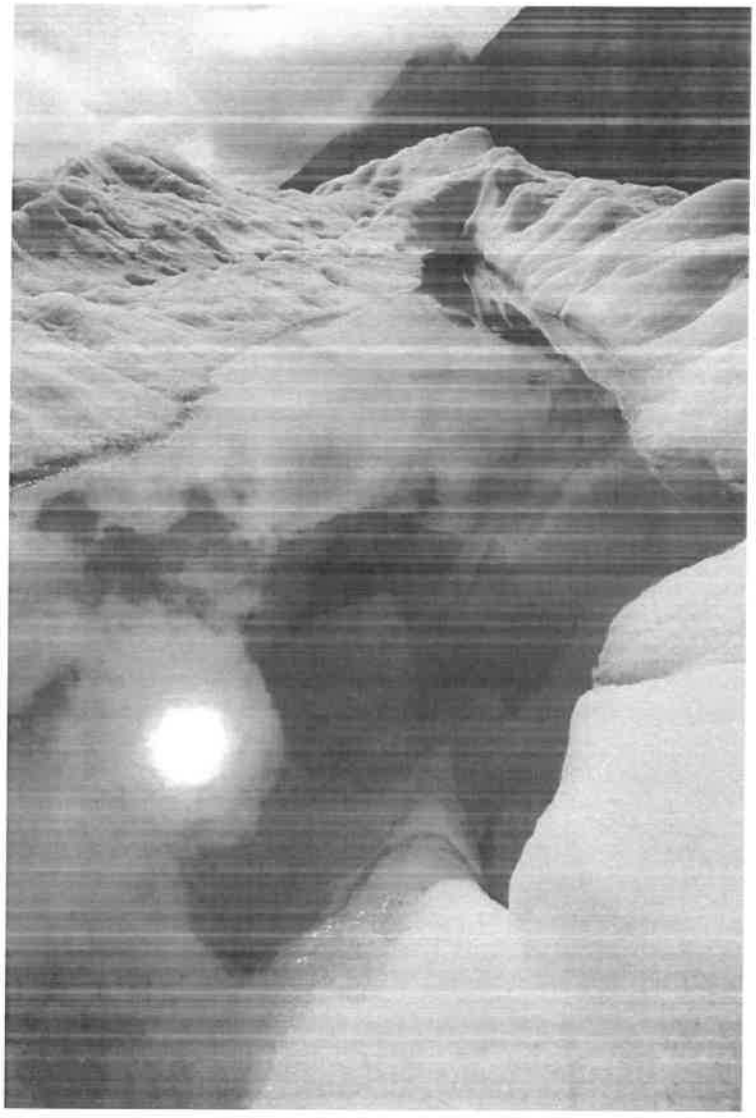


Marine Science

LEARNING PACKET

Mrs. Brinkman | 4th Quarter Week 2 | April 6-10, 2020

Week 2 Highlights

- Please continue to use my school email BRINKMANS@LeonSchools.Net to reach me.

- There are 3 assignments(4, 5 & 6,) all due on Due on Friday, April 10rd. I'd like to suggest you do one on each Monday, Wednesday and the final one on Friday. So that way you can balance it with requirements in your other classes.

- Thank you so very much and I look forward to seeing you soon.

Sincerely, Mrs. Brinkman

ASSIGNMENT #4 -READWORKS FOSSIL INDICATORS OF MARINE LIFE.PDF

Read "Fossil Indicators of Marine Life" about ammonites.

Please write a one page summary of this article.

This is the hardest assignment this week. They get easier! All I expect is for you to Just do your Best!

ASSIGNMENT #5- READWORKS SEA TURTLE CONSERVATION.PDF

Read "Keeping Sea Turtles in the Dark" about efforts to save sea turtles hatching on Florida beaches.

There are 7 questions you need to complete at the end. I only need to see the last 3 pages to grade this.

ASSIGNMENT #6 – READWORKS LONGLEAF CONSERVATION MEASURES.PDF

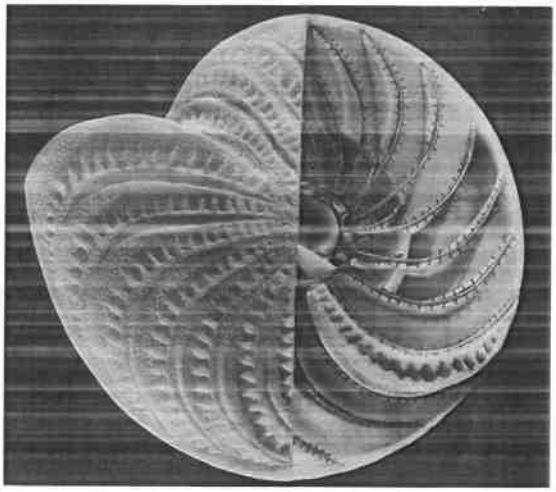
Please read this article. While it does not cover the marine environment, it covers conservation attempts of our own backyard forest by researchers in Montana!

All I expect is for you to give me a one paragraph summary. Simple! That's it now enjoy your weekend!

Fossil Indicators

This text is provided courtesy of the American Museum of Natural History.

Whether it's insight into the anatomy of an ancient animal or the ecology of plants that died out eons ago, fossils can offer up a vast array of information. Take, for example, the tiny marine organisms known as foraminifera or-when even scientists admit six syllables is a mouthful-forams. These are abundant, widely-scattered, single-celled creatures that still fill oceans today. The fossilized shells left behind by their foram forefathers are widely used as time capsules for ancient climate data.



AMNH / Research Library

Early microbiology researchers mistook foraminifera for ammonites. This model of a foram species-Elphidium crispum-was at one time on display in the Museum.

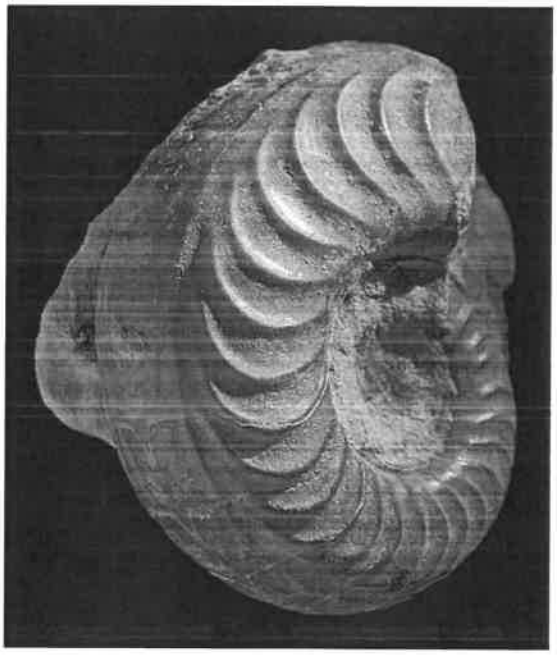
When forams were first discovered, their intricate forms were mistaken for another kind of marine organism-the long-extinct group of animals known as ammonites. While the forams' chambered shells function in very different ways than those of the ammonites, they both contain climate clues.

Ammonites are a group of ancient mollusks related to modern animals like nautiluses, which most closely resemble their extinct cousins, squid, and octopuses. Like forams, ammonites were a phenomenally successful group, branching out into a wide variety of distinct species and diverse forms all over the world's oceans, where they endured for more than 300 million years. They also had hard shells-most frequently coiled, though some species sported spiral helices and U-shaped shells-and hard jaws, an extraordinary number of which survived as fossils. The Museum's invertebrate fossil collection, one of the largest in the world, has more than 2 million ammonite specimens. (The . . . accessioned Mapes Collection of marine fossils, which pushed the Museum's total holdings past 33 million specimens and artifacts . . ., added about 150,000 more.)

AMNH / S. Thurston

The Mapes Collection includes fossil ammonites from about 400 million years ago, during the Devonian period.

Their abundance, broad geographic distribution, and a lengthy but limited stay on the planet make ammonites very useful markers of geologic time. They're also great indicators of ancient climate. Ammonite shells and jaws consist mostly of calcium carbonate, the same substance that makes up the tiny shells of foraminifera. Depending on the temperature of the surrounding water when it forms, calcium carbonate contains different amounts of two oxygen isotopes. The ratio of these isotopes, says Neil Landman, curator in the Division of Paleontology, make the shells "very sensitive indicators of the environments and temperatures in which they were formed." And since shells from one period can be compared against those from another, they can be used to track changes in climates over time.



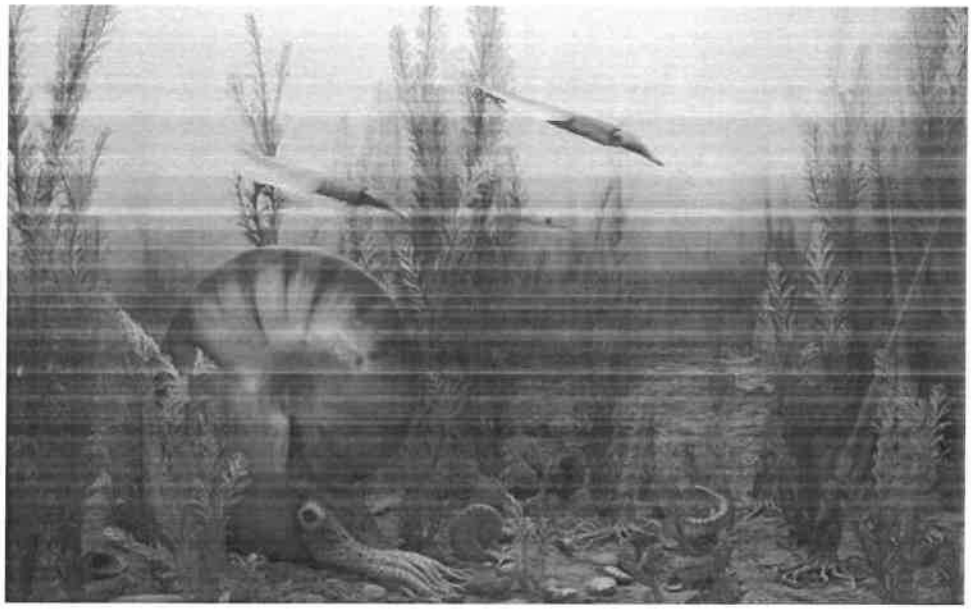
AMNH / S. Thurston

Once among the most common invertebrates in the oceans, ammonites went extinct around 65 million years ago.

Ammonite shells could provide other clues about the ancient world as well. The fossil record shows that the first ammonites appeared during the Devonian period, around 400 million years ago. After thriving in ancient oceans for hundreds of millions of years, nearly all ammonites fell victim to the mass extinction at the end of the Cretaceous period that also wiped out the dinosaurs

and more than half the species on the planet.

"Ammonites are everywhere toward the end of the Cretaceous period," says Landman. "There's no decrease in the number of individuals or the number of species leading up to their sudden disappearance."



AMNH / D. Finnin

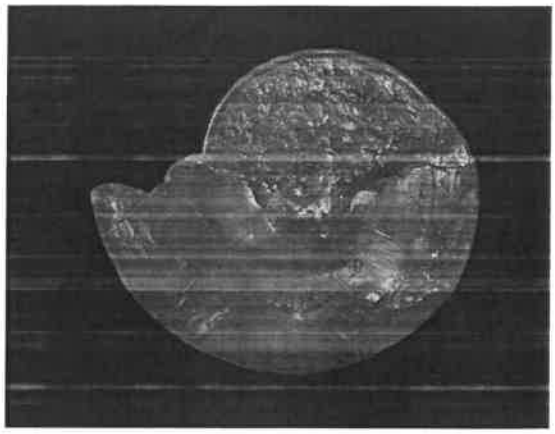
An exhibit in the Milstein Hall of Ocean Life depicts life in a Cretaceous sea that covered present-day Tennessee and was home to ammonites.

Their vanishing act can tell us more about the event that killed off so many forms of life, which is why Landman studies ammonite fossils that occur at the Cretaceous-Paleogene (K/Pg) boundary-the thin slice of geologic time immediately after the extinction.

This slice is found in just a few dozen places around the world, including sites in Morocco where Landman and colleagues traveled on a recent Constantine S. Niarchos expedition. Working with local geologists and university professors, Landman and other Museum paleontologists conducted the first big survey for ammonites around the K/Pg boundary in sedimentary rock layers on Morocco's eastern coast. The result was a treasure trove of fossilized ammonites.

"We knew ammonites existed in this area," Landman says. "But there is not much information known or published about them in this site." The new specimens from the Moroccan expedition are still being studied, and Landman expects several papers will come out of the research. In addition to ammonites, the team gathered new specimens of foraminifera to add to the Museum's collection and looked at levels of the element iridium, which was scattered across Earth during the meteorite impact, in samples of surrounding sediment.

Previous studies of ammonites have produced one consistent finding with implications for ocean life today. On the Cretaceous side of the K/Pg Boundary, ammonites are plentiful, while related nautilids are less common. After the extinction event, ammonites mostly disappear, while nautilid populations persist, largely unaffected. Their fates, Landman suggests, could have been clinched by the animals' respective life cycles.



AMNH / C. Chesek

Some ammonites were formidable animals more than 2 feet in diameter, such as this spectacular 75-million-year-old specimen.

Ammonites hatched very small-less than a millimeter in diameter for some species-and would have made their homes among plankton and similar creatures in warm surface waters. Nautilids, meanwhile, were born larger and would have spent more time in deeper waters. If a meteorite impact caused rapid acidification of surface waters around the world, as some suggest, that would explain why ammonites, which used those waters as a kind of crib, would have been devastated, while young nautilids could have soldiered on through the catastrophe, sheltered in deeper water. (Deep-sea forams, known as benthic foraminifera, similarly weathered this extinction more successfully than surface-skimming planktonic foraminifera species, which were mostly wiped out at the end of the Cretaceous, then made a comeback in the early Miocene).

As today's oceans become increasingly acidic due to climate change, learning more about the ammonite extinction is more than an academic concern. The details of the catastrophe that struck 65 million years ago could inform how we deal with similar environmental issues in the modern era.

"Calcium carbonate shells on modern animals are getting thinner, and some evidence suggests the calcium carbonate spikes of sea urchins are getting smaller as well," Landman says. "Understanding how ocean acidity affects marine species is very pertinent to where we are today."

The 2013 Constantine S. Niarchos Expedition to Morocco was generously supported by the Stavros Niarchos Foundation.

Fossil Indicators

This video is provided courtesy of the American Museum of Natural History.

implication

im · pli · ca · tion

Advanced Definition

noun

1. the act of stating something indirectly; act of implying.
2. something implied or suggested, from which an inference may be drawn.

   The implication of his remark was that I shouldn't have returned.
3. the act of implicating or state of being implicated.

   his implication in the crime
4. (usually plural) something intimately associated or involved, as implying a potential situation or outcome.

   The decision has serious implications for our future stability.

Spanish cognate

implicación: The Spanish word *implicación* means implication.

These are some examples of how the word or forms of the word are used:

1. If you decide to get tattoos or piercings, make sure you're well-informed. Don't just go ahead without considering the **implications** of decorating your body.
2. Hudson's exploration of the river had profound **implications** for both Europeans and Native Americans. The waterway would prove to be an important route to trade, colonization, and conflict.
3. Every thirty minutes the equivalent of a football field is lost. This has serious **implications** for the region's wildlife and economy, as well as the ability of the region to withstand natural disasters.
4. The geologic time scale has got to be one of the simplest, most ingenious applications of chronography-the measurement of time-to natural science. All the ideas it's based on are amazingly, smackyourselfinthehead obvious to us today, and yet they have huge **implications** for the way we're able to tell how old something in the natural landscape really is-including living organisms, dinosaurs and whole continents.
5. In 1940, Republicans were apprehensive of Roosevelt's expansive New Deal policies, the potential for US intervention in World War II, and the **implications** of a third term in office for the nation and the candidate. In this broadside, the Republican National Committee laid out five reasons to "Vote Against a Third Term and Dictatorship," noting that a third term would go against American historical tradition as well as make the man holding the office "believe that his will alone should be the law."

indicate in · di · cate

Definition

verb

1. to show or point out.

Can you indicate your street on the map?

Advanced Definition

transitive verb

1. to show or point out.

The police officer asked her to indicate the man she thought was the attacker.

The results of the study indicate that their hypothesis was correct.

2. to signify or serve as a token, index, or sign.

The presence of a fever usually indicates illness.

The expression on his face indicated great displeasure.

3. to briefly state or express.

Please indicate your choice by putting a check mark in one of the boxes.

We had to put our pencils down when the proctor indicated that time was up.

You use your turn signals to indicate your intention to turn.

Spanish cognate

indicar: The Spanish word *indicar* means indicate.

These are some examples of how the word or forms of the word are used:

1. This is not to say that mutations are always helpful. Sometimes they are simply inconvenient, odd or unsupportable. They can even be **indicative** of a disruption in the environment.
2. A healthy ecosystem is one in which its plants and animals work in harmony. There are no drastic spikes in the populations of any one species, or drops in another. A large number of different species (a great biodiversity) is one **indicator** of an ecosystem's health.

3. Michael Jordan's body was strong, stable, and proportioned in such a way that the force he pushed onto the ground placed him above the rest. He was one of the best overall athletes in the game, and his slamdunking ability was an **indication** of his prowess.

4. While these new formations may not be the most attractive additions for a beachfront view, it was the previously unobstructed nature of those views that **indicates** just how exposed communities like Long Beach, Long Island were. Perhaps if concrete barriers had been in place, flooding would not have reached beach residences and apartment complexes so easily.

5. Using these scientific foundations, toy companies began to manufacture fake gun sets that shot out infrared lasers in the late 1970s, which became hugely popular in the mid-80s with the promotion of the particular sets Photon and Lazer Tag. The laser infrared beams used in those play-sets included coded messages that **indicated** where each stream of light came from originally.

insight in · sight

Advanced Definition

noun

1. the power of mind to grasp an essential meaning or truth.

   We expect our leaders to have not only knowledge but insight, so that we may trust their decisions.

2. the understanding or knowledge of essential meanings or truths.

   Her brilliant book is full of insights into human nature.

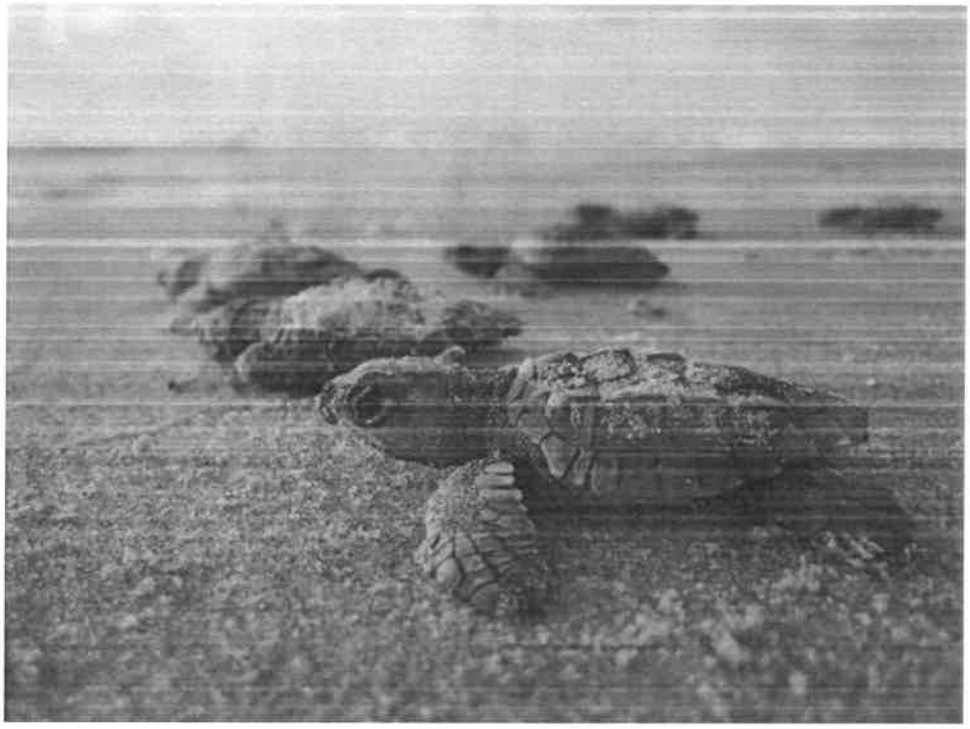
   Extensive research and personal experience gave him insight into the causes of war.

These are some examples of how the word or forms of the word are used:

1. That evolution provides **insight** into the values and aspirations of the country. In Europe and America in the seventeenth century, education came mostly from private tutors.
2. These complaints give **insight** into the sort of things that bothered the colonists by 1776. Let's look at a few specific lines and think a little bit about what they mean.
3. This declaration of concern, written after the United States bombed Hiroshima and Nagasaki, offers **insight** into the Manhattan Project, an atomic development program led by the United States. The "Preliminary Statement of the Association of Manhattan District Scientists" emphasizes the need to control atomic weaponry and acknowledge the consequences of its use.
4. By sequencing the genome of the infant recovered at the Anzick site, the international team of researchers gained the most vivid **insight** yet about who these people might actually have been. They compared the DNA of the Clovis infant to several different genomes, including a 24,000-year-old sample from a young man buried on the banks of Lake Baikal in Siberia, a 7,000-year-old sample from Spain and a 4,000-year-old sample from Greenland.
5. Two stories, one from what the French called Canada and the other from Tsenacommacah (present-day Virginia), provide some **insight** into the dynamics at work. In 1636, an Algonquin chief announced to a group of Wendats (Hurons) who were reluctant to join him in a military campaign "that his body was hatchets; he meant that the preservation of his person and of his Nation was the preservation of the hatchets, the kettles, and all the trade of the French, for the Hurons." Indeed, he claimed that he was so much "master of the French" that he could make them "all recross the sea." Europeans made the hatchets, but the power flowed through him.

Keeping Sea Turtles in the Dark

This text is provided courtesy of the National Fish and Wildlife Foundation.



Sea turtle hatchlings

Funding boosts efforts to cut light pollution along Florida's nesting beaches

Selling darkness in the Sunshine State can be tough.

Florida's beach communities sparkle at night with homes and condominiums decked out with beautiful lighting systems. Beachside resorts and businesses depend on artificial lighting to ensure safety and entertainment for guests and customers at night.

Wherever people live, work and play, nighttime lights follow. For decades, steadily increasing illumination along Florida's coasts has wreaked havoc on sea turtles, which rely on subtle, nighttime lighting cues to deposit eggs on beaches and make it safely to sea as hatchlings.

By the early 1990s, Floridians committed to turtle conservation understood how tenuous the

situation had become. Suzi Fox, director of the Anna Maria Island Turtle Watch, remembers the bad days on her island community on the Gulf of Mexico just south of Tampa.

"There wasn't one half-block area in 7 miles where you could release a hatchling and have it go to the sea," Fox said. "We didn't have any lighting ordinances back then, and people just didn't want to turn off their lights."

Throughout the 1990s and early 2000s, Fox and her fellow turtle conservationists chipped away at light pollution in Florida, which hosts more than 90 percent of all sea turtle nesting in the continental United States. Local governments began adopting turtle-friendly lighting ordinances, and conservation projects helped focus efforts along high-density nesting sites.

On Anna Maria Island, Fox and her group were making progress - until 2010, when the disastrous Deepwater Horizon oil spill threatened to wipe out everything they had been working toward.

"I've been doing sea turtle work for 30 years, and that 2010 spill dropped the bottom out of my world," Fox said. "But I'll tell you what - there has been a little silver lining, and it has really blossomed into something bigger."

That silver lining emerged in the years following the spill, when sea turtle conservation groups in Florida began tapping into unprecedented conservation funding offered by the National Fish and Wildlife Foundation.

For Anna Maria Island's sea turtles, Fox said, the difference sparked by NFWF funding "has been night and day."

"Before that first round of funding," Fox said, "there would be 10 disorientations in front of just one resort. Practically all of the hatchlings would go backward, year after year. They'd all wind up in a pool or out into the road and run over by cars.

"In the first year after those first projects - nothing. Everything went into the sea."

Residents along Florida's Gulf Coast seem to have come around, too, Fox said.

"People are learning how good it feels to do something for wildlife. They can see the difference these lighting projects makes for turtle nesting, and they can see that properties are still safe, well-lit and even more attractive at night. Just last night we had people out on the beach watching meteor showers, really enjoying the beauty of a dark beach. For many of them, it's like they've come back to a place they knew and enjoyed as a child - before all the

development - and they want that for their children and grandchildren, too."

Armed with funding and the knowledge gained in such early projects, turtle experts are now steadily moving along Florida's Panhandle, expanding the darkness as they go.

Deadly disorientation

Sea turtles face threats to their survival from the moment they hatch out of their sandy nests to the ends of their often long lives.

Hatchlings that survive a gauntlet of land-, air- and sea-based predators must still contend with man-made threats. Fishing bycatch, loss of nesting habitat to development, boat strikes and even direct consumption of turtle meat and eggs have taken a heavy toll. Today, almost all sea turtles found in U.S. waters are federally listed as endangered; the loggerhead is listed as threatened.

Of all the man-made threats to sea turtles, artificial lighting near nesting beaches may be the most widespread and onerous, affecting both nesting females and legions of hatchlings.

"The exact number of hatchlings who are disoriented and die every year in Florida is unknown, but it's probably well over 100,000," said David Godfrey, executive director of the Florida-based Sea Turtle Conservancy. "When they pop out of an egg in a dark nest, their very first instinctive drive is to make it to the water and swim out as far as they can. In that moment, they're relying a little bit on the slope of the beach - they instinctively know to go downward - but they're relying even more on light. The visual cue they would typically use, the horizon out over the ocean, is always just a bit brighter, because of starlight and moonlight."

Even a single bright light near a nesting site can cause all of the hatchlings on a given beach, or most of them, to head inland, Godfrey said.

"They've got a finite amount of energy when they hatch, which they desperately need to get to the water and swim out to safety. When they get disoriented like that, they expend all of that energy scrambling around looking for the ocean. They become very vulnerable to predation, to dehydration, to being cooked in the sun, to being crushed by cars."

Artificial lights near nesting beaches also threaten adult female sea turtles hauling out to nest.

As they're approaching a beach from the sea, these females instinctively seek out dark places

to deposit their eggs. Bright lights can deter females from coming ashore at all. If they come ashore despite the lights, they can be lured away from the sea.

Evidence of sea turtle disorientation along Florida's Atlantic and Gulf coasts can be heart-rending and grisly. Hatchlings often leave confused, zig-zagging tracks in the sand before heading inland to be crushed on a nearby roadway. Gigantic adult females sometimes wind up in a resort's swimming pool, or under the wheels of a vehicle.

Expanding the darkness

Throughout its history, NFWF has worked to bolster sea turtle numbers and maximize conservation investments by awarding competitive grants to a range of organizations operating in southeastern and Gulf Coast states, as well as in nearby countries where sea turtles migrate. NFWF-funded projects have focused on habitat restoration, nest relocations, predator control, bycatch avoidance and public outreach.

In 2009, NFWF launched a 10-year strategy to guide conservation investments that measurably improve the recovery of seven sea turtle populations in the Western Hemisphere: leatherbacks, Kemp's ridleys, loggerheads, and hawksbills in the Northwest Atlantic; and leatherbacks, loggerheads and hawksbills in the Eastern Pacific.

Various projects by groups with funding from NFWF have increased the productivity of more than 100 miles of priority nesting beaches, allowing hundreds of thousands of new hatchlings to make it to the sea. Additionally, in-water efforts to implement safer fishing gear practices reduced sea turtle bycatch 50-100 percent in the United States and some neighboring countries, saving thousands of turtles each year.

NFWF-funded projects focus on all aspects of the turtle life cycle, from nesting beaches to in-water interactions with fisheries, but there are other important pieces in the conservation puzzle. Many other conservation teams both large and small are working to increase the available science, educate the public on key issues and improve management of these threatened and endangered species.

The cumulative effects of all sea turtle conservation efforts made headlines when scientists announced record-breaking numbers of nests at many Southeast beaches. The news was especially good for green sea turtles, which were in serious jeopardy just 20 years ago when only 455 nests were recorded in the Archie Carr refuge on Florida's Atlantic coast. After significant conservation efforts and management protection, this population is recovering its

former numbers, with 12,026 green turtle nests counted at the Archie Carr refuge in 2015.

Ramped-up conservation efforts following the Deepwater Oil Spill are expected to multiply these successes by giving increasing numbers of turtles even better nesting habitats. In quick action following the 2010 disaster, NFWF established the Recovered Oil Fund for Wildlife to help protect endangered sea turtles and thousands of migratory birds. One project involved the relocation of turtle eggs directly threatened by oil washing ashore.

Local turtle experts and NFWF staffers established key focal areas for conservation efforts that would mitigate the damage to turtles caused by the oil spill. At the top of the list: eliminating light pollution along nesting beaches.

"We knew sea turtles were being disoriented, and we had good evidence and guidance from researchers on what could be done with lighting," Godfrey said. "There were a variety of products already on the market, amber or red LEDs for example, that had already been reviewed and approved by state researchers as turtle-friendly lighting."

In addition to implementing conservation projects on a massive scale, new funding offered the opportunity to do something unprecedented in Florida, Godfrey said. Investments by various entities, including state and federal agencies and the spill-related Natural Resource Damages Trustees, had helped dim the lights at beaches along public lands. But, Godfrey said, there had never been a large, focused effort to help private property owners convert their lights.

"This was the first time that a pool of money was available for various groups to go out, meet with property owners, show them evidence of problem lights, show them the types of lights that would fix it, and then tell them that we're going to help them pay for it. All they had to do was let us do it. It was a really unique position to be in, helping big condos or resorts or businesses cover that expense, and providing the guidance to do it right."

These early projects, Godfrey said, provided ample evidence of success.

"Turtles were disorienting less, the lights last longer, and the people who live there actually like it. There's no security issue, and they're saving tons of money on exterior lighting bills. That first shot of funding showed that turtle-friendly light management is effective, it works, people like it, and the turtles respond the way we hoped they would."

On Anna Maria Island, Fox's group also found success. The group retrofitted commercial and residential private properties with lower-frequency, turtle-friendly lighting. New research into the latest technologies - LEDs, light shields and other technologies and techniques - helped

establish the most cost-effective practices for property owners to comply with nighttime lighting ordinances.

Working on private properties was key, Fox said, as homes often outnumber businesses along the state's Gulf Coast. Before those projects began, she added, property owners thought they'd have to pay thousands of dollars to comply with lighting ordinances.

"Once it was established that only a couple hundred bucks could make a huge difference, people were knocking down our door. People started to change their own properties, even without grant funding, to match their neighbors."

And now, after decades of NFWF-funded conservation work and the recent funding boosts, Fox's group and others like it around Florida are reporting incredible progress in addressing nighttime disorientations, one of the most daunting man-made threats to sea turtles. When Fox and local codes enforcement officers look over Anna Maria Island's beaches at night, they're astonished at how far they've come.

"In between the grant-funded buildings, everybody else has come into compliance," she said. "Now we have blocks, whole cities, with turtle-friendly lighting."

Sea Turtle Rescue

This video is provided courtesy of the National Fish and Wildlife Foundation.

[VIDEO TRANSCRIPT]

The Gulf of Mexico is an incredibly special body of water. It basically serves as the nursery for just about all life in the Atlantic Ocean. A lot of the sea turtles come here to the Gulf of Mexico to nest even though they live their lives throughout the entire Atlantic Ocean. And traditionally what we do as the US Fish and Wildlife Service, we work to just monitor those nests and then let nature take its course, and let those hatchlings then go right back into the Gulf. Because of the oil spill, there's a great fear that this year's hatch off of this beach would be completely lost if we let it go back into the Gulf.

There really is a calamity developing. If we don't do anything, probably all 70,000 hatchlings that would be emerging from beaches are going to be swimming into their doom.

A plan has been developed to try to save these nests from certain death.

What we're going to be doing, is we're taking all of the nests and we're gonna be moving them to the Atlantic coast side of Florida. And there, those turtles will then hatch and be released directly into the Atlantic, thus removing the risk of them being released into the Gulf directly.

We knew we could get the eggs out of the sand. We knew we could allow them to incubate in place. We knew we could release them into a safe environment. But how do you actually move all those eggs over the course of several months in a safe way?

We approached FedEx, as FedEx has been a partner with the Foundation now for over a year doing many other projects. And it became very obvious that FedEx not only could contribute incredible advice, but then offer to do it as a philanthropic gesture, the actual movement.

The way this works is, Fish and Wildlife folks are excavating hundreds of sea turtle nests along the coast. They carefully dig those nests up, put them in special Styrofoam containers in sand, and bring them to us to be loaded on our truck. FedEx Custom Critical is transporting the eggs on an eight-hour trip to the John F. Kennedy Space Center in Cape Canaveral, Florida, where the eggs will be stored at a temperature-controlled facility until they are ready

to hatch. Once the little guys hatch, they will be released onto the beach, where they will make their way out to the clean waters of the Atlantic.

FedEx Custom Critical trailers are perfect for this, because they're climate- controlled. They have a satellite monitoring system that monitors every second of every day. These trailers are designed to securely hold any type of cargo. In this particular case, that's extremely important, because these turtle eggs can die if they are jostled or shaken in any way.

The hatchlings inside those eggs are very tenuously connected to the side of the shell, so it's very important that there's as little movement as possible.

FedEx has designed a special palette that holds six individual containers of eggs. They're spaced so that each one can essentially breathe. The containers are equipped with air holes. You don't want them to be right up next to each other.

Also in the design of the palettes, FedEx put rubber shock absorbers, particularly to secure the turtle eggs, that prevent any additional vibration. Once the palettes are made, once the Styrofoam containers are made, we are ready for the eggs.

Equipment's in good shape, roads are in good shape, we're in good shape.

It's amazing. It's something that makes you feel like you're really doing something worthwhile for our country and for the world.

The fact that we can all come together, FedEx, the National Fish and Wildlife Foundation, the Fish and Wildlife Service, the unified command, and come up with a plan, and actually carry out a plan to try to save some of the natural resources that would clearly be lost if we didn't step in, is not only rewarding, it is one of those things that you cherish the rest of your life.

Name: _____ Date: _____

Use the article "Keeping Sea Turtles in the Dark" to answer questions 1 to 2.

1. What was causing sea turtle hatchlings to become disoriented and go inland instead of out to sea?

_____

_____

_____

2. What did conservationists do to solve the problem of sea turtle disorientation?

_____

_____

_____

Use the video "Sea Turtle Rescue" to answer questions 3 to 5.

3. Why would it have been dangerous for the sea turtle hatchlings to swim out into the Gulf waters?

_____

_____

_____

4. What did scientists and their partners do to help protect the hatchlings from certain death?

5. Describe the way the sea turtle eggs were transported.

Use the article "Keeping Sea Turtles in the Dark" and the video "Sea Turtle Rescue" to answer questions 6 to 7.

6. How has human activity negatively affected sea turtle populations?

7. How has new or special technology enabled humans to help support threatened sea turtle populations?

Longleaf Conservation Gets High-Tech Help

This text is provided courtesy of the National Fish and Wildlife Foundation.

Matt Winter, NFWF

Open, sunny, healthy longleaf forests feature a park-like aesthetic.

Recognizing a healthy longleaf pine forest is easy enough, when you're walking through it. Stately, mature trees tower over a thick carpet of ferns and switchgrass. Everywhere you look, clusters of long, bright-green needles hang like droopy starbursts.

Many of the remaining large tracts of longleaf pine can be found on public lands; most are well-known to conservationists working to restore these once-dominant forests of the Southeast. Identifying hidden fragments of these critical ecosystems gets a bit trickier on private land, especially when the trees are young, interspersed with other pines, or crowded by intruding hardwoods.

Until recently, one of the few ways to discover these ecological jewels involved time-consuming and costly "timber cruises" conducted by professional foresters. Finding potential conservation sites required time, money and coordination with many private landowners.

But now, longleaf conservation efforts are getting some high-tech help. Scientists based in the Rocky Mountains are using state-of-the-art computing techniques and high-resolution aerial imagery to help their colleagues in the Southeast identify some of the best remaining opportunities to restore the mighty longleaf pine.

Nate Anderson, a research forester based at the U.S. Forest Service's (USFS) Rocky Mountain Research Station (RMRS) in Missoula, Montana, said that developing new tools to identify stands of longleaf involved using new software to train computers how to analyze and compare patterns in massive, high-resolution aerial imagery files.

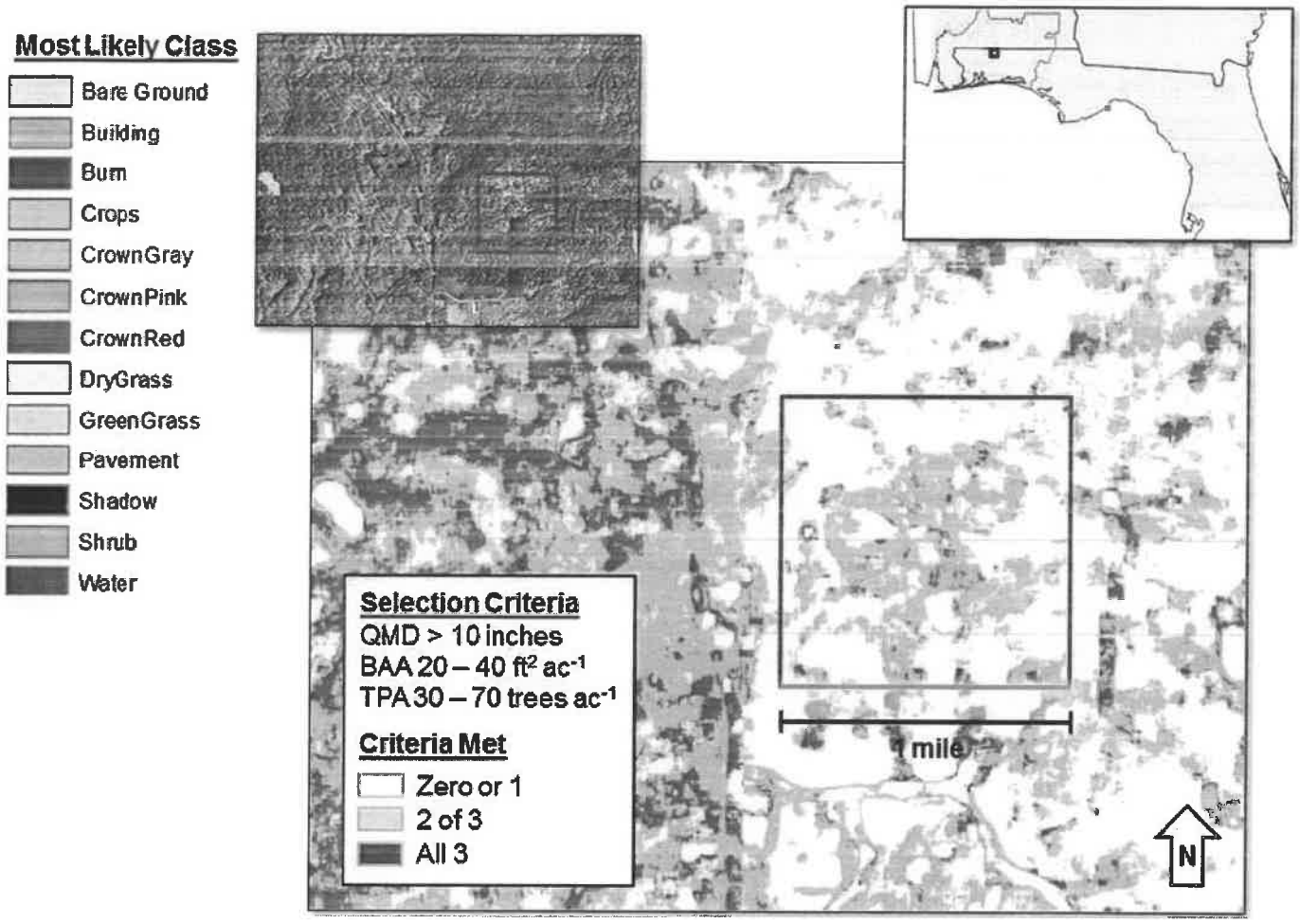
"The foresters are joking that they can hang up their cruising vests and just not go out anymore," Anderson said with a laugh. "But that's not true at all. We still have to go out and ground-truth this stuff, and we need good field data to develop accurate models.

"But if we can provide relatively accurate estimates of forest characteristics - over large areas, at high resolution, and in ways that are accessible to managers and analysts - then that really is a game-changer when it comes to conservation prioritization. This becomes a really powerful tool for this cross-ownership, cross-organizational planning. I mean, we don't need to go out and cruise forest tracts blindly - we know what's out there and where to target our efforts."

The longleaf pine ecosystem once encompassed more than 90 million acres of North America, stretching from Virginia to Texas. Unique to the southeastern United States, it contains a stunning diversity of plants and animals, including rare and endangered wildlife such as the indigo snake, red-cockaded woodpecker and gopher tortoise. Only 5 percent of the original acreage remains; threatened and endangered species that depend on longleaf habitat are struggling to survive.

For groups such as the Longleaf Alliance and the National Fish and Wildlife Foundation, harnessing new analytical capabilities will become even more important as conservation efforts expand from large tracts of publicly owned land to pockets of longleaf on private land. "A lot of the low-hanging fruit has already been well identified, and much of it is already in the conservation scope of influence," Anderson said. "The next step is to try to identify some of the stuff that's a bit more difficult to move into restoration."

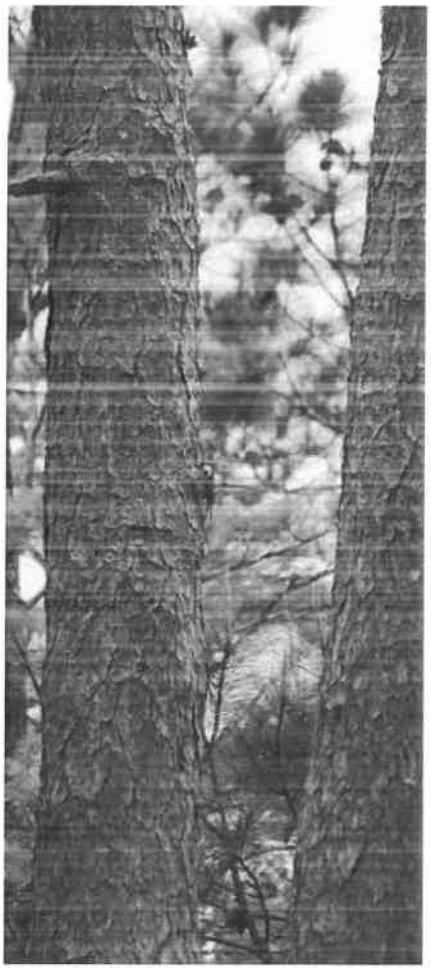
The new tools developed by the U.S. Forest Service team won't give scientists and conservation organizations easy answers to these questions, he said. But it will give them a much-needed head start in developing new conservation partnerships with willing landowners.



Researchers are developing new tools to identify stands of longleaf pine using high-resolution aerial imagery and advanced software systems. These new tools crunch data to determine cover type, tree density and other factors that can differentiate longleaf from other types of trees.

"It's important to know what's left, and it's just as important to know its condition," Anderson said. "We need to take it to the next level."

To develop these new tools, Anderson's team focused on test areas in Florida, Alabama and Georgia which already had fly-over images from the National Agriculture Imagery Program. They zeroed in on extremely detailed, "leaf-on" spectral images of forested areas that already had been studied by foresters on the ground. These study areas served as benchmarks that researchers used to "train" their software systems to predict which pixels represented different cover classes - asphalt, shrubs, grasses, longleaf pine and others - and then linked the imagery to plot data provided by the USFS Forest Inventory and Analysis Program through novel statistical models.



Matt Winter, NFWF

A red-cockaded woodpecker hunts for insects on the trunk of a mature longleaf pine. The birds, which evolved to rely on the longleaf pine, are an endangered species.

"Different species of pine can have very similar spectral signatures, and it can be very difficult to train a computer to distinguish between them," Anderson said. "But we've developed some new techniques to integrate texture and other factors into that analysis. So it's not just looking at each individual pixel, but also the values of pixels surrounding them."

Such predictive power arises from pixel-to-pixel analysis of canopy reflective values, tree density, tree shadows, understory and a host of other factors. To do all this without the use of supercomputers - Anderson's team uses stock laptops and desktops - the researchers use methods that leverage the latest developments in parallel processing and function modeling and a coding library and suite of software developed by RMRS biological scientist and team member John Hogland. Their methods, which involved writing more than 100,000 lines of code and juggling 15 terabyte datasets, can even offer confidence intervals for model predictions, which allow evaluation of their uncertainty and accuracy. This new set of tools can predict, for example, with 80 percent confidence that a given section of forest contains longleaf pine trees with a diameter greater than 20 inches.

The underlying mathematics, Hogland said, are "elegant."

"This is something we developed in Colorado and Montana for different types of forests, but it's just a great application for longleaf pine," Hogland said.

conservation

con · ser · va · ti

Definition

noun

1. the protection of natural resources such as soil, water, or forests from harm.

Water conservation is important for people's health.

Advanced Definition

noun

1. the act of preserving and protecting from loss, destruction, or waste.
2. the preservation of a resource, esp. a natural resource such as soil, water, or forests, from loss, pollution, or waste.

Spanish cognate

conservación: The Spanish word *conservación* means conservation.

These are some examples of how the word or forms of the word are used:

1. **Conservationists** regularly take up arms against plant and animal invaders by trapping, hunting, poisoning, or bulldozing them.
2. Kress knew a local treasure had been lost. He has since made it his life's work to return that treasure. His efforts have become a model for seabird **conservation** efforts worldwide.
3. Billions of dollars are spent in the U.S. alone to control invasive species each year. Tim Male, vice president of **conservation** policy at Defenders of Wildlife, says the country should do even more to fight nonnative species.
4. Because of overhunting and habitat loss, tree kangaroos are endangered. In 2009, after Dabek and her team spent 10 years working with hunters and landowners on the Huon Peninsula, the community set aside more than 70,000 hectares (173,000 acres) of forest for **conservation**.
5. Countless seabirds have since benefited from Kress's ingenuity. Seabird **conservationists** around the globe have adopted his techniques to reestablish almost 50 species in 14 countries, including petrels in New Zealand and albatross in Japan. "That was always my hope," says Kress, "to extend this beyond the puffin."
6. As erosion has become a bigger problem in past decades, scientists have been working to better understand the phenomenon. In 1965, American scientists came up with the Universal Soil Loss Equation, a way to estimate soil erosion by raindrop impact and surface runoff. The mathematical equation has since been applied all over the world, helping scientists predict which **conservation** measures will have the greatest impact on reducing soil loss.
7. There are only somewhere between 3,500 and 7,000 snow leopards left in the wild. Since they are still being hunted for their pelts and bones, **conservationists** have set up cameras to watch the endangered animals in their natural habitats, which are found in Kyrgyzstan, Afghanistan, Tajikistan, China, and Pakistan. The snow leopard habitat at the Bronx Zoo is part of the Species Survival Plan Program, which helps to manage the species population around the world.

distinguish

dis · tin · guish

Definition

verb

1. to tell apart by seeing differences.

It was hard to distinguish the twin brothers.

Advanced Definition

transitive verb

1. to correctly discern the identity of (each of two or more things) by recognizing how they are different (often fol. by from).

Can you distinguish Japanese writing from Chinese writing?

She is good at distinguishing different smells.

2. to see clearly or hear plainly.

It was too dark to distinguish his face.

3. to act in a way that causes (oneself) to be recognized or to be set apart from others.

She distinguished herself in yesterday's race.

4. to be the factor or factors that make (something) different from another or others.

A birthmark on the cheek distinguishes one twin from the other.

intransitive verb

1. to discriminate by noting or claiming differences (usu. fol. by between).

The teacher can usually distinguish between a student's original work and work that has been strongly influenced by a parent.

This historian distinguishes between "just" wars and "unjust" wars.

Spanish cognate

distinguir: The Spanish word *distinguir* means distinguish.

These are some examples of how the word or forms of the word are used:

1. "Maybe it's the direction that matters, the intention that **distinguishes** one work of art from another."
2. Each species (or type) of butterfly has its own genetic information that dictates what characteristics it will have and **distinguishes** it from other butterflies. Inherited genetic information explains why certain species look different from others.
3. Jake and Alice each have a collection of traits that make them unique that **distinguish** them from their family and friends. Some of these traits are physical-dark blonde hair, light eyes, freckles-and some are behavioral-curious about the world around them, generous, heavy-sleepers.
4. The Virginia Statute for Religious Freedom **distinguishes** between civil rights and religious beliefs, stating that a man should not be judged fit or unfit for a particular office based on his religion. To do so would be to deprive him "injuriously of those privileges and advantages to which, in common with his fellow citizens, he has a natural right." In it, Jefferson also addressed the "rightful purpose" of a civil government, which, he said, is to intervene only when certain acts disturb the peace and good order of things.

resolution

res · o · lu · tion

Advanced Definition

noun

1. mental firmness, determination, or resolve.

   Without strong resolution, she would not have risen to the top of her profession.

2. a personal decision to do something made with sincere determination.

   He made a resolution to give up gambling, and so far he has stuck to it.

3. a statement, decision, or course of action decided upon by a group or organization, esp. one formally adopted by a legislature.

   The resolution was adopted in order to combat the problem of piracy in the region.

4. a solution or satisfactory end to a quarrel, conflict, or legal dispute.

   Both sides were happy to have arrived at a resolution.

5. the process of separating into constituent parts, as light into the colors of the spectrum.

6. in music, the passing from dissonant to consonant harmony.

7. the degree or measure of sharpness of an electronic image, usually expressed in pixels per inch.

   The image's resolution is too low for it to be enlarged without blurriness.

8. the degree or measure of sharpness with which a device, such as a monitor or printer, reproduces an image, usually expressed in pixels or dots per inch.

   Their machine can scan your pictures at a very high resolution.

Spanish cognate

resolución: The Spanish word *resolución* means resolution.

These are some examples of how the word or forms of the word are used:

1. A **resolution** for a problem can only be met after evaluating the criteria and constraints of a problem.
2. Once the ideas have been expressed, the designer chooses the best **resolution** for the problem. Sometimes, a designer will consult an engineer, who helps produce a prototype.
3. He was one of the few men to attend the first women's rights convention, held in Seneca Falls, New York, and he was the only man to vote for a **resolution** demanding the vote for women.