

ECOLOGY

Emergency manual

Maps define guidelines for preserving native vegetation, restoring degraded areas and carrying out environmental research in São Paulo

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Get ready for some surprises. Less than 300 km from the capital of Brazil's most industrialized state, symbolized by its noisy metropolis, its stressed people and the endless sugar cane plantations of its inland plains, cougars and jaguars still roam freely; marsh deer and *jabiru* storks live in the wetlands of the west, in the midst of *novateiros* tree trunks that are always covered with ants, and *buritis*, tall elegant palms. In the south-west a native forest of indescribable abundance grows, full of *pitangueiras* [Surinam cherry], *jabuticabeiras*, *cambuís*, *araça*, *uvaías* and other trees of the myrtle family, including the lesser known *gabirobeiras* and *piúnas*, which in the spring and summer feed the birds and monkeys with their succulent fleshy fruit and form an immense and sweet smelling orchard.



The jaguar:
bad reputation
for attacking
unprotected
cattle when its
own environment
no longer supplies
it with food

Biologists have decided to open up this treasure chest and share these rarities. In partnership with the Department of the Environment, 160 researchers from the Biota-Fapesp Program have prepared three general maps and a further eight thematic maps by animal and plant groups to show the abundant wealth or the state of destruction of the native forests and Cerrado [scrubland/savannah] in the state of São Paulo, as shown in the poster inserted in this edition and on the website www.biota.org.br/info/wap2006. These maps, the result of almost ten years of research, should be used to guide the work of conserving and extending the native forests where São Paulo's authentic wild life is concentrated. Although there are few of them left, the remaining areas of vegetation form environments that are as different from each other as the humid forests of the coast, which are reminiscent of the Amazon forest; they are also different from the dry vegetation of those inland areas that are similar to the Northeastern Caatinga region [arid scrubland and thorn forest].

The maps, which were prepared from the distribution study of 3,326 species of plants and animals considered strategic to maintain the state's natural areas and are entitled *Directives for Conserving and Restoring Biodiversity in the State of São Paulo*, propose two simultaneous plans for action. The first is the creation of 10 to 15 total protection conservation units in areas that are extremely rich, biologically, and that are shown on one of the maps. This is the case of the exuberant stretch of Atlantic Rain Forest between the three state parks on the outskirts of the town of Itapeva, in the south of the state, which is privately owned, at present. It is also the case of the Japi hills, which are being corroded by the expansion of towns close to the capital and are now seen as strategic in linking up the forests of the Mantiqueira hills, which are already legally protected, and the south of the state of Minas Gerais.

These new areas could add as much as 25,000 hectares to the already preserved 800,000 hectares spread over 28 conservation units subject to total protection (100 hectares equals one sq. km). This, however, is the most difficult, expensive and lengthy route

Much less protected than the Atlantic Rain Forest and split into thousands of fragments, the Cerrado is the environment of which the least remains and that is disappearing the fastest in São Paulo

to keep such areas green. The State would have to buy the land from the private owners and compensate the local residents before setting up and effectively managing these new areas. The other route, proposed in the second general map, might be faster: encourage the land owners to protect the forests on their properties. "If all the rural landowners obeyed the Law and maintained the 20% of mandatory native vegetation, that would already be a huge expansion of green areas", says Marco Aurélio Nalon, Deputy Director General of the Forest Institute and one of the coordinators of this work. Today, the areas of native forest, called Legal Reserves, correspond to 10%, on average, of the state's rural properties.

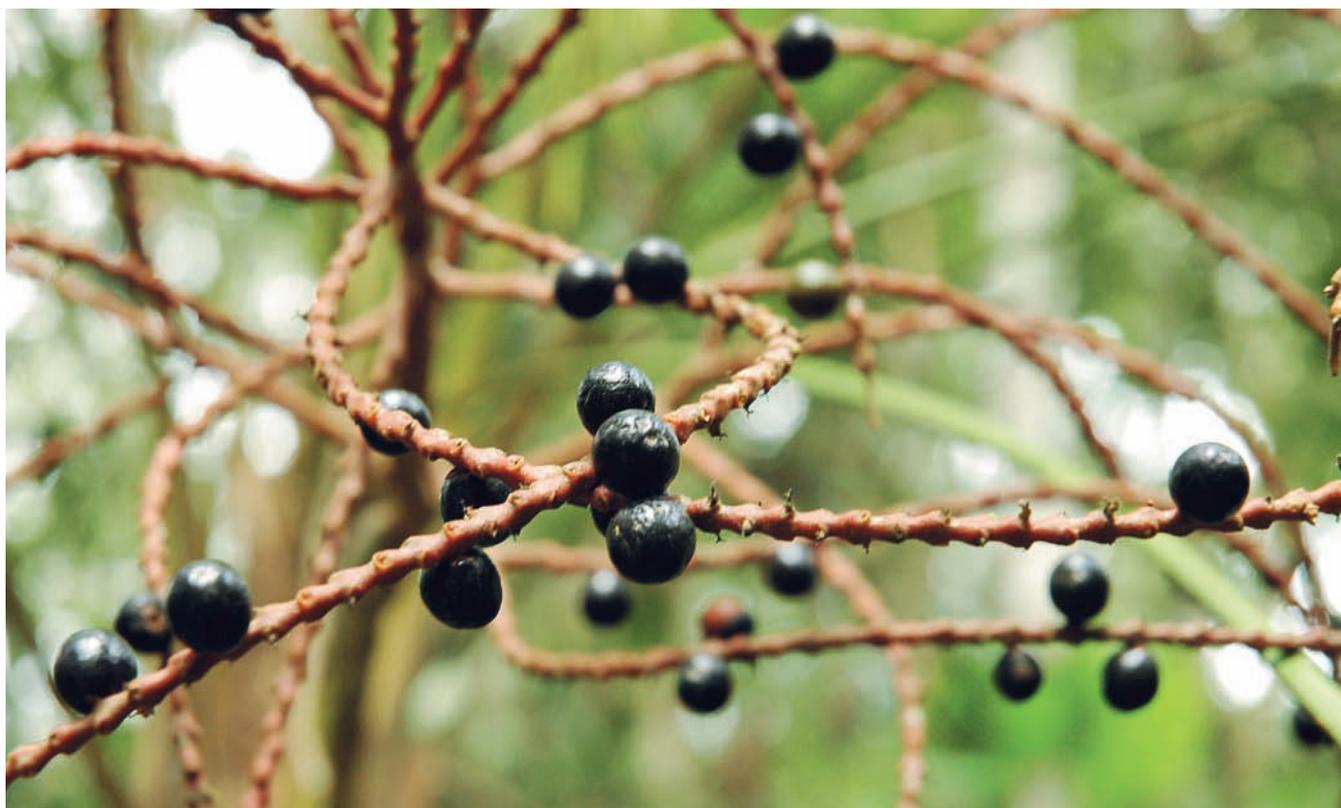
"In order to make good decisions and determine what areas should be protected in the form of Legal Reserves, we need good information", comments Helena Carrascosa von Glehn, the agronomist who is coordinating the environmental licensing and natural resource protection teams at the Department of the Environment. "Now we'll be able to work better, with more

arguments." Her 320-technician team, along with the 2,200 environment wardens, will finally be able to tell the most stubborn farmers and cattlemen what they may or may not do on their land, based not only on the Law, but also on the map of the priority areas for the establishment of private reserves, for conserving or restoring native forests. Thus, ecological corridors may be formed that will connect the remaining areas of native forest, which cover at least 1,000 hectares, as proposed in one of the summary maps.

The maps are, therefore, becoming a sort of Green Constitution, to be adopted also by other departments to avoid highway construction or electricity transmission line projects, for example, being vetoed by the Department of the Environment, if they do not follow the map's recommendations. Other likely users are members of the Environmental Compensation Chamber, which obliges business people to invest at least 0.5% of the overall value of any works that are potentially harmful to the environment in conservation units. "The maps will be the basis of all of the state's environmental strategic planning", says Carlos Alfredo Joly, a biologist and a professor at the State University of Campinas (Unicamp) and the first coordinator of the Biota-FAPESP Program.

Joly says that he started strongly advocating the use of scientific information for environmental management ten years ago with the then-state Secretary of the Environment, Fábio Feldmann. But they advanced little, mainly because knowledge about plant and animal diversity in the state was very limited, apart from the difficulty that researchers and state administration bodies had in agreeing and coordinating their priorities and working pace. As from March 1999, researchers from São Paulo working together in the Biota-FAPESP Program began to overcome this gap and transform the database they were using into a tool to be used also for formulating and perfecting public policies in the State of São Paulo.

At this time a lot of greenery disappeared. "Lots of natural areas were and continue to be destroyed by fire,



Palm fruit in the salt marshes of São Paulo's southern coast: an environment for which biologists are recommending greater legal protection

logging or hunting and they don't have much of a role to play in biodiversity conservation because they are tiny and very isolated", comments Ricardo Ribeiro Rodrigues, current Biota coordinator and a professor at the University of São Paulo (USP) in Piracicaba. "We need to reverse this picture." Eliminated over two centuries, mainly because of the expansion of coffee plantations and towns, natural vegetation today covers only 13.9% of the territory of São Paulo, the or 3.5 million hectares, of which 77% belong to private landowners and 23% to the State. Native forests should cover at least 20% of São Paulo in order to maintain not only animal and plant diversity, but something that is nearer to the hearts of city residents, the so-called environmental services, such as the water supply.

Fewer forests also imply more heat. It is no coincidence that the State's Northeast region, between the Tietê and Grande Rivers, is the barest, with less than 5% of its natural cover left, as well as the hottest and driest; this is the São Paulo desert. As luck would have it, it is not actually a desert. In a

small stream running alongside a patch of remaining forest in the municipality of Planalto, one of Lilian Casatti's teams, from the ichthyology laboratory at the Paulista State University (Unesp) in São José do Rio Preto, found for the first time in the region the *Tatia neivai* species, a 4 cm long colored catfish that lives among the fallen trunks and branches close to riverbanks. In a well on the edge of a forest surrounded by sugar plantations in União Paulista, another group from the sane Unesp unit, coordinated by Denise Rossa-Feres, also found for the first time a green tree frog, *Phyllomedusa azurea*. "In one night", she says, "I found 14 species of toad, frogs and tree frogs, all singing at the same time, right after the first rains in October". Both the Northeast and the West of the state have gaps

in scientific knowledge, according to a third summary map, which establishes priorities for research to be carried out by teams of researchers from the Biota Program and the research institutes at the Department of the Environment.

The contrasts between the natural environments in the state have also become evident. Until now only one type of Atlantic rainforest, the dense ombrophilous forest, has been biologically well represented in extensive blocks protected by law, mainly along the coast, and has a reasonable structure of parks and supervision. In contrast, the Cerrado still falls outside the environmental protection laws and is spread throughout the state, inland, in thousands of fragments in the middle of private properties; only one of them, on the Jataí Ecological Station, is more than 2000 hectares. The Cerrado is the environment of which the least remains and that is disappearing fastest: less than 7% of the original area, and less than 1% of the area of the state, is well conserved.

The fragmentation that isolates animal and plant populations and makes seed dispersion difficult is just one of the



threats to survival of São Paulo's Cerrado. An analysis of 81 fragments carried out by Giselda Durigan and Geraldo Franco, from the Forest Institute, and Marinez Siqueira, from the Environmental Information Reference Center (Cria), exposes other dangers, such as invading grasses and fire, especially in areas close to highways and cities, which are more harmful than the expansion of sugarcane plantations and the planting of forests for commercial exploitation. It is not just the Cerrado that deserves extra attention. It is equally necessary to protect two coastal environments that are much coveted for residential developments; salt marshes and mangrove swamps, warns Kátia Piscioti, a technician from the department of environmental conservation management at the Forest Foundation, who intends to use the maps as arguments to speed up approval for requests to create natural reserves on private properties.

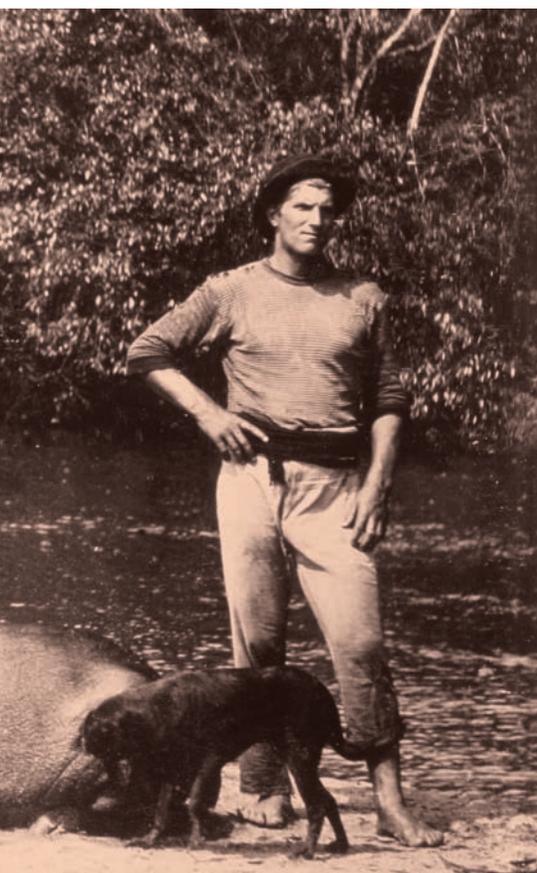
Neither the conservation priorities nor the knowledge gaps would have been so clearly apparent were it not

for the great capacity of Joly himself, his successor, Ricardo Rodrigues, and researchers such as Vera Lúcia Ramos Bononi, director of the Botanical Institute and highly aware of the complicated and tortuous ways of the Department of the Environment (she was a trainee there in 1968). Because she knows the plans of the team from Biota to select the priority areas for conservation and restoration in the state she invited Rodrigues, as the coordinator of Biota, to a meeting on April 15 this year, at which Francisco Graziano Neto, the new Secretary of the Environment, would present the research program to be carried out during his term in office. Upon realizing that one of the priorities was to study São Paulo's diversity, Rodrigues described Biota, a flora and fauna survey in the state that today has 1,200 researchers. He then expressed his interest in organizing the information already obtained to help formulate environmental policies and establish conservation strategies in the remaining areas of vegetation, in

partnership with the Department of the Environment. "This was the moment", says Vera, "when the priorities of the Department of the Environment gelled with those of the researchers".

Almost six months later, on October 3, Graziano observed the ready maps and was surprised by the richness of the detail. Enthusiastic about the possibilities of using these maps he had already signed a resolution suspending for six months, as from September, the granting of any authorizations for deforestation. In presenting the maps publicly, on the morning of October 10, Graziano said that his plan was to reorganize the authorization procedures for cutting down native forests; the most delicate areas or priority areas for conservation are likely to have stricter laws. According to Graziano, the information from the researchers has become "fundamental for environmental management in São Paulo".

The men of science did not imagine the difficulties, deadlocks and conflicts



INSTITUTO GEOLOGICO

Researchers in the Northwest of Sao Paulo state in 1910: the intense pace of occupation in the territory has left the state with a meager 13.9% of its native vegetation

that they would have to face between one meeting and another with the secretary. At the beginning it was all very easy. The new maps would have as their basis the *Forest Inventory of São Paulo*, a survey by a team from the Forest Institute that shows how the surviving 13.9% of native vegetation in the state is distributed (see Pesquisa FAPESP 91, September 2003). Constantly updated (this month, as a matter of fact, a more detailed version has been published, covering only the 27 coastal municipalities) the *Inventory* would become a point of reference for public environmental control organs. Since it was launched in 2005 it has is-

sued warnings about the silting up of rivers in São Paulo, because of the loss of waterside vegetation, increasing the risk of water shortages in towns and the countryside, and has helped identify the areas that supply the Guarani aquifer that were receiving fertilizers or where the native forest was scarce in the Ribeirão Preto region.

The problems first appeared when they started deciding on the biological wealth and the priorities for conservation in the areas outlined in the *Inventory*. The biologists had organized themselves into working groups covering birds, fish, mammals, reptiles and amphibians, arachnids and insects, landscapes, cryptogams (non-flowering plants) and phanerogams (flowering plants). To assess the diversity and distribution of the species they had resorted to the collections that they themselves or other teams had put together and were mentioned in SinBiota, the Biota database, and other scientific databases in the State of São Paulo. They assembled, therefore, nearly 220,000 collection records, including those that had been made decades earlier. When they opened up this information bank, however, many of the scientific names were wrong, there were invalid records of common plants that appeared as rare and excessive generic information, particularly the oldest, which referred only to the municipality in which the sample had been collected. Because of the technical limitations and the difficulty in recording collection locations with any degree of accuracy (devices that show geographic coordinates do not work well in the forest), many plants and animals seemed to have been collected outside the State of São Paulo. In practice, a lot less information was used than expected.

The effort of filtering and organizing this information, which began at the end of last year, intensified after a meeting in April of teams from the Forest Institute, the Botanical Institute, USP, Unicamp, Unesp and Conservation International, an NGO. This was when each one had to demonstrate what talent they had. Nalon, whose background is physics, and who has been working for 15 years with maps in the geoprocessing laboratory of the

Forest Institute, assembled the information from each working group and applied it to the vegetation maps, catchment areas, roads and cities. An ecology professor from USP, Jean Paul Metzger, assembled information about nearly 100,000 fragments of native vegetation in the state and had to discover which could be connected, depending on their shape, size and proximity. In the background, untiring young workers collected information and edited the maps: Milton Cezar Ribeiro, Giordano Ciocetti and Leandro Tambosi from USP worked on the final versions of the maps up until five minutes before Metzger and Rodrigues went on stage in the department's auditorium on the night of October 10 to show what had been done to a select audience of 150 people.

The happy ending of this rare story of integration between scientific research and public interest may still be lost in the jungle of cultural prejudice. Many crop and livestock farmers see native forests as weeds, as something that is worthless. Furthermore, many people think that wild animals such as the jaguar should be eliminated since they attack cattle, chickens and dogs. "Jaguars only eat cattle that are badly looked after, sick, unprotected and close to the forest and if there is no food available in their own environment", comments Beatriz de Mello Beisiegel, a researcher at the National Research Center for the Conservation of Natural Predators (Cenap), in Atibaia. When farmers call, terrified because they have seen a jaguar, the team from Cenap tells them they can protect themselves by adopting simple measures, such as leaving a light on close to where the animals sleep and letting off a loud firecracker when night falls.

Progress, however, is undeniable: the demonstration that experts from Universities and public bodies can work together sharing the same objectives of social interest. "It seems difficult for researchers to understand our urgency for rapid responses", comments Helena von Glehn. "They have to be strict and perfectionist, but even incomplete information, which may not be worth much for scientific work, may help a lot when it comes to solving urgent environmental problems." ■