

NOAA Teacher at Sea Program

Spencer Cody, Aboard NOAA Ship Pisces, May 27-June 11

SEAMAP Reef Fish Survey

Activity Title: Investigating NOAA Science aboard the NOAA Ship *Pisces*

Subject (Focus/Topic): NOAA Science Relating to the SEAMAP Reef Fish Survey

Grade Level: 7-12

Average Learning Time: 50 minutes

Lesson Summary (Overview/Purpose):

Students will research various aspects of the science behind NOAA careers using a Virtual Field Experience and present to the rest of the class what they have learned about their area of science.

Specific Concepts (Key Concepts):

NOAA has many varied areas of science to choose from.

NOAA sciences require a varied and diverse background and preparation.

NOAA sciences are a possibility for my future.

Focus Questions (Specific Questions):

What is a specific NOAA science that can be found aboard a NOAA vessel such as the *Pisces*?

What is the significance of the NOAA science?

What types of equipment, technology, and expertise are needed in order to carry out this NOAA science?

Objectives (Learning Goals):

Students will be able to identify at least one specific NOAA science.

Students will be able to explain what the significance of the NOAA science is.

Students will be able to describe the equipment, technology, and expertise that are needed in order to carry out the NOAA science.

Rubric for Presentations (6pts.)

1. Did the student present a specific NOAA science from the VFE?

0 pts. (No science was identified.) 1 pt. (Only a general reference to an area of science from the VFE was mentioned.) 2 pts. (A science from the VFE was specifically identified.)

Comments:

Did the student explain the significance of the selected NOAA science?

0 pts. (Significance was not stated.) 1 pt. (A very limited description was given.) 2 pts. (All information on the VFE concerning the significance of the selected NOAA science was presented.)

Comments:

Did the student present information on the equipment, technology, and expertise required for the selected NOAA science?

0 pts. (No information was given.) 1 pt. (A very limited amount of information was given.) 2 pts. (All information on the VFE concerning the selected science was presented.)

Comments:

Virtual Field Experiences

Making the Inaccessible, Accessible

Spencer Cody

7-12 Science Instructor

Hoven, SD

Don Duggan-Haas, The Real Earth Inquiry Project, Paleontological Research Institution and NOAA Teacher at Sea Program

This material is based upon work supported by the National Science Foundation under grant No. 0733303. Any opinions, findings, and conclusions or recommendations are those of the authors and do not necessarily reflect the views of the National Science Foundation.



- *Nothing can replace a real geology field experience
- *Usually nature is the best model for a basic concept
- *VFEs provide a practical and innovative alternative



CURRENT APPLICATIONS:

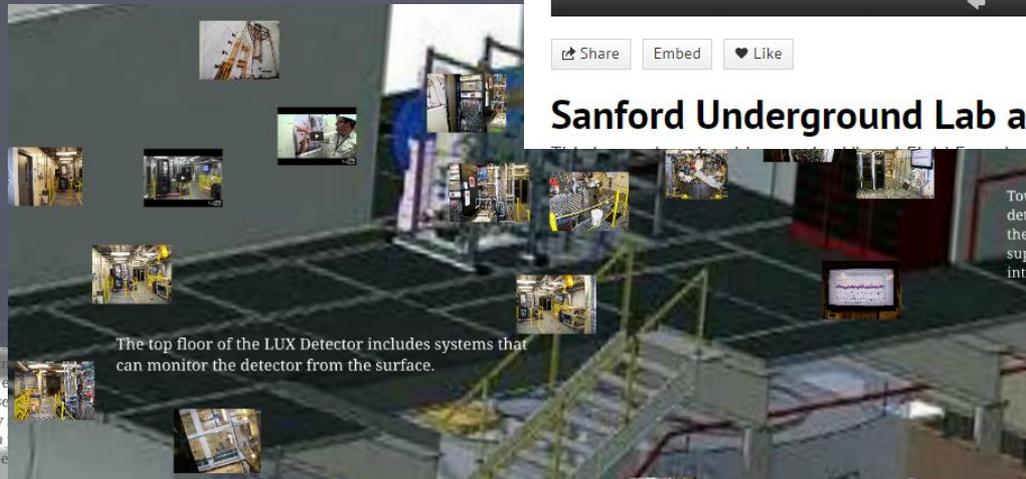
- *Craters of the Moon NM
- *Badlands National Park
- *South Dakota Wisconsin Glaciation Movements
- *Sanford Underground Lab



The people who work on physics experiments at the Sanford Deep Underground Lab are both scientists and students with an interest in finding more about the

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Sanford Underground Lab at Homestake



The top floor of the LUX Detector includes systems that can monitor the detector from the surface.

The detector is housed in a... by Ray Davis's neutrino e... 1960s. LUX is the most se... detector ever built. Why... matter? Dark matter is a... substance that may be the... of matter in the universe.



The LUX Detector relies on a complex system of computer controlled valves that keeps the xenon in the detector in a super-cooled state with the hopes that a large concentration of dense xenon could interact with dark matter. Several safety systems (containment tank and inflatable bag) need to be in place to ensure xenon is not vented into the lab in case a containment issue arises with the detector.

SOFTWARE:

- *Prezi, Google Earth, Powerpoint, and Picasa



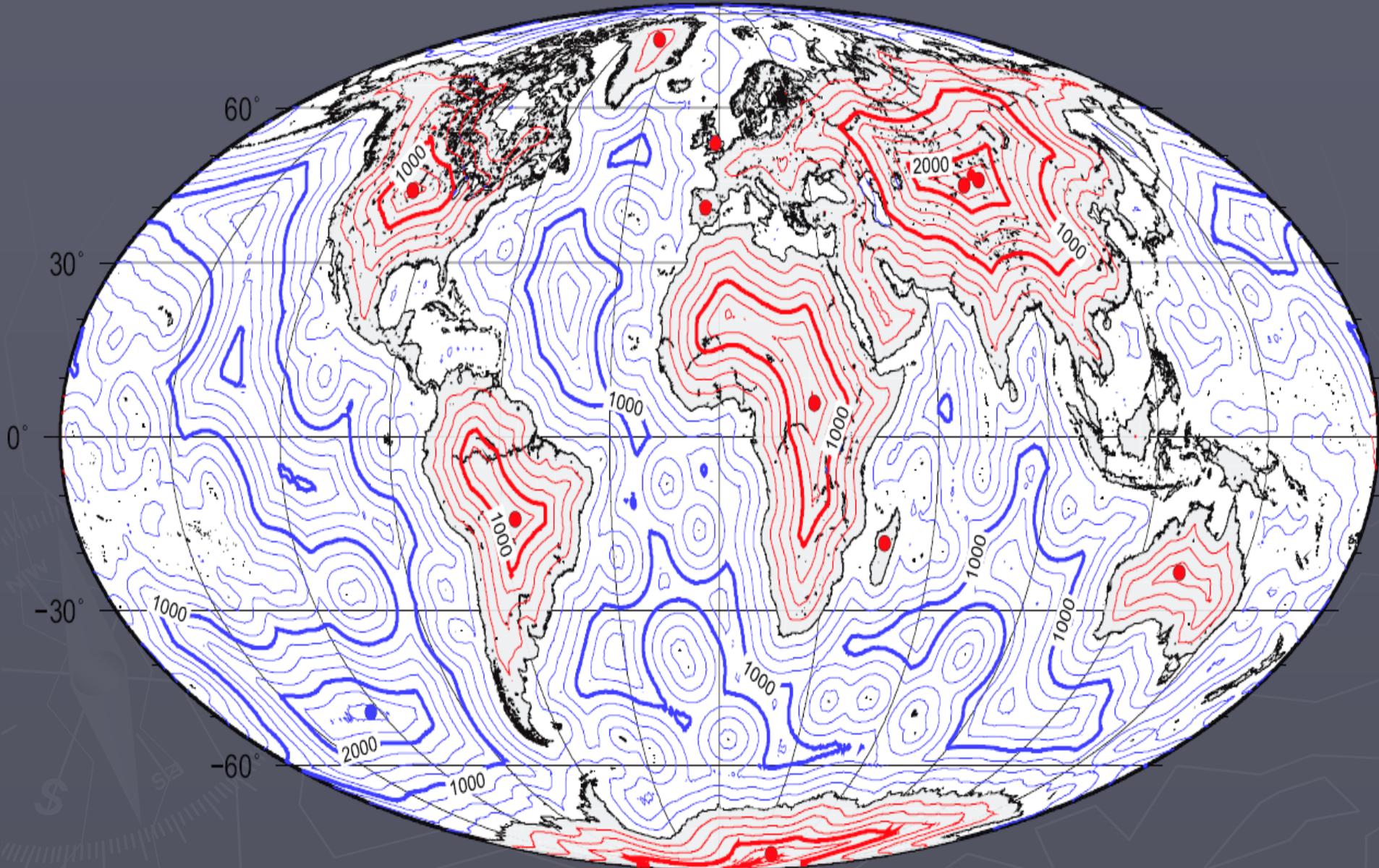
NEW CHALLENGE:

How do you get students from Hoven, South Dakota, to experience and understand an ocean planet?

SOUTH DAKOTA,
A POLE OF
INACCESSIBILITY?

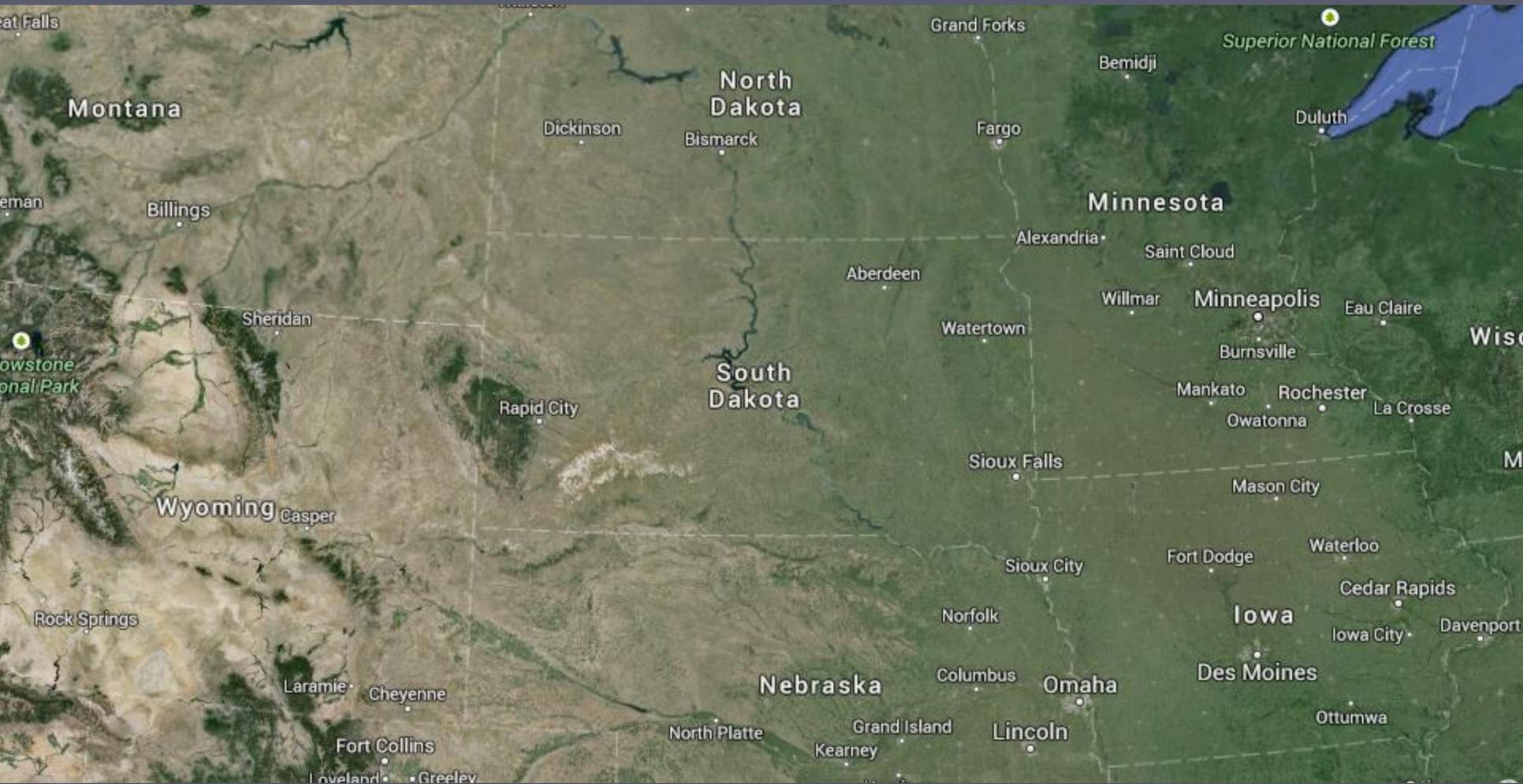


SOUTH DAKOTA, A POLE OF INACCESSIBILITY?

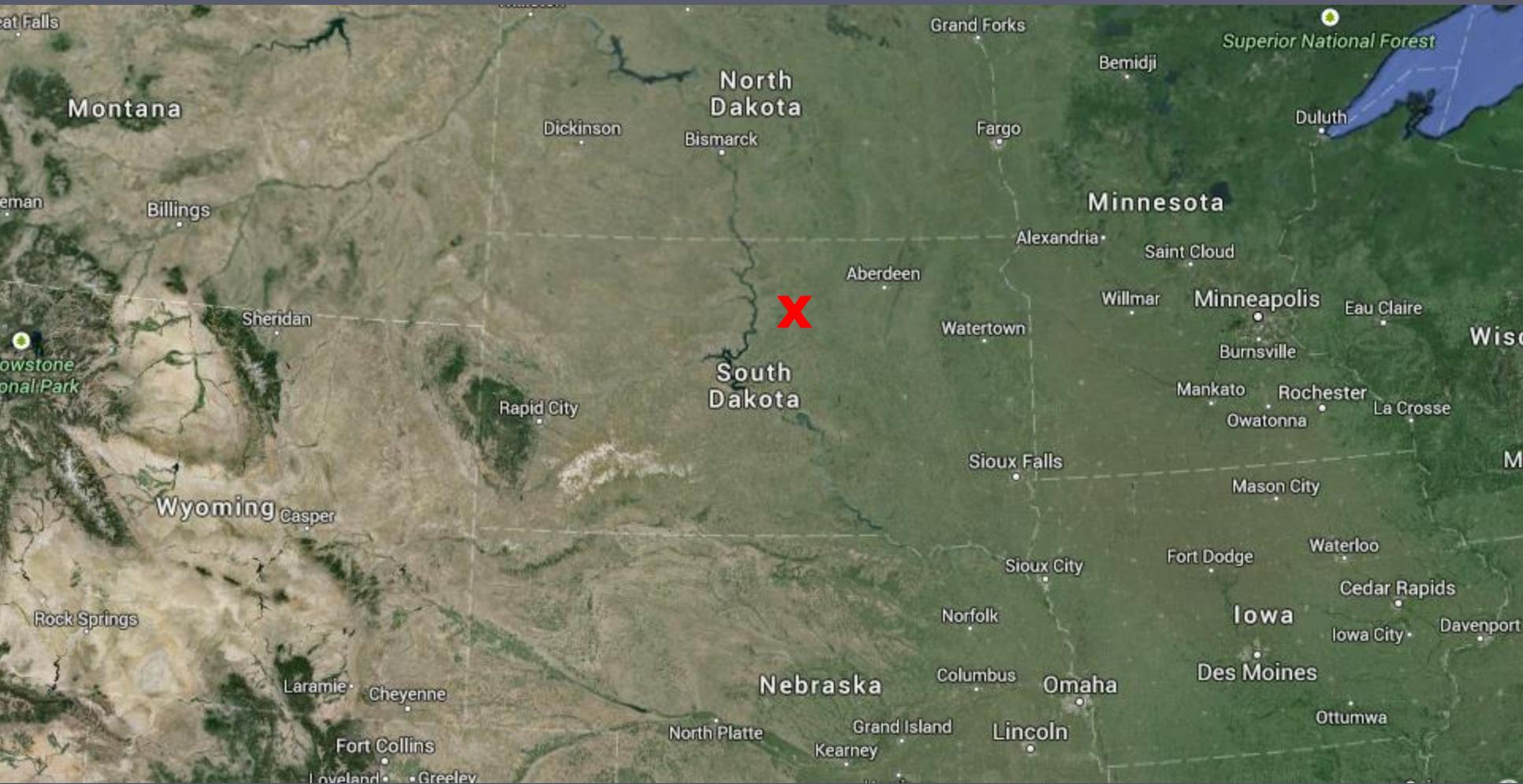


Credit: [Gaiernauta](#) - self-made using the technique described in Garcia-Castellanos, D., & U. Lombardo, 2007. Poles of Inaccessibility: a calculation algorithm for the remotest places on Earth. *Scott. Geogr. J.*, 123, 227-233. Based on the coastline database of Wessel, P. & Smith, W. H. F. (1996) A global self-consistent, hierarchical, high-resolution shoreline database, *Journal of Geophysical Research*, 101, B4, 8741 – 8743. Lake shores are excluded.

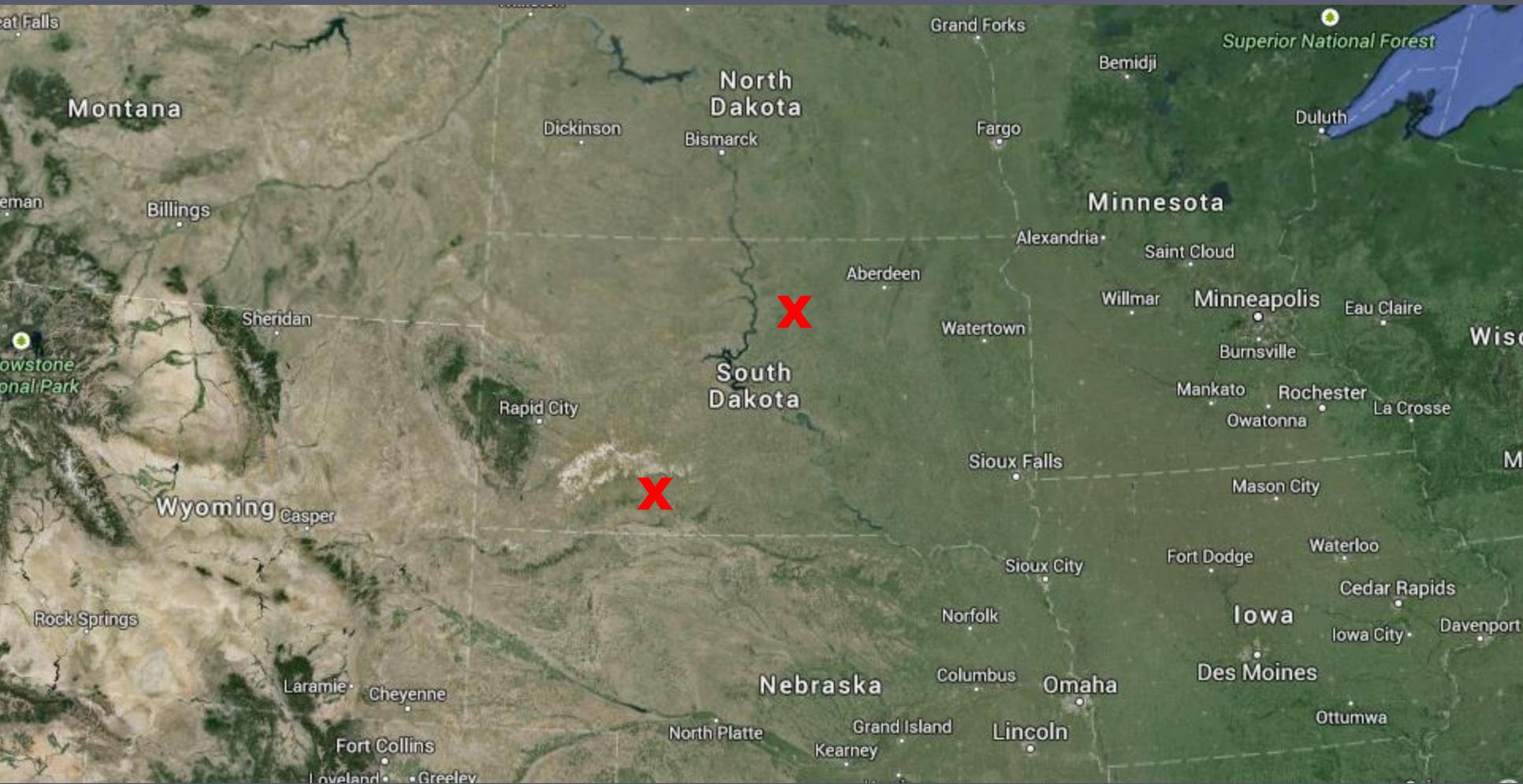
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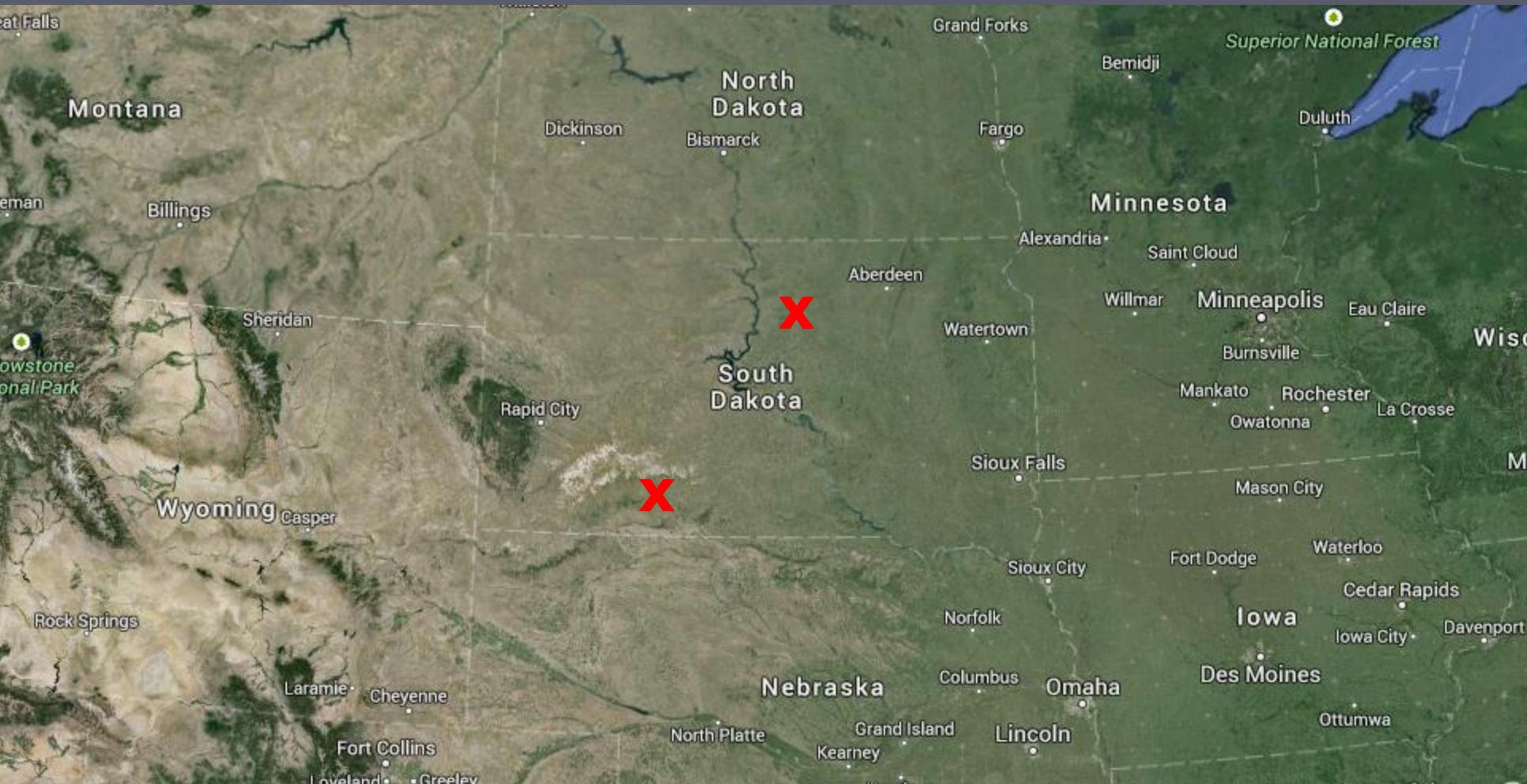
SOUTH DAKOTA, A POLE OF INACCESSIBILITY?



SOUTH DAKOTA, A POLE OF INACCESSIBILITY?



SOUTH DAKOTA, A POLE OF INACCESSIBILITY?



*1,650 km or 1,000 mi. from any coast

*But, it may be more than a mere physical distance.

PERHAPS, ALSO CONCEPTUALLY?

the longest mountain range
in the world exists under
water.

blue

It's huge.

94% of life on Earth
lives in the ocean.

70% of planet is ocean

It's wet.

We know more about the moon than
the ocean.

Many different kinds of
plants.

Crustaceans live in ocean

NOAA Teacher AT SEA



NOAA TEACHER AT SEA

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Amy Orchard at Sea

Amy's Cruise on NOAA Ship Nancy Foster... [MORE »»](#)

«« 1 2 3 4 5 6 || »»



VIRTUAL FIELD EXPERIENCES BRING TEACHER AT SEA TO THE CLASSROOM

*Virtual Field Experiences from ReaL Earth Inquiry



HOW DOES A TEACHER BRING THEIR EXPERIENCE BACK TO THE CLASSROOM?

The image shows a Prezi presentation interface. At the top, the Prezi logo is on the left, and navigation links for 'Your prezis', 'Learn & Support', and 'Explore' are in the center. On the right, there is an 'Upgrade' button and the user name 'Spencer Cody'. The main content area features the text 'NOAA Careers' and 'NOAA Science' in a large, bold, black font. Below this text is a map of the Gulf of Mexico coastline, with a red line indicating a path or route. A Prezi logo is visible in the bottom-left corner of the map area. At the bottom of the presentation, there is a control bar with buttons for 'Edit', 'Present remotely', 'Download', 'Save a copy', 'Share', 'Embed', 'Public & reusable', and a trash icon.

NOAA Careers **NOAA Science**

NOAA Careers and Science Virtual Field Experience

<http://prezi.com/ccumbcbcnugl/noaa-careers-and-science-virtual-field-experience/>

NOAA CAREERS



NOAA Careers: Do you have an interest in the biological science?

If so, NOAA needs you! Meet the fishery research biologists onboard the Pisces; this includes the science party's chief scientist and fishery research biologist, Kevin Rademacher, fishery research biologist Paul Felts, and fishery research biologist John Moser. Other members of the science party include fishery biologist Adam Pollack and guest scientist Harriet Nash. In order to be a fishery biologist, one needs a degree that includes courses such as limnology, ichthyology, fishery biology, and various other aquatic topics. A background including technology, computer programming, and statistics is also useful when data analysis software is needed to produce maps and other displays of research data. Having research experience that gives one the ability to do the data collection and processing, troubleshooting, and analysis that is needed to carry out fishery research is also necessary.



NOAA CAREERS



NOAA Careers: Do you have an interest in computers, computer programming, and electronics?

If so, NOAA needs you! Meet Jim Johnson; Jim is an electronics technician for this mission. His responsibilities include data downloading and maintenance and repair of the camera array system. He started working for NOAA as a contractor and has been a NOAA employee for the last five years. He has a four year degree in electronic engineering technology and a background in computers, technology, and computer programming.



NOAA CAREERS



NOAA Careers: Do you have an interest in the physical sciences and mapping?
If so, NOAA needs you! Meet Joe Tegeder, Joe is a physical scientist who is responsible for using the acoustics equipment onboard specifically the ME-70 and the EK-60 in order to map fish habitat on the ocean bottom. He has both an undergraduate and graduate degree in marine science. He currently works for the Pacific Hydrographic Branch for NOAA where he primarily works with updating nautical charts in the U.S. waters of the Pacific. Previously, he worked for the Naval Oceanographic Office where he helped map out harbors from around the world to develop anti-mining operations for possible future military missions.



NOAA SCIENCE



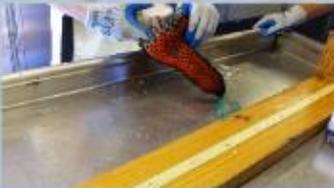
NOAA Science: Arrival in Pascagoula

I arrived at the Pisces during the afternoon on the 26th. This was very helpful in giving me some time to explore the area in Pascagoula and the ship before takeoff the next day. I was assigned a very nice stateroom that I am sharing with another member of the science party. I was surprised that our accommodations were so spacious. We get our own desk, tv, sink, bathroom, and shower. It reminded me of living in the college dorm my freshman year minus the group showers, so I was more than pleased with the living arrangements.

Looking around Pascagoula directly adjacent to where the Pisces was docked, I was amazed at all of the heavy industry concentrated around the Pascagoula River. The river hummed with activity day and night with trains, cargo ships, tugboats, oil and gas well repair work, ship repair work, fishing operations, and tourism. It was quite remarkable to see where some of the goods that we buy in stores back in South Dakota first make their landing on the North American continent and to get a sense of the scale of the sea-based operations needed to make international trade possible. The ocean is how you are able to sell your beans to Brazil or wheat to China. It is the economical lifeblood that connects all of us, but we seldom think of what happens to our goods beyond the retail store or the elevator. We just know the system works and take the infrastructure behind it for granted. Though South Dakota is more than a thousand miles from the Gulf of Mexico, it is linked by trade with the rest of the world through the Gulf.



NOAA SCIENCE



NOAA Science: Camera Array

Once we arrived at our initial survey area within the SEAMAP survey grid, the amount of science conducted increased dramatically. In the survey areas, the camera array is dropped to the sea floor to survey fish populations. In most cases we are looking at fish habitat from 50 to 120 m deep. Video and still photos are taken of fish attracted to the bait bag filled with squid. To ensure that sampling is both consistent and unbiased for the survey, pictures and video are pulled at random from all four cameras on the camera array. It is important that the same procedures are carried out throughout the SEAMAP survey grid concerning data collection in order to be able to reliably compare different survey areas and track species development and abundance.

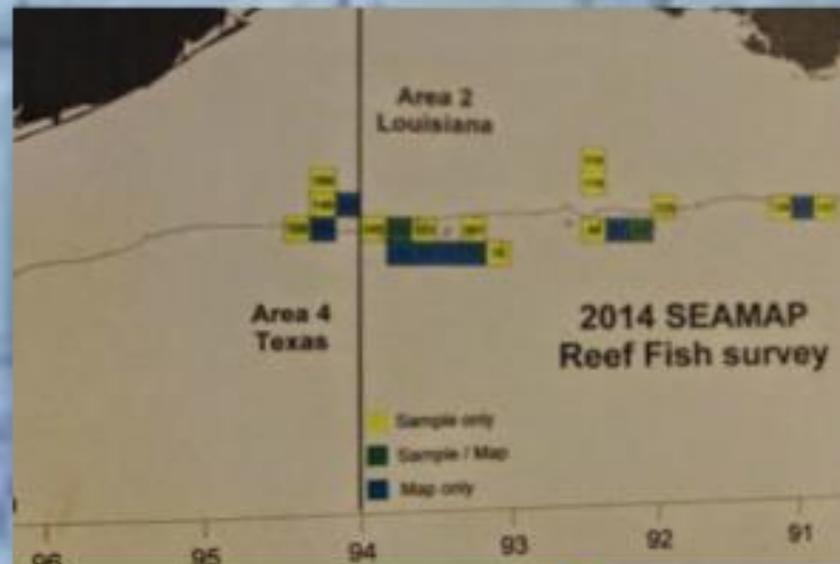
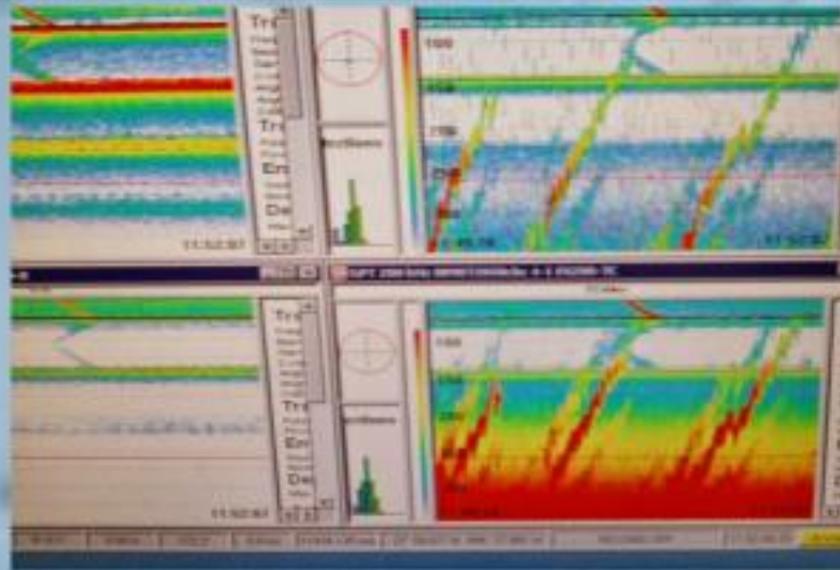


NOAA SCIENCE

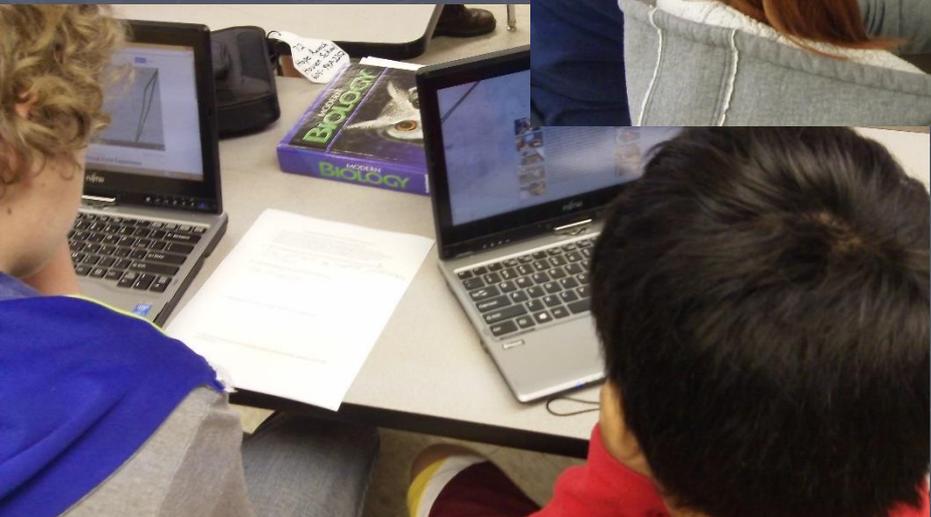
NOAA Science: Acoustics

In addition to collecting meteorological data, the Pisces uses a fishery acoustics system called the ER-60 to track depth and various sea floor features. This system can also be used to monitor biomass such as fish, coral, and even plankton.

The Pisces not only has the ER-60 for fishery acoustics, but it also has a state-of-the-art multi-beam echo sounder, the ME-70, that has 27 transducers that are aligned in a configuration allowing for scans of wide swaths of the ocean bottom. In fact, the Pisces has engines that are specifically designed to run quietly enough to accommodate such advanced acoustic equipment. The ME-70 is used for mapping various sample areas of the SEAMAP survey.



VFE USAGE



VFE PRESENTATIONS

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NOAA Careers: Do you have an interest in computers, computer programming, and electronics?
If so, NOAA needs you! Meet Jim Johnson. Jim is an electronics technician for this mission. His responsibilities include maintaining and repairing the camera array system, performing wiring for NOAA's data collection system, and other NOAA projects. Jim has a Bachelor's degree in electronics technology and a background in computer programming.

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NOAA Careers: Do you have an interest in meteorology or oceanography?
If so, NOAA needs you! Meet Anna. Anna is a meteorologist who is responsible for collecting meteorological and oceanographic data and managing and maintaining the data. She also helps manage the data collection system. Anna has a Bachelor's degree in meteorology and a background in oceanography. She has worked for NOAA for 10 years with the Meteorology and Oceanography Center in Silver Spring, Maryland. During her time at NOAA, she has worked on various projects, including the development of the NOAA's new weather forecasting system. She also works for the Department of Defense. She has a strong interest in meteorology and oceanography and is looking for a career opportunity in this field.

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NOAA Careers: Do you have an interest in working with food preparation and presentation?
If so, NOAA needs you! Meet Mike. Mike is a chef who works in the NOAA's mess hall. He is responsible for preparing and serving meals for NOAA's crew members. Mike has a Bachelor's degree in culinary arts and a background in food service. He has worked for NOAA for 5 years and is looking for a career opportunity in this field.

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NOAA Careers: Do you have an interest in engineering and mechanical systems?
If so, NOAA needs you! Meet Jake. Jake is the chief engineer for the NOAA's research vessels. He is responsible for maintaining any mechanical, propulsion, or electrical system. He works to ensure that these systems are running safely and efficiently. He has worked for NOAA for six years. Prior to NOAA, he worked in engineering on cruise ships and tankers. He has a Bachelor's degree in mechanical engineering from the California Maritime Academy and is licensed as an unlimited chief engineer through the Coast Guard.

SUMMARY

*VFEs make the inaccessible, accessible

*VFEs are practical to implement

*VFEs are very flexible to meet individual needs of educators and students

*VFEs offer many opportunities to incorporate technology into science education