JOHN ROBINSON

ES: Thanks, Steve—that was great. It's actually probably a preface for next year's symposium on marine reserves and conserving the seascape.

Our next speaker, Dr. John Robinson, is the Senior Vice President and Director of The International Conservation Program for The Wildlife Conservation Society. In your program it says that he oversees more than 300 field projects in 53 countries in Africa, Asia, and Latin America. It also mentions that he has undertaken fieldwork.

We don't ask any managers, including myself, how long it's been since we've undertaken fieldwork. But one of the things he doesn't mention is what he undertook fieldwork on. And something you might want to ask him about, in the break or at lunch, is the fellowship that he belongs to. It's a secret fellowship that no one talks about. And if you scratch the surface of any conservation organization in the United States, you will find a primatologist.

So John's going to give us a little bit of an overview of putting the conservation genetics field into the broader context of landscape conservation. Thank you, John.

(Applause)

MANAGEMENT OF DIVERSITY: A LANDSCAPE APPROACH

John G. Robinson, Senior Vice President and Director,
International Conservation, Wildlife Conservation Society

JR: Thank you, Eleanor. It was a long time ago. . . .

I'm going to speak more broadly about biological diversity. Biological diversity, biodiversity, has been the subject of a lot of governmental, intergovernmental, and nongovernmental discussions over the last decade. It's become, really, a central preoccupation of conservation. And numbers like these—25% of all species of birds have been driven to extinction over the last 200 years; statements like—of the remaining 9,600 species, 1,100 are listed as endangered; about 18% of all mammals are listed as endangered.

But despite all of this attention, a consensus has not really been developed on: What is the biodiversity that we're talking about? Most people, when you talk about biodiversity, think about lists of species—just like the list that I just gave you. Nor is there a broad consensus on how to conserve biological diversity. A lot of discussion about parks and reserves, sustainable use, multiple-use areas and the like. This presentation will sketch out some answers to some of these questions, especially from the perspective of The Wildlife Conservation Society (WCS).

When we think about biological diversity, I think we all recognize that biological diversity has got a number of components out there—genetics, species, communities, ecosystems, and landscapes—and that each of those components has a number of attributes. Structure—which really relates to the physical organization and pattern of that diversity; composition—which is the identity and variety of biodiversity; and function, which is the ecological and evolutionary processes linking and acting between those elements.

Conservation and biological diversity therefore really has to occur at all of these different levels. We're looking at all of that, and attempting to conserve the whole pattern. You can focus on different cells, and there's going to be collateral effects across different cells, but no one approach is going to capture all of this. And I'm going to argue that the genetic component gives us the most sensitive indicator of biodiversity loss, and the landscape component gives us the most cost-effective and pragmatic approach. But ultimately, all of these components are inextricably linked, as Stephen Palumbi was saying.

Looking at genetic diversity—just a few examples. We can look at the attributes of genetic diversity, and we can say that a conservation strategy, like the creation of gene banks—which basically targets the composition of genetic diversity—is a very effective strategy for that one cell. There are some collateral impacts—but, generally speaking, it's a quite focused approach.

And then, going to the other extreme, we can look at landscapes and say: At the landscape level you can focus your conservation activities at the landscape level. But while this approach can be quite good at conserving these overall patterns, an approach that is restricted to looking at landscape tends not to do such a good job of conserving species, diversity, or genetic diversity. An agroscape, basically, can conserve these kinds of landscape characteristics or attributes, but it's not the same as a natural landscape.

Now traditionally, what conservationists have done is, they have created parks. And WCS, as a fairly typical conservation organization, has, over the course of its history, created 130—or helped in the creation of 130—parks and reserves around the world. And in the last 12 years or so we claim to have created, or helped create, about 130 million acres of land around the world. The problem with parks is that we're only able to preserve a certain percentage—a very small percentage—of the terrestrial land in parks and reserves, and the proportion of the marine realm that we have been able to conserve is much, much less than that.

Also, an issue with parks is that we are, perhaps, reaching the end of the park-creation era. This looks at protected areas in tropical forests really from 1900 to 1995. And basically, what you can see is that we seem to be reaching the end of the creation of these kind of areas as a conservation strategy. We also have to deal with the whole issue that we're not going to be able to keep all these species bottled up in parks. Species tend to move. Populations tend to require larger areas than most of the parks that we're dealing with today.

So conservation can basically occur at a number of different scales. At the local-site level, we can do a very, very good job of controlling and managing the biological communities out there. Less so at the park and reserve level. But, again, our level of control is fairly significant.

But at these levels, at these scales, there are many species that we do not conserve in anything like a systematic way. At the other extreme—basically, the regional conservation efforts—you're very, very effective at influencing things, and you're very effective in the planning. And a lot of what conservation organizations are involved in today—which is sort of planning for conservation; developing priorities; developing lists of ecoregions, or lists of hot spots—really occurs at this level. And it's an influential level, but it is not a very good level to actually implement conservation action. You've got a lot of influence but not a lot of control.

The landscape level is a mesolevel, and conservation organizations, I think, are increasingly focusing their conservation activities at that level.

If you'll look, though, at the conservation at the landscape level, what you're trying to get to is levels of connectivity between natural areas. As you do that, you reach out from those natural areas, moving into the human landscape, and you get conflicts over resource use; you have issues of the social context and enforcement of various kinds of things.

If you're going to do conservation at the landscape level, you must include human land uses and activities. The reality, of course, is that our expertise and ability to do that kind of management is still pretty limited. Especially because humans and wildlife frequently come into conflict in these intermediate zones.

Now, let's look at the effects of human use on biological diversity. If you examine the components of biological diversity across a gradient of human impact—reading across the top here—natural, managed, and cultivated—what you can clearly see is that, in a general sense, the more you have human use, the less you are able to conserve biological diversity. But if you go down the components here, you recognize that you can conserve, even in cultivated areas, a fair bit of landscape diversity, a little bit less of ecosystem diversity, but not very much of species and genetic diversity. Now, this is a very broad pattern out there—but, basically, you've got both of these things in place. If you're interested in conserving genetic diversity, in general—and trying to capture all of that genetic diversity—clearly, what you need is some strictly protected areas.

One of the approaches the WCS is using, in a sense, to try and integrate across those different levels, is what we're calling the "landscape species approach"—which basically tries to integrate species conservation with ecosystem conservation, with a more landscape approach. Where the goal of this, in some sense, is to conserve the landscape, and the landscape attributes, but the mechanism is through the eyes of the species.

And we've defined a set of species out there that we call "landscape species." These species use large ecologically diverse areas, and often have significant impact on the structure of natural ecosystems. In other words, spatially, they move across large areas, or their populations require large areas, and their requirements in time and space make the landscape species especially susceptible to human alteration. These are species that use space, in many ways, at a level very similar to the way that we, as human beings, use space. And it's actually because of that that many of these species are in pretty bad shape.

Now, going back to our scale diagram, one can actually define different kinds of species that tend to occur, and tend to subsist, at different kinds of levels. So you have local-scale species—which can be conserved at the local site—and they can be things like bog turtles.

Landscape species, though, tend to occur and move across space which is broader than your typical park and reserve. These are not necessarily all charismatic megafauna. Many of them are. But many species—hummingbirds, black-back woodpeckers—tend to use space at a much larger kind of scale. Many of these species occur at low population densities. So if you're interested in conserving minimum viable populations of these species, you need to think about the larger areas. Other species, which may occur in locally abundant situations, tend to move across very large areas—and you need to be able to think about their conservation in terms of those large areas.

Now, the challenge, in some sense, is defining the conservation landscape. What defines the characteristic needs for a population of one of these landscape species? Clearly, what we're trying to do is, we're trying to conserve ecologically functioning populations. And, at a minimum, that probably means we're trying to conserve minimum viable populations, which are going to be defined by the genetic characteristics of the population. A population requires a certain kind of area to survive. And by characterizing the movements of that species, and identifying the requirements of that species, you can begin to identify the resources that they need, and the area that they need to survive.

As a conservation strategy it can be quite effective, because the population exists at a landscape level, and working to conserve that species allows you to get at the landscape-scale processes. If the species, as well, is a good umbrella species—capturing a lot of species underneath it—you can also capture and conserve a lot of the species and their genetic constituencies.

Let me give you a very specific example. This is actually a drawing by a 14-year-old who immediately understood the concept. And its core—a park, and different land uses—human land uses—around those parks. And, basically, the idea is, this area is the required area to support a certain suite of landscape species. And this approach very rarely just uses one species—it tends to use a whole stack.

I'm going to give you a very specific example. WCS has been involved in the conservation of the Nouabalé Ndoki National Park, right here in the middle, in northern Congo, for about the last eight years, when the park was created. There are a number of adjoining parks in other countries—some of which are quite successful, some of which are not. To the southwest and north of the park there are large forested areas that are being opened up for forestry exploitation.

As we looked at this area we began focusing the activities on a set of landscape species—species like the forest elephant—which, apparently—we seemed to be finding movements all through this area—right from the Nouabalé Ndoki area, right down into Lac Lebeki; crossing the rivers here, into two other countries; moving out in this direction. So these are species which move fairly broadly. There are also other species, like the bongo, which occur in locally abundant populations, but they're very, very restrictive. And so to manage this population you need to think about a much broader metapopulation.

At the core of all this is the Nouabalé Ndoki Park. And, as you can see from these pictures, you're dealing with a very heterogenous landscape, and the animals are moving out across that landscape. And then you have—again, here's the park here. To the south—this is the forestry concession of the Congolese Industrielle du Bois—CIB—which is the largest employer in the country of Congo. And this is their *coupe* pattern. They're now actually moving right up here. They've cut roads up here, and moving up into this area, up here. And their impact on the landscape is very, very significant.

Bokala, the main headquarters has got probably between 12 and 15,000 people now living there—that's down here—with industrial sawmills and the like. These are cutting camps, out on the edge, and the impact on the forest is very significant. Not only on the forest, itself—but there's a very, very significant bushmeat trade in the area, because almost all of the animal protein, which supports all of those people, comes from

wild meat. And there is commercial hunting which goes on for things like elephant, and for their ivory—and, also, for their bushmeat.

However, the conservation of this whole area must recognize that these things are going to be going on. They need to be integrated into the conservation landscape; they need to be mitigated to the extent that we can. But if we're going to conserve populations of wildlife—even in this very remote area—we're going to have to manage for all of these things.

So to recap in a general way, we need to think about the biological landscape of the species. You saw the movement patterns, just as an example, of mandrills in Gabon. These are animal movements around a water hole. And so we define a biological landscape, which is defined by the needs of wildlife in time and space. We have preferred food resources, breeding habitats, secondary food resources, etc.—and we have a human landscape.

And the human landscape, again, is a landscape which frequently takes the natural landscape and alters it, or converts it, in one way or another. And we have our human land-use patterns—with creating indigenous reserves; totally protected areas; agricultural areas. Frequently, as in this particular case, you know, nations cut through this area. And the conservation landscape is basically the intersection of the human and biological landscapes.

And that intersection allows us to define the key threats to the wildlife populations—be it bushmeat hunting, and that kind of problem; or it could be agricultural areas, which are affecting things like breeding habitats. And, ultimately, this gives us a way to focus our conservation actions. In this particular case, in this example, minimizing demand for bushmeat—or better enforcement, or whatever—maximizing habitat quality and the like.

The bottom line is, we are clearly seeking to conserve all the components of biological diversity. The landscape-species approach is an efficient and cost-effective approach, especially if conserving the higher components—in other words, the ecosystems and landscapes out there—because you're trying to conserve at that scale. And to the extent that these landscape species are umbrella species, we're also capturing much of the species and genetic diversity out there.

But conserving many species in the full range of genetic diversity clearly requires totally protected areas. Genetic diversity, in general, is our most sensitive indicator of change, and very difficult to manage for it. However, it is the component of biological diversity which is most affected by human use.

Thank you very much.

(Applause)