

Our work has taken us across the country, into the Mojave Desert and the fens of Indiana. We've met new scientists and interpreters. We've challenged ourselves and our park partners to use stories and sketches to build enthusiasm for scientific research. We have offered encouragement, coaching, and read with delight the results of interpreters' efforts. In this report, we recount high points and sticking points.

## Issues Across Sites

### *Planned programs vs. opportunistic use*

Spontaneous interactions are powerful, but interpreters then have to recognize and act on them with little notice. For example, an interpreter was walking with a group of moms and kids when she spotted some amphibians.

**... There had to be around 10 huge green frogs and 2 bullfrogs. Perfect iSWOOP opportunity so we whipped out the DR. BOB presentation and asked the kids like "Hey, what do frogs sound like? Do any of you know any different kinds of frogs?" ... It was pretty inspiring how into it they became. We even broke out the sound analyzer and had then making frog calls into it. The visitors were really into discussing why that particular area of water had so many frogs. — Indiana Dunes Ranger**

iSWOOP use at Acadia was planned. All of the experimentation occurred within pre-determined program slots. At Indiana Dunes, interpreters were free to use the visualizations and equally free not to during programs and informal conversations with visitors. Both approaches have helped us learn how to improve our conversations with scientists in advance of professional development sessions. Project leaders want to learn how such decisions will impact the institutionalization of iSWOOP at individual parks.



Observing and measuring. We look for the story of "how scientists know" to complement the punchline of "what they know." At Joshua Tree, revisiting Hogan's data from the 1970's involves measuring trees' diameter at the root collar, calculating the height, and rating the condition of the trees. Photo credit: NGraver

## Overview

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### *iPads: An opportunity and a challenge*

At Carlsbad Caverns, displaying researchers' visualizations on iPads opened up opportunities for conversations about park-based research in the cave, hundreds of feet below the visitor center. During summer 2017, we heard the downsides of tablet technology from interpreters who were loathe to introduce screens in the cave where natural wonders abound. Though iPads are portable, flexible, and feel right for a conversation with a small group, for bigger groups, outdoors on sunny or windy days in sandy areas, they are less than an ideal tool. We are left wondering how to compensate for the movement, dynamics, and flexibility of a tablet-based collection of visuals.

**Most of them [the kids] thought that there was just one normal frog that we had everywhere and didn't realize the diversity of frogs and toads that we have here. —Indiana Dunes Ranger**



Two of the 17 amphibian species Dr. Bob has researched.

### *Competitors or Complements: Natural history and park-based research*

Educating about biodiversity and natural history is a natural fit for place-based learning in national parks. For many visitors, concepts like biodiversity are new. School-age children in Gary, Indiana were surprised to hear there is more than one type of frog. Families on geology walks in Acadia learn how sediment accumulates in bogs and lake beds and that glaciers don't retreat (they fray and melt, and may appear to retreat, but don't actually move backwards). These ideas seem to sit comfortably next to conversations about current research for interpreters. We wonder: are we making the most of these exchanges as springboards for conversations on park-based research. Are they helpful to the project's goals or a distraction to making research more prominent? More study needed!

# Acadia and ASAP

**Highlights** Nick Hristov and a team of undergraduates at ASAP, New Media Services at the University of Maine in Orono, developed visualizations on landscape succession, animations of glacial action, and North Carolina School of the Arts students produced a short video showing the coring process. Interpreters have used the visual library with more than 1,000 visitors during Summer 2017.

**Significance** Without tree rings or fossils, paleoecologists look for pollen grains and charcoal preserved in sediment cores. They count the microscopic particles and make graphs to show how plant communities have changed over time (see illustration to the right and the graph below). The oldest kettle pond in Maine is in Acadia. The glacier's impression made a deep indent that has subsequently acted like flypaper, catching grains of wind-blown pollen, charcoal, and even particles of heavy metals like lead and mercury, common in air during the era of leaded gasoline. Turns out mud is like a diary, allowing us to look back and understand conditions in the past.

I found a sediment sample that was taken from the Bowl and I have been bringing that to the program. It is in an acrylic tube and you can see the dirt and hold it. Visitors love the sediment sample. They seem to be unaware of the toll that people had on the forests of Maine. I tell visitors that to truly see the forest primeval they need to look at the tube of sediment. —Acadia Ranger

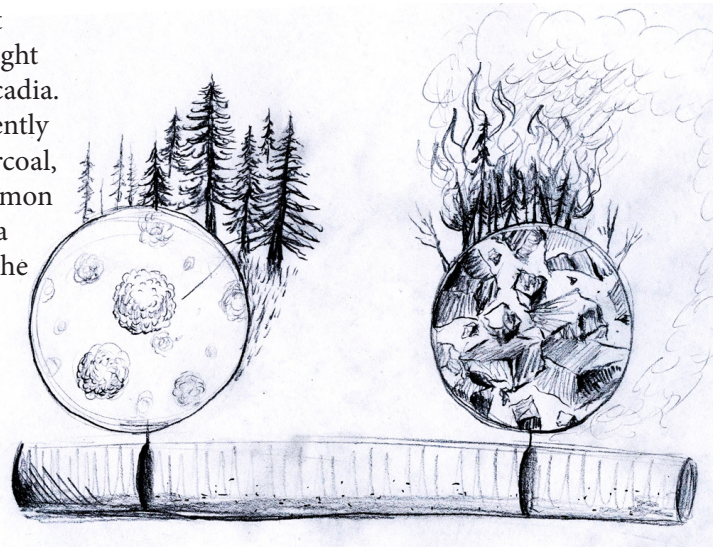
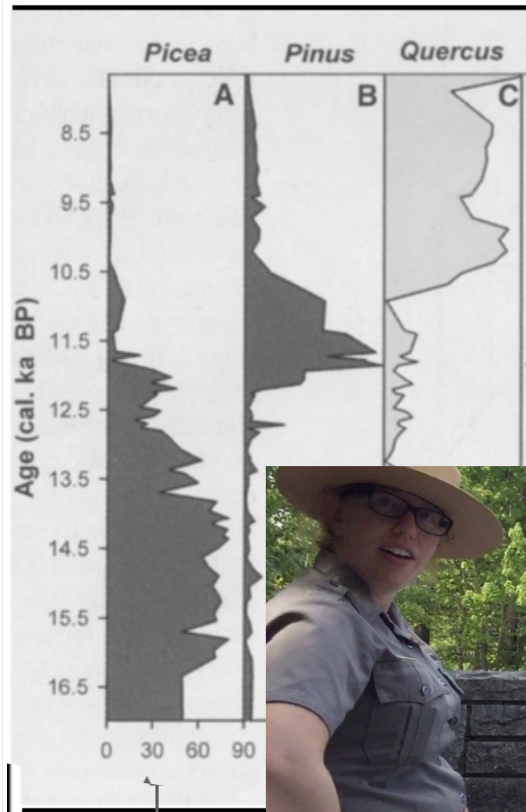


Illustration by ASAP. Pollen abundance graph in Gill et al, 2009.



**What's tricky** It's difficult to know just where to start a conversation about 10,000 years of change.

**What's next** ASAP students will continue to expand and refine the visuals depicting landscape change on Mount Desert Island.

After talking about the long term changes over thousands of years, I ask if they think the landscape is currently changing. Everyone says yes. —Ranger M



Visitors examine a sediment core, an enlarged pollen grain, and talk with Ranger Mackette about what scientists can learn about the way Acadia looked 10,000 years ago. Photo credit: MMerson





# At Indiana Dunes National Lakeshore with Dr. Bob Brodman

**Highlights** iSWOOP led training for 22 park staff. Dr. Bob discussed research on the importance of connected wetlands of different types, how he came to realize that spring peepers are breeding three weeks earlier than they used to, and length of time for an amphibian population to recover after a prescribed burn.



Thank you so much for the work you are doing it has been tremendously helpful ... and I hope has made me a better interpreter.  
—Ranger G

Rangers were able to talk about the impact of weather patterns on the timing of mating and about the ways amphibians take advantage of a variety of wetland habitats.

The kids were not really interested in Dr. Bob's research. That is until we brought out the visualization app. The kids LOVED making various noises and seeing how the noises plotted in the app. We made predictions about how different noises would graph on the app. ...We tied that into Bob's research ... The app was a big [hit]! They were super engaged the rest of the time, too! —Indiana Dunes Ranger

**What's tricky** New approaches are bound to hit snags. During the summer, interpreters and iSWOOP staff together identified three kinds of obstacles to implementation.

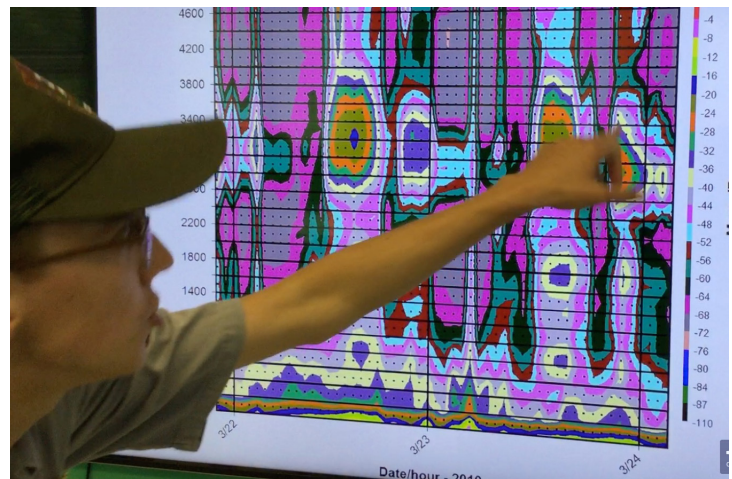
- Knowing enough about Dr. Bob's research (Information)
- Being competent with the iPads (Tech management)
- Believing that a different topic like the sand dunes would be better (Refocusing the effort)

Noticeably in out-of-school settings, opportunities are negotiated and invented, not given (as is a math class that occurs daily). Interpreters have to figure out a location where the content and available time to interact make sense. Once they do that, they may need to adjust due to logistics like availability of shade, traffic patterns on narrow trails, ambient sound, or visitors' priorities for their time on site.

**Significance** Interpreters estimate that more than 800 visitors of all ages heard about amphibian research methods. On hikes with a tablet-based set of visualizations, visitors learned that scientists estimate population size by collecting sound as well as trapping amphibians and conducting visual surveys.

Talking with college students from the Chicago region: A few of them wanted to work in NPS as scientists in some capacity. They were interested in frog migrations, especially in years with extreme weather. —Indiana Dunes Ranger

The kids really enjoyed trying to catch their own frogs, and being able to hold anything we caught. They also enjoyed learning that this was a potential career, to be a professional frog-catcher (sort of). —Indiana Dunes Ranger



Left: Dr. Bob's students lead visual surveys and trapping for a study on amphibian population. Above: Ranger Alex talks through a visualization of frog calls. Some sing low, some sing high. Some sing early, some are more active later. Dr. Bob's data show that mating calls start earlier in the spring than they did in the 1990's. Photo credits: (L) RBrodman (R) JLarson

## A Featured Scientist for Jean Lafitte National Park

**Highlights.** With help from Julie Whitbeck and Aleutia Scott, Jean Lafitte National Park and the iSWOOP project issued its first request for proposals designed to recruit a featured scientist with an interest in science communication and a story to tell. With solid applicants to choose among, Louise Allen recommended iSWOOP work with Katie Percy, Avian Biologist for Audubon Louisiana.

**Significance** Katie Percy is studying the Prothonotary Warbler, listed a top conservation priority species by Partners in Flight, National Audubon Society's 2007 WatchList, and U.S. Fish and Wildlife Service's 2008 Birds of Conservation Concern. This bright yellow songbird breeds in southeastern U.S. hardwood forests and winters in forests in Central America and northwestern South America. Populations have declined every year over the last 50 years. Louisiana supports a hefty 25% of the world's breeding population, making this a critical location for understanding what habitat factors affect breeding productivity.

Percy installs nesting boxes, and bands birds. She hopes that a better understanding of the birds' travel between and use of breeding and wintering grounds will reveal factors that are driving population declines.



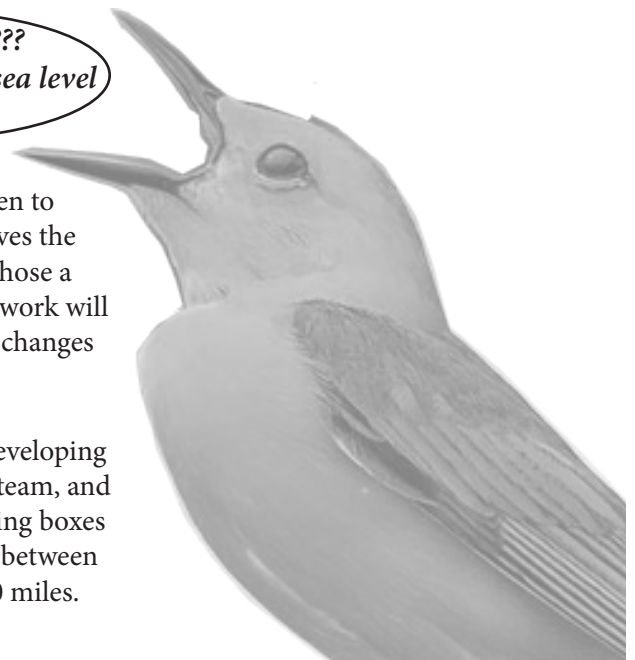
Geolocators on the bands record light intensity every two minutes. Percy calculates the timing of sunrise and sunset each day, which in combination with the date, provides a daily estimate of the bird's latitude and longitude over several months. Photo credit: KPercy



*What's tricky???*  
*What to expect for sea level changes!*

**What's tricky** Scientists are working diligently to model what will happen to Louisiana wetlands with changes to sea level. Much of this science deserves the public's attention, but complicated hydrology could be a tough sell. We chose a scientist whose focus coincides with the public's interest in birds, whose work will be visually stunning, and will be a catalyst for conversations about rapid changes in Barataria Preserve and elsewhere.

**What's next** Katie has been documenting her work as the first step to developing a visual library for interpreters' use. In March 2018, Katie, the iSWOOP team, and interpreters will meet. In the field, park interpreters will help set up nesting boxes in anticipation of the return of the warblers after their annual migration between Louisiana and Latin America— an impressive journey of more than 5,000 miles.





## Joshua Tree National Park

**Highlights** The iSWOOP team met Neil Frakes and Juniper Harrower in December 2016. Both are leading research on the charismatic Joshua Tree.

**Significance** *Yucca brevifolia*, the Joshua tree, is such a survivor. Its seedlings grow in the shelter of nurse plants, meaning seedlings use other plants' canopy as protection. The trees can survive fire and grow in all different types of soils, and yet the future of the Joshua tree, particularly within the current park boundaries, is precarious. The rate of new trees to dead trees is cause for concern. With warmer temperatures, will the life cycle of its one pollinator, the moth, stay in synch with the bloom cycle of the tree? The Joshua tree is under review for endangered species status.

**What's tricky** We won't have an answer for the public soon.

**What's next** This fall we are planning the visual library development and will meet with staff in mid-December.



Park staff and volunteers are measuring Joshua trees to compare the conditions now with the health of the trees in 1977 when a grad student named Hogan set up plots and documented the condition of the Joshua trees. They document the condition of dead trees too, whether the tree remains standing or has fallen over and how long the tree appears to have been dead. Photo credit: MMerson

### Concerned about National Parks?

We'll see what the new budget brings. Meanwhile, this blog entry is one perspective on the work that needs to get done. <http://citizenoversight.blogspot.com/2017/05/trumping-parks.html>

## Interviews & Research Directions

*iSWOOP is dedicated to increasing interpreters' capacity* to make park-based science a prominent part of visitors' experiences. What do interpreters need to do this work? In an effort to understand how interpreters plan, what they count as success, and how they see opportunities for interpretation in research briefs, we conducted several semi-structured interviews with interpreters—new and experienced—with science backgrounds and majors in other disciplines from design to music.

*Interviews of 10 interpreters* provided a window into their practice, the art of interpretation. iSWOOP staff, Merson and Wright, asked, "In the past, what made a program rewarding to lead?" Answers included observable, immediate behaviors on the part of participants such as:

- Participants said, "WOW"
- The audience took notes
- People laughed
- Kids explored in an environment that was new to them.

For other interpreters, their success as facilitators made the program rewarding:

- I got deeper thinking going (e.g., on tough management issues and climate change)
- I used maps, pictures, skulls, art, movement.

The iSWOOP team is interested in the ways in which iSWOOP programs that interpreters design line up with priorities for meeting goals such as *revealing the significance* of natural (and historical) resources, of establishing *relevance*, and of provoking thought and communication, what we term *interaction*.

Interpreters said iSWOOP feels different because of:

- Real data
- Scientists' stories
- Visualizations
- Roving (with an iPad)
- My personal story & interest in the research
- Facilitated dialogue

The first four elements can support revelations, whereas story and dialogue fit under our category of "interaction".

**What's Next** Project staff are continuing to analyze the data and will begin write-ups of case studies about iSWOOP's adoption.

## 6/ Research Briefs through Interpreters' Eyes

**Highlights** iSWOOP leaders kicked off a concerted effort to characterize existing research briefs. Briefs are a standard product within NPS with a look and feel like the example below. Authors imagine the briefs will enlighten interpreters, visitors, and make pertinent information available to resource managers.

**Significance** We were curious to hear interpreters' perspectives on briefs, particularly as they are a resource for interpreters keen to interpret park-based research. Furthermore, when iSWOOP needs to generate supplementary material, should it take this format? If not, what format could a research brief take that would be most useful in supporting interpreters' efforts to increase science and visual literacy and to promote two-way conversations about the value and relevance of park-based research? With information from an audit of existing briefs and 19 interviews during which interpreters commented on the two versions pictured here, we have a better grasp of interpreters' preferences

Great Lakes Research and Education Center

### Amphibian Response to Climate Change at Indiana Dunes National Lakeshore

#### Importance

This study is part of the Terrestrial Wetland Global Change Research Network project coordinated by US Geological Survey Amphibian Research & Monitoring Initiative (USGS ARMI) to investigate the response of amphibian populations to climate change in the northern parts of North America. The research focuses on Wood Frogs (*Rana sylvatica*) and Blue-spotted Salamanders (*Ambystoma laterale*). These are the two species of amphibians that range the furthest north and are the most likely to be impacted by climate change and management approaches. Researchers asked: Does warming impact amphibians in north-west Indiana, including Indiana Dunes National Lakeshore?

#### Methods

In 2013 and 2014 data were collected in the Cowles Bog wetland complex (Figure 1). Amphibian communities are monitored in the field by surveying wetlands and surrounding forest habitat. Each site is surveyed at least once a month from March to June. Adult and larval amphibians, and eggs are surveyed in wetlands using visual searches, minnow traps, and dipnets. Researchers search for terrestrial adults and juveniles under logs and leaf cover. Song meters are mounted in boxes on trees at four sites to record frog calls. The digital recordings are sent to the USGS ARMI program for analysis. The call data can be used to identify species. Dates are added to a database on timing of breeding activities for each species. The amphibians collected are photographed and identified in the field and immediately returned to their site of collection.

#### Preliminary Results: Amphibian Abundance

Observations made in 2013, the year flooding ended the 2012 drought, revealed larger numbers of breeding amphibians however, this was the first year that the research team did not observe any Four-toed Salamanders. Slimy Salamanders had become rare in recent years, and none was found in 2012 or 2013. Other herpetologists have observed similar declines.

In 2013 data were collected during four survey visits and from one songmeter in Cowles Bog.



Figure 1. Researchers assessed abundance for baseline (2013), restoration activity (2014-2015), and post restoration (2016).

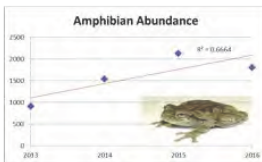


Figure 2. Amphibian trends are shown with red regression lines and R2 for amphibian abundance, diversity index, species richness, and salamander abundance for baseline (2013), restoration activity (2014-2015), and post restoration (2016).

Interpreters compared two versions with similar text, but different sub-heads and images.

Great Lakes Research and Education Center

### Frogs & Salamanders of Indiana Dunes

#### Range—Does warming impact amphibians in NW Indiana?

Dr. Bob Brodman and his students from Saint Joseph's College asked: Do amphibians believe in climate change? It seems like a silly question but animals don't have political biases, yet they respond to changes in their environment. The research team tracked timing of hibernation, breeding, and tadpole development to see if amphibians are responding to a warming environment in a predictable way.

#### Methods—How did scientists determine an answer?

Dr. Bob's team has surveyed 17 species of amphibians since 1994 and compared their abundance and earliest date encountered to climatic data collected by the weather station in Rensselaer, IN. Temperature and humidity, to a lesser extent, are the main factors that trigger breeding, which is indicated by mating calls.

Adult and larval amphibians, and eggs are surveyed in wetlands using visual searches, minnow traps, dipnets, and seines. Research team members looked for terrestrial adults and juveniles under logs and coverboards.

One approach since 2010 has been to record frog calls with monitors. Four installed songmeters captured data on the abundance of Wood Frogs and Blue-spotted Salamanders within parklands. The digital recordings are sent to the US Geological Society Amphibian Research and Monitoring Initiative (ARMI) program for analysis and species identification. Dates are added to a database on timing of breeding activities for each species.

Unisexual (all female) populations of Blue-spotted Salamanders and Jefferson Salamanders are cryptic, meaning they look alike but might be either (a/the) type that takes genetic material from males or not. However, unisexual salamanders have hybrid genomes, so to get an accurate count, tail tips (2 mm) are taken in the field from salamanders that look like Blue-spotted Salamanders or Jefferson Salamanders for genetic work using microsatellite analysis. All wildlife collected is photographed, identified in the field, and immediately returned to their site of collection.

#### What were scientists' hunches?

- A change in climate could impact amphibian survival.
- Amphibians come out of hibernation earlier than usual and many die because their food sources are not yet available.
- Breeding may not stay in synch between males and females.
- Amphibian population numbers may drop if wetlands fill too



Researchers set minnow traps in standing water to capture amphibians.



Blue-spotted salamander from Cowles' Bog

Interpreters offered positive comments about images of "critters." Several liked the sub-head, "What were scientists' hunches?" saying that this humanized scientific research and opened up the opportunity to talk about how much more there is to learn.

86 briefs were analyzed

According to the Flesch Reading Ease score, the briefs were a difficult read.

82 briefs featured images, providing visual interest, illustrating text, or reporting trends with photos, maps, and graphs. Although 11 briefs included 6-10 visual elements, 2 was the mode.

#### Notably

—Briefs rarely developed a story line about the research process or showed researchers at work (fewer than 5)

—Sections on implications addressed park managers.

Very few offered next steps for interested visitors.

—A contact for further info was provided, however, interpreters looked for terms of use and ways to access hi-res images, which were not provided.

**What's Next** We hope to publish findings in 2018. iSWOOP products will adopt interpreters' recommendations.

Merson has joined a work group of NPS staff collaborating on research brief makeovers. The edited versions are written with interpreters in mind.



# Science in the Public Eye Symposium, One-time Opportunity

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iSWOOP is coordinating a symposium entitled “Science in the Public Eye: Leveraging Partnerships.” The symposium will take place as part of the annual meeting of the Society for Integrative and Comparative Biology in San Francisco, January 3-7, 2018.

Art and design, play, professional development, conversation, collaboration are all part of the mix as speakers share experiences and strategies for moving cutting edge science into the public eye.

The deadline for interpreters to apply for scholarships is November 5, 2017. Priority given to those within driving distance.



**An invitation:** Assistance with registration costs is available for leaders in informal settings interested in science communication. E-mail Martha\_merson@terc.edu by Nov. 20. iSWOOP will provide scholarships covering registration and travel costs for park rangers/environmental educators committed to planning for iSWOOP at their parks. Photos: (top 7 bottom R) Lebar, Pfundstein, Marquardt (bottom L)

**For the application** [https://docs.google.com/forms/d/e/1FAIpQLSef4GspgVeiAPVqr1E5u1hhS21vjHUrHqmTkvgQNse8\\_HWhDQ/viewform?usp=sf\\_link](https://docs.google.com/forms/d/e/1FAIpQLSef4GspgVeiAPVqr1E5u1hhS21vjHUrHqmTkvgQNse8_HWhDQ/viewform?usp=sf_link).



**Thank YOU!!**

Please know, named or not, we feel gratitude for your ongoing support and interest. Thank you ...

Interpreters and park leaders for taking on the project!!!!

Advisors for your enthusiasm, for advice, and editorial suggestions.

Research Learning Center staff in Maine, NC, Indiana, and Alaska for collaborating and supporting iSWOOP's work.

Scientists! Your generosity and patience keep us motivated.

Film makers, designers, thank you for keeping us lookin' good.

Visitors, volunteers, relatives, allies, all, in your workplaces and networks. We can't imagine where we would be without you.



Ranger Bill contrasts the relative position of dunes and trees on Mt. Baldy, one of the world's most studied dunes. Geologists and biologists are working to explain why there would be holes in a dune large enough to trap a child when sand grains usually pack tightly against each other. We keep learning! Photo credit: MMerson