



# Getting Started with iSWOOP

A Guide

## Acknowledgments

We are grateful to the many interpreters, scientists and resource managers who have made park-based research a lively, interactive part of park visitors' experiences. We are thankful for Park Service staff who have advised the iSWOOP project, and to the National Science Foundation for its support.



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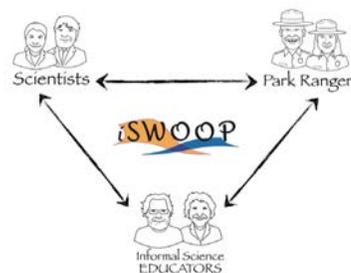
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## To You

Welcome to a unique collaboration of rangers, educators, and scientists to advance the public's engagement with park-based science.



iSWOOP has promised to:

- Expand STEM learning opportunities at our nation's parks.
- Create a model for making science prominent that works at parks of different sizes and types

**Whether curious about iSWOOP or already committed, this guide is for you.**

iSWOOP's success hinges on professional development for interpreters, but so much has to happen before the first session can get underway. Wondering if your park can benefit from iSWOOP? Skeptical that a park with your visitation patterns, staffing, or resource can implement an iSWOOP approach to making research part of an interactive experience for visitors? In this guide, you will find an overview of iSWOOP's goals as well as:

- an explanation of what iSWOOP is and is NOT;
- a brief checklist to help you determine if iSWOOP could work at your park
- strategies for getting buy-in from leadership and front-line interpretive staff
- handouts and tools to help you get started, (e.g., an application to recruit a featured scientist)



iSWOOP focused on bats and wildlife researchers originally, but can feature any scientist or resource.

Depending on scientists' availability, the range of existing visualizations, and staffing and the schedule, you may need more or less time to get iSWOOP rolling. Once you have colleagues and a featured scientist on board, consult the guide for facilitating professional development, which gives more detail on the professional development sessions for interpreters. In that document, the training is presented as four days, however sessions can be presented during one week or spread over several weeks. This guide repeats some of the introductory matter so you have a reference close at hand on the project goals, the fit with 21st Century Standards for Interpretation and how iSWOOP fulfills NPS goals to advance science learning and communication.

### Getting Ready for iSWOOP

Is your park one that could do iSWOOP? Nearly every park could take an iSWOOP approach to interpreting science for the public, but it will take slightly different form at every park. Someone needs to think carefully about the following:

- What scientific research is underway?
- What science research is exciting to resource managers?
- What questions do visitors ask?
- Where are substantive conversations with visitors occur?
- Will interpreters showcase science research?
- Will resource managers offer support?
- When is there time to train staff?

## A Brief Rationale: iSWOOP Overview and Project Goals

iSWOOP stands for Interpreters and Scientists Working On Our Parks. Funded by the National Science Foundation, iSWOOP can help the NPS accomplish its mission. NPS strives to be an educational force based on core American values, historical and scientific scholarship (The Park Service Call to Action, 2011). iSWOOP can be a mechanism that helps park units take up the challenge of improving the scientific literacy of the citizens of this nation and help foster a national stewardship ethic (NPS Science in the 21st Century, 2009).

In a nutshell, iSWOOP advances STEM (science, technology, engineering, and math) learning among national park visitors. iSWOOP educators, scientists, and National Park Service (NPS) interpreters bring visitors into the loop on the science research underway on park lands. **iSWOOP programs and informal interactions led by interpretive rangers give visitors an opportunity to see aspects of the park that are not usually visible and to discuss the relevance of park-based research.**

The iSWOOP model on p. 3 lists the components and expected outcomes for visitors.

During iSWOOP's funded research, we are looking to interpreters to:

- Contribute to a model for making park-based research a prominent part of the visitor experience across the park service
- Contribute to research on interpretive techniques and visitors' interests
- Showcase science happening in national parks
- Increase visitors' science literacy
- Increase visitors' visual literacy (See p. 13 for more details).

Interpreters plan and deliver formal and informal interpretive programs, incorporating these central elements of iSWOOP:

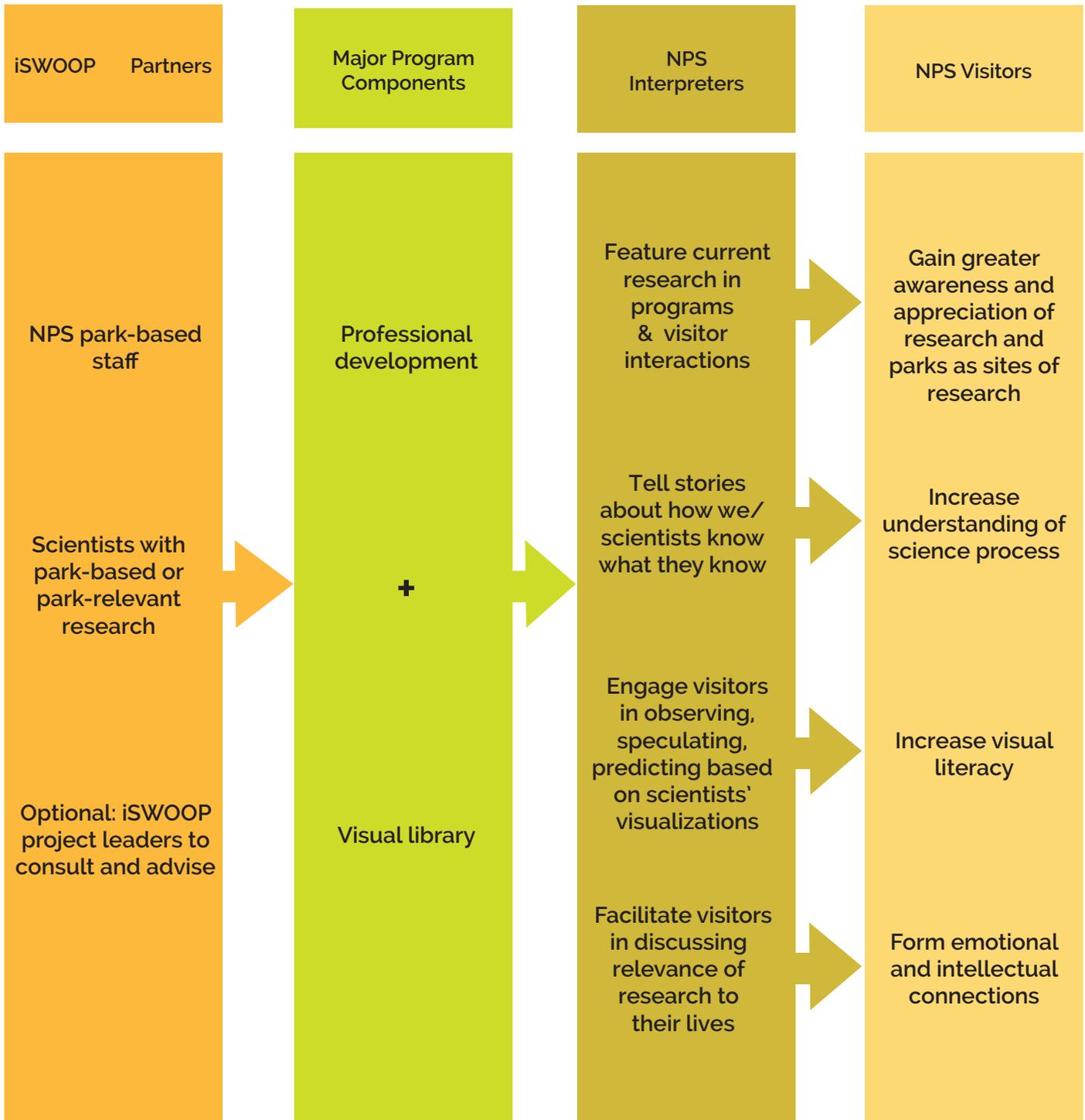
- Facilitating interactions that feature opportunities for visitors to observe, predict, and speculate
- Making research prominent through stories about research, scientists, and technology innovations
- Making research prominent through the use of still images, video, and other visualizations.



iSWOOP addresses the disconnect that NPS interpreters often feel between themselves and the research underway behind the scenes. iSWOOP helps interpreters do their jobs with excitement and confidence.

The project is working toward developing models for parks of different sizes, types, and visitors. Together with park partners, the project will document how programs for visitors are implemented (program outlines), what works in NPS staff members' opinions (on-site interviews and blog posts), when an effort misses the mark, and what might be adjusted (feedback forms on programs).

## The iSWOOP Model: Components and Outcomes



# Moving Ahead Strategically

## Questions to Answer—Before you iSWOOP

___Yes ___No	Do interpretive rangers regularly interact with visitors during roves, patio talks, tours, or formal programs?
___Absolutely ___Not really	If not, can the schedule shift to include programming (including roves) to allow for longer interactions?
___Of course ___Need to check	Do interpreters use techniques to involve visitors in sharing observations, predictions, and speculations with each other?
___Absolutely ___Not really	If not, are staff motivated to shift interpretive practice to interactive exchanges about scientists' methods and findings?
___Of course ___Need to check	Is there active science research on topics visitors tend to ask about?
___Absolutely ___Not really	Are visitors curious about wildlife or the landscape, flooding, fires, recent discoveries? What questions do they pose?

Most likely you answered yes or absolutely to the questions above. iSWOOP is meant for you! And it's meant to be flexible, but you'll need to build support for it and shape it to meet the opportunities and challenges at your park. To get started, build buy-in and confirm support. As you talk with co-workers, you can show or direct them to the 3-minute videos available on [iswoopparks.com](http://iswoopparks.com) or access slides and handouts to explain the project and generate enthusiasm (**in development**). This guide provides suggestions for talking broadly about the project goals, the outcomes at Carlsbad Caverns, situating iSWOOP in interpreters' worlds, and the requests of resource managers. You will know best in what order to approach people and what details will make a difference to them.

### Building Support among Leadership

- Talk with park leaders about iSWOOP, its goals (pp. 2-3) and benefits (Findings, pp. 7-8)
- Be clear on what iSWOOP is and is not, how it differs from science-based programming you already do. See p. 9 for talking points
- Explain the resources needed. See p. 6.

### Building Excitement among Interpreters

- Talk with interpreters about the fit with 21st century interpretation
- Talk through trade-offs and concerns

### Talking with Resource Managers

- Explore options for the science focus
- Ask for their help contacting scientists

## What iSWOOP Is and Is NOT

Parks get at science in many ways, through waysides, newspaper articles, social media posts, talks and walks, and even apps that help visitors identify species or contribute data to a study. How does iSWOOP distinguish itself from the science-based interpretation currently happening in parks? Below are some of the ways we see iSWOOP as different.

### iSWOOP Is ...

Personal and interactive: an approach to personal interpretation that makes science in parks an interactive and visible part of the public's park experience

Audience-centered, two-way conversations that allow time for visitors to engage with each others' ideas

A way to talk about science as a process that starts from questions, involves revision, and has the potential to matter to all of us

Science in parks is inherently interesting and full of good stories--both first person from interpreters' experiences and about the researchers and what they are studying

Technology and innovative methods are key to understanding how we know what we know.

Images are sequenced to reveal something about the resource, but also as a starting point for inquiry and discussions of relevance

Programs, formal and informal, that invite visitors to predict, observe, and speculate.

Comfortable with silence and reflection

Possible because interpreters and scientists spend time together in the field and in the classroom

### iSWOOP Is Not ...

Primarily using waysides, social media, exhibits, or print media to showcase park-based science

Information out,

A way to remind visitors that science is largely a collection of facts about how the world works

Facts strung together and offered in an engaging way

Facts shared without attention to who figured it out and how

Images are primarily shown to illustrate a place

A replacement for the strategies and know-how interpreters possess already

Pre-scripted and pre-determined

Minimal or limited direct contact between interpreters and scientists, such as a 1 hour bag-lunch or field work encounter without follow up

## Resources Needed

### Supporting an iSWOOP collaboration

iSWOOP is based on a collaborative model. The items in the center of the triangle are the infrastructure that will make iSWOOP-style science communication a success. Interpreters need a repertoire of techniques to promote visitor interaction; display options such as tablets, a large screen, or simply laminated photos. High quality prints and visual media reveal to visitors how scientists see the resource. Professional development supports the use of techniques, devices, and media.

### Make a plan to acquire (or reserve for use)

**Display Options:** Possible equipment includes iPads, laptop, large monitor

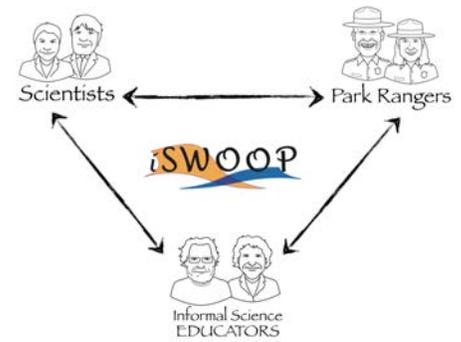
**Visual Media:** Assess options for the visual library. For example, ask the featured scientist to show you powerpoints from conferences and speaking engagements to lay audiences. Once you have a story in mind, e.g., how did scientists figure out how many bats live in the cavern, or how are the park's amphibians reacting to climate change, ask resource managers if they have photos or maps to contribute. Depending on the scientists' and the park's visual assets and staff expertise, you may decide to budget for assistance with graphic design, a photo shoot to capture researchers at work, pay for copyright permission to use others' maps or video. (See p. 13-14 for more detail.)

Dedicated time for professional development to go over Visitor Interaction Techniques: Practice with questioning, storytelling, and techniques to elicit discussions about relevance. See the iSWOOP Professional Development: A Guide for Facilitators. The guide describes how to lead sessions on visitor interaction techniques as well as how to structure time direct contact with scientists--both in the classroom and the field.

### Reach Out!

Please! Seek out iSWOOP project leaders as a sounding board. Ask us about available resources to support your efforts (devices help with professional development, evaluation), and to let us know how it goes.

Project contact: [martha\\_merson@terc.edu](mailto:martha_merson@terc.edu); [iswoop@terc.edu](mailto:iswoop@terc.edu)



Scientists bring knowledge of phenomena; Rangers bring knowledge of place; the public brings questions and prior knowledge. iSWOOP adds display options, visual media, and professional development.



Interpreters gather for professional development.

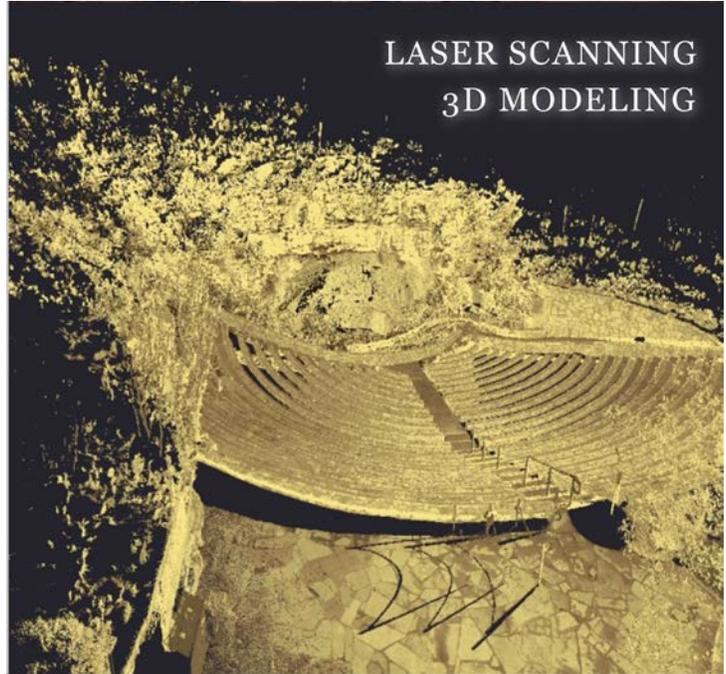
"I find the opportunity to see and do the research most valuable. In many parks it happens behind the scenes and the interpreters are only told about the end result. We are asked to talk about something we are expected to take on faith."—NPS Interpreter

## Findings from iSWOOP at Carlsbad Caverns

iSWOOP's pilot project involved 14 interpreters at Carlsbad Caverns in training in January and June 2014. The program's external evaluator reported on its reception. Findings from the pilot at Carlsbad Caverns are based on survey responses gathered before and after professional development, posts and comments to the project blog, 26 observations of interpreters' programs and several more observations of interactions during roves, as well as feedback logged by interpreters after their formal programs. More detail can be found online in the report "To Be More Inquisitive in the Natural World," available on [iswoopparks.com/reports](http://iswoopparks.com/reports). Highlights include:

### iSWOOP fostered multi-directional communication about park-based research.

The project provided a structure and point of access for park-based research. iSWOOP encourages conversation, where interpreters listen and question more and talk less. Nine out of 14 interpreters reported that iSWOOP had enabled them to look at visitor engagement differently.



Rangers used images like this from Hristov and Allen's research to give visitors another way to see the caverns.

**10 out of 14 interpreters named research knowledge and access as the biggest benefits of iSWOOP.**

*It helped me put some energy back into my programs and approach them a different way. Oftentimes the default for our programs is to do all the talking. This helped me step back from that.*

*I've realized that I should let the visitor define the parameters of the interaction more, especially in family settings. When I hear a question, instead of immediately swooping in to answer, let the adults in the group respond first, and let them invite me to participate. This has been richly rewarding ...*

### iSWOOP affected interpreters' skills and practice.

Following iSWOOP professional development sessions, interpreters reported that they had improved in their ability to:

- make sense of scientists' visualizations: 11 out of 14; 79%
- explain areas of scientific bat research being conducted at CAVE: 79%
- generate excitement about park-based research: 71%

*My own personal science literacy has been drastically improved. How are we to be good residents of this planet if we barely understand it and our impact?*

Just about half of the sessions observed (14 sessions; 54%) used a range of interactive techniques.

## Findings continued: More Benefits

### Additional Benefits for Staff

iSWOOP motivates collaborations. Among interpreters who were trained, many commented on the value of seeing the variety of ways their colleagues interpreted research stories. Interpreters also value the time in the classroom and in the field with scientists. One interpreter wrote: "I have truly appreciated the improvement in my workplace."

### Benefits to Visitors

With iSWOOP, visitors had opportunities to engage with park-based research. With further research, the iSWOOP team expects to show gains in visual and science literacy. Depending on the interpreter's framing, participants could be revisiting important ideas about science process:

- that investigations start with questions and there is always a next question;
- that science involves revising and refining what we know in light of new findings
- that science is about how we know what we know, not simply a body of facts

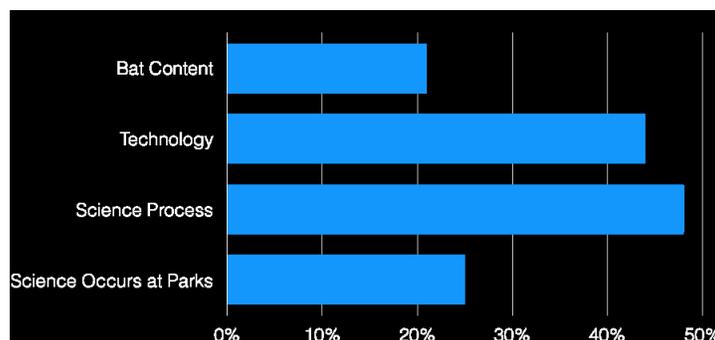
**At Carlsbad Caverns** interpreters invited visitors to examine high-speed video of the bats' emergence and thermal footage from the roost. They viewed high-speed video of different bat species to talk about wing structure and function. They discussed patterns related to precipitation and colony size. The idea that researchers are working at national parks was new.

*Most of them [the visitors] thought that seeing scientist's work presented this way was different. It was not a presentation of facts so much as an opportunity to see things they weren't expecting to.*

The idea that researchers are working at national parks made an impression. Visitors explicitly commented on this.

*... One lady talked about how she didn't even know the park was being used for research.*

*One person said that they had no idea anybody was researching bats. Someone else didn't realize that the National Science Foundation was publicly funded.*



Visitors Comments on "What was New?"

48% stated they learned about how scientists work (aka, the process of doing science)  
44% stated they learned how scientists use technology to conduct their work.  
25% stated they became aware of the fact that scientific work is being done at parks.  
21% stated they learned more about bats. N = 73

Acadia National Park,  
Summer 2016

Rangers' reported on the science that was engaging, surprising, and valuable to their visitors.

[Visitors] appreciated the perspective that they had their own set of valuable knowledge (understanding of science principles) and that they could begin to look at the landscape and piece stories or questions together.

Many never thought about pollen grains looking different from each other, or being species specific.

People like to feel connected to current research in the park.

## Talking with Interpreters

In iSWOOP's experience, interpreters welcome direct contact with researchers and opportunities to learn about their research. Many also embrace the opportunity to work on their craft.

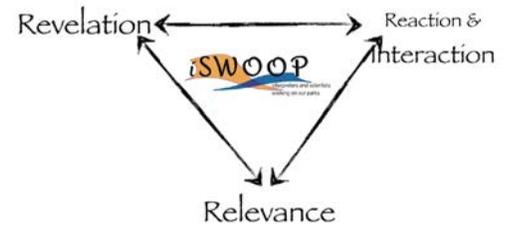
**"The methods we have been encouraged to use in our iSWOOP programs are the future of NPS interpretation..."—Interpreter, Carlsbad Caverns**

**Points to highlight.** When talking with interpreters, stress that:

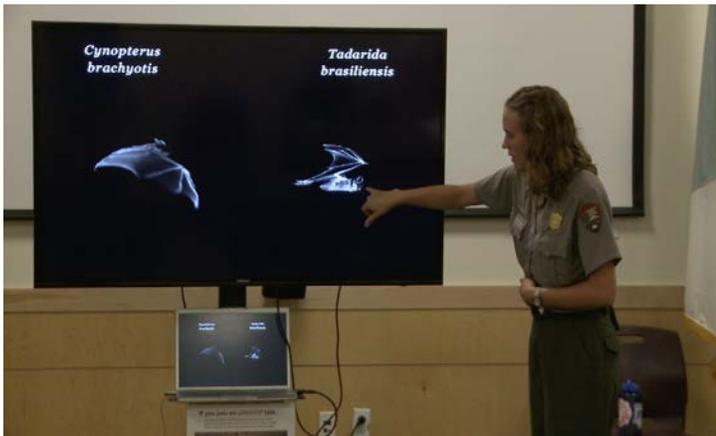
*iSWOOP is meant to make park rangers' jobs easier.* Talking about park-based research gives visitors another way to form emotional and intellectual connections with the resource—through stories about research, gaining insight into new technologies, and considering the relevance of park-based research.

*iSWOOP is in synch with the standards released by the Interpretive Development Program in 2016.* See p. 11 for iSWOOP's take on the standards for interpretation.

*iSWOOP assists Park staff in accomplishing recommendations,* such as the Natural Resource Challenge (1999) in the area of science communication: "Knowledge gained in national parks through scientific research is promulgated broadly by the National Park Service and others for the benefit of society."



iSWOOP's strengths align with the standard elements of interpretation include revelations about the resource; provoking an emotional or intellectual reaction; and forging connections, which involves establishing relevance.



Ranger presents using Keynote™ and a 60" screen.

**Questions and Responses.** Interpreters may be skeptical, reticent, or opposed to adopting new (prescribed) techniques, managing technology, or giving up existing programs if there has to be a choice. Interpreters may raise questions along the lines of those below. The answers below reference ways iSWOOP and collaborating parks have handled conflicting interests.

**Learning to present with new tools—Is it necessary?**

Depending on the formats that scientists work in, interpreters might have to learn new software. At Carlsbad Caverns, all visual material was shared in Keynote™. It had a steep learning curve. After the first round of training, facilitators made sure to allow for

more hands-on practice time with the devices.

iSWOOP encourages a period of experimentation, documentation, and data analysis. If data collected by the park or the project indicate benefits to visitors, supervisors may want to set expectations--and even incorporate them into their employees' annual reviews. At each park, leaders will have to decide what the expectations are of staff. Is iSWOOP a matter of interpretive style, one that is a matter of choice, or is it about making STEM learning opportunities available to visitors in an equitable and consistent way? The project hopes that approaches with proven value become standard practice, woven into expectations of interpreters in a formal way.

## Does doing iSWOOP programs mean giving up other popular programming?

Participating interpreters are asked to develop an iSWOOP program, meaning that they think through the theme, objectives, universal concepts, techniques, etc. that they would use to present interactive opportunities for visitors to learn about and discuss park-based research in a 20-30 minute-long program. Once that program is developed, parts or all of it can be delivered as part of a tour, incorporated into a hike, daylong program for a group, etc. Each park needs to think about where the best time and place is to offer iSWOOP. At Carlsbad Caverns, roving in the caverns enabled interpreters to talk with visitors where the visitors wanted to be spending their time. Visitors seemed more likely to respond to questions in an informal conversation than when they were asked in the theater during a formal program. Interpreters may have favorite programs that draw a large audience. Giving these programs up in exchange for offering iSWOOP programs on particular park-based research can feel like a loss. Supervisors making the schedule can take this into account. At Carlsbad Caverns, interpreters wondered if every surface program on the schedule had to be an iSWOOP program about bats and bat research. It did not. (However, current park partners are expected to offer multiple opportunities a week for visitors to discuss park-based research.)

## What if visitors did not come to the park to learn science?

National park visitors have many reasons for visiting. Like museum visitors, they may fall into a few different categories, but these are not necessarily fixed. On one day motivation for visiting may be to facilitate someone else's enjoyment--"We brought our out-of-town cousins to show them ...," but on another day, it's for personal reflection an escape, or adventure. It's a park, where people make their own decisions about what they would like to do. Looking for opportunities and offering iSWOOP is fine. Forcing or inflicting interpretation is not expected.

### Target Audience

Research on museum visitors' motivations has yielded categories that can be a useful way to think about park visitors as well (Falk, 2012). The types of visitors most likely benefit from iSWOOP include:

**EXPLORERS:** Visitors who are curiosity-driven. They expect to find something that will grab their attention and fuel their learning. At parks, these folks eat it all up. They read signs, listen to audio-guides, sign up for tours.

**FACILITATORS:** Visitors who are socially motivated. Their visit is focused on enabling the experience and learning of others in their group. Rangers see this when adults push their kids forward and position themselves in the background.

**PROFESSIONAL/HOBBYISTS:** Visitors who feel a close tie between the resource and their professional or personal passions. Their visits are typically motivated by a desire to satisfy a specific objective.

**EXPERIENCE SEEKERS:** Visitors who are motivated to visit because they perceive the park as an important destination. Their satisfaction primarily derives from the mere fact of having 'been there and done that'. iSWOOP can work for this type of person too because their agenda isn't too fixed. They're ready to make the most of the opportunities available.

The types of visitors who are less likely to participate actively and to enjoy an interactive experience are:

**RECHARGERS:** Visitors who are primarily seeking to have a contemplative, spiritual and/or restorative experience. They see the park as a refuge, crave time alone or seek a confirmation of their religious beliefs.

**EXPERIENCE SEEKERS OR EXPLORERS WITH A PLAN:** Sometimes explorers and experience seekers have a plan. They are fixated on a geoquest or a physical challenge like a bouldering expedition and may not pause for science learning opportunities.

[http://slks.dk/fileadmin/user\\_upload/dokumenter/KS/institutioner/museer/Indsatsomraader/Brugerundersogelse/Artikler/John\\_Falk\\_Understanding\\_museum\\_visitors\\_motivations\\_and\\_learning.pdf](http://slks.dk/fileadmin/user_upload/dokumenter/KS/institutioner/museer/Indsatsomraader/Brugerundersogelse/Artikler/John_Falk_Understanding_museum_visitors_motivations_and_learning.pdf).

# iSWOOP Foundational Competencies for NPS Interpreters

Based on The Foundations of 21st Century Interpretation, 2016

## Evolving Interpretive Theory and Relevant and Essential Ideas

- Uses park-based (or site-relevant) research to provoke emotional and intellectual engagement with resource meanings and relevances (sparking or fueling visitors' interests)
- In active and engaging ways, uses scientists' research questions and findings to explore how we know what we know, as well as other relevant and essential ideas and/or values
- Asks questions which help audiences consider both personal relevance and broader needs of society

## Knowledge of Audience and Community and Embracing Multiple Engagement Strategies

- Actively engages participants and solicits open expression of their unique perspective
- Invites audience to express observations, speculations and predictions
- Balances the amount of "broadcast" and "listening" time intentionally to facilitate visitor engagement and expression of knowledge
- Continuously adapts and employs different modes of communication in response to evolving audience input, reaction, and self-expression
- Responds to audience input in intentional ways, allowing experience to evolve based on audience motivation
- Encourages audience members to build on each others' ideas and perspectives

## Knowledge of On-Site Resources, Research and Current Context

- Incorporates current scholarship, giving the research a frame or context related to the meanings of the resource and engages visitors in learning about science research
- Shares details or broad purpose of the scientific research being conducted at the park (e.g., research questions, methods, findings, future research agendas from park-based research)
- Positions self and audience as learners and stakeholders in research, its questions, challenges, innovations and applications
- Incorporates scientists' graphs, descriptions or demonstrations of instruments, and visualizations into programs
- Explains/fields questions to help visitors make sense of scientists' visualizations

The Mather Center for Interpretive Development intends to update these annually. See <http://idp.eppley.org/sites/default/files/Foundations%20of%20Interpretation-Version%202016-NPS-IDP-with%20cover%20%281%29.pdf>

## Talking with Research Managers: Identifying Scientists to Participate

To talk about park-based researcher credibly, interpreters need to acquire stories and an understanding of the science.

**Choose a featured scientist to begin.** The pool for scientists can include four types of scientists:

- 1) Currently and actively conducting research in the park, but employed elsewhere
- 2) Currently and actively conducting research in the park, works at the park, employed by NPS (e.g., on resource management)
- 3) Currently and actively conducting research in the park, does not work at the park on a daily basis, however, is employed by NPS or a sister organization, e.g., Fish and Wildlife or Forestry Service or NPS' Inventory & Monitoring team)
- 4) Active researcher on topics with relevance to the park, but not employed at the park and does not hold an active research permit.



Bob Brodman, Indiana Dunes' scientist, is Type #1.



Jacquelyn Gill, Acadia's featured scientist, is Type #4.

**Figure out who should be in on the decision for selecting a scientist.**

**Establish criteria.**

Recognizing that you probably will not find a person who meets all of the criteria, you and others should establish criteria and prioritize them. Suggestions for criteria include:

- Research interests are close to visitors' interests and/or the interpretive division's plan or a resource management topic of concern
- Personifies or embodies a good story (the research questions are suspenseful), applies technology in innovative ways, etc.
- Has some characteristics that will help audiences expand their idea of who a scientist is, e.g. is female, is from an underserved community, brings art to their science
- Is someone whose work can use the visibility
- Researcher is interested in participating in iSWOOP. With or without funding,
  - a) Will be willing to donate images and to generate new images, animations, graphs, etc.
  - b) Is willing to participate in on-site professional development sessions and
  - c) Is willing to lead a field-based component for interpreters; with authentic tasks.
  - d) Will be responsive (e.g., via email and phone) and
  - e) Embraces the iSWOOP mission with enthusiasm and is pleasant to work with

You may create a short list of candidates and set up times to talk with each one or send out an application (See sample, p. A-3) and then reach out to the candidates who look most suitable.

### Selecting a Scientist

At Indiana Dunes, staff from interpretation and resource management considered whether we wanted to feature bat research, as the iSWOOP pilot did. We have no caves and the majority of people don't visit at night or encounter bats. The monitoring project underway is also very simple, and we were looking for a more complex story. We decided not to go with a bat project.

One project leaped out when we consulted the NPS Research Permit and Reporting System (RPRS)—"Amphibian Response to Climate Change." The selection team was excited about improving our ability to interpret climate changes in northwest Indiana and the Dunes. We thought that people might relate in positive ways to amphibians, and might take action to slow climate change if they understood negative impacts on amphibians. We also knew that Dr. Brodman's data is analyzed in association with satellite data from USGS. We thought we could get some people interested in the use of the satellite technology.

The fit seemed promising, especially when we factored in how passionate Dr. Brodman of St. Joseph's College is about helping people understand his work.

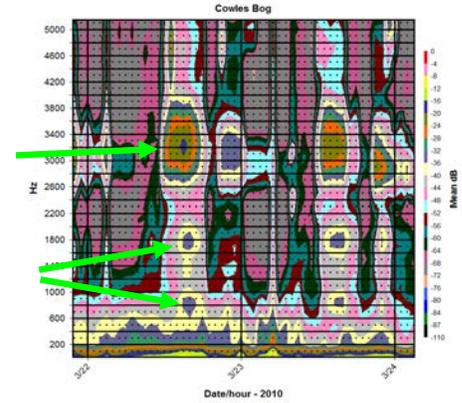
Wendy Smith  
Great Lakes Regional Learning Center,  
Education Coordinator

# An iSWOOP Visual Library—A Must-Have

## Promoting Visual Literacy

Proponents argue that visual literacy is essential for 21st century learners, a skill that cuts across disciplines. Visual literacy is the ability to interpret, use, appreciate, and create visual media to advance thinking, decision making, communication and learning (North Central Region Education Lab (NCREL); the Metiri Group, 2003). Visual literacy skills equip learners to understand and analyze the aesthetic, intellectual, and technical components involved in the production and use of visual materials (Association of College and Research Librarians, ACRL, 2011)

A visually literate individual is both a critical consumer of visual media and a competent contributor to a body of shared knowledge and culture (Association of College and Research Librarians, ACRL, 2011) Yet students tend to exhibit less comfort and skill with interpreting and discussing visual information than they do with textual information (Hattwig, Bussert, Medaille & Burgess, 2012). College faculty convey dissatisfaction with students' abilities to coordinate visuals with other information and make effective arguments with visuals, and (Green, XXXX). iSWOOP programs can offer a safe space for adults and youth to apply and refine a subset of their visual literacy skills. iSWOOP is best suited to influencing these three aspects of visual literacy.



Spectrographs make sounds easier to analyze.

*Interpretation of visualizations.* The ability to make sense of visual information like lines, shape, color and interpret these to understand phenomena and how they represent action or change. Interpreting complex relationships represented in a visualization can be a challenging, compelling puzzle. Visitors can look for patterns and a story that the data tell. They can make sense of individual points and overall trends.

*Applying a critical lens.* Posing questions about the production of an image can lead to a critical stance so that visualizations are not taken at face value. Questions include: Who took captured the image? How was it processed? Where was it cropped and what was left out? (See Jarman et al, 2012).

*Becoming inquisitive.* Prompts can stimulate an imaginative response that explores multiple perspectives: How would it feel to be in this image? Questions like: What else do you want to know? What is puzzling? spark curiosity.

## Compiling a Visual Library

At Carlsbad, interpreters enjoyed having a selection of 40+ visualizations that they could choose among to create their unique mix of slides and story. Start with 10 or 12 images. Reflect on how conversations between interpreters and visitors unfold. Add to the library as needed. Suggestions for getting started and examples for what to include follow:

- Ask the featured scientist to show you slides from conferences and speaking engagements to lay audiences.
- With a story in mind, (i.e., how did scientists figure out how many bats live in the cavern, or how are the park's amphibians reacting to climate change), request permission to draw from scientists' existing imagery.
- Identify gaps in the story and see if there is a way to fill in (e.g., There is nothing on taking measurements in the field. Will you be going out again soon? Can someone take pictures or video when you do?)
- Request less complex versions of graphs, to scaffold understanding. For example, if a graph shows multiple species over multiple years with multiple environmental factors, ask about creating graphs with one species. Building toward complexity creates intermediate steps so visitors stay engaged and follow along. Use this approach especially if a feature or concept is counter-intuitive, i.e., color-coding is used to relay information about wind strength or depth rather than temperature or if red doesn't denote the hottest spot.

- Ask resource managers for photos or maps. In addition to road or topo maps of the area, they may have maps of habitats, types of rock, or plant ranges. Before and after pictures are a great way to generate observations and conversation, e.g., before and after restoration projects, fire, or flooding.
- Seek out images for comparison and contrast. Researchers have documented that youth benefit from scaffolds for meaning-making, particularly those that juxtapose literal with symbolic representations. Imagine comparing video of actual movement with a graph of the speed of movement. Researchers (Nemirovsky, Wright, Rubin, Barstow) have all found such scaffolding helps learners understand change over time and scale, which are invaluable in understanding the natural processes at work in parks.
- Create a collection of physical images or install digital media on a tablet or laptop. Start testing with small groups of staff or visitors. Listen for combinations of questions, silence, comments, prompts, and images that spark reactions and conversations about relevance.

### Visual Library Contents

Image Type	Purpose for Inclusion	Example
High resolution images of the resource, May be close-ups or not, action or not	Showcase the resource; make off-limits, inaccessible, out of season aspects visible; reveal biological structure or function; evoke a reaction of "So cute," in order to spur stewardship, care and concern.	Close up of Brazilian free-tailed bat  Bog or coastal landscape or forest with varied features
High-res images of the hi- or low-tech instruments	Supply a visual reference for scientists' tools that may or may not be familiar to visitors. Illustrate a story about innovation.	Instrument for taking a sediment core or laser scans
Visual that documents the problem or focus of study	Illustrate what was investigated or still to be investigated.	Bridge in a high traffic area that is home to bats
Video of the phenomenon	Establish shared experience of watching the phenomenon; help viewers imagine themselves as researchers; provoke conversations about challenges to research.	Laser scans of the cave, bat emergence or return, mating, especially an off-limits or out-of-season phenomenon
Tutorial slides	Introduce complexity starting with few variables or familiar objects.	Candle and icepack
Video of the research in action	Illustrate science process; inspire people to pursue related career	Researcher swabs a bat
Humans in interaction with the resource	Model how to handle the resource without harm; gets across scale	Researcher holding an infant bat
Images that precede graphs or visualizations	Show the process of data analysis, that is, what the instruments pick up that the researchers then analyze	Algorithms at work, e.g., computer as it counts and tallies bats
Images of applications of technology or approach	Illustrates relevance outside of the park	Applications in medicine or architecture
Graphs, spectrographs	Show variation over time	Precipitation over time or nighttime soundscape
Juxtapositions of nearly any of the above	Invites comparison of species or conditions; illustrates confirmation of findings	Bog during wet and dry seasons; bat in flight at slower and faster speeds

## So, What's Next?

You may find iSWOOP doable or you may find that one aspect or another places unrealistic demands on staff. If this is the case, perhaps you have new ideas for how to collaborate with resource managers or scientists. Please don't call programming iSWOOP if it looks more like what iSWOOP is not than what it is (See p. 5).

There is much to do to begin iSWOOP programming. On the other hand, you have much of what you need on-site.

- Active science
- Interpretive rangers
- Curious visitors
- Visual media



### Reminders for Successful Implementation

- Get administrators and interpreters on board
- Seek a scientist partner who meets your criteria
- Set aside time for professional development and
- Form a team to help assemble the visual library and decide on display options, locations, program slots.
- Refer to the iSWOOP Guide for Facilitators for advice on logistics and content. (Draft version available upon request).
- Seek out iSWOOP project leaders as a sounding board. Ask us about available resources to support your efforts (devices help with professional development, evaluation), and to let us know how it goes. [Martha\\_merson@terc.edu](mailto:Martha_merson@terc.edu); 617-873-9742

### Reminder— iSWOOP Is ...

Personal and interactive: an approach to personal interpretation that makes science in parks an interactive and visible part of the public's park experience

Audience-centered, two-way conversations; visitors engaging with each others' ideas

A way to talk about science as a process that starts from questions, involves revision, and has the potential to matter to all of us

Good stories--both first person from interpreters' experiences and about scientific researchers and what they are studying

Discussions of Technology and innovative methods that are key to understanding how we know what we know.

Images sequenced to reveal something about the resource, but also as a starting point for inquiry and discussions of relevance

Programs, formal and informal, that invite visitors to predict, observe, and speculate.

Comfortable with silence and reflection

Possible because interpreters and scientists spend time together in the field and in the classroom

iSWOOP is a way to accomplish recommendations for audience-centered interpretation, and for meeting one of the key goals identified in the Natural Resource Challenge (1999) articulated the responsibility of the NPS in science communication: "Knowledge gained in national parks through scientific research is promulgated broadly by the National Park Service and others for the benefit of society."

We wish you the best of luck as you move forward.

*The iSWOOP Team of Martha, Nick, Louise, Tracey, and Sherry*



# Sample Application: Recruiting a Scientist Partner

## Request for Proposals for Interpreters and Scientists Working on Our Parks (iSWOOP)

### Applications Due [Date] at [Time and Time Zone]

Scientist Partners Sought: [Name of Park] seeks applications from scientists with natural resource research interests for its iSWOOP program. iSWOOP seeks to build capacity among park interpreters in understanding and communicating science to the general public. It offers scientists the opportunity to develop or improve science communication skills via a partnership with communication and visualization experts and park interpretive staff. We especially encourage applications from investigators with ongoing studies in the park. Direct questions to: Contact [Name, email address, and phone number].

### Target Dates

- In-person or phone meetings for top candidates, [specified weeks or months]
- Final candidate(s) will be chosen [specified weeks] and all applicants notified by [date].

Selection Process: A committee comprised of representatives from [Park Name] interpretive and resource management divisions will review the applications. The top candidates will be selected based on their fit with park priorities for science content/messaging.

### Program Goals, Outcomes, Expectations of Scientists, and Timeline

iSWOOP stands for Interpreters and Scientists Working On Our Parks. See [iswooparks.com](http://iswooparks.com) for more.

#### *Project Goals*

This project is meant to advance STEM (science, technology, engineering, and math) learning among national park visitors. iSWOOP brings together educators, scientists, and National Park Service (NPS) interpreters to create a model that brings visitors into the loop on the science research underway on park lands. iSWOOP ranger-led programs and informal interactions led by interpretive rangers will give visitors an opportunity to see aspects of the park that are not usually visible. The program model [ATTACH, see p. 3 in this guide, designate location in the application] shows project components and expected outcomes. This project is funded by the National Science Foundation.

iSWOOP is successful when interpreters:

- Showcase science happening in national parks
- Increase visitors' science literacy
- Increase visitors' visual literacy

The iSWOOP project is funded (2015-2019) to develop models for parks of different sizes, types, and visitation. The project team is committed to experimenting, observing, and revising all elements of the project. We will be interested in how programs for visitors are implemented (program outlines), what works in scientists' and NPS staff members' opinions (surveys, on-site interviews and blog posts following professional development), as well as when efforts miss the mark, and what might be adjusted (feedback forms on programs).

## Expected Outcomes

- Increase interpreters’ knowledge of and increase their strategies for communicating about research,
- Increase interpreters’ repertoire of strategies for explaining scientists’ visual data, and
- Increase public understanding of how we know what we know.

## The Role for Scientists

Bringing scientists into direct contact with interpreters for extended interactions in seminar style settings and in hands-on work in the field helps interpreters tell research-focused stories that generate enthusiasm for science.

We recognize that iSWOOP is asking more of scientists than the typical one-hour presentation with Q & A. On the other hand, scientists can benefit:

- Gaining help with data collection or analysis from interpreters
- Increasing the visibility of research to public audiences at the park and beyond
- Enjoying the opportunity to experiment with innovative teaching methods

## Program Requirements

- Participate in planning and leading professional development for 10-20 interpreters during a workshop spanning two-to-five days (classroom and field-based sessions)
- Contribute data representations, still images, video, and other visual media for park interpreters’ and project use (website, blog, video products). Revise and refine as needed. 2017-2019
- Support interpreters as needed by consulting on program outlines and responding to questions

## Timeline

The timeline below provides a guide to how implementation may unfold from the scientist's perspective.

	Year 1			Year 2				Year 3		
Phase	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer
1	X									
2	X	X	X	X	X	X	X			
3							X	X	X	
4								X		X

Phase 1— A scientist is selected and timeline set which will fit the research program and participant availability.

Phase 2—Development of a visual library. The featured scientist and park staff co-develop a set of visualizations for park rangers to use with the public. The set includes images from past presentations, publications, field work and data representations from various stages of analysis.

Phase 3—Scientists and park staff co-lead professional development for interpreters. Scientists give feedback on interpreters’ draft program outlines and respond to follow up queries.

Phase 4— Scientists consult on or contribute to revisions of the visual library after its use with visitors. Scientists hear feedback from visitors on the questions and reactions that have surfaced.



## APPLICATION

In addition to filling out the application below, please list of up to five products that are closely aligned to the work you propose bringing into the iSWOOP model. The word counts are meant as guidelines, not limits.

- 1) What attracts you to iSWOOP? Why are you considering taking the time to be part of it? 150 words
- 2) Describe a situation where you presented your research to the public or an audience of professionals outside your field. What was your hook? 200 words
- 3) What story about your research investigations is important to tell? Why? (200 words)
- 4) Given the opportunity to present to park rangers who will pass on details about your research to the public, what messages about science, science process, or who does it are important to you to convey? (150 words)
- 5) Given the nature of your research, could you imagine a half day of fieldwork for 8-15 interpreters? What would the work entail? In what ways would it be an authentic, enriching experience for interpreters? (200 words)
- 6) If you will be relying on students to assist, describe their roles and how you and they will interact with interpreters in the field. (150 words)
- 7) How important is it to you to build public understanding of your research? Do you blog, tweet, present to the public frequently? How much exposure has your work had (e.g. via radio or tv, social media, park events, other)? What are your preferred ways to communicate about your work? (max. 300 words)

### Budget [If Applicable]

**If applicable:** A grant of up to [amount, renewable or not] is available to defray costs associated with providing professional development and ongoing support to the park's interpretive and education rangers. Expenses related to travel, supplies, equipment, and student assistants will be considered for reimbursement. Some funds should support collaborative development of visual media for the visual library and costs supporting the scientist's participation in and facilitation of interpreter training:

Each grantee can request up to [\$ amount]. Please provide a budget that details the following: costs associated with travel to in-park professional development for interpreters, supplies for field work, stipends for students to assist with data representations or field work set up.

Category/Line Item	Amount requested	Justification
Visualization development		
Stipends for students		
Supplies & Equipment		
Travel (mileage, lodging)		
Other		
Total		

## Research Underpinning iSWOOPs Professional Development Approach

iSWOOP asks interpreters to incorporate content, specific techniques, and approaches to increase visitors' scientific and visual literacy. Effectively handling new content matter, new techniques, and new devices warrants a serious commitment to professional development. During approximately 20 hours of classroom- and field-based professional development (PD), interpreters delve into:

- 1) Scientific field work and studies by the featured researcher
- 2) The interactive use of visualizations (using questioning techniques)
- 3) The power of story-telling to communicate science
- 4) Beliefs about science and science process

**Maximizing impact.** Studies show that educators may stall before actually implementing new innovations or new practices. Researchers have identified eight levels of how people enact or defer enacting change from non-use and preparation, to routine use and refinement (Hord, Rutherford, Huling-Austin & Hall, 1987, p.55).

Consensus in the professional development literature emphasizes the importance of educators engaging in science investigations, experiencing the same approaches that they will adopt with learners (Bevan & Xanthousdaki, 2008). Such experiences set new habits and behaviors in place. PD sets interpreters up to draw *less* upon the familiar techniques associated with K-12 settings and *more* on techniques that foster learning in an informal setting.

**Bolstering Confidence.** Without investing in serious efforts to equip interpreters to handle new content and techniques, we risk undermining interpreters' confidence, as well as their authority, competence, and credibility in the eyes of the public. Stern and Powell (2013) analyzed 376 interpretive programs in 24 units of the U.S. National Park Service. They found 15 characteristics of interpreters, including confidence, that were strongly correlated with positive visitor outcomes. iSWOOP interpreters spend time learning about researchers' methods, questions, instrumentation, findings, prior work and planned studies so that interpreters can credibly and confidently represent the research, field questions, and generate enthusiasm for park-based research.

**Attention to Craft.** iSWOOP professional development facilitators lead sessions on visitor interaction. The intent is to create memorable science learning experiences. Researchers have found that learning experiences in informal settings promote the development of rich episodic memories, which can subsequently be leveraged for learning in new informal settings...." (McClain and Zimmerman (2016).

*Interactive use of visualizations.* During PD, interpreters experiment with interfaces and using display devices during interactions with visitors. They become smoother at managing the devices while directing a conversation, which takes time (Garibay & Ostfeld, 2013). They also gain experience using visual media in three ways: as a hook, as an illustration, and as a jumping off point for inquiry-oriented, two-way or multi-directional communication. During PD, participants pay close attention to the purposes of their questions. Interpreters will elicit predictions,

"Without sustained, critical and reflective professional development, ...educators ... often revert to conceptualizations of knowledge and pedagogy they themselves experienced in their own learning, ... usually in schools" Bevan and Xanthousdaki (2008).

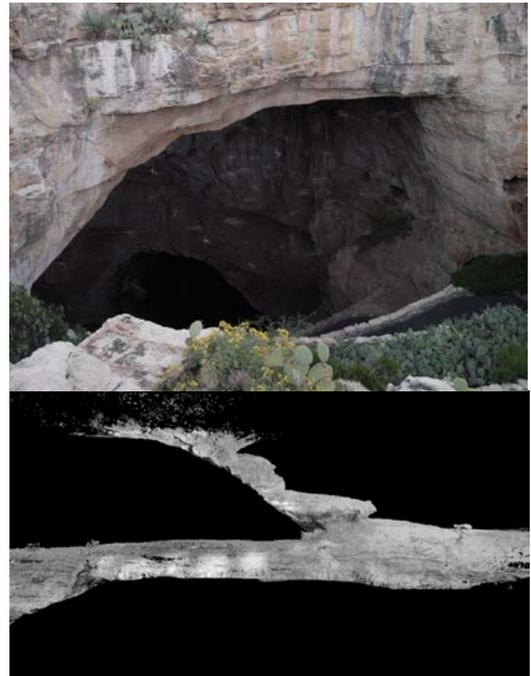
observations, and speculations, core skills that distinguish experts and novices (Eberbach & Crowley, 2013).

*Attention to families as learning units.* Influenced by research in museums and parks, iSWOOP recommends techniques and approaches that support group learning. Family groups often come to new informal settings with relevant prior knowledge and experiences that they can build on (McClain and Zimmerman, 2016). Children and adults offer different interest areas or expertise for dialogic negotiation. Picking up these cues when there are cultural or language differences is vital but not trivial (Ash, 2013). Furthermore, there is an art to inviting family groups to use their inquiry skills in dialogue to explore matters of importance (Ash, 2013) and to shaping roles for learners and authority figures within the group (Pattison & Dierking, 2013).

**Marshalling storytelling** techniques to advance science engagement is relatively new. Recent research underscores the impact of stories of scientists' struggles on students' motivation and performance in science class (Lin-Siegler, Ahn, Chen, Fang, & Luna-Lucero, 2016). Using Randy Olson's paradigms, participants in iSWOOP PD draft programs that build on archetypal conflicts.

**Messaging about science.** Participants reflect on their own beliefs about science and examine the messages being conveyed to public audiences. The predominant message about science in most people's education is that science is the compilation of facts about how the world works. While this is not false, it is a narrow view that eclipses the role of questions, revision, innovations to support solving puzzles, collaboration, how we know what we know, and who has a stake in the process and findings. Stuart Firestein's text *Ignorance: How It Drives Science* (2012) makes two points that are critical to communicating science in park settings: 1) much more is not known than is known about how the world works; and 2) regardless of training or academic background, any one of us can have an interesting conversation about the questions that drive scientific inquiry. These ideas are critical to inspiring youth and adults to participate in, follow, pursue careers in, and support park-based science.

**Conclusion.** iSWOOP seeks to support adoption. With intensive PD, interpreters move from understanding and experiencing new ideas to crafting and implementing programs. After iSWOOP PD, interpreters are ready to incorporate approaches into programs. When educators are expected to adopt new practices that stand in stark contrast to how they have learned science and math themselves, it is incumbent on leaders and supervisors to offer professional development support them. New props, techniques, and approaches to visitor interaction require time to practice. Without a commitment to professional development during which they increase their understanding, comfort with new devices and techniques, interpreters may lose confidence in themselves and credibility in the eyes of visitors.



During iSWOOP professional development interpreters practiced moving between the resource and scientists' visualizations, questions, and findings.

# To Do Before Professional Development Begins

## Preview Excerpted from The iSWOOP Professional Development Guide for Facilitators

### Planning Logistics Allow about two months in advance of Session 1 to:

- Recruit participating interpreters (may include partner organizations, staff from nearby parks, volunteers. See suggestions for an application)
- Select participants
- Establish times and place(s) for sessions
- Choose readings and review them. Send participants the details for the sessions sent including dress, start time, what to read or bring. See sample email in Appendix, pp. A-X. Confer with Martha (martha\_merson@terc.edu) on:
- Reading assignments
- Blog access instructions
- Link to survey invite

### Planning with the featured scientist

Schedule professional development sessions in consultation with the featured scientist. Three six-hour sessions scheduled over three or more days is minimal. With more time, you can cover more in more depth, and segue to program planning.

Agree on and disseminate the agenda.

Make sure to discuss:

- A hands-on activity or challenge that functions as an entry to the research presentation
- Field work logistics, and
- The scientist's presentation(s) which should include:
  - a back story on finding this topic, focusing on this species or phenomenon
  - false starts, missteps, mistakes
  - obstacles overcome
  - research questions, methods, and findings
- A plan for how to promote the collaboration. For example, invite the Communications point person at the park to observe the professional development sessions, field work, or to talk with interpreters who participate in it.

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