

**Coding Manual for a Study With the Girl Scouts of Western Washington on the  
Importance of (Not Just Visual) Interaction With Nature**

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### **Abstract**

This technical report provides our coding manual – our systematic method to code the qualitative narrative data – from a study of Girl Scouts' meaningful nature experiences. Other authors on this study (but not on this coding manual) include Joshua J. Lawler, Pooja S. Tandon, Gregory N. Bratman, Sara P. Perrins, and Frances Boyens. Our research question was whether children's nature interactions that are embodied (vs. only visual) would be associated with eudemonic wellbeing. Using the interaction pattern approach detailed in this coding manual, we coded written narratives from 127 Girl Scouts (8-11 years old) about a recent meaningful nature experience, and, through a novel questionnaire, assessed Presence, a eudemonic state of wellbeing. A total of 372 interactions patterns were coded from the Girl Scouts' written narratives. Participants who enacted embodied interactions with nature (e.g., "making snowman," "wrapping arms around tree," "talking to chickens") experienced a greater sense of Presence than participants whose interactions relied solely on vision (e.g., "seeing snow," "seeing moss," "watching pileated woodpecker"). This technical report provides open access to our core intellectual qualitative work on this project, and can be used by others seeking to employ an interaction pattern approach, or more generally seeking to characterize people's interactions with nature.

## Introduction

Over the past several decades, a rapidly growing body of literature on the benefits of interaction with nature has emerged. Studies detail the benefits of nature exposure for ADHD symptoms, positive emotions, prosocial behaviors, eyesight, stress recovery, attention, and more (for a review, see e.g., Bratman et al., 2021; Frumkin et al., 2017). And yet, many questions remain. One of them, addressed in part by the approaches detailed in this coding manual, is whether the form of interaction with nature matters. This contrasts with the epidemiological approach of nature “exposure”, which has often been used to identify the effects of nearby nature at a population level.

In the current study, we specifically asked whether embodied nature interactions, versus only visual interactions, were associated with differences in children’s eudemonic wellbeing. To investigate this question, we (1) drew on the theory of interaction patterns to characterize human-nature interactions, (2) developed a new questionnaire to assess a state of eudemonic wellbeing, and (3) brought both together in a study of children who participated in an organization—the Girl Scouts of America—that has a long history of engaging children in interactions with nature. The coding manual presented here details the process of identifying and coding child-nature interaction patterns and their related features.

The interaction pattern approach employed in this study and detailed in this manual presents a way of characterizing the essential features of human-nature interaction specified abstractly enough such that countless different versions can be enacted based on different of nature, people, and purposes (Kahn et al., 2012, 2010; Kahn, Lev, et al., 2018; Kahn, Weiss, et al., 2018b, 2018a; Kahn & Weiss, 2017; Lev et al., 2020). Take, for example, the interaction pattern *walking the edge of water and land*. One could enact this interaction pattern by *strolling*

*the bank of a river, walking along the edge of the ocean surf, or walking the trail around a lake.*

In a more urban context, one could enact a form of this interaction pattern by *walking the edge of the water and concrete*, along the edge of an urban fountain. Each of these would be forms of the interaction pattern *walking the edge of water and land* enacted in different nature and, perhaps, for different purposes.

Additionally, this coding manual identifies some interaction patterns as having disproportionate influence within the nature experience. We call these Keystone Interaction Patterns, in line with the concept of keystone species in conservation biology (Mills et al., 1993; Paine, 1995). Interaction patterns are identified as keystones because “(a) it occurs frequently, (b) it is itself hugely beneficial or meaningful, (c) it engenders dozens or even hundreds of complementary, subsidiary, or overlapping interaction patterns, and/or (d) its loss leads to the subsequent loss of dozens or even hundreds of complementary, subsidiary, or overlapping interaction patterns” (Kahn, Lev, et al., 2018). In this coding manual, we outline the process of determining two types of Keystone Interaction Patterns: Most Meaningful Interaction Patterns and Most Foundational Interaction Patterns. Additionally, those interaction patterns that occur most frequently can also be identified as Keystone Interaction Patterns after analyses are completed.

Finally, this coding manual specifies the coding process of Meaning Reason Themes, which identify the common themes for why participants considered their nature experience to be meaningful. By identifying the reasons why children find their experiences meaningful, we seek to understand motivations involved in their interactions with nature and how their nature interactions might be sustained and further encouraged.

In combination with interaction patterns, we suggest meaning reason themes can be used to encourage and support children's interactions with nature. Often, parents and educators seeking to impart the benefits of nature interaction extoll the need to "get outside and play!" Not uncommonly, children might respond with "there's nothing to do outside"; indeed, Richard Louv opens *Last Child in the Woods* with a quote from a fourth-grader in San Diego, who states, "I like to play indoors better 'cause that's where all the electrical outlets are" (2005). A parent or educator can then take an accessible nature feature, such as a tree in the backyard, and, using the structure of an interaction pattern, consider suggestions: *climbing up a tree to map out one's surroundings, gathering fruit from a fruit-bearing tree*, or, on a rainy day, *constructing a lean-to against a tree*. The meaning reason themes identified in these data then serve to answer the all-important "why" question that undoubtedly follows from the child: you'll have *fun*, because it's *beautiful* outside, or because this would be your *first time* climbing to the top of the tree! Together, interaction patterns and their associated features constitute a Nature Language of the human relationship with nature (Kahn et al., 2012, 2010; Kahn, Lev, et al., 2018).

This coding manual serves as a record of the intellectual work of coding the meaningful nature experience narratives of these Girl Scouts. We share this coding manual in the hope that others may find it useful for their own investigations using an interaction pattern approach.

### **Definitions and Coding Rules**

#### **Interaction Patterns**

An interaction pattern is a characterization of essential features of interaction between humans and nature, specified abstractly enough such that countless different embodied versions of each one can be enacted given different types of nature, people, and purposes (Kahn et al., 2012, 2010; Kahn, Lev, et al., 2018; Kahn, Weiss, et al., 2018b, 2018a; Kahn & Weiss, 2017;

Lev et al., 2020). As the simplest and most important level of coding, the interaction pattern (IP) characterizes any physical and/or sensorial (including any one or combination of five senses: touch, smell, sight, taste, sound) activity between the participant and nature. We define nature here as features of nature, both biotic and abiotic, generally excluding any humans or human artifacts.

We attempt to standardize each participant's unique way of writing their human-nature interaction through coding the IP in "present progressive tense verb-(preposition)-noun" form (V-(P)-N), where all extra words or information (such as adjectives) are excluded. Though the V-(P)-N is the most typical way an IP is coded, an IP may also be coded in "present progressive verb-(preposition)-noun-preposition-noun" form (V-(P)-N-P-N), as described in the below coding rules.

All verbs must be in reference to the participant's own action, and any instance where a participant has written about a human non-participant enacting an IP is not coded. Nouns must be a "nature noun," meaning that the coded noun must identify a feature of nature, biotic or abiotic, generally excluding any humans or human artifacts. As much as possible, use the direct language of the participant so as not to lose any of the intended meaning from their chosen language.

### ***Coding Rules***

Examples are provided for each coding rule. The relevant part of the nature experience that exemplifies the rule of interest is **bolded**, though there may be other codable human-nature interactions that are not shown as coded in the example. There are examples of fully coded meaningful nature experience responses at the end of the document to exemplify how all the rules apply to code a full narrative.

#### **Rule 1.**

Code every IP in present progressive tense verb-preposition-noun (V-P-N) form, using the participant's own words and only changing the tense of the verb, if needed. In some cases where there is no preposition, code the IP in present progressive tense verb-noun (V-N) form. Adjectives and other modifiers are excluded from codes. The coded noun must be a "nature noun", a feature of nature, biotic or abiotic, generally excluding any humans or human artifacts. The verb must be physical or sensorial in some way. Refer to interaction pattern rules 12 and 13 for guidelines about which verbs and nouns can be coded.

1. Example: "**Sitting on a rock** on the shore of the water." → coded as *sitting on rock*
2. Example: "I **saw some big grass in someone's yard.**" → coded as *seeing grass*
3. Example: "Walking and looking at lights" → no coded IP because there is no nature noun.

### **Rule 2.**

In cases where the IP is phrased in a way such that it does not fit in with the standard V-(P)-N form, you may code the IP in the V-(P)-N-P-N form (present progressive tense verb-(preposition)-noun-preposition-nature noun). There may or may not be a preposition after the first present progressive tense verb coded, but, grammatically, there must always be a preposition before the nature noun. Note that the *second* noun must be a nature noun to be coded, whereas the first noun does not have the same restriction. Refer to interaction pattern rule 12 for additional guidelines about nature nouns.

1. Example: "**Playing with my dog in the snow.**" → coded as *playing with dog in snow*
  - i. Note that, in this case, there are two prepositions and two nouns. Importantly, the second noun must be a nature noun and be preceded by a preposition to

be coded as an IP. The first noun need not be a nature noun. In this case, both the first and second noun are nature nouns.

2. Example: "...and we would **eat the breakfast in the fort...**" → coded as *eating breakfast in fort*

- i. Note that, in this case, there is only one preposition in the IP between the first noun and the "nature" noun. "Fort" is considered a nature noun for our purposes, see interaction pattern rule 12.

### **Rule 3.**

If no physical or sensorial verb precedes a nature noun listed in the first section of the nature experience, code the nature noun as "seeing *nature noun*". We are inferring that the verb *seeing* applies to these nature nouns based on the wording of the prompt ("Describe the nature you saw"). If the nature noun is preceded by a physical or sensorial verb, code that verb for the IP instead. If the nature noun is preceded by a form of the verb "being" or other verbs that cannot be coded (see interaction pattern rule 13), do not code an IP. These IPs will be marked as "inferred IPs" and will be noted as such in any analyses.

1. Example: "**Hummingbirds** / playing in the garden / maybe? I liked it. / I wondered what the hummingbirds eat in the winter if we did not have the feeder. We looked it up. They eat bugs!" → coded as *seeing hummingbirds*
2. Example: "**Exotic plants and animals, beautiful landscapes, lush trees and grass, and amazing flowers.** / vacation in Europe. / because there was history and wonderful culture. / a family vaycay." → coded as *seeing plants, seeing animals, seeing landscapes, seeing trees, seeing grass, seeing flowers*

3. Example: “We were at Universal and **there were so many pretty plants** in Florida. / Walking the theme park. / We were together as a family. / We rode Harry Potter rides. It was so fun!” → no coded IP
  - a. Note that “pretty plants in Florida” is preceded by the verb “were”. “Being” is not coded as an IP verb (see interaction pattern rule 13) and the participant does not describe any physical or sensorial interaction with the “pretty plants”, so we do not code this nature noun as *seeing plants*.
4. Example: “I saw lots of nature. **There was a big lake. There was trees and grass. It actually kind of looked like a forest. There were flowers and plants. There were BIG trees. / ...**” → no coded IP
  - a. Note that “big lake”, “trees”, “grass”, “flowers”, and “plants” are not coded as IPs because they are preceded by a form of the verb “being”, see rule 13. To stay consistent with the coding rules, we cannot code these nature nouns as inferred IPs.

#### **Rule 4.**

If nature enacted an interaction pattern on the participant, the interaction can be coded as an IP. These IPs are still coded in the V-(P)-N form, but the verb will generally be in the past participle tense. IPs enacted by nature on non-participants are not coded as interaction patterns unless the participant wrote that they saw, heard, or otherwise perceived the interaction, in which case the IP will follow the form V-(P)-N-P-N.

1. Example: “My parents were both bit by a fish and my brother was scraped by coral. I was **bit once by a fish and stung by plankton!**” → coded as *bit by fish, stung by plankton*

- a. Note that the IPs must be enacted on the participant to be coded. The code *bit by fish* and *scraped by coral* when referring to family members are therefore not coded, see interaction pattern rule 14.
- b. Note also that *stung by plankton* is coded even though most plankton do not sting. *Stung by plankton* is how the participant perceived the experience, and therefore we code the IP as *stung by plankton* to stay true to the participant's language.

#### **Rule 5.**

Do not include any adjectives or extra descriptive words or explanations surrounding the IP. For exceptions to this rule, in which we have identified some specific instances of coding descriptive words along with the nature noun, see interaction pattern rule 12.

1. Example: "I **saw a very very pretty yellow bird** and it was really cute." → coded as *seeing bird*
2. Example: "**Snow covered trees** / Playing in the snow." → coded as *seeing trees*

#### **Rule 6.**

To fit with the standardized coding, do not include any articles (such as: "the," "a," "an," etc.) in the coded IP.

1. Example: "**Playing in the garden.**" → coded as *playing in garden*
2. Example: "**Exploring the forest** in the backyard." → coded as *exploring forest*

#### **Rule 7.**

If the participant's written narrative includes misspellings, change the spelling to the correct spelling if it is clear what the participant intended to write. The examples below include the misspelling, but when including quotes from participants in manuscripts, correct misspellings by bracketing [ ] the corrected spelling.

1. Example: “Trees, wildlife, and smelling the outdoors. / **Walling a trail** / It feels good to be outside and experience it / My family and I **took a walk on a trail** in our city”  
→ coded as [*walking*] *trail, walking on trail*
  - i. Note that the verb “walk” is used later in the narrative, which helps us assume that the misspelling “walling” was intended to be “walking”.
2. Example: “We **saw tons of animals** including the rare **targier monkey**... We were in the Philippines for 16 days...” → coded as *seeing animals, seeing [tarsier]*
  - i. Note that the participant said “rare targier monkey” and wrote about being in the Philippines in their narrative. It can be assumed the participant is writing about *seeing tarsier* because this species is only found in the Philippines and the misspelling is one letter different from the species name.

### **Rule 8.**

Include the plural form of the noun written in the participant’s narrative. The quantitative difference noted by the participant is important to retain in our coding. If the plural form of the noun is the same as the singular form, note that quantitative difference in a coding memo associated with the coded IP (this can be a comment in an excel file, a written note in a separate document, etc.).

1. Example: “I got to **see animals and different types of ferns and Dead salmon.**” → coded as *seeing animals, seeing ferns, seeing salmon (plural)*
  - i. Note that the nature noun *salmon* is presumed to be plural because there is no article in the original written narrative (i.e., “and a dead salmon”). In this example, another indication is that all other nature nouns are also plural.

2. Example: “I **saw some moose and deer** in Spokane.” → coded as *seeing moose* (plural), *seeing deer* (plural)

**Rule 9.**

If the participant writes about an interaction with nature, but the potential codeable verb is in the form of a noun, change the noun to its appropriate form of a present progressive tense verb to fit the standard IP form. See interaction pattern rules 12 and 13 for specific examples of verbs that may be changed.

1. Example: “If you **have breakfast under one of the trees** that’s one of my favorite things to do.” → coded as *eating breakfast under tree*
  - i. Note that the verb is switched from “have” to “eating” because there is no verb form of “breakfast”. “Eating” is the verb that best represents the interaction the participant is enacting, see interaction pattern rule 13.
2. Example: “The nature I saw was in Leavenworth, on a horse drawn sleigh and there was snow everywhere. / I **was on a horse sleigh ride** on my vacation with my family.” → coded as *riding on horse sleigh*
3. Example: “I went outside to feed the chickens, **let them out of [their] cage** and then collected the eggs if they had any usually they had either two or three 2. **I got to let one [dog] out of her cage...**” → coded as *uncaging chickens, uncaging dog*
  - i. Note that the verb is switching from “let” to “uncaging” because retaining “let” would structure the interaction pattern as “letting chickens out of cage”. Based on interaction pattern rule 2, the second noun must be a nature noun (i.e., “chickens” rather than “cage”). Therefore, the interaction gets restructured so that “chickens” is the final noun and “cage” becomes the verb.

4. Example: “We saw trees and waterfalls / **Going on a hike**” → coded as *hiking in nature*

- i. Note that the nature noun becomes the verb in this case, but a new nature noun, “nature”, is introduced that was not initially in the participant’s language to keep with the V-(P)-N format of interaction patterns. See interaction pattern rule 13.

### **Rule 10.**

If there are multiple IPs embedded within one continuous sentence, then parse out each IP and code them individually. If one verb is used with many different nouns, use that same verb for each of the coded IPs.

1. Example: “**Threw snowballs** in the air and **had my dog catch** them with her mouth.”

→ coded as *throwing snowballs, playing catch with dog*

- i. Note that the verb “playing” is introduced to the second interaction pattern. “Having” is not a codeable verb, but “playing” is the verb that best represents the interaction the participant enacted, see interaction pattern rule 13.

2. Example: “I **saw, green grass, squirrels, birds, dogs, and trees.**” → coded as *seeing*

*grass, seeing squirrels, seeing birds, seeing dogs, seeing trees*

### **Rule 11.**

If the verb and the noun of the IP are in two different sentences but are clearly part of one IP, unite the appropriate verb, preposition, and nature noun into one IP.

1. Example: “There was a **pileated woodpecker** outside of our window. / We **were**

**watching it** from our window.” → coded as *watching pileated woodpecker*

- i. Note that “it” in this case refers relatively clearly to “pileated woodpecker”, the predicate noun in the first sentence.

**Rule 12.**

Interaction patterns must represent an interaction with “nature”, meaning the noun (or the second noun, if in the V-(P)-N-P-N form) in the IP must specifically be a nature noun. For the purposes of this study, nature is defined as non-human features of the external world, both biotic and abiotic, excluding all human-made artifacts aside from those listed below.

1. Example: “We rode Harry Potter rides.” → no coded IP
2. Example: “I saw lights and drank terrible hot cocoa.” → no coded IP
3. Example: “Standing on top of a sun roof.” → no coded IP
4. Example: “I was **jumping in a pile of leaves** with my friend.” → coded as *jumping in leaves*

Sometimes it is difficult to tell if a word should count as a nature noun. Thus, we have provided a list of some nouns encountered in the data that can be coded as a nature noun, in addition to a list of some nouns that cannot be coded as nature nouns:

1. List of nouns that can be coded as nature nouns in an IP:

- i. Nature
- ii. Garden
- iii. Yard/Backyard

→ \*Do not include in an IP if yard or backyard would be the second of two nature nouns in a V-(P)-N-P-N IP. Only code the first nature noun.

- a. Example: “**Exploring the forest in the backyard.**” → coded as *exploring forest*

- 1. Note that “in backyard” is dropped from the IP in this case because it could be considered a nature description rather than an essential feature of the interaction with nature, see interaction pattern rule 5.

- iv. Landscape

- v. Scenery

→ \*Code only if the scenery can be reasonably assumed to be in or of what we define as “nature”.

- a. Example: “Grass, trees, leaves on the ground, branches, puddles of water / Walking, **looking at the scenery.**” → coded as *looking at scenery*

- vi. Outside\*

→ \*As always, Code only if the preceding verb is an acceptable verb, see interaction pattern rule 13.

- a. Example: “I had fun **being outside** and exercising with my mom and brother.” → no coded IP
- b. Example: “Running around, **playing outside**” → coded as *playing outside*

- vii. Outdoors

- viii. Park\*

→ \*Code only if the preceding preposition is not “to”. The participant must be interacting *in* or *with* the park or features of the park. The verb must still be an acceptable verb, see interaction pattern rule 13.

a. Example: “Trees / **Playing at the park** / It was with my friend / We had fun” → coded as *playing at park*

b. Example: “Lastly, we **went to the park!**” → no coded IP

1. Note that this IP is not coded for two reasons. First, this IP would use the verb “going”, which is not an acceptable IP verb, see interaction pattern rule 13.

Second, the preposition in the IP would be “to”, which is not an acceptable preposition for this nature noun.

c. Example: “I **went on a bike ride to the park** and I had soccer practice. / ...” → no coded IP

1. Note that although the verb “biking” could be an acceptable verb for an IP, the preposition is “to”, so this cannot be coded.

→ \*Do *not* code if the park is specified to be a theme park.

a. Example: “We were at Universal and there were so many pretty plants in Florida. / **Walking the theme park.**” → no coded IP

ix. Dog(s)

x. Horse(s)

xi. Food\*

→ \*Code only if the food is gathered or collected in what we define as “nature”, see above.

- a. Example: “Dog walking. I’m outside a lot and get to see everything. Plus I **gather food** for my stick bugs. ... The fresh air and its calming.” → coded as *gathering food, dog walking*

xii. Fresh air

xiii. Sunset/sunrise

xiv. Snowball fight\*

→ \*Code as *having snowball fight*

- a. Example: “Playing and having snowball fights with my friends” → coded as *having snowball fights*

xv. Species names\*

→ \*Proper species names count as a nature noun in this level of coding.

- a. Example: “There was a **pileated woodpecker** outside of our window. / We **were watching it** from our window.” → coded as *watching pileated woodpecker*

## 2. List of nouns that cannot coded as nature nouns in an IP:

- i. View
- ii. Point
- iii. Direction
- iv. Sidewalk
- v. Life, living things

3. List of human-made artifacts that can be coded as part of an IP:

i. Window\*

→ \*Code only if the participant is interacting with what we define as “nature” through the window. Separate this type of interaction into two IPs: *looking through window at nature* and, if codeable, an IP specific to the nature they are interacting with.

a. Example: “There was a **pileated woodpecker** outside of our window. We were **watching it from our window**” → coded as *watching pileated woodpecker, looking through window at nature*

1. Note that the verb associated with the window changes from “watching” to “looking”. This is to maintain consistency across narratives for the unique IP *looking through window at nature* and to maintain the structure of the nature noun being the last word in the IP.

b. Example: “I **saw a very very pretty yellow bird** and it was really cute. / I was **inside looking [through] the window.**” → coded as *seeing bird, looking through window at nature*

ii. Cage\*

→ \*If cage is the second noun in an IP of the V-(P)-N-P-N form, change “cage” to be the verb, as in “*caging* [nature noun]” or “*uncaging* [nature noun]”.

- a. Example: “Example: “I went outside to feed the chickens, **let them out of [their] cage** and then collected the eggs if they had any usually they had either two or three 2. **I got to let one [dog] out of her cage...**” → coded as *uncaging chickens*,  
*uncaging dog*

iii. Fort\*

→ \*Code only if the fort can be assumed to be in what we define as “nature” or made of natural materials.

- a. Example: “Usually I go out with my best friend [Rachel] to the forest in the back yard first thing in the morning and we bring out fruit and cheese with [pretzels] and we would **eat the breakfast in the fort** we had built” → coded as *eating breakfast in fort*

iv. Snow fort

v. Snowman

vi. Other forms of human-modified nature\*

→ \*Code only if the modified nature can be assumed to be in what we define as “nature”.

- a. Example: “I saw so much dirt but I loved it and I saw lots of trees / **Riding my dirt bike** with my brother and dad. / Because it’s good cardio and I like doing it with my family / I got to **go up the dirt ramp** my dad built really fast and I did not fall once.” → coded as *riding dirt bike up dirt ramp*

1. Note that in this case, “dirt ramp” is the human-modified nature and it is assumed the dirt ramp is in nature because the participant said they “saw lots of trees”.
  2. Note also that the verb of the IP, “riding dirt bike” is found in the previous sentence.
- b. Example: “**Painted rocks**. I found a lady bug one. / I was **searching for painted rocks** with my mom.” → coded as *seeing rocks, searching for rocks*
1. Note that the description of the rocks is dropped. The description is the human-modified aspect of the rocks, but we do not code adjectives in IPs, see interaction pattern rule 5.

vii. Horse sleigh ride\*

→ \*Code as *riding on horse sleigh*

viii. Lookout tower\*

→ \*Code only if the lookout tower or similar structure can be assumed to be in what we define as “nature”.

- a. Example: “We **hiked 2 miles to a lookout tower** that was very high up. ... We also saw lots of waterfalls on the trail. At the top there were a lot of snowy mountains to see!” → coded as *hiking to lookout tower*

1. Note that the other context in the narrative signals that the hike took place in what we define as “nature”.

**Rule 13.**

Only code clear physical or sensorial human-nature interactions, excluding any emotional verbs in the coded IP. Sometimes it is difficult to tell whether a verb counts as physical and/or sensorial, thus we have provided a list of some verbs encountered in the data that can be coded in the IP, in addition to a list of some verbs that cannot be coded in the IP.

1. List of some verbs that can be coded as part of an IP:

- i. Pointing out
- ii. Peeking at
- iii. Exploring
- iv. Discovering
- v. Wandering
- vi. Finding
- vii. Identifying
- viii. Taking\*

→ \*Code only if it is connected to a specific physical action with a

“nature” noun or if it is in the form of “taking care”.

a. Example: “Taking my 2 Bengal cats outside with leash and harness.” → coded as *taking Bengal cats outside*.

b. Example: “Because I want to become a vet so I was experiencing how to take care of some animals” → coded as *caring for animals*.

- ix. Looking out
- x. Bird watching\*
  - \*Code as *watching birds*.
- xi. Storm watching\*
  - Code as *watching storm*.
- xii. Playing\*
  - \*Code only if the participant specifies that they were playing in what we define as “nature”.
    - a. Example: “The trees and flowers at the local park / **Playing** / It was nice to see ...” → no coded IP.
    - b. Example: “**Playing at the park**” → coded as *playing at park*.
    - c. Example: “Snow covered trees / **Playing in the snow**” → coded as *playing in snow*.
- xiii. Skiing\*
  - \*Code as *skiing on snow* if no nature noun is present in the narrative.
    - a. Example: “Snow in mountains / **Skiing** / Spending time with family / Skiing with my little brother for his first time. I go every year since I was 4. Nice to share this with him now that he is 3” → coded as *skiing on snow*.
- xiv. Sledding
  - \*Code as *sledding on snow* if no nature noun is present in the narrative.
- xv. Building

→ \*Code only if the participant can be reasonably assumed to be building with materials found in nature or building in nature.

- a. Example: “Playing in the snow. **Building a snowman** and knocking snow off the bushes.” → Coded as *building snowman*.

xvi. Biking\*

→ \*Code only if the participant specifies that they were riding a bike (of any kind) in or on what we define as “nature” or a nature noun.

- a. Example: “**Riding my dirt bike** with my brother and dad... I got to **go up the dirt ramp** my dad built really fast and I did not fall once.” → coded as *riding dirt bike up dirt ramp*.

- b. Example: “I **went on a bike ride to the park** and had soccer practice.” → no coded IP, see interaction pattern rule 12.

1. Note that in this example, the bike does not clearly mediate an interaction with nature, so we do not code an IP. If the preposition had been “in”, as in “went on a bike ride in the park”, this narrative would be coded as *biking in park*.

xvii. Hiking\*

→ \*Code only if the narrative includes a description that suggests the hike took place in what we define as “nature”. If no nature noun is present in the narrative that would constitute the IP but it is clear the IP took place in “nature”, code as *hiking in nature*.

- a. Example: “We **hiked 2 miles to a lookout tower** that was very high up. ... We also saw lots of waterfalls on the trail. At the top there were a lot of snowy mountains to see!” → coded as *hiking to lookout tower*.
- b. Example: “Flowers, trees and different shrubs / **Hiking** / Because I love to go hiking and go [on] adventure. I was listening to the animals and inspiring sound of the trees” → coded as *hiking in nature*.

1. Note that in this example, the participant describes natural elements, so it is assumed the hike took place in nature. In this case, we code the IP as *hiking in nature*.

xviii. Camping\*

→ \*Code as *camping in nature* if there is no nature noun present.

xix. Eating\*

→ \*Code only if the eating took place in what we would consider “nature”. Though food is a non-human natural substance, the food itself cannot be the “nature” noun unless it was clearly gathered, foraged or otherwise collected in nature.

- a. Example: “Usually I go out with my best friend [Rachel] to the forest in the back yard first thing in the morning and we bring out fruit and cheese with [pretzels] and we would **eat the breakfast in the fort we had built**” → coded as *eating breakfast in fort*

2. List of some verbs that cannot be coded as part of an IP:

- i. Experiencing
- ii. Being
- iii. Spending time
- iv. Going
- v. Getting
- vi. Trying\*

→ \*Do not code “trying” as the verb in the IP, but the interaction that the participant attempted may be coded as an IP according to the other rules. For example, the IP *climbing mountain* would refer to the process of climbing a mountain, rather than the achievement of *summitting mountain*. Thus, a participant who tries to climb a mountain could be considered to have enacted the IP *climbing mountain*.

- a. Example: “We played snowball fights, ran around and **tried to build a snowman**” → coded as *building snowman*

- vii. Enjoying
- viii. Picnicking\*

→ \*Do not code “picnicking” as an IP verb unless the picnicking is specified to be in what we define as “nature”.

- a. Example: “We went hiking to a waterfall! / We built fairy houses and we went hiking to the waterfall. **We also had a picnic!** Lastly, we went to the park! / It was meaningful day

because it was a pretty and it was a nice day and a great way to get out of the house. / We were with my cousin, [Marie], and it was so fun!" → no coded IP

1. Note that the participant does not specify where the picnic took place, so "picnicking" cannot be coded as an IP.

ix. Helping

x. Saving

xi. Feeling

→ \*Do not code "feeling" as an IP verb unless the feeling is clearly used in the sense of feeling a texture or other physical stimulus through the sense of touch.

- a. Example: "We got a lot of snow this month and I was very happy I love seeing it fall and **feeling the fresh cold air** when you go for walks in the snow." → coded as *feeling air*

#### **Rule 14.**

Do not code IPs that are not enacted by the participant themselves. In other words, if the participant writes about the actions of someone they were watching, do not code those IPs. This is because the Girl Scouts' written narratives are linked to other data provided by the participant, thus we want coded IPs to only represent participants' direct nature interactions.

1. Example: "I am sad that **my dad [cut] the limbs** on the only climbing tree in our backyard." → no coded IP.

2. Example: “**My parents were both bit by a fish and my brother was scraped by coral.**” → no coded IP.

**Rule 15.**

Do not code an IP if it were part of a participant’s stated intention, but the participant did not specify that they actually enacted it. We only want to code participants’ interactions with nature when we are certain they had enacted it.

1. Example: “Beautiful mountains, trees and river. / **Taking walking tour of Howard Miller Steelhead Park to see bald eagles.** / Was a bit bored, but being outside was peaceful. / Was with brother, mom and grandfather.” → coded as *walking Howard Miller Steelhead Park*
  - i. Note that *seeing bald eagles* is not coded because the participant did not specify that they had fulfilled their intention to see bald eagles.

**Rule 16.**

Do not code an IP if the participant clearly indicates they had enacted it in the past, separately from the immediate experience they are writing about. General reflections that directly relate to the meaningful nature experience described may be coded, unless indicated that the experience took place more than a month ago. Do not code general reflections in a meaningful nature experience narrative if there is no other IP to be coded according to the other rules. Be careful not to encode intentions, as stated in rule 15.

1. Example: “...and we would eat the breakfast in **the fort we had built** and packed a towel to sit down on.” → no coded IP.
  - i. Note that it is unclear whether the fort was built within the past month, which is the time frame specified by the meaningful nature experience prompts.

2. Example: “Snow, trees, animals / Snow skiing and walking the dog. **In summer we camp which I love. / Snow is really fun to sled and build a snow man.** I like **walking the dog** with my mum / **Camping** is the most fun ever. We **are all in a tent** together. No RV,” → coded as *sledding on snow, building snowman, walking dog*
  - i. Note how the coded interactions are clearly relevant to the meaningful nature experience the participant describes in parts A and B. *Walking dog* is coded as it can be reasonably assumed this interaction took place in the past month. The activities that took place in the summer are not coded since they clearly took place more than a month prior.
3. Example: “We had snow one day. / Walking in the snow and making a snowman. / It was fun. / **I like playing in the snow**, but it gets really cold.” → coded as *playing in snow*.
  - i. Note how “I like playing in the snow” is coded because the participant is writing generally about their opinion of their meaningful nature experience.
4. Example: “**I went on a bike ride to the park** and I had soccer practice. / Having lunch and playing soccer / Because it is active / **I think [it’s] weird that we practice soccer in the rain and play indoors.**” → no coded IP.
  - i. Note that the general reflection on the potential IP *practicing soccer in rain* is not coded because there is no other IP in the narrative to be coded.

### **Rule 17.**

Do not code the exact same IP more than once for one narrative. Sometimes the participant may write about enacting the same IP more than one time in their narrative, but you

should still only code that IP once. If the participant writes multiple IPs that are very similar, but slightly different, code all those IPs.

1. Example: “Playing and having snowball fights with my friends and **playing with Lucky [their] dog** / it was really fun even though I was frozen [inside] but it was fun to **play with the dog** Lucky and have snowballs thrown at you” → coded as *playing with dog*.
  - i. Note that *playing with dog* is only coded once, as you should not code the exact same IP more than once.
2. Example: “...I fed the chickens and **played with dogs** in California ... I got to let one [dog] out of her cage and her name was Shine then **I played fetch with her**” → coded as *playing with dogs, playing fetch with dog*
  - i. Note that two IPs are coded. The addition of the first noun and the quantitative difference in the nature noun (“dogs” vs. “dog”) makes them slightly different. We want to retain the unique qualities of the participant’s choice of language; thus it is important to code both IPs.

### Keystone Interaction Patterns

The term keystone draws upon the conservation biology concept of “keystone species”, which refers to species, such as a top predator, that has a disproportionate benefit to its environment relative to its abundance (Mills et al., 1993; Paine, 1995). Our term “Keystone Interaction patterns” follows suit by specifying interaction patterns that play a disproportionately large role in human-nature interaction. We identify an interaction pattern as a keystone because “(a) it occurs frequently, (b) it is itself hugely beneficial or meaningful, (c) it engenders dozens or even hundreds of complementary, subsidiary, or overlapping interaction patterns, and/or (d)

its loss leads to the subsequent loss of dozens or even hundreds of complementary, subsidiary, or overlapping interaction patterns” (Kahn, Lev, et al., 2018). As such, we have classified three distinct types of Keystone interaction patterns in accordance with the definition provided above:

1. Most Frequent interaction patterns
2. Most Meaningful interaction patterns
3. Most Foundational interaction patterns

These classifications are related to definitions (a), (b), and (c and d) respectively. Of note, the Most Frequent interaction pattern is not directly a part of this coding process, these are instead identified after coding of the data is complete.

### ***General Keystone Interaction Pattern Coding Rule***

All Keystone IPs must be selected from the IPs that have already been coded in the previous step. An inferred IP (an IP from part A of the narrative for which the verb “seeing” was inferred) cannot be a Keystone IP. The coding process for each individual type of Keystone IP is outlined through the following definitions and rules.

### ***Most Meaningful Interaction Pattern***

The Most Meaningful interaction pattern (MMIP) is any IP that the participant clearly stated as a “meaningful” part of their nature experience. Given that the participants are already writing about a recent “meaningful nature experience”, most IPs could be considered meaningful. However, we are interested in any interactions regarded as *most* meaningful to capture the most special aspects of participants’ nature experiences. To select a MMIP, you must first read the entirety of the participant’s narrative, and then review all of the coded IPs from this participant’s narrative to identify which IP is regarded as most or especially meaningful by the participant. Often, an MMIP will be found in part C of a participant’s narrative (in response to

the prompt “Why was it meaningful?”), but you should not restrict yourself to IPs coded from part C. An inferred IP from part A should never be an MMIP.

Sometimes participants do not explicitly use the word “meaningful” to describe their most meaningful experiences, so you should be sensitive to other potential descriptors, including phrasings such as “It was unforgettable,” “I really loved that,” “This made my day,” and so on. Still, be careful not to infer too much from the participant’s narrative. Most often you will *not* code a MMIP, given that participants rarely use language that is specific enough to identify an IP as a MMIP.

The examples below fall along a continuum from the most prototypical MMIPs to boundary cases where it is less clear whether the IP is a most meaningful IP. Each example is introduced with the label “Prototypical”, “Boundary: Code” or “Boundary: Do not code”.

**Example #1: Prototypical MMIP.**

**Meaningful nature experience narrative:** “The rain dripping from the cedar trees and the cold air on my face. / Exploring the forest in the back yard. Finding a bridge across the stream and sitting on a rock on the shore of the water. / I just find it relaxing. I like the cold and I love how everything is green and you can see the rain dripping on the water making ripples. the best time to go out is in the morning and **if you have breakfast under one of the trees that's one of my favorite things to do.** In the morning you can hear all of the [forest] waking up with all of the birds singing. The morning air is cold and fresh and it just feels like [you're] in another world. / [Usually] I go out with my best friend [Rachel] to the forest in the back yard first thing in the morning and we bring out fruit and cheese with [pretzels] and we would eat the breakfast in the fort we had built and packed a towel to sit down on. After we were done eating we would just take a walk [or] add on to the fort we had been making.”

Most Meaningful Interaction Pattern (MMIP) Example #1	
Interaction Patterns	Most Meaningful Interaction Pattern (MMIP)
<i>Seeing rain</i>	
<i>Exploring forest</i>	
<i>Finding bridge across stream</i>	
<i>Sitting on rock</i>	
<i>Eating breakfast under tree</i>	X
<i>Hearing forest</i>	
<i>Hearing birds</i>	
<i>Eating breakfast in fort</i>	
<i>Adding on to fort</i>	

➔ Note that the participant says that one specific interaction pattern, *eating breakfast under tree*, is one of their “favorite things to do.” This indicates that the IP enacted is the MMIP in this meaningful nature experience.

**Example #2: Boundary MMIP: Code.**

**Meaningful nature experience narrative:** “Flower, trees and different shrubs / Hiking /

**Because I love to go hiking** and go [on] adventure. / I was listening to the [animals] and inspiring the sound of the trees”

Most Meaningful Interaction Pattern (MMIP) Example #2: Boundary MMIP—code	
Interaction Patterns	Most Meaningful Interaction Pattern (MMIP)
<i>Seeing flower</i>	
<i>Seeing trees</i>	
<i>Seeing shrubs</i>	
<i>Hiking in nature</i>	X

➔ Note that the participant says they “love to go hiking and go on adventure.” The keyword “love” indicates that the IP *hiking in nature* is a MMIP for our purposes.

➔ It is also helpful that the participant identifies one distinct IP as the MMIP rather than saying they loved every aspect of the experience. This makes it easier to identify one IP as the MMIP.

**Example #3: Boundary MMIP: Code.**

**Meaningful nature experience narrative:** “Trees, moss and animals / Hiking / It was pretty outside. / The big tree was so fun to see. I got to find hidden holes that I could fit in! My sisters and I could not wrap our arms around the tree it was so big. I heard birds too. It made me happy and tired at the same time.”

<b>Most Meaningful Interaction Pattern (MMIP)</b> <b>Example #3: Boundary MMIP—code</b>	
<b>Interaction Patterns</b>	<b>Most Meaningful Interaction Pattern (MMIP)</b>
<i>Seeing trees</i>	
<i>Seeing moss</i>	
<i>Seeing animals</i>	
<i>Hiking in nature</i>	
<i>Seeing tree</i>	X
<i>Finding holes</i>	
<i>Wrapping arms around tree</i>	
<i>Hearing birds</i>	

➔ Note that the participant specifies that “the big tree was so fun to see”. Within the context of the entire narrative, the participant notes that they saw trees, but then identifies one specific big tree as being “so fun to see”. By re-reading the entire narrative, we can identify the IP *seeing tree* as the MMIP.

**Example #4: Boundary MMIP: Do not code.**

**Meaningful nature experience narrative:** “snow / building a snow fort / because there was snow / I love snow.”

<b>Most Meaningful Interaction Pattern (MMIP)</b> <b>Example #4: Boundary MMIP: Do not code</b>	
<b>Interaction Patterns</b>	<b>Most Meaningful Interaction Pattern (MMIP)</b>
<i>Seeing snow</i>	
<i>Building snow fort</i>	

➔ Note that although the participant says they “love snow”, but there is no interaction pattern to which this descriptor would clearly apply. The IP *seeing snow* is an inferred IP from part A of the narrative, so it cannot be the MMIP.

**Example #5: Boundary MMIP: Do not code.**

**Meaningful nature experience narrative:** “Beautiful, teal ocean water with white sand, and starfish, rainbow fish and coral in the Philippines. I also saw one of the world's seven wonders of nature at the underground river. We saw tons of animals including the rare [tarsier] monkey. / Exploring, snorkeling, playing in the ocean with my brother, and having fun! / We were on a family trip and exploring in the Philippines. / We were in the Philippines for 16 days and spent much of the time exploring the outdoors. My parents were both bit by a fish and my brother was scraped by coral. I was bit once by a fish and stung by plankton! We saw lots of animals and so many stray dogs and cats -- it was sad. I had a great time exploring with my family!”

<b>Most Meaningful Interaction Pattern (MMIP)</b> <b>Example #5: Boundary MMIP: Do not code</b>	
<b>Interaction Patterns</b>	<b>Most Meaningful Interaction Pattern (MMIP)</b>
<i>Seeing ocean</i>	
<i>Seeing sand</i>	
<i>Seeing starfish</i>	
<i>Seeing fish</i>	
<i>Seeing coral</i>	
<i>Seeing animals</i>	
<i>Seeing tarsier</i>	
<i>Exploring in ocean</i>	
<i>Snorkeling in ocean</i>	
<i>Playing in ocean</i>	
<i>Bit by fish</i>	
<i>Stung by plankton</i>	
<i>Seeing dogs</i>	
<i>Seeing cats</i>	

➔ Note that there is not a clearly identified IP designated as most meaningful, either directly or using words like “love”, “really liked”, “favorite”, or other words that single out an IP as most meaningful.

- ➔ The participant does say “I had a great time exploring with my family!” but there is no clear IP to which this statement refers.

### ***Most Foundational Interaction Patterns***

The Most Foundational interaction pattern (MFIP) is the basis for other IPs which are coded from the same narrative data. In other words, the MFIP engenders the enactment of other subsequent IPs, and if the MFIP were not enacted, the other IPs that are based on the MFIP would presumably be lost. Therefore, an MFIP can only be present in a narrative that includes more than one IP. An MFIP can still be coded if the only other IPs are inferred IPs. Examine the context of the participant’s narrative carefully to determine which IP works as a foundation for the other IPs.

As always, do not infer too much from what the participant wrote. An inferred IP from part A should never be a MFIP. Generally, part B of the meaningful nature experience is a likely place for an MFIP, however keep in mind that participants may not write their meaningful nature experience narrative in a chronological order that would more clearly indicate an MFIP. Not every narrative will have an MFIP to code.

The examples below fall along a continuum from the most prototypical MFIPs to boundary cases where it is less clear whether the IP is a foundational IP. Each example is introduced with the label “Prototypical”, “Boundary: Code” or “Boundary: Do not code”.

#### **Example #1: Prototypical MFIP.**

**Meaningful nature experience narrative:** “**Snow covered trees / Playing in the snow /** Because it had been a while since we had snow last / I got to **play outside in the snow** with my brother. We **played snowball fights** ran around and **tried to build a snowman**”

<p><b>Most Foundational Interaction Pattern (MFIP)</b>  <b>Example #1: Prototypical</b></p>
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Interaction Patterns	Most Foundational Interaction Pattern (MFIP)
<i>Seeing trees</i>	
<i>Playing in snow</i>	X
<i>Playing snowball fights</i>	
<i>Building snowman</i>	

➔ Note that *playing in snow* is an IP from part B of the participant’s narrative and the most overarching IP that enables the IPs *seeing trees*, *playing snowball fights*, and *building snowman*.

**Example #2: Prototypical MFIP.**

**Meaningful nature experience narrative: “Flower, trees and different shrubs / Hiking**  
 / Because I love to go **hiking** and go [on] adventure. / I was **listening to the [animals]** and  
 inspiring the sound of the trees”

Most Foundational Interaction Pattern (MFIP) Example #2: Prototypical	
Interaction Patterns	Most Foundational Interaction Pattern (MFIP)
<i>Seeing flower</i>	
<i>Seeing trees</i>	
<i>Seeing shrubs</i>	
<i>Hiking in nature</i>	X
<i>Listening to animals</i>	

➔ Note that *hiking in nature* allows for all the other IPs to be possible. *Hiking in nature* is therefore the MFIP.

**Example #3: Boundary MFIP: Code.**

**Meaningful nature experience narrative: “I saw some moose and deer in Spokane**  
 and I **fed the chickens** and **played with dogs** in California / I was just playing by myself and  
**talking to the chickens** / Because I want to become a vet so I was **experiencing how to take**  
**care of some animals** / 1. I went outside to **feed the chickens, let them out of [their] cage and**  
**then collected the eggs** if they had any usually they either had two or three  
 2. I got to **let one [dog] out of her cage** and her name was shine then I **played fetch** with her

3. I got to **see some deer and moose** on a deer cam because my cousin used to hunt deer with deer cams and she doesn't hunt any more so she just leaves them up to look at them instead.”

Most Foundational Interaction Pattern (MFIP) Example #3: Boundary MFIP: Code	
Interaction Patterns	Most Foundational Interaction Pattern (MFIP)
<i>Seeing moose (plural)</i>	
<i>Seeing deer (plural)</i>	
<i>Feeding chickens</i>	
<i>Playing with dogs</i>	
<i>Talking to chickens</i>	
<i>Caring for animals</i>	X
<i>Uncaging chickens</i>	
<i>Collecting eggs</i>	
<i>Uncaging dog</i>	
<i>Playing fetch with dog</i>	

- ➔ Note that “caring for animals” does not come from part B in the narrative, instead this IP is found in part C. This is an example of a narrative that does not necessarily follow a chronological pattern or a pattern from most to least foundational IPs.
- ➔ Note also that not every IP in the narrative is based on this MFIP. It is acceptable to code an MFIP if some, but not all, of the IPs depend on it.

**Example #4: Boundary MFIP: Do not code.**

**Meaningful nature experience narrative:** “It snowed at my house / **making [snowmen]** and **snowball fights** and **sledding** / Because it only does it once a year / We **walked** to the store **in the snow** to get food. Some [friends’] friends came over and we **played in the snow.**”

Most Foundational Interaction Pattern (MFIP) Example #4: Boundary MFIP: Do not code	
Interaction Patterns	Most Foundational Interaction Pattern (MFIP)
<i>Making snowman</i>	
<i>Having snowball fights</i>	
<i>Sledding on snow</i>	
<i>Walking in snow</i>	

<i>Playing in snow</i>	
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➔ Note that there is not a clear IP that allowed for the possibility of other IPs. *Playing in snow* may be an overarching theme, but it is unclear whether this IP refers to the IPs *having snowball fights* and *sledding on snow* or a separate instance of *playing in snow*. Therefore, we cannot code an MFIP for this narrative.

### **Nature Actions**

A Nature Action is an event or situation initiated by a non-human cause that is meant to capture the overarching scenario surrounding the “nature” described in the meaningful nature experience narrative. Like a human-nature interaction, in which the human and nature interact with each other, a Nature Action characterizes when nature is “interacting” with other nature, as described by the participant. Specifically, a Nature Action can code: 1) an interaction between at least two biotic organisms (e.g., *eagle catching fish*), 2) an interaction between biotic organisms and abiotic components (e.g., *crab hiding under rock*), 3) an interaction between at least two abiotic components (e.g., *rocks falling over cliffs*), and 4) a general action of one biotic organism or abiotic component on its own (e.g., *eagle flapping wings*; *blooming flowers*). The biotic organism in a Nature Action generally should not be the participant, since human-nature interactions can be coded as interaction patterns (see interaction pattern rule 4). Presumably, the Nature Action would have happened regardless of the participant experiencing it, though it is possible that the participant’s presence could have influenced the Nature Action anyway. In short, the Nature Action is meant to capture the rich and diverse ways in which people notice and characterize aspects of their surrounding natural environment.

When coding the Nature Action, try to distill the participant’s written scenario to only its essential features. Always try to code the Nature Action as close to the participant’s original

language as possible; typically, you should only alter their language to change the relevant verb to its present progressive tense.

### *Nature Action Coding Rules*

#### **Rule 1.**

If necessary, make sure to change the tense of the action so that the relevant verbs are in their present progressive tense (“-ing”) form. Nature Actions will often follow the form noun-verb-(preposition)-(noun), but their form is more flexible than interaction patterns.

1. Example: “The **rain dripping from the cedar trees** and the cold air on my face. / ...” → coded as *rain dripping from cedar trees*
  - i. Note that this is an example of an abiotic and biotic interaction within nature, between the rain and the cedar trees, respectively.
  - ii. Note also that the participant has already written the verb “dripping” in its present progressive form, so you do not have to change the tense.
2. Example: “white snow that covered the grass and all things / ...” → no coded Nature Action
  - i. Note that the verb “covered” is a passive description of what the snow was doing, rather than a physical or sensorial interaction. This can instead be coded as a Nature Description

#### **Rule 2.**

Like coding IPs, drop all articles and unnecessary words in your coding (see interaction pattern rule 4). Your goal is to *distill* the participant’s narrative to its essential features, while trying to maintain a balance of keeping the richness of their original word choices.

1. Example: “I like the cold and I love how everything is green and you can see **the rain dripping on the water making ripples.**” → coded as *rain dripping on water making ripples*
2. Example: “At the place where I was on the sleigh, there [were] **4 dogs running around in the snow.**” → coded as *dogs running around in snow*
  - i. Note that “at the place where I was on the sleigh” and the number of dogs are excluded because this is extraneous information for understanding the nature interaction.

### ***Linked versus Non-Linked Nature Action***

The decision to link a Nature Action depends on whether the Nature Action is extra information that is directly related to the coded IP. If there are no coded IPs in a narrative, then all coded Nature Actions are automatically Non-Linked, because there is no IP to which you would link the two. Typically, the IP and Nature Action are Linked if they are written within the same sentence. However, sometimes the IP and Nature Action are in two separate sentences and can still be coded as Linked if the Nature Action is clearly additive information to the IP. If the Nature Action is not in the same sentence as the IP, use your discretion to decide whether the Nature Action is *directly* a part of the coded IP, and naturally flows in its addition to the IP. In other words, a Nature Action is Non-Linked if: 1) there is no coded IP, or 2) there are coded IPs, but the Nature Action is describing a separate occurrence unrelated to the coded IPs. Note that in some cases the Nature Action may be additive information to multiple of the coded IPs in a narrative, in which case you would link the Nature Action to each IP you deem fit.

#### **Example #1.**

**Meaningful nature experience narrative:** “There were lots of tall trees and a **fast stream flowing along the street.** / Picking up trash and recycle in our neighborhood and on the road. / I felt good that I was helping out and possibly saving animals from eating toxic stuff, like plastic bottles and wrappers. / It was pretty quiet outside, other than a few cars passing by, and it felt nice to get out of the house and help out.”

<b>Linked vs. Non-Linked Nature Action: Coding Example #1</b>		
<b>Interaction Patterns</b>	<b>Linked Nature Actions</b>	<b>Non-Linked Nature Actions</b>
No coded IPs		Fast stream flowing along street

➔ Note that a Nature Action is still coded even though there are no IPs in this narrative.

According to the rules for coding Nature Actions, this Nature Action is Non-Linked.

**Example #2.**

**Meaningful nature experience narrative:** “The **rain dripping from the cedar trees** and the cold air on my face. / Exploring the forest in the back yard. Finding a bridge across the stream and sitting on a rock on the shore of the water. / I just find it relaxing. I like the cold and I love how everything is green and you can see the **rain dripping on the water making ripples.** the best time to go out is in the morning and if you have breakfast under one of the trees that’s one of my favorite things to do. In the morning you can hear all of the **forest waking up with all of the birds singing.** The morning air is cold and fresh and it just feels like [you’re] in another world. / [Usually] I go out with my best friend [Rachel] to the forest in the back yard first thing in the morning and we bring out fruit and cheese with [pretzels] and we would eat the breakfast in the fort we had built and packed a towel to sit down on. After we were done eating we would just take a walk [or] add on to the fort we had been making.”

<b>Linked vs. Non-Linked Nature Action: Coding Example #2</b>		
<b>Interaction Patterns</b>	<b>Linked Nature Actions</b>	<b>Non-Linked Nature Actions</b>

<i>Seeing rain</i>	Rain dripping from cedar trees	Linked
	Rain dripping on water making ripples	Linked
<i>Exploring forest</i>		
<i>Finding bridge across stream</i>		
<i>Sitting on rock</i>		
<i>Eating breakfast under tree</i>		
<i>Hearing forest</i>	Forest waking up	Linked
<i>Hearing birds</i>	Birds singing	Linked
<i>Eating breakfast in forest</i>		
<i>Adding onto fort</i>		

➔ Note that the IP *seeing rain* has two Linked Nature Actions because the IP is enacted twice in narrative. In the first enactment of *seeing rain*, the participant writes about *seeing rain* “dripping from cedar trees”. In the second enactment of *seeing rain*, the participant writes about *seeing rain* “dripping on water making ripples”. We only code the IP once (see interaction pattern rule 17), but two distinct Nature Actions are linked to this IP.

### Nature Descriptions

A Nature Description is the portion of the participant’s meaningful nature experience narrative that directly describes any of the nature identified by the participant. In contrast to Nature Actions—which describes either an interaction between different components of nature or a general action happening within nature—the Nature Description is relatively stationary. This level of coding captures the rich ways in which participants notice and describe their surrounding environment, thus a form of engagement.

When coding the Nature Description, you want to stay as close to the participant’s original language as possible. Thus, there is no standardized form for this category, and most often the coded Nature Description will be a direct excerpt from the participant’s narrative. If

you encounter a nature noun without any extra descriptive words or adjectives, then it does not have enough extra descriptive information to code a Nature Description.

### *Nature Description Coding Rules*

#### **Rule 1.**

Include the nature noun within your coded Nature Description. In other words, do not only code the description itself, but also include the object of the description. Similarly, if the participant writes about a nature noun without any descriptive words or adjectives, then do not code it.

1. Example: “We went to a state park / Climbing in trees and playing on **huge rocks** / ...” → coded as *huge rocks*
2. Example: “... / The pileated woodpecker is the biggest in North America that’s not extinct so we get excited when we see it. We also like to look at **the smaller woodpeckers** and the [squirrels].” → coded as *smaller woodpeckers*

#### **Rule 2.**

Nature Descriptions should describe relatively stationary features of the participant’s surrounding environment. This is in contrast with Nature Actions, which generally describe interactions in nature that include some active movement or transfer of energy. Therefore, both Nature Descriptions and Nature Actions may contain verbs, but Nature Description verbs should be relatively passive, stationary verbs.

1. Example: “**white snow that covered the grass and all things** / playing and having snowball fights with my friends and playing with Lucky [their] dog / ...” → coded as *white snow that covered the grass and all things*

- i. Note that the adjective “white” is still coded along with its respective nature noun “snow”.
  - ii. Note that the verb “covered” is a relatively stationary description rather than an active interaction within nature, so it is coded as a Nature Description rather than a Nature Action.
2. Example: “**How pretty willow trees are** / Walking around looking for the dogs that got out / The shape of the tree / The **tree was hanging over** and I walked inside it” → coded as *pretty willow trees, tree was hanging over*
- i. Note that the second Nature Description, “tree was hanging over”, contains a verb, but the participant describes a relatively stationary feature of the environment, not an interaction within non-human nature, so “tree was hanging over” is coded as a Nature Description rather than a Nature Action.

### Rule 3.

Like interaction pattern rule 10, if there are multiple Nature Descriptions embedded within one continuous sentence, then parse out each Nature Description and code them individually. If one adjective appears to be clearly intended for multiple nature nouns, then use that same adjective for each of the coded Nature Descriptions.

1. Example: “**Beautiful mountains, trees and river.** / Taking walking tour of Howard Miller Steelhead Park to see bald eagles. / Was a little bit bored, but being outside was peaceful. / Was with brother, mom and grandfather.” → coded as *beautiful mountains, beautiful trees, beautiful river*

- i. Note that the adjective “beautiful” is applied to all three of the nature nouns in the first part of the narrative. It is reasonable to assume this adjective applies to each of the nature nouns.
2. Example: “I saw, **green grass**, squirrels, birds, dogs, and trees / Walking on the sidewalk / Yes / We went on a walk with me, my mom, Dasher my dog, and [Rachel] my baby brother. We walk to school and I see my mom go back and take a walk at Garfield park.” → coded as *green grass*
  - i. Note that the adjective “green” is not applied to all of the nature nouns in the list because it is not reasonable to assume that each of the nature nouns were intended to be described as “green”.

#### **Rule 4.**

When coding, drop all articles from the Nature Description. Given that the Nature Description does not have a standardized form, you may encounter situations in which the participant has used prepositions within their description of nature. In these cases, include the prepositions in your coded response.

1. Example: “Walking through Swan Lake Creek with my family and the Tacoma nature Center staff. / Hiking / I got to see animals and **different types of ferns** and **Dead salmon**. / Hiking with my family is so fun!” → coded as *different types of ferns, dead salmon*
  - i. Note that in this example, “salmon” is a nature noun, and “dead” is the adjective used to describe this nature noun. Similarly, “ferns” is a nature noun and “different types of” is a descriptor that provides more context for the ferns that the participant saw.

2. Example: “Trees, moss and animals / Hiking / It was pretty outside. / The **big tree** was so fun to see. I got to find **hidden holes that I could fit in!** My sisters and I could not wrap our arms around the tree it was so big. I heard birds too. It made me happy and tired at the same time.” → coded as *big tree, hidden holes that I could fit in*

- i. Note that “holes” is the nature noun and “hidden” is the adjective used to describe this nature noun. The additional descriptor “that I could fit in” is included in the Nature Description because it provides additional context for the “hidden holes” the participant found.

#### **Rule 5.**

Do not code quantities alone within the Nature Description code. We are more interested in the way people are using language to describe their environment, rather than their quantitative notations of the nature they are describing.

1. Example: “**Snowy mountains** / Hiking to a lookout tower / To see nature and spend time with my family / We hiked 2 miles to a lookout tower that was very high up. I was a little scared but kept going because we were going to see Santa Clause at the top! I had fun being outside and exercising with my mom and brother. We also saw lots of waterfalls on the trail. At the top there were **a lot of snowy mountains** to see!” → coded as *snowy mountains*
  - i. Note that “a lot of” is omitted from the coded response, because it is an indicator of the quantity of mountains.

2. Example: "... / 1. I went outside to feed the chickens, let them out of [their] cage and then collected the eggs if they had any usually they either had two or three" → no coded response
  - i. Note that no Nature Description is coded because "two or three" reflects a quantity of eggs and there are no additional descriptors of the eggs.

### ***Linked versus Non-Linked Nature Description***

The decision to "link" a Nature Description depends on whether it is literally linked to a coded IP, meaning that the Nature Description is extra information that is directly related to the coded IP. If there are no coded IPs in narrative, then all coded Nature Descriptions are automatically Non-Linked, because there is no IP to which you would link the two. Typically, the IP and Nature Description are Linked if they are written within the same sentence. However, sometimes the IP and Nature Description are in two separate sentences and can still be coded as Linked if the Nature Description is clearly additive information to the IP. If the Nature Description is not in the same sentence as the IP, use your discretion to decide whether the Nature Description is a direct component of the coded IP, and naturally flows in its addition to the IP. In other words, a Nature Description is Non-Linked if: 1) there is no coded IP, or 2) there are coded IPs, but the Nature Description is describing a separate occurrence unrelated to the coded IP's. Note that in some cases the Nature Description may be additive information to multiple of the coded IPs in each narrative, in which case you would link the Nature Description to each IP you deem fit.

#### **Example #1.**

**Meaningful nature experience narrative:** "I saw lots of nature. There was a **big lake**. There was **trees and grass**. It actually kind of **looked like a forest**. There were **flowers and**

**plants.** There were **BIG trees.** / Walking with my family and my doggie. / It was okay because it was **kind of cold** but I liked the scenery. And I liked walking with my parents and joking around. Except I didn't like my brothers, they were annoying. / I don't really have anything else to say about it. It was a **big cold park. It was sunny.**”

Linked vs. Non-Linked Nature Description: Coding Example #1		
Interaction Patterns	Linked Nature Description	Non-Linked Nature Descriptions
<i>Seeing nature</i>	Big lake	
	Trees and grass	
	Looked like a forest	
	BIG trees	
	Kind of cold	
	Big cold park	
	Sunny	
<i>Walking dog</i>	Big lake	
	Trees and grass	
	Looked like a forest	
	BIG trees	
	Kind of cold	
	Big cold park	
	Sunny	

**Example #2.**

**Meaningful nature experience narrative:** “I saw a **very very pretty yellow bird** and it was **really cute.** / I was inside looking [through] the window. / It was meaningful because when I think about it; it makes me really happy. / The **bird was right outside the window** when I was looking outside; it was **bright yellow and a deep black color it was small** and I thought it looked **really cute.**”

Linked vs. Non-Linked Nature Description: Coding Example #2		
Interaction Patterns	Linked Nature Descriptions	Non-Linked Nature Descriptions
<i>Seeing bird</i>	Very very pretty yellow bird	
	Bird was really cute	

	Bird was right outside window	
	Bright yellow and a deep black color	
	Bird was small	
	Kind of cold	
	Looked really cute	
<i>Looking through window at nature</i>	Bird was right outside window	

➔ Note that only one Nature Description is associated with *looking through window at nature*. This is because most of the Nature Descriptions are more closely associated with the IP *seeing bird*. The Nature Description “bird was right outside window” is linked with both IPs because it describes both the bird and the interaction through the window.

**Example #3.**

**Meaningful nature experience narrative: “exotic plants and animals, beautiful landscapes, lush trees and grass, and amazing flowers. / vacation in Europe. / because there was history and wonderful culture. / a family vaycay.”**

<b>Linked vs. Non-Linked Nature Description: Coding Example #3</b>		
<b>Interaction Patterns</b>	<b>Linked Nature Descriptions</b>	<b>Non-Linked Nature Descriptions</b>
<i>Seeing plants</i>	Exotic plants	
<i>Seeing animals</i>	Exotic animals	
<i>Seeing landscapes</i>	Beautiful landscapes	
<i>Seeing trees</i>	Lush trees	
<i>Seeing grass</i>	Lush grass	
<i>Seeing flowers</i>	Amazing flowers	

➔ Note that each of the Nature Descriptions are single adjectives that precede the nature nouns coded in the IPs. These Nature Descriptions are therefore linked to the corresponding IP.

➔ Note that single adjectives are applied to multiple nature nouns according to nature description rule 3. For example, “exotic plants and animals” is coded as *exotic plants* and “*exotic animals*.”

**Example #4.**

**Meaningful nature experience narrative:** “All the trees around our house / Playing with dog / Being outside with my dog / We live on an acre and half of woods and trails”

<b>Linked vs. Non-Linked Nature Description: Coding Example #4</b>		
<b>Interaction Patterns</b>	<b>Linked Nature Descriptions</b>	<b>Non-Linked Nature Descriptions</b>
<i>Seeing trees</i>	Trees around our house	
	An acre and half of woods and trails	
<i>Playing with dog</i>	An acre and half of woods and trails	

➔ Note that *trees around our house* is a linked Nature Description to the IP *seeing trees* because *around our house* directly describes the nature noun “trees”.

➔ Note that *a an acre and half of woods and trails* is linked to both IPs because it provides context for the environment in which both IPs were enacted. If this description were describing a context unrelated to the IPs enacted, it would be a non-linked Nature Description.

**Psychological Descriptions**

A “Psychological Description” is the portion of the participant’s meaningful nature experience narrative that describes their personal reflections on and feelings about their meaningful nature experience, including cognitive, emotional, and psychological experiences. The Psychological Description contrasts with the physical/sensorial experiences that are coded as IPs. There are three possible forms that a Psychological Descriptions could take: 1) the participant’s description of their personal feelings, 2) the participant’s description of an action, where the verb is more psychological or emotional (though this is not always the case), as opposed to the physical or sensorial verbs coded within interaction patterns, and 3) the participant’s description of the general feelings surrounding their larger experience described in

their narrative. The first and second types are almost always founded upon a verb (e.g., “I **felt** happy” and “I **admired** the sunset”, respectively), and the third type is almost always simply a list of adjectives or descriptive words (e.g., “my walk was **quiet and peaceful**”). Note that the first two forms are in reference to the participant’s self, and the third form is in reference to the participant’s more general experience. Sometimes a Psychological Description could fit into multiple of the above forms, but these are meant to be general guidelines, so you do not have to worry about classifying a Psychological Description as only one of the outlined forms.

When coding, try to stay as close to the participant’s original language as possible. In cases where the Psychological Description is founded upon a verb (e.g., “I **felt** happy”), change the verb to the present progressive tense to keep in line with the standard interaction pattern form.

Unlike the other coding levels, the Psychological Description can include information that did not necessarily happen within their meaningful nature experience if the Psychological Description is still a reflection on the participant’s selected experience. This is because our psychological response to interacting with nature does not always end when the discrete experience ends; rather, the effects and reflections can linger long after the human-nature interaction.

### ***Psychological Description Coding Rules***

#### **Rule 1.**

If necessary, change the tense of the relevant verb to the present progressive.

1. Example: “Trees, wildlife, and smelling the outdoors. / [Walking] a trail / **It feels good to be outside and experience it** / My family and I took a walk on a trail in our city.” → coded as *feeling good to be outside and experience it*

- i. The phrase “it feels good” is a general psychological description but should be retained as the way in which the participant described their experience of being outside. The verb “feels” is changed to “feeling”.
2. Example: “Trees, grass, bushes, blackberry bushes / Running around, playing outside / It smelled like it was going to rain / **I like playing outside.**” → no coded response
  - i. The verb “liking” is not coded as a psychological description for our purposes. Similarly, verbs such as “enjoying”, “loving”, and “hating” are not considered psychological descriptions for our purposes.

**Rule 2.**

If you encounter an adverb used in place of the emotional or psychological adjective, then change the adverb to its respective adjective.

1. Example: “I **happily** walked around.” → coded as *happy*
2. Example: “I was **excitedly** hiking.” → coded as *excited*

**Rule 3.**

If the participant writes a Psychological Description in what appears to be either its first or its third form, in which they are describing their general experience or feelings, only code the relevant adjectives, nouns (that function similar to adjectives), and descriptive words without the extra information.

1. Example: “Dog walking. I'm outside a lot and get to see everything. Plus I gather food for my stick bugs. / Dog walking/ gathering food for my spinny stick bugs. / The fresh air and [**it's**] **calming**. / Taking time in outdoors area is good for anyone's physical and mental state.” → coded as *calming*

2. Example: “Beautiful mountains, trees and river. / Taking walking tour of Howard Miller Steelhead Park to see bald eagles. / **Was a little bit bored, but being outside was peaceful.** / Was with brother, mom and grandfather.” → coded as *bored*, *peaceful*

### ***Linked versus Non-Linked Psychological Description***

The decision to “link” a Psychological Description depends on whether it is literally linked to a coded IP, meaning that the Psychological Description is extra information that is directly related to the coded IP. If there are no coded IPs in a narrative, then all coded Psychological Descriptions are automatically non-linked, because there is no IP to which you would link the Psychological Description. Typically, the IP and Psychological Description are linked if they are written within the same sentence, yet sometimes the IP and Psychological Descriptions are in two separate sentences and can still be coded as Linked if the Psychological Description is clearly additive information to the IP. If the Psychological Description is not in the same sentence as the IP, use your discretion to decide whether it is directly a part of the coded IP, and naturally flows in its addition to the IP. In other words, a Psychological Description is Non-Linked if: 1) there are no coded IPs, or 2) there are coded IPs, but the Psychological Description is describing a separate occurrence unrelated to the coded IP's. Non-Linked Psychological Descriptions can still be additive information to Nature Actions, and/or Nature Descriptions in addition to providing some background information to the participant's experience. Note that in some cases the Psychological Description may be additive information to multiple of the coded IPs in a narrative, in which case you would link the Psychological Description to each IP you deem fit.

#### **Example #1.**

**Meaningful nature experience narrative:** “I saw a very very pretty yellow bird and it was really cute. / I was inside looking [through] the window. / It was meaningful because when I think about it; **it makes me really happy**. / The bird was right outside the window when I was looking outside; it was bright yellow and a deep black color it was small and I thought it looked really cute.”

Linked vs. Non-Linked Psychological Description: Coding Example #1		
Interaction Patterns	Linked Psychological Descriptions	Non-Linked Psychological Descriptions
<i>Seeing bird</i>	Happy	
<i>Looking through window at nature</i>		

➔ Note that although the participant describes feeling “happy” when thinking about the interaction pattern *seeing bird*, this psychological description is still linked to the IP *seeing bird* because the participant refers specifically to this interaction.

➔ Note that this is an example of a psychological description based on a later reflection about the IP, rather than the psychological state during the experience.

**Example #2.**

**Meaningful nature experience narrative:** “Dog walking. I'm outside a lot and get to see everything. Plus I gather food for my stick bugs. / Dog walking/ gathering food for my spinny stick bugs. / The fresh air and **its calming**. / Taking time in outdoors area is good for anyone's physical and mental state.”

Linked vs. Non-Linked Psychological Description: Coding Example #2		
Interaction Patterns	Linked Psychological Descriptions	Non-Linked Psychological Descriptions
<i>Walking dog</i>		Calming
<i>Gathering food</i>		

➔ Note that this psychological description is non-linked because it is not clear which IP the participant is referring to when they say, “the fresh air and [it’s] calming”.

## **Meaning Reasons**

Meaning Reasons are the participants' justifications for why they consider their experience meaningful. Meaning Reasons are typically found in the participant's response to part C of the meaningful nature experience prompt, in which participants were asked, "Why was it meaningful?"

Meaning Reasons are reflections on the participant's experience and therefore may overlap with Psychological Descriptions. You may also find Meaning Reasons overlapping substantially with Most Meaningful interaction patterns (MMIPs). Meaning Reasons have their own coding category to specifically address the question "Why does a participant consider their experience to be meaningful?" as opposed to "What was the emotional or cognitive state of the participant?" (i.e., psychological descriptions) or "Which of the participant's interaction patterns did they consider most meaningful?" (i.e., most meaningful interaction patterns).

Unlike other coding categories, Meaning Reasons do not necessarily need to maintain the participant's original language. We are more interested in general justification themes such as *beauty, relaxation, enjoying an infrequent nature experience, or spending time with family*. As such, it may be helpful to first code a Meaning Reason by copying the exact text that you think provides a justification for why the experience was meaningful. After doing this for all the narratives, you may then generalize the language into a theme that overlaps with other participants' Meaning Reasons. For this reason, we provide "Coding Guidelines" rather than "Coding Rules" for the first level of coding before arriving at themes. We then provide examples and explanations of several common Meaning Reason themes.

### ***Meaning Reason Themes Coding Guidelines***

#### **Guideline 1.**

If part C of the participant's narrative states something to the effect of "it was fun", "fun", "because I had fun", simply code the single descriptive word or phrase the participant used (e.g., "fun").

1. Example: "Winter wonderland, snowing / Playing in the snow, riding my horse / **Because it was pretty and it was fun.** / It was cold and windy. It was fun to ride bareback on my horse." → coded as *pretty, fun* → Beauty; Fun
  - i. Note that "Because it was" and "it was" are dropped from the Meaning Reason for conciseness and because they do not add further information to the Meaning Reason.
  - ii. We then generalize the codes *pretty* and *fun* to the Meaning Reason themes Beauty and Fun.
2. Example: "We had snow one day. / Walking in the snow and making a snowman. / **It was fun.** / I like playing in the snow, but it gets really cold. → coded as *fun* → Fun
  - i. Note that this code remains the same ("Fun") when the second level of coding is completed. Some Meaning Reasons will not require further generalization.
3. Example: "A really pretty flower / I was playing / **It was very colorful** / I was jumping in a pile of leaves with my friend." → coded as *colorful* → Visual Features
  - i. Note that this descriptive word is more like a Nature Description, rather than a Psychological Description as in the two examples above. This type of description can still be coded as the Meaning Reason.
  - ii. Note that this code changes to be more general at the second level of coding.

## Guideline 2.

If part C of the participant's narrative consists of interaction patterns, use those IPs as the Meaning Reason. Include any linked Nature Descriptions or Nature Actions that would otherwise be left out of a coded IP.

1. Example: "Walking through Swan Lake Creek with my family and the Tacoma nature Center staff. / Hiking / I got to **see animals and different types of ferns and Dead salmon.** / Hiking with my family is so fun!" → coded as *seeing animals, seeing ferns, seeing dead salmon* → Meaningful interaction pattern(s) Enacted
  - i. Note that it is important not to infer too much about the participant's emotional or cognitive assessment of the Meaning Reason. For example, this Meaning Reason should not introduce a verb such as *enjoying seeing different types of ferns*, for the participant could have been *resenting seeing different types of ferns*, as an extreme example.
  - ii. Note that the second level of coding is very general, "Meaningful interaction pattern(s)". This theme applies to all Meaning Reasons that consist of only IPs.
  
2. Example: "Flower, trees and different shrubs / Hiking / **Because I love to go hiking and go [on] adventure.** / I was listening to the [animals] and inspiring the sound of the trees" → coded as *loving hiking in nature, loving going on adventure* → Meaningful interaction pattern(s) Enacted
  - i. Note that *loving* is included in both Meaning Reasons. *Going on adventure* is not coded as an IP (see interaction patterns, rule 13), but can be included as a Meaning Reason that closely follows the format of an IP.

### Guideline 3.

Read through the entire meaningful nature experience narrative to make sure you consider the entire response in coding Meaning Reasons. There may be some Meaning Reasons in other parts of the narrative, but only if the participant clearly indicates they are describing a reason their experience was meaningful. More than one Meaning Reason may be coded for a given narrative.

### ***Common Meaning Reason Themes***

The goal of Meaning Reasons is to organize the data around broader theme categories for why the participants found their experiences meaningful. The following seven Meaning Reason themes are some of the most common in these data: *Infrequent or First Experience; Beauty; Spending Time with Close Relationships; Fun; Being Outside; Meaningful Interaction Pattern(s) Enacted; and Relaxing, Calming, Peaceful*. Each is presented with “Prototypical”, “Boundary – Code” and “Boundary – Do not code” examples to guide decision-making when coding the data.

#### **Infrequent or First Experience.**

An infrequent or first experience can be anything from a new encounter with an animal to a rare weather event. Often the participant will explicitly note that the experience does not happen often, or it was their first experience of this kind. This Meaning Reason was especially common in these data due to data collection occurring shortly after a first snow in the area.

#### ***Prototypical Examples.***

1. “It snowed at my house / making [snowmen] and snowball fights and sledding / **Because it only does it once a year** / We walked to the store in the snow to get food. Some [friends’] friends came over and we played in the snow.”
  - i. Note that this participant clearly responds to the question “Why was it meaningful?” with a comment about the frequency of snow.

2. “Storm [watched] at the beach / Standing on top of a sun roof / **It was my first experience** / We took lots of pictures and videos and my face got super wet.”
  - i. Note that this participant labels this experience as her “first”, which clearly denotes this part of the meaningful nature experience as being meaningful because it was an “Infrequent or First Experience.”

***Boundary: Code Example.***

1. “snow / building a snow fort / **because there was snow** / I love snow”
  - i. Note that this participant says the snow was the reason they thought their experience was meaningful but does not specify that it is the frequency of snow that makes their experience meaningful. However, snow is known to be an infrequent occurrence in the region of data collection and, in this dataset, is repeatedly named as something that rarely happens. Therefore, we are considering the participant’s Meaning Reason “because there was snow” to be meaningful because of the relative infrequency of the event.

***Boundary: Do not code Example.***

1. “Walking through Swan Lake Creek with my family and the Tacoma nature Center staff. / Hiking / **I got to see animals and different types of ferns and Dead salmon.** / Hiking with my family is so fun!”
  - i. Note that one could imagine that seeing the variety of ferns and the dead salmon are relatively infrequent experiences for this participant. However, this narrative does not specify that this is an unusual, unique, or infrequent experience. Therefore, we cannot code this as an example of the Meaning Reason theme Infrequent or First Experience.

**Beauty.**

Beauty is a common Meaning Reason from participants. A Beauty Meaning Reason will often be written as “It was pretty” or “It was beautiful”. Though the adjective may vary, code all Meaning Reasons that note the attractive features of the nature they experienced as Beauty.

***Prototypical Examples.***

1. “there was a beautiful sunset tonight / driving home from the store / **because it was so pretty** / the sunset made me feel happy”
  - i. Note that this Meaning Reason solely consists of the Beauty theme, as indicated by the adjective “pretty”.
2. “I saw some big grass in someone’s yard / walking to and from school / **because it’s a pretty walk** / [n/a]”
  - i. Note that this Meaning Reason specifies that the walk was pretty. This is still considered a Beauty Meaning Reason even though a specific part of the narrative is identified as “pretty”.

***Boundary: Code Example***

1. “The trees and flowers at the local park / Playing / **It was nice to see** / It is good to have nature to remind you of other places outside your daily environment”
  - i. Note that the phrase “nice to see” is less explicitly a comment about the beauty or attractiveness of the nature experienced, but the participant is still reflecting on the visually pleasing aspects of the experience, so we consider this a Beauty Meaning Reason.

***Boundary: Do not code Examples.***

1. "I saw lots of nature. There was a big lake. There was trees and grass. It actually kind of looked like a forest. There were flowers and plants. There were BIG trees. / Walking with my family and my doggie. / **It was okay because it was kind of cold but I liked the scenery. And I liked walking with my parents and joking around. Except I didn't like my brothers, they were annoying.** / I don't really have anything else to say about it. It was a big cold park. It was sunny."
  - i. Note that the participant writes, "I liked the scenery", but we do not have enough information about the visual attractiveness of the environment. In the above Boundary: Code example, "nice to see" indicates a visually pleasing environment. This example indicates a preference for the scenery but does not indicate why the participant liked the scenery. The distinction is subtle.
2. "A really pretty flower / I was playing / **It was very colorful** / I was jumping in a pile of leaves with my friend."
  - i. Note that the participant writes about a visual feature of the environment, but the feature is not explicitly described as visually pleasing or attractive. If this Meaning Reason were coded as the theme Beauty, we would be imposing a judgment about whether colorful features are beautiful.

### **Spending Time with Close Human Relationships.**

This Meaning Reason applies to meaningful nature experience narratives in which the participant indicated they were with family members or friends. The participant does not necessarily need to indicate that they enjoyed the time spent with family or friends, only that the presence of family or friends was a reason for why their experience with nature was meaningful.

#### ***Prototypical Examples.***

1. “Snow / Making a snowman / **It was with my family** / It snowed and I went outside with my siblings and made a snowman and went sledding”
  - i. Note that the participant states that the experience was with their family in part C of the meaningful nature experience narrative. The participant does not say whether they enjoyed the experience or not, but that an evaluation of the experience or time spent with close relationships is not required for this Meaning Reason theme.
2. “Climbing trees / Riding my bike / **I was with my friends from school** / I love climbing trees. Not every tree is a good climbing tree. I am sad that my dad caught the limbs on the only climbing tree in our backyard.”
  - i. Note that friends are considered close relationships for the purpose of this Meaning Reason theme.

***Boundary: Code Examples.***

1. “I saw lots of nature. There was a big lake. There was trees and grass. It actually kind of looked like a forest. There were flowers and plants. There were BIG trees. / Walking with my family and my doggie. / **It was okay because it was kind of cold but I liked the scenery. And I liked walking with my parents and joking around. Except I didn't like my brothers, they were annoying.** / I don't really have anything else to say about it. It was a big cold park. It was sunny.”
  - i. Note that the participant did not enjoy spending time with their brothers, but we still code this as Spending Time with Close Human Relationships. It is not necessary for the participant to have enjoyed the interaction to code this Meaning Reason theme.

2. “Beautiful, teal ocean water with white sand, and starfish, rainbow fish and coral in the Philippines. I also saw one of the world's seven wonders of nature at the underground river. We saw tons of animals including the rare [tarsier] monkey. / Exploring, snorkeling, playing in the ocean with my brother, and having fun! / **We were on a family trip and exploring in the Philippines.** / We were in the Philippines for 16 days and spent much of the time exploring the outdoors. My parents were both bit by a fish and my brother was scraped by coral. I was bit once by a fish and stung by plankton! We saw lots of animals and so many stray dogs and cats -- it was sad. I had a great time exploring with my family!”

- i. Note that this participant says they were on a family trip rather than explicitly saying they were spending time with their family or friends. Within the broader context of this narrative, however, the participant was clearly spending time with their family members, so we code this as Spending Time with Close Human Relationships.

***Boundary: Do Not Code Example.***

1. “Beautiful mountains, trees and river. / Taking walking tour of Howard Miller Steelhead Park to see bald eagles. / **Was a little bit bored, but being outside was peaceful.** / Was with brother, mom and grandfather.”
- i. Note that this participant mentions they were with family members, but this information is provided in part D of the narrative in response to the prompt, “Please tell us more about your experience. We’d love to know!” Therefore, we cannot interpret the presence of family members in this narrative to be the participants’ Meaning Reason. If the same information were in part C of the

narrative, this narrative could be coded as Spending Time with Close Human Relationship.

2. “All the trees around our house / Playing with dog / **Being outside with my dog** /

We live on an acre and half of woods and trails.”

- i. Note that for the sake of this Meaning Reason theme, we do not consider pets or other animals to be close relationships.

### **Fun.**

Like the Beauty Meaning Reason theme, participants commonly respond to part C of the meaningful nature experience prompt by saying, “it was fun” or “I had fun”. Narratives with this type of response to part C can be coded as having the Meaning Reason theme Fun.

#### ***Prototypical Examples.***

1. “Winter wonderland, snowing / Playing in the snow, riding my horse / **Because it was pretty and it was fun.** / It was cold and windy. It was fun to ride bareback on my horse.”

- i. Note that this narrative has two Meaning Reason themes, Beauty and Fun. Both can be coded.

2. “The beach / Walking/ running / **[It] was fun** / My mom needed vitamin D so we went to the beach it was cold!!!!!!! But fun.”

#### ***Boundary: Code Example.***

1. “Well I went to the park and saw a lot of pretty trees and bushes I also saw a bunch of birds / Just walking with friends / **Well it's the fun part about after school** / Well we were just walking because we set a goal to go on a walk every day except holidays”

- i. Note that this participant references a more specific part of their experience as the “fun part”. The entire narrative can be coded with the Meaning Reason theme Fun.

***Boundary: Do Not Code Example.***

1. “We were at Universal and there were so many pretty plants in Florida. / Walking the theme park. / **We were together as a family.** / We rode Harry Potter rides. It was so fun!”

- i. Note that this participant mentions that the experience “was so fun!” in part D of the narrative, however, part C speaks to another theme. Since “fun” is not explicitly part of why the experience was meaningful, we do not code this with the Meaning Reason theme Fun.

**Being Outside.**

This Meaning Reason theme applies to narratives in which the participants write something about enjoying time in nature, the outdoors, or outside. Often the participant will write this meaning reason as “I liked spending time outside” or “It was good to be outdoors”.

***Prototypical Examples.***

1. “Trees, wildlife, and smelling the outdoors. / [Walking] a trail / **It feels good to be outside and experience it** / My family and I took a walk on a trail in our city.”
2. “snow, trees, plants in yards, and bushes / playing in the snow / **I like being outside with my family** / I watched my brother and his friends shoot a foam dart with a hook so you could launch it from a sling shot that came with it”
  - i. Note that this narrative has two Meaning Reason themes, Being Outside and Spending Time with Close Relationships.

***Boundary: Code Examples.***

1. “All the trees around our house / Playing with dog / **Being outside with my dog** / We live on an acre and half of woods and trails.”
  - i. Note this narrative includes another living being in the Meaning Reason. We still consider the Meaning Reason theme Being Outside to apply to this narrative.
2. “We went hiking to a waterfall! / We built fairy houses and we went hiking to the waterfall. We also had a picnic! Lastly, we went to the park! / **It was meaningful day because it was a pretty and it was a nice day and a great way to get out of the house.** / We were with my cousin, [Marie], and it was so fun!”
  - i. Note that this narrative does not include the language “being outside”, “being outdoors”, or “being in nature”, but the participant says that they liked getting out of the house. We can therefore code this narrative with the Meaning Reason theme Being Outside.
  - ii. Note also that Meaning Reason theme Beauty would also apply to this narrative.

***Boundary: Do Not Code Examples.***

1. “Trees, moss and animals / Hiking / **It was pretty outside.** / The big tree was so fun to see. I got to find hidden holes that I could fit in! My sisters and I could not wrap our arms around the tree it was so big. I heard birds too. It made me happy and tired at the same time.”

- i. Note that the word “outside” is in part C of the narrative, but the participant describes outside as “pretty”, which means the Meaning Reason theme Beauty applies better.
2. “Trees, grass, bushes, blackberry bushes / Running around, playing outside / **It smelled like it was going to rain** / I like playing outside”
  - i. Note that the participant says they “like playing outside”, but the participant includes this information in part D of the narrative. Without the participant explicitly writing that being outside was what made the experience meaningful, we cannot apply the Meaning Reason theme Being Outside based on information outside of part C.

### **Relaxing, Calming, Peaceful.**

This Meaning Reason theme applies to narratives in which participants say their experience was relaxing, calming, or peaceful. This Meaning Reason theme can be applied even if it is only a specific aspect of the experience that had these qualities.

### ***Prototypical Examples.***

1. “Beautiful mountains, trees and river. / Taking walking tour of Howard Miller Steelhead Park to see bald eagles. / **Was a little bit bored, but being outside was peaceful.** / Was with brother, mom and grandfather.”
  - i. This narrative specifically says that being outside was peaceful. At a glance, it may seem that this narrative would be coded with the Meaning Reason theme Enjoying Being Outside, but since the participant indicates the experience was peaceful, we code it with the Relaxing, Calming, Peaceful theme.

2. “Dog walking. I'm outside a lot and get to see everything. Plus I gather food for my stick bugs. / Dog walking/gathering food for my spinny stick bugs. / **The fresh air and it's calming.** / Taking time in outdoors area is good for anyone's physical and mental state.”

- i. Note that the participant specifically writes that the experience is “calming”.

***Boundary: Code Example.***

1. “The rain dripping from the cedar trees and the cold air on my face. / Exploring the forest in the back yard. Finding a bridge across the stream and sitting on a rock on the shore of the water. / **I just find it relaxing. I like the cold and I love how everything is green and you can see the rain dripping on the water making ripples. The best time to go out is in the morning and if you have breakfast under one of the trees that's one of my favorite things to do. In the morning you can hear all of the [forest] waking up with all of the birds singing. The morning air is cold and fresh and it just feels like [you're] in another world.** / [Usually] I go out with my best friend Bryn to the forest in the back yard first thing in the morning and we bring out fruit and cheese with [pretzels] and we would eat the breakfast in the fort we had built and packed a towel to sit down on. After we were done eating we would just take a walk [or] add on to the fort we had been making.”

- i. Note that this narrative has quite a long Meaning Reason, but the first few words indicate the Meaning Reason theme Relaxing, Calming, Peaceful.

***Boundary: Do not code Example.***

1. “There were lots of tall trees and a fast stream flowing along the street. / Picking up trash and recycle in our neighborhood and on the road. / **I felt good that I was**

**helping out and possibly saving animals from eating toxic stuff, like plastic bottles and wrappers.** / It was pretty quiet outside, other than a few cars passing by, and it felt nice to get out of the house and help out.”

- i. Note that part D of this narrative indicates that it was “quiet outside”, but this narrative cannot be coded with the Meaning Reason theme Relaxing, Calming, Peaceful for two reasons. First, “quiet” does not necessarily indicate that a narrative should be coded with the Meaning Reason theme Relaxing, Calming, Peaceful. Second, this phrase appears in part D of the narrative without any additional indication that the participant is writing about something they found meaningful.

#### **Meaningful Interaction Pattern(s) Enacted.**

This Meaning Reason theme is more general than others; it can apply to all Meaning Reasons that specifically include an interaction pattern. To code this Meaning Reason theme, there must have been an IP coded from part C of the narrative. This Meaning Reason theme will likely overlap with the Most Meaningful interaction pattern (MMIP).

#### ***Prototypical Examples.***

1. “There was a pileated woodpecker outside of our window. / We were watching it from our window. / **Because we like to look at birds and identify them with our bird book.** / The pileated woodpecker is the biggest in North America that's not extinct so we get excited when we see it. We also like to look at the smaller woodpeckers and the [squirrels].”
  - i. Note that this narrative includes the IPs *looking at birds* and *identifying birds* in part C and the participant writes that they like enacting these IPs.

2. “painted rocks. I found a ladybug one. / I was searching for painted rocks with my mom. We took pictures and showed my friends. / **I got to spend time with my mom and go on a hunt for rocks.** / My mom and me like to take pictures of flower and other cool things we find outside. We print them and put them in a book at home.”
  - i. Note that this narrative has the IP *hunting for rocks* in part C, which indicates that this interaction pattern was one of the reasons this experience was meaningful for the participant. Even though the participant does not explicitly say they enjoyed the IP, we code this as Meaningful interaction pattern(s) Enacted because the IP is included in part C.
  - ii. Note also that the Meaning Reason theme Spending Time with Close Human Relationships would apply to this narrative.

***Boundary: Code Examples.***

1. “Snow, trees, animals / Snow skiing and walking the dog. In summer we camp which I love. / **Snow is really fun to sled and build a snow man. I like walking the dog with my mum** / Camping is the most fun ever. We are all in a tent together. No RV,”
  - i. Note that this narrative includes the IPs *sledding on snow*, *building snowman*, and *walking dog* in part C and the participant writes that they like enacting these IPs.
  - ii. Note also that this narrative has the Meaning Reason themes Fun and Spending Time with Close Relationships.
2. “I saw some moose and deer in Spokane and I fed the chickens and played with dogs in California / I was just playing by myself and talking to the chickens / **Because I want to become a vet so I was experiencing how to take care of some animals** / 1.

I went outside to feed the chickens, let them out of [their] cage and then collected the eggs if they had any usually they either had two or three 2. I got to let one [dog] out of her cage and her name was Shine then I played fetch with her 3. I got to see some deer and moose on a deer cam because my cousin used to hunt deer with deer cams and she doesn't hunt any more so she just leaves them up to look at them instead.”

- i. Note that this narrative has the IP *caring for animals* in part C, indicating that this IP was one reason the experience was meaningful for the participant.
- ii. Note also that this narrative can be coded with the Meaning Reason theme Working Toward Goals, however, this theme was not a common theme in these data, so we have not included other examples in this manual.

***Boundary: Do Not Code Example.***

1. “Trees, grass, bushes, blackberry bushes / Running around, playing outside / **It smelled like it was going to rain** / I like playing outside”
  - i. Note that this Meaning Reason includes a phrase that may appear to be an interaction pattern; however, it cannot be coded as such because it is in the form of an analogy. No IP was coded from part C of this narrative, so the Meaning Reason theme Meaningful interaction pattern(s) Enacted cannot be coded.

***Common Meaning Reason Themes***

Other Meaning Reason themes that appeared in these data but were not frequent enough to be featured in the manual include: Creating Happy Memories; History, Culture; Unique Features in Nature; Working Toward Goals or Learning Skills; and Physical Activity in Nature.

Examples of Fully Coded Responses

MNE narrative	IP	Part(s)	Inferred?	Keystone	MFIP?	MMIP?	NA	NA linked?	ND	ND linked?	PD	PD linked?	Meaning reason theme(s)
Snow / Playing with my dog in the snow. / Because I spent time with my family. / Threw snowballs in the air and had my dog catch them with her mouth. Also had snowball fights with my family.	Seeing snow	A	Y	Experiencing snow									Spending time with close human relationships
	Playing with dog in snow	B		Interacting with domestic animal(s)		Y	Dog catching snowballs with mouth	Y					
	Throwing snowballs	D		Experiencing snow				Y					
	Having snowball fights	D		Experiencing snow									
I went on a bike	Seeing nature	A	N	Viewing nature									Meaningful IP enacted

ride and it was very pleasant to see nature / I was listening to the sounds of nature / Because I love hearing all the beautiful sound of nature / I saw birds and wet branches beautiful sun And steaming mud puddles	Listening to sounds of nature	B		Listening to nature		Y							
	Hearing sounds of nature	C		Listening to nature	Y				Beautiful sound of nature	Y			
	Seeing birds	D		Encountering wildlife									
	Seeing branches	D		Viewing plantlife									
	Seeing sun	D		Seeing sun									
	Seeing mud puddles	D		Seeing puddles									

*Note.* MNE = Meaningful nature experience; IP = Interaction pattern; Part(s) = in response to which part of the meaningful nature experience prompt; MFIP = Most foundational interaction pattern; MMIP = Most meaningful interaction pattern; NA = Nature action; ND = Nature description; PD = Psychological description.

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