

Dr. Sylvia Earle Talks about the Role of GIS in Ocean Conservation

Dr. Sylvia Earle, oceanographer and former chief scientist for the United States National Oceanic and Atmospheric Administration (NOAA), gives the keynote presentation at the 1999 Esri International User Conference.

<http://video.esri.com/watch/143/dr-sylvia-earle-talks-about-the-role-of-gis-in-ocean-conservation>

Video Transcription

00:07 Thank you, Jack Dangermond, and to all of you.

00:11 Yes I have been called many things.

00:15 Explorer in residence is one of the greatest I think.

00:18 When I was chief scientist at NOAA, it was sometimes whispered that I was the sturgeon general.

00:29 The title I think I am most happy with though is one that my four grandsons have dubbed me, and that's G-mom.

00:38 It's really given me new eyes to see the world through theirs and to imagine what the world is going to be like...

00:47 ...when they're at the stage that we are at present.

00:51 I mean they range in ages now from the oldest is 10, the youngest about 3 months.

00:58 The world in my lifetime and yours has changed so much.

01:04 It's almost inconceivable to imagine what it's going to be like in the next 30, 40, 50 years.

01:12 It's really exciting to be around at this pivotal point in history as we embark on a new century, a new millennium...

01:20 ...which is just the way we account for time.

01:23 I don't think the fish know one way or the other whether it's a new century.

01:27 But certainly it's a new turning point, no matter how you account for time.

01:33 I'm really excited to be here as a part of this partnership, partnerships everywhere I look.

01:41 From my standpoint very personally, with the National Geographic Society and Esri...

01:47 ...I can't wait to see what new blossoms form from this alliance...

01:51 ...and from the others that are developing with NOAA, with Navy, with industry.

01:56 Everywhere you look, this new technology that is embodied by the GIS approach is just amazing.

02:05 And it's high time.

02:08 Esri is everywhere, GIS is everywhere, and they need to be at this critical, pivotal point in history...

02:16 ...when, for the first time in human history...

02:20 ...we're beginning to know enough to know just how much we don't know.

02:27 There was a point in time not so many centuries ago when the big news was that earth is not the center of the universe.

02:36 It's sneaking up on us, but I think one of the equally stunning bits of news is just beginning to dawn on humankind...

02:45 ...and that is that the sea is not limitless.

02:50 There are limits to what the natural systems that support us can endure...

02:55 ...as a consequence of what we do.

03:00 And also, to some extent, what we do not do.

03:04 But one thing is certain.

03:06 We, who have come along at this extraordinary time in history with technology that has given us eyes in space...

03:13 Just this past week we've been celebrating the 30th anniversary of the first footsteps on the moon.

03:21 And that perspective of earth from afar by real people out there in space looking back on us.

03:27 And just bringing home that this is a water planet.

03:31 I mean, we know it, we look at the globes and those big blobs of blue that are represented as ocean...

03:38 And on one face of the earth, of course, it's entirely blue looking at the Pacific from afar.

03:46 But we don't really get it, or at least we haven't until recently, that the ocean...all that water...

03:53 ...is the cornerstone of our life support system. It's many things, of course.

03:59 But fundamentally, water is absolutely vital for life. It's the single nonnegotiable thing that life requires.

04:07 And most of it is out in the ocean. Of the freshwater, 97 percent is in the area locked up in polar ice.

04:17 Think of the alternatives. Mars, for example. A planet that's at the same life history in many ways as...as ours...

04:26 ...four and a half billion years, but not a very hospitable place for humankind.

04:30 Only in our time, recently, has it become clear that the oceans govern climate and weather.

04:38 It's home for most of life on earth, some 97 percent of the biosphere is ocean.

04:45 But our ability to explore it, to know it, to put it on our balance sheet, to think about what we're doing to the sea...

04:52 ...and how important the ocean is to us, has come about as a consequence of technologies developed largely in our time.

04:59 Although we still to very good advantage use ships just as our predecessors have...

05:05 ...just as the first oceanographic expedition ever that set forth in 1872 from the shores of England...

05:11 ...the Challenger expedition, to explore for the first time all of the oceans in a single four-year mission of exploration.

05:19 But pity those poor scientists, and I'm one of them...

05:22 ...who has sat on the deck of a ship, longingly wished to know what's in the depths below...

05:27 ...and we're stuck with the techniques that aliens might use if they were flying overhead in ships...

05:35 ...dangling nets, lowering bottles, and sweeping the...the area below trying to figure out...

05:41 ...well, what's it like down there? This three-dimensional realm, this aquatic realm, is still largely unknown.

05:48 Less than 5 percent of the ocean has really been explored.

05:52 We have fairly good maps thanks to new technologies, acoustic technologies and other means of exploring the sea.

05:59 We know where the mountains are, the plains, and valleys and so on.

06:02 What we don't really know, is the nature of that place...

06:06 ...that three-dimensional part of the planet that is home for most of the water and most of the life on earth.

06:14 When we drag a net through the sea, we get often a scene such as this. Jelly soup.

06:21 I mean, it's really incredible that we know as much about the sea as we do...

06:25 ...when much of what we now find in text, in our atlases, and so on, are based on little bites that are taken out of the ocean's bottom.

06:35 Little scoops that are pored over by seagoing detectives that try to figure out who's who and what's what...

06:42 ...based on tiny samples that really are more like taking a spoonful of North America...

06:48 ...and trying to figure out what's it like in this part of the world.

06:53 Imagine, for example, that you're trying to figure out what a city is like by dragging a net through the streets.

06:59 Imagine your backyard, wherever it is.

07:01 My backyard, San Francisco. I don't know what's going on there even though I live there.

07:05 But if I were using standard oceanographic techniques, just think of it.

07:10 Dragging a big trawl right down Market Street, or San Diego...

07:13 ...any other place that you can think of, and try to piece together from bits of, you know, cement...

07:21 ...a few puzzled pedestrians, whatever it might be, caught in the sweep that...of a net that goes down the backyards and alleyways...

07:32 ...and make sure you crunch it all together before shaking it out on the alien's deck of a ship in the sky to...

07:39 ...and then figure out well, what's it like down there?

07:43 We know quite a lot about the...the nature of the kinds of things through there...

07:51 ...but not really what they are or how they live, how they interact one with another.

07:59 So we have a very long way to go.

08:01 But in our time we've been blessed with technologies, thanks to Jacques Cousteau and some of his colleagues...

08:09 ...of being able to take ourselves into the sea directly as our predecessors never could.

08:13 And the first thing that anyone really discovers when they first put their face in the water...

08:18 ...and my mother waited until she was 81 before she did this.

08:23 I mean, she came back and says, it's alive! It's alive! It's not just water, it's not just rocks and water.

08:30 It's a living system. Every drop of ocean water, every drop of water is likely to have some form of life...

08:39 ...small, medium, sometimes very large forms of life.

08:42 But alive...the ocean is alive.

08:45 There are forests there. Just offshore from where we are right now, forests as tall, as mighty, as diverse as rain forests...

08:55 ...and they're even wetter than rain forests.

09:01 Small...most of life in the ocean, most of life on the planet is small.

09:07 But we have a bias. We are giants.

09:09 And we take for granted some of the lesser creatures in terms of size.

09:14 We notice the whales.

09:16 We are just beginning to really appreciate whales and take care of them in ways that our predecessors did not...

09:22 ...just as we were on the verge of perhaps losing them.

09:25 But the diversity of life in the sea is just monumental.

09:30 And that too, is something that we're beginning now to...to tune in to.

09:35 To realize that nearly all of the major divisions of plant and animal life and bacteria...

09:40 ...and the new kingdom of divide...of life recently discovered in the deep sea, the archaea...

09:45 ...nearly all of them are found in the sea.

09:47 Only about half occur in terrestrial environments.

09:50 So if you really want to tune in to this thing called biodiversity, go jump in the ocean. That's where the action is.

09:59 Not that there isn't action on the land, of course, there is.

10:02 But we've been ignoring the sea until recently.

10:06 This place filled with jellies, with the counterparts of insects, the crustaceans.

10:13 The counterparts of backyard earthworms, the souped-up version, the polychaete worms.

10:19 Thousands that do not yet have names. Maybe millions that do not yet have names.

10:26 Creatures that preceded dinosaurs in their history by a lot, and they're still here.

10:31 These are, in a sense, living fossils.

10:34 Every time I go into the ocean it's like diving into the history of life on earth.

10:39 Because we see creatures with roots, with relatives that go back half a billion years...

10:45 ...when multicellular life first got up and running.

10:48 And it's still there. At least their relatives are still there.

10:52 We can learn a lot about what life must have been like hundreds of millions of years ago...

10:58 ...by really looking seriously at the sea with new eyes.

11:02 By looking at fish with new eyes.

11:04 I mean, I know because I have been there myself in terms of looking at fish...

11:09 ...thinking of lemon slices and butter.

11:12 But now that I know fish face to face, nose to nose, I look at them in different ways...

11:19 ...the way many people have come to look at birds.

11:22 Now it doesn't mean that we don't eat birds or we shouldn't eat birds or fish.

11:27 We eat Kentucky Fried birds, we eat Christmas birds, Thanksgiving birds...

11:31 ...but we are pretty selective about what we eat in the ocean. I mean, anything is fair game.

11:37 Perhaps the day will come when we'll see fish in the sea as we have come to view birds on the land...

11:44 ...for the many things that they are to the world in which we live.

11:49 Values that transcend just how good they taste. But we aren't quite there yet.

11:55 We are still, in many ways, frustrated by getting there.

12:00 We look longingly from the decks of ships. We peer wistfully over the side.

12:07 And only, relatively speaking in recent times, the last two, three, four decades...

12:14 ...have we had increasingly effective access to see for ourselves what's out there.

12:20 It's still a pale shadow of our access even to the skies above, let alone to the land, but we're getting there.

12:27 Thirty years ago, I had the pleasure of seeing what it's like to live underwater.

12:31 In fact, I emerged from a two-week stay underwater on...guess what? July 20th.

12:38 This was 1970, one year after Buzz Aldrin and Neil Armstrong and Mike Collins returned...

12:44 ...or actually made their return from their famous moon walk.

12:49 There was for a while a great parallel between sea and space, which is...

12:54 ...they have sort of gone separate ways more than not in the last few decades.

12:58 But I think there is again a convergence as we are learning so much from looking at earth from afar...

13:05 ...and now, as we are beginning to look at the sea from within.

13:11 There's the Yea, Team! picture of the so-called aquabelles.

13:15 They couldn't quite begin to call us aquanauts like the guys.

13:19 Remember, this is 1970.

13:22 I don't think they would've called the astronauts astro hunks, but the women got called astro...I mean aquabelles, aqua babes...

13:31 ...aqua you-name-it, but there we were.

13:35 I didn't care what they called me, just so they let me go, and they did.

13:40 And here is a little view from inside the sea space version of living underwater.

13:47 In a sense, our space station under the sea as of 1970.

13:52 Just last week I went to visit the new space station under the sea, the Aquarius that is operated by NOAA.

14:00 There have been a number of attempts by many nations to actually have underwater dwellings.

14:06 And certainly the oil industry has used this technique for living underwater...

14:10 ...saturation diving...to prolong the time that people can stay and work underwater.

14:15 But scientists certainly have a great deal of fun.

14:18 I can tell you that the gift of time, being able to stay in the sea...

14:23 ...not just for an in-and-out 20-minute passport to a maximum depth of 100 feet or so...

14:28 ...as scuba divers go sometimes to 200 feet for an even shorter period of time...

14:33 ...but to be able to stay for a week or longer, to go in and out at will...

14:38 ...to be able to really get to know creatures and know the system as time will allow one to do.

14:45 The new technologies that have come along in the last three decades have given us other means to explore...

14:51 ...at greater depths and for longer periods of time.

14:54 The Monterey Bay Aquarium Research Institute has made such good use of robotic technologies, as has the oil industry...

15:02 ...as have others, to explore the ocean.

15:05 But this is new. This is really new.

15:08 We're just beginning to have enough information to start being able to characterize the sea in new ways.

15:18 Curiously, although many take the ocean for granted, many seem to think that the great era

of exploration is over.

15:27 Few people are aware that only once in all of human history...

15:32 ...have people made a descent to the deepest part of the sea, and it's only seven miles down.

15:39 Well, a round-trip to seven miles. One-way trips are really easy anywhere in the ocean.

15:45 But coming back, as well as going down, is the key...

15:49 ...and in 1960 two men, a Swiss scientist and a U.S. Navy Lieutenant, Don Walsh, Jacques Piccard...

15:58 ...made a descent to the bottom of the ocean, seven miles down, the Marianas Trench, and returned...

16:04 ...but here is the interesting thing. Nobody has been back there since.

16:08 This robot, developed in Japan, is the only piece of equipment that has, as far as anybody knows at least...

16:14 ...made a round-trip journey to bring back the news that guess what, yes, there is life in the deepest part of the sea.

16:21 And not just a little bit. Quite a lot of life prospering at a depth where the pressure is 16,000 pounds per square inch...

16:32 ...and sunlight is a very far distance away.

16:37 Many new small portable robots have been put into use.

16:41 We're using one presently with the Sustainable Seas Expeditions that I want to share with you, information about that.

16:48 New manned submersible technologies are also coming along slowly.

16:53 Not nearly as rapidly as our reach into the skies above, but you know...

16:57 ...I guess I'm just a bit more impatient than some, because I feel the sense of urgency. I feel the need to know.

17:04 I understand how little any of us know about what's happening in the ocean, and yet, how important the sea is to every breath we take.

17:13 It is so important that we understand what makes the planet tick.

17:19 And if we ignore the sea, we're ignoring the cornerstone of what makes the planet what the planet is.

17:26 Again, Japan has taken the leadership role with technologies now in use.

17:32 This is the SHINKAI 6500, a manned submersible that goes to at least half the ocean's depth, to 6,500 meters, and brings people back.

17:45 The Alvin, the workhorse of deep diving submersibles, has been in operation since the mid-1960s...

17:52 ...upgraded and revamped and brought up to speed with many alterations over the years, but still, there it is...

18:00 ...the workhorse of submersible technologies, operated by Woods Hole Oceanographic Institution.

18:06 Hundreds of scientists have been given access to the deep sea...

18:10 ...but instrumental in the discovery of hydrothermal vents and life in the deep sea, about which we knew so little.

18:16 Didn't know anything before, even to gain access to some of our...our history, now submerged.

18:24 Alvin can go to the average depth of the ocean, where the Titanic rests. Think of it. That's the average depth of the ocean.

18:31 Scuba divers can go maybe a hundred, hundred and fifty feet, and here we are now still scratching the surface of this vast realm.

18:40 In 1979 I had the pleasure of using a new twist on manned submersible technology, well, womanned submersible technology in this case.

18:49 This one person, personal submersible, to be able to go walk around on the ocean floor 400 meters down...

18:56 ...offshore from the coast of Hawaii, and to see for myself those little fish with lights down the side and sharks with green, glowing eyes...

19:04 ...and other creatures, another project that the National Geographic sponsored.

19:09 Soon thereafter, I was inspired to put together a company myself, to further the ways and means of developing ocean access.

19:17 And one of the things that came as a result of that, was this little submersible called the Deep Rover.

19:23 It's small, as you can see. This is a mighty kind of oceanographic support platform.

19:29 It actually costs about \$1,000 to build this raft.

19:33 It was used in the national park in Crater Lake, Oregon, for dives down to almost 2,000 feet.

19:39 We had to use a helicopter to fly it in. It weighs about 6,000 pounds.

19:44 The whole idea behind developing this system was to get something that would be so simple that even a scientist could operate it...

19:52 ...and I'm living proof that the engineers involved, especially Graham Hawkes, the principal engineer who designed it...

19:58 ...got his sums right and got the human factors right, and it...you know, you can wear what

you like when you fly it.

20:09 But a new technology that is derived from all that has gone before is now on the scene...

20:13 ...and it...it is a primary tool that we're using with the Sustainable Seas Expeditions.

20:20 A partnership that has developed in the last two years, or so, that came about because of funding provided by a private foundation.

20:28 The Goldman Fund in San Francisco made a grant to the National Geographic Society for \$5,000,000 for five years...

20:36 ...to go out and explore our own continental shelf with a focus on the national marine sanctuaries.

20:43 Now some of you may not have heard of national marine sanctuaries, and I'm not surprised if you haven't.

20:47 It's one of the nation's not only best ideas, but one of the best kept secrets.

20:53 In a way though, it is a secret that is beginning to be spread as news all over the place.

21:01 The book Wild Ocean is really a tribute to the marine sanctuaries...

21:05 ...as the counterpart to the national parks on the land, an idea whose time is well overdue in many ways because we are using the ocean...

21:15 ...but we are not really...do not really understand what it takes to protect the natural systems...

21:21 ...that are at the heart and soul of what makes the earth hospitable for us.

21:27 By getting a piece of technology that is really transportable, small enough to throw in the back of a pickup truck or in a box...

21:35 ...and send around the world or across the country, wherever you want it to go, weighs half as much as the Deep Rover...

21:43 ...designed in Canada by a company called Nuytco Research with a visionary engineer, the guru behind it, Dr. Phil Nuytten...

21:53 ...who is the one who dreamed up this sort of a synergy of various technologies, to come up with a one-atmosphere shell...

22:01 ...much the way an astronaut walks around breathing a close-to-one-atmosphere environment...

22:09 ...so in the DeepWorker system, individuals can climb aboard, fly around for 4, 5, 6, 8, 10 hours.

22:18 It has a hundred hours of life support.

22:20 Come back to the surface and simply go about your business with no decompression.

22:25 Now this group of smiling people on the screen represent a cross section of hardy souls...

22:32 ...who were encouraged to accept the invitation to come and try it out during this past year.

22:39 This is the second year of the five-year mission of exploration, research, and education that is fostered by the Goldman Grant...

22:48 ...by the National Geographic; and our logical, natural partner, NOAA, the National Oceanic and Atmospheric Administration...

22:55 ...because it is within their jurisdiction that the national marine sanctuaries lie.

23:00 Moreover, of course it is our nation's ocean agency, and for mission exploration, research, monitoring, education...

23:09 ...and so on, in the sea, it just makes sense that NOAA should be a partner, but there is no guarantee.

23:15 As it has turned out, NOAA has not only taken the program and embraced it, they have invested heavily in it...

23:25 ...so that during the past year alone, by providing ship time, personnel, and other resources...

23:31 ...a commitment of more than \$4,000,000 has been made to this project...

23:36 ...and we hope that that partnership will certainly continue and grow.

23:42 The concept, in a way, in so many ways, is outrageous.

23:47 I was talking recently with Dan Basta from NOAA, who's been one of the champions of the Sustainable Seas Expeditions...

23:55 ...and that's a word he used too. It's outrageous! It's just outrageous!

23:59 Imagine, getting scientists to pilot a submarine themselves.

24:04 It's been thought that, you know, scientists get down under water and they get so busy with what they're there looking at...

24:10 ...and doing that they forget about things like life support.

24:14 And so there's been a hesitancy about trusting a scientist to actually drive a little submarine around.

24:19 You have to have a, you know, skilled pilot to do it and...and I'm all for hep...the training investment...

24:25 ...just as in driving a car or flying an airplane, but these little subs are so easy to drive...

24:32 ...it's said to be like driving a golf cart, in terms of ease of operation.

24:37 Those of you who have done so can perhaps vouch for it, but since I've not driven a golf cart, I can't say for sure...

24:44 ...but I can say that DeepWorker is very user-friendly.

24:49 And it is being used by dozens of scientists right now.

24:53 Some are active in one of the marine sanctuaries in Gray's Reef off the coast of Georgia, one of those systems.

25:03 You climb aboard, as you see Francesca Cava here climbing aboard.

25:08 Francesca joined this expedition, bringing her mind and heart and spirit, formerly the head of the National Marine Sanctuary Program...

25:16 ...a colleague of mine when I was at NOAA, and now one of the guiding spirits and strong elements...

25:23 ...in making a success of the National...of...of the Sustainable Seas Expeditions.

25:30 She's here, if you can catch her. Ask her, "Well, what's it like, Francesca?"

25:34 Here are some other partners. Right there in the center is Nancy Foster, head of the National Ocean Service for NOAA...

25:41 ...without whose endorsement and strong support we might not be as far along with our partnership with NOAA as we are.

25:50 And I really want to thank Todd Jacobs for helping me with the presentation that you're hearing today...

25:54 ...and that's my smiling face there on the other side.

26:00 It's outrageous because we are pulling together through this effort...

26:05 ...agencies that sometimes don't work together very often or very well.

26:10 We are actually pioneering a new kind of arrangement with the National Geographic Society...

26:17 ...an agency that is well known for making grants to others, but here the grant was made to them...

26:24 ...to actually explore the ocean using funds that were given to the...the society, and it is a beginning perhaps...

26:32 ...of a new approach for the National Geographic, for similar projects that may be forthcoming in the future.

26:40 Certainly this one will prosper and grow with additional resources...

26:45 ...that may be contributed to the National Geographic and to the partners who are making this...this work.

26:51 You saw in the initial presentation, which I love...

26:54 ...Jack Dangermond, that was a great introduction...

26:57 ...the Channel Islands, here off the coast of California.

27:00 It's one of the national marine sanctuaries, or the waters surrounding it.

27:03 The national park system under the Department of Interior actually has jurisdiction of the land and protects that...

27:09 ...but we involved with the National Marine Sanctuary Program...

27:14 ...have seen a time when the waters surrounding the islands have also been included in this...this protective umbrella.

27:24 Northward, Monterey Bay...5,000 square miles of ocean embraced within the sanctuary program.

27:31 And north of there, off of San Francisco, two other sanctuaries, Cordell Bank and the Farallon Islands, the waters around them.

27:37 And then up to the Olympic coast in Washington.

27:41 The sea, offshore some 3,300 square miles within the National Marine Sanctuary Program.

27:48 These are logical places to put an investment in understanding how the ocean works from the inside out.

27:59 Places where GIS is certainly a logical extension from what has been done on the land.

28:06 To be able to integrate from many sides the kinds of information that has been growing over the years.

28:15 We're beginning to see not just the excitement of exploration but the need for exploration...

28:22 ...for integrating information about what's happening in the sea.

28:26 Why? Because the sea is changing...changing dramatically, just in the past 30 years.

28:34 One sign of that is what's happened to coral reefs around the world.

28:39 If the rate of decline of coral reefs continues over the next 30 years...

28:46 ...as my grandsons grow up and begin to become divers on their own right I trust, I hope all the coral reefs do not look like this.

28:57 But it's frightening to get the news from my friends and from what I have...have seen myself as I travel around the world...

29:03 ...of places that I knew years ago that are no longer in the good, healthy state that they were.

29:10 Jacques Cousteau said before he died, just a couple of years ago...

29:15 ...that he could not take his sons to places that he knew as a boy, they had changed so much in his lifetime.

29:24 And here's the scary thing. Jean-Michel, one of his sons, says the same thing.

29:30 That he could not take his children to places that he knew as a child because things have changed so much in his lifetime.

29:38 The same is true with me. I'm sure it's true with you, not just in the sea, but the world over.

29:45 What's happening to the ocean?

29:46 Well, it's pretty straightforward. We're taking too much out of the ocean.

29:52 Natural systems that have no way to really be prepared for the heavy level of predation that we bring to the scene.

30:01 We're getting a wake-up call from nature as is evidenced by the collapse of some kinds of ocean wildlife...

30:09 ...that once we thought were essentially infinite in their capacity to sustain high levels of take.

30:17 Bluefin tuna is one example, down to perhaps 10 percent of what it was 25 years ago in the Atlantic...

30:25 ...and certainly not in good shape elsewhere.

30:28 True with sharks. Here a visit to the Tokyo fish market...

30:31 ...where these ocean giants are now really appearing as hold-in-your-arms individuals.

30:41 The giants are basically gone. And it's happened in our lifetime.

30:47 Every time you take a little bite of a succulent morsel of scallops or...or shrimp...

30:52 ...one should think about what the actual cost to the ocean ecosystems are to deliver that to your plate.

30:58 I mean, here is an example of a scallop dredge going across the sea floor...

31:02 ...actually missed one scallop, that one dislike thing in the foreground.

31:08 If we knew better, we perhaps would do better.

31:11 It doesn't mean we shouldn't eat seafood or that we should avoid eating scallops or shrimp, but we should know what we're doing.

31:18 The greatest threat to the ocean as big...big as these problems are, about what we're taking out of the sea...

31:25 ...about what we're putting into the sea, far and away the biggest problem is ignorance.

31:29 It's not knowing. It's not understanding what the limits are.

31:33 What can we do? What should we not do?

31:37 I'll tell you that you'll never look at a calamari in the same way again once you've been inspected by one.

31:43 I can say that from personal experience.

31:46 I don't think the same way about grouper, having met some face to face. They're like the Labrador retrievers of the sea.

31:54 It doesn't mean that some people don't munch on puppy dogs...

31:57 ...but it's just the idea that if we understand their total value to the natural systems that support us...

32:05 ...doesn't mean that we'll stop eating them, but we'll eat them with new respect and a new understanding about how many...

32:11 ...of what kind, and which ones perhaps should be kept just because they are fantastic.

32:17 They're part of the system that keeps the world habitable, not just for them, but for us as well.

32:24 This is the time, perhaps as never before, and never again, for a new ethic.

32:31 To do for the oceans in the 21st century, through technologies, through new understanding, through new insights...

32:38 ...what was done in the 20th century for aviation, for aerospace.

32:43 Certainly, as we go forward into the next century, it's going to become increasingly clear that the pressures on the planet are increasing.

32:53 The size of the planet is not.

32:57 Where does GIS come into all of this? Where does Esri come into all of this?

33:03 I'll put it another way, where doesn't it? Where doesn't GIS come into the understanding of the ocean?

33:13 I mean, after all, marine ecosystems, just as those on the land, are geospatial...

33:20 ...and therefore so are the solutions that we must craft as we go forward.

33:29 We will go forward if technology will let us go forward.

33:37 In my lifetime and yours, actually in the last 10 years, a very swift development of new tools that have provided...

33:45 ...literally a quantum leap in our ability to understand and manage marine ecosystems.

33:52 We're going forward...I hope.

33:59 SSE, the Sustainable Seas Expeditions, is making good use, a running start with the partnership with Esri...

34:09 ...with the ability now through software that has been given to the marine sanctuaries...

34:14 ...to start to integrate the databases that have been out there for years and that we're adding to.

34:19 I mean, scientists have been looking here, there, and other ways for decades all through this past century...

34:25 ...but now we have the technology to begin to build an understanding of what it all means.

34:30 About who lives...who and how many of what lives where.

34:35 About the changes through time.

34:38 We have real-time navigation and tracking of the submersibles, so we can, in three dimensions, get information.

34:44 As the little submarines dive, and we can do this with remotely operated vehicles as well...

34:49 ...get a profile of salinity, depth, temperature, oxygen, and other factors, and little by little...

34:55 ...and in a growing sense, gather information about these very special places.

35:01 Why focus on the marine sanctuaries?

35:04 Several reasons. But first of all, they're acknowledged to be special.

35:08 They've been set aside over the past 25 years...

35:10 ...a program that started in 1972, a full 100 years after the first national park was established.

35:18 I hope it doesn't take a hundred years to catch up with where we are now with protecting the land...

35:24 ...with the ethic and actual policies of protection that we can apply now to the sea.

35:30 But the sea is a little more complicated. It's truly three dimensional.

35:34 Ask any fish. Ask any whale. Ask any diver just how three-dimensional the ocean is.

35:40 We need the new technologies that have only come into focus in the last decade.

35:47 By generating a series of GIS products to document and communicate the expeditions over the next several years...

35:55 ...we will begin to complement and put in the bank, if you will, new insights into how the ocean works.

36:03 Is it enough to focus on marine sanctuaries?

36:06 Of course not. No, it's a good start. It's a really good start.

36:10 One other good reason is that if any place in the ocean is likely to have an enduring future...

36:17 ...in terms of an investment for research, for monitoring, some place that, you know, 5 years, 10 years, 50 years, maybe 500 years...

36:25 ...will still kind of be there protected, the investment in the research protected, it's probably in a protected area, in a marine sanctuary.

36:35 Now there isn't a great deal of sanctity in the marine sanctuaries as they're presently crafted...

36:40 ...but it's the best hope that we have for having some enduring policy of maintaining a long-term research program.

36:49 And we know already that they're special.

36:51 And they can serve as models about what can be used elsewhere, not just in North America but of course, around the world.

37:06 One of the great advantages, at this point, of enlisting these new technologies is what I...

37:14 ...I personally see it as a scientist who's been, you know, nose down looking at things close up...

37:18 ...and now suddenly, so much I can see as never before in context.

37:25 It's that kind of ah-ha breakthrough, that this...these new integrated data systems allow.

37:34 I can't wait to see what's going to happen as we begin to work together.

37:38 I mean, right here in this room, there is the power to change the world...

37:45 ...the way we look at the world, the way the world goes forward henceforth.

37:49 If we just use the technologies joined together with our minds and our hearts...

37:55 ...and our commitment to make a difference, there will be a different world.

38:00 One that will be happy, that your children and mine, your grandchildren and mine, will have on into the future.

38:09 What can you do? What can I do? What can anybody do?

38:12 Well, I like to think that there's one piece of technology that really is the greatest. It's called a mirror.

38:21 It's something everybody can use to hold up and say, Yep, here's what I am, and here's what I can do.

38:29 I don't...I can't really advise anyone better than I can advise myself.

38:34 And what I'm doing is perfectly clear. I'm making a commitment to do everything I can, in whatever time I have left...

38:42 ...to understand whatever I can about the ocean, to share the news, to protect the wild systems that are at the heart and soul...

38:51 ...of what makes the planet work, on the land and on the sea, in the sea.

38:57 This I think is rather much in keeping with what my mom used to say to me when I was a little kid.

39:03 She'd come into my room and see the disaster that was there and she'd say...

39:09 ..."Don't you remember, Sylvia, you're supposed to leave the place better than you found it."

39:13 And so I went and cleaned up my room and tried to leave it at least as good as I found it.

39:17 And that's our assignment I think.

39:19 To use whatever powers any of us have, whatever it is we do, as businessmen, as scientists, as policy makers...

39:28 ...whatever it is, to leave the place better than we found it.

39:35 So, that's what drives me when I see my little munchkin kids.

39:40 I just am haunted by the vision that they're going to say to me at some point, "Gee, Mom, why didn't you do something?"

39:48 This is like 30 years from now.

39:50 Or maybe they'll look back on what I was and say, "Why didn't you...You know, you were there when there were blue whales.

39:57 "You were there when there were still coral reefs.

40:01 "And you didn't do everything you could to make sure that they didn't sort of go over the edge into infinity?"

40:09 So, I guess whatever else today is, my chance to be with you, I'd like to think of this as a call to action.

40:15 To use your minds, use your hearts, make a commitment.

40:20 I'd love to work with any of you, or maybe just watch as you get an idea and take off on your own.

40:25 Jack Dangermond and the National Geographic Society, Esri, will be this fall, hosting a meeting, a series of meetings that we'll follow...

40:36 ...to see what we can do to use the kinds of technologies that you bring to the world at this point in time.

40:45 If you have an interest, a desire to make a commitment, I'd love to work with you. The Geographic would love to work with you.

40:51 Jack Dangermond says he would like to work with you too, but he can tell you that for himself.

40:56 I'd like to share with you a little piece of video at this point...

40:58 ...just to give you a taste of what's happening while we're sitting here in this dark room...

41:03 ...there're some lucky ducks who are out there splashing around in the ocean.

41:07 Sustainable Seas, could we show this video please?

[41:09](#) [Video running]

[41:18](#) We should turn the...sound right down. Thank you.

[41:23](#) If anyone is inclined to hum or whistle we could have a soundtrack.

[41:31](#) But this is fresh from the field and so pulled together by Kip Evans who's working with the National Geographic...

[41:41](#) ...to compile sort of the latest news and bring it to you.

[41:45](#) If you check out the...NOAA's Web site, the National Geographic's Web site, and of course, they're linked...

[41:52](#) ...you will have access to more than a thousand pages that have been generated since April of this year...

[41:57](#) ...when we began the training exercises to engage these wild and crazy scientists, and others.

[42:06](#) Teachers are attracted to our project.

[42:09](#) And one in particular, Mike Guardino from Monterey, went through the training...

[42:14](#) ...and took the DeepWorker for dives off Monterey and shared the news with his classes...

[42:21](#) ...and really was able to magnify his experience many times over.

[42:28](#) Just what all of those involved with this project are doing, and certainly have the potential for doing even more in the future.

[42:36](#) At each of the sanctuary sites, the sanctuary managers get involved very personally.

[42:42](#) Most of them have actually gone through the training.

[42:44](#) The training consists of agreeing to come and learn how to drive and dive the submersibles.

[42:50](#) We call it Driver's Ed Underwater. For about a week of book learning as well as hands-on, feet-on experience.

[42:59](#) You drive these little subs with your feet by the way, your hands free to operate cameras...

[43:04](#) ...or scratch your ear or eat a sandwich or whatever else it is you want to do...

[43:09](#) ...to manage the equipment that you care to put on the submersibles.

[43:14](#) We've had the pleasure so far of visiting the four sanctuaries in California as well as going up to the Olympic Coast...

[43:23](#) ...and from there to the East Coast, to Stellwagen Bank off the coast of Massachusetts.

[43:29](#) We've operated so far from three different ships, two from NOAA and one from the U.S. Navy.

[43:38](#) Up in the Olympic Coast, we had a vessel called a YTT to deploy the little DeepWorker sub.

[43:45](#) They weigh about 3,000 pounds fully loaded, and that means with you inside, and your

lunch...

43:53 ...and of course, if you're small and tiny you get more room, more lunch.

43:59 If...if you're sort of tall and lanky, Jack Dangermond, the new three...or the 3,000-pound systems...

44:12 ...we had some trainer subs that were a little more petite, these are for you.

44:16 And also for Boyd Matson. You'll see his smiling face on the screen here soon.

44:21 The host of the National Geographic's popular Explorer series.

44:27 Boyd is I think six foot four and exceeds by two inches the optimum length for occupancy in DeepWorker...

44:35 ...but even though his knees are a little bit scrunched up around his chin...

44:39 ...you'd never know it from the big smile on his face as he cruised around in the DeepWorker.

44:44 And he's going to be with us again soon out in the Flower Garden Banks in the Gulf of Mexico.

44:52 One of the sanctuaries that has been...an act...a wonderful bridge between the conservation community and industry.

45:01 It's a place actually surrounded by oil wells, and at first there was some resistance and mutual suspicion.

45:08 But over the years, since the Flower Garden Banks Sanctuary was dedicated in 1992 during the Bush administration...

45:17 ...an interesting kind of alliance has been developing between the oil companies that have an investment there...

45:24 ...and the scientists and others who are concerned about the future of that part of the world.

45:29 It's not either/or. In fact, both are concerned, of course, about the future of the ocean, but with slightly different perspectives.

45:37 And they are working together to conduct research and I see this as a blueprint for other areas as we all kind of "get it" ...

45:46 ...that it's not sound economy on one side, sound environment on the other...

45:49 ...but rather, not only are they not at odds, they're inextricably linked.

45:55 Both are absolutely necessary and dependent on one another, on each other.

46:02 This is my view from inside the submersible.

46:05 Hold a little camera and look out at the action.

46:09 Getting deployed by a NOAA diver that released little sub that once it was lowered over the side and down into the depths...

46:18 ...into the kelp forest, or into the rockish...rocky outcroppings off Stellwagen Bank off the coast of Massachusetts.

46:25 Favored place by whales and other marine mammals and fish.

46:32 But to be able to go down there where whales go and to stay, not just for the time that you can hold your breath...

46:38 ...not just for the time that a scuba tank would allow you to go, but literally hours, to spend the night if you'd like out there...

46:46 ...sitting like a bump on the reef to watch what goes on.

46:50 I mean, people take for granted you can do this on the land.

46:53 Go park on a log and watch what goes on, but to do this in the ocean, and to do it down to 2,000 feet...

46:59 ...which is the maximum depth for this particular version of DeepWorker, is such a gift.

47:05 Now, onward and downward as they say.

47:08 What's next? When do we get to go to 20,000 feet, and then 35,000 feet?

47:13 It's right out there for us to do.

47:16 What's lacking? It's just those things that have driven us to go skyward. It's the vision. It's the commitment. It's the imagination.

47:26 It's the desire. It's the understanding that it's really important for us to make that investment.

47:34 Here's...a glimpse of one of the critical areas that is now under consideration...

47:40 ...through the Sustainable Seas Expeditions along the coastal area of this country.

47:47 Imagine that there is another North America out there. It just happens to be submerged.

47:53 Go back 10,000 years. A lot of that which is now under water was dry land.

47:59 In fact, next week I'll be going to such a place. Stell...right off the coast of Georgia. Gray's Reef, it's 20 miles offshore.

48:06 Sixty feet down they're finding mastodon bones, saber-tooth cat relics.

48:12 Twenty miles offshore, 60 feet down in this protected area, which may in fact have been home to some of our relatives as well...

48:22 ...during the time when human beings who loved the coast 10,000 years ago just as much as we love the coastal areas today.

48:31 That was an ancient shoreline.

48:33 The Florida Keys. That is a place that 10,000 years ago was much more land than the ocean that it...now surrounds the areas.

48:45 So to be able to explore that, along with all of the coastal areas.

48:49 There are remains of our culture as well as the creatures who now occupy the space that is within our exclusive economic zone.

49:01 18,000 square miles presently embraced within the National Marine Sanctuary Program.

49:09 Twenty-five years in the making. What is to be the case during the next 25 years?

49:14 I can't wait to see that as a consequence of the new understandings that come about with the information that is now being gathered...

49:22 ...as we get a grip on really understanding, not just where the valleys are...

49:26 ...not just where the mountains are, but what kinds of events are taking place there. Who lives there?

49:33 What kinds of forces are at play? Not just on a flat-surface basis, but looking at the three-dimensional characteristic of the ocean.

49:41 I mean, I can imagine a Sim City for every one of the sanctuaries.

49:45 Not just to look at what is or what was, but let's play with it a little bit and see if...if you do this, what will be the consequence?

49:52 Just as we have done so effectively, just as you have done so effectively, for so much of the land.

49:59 There's all that ocean out there just waiting for your attention and it really is fundamentally vital to the future of not just the fish...

50:11 ...and not just the whales, and not just my kids, but yours as well, to the future of humankind.

50:20 I'm excited about the potential for what this year will bring.

50:24 This is a so-called shakedown year, as we understand how do these systems work together...

50:30 ...and as we go forward next year to focus more on the California sanctuaries and the Florida Keys...

50:37 ...to have a smaller number of people for a longer period of time using new technologies...

50:42 ...and really investing as much as we can in developing databases for these areas...

50:48 ...ultimately for all of the existing marine sanctuaries and maybe inspiring the establishment of others.

50:56 Around the world, there are presently some 1,200 so-called protected areas.

51:02 Many of you know about the Great Barrier Reef in Australia.

51:05 That's the largest of all in the world.

51:08 The second largest is here in California, the Monterey National Marine Sanctuary.

51:13 But taken all together, all of these so-called protected areas that still allow a great deal of activity to continue...

51:22 ...it's less than 1 percent of the ocean.

51:26 In the bank, less than 1 percent really protected as a heritage for the future.

51:33 So do we have a job to do?

51:34 I think so, and I really look forward to working with you to make that future more secure.

51:42 As a final thing before I leave the stage, I have a special finale to offer.

51:50 You know, I mentioned that, as my mom said, "You've got to leave the place better than you find it."

51:54 Well, I serve on the board of the Conservation Fund.

51:58 This is an organization that protects wild places, land and water.

52:05 Aldo Leopold 50 years ago commented in Sand County Almanac that...

52:09 ...you know, wilderness is one thing they don't make any more of.

52:13 It's easy to destroy but we don't know how to put it back together again.

52:16 And the Conservation Fund is one of those organizations that is dedicated to trying to protect the wild places.

52:23 So it is very special for me to be associated with this organization.

52:29 The Conservation Fund periodically recognizes individuals and organizations...

52:34 ...who make outstanding contributions to the conservation movement...

52:38 ...individuals and organizations that make a difference.

52:43 In its 10th year, the Esri Conservation Program has donated software, training,...

52:52 ...technical support to over 4,000 conservation organizations worldwide.

53:00 That just takes my breath away.

53:02 Esri, Jack Dangermond, I really want to thank you, so all of you, whoever you are, thank you.