤

## Part 3

	SD	D	U	A	SA
10. A career in science would enable me to work with others in meaningful ways.	①	②	③	④	⑤
11. Scientists make a meaningful difference in the world.	①	②	③	④	⑤
12. Having a career in science would be challenging.	①	②	③	④	⑤

# STEM Semantics Survey

## To me, SCIENCE is:

1.	fascinating	(1)	(2)	(3)	(4)	(5)	(6)	(7)	mundane
2.	appealing	(1)	(2)	(3)	(4)	(5)	(6)	(7)	unappealing
3.	exciting	(1)	(2)	(3)	(4)	(5)	(6)	(7)	unexciting
4.	means nothing	(1)	(2)	(3)	(4)	(5)	(6)	(7)	means a lot
5.	boring	(1)	(2)	(3)	(4)	(5)	(6)	(7)	interesting

## To me, MATH is:

1.	boring	(1)	(2)	(3)	(4)	(5)	(6)	(7)	interesting
2.	appealing	(1)	(2)	(3)	(4)	(5)	(6)	(7)	unappealing
3.	fascinating	(1)	(2)	(3)	(4)	(5)	(6)	(7)	mundane
4.	exciting	(1)	(2)	(3)	(4)	(5)	(6)	(7)	unexciting
5.	means nothing	(1)	(2)	(3)	(4)	(5)	(6)	(7)	means a lot

## To me, ENGINEERING is:

1.	appealing	(1)	(2)	(3)	(4)	(5)	(6)	(7)	unappealing
2.	fascinating	(1)	(2)	(3)	(4)	(5)	(6)	(7)	mundane
3.	means nothing	(1)	(2)	(3)	(4)	(5)	(6)	(7)	means a lot
4.	exciting	(1)	(2)	(3)	(4)	(5)	(6)	(7)	unexciting
5.	boring	(1)	(2)	(3)	(4)	(5)	(6)	(7)	interesting

## To me, TECHNOLOGY is:

1.	appealing	(1)	(2)	(3)	(4)	(5)	(6)	(7)	unappealing
2.	means nothing	(1)	(2)	(3)	(4)	(5)	(6)	(7)	means a lot
3.	boring	(1)	(2)	(3)	(4)	(5)	(6)	(7)	interesting
4.	exciting	(1)	(2)	(3)	(4)	(5)	(6)	(7)	unexciting
5.	fascinating	(1)	(2)	(3)	(4)	(5)	(6)	(7)	mundane

## To me, a CAREER in science, technology, engineering, or mathematics (is):

1.	means nothing	(1)	(2)	(3)	(4)	(5)	(6)	(7)	means a lot
2.	boring	(1)	(2)	(3)	(4)	(5)	(6)	(7)	interesting
3.	exciting	(1)	(2)	(3)	(4)	(5)	(6)	(7)	unexciting
4.	fascinating	(1)	(2)	(3)	(4)	(5)	(6)	(7)	mundane
5.	appealing	(1)	(2)	(3)	(4)	(5)	(6)	(7)	unappealing

# ROSE-D

	<i>Disagree</i>		<i>Agree</i>	
1. Threats to the environment are not my business .....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Environmental problems make the future of the world look bleak and hopeless .....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Environmental problems are exaggerated .....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Science and technology can solve all environmental problems ...	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. I am willing to have environmental problems solved even if this means sacrificing many goods .....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. I can personally influence what happens with the environment ..	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. We can still find solutions to our environmental problems .....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. People worry too much about environmental problems .....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. Environmental problems can be solved without big changes in our way of living .....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. People should care more about protection of the environment....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11. It is the responsibility of the rich countries to solve the environmental problems of the world .....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12. I think each of us can make a significant contribution to environmental protection.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13. Environmental problems should be left to the experts .....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14. I am optimistic about the future .....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15. Animals should have the same right to life as people .....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
16. It is right to use animals in medical experiments if this can save human lives .....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
17. Nearly all human activity is damaging for the environment .....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
18. The natural world is sacred and should be left in peace .....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



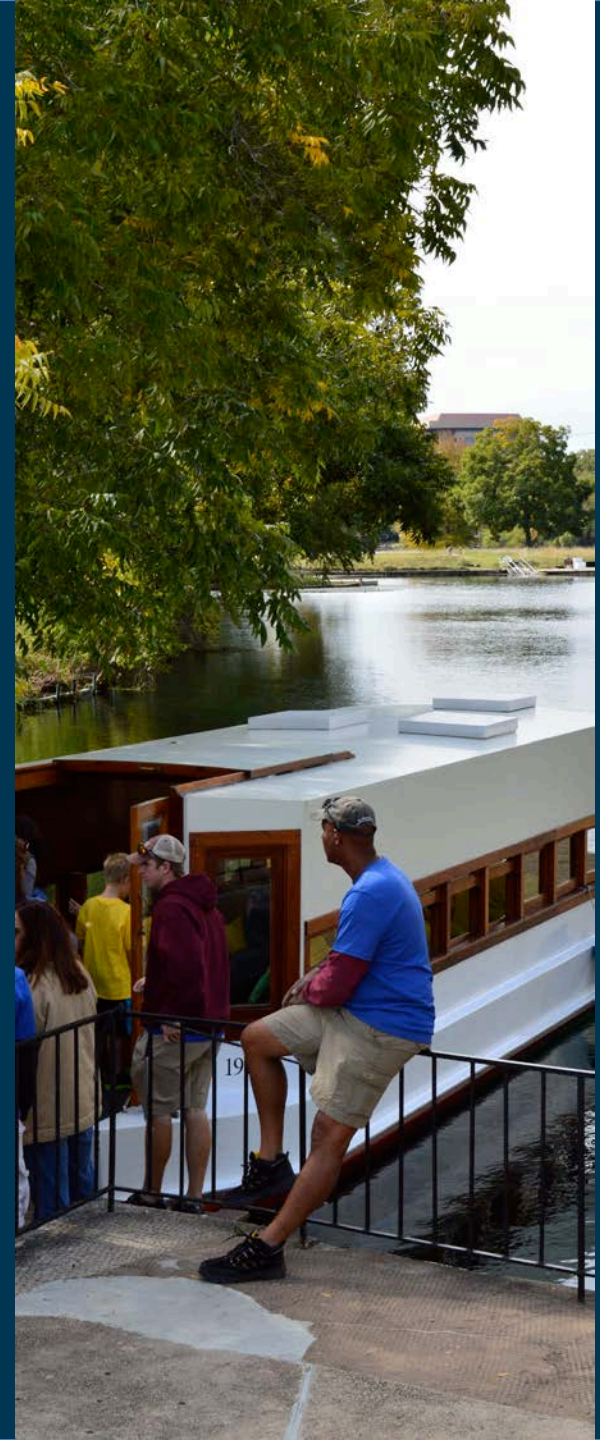


# Mindlessness

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An inactive state of mind characterized by the reliance on, categories drawn from the past:

- The past over-determines the present
- Trapped inside a single perspective
- Insensitive to context
- Rule and routine governed



# Simons and Chabris (1999)



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# Mindfulness

An active state of mind characterized by drawing novel distinctions that result in:

- Being situated in the present
- Sensitive to context and perspective
- Rule and routine guided
- Phenomenological experience of engagement



# Mindfulness Studies

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- Even animals can recognize mindfulness-Dolphins (Langer, 2014)
- Mindfulness affects the way children perceive themselves-Camp Study (Langer, Cohen, and Djikic, 2012)
- Mindfulness is empowering- Dog Toy (Langer & Piper, 1987)





# Cohen 53

## Natural Senses

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Sense of time

Appetite and hunger

Sense of temperature and temperature change

Sense of season

Humidity sense – acumen to find water, avoid flooding

Hearing, resonance

Sense of one's visibility

Proximity

Fear

Play

Emotional belonging, sense of community

Tacit knowing / foreknowledge

Conscious capacity for love, sublime, sorrow, spiritual

Sixth sense



# Mindfulness Interventions and Environmental Interpretation (Dussler & Deringer 2018)

The purpose of this study is to understand the experience of environmental interpreters participating in mindfulness-based interventions as it relates to nature connectedness and ecological behavior.

## Assumptions:

- that interpreters practicing mindfulness will experience greater awareness and connection to nature
- Mindful interpretation is beneficial for participants' development of nature connection and meaning



# Interpretation

*Defined as a mission-based communication process that forges emotional and intellectual connections between the interests of the audience and meanings inherent in the resource.*

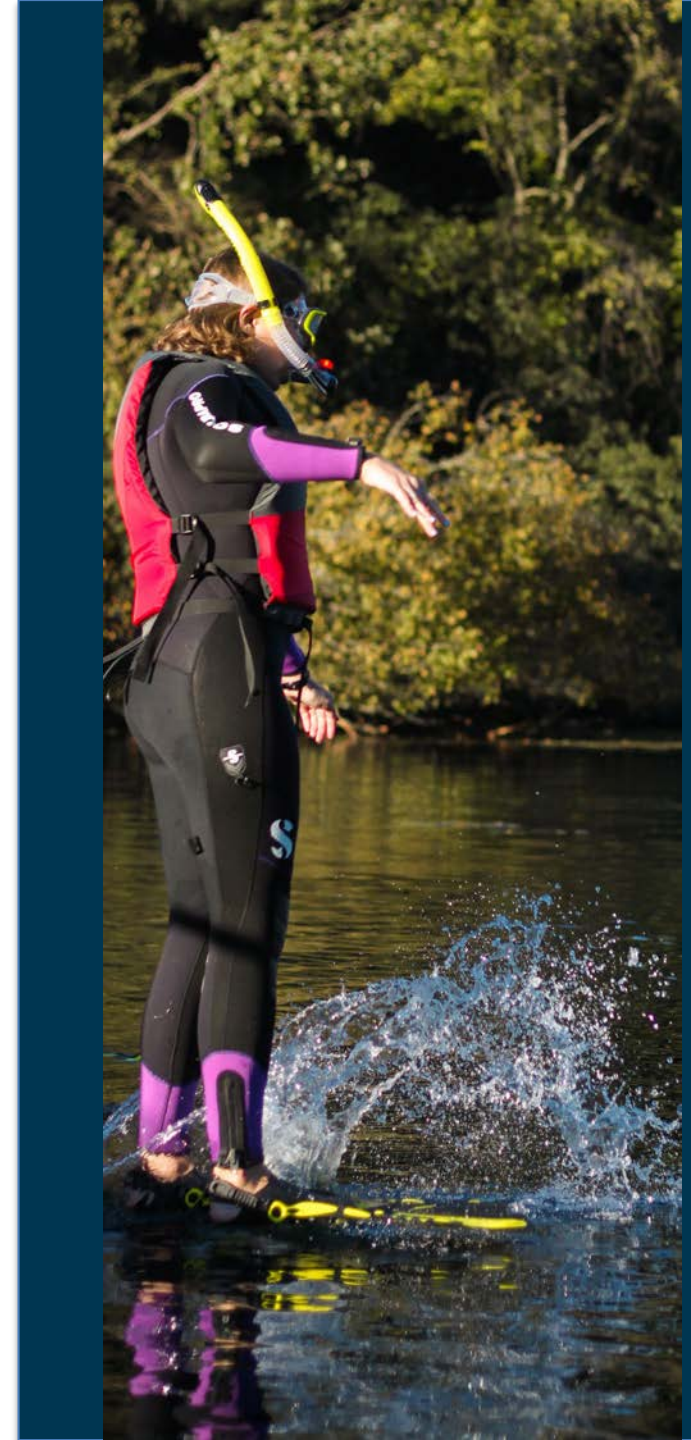
*-National Association for Interpretation*



# Mindful Interventions

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- Noticing Walks / Expanding Awareness
- Nature Sketching
- Moving Closer – Kayaking
- Moving Closer Still - Snorkeling
- Solo Experience
- Story of the Day
- Focus Group
- Journaling
- Mindful Meditation



# Mindful Connections to Nature

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Where the path closed  
down and over,  
through the scumbled leaves,  
fallen branches,  
through the knotted catbrier,  
I kept going. Finally  
I could not  
save my arms  
from thorns; soon  
the mosquitoes  
smelled me, hot  
and wounded, and came  
wheeling and whining.

And that's how I came  
to the edge of the pond:  
black and empty  
except for a spindle  
of bleached reeds  
at the far shore  
which, as I looked,  
wrinkled suddenly  
into three egrets - - -  
a shower  
of white fire!  
Even half-asleep they had  
such faith in the world

that had made them - - -  
tilting through the water,  
unruffled, sure,  
by the laws  
of their faith not logic,  
they opened their wings  
softly and stepped  
over every dark thing.  
- Mary Oliver - Egrets



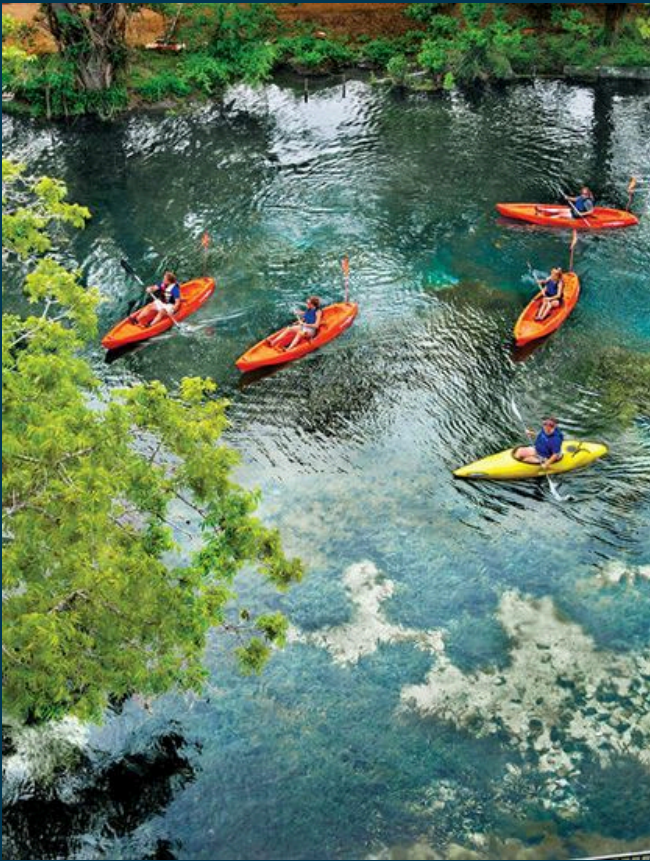


## Preliminary Themes and Questions

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- Difficulty in connecting with nature (Spring Lake) while busy working, and leading tours
- Need for personal time and slower pace to connect and notice
- Reflecting on experience and sharing helpful in making sense of mindful engagement
- Easier to notice (be mindful?) when experience is immersive and new (snorkeling)
- Children may need more noticing skills - balance of structure and wandering





Many great American conservationists have speculated that if humans had a closer connection with natural spaces, they would not be so willing to damage and destroy them (Leopold, 1949; Muir, 1912).



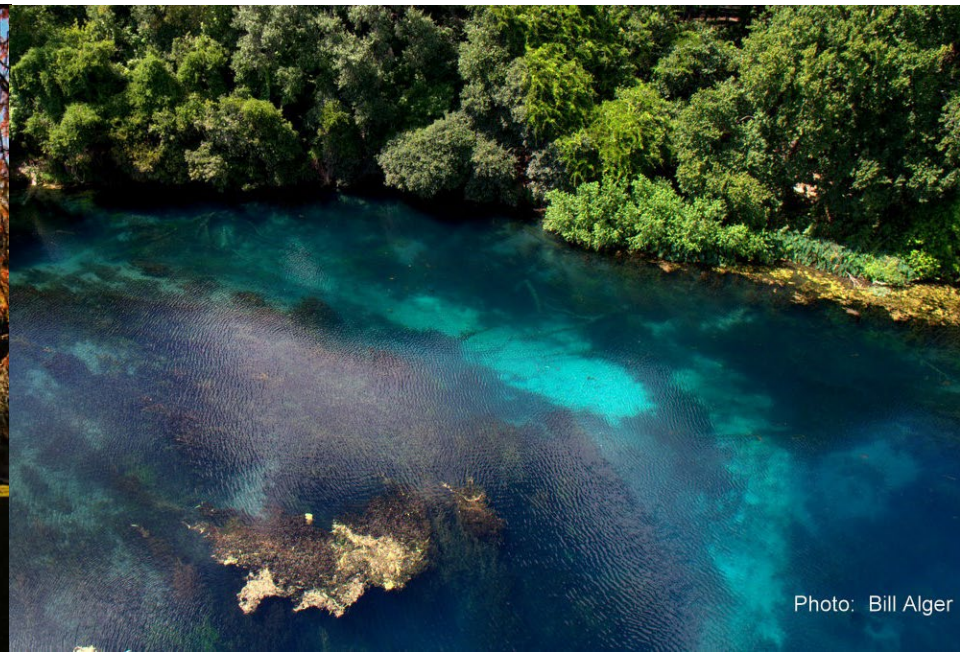
This work is about fostering connection through mindful interaction with nature.

# Reflections

Think of outdoor space that has meaning to you. What are some elements of the place? What makes it special? What parts of the place did you connect with?



What did you have to do to know your place?



# Call to Action

1. As the children in nature movement continues to grow and gain momentum there are an increasing number of opportunities, and need, to greater understand nature connection through research. What are you curious about? What exciting things are happening at your nature center, in your nature experiences and programming? How can you go deeper through research- either digging into current literature or designing a study to employ at your program?
2. We want to begin the conversation on research and data hubs and discuss the different ways we can collaborate as educators and researchers in our field.



# THANK YOU

Visit [www.explorespringlake.org](http://www.explorespringlake.org) for more info.



THE MEADOWS CENTER  
FOR WATER AND THE ENVIRONMENT

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