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V.

RESEARCH MANAGEMENT POLICIES: PERMITS FOR COLLECTING AND RESEARCH IN THE TROPICS

Daniel H. Janzen, Winnie Hallwachs, Rodrigo Gámez, Ana Sittenfeld, Jorge Jimenez

Countries reap benefits from their wildland biodiversity, but they also pay both direct management and opportunity costs to maintain it. Field research can yield major benefits, and a national system of permits for field research helps allocate both these benefits and research costs within and between countries. Such a system also helps insure that research does not destroy its own raw materials.

Properly designed, research permits can facilitate the work of *both* the wildland custodian and the researcher. They also influence inter-institutional relations. To the extent that they determine researchers' and managers' time budgets and opportunities, they can also prompt researchers to choose one country or part of a country instead of another to work in. This choice, in turn, influences the overall advance of scientific and managerial understanding, nationally and internationally.

With so much at stake, the traditional view of the raw materials used in research on tropical wildland biodiversity—whether data, samples, or specimens—as "free goods" must be abandoned, and permit guidelines expanded to cover ecotourists, school groups, private collectors, taxonomists, collectors for pharmaceutical and biotechnology research, wildland managers, national developers, and many other kinds of users. In one sense, all of these people are

participating in biodiversity prospecting, so the term "research agreements" as used here includes collecting permits but also covers other inter-related management activities and other non-destructive uses of wildlands and their biodiversity.

Traditionally, permits for research on biodiversity information have been granted on the basis of cost-benefit analyses, whether implicit or explicit. But collecting permits, research regulations, hunting licenses, tourism concessions, export permits, export taxes, national patents, and the like have tended to minimize either the costs or the benefits of a given research (or sampling) program. If society is to fully realize the benefits of wildland biodiversity, a full accounting of both costs and benefits is essential, and the potential value of wildland research must be considered in conjunction with the direct impact of that research on the organisms of a conserved wildland.

In response to this need, the structure of research agreements is rapidly evolving. "Codes of ethics" for tropical gene collectors, ethnobotanists, phytochemical samplers, etc., rest on philosophical positions and traditions that have been made largely obsolete by recent international agreements, advances in biodiversity technology, changes in our understanding of biodiversity information (or products), and new development policies in tropical countries. A simple lack of research experience throughout the tropics also all but guarantees that current guidelines will be interim guidelines only. In fact, major groups of wildlands users still largely ignore research permits, and beneficial collaboration among wildland managers, researchers, collectors, and other users is in its infancy.

At the same time, the basic concepts and rules governing biodiversity prospecting are changing extremely rapidly. For example, the simple recognition that traditional taxonomy is biotechnology "know how"—that, for instance a field guide to the moths of Costa Rica can be an essential tool for the biodiversity prospector—will give taxonomists more power when research contracts and permits are negotiated. This phenomenon is directly reflected in the recent funding of INBio's inventory process as a national development activity by bilateral aid agencies. Equally disruptive to the "balance of

power" in the wildland biodiversity marketplace is the recognition that all tropical lands and climates are suitable for agriculture if biotechnologists put their minds to generating crop plants and technologies for them. With all tropical wildlands thus becoming potential agricultural zones, wildlands conserved for their biodiversity (and other) products must produce even more and their production must be valued correctly if biodiversity conservation and managed use are to be viewed as economically legitimate land uses.

Custodians of tropical wildlands must understand the basic issues and general principles behind the concept of the biodiversity research agreement and use them for guidance. In today's dynamic environment, specific collecting recipes or "codes" may be of little use. The guidelines presented here do not dwell on specific legislation either, because each country's approach to law and law-making differs. How relevant various countries find the Costa Rican experience distilled here also depends on which kinds of research, researchers, and users of research results are involved.

Key Considerations in Granting Wildland Biodiversity Research Agreements

Whether individual contracts, government regulations, or laws, research agreements can have a bewildering array of primary and secondary repercussions on current wildland management, academic collecting and research, commercial collecting and research, and financing for all three. Such agreements will produce significant new responsibilities and power shifts in the countries rich in wildland biodiversity, as well as create ample opportunities for corruption. The social consequences won't be the same in every country; rather they will be experienced as part of the broader changes now sweeping through the centuries-old relationships between "developed" and "under-developed" countries. Here, we consider some aspects of research agreements. *(See Box V.1.)*

1) Collecting Permit vs. Research Agreement

The word "permit" or "collecting permit" should be eliminated from the research management vocabulary and replaced with

Box V.1. Elements of a Biodiversity Research Agreement

At least eight elements should be included in any kind of research agreement between researchers and in-country biodiversity custodians (national park managers on site, national forest services, private reserve owners, national museums, ministries of natural resources, universities, conservation NGOs and other in-country custodians of biodiversity).

1) A clear and unambiguous description of the research itself. The researcher needs to specify:
   a. Who (individuals and institutions, with roles indicated and attached CVs of the individuals);
   b. Where, when, and how;
   c. Why the research is to be conducted;
   d. What kinds of information are to be extracted (recorded, collected, photographed, observed, etc.) and in what format (notes, specimens, photographs, computer entry, human memories, etc.);
   e. What the anticipated intermediate and final destination of this biodiversity information will be;
   f. How the information to be obtained will be used both initially (e.g., in a national inventory collection) and subsequently (e.g., in drug exploration, field guide preparation).

"agreement" or "research agreement." *(See Box V.2.)* The word "agreement" emphasizes the social partnership between the researcher and the custodian and de-emphasizes the "finders-keepers" rule on which "collecting permits" are based.

This need for a shift in thinking has a history. For many years, collecting has been viewed by conservation administrations with suspicion because organisms in protected areas are often damaged or killed during the process. Even if no biological damage occurs, col-

2) Copies of the funding proposals (with budget attached) or a description of the funding support if there is no formal proposal.
3) An analysis by the researcher of the foreseen impact on the biology of the subjects of the research and on the habitats in which they occur.
4) A context-dependent evaluation of 1) and 2) above by the custodian of the wildland, including an analysis of why the perturbation is not deemed significant, or alternatively, of what is needed to mitigate the perturbation.
5) A detailed description of the immediate compensation anticipated—whether in cash, barter, services, or specimens—to the wildland custodian.
6) A detailed description of how the wildland custodian is to be compensated over the long-term—whether sharing in future production possibilities from the research, cash royalties, services, equipment or goods.
7) A roster of the in-country entities likely to receive the various compensations spelled out in item 5 above and the legal and logical reasons for such a distribution.
8) Clear protocols that either party can use to break the agreement and a list of the acceptable reasons for breaking it. The court or mechanism for resolving grievances should also be specified.

lecting represents a confusing exception to the "no extraction" ethic generally applied to national parks and other strictly protected areas.

The bigger the object collected, or the more objects collected, the more anguish. However, size, visibility, and number usually have little to do with either conservation importance or economic importance. Context is everything. The collection of the last 100 wild grizzly bears in North America would be far less devastating to the ecosystem than the introduction of ten 1-kg male and female

Box V.2. Collecting Permits are Research Agreements

For two reasons, "collecting permits" should be considered to be "research agreements." First, all collection of ideas, data, and samples is part of some research program. Second, the impact and significance of this research program are of primary interest to society, not the actual act of bagging up a sample or writing down a number. "Collecting" should be evaluated in terms of much more than whether it may lower or raise the population of the target organism or whether the observer may perturb or preserve a fragile ecosystem. Equally important, the "researcher" (as used here) refers to anyone from a schoolchild trampling a rare flower to a collector of samples working for a gene technology company.

We can no longer afford to classify events by who conducted them rather than by their impact on biology and economics. The burning of fire breaks by national park personnel should be scrutinized as carefully and objectively as the harvest of those same plants for a pharmaceutical company.

mongooses to the mainland neotropics. A pocketful of seeds may contain more than 90 percent of the biodiversity information in a plant species; the next ten million seeds collected from that species matter much less. A group of schoolchildren trampling through a scarce habitat may do much more damage than a plant taxonomist taking 100 herbarium specimens.

Collecting can also violate national sovereignty. This form of research, in contrast to the many kinds of observation research, looks like robbery to many wildlife custodians, even if they had no use or plan for the specimens themselves. Accusations of robbery come particularly easily when the custodians are irritated about something else (lack of professional respect, cultural conflict, lack of a budget to pay national park personnel, etc.). The basic problem is viewing research as "collecting" or "taking," rather than as col-

laboration—a perception that makes it difficult to form normal contractual relationships between custodians and users. Taxonomists, ecologists, chemical prospectors, and others who take samples without a research agreement, and justify their acts on grounds that nobody was using the material, hurt collectors and custodians alike, as well as science and the environment.

Physical samples (genes, tissues, specimens, populations) and the information about them are becoming almost interchangeable. From the standpoint of research management, there is often no reason to distinguish between them. But since collecting generally refers to the accumulation of specimens or samples, the assumption is that a "collecting agreement" covers only the act. In fact, it's often much broader. For example, under one agreement, a caterpillar will be dissected to study its parasites and then discarded. Under another, it may be ground up and screened in a bioassay, and then discarded. In yet another, the caterpillar will be used to establish a permanent tissue culture in a foreign laboratory. Each of these "collections" of a caterpillar generates quite different kinds of biodiversity information, and each has different economic implications for the custodial country. Clearly, a research agreement can cover all these uses and activities, but a collecting permit cannot.

2) Biological Damage vs. Economic Benefits

Every research agreement potentially involves both biological damage and economic benefits (including intellectual and financial gains). Wildland custodians have traditionally been deeply concerned about biological damage by biodiversity researchers. Requests to harvest organisms within national parks for commercial purposes are often evaluated (and frequently rejected) on grounds of perceived biotic damage.

Biodiversity researchers may need nothing more than a few leaves or just the chance to observe wildlands, or they may need so many specimens or such free rein that local extinctions or massive interference result. To get a sense of what the casualties of research might be, national park officers, field station directors, and private owners of conserved wildlands must reach a level of "biodiversity

literacy" high enough so they can evaluate biological damage and oversee research on-site. Reciprocating, researchers should foster this technical capability, serve on wildland advisory committees, and become volunteer custodians themselves. Certainly, experience and training will make both conservation area staffs and researchers much more capable of such on-site evaluation.

That said, few custodians or researchers worry much about how to mitigate biological damage or how to realize national benefits from biodiversity research. Wildland custodians rarely analyze the benefits of biodiversity research, and even when they do they focus on such abstractions as "national patrimony" or national pride, or rail about political patronage, contradictory regulations (e.g., a flat rule against commercial harvesting in a national park where tourists and tour companies are allowed to "harvest" information for only a token fee and to trample fragile habitats), or the motives of scientists working in their areas—real enough issues, but by no means the last word on either costs or benefits. Then too, custodians may not have any incentive to clearly identify benefits since doing so may intensify competition for these resources.

A further difficulty is that many benefits are hard to capture. For example, the fees charged by a national park may well go into the national treasury or fall under the control of distant politicians: why then should park staff raise fees or go out of their way to collect them if the parks don't benefit as a result? As a second and quite different example, planned culling of elephant family groups and the subsequent sale of ivory may be the best way to sustain biodiversity in a specific African conservation system, yet wreak havoc with international efforts to halt illegal trade in ivory. Such situations are probably best handled by an institutional structure flexible enough to work with wildlife custodians, the research community, and business, to optimize benefits nationally and internationally. To what degree such an institutional structure should be national or local, and private or governmental, depends totally on the context. A pilot project that is functioning in Costa Rica is INBio, a private non-profit organization that advises government on biodiversity, collects and distributes biodiversity information, and facilitates biodiversity use by all sectors. *(See Chapter II.)*

Within research agreements, the inclusion of more benefits in the cost-benefit calculations is definitely desirable. Cash grants for management, an increase in the size or diversity of the area conserved, public good will, information and technology transfer, and contributions to GNP, etc., should all be considered as benefits of research. The amount of biodiversity damage acceptable in a given research project can also be negotiated and mitigated. This way, the survival of tropical biodiversity hinges on a social contract, not a futile wish for 100-percent protection.

3) Who needs a research agreement?

A research agreement should be required for any research in any wildland conserved or used for its biodiversity. The terms for private and public holdings will differ with (1) national and international laws, (2) biodiversity prospecting rights, and (3) agreements in technology transfer, etc. Other kinds of users (e.g., fire crews, school groups, ecotourists) should be granted or denied access to wildlands on the same basis as conventional researchers. Just as a research agreement with a biodiversity prospector can insure that a conservation area is appropriately compensated, a very similar agreement can be made with an ecotourism company having a stake in the conserved wildland. Similarly, a taxonomist may easily compensate a wildland by providing identification services. In any case, sound biodiversity management may require trading severe damage to a hectare of vegetation or very light damage to a thousand hectares, for enough cash, training opportunities for nationals, technology, or jobs, to, for example, manage a conservation area adequately or even add another 1,000 hectares to it.

When a tropical research agreement is constructed, international scientists and commercial researchers are often treated differently from their national counterparts. The distinction rests on fact: many foreigners have comparatively little stake in the society's future, and they are inclined to export their earnings, and to pay low or no taxes. However, they also provide foreign currency and technology. But what about the many national scientists trained in developed-world universities? Although such scientists may have an international perspective on the user impacts of bio-

diversity, foreign universities aren't the best place to acquire a rounded sense of national (home-country) interests. Then too, exploitative commercial biodiversity research and contempt for research regulations are by no means restricted to foreigners.

The question of who serves the national interest and who doesn't is tricky. In a developing country, it is rarely clear just what the national interest is and just what segment of the national population represents the country. In nascent democracies, governmental policies can take wild swings, owing to the absence of strong national research institutions that can weather political changes. In unstable situations, researchers may seek shelter within international organizations (which may or may not have their host country's very best interest in mind) and their institutional research agreements. Instability also invites the international researcher to keep his or her distance from the host government, including the government custodians of conserved wildlands.

Undergraduate, graduate, and post-doc research is particularly difficult to incorporate into a research agreement because it is, at least initially, often very unfocused, and the outcome is hard to predict. Its practitioners are also socially powerless and unsure of the importance of their research. The same applies to many taxonomists, though they contribute important information to a tropical country. So as not to dampen students' curiosity about tropical research, some kind of "learner's agreement" is imperative. Such licenses should be given only in conjunction with a regular research agreement or on the condition that someone with appropriate experience supervises the student. (Of course, students inside and outside of the tropics still need to learn the mechanics and philosophy behind research agreements. Indeed, to help tropical biodiversity contribute commercially to both GNP and scientific advancement, the contemporary tropical biodiversity graduate student needs to understand the complicated implications of patenting genomes, as well as the opportunity costs to tropical countries of making their biological diversity available for research.)

Like the student, the experienced researcher also needs a type of exploratory agreement. Such an agreement would be deliberately vague about the directions and exact nature of the research, but just as firm as a regular research agreement on the destiny, ownership, commercialization, etc., of the findings. Unadorned trust between researcher and custodian, essential in all research agreements, is especially important in exploratory agreements.

Establishing a research agreement will always cost the researcher and the custodian time, and a slow process can cause friction or tempt the researcher to skip filing a research application. For researchers, time is often scarce, whereas for many bureaucracies time is abundant and wrong decisions are heavily penalized. Moreover, the research community tends to base its action on logic rather than on appeal to higher authority while regulatory agencies may be more comfortable appealing to written rules. Reasoned and constructive governmental response to a defective research application will make the researcher a more willing negotiator than will an authoritative "no." In general, rapid, sensitive, and constructive responses to research applications, even to defective applications, will attract international researchers and make national ones more productive. Considering that tropical countries will be competing with each other for research agreements, market competition will serve as a not-so-gentle instructor for this lesson in applied psychology.

4) Who Signs Research Agreements?

At a minimum, a research agreement should be evaluated and signed by (1) the researcher, (2) the custodians of the wildland, and (3) the government institution that oversees the potential benefits and costs to society. The second and third signatory may or may not be the same party. In any case, the third signatory should be the highest level national custodian of natural resources. (In many instances, this person will be a representative of a Ministry of Natural Resources or Ministry of Science and Technology.) Each of these three evaluators and signatories may designate others to perform their functions. What matters here is high technical competence and policy awareness—backed up on-site by government, private, or outside-funded expertise in evaluating and managing biodiversity research. Either the government should bear the very great costs of training and keeping the appropriate specialists on staff, or it

should subcontract this responsibility to responsible private non-profit institutions—a task requiring more flexibility than usually found in middle-management ranks in most tropical governments.

The researcher who signs the research agreement is making a commitment to try to generate certain types of information. But the researcher's work inevitably entails resource or opportunity costs for the custodians, so something should be given in return. This introduces into research an accountability factor beyond the experience of most academics, who at best feel indebted to the granting agency and to their peers. Yet, the conserved wildland is, in a sense, a kind of granting agency insofar as it sustains the cost of keeping the organisms alive and maintains the infrastructure that all researchers use.

At present, a researcher's failure to comply with the terms of the research agreement typically jeopardizes future research contract applications or receptivity to the research results, but does not entail direct penalties. Assigning penalties fairly is tricky, however. In some cases, damage to a researcher's personal reputation may count for more than a monetary penalty.

Conflicts over confidentiality and use have already erupted, and more can be predicted. For example, it is a tacit assumption that NSF-funded research (funded by U.S. taxpayers) will be put into the "public domain" through publication in scientific journals or entry into electronic networks. But what if the research agreement with a tropical conservation area specifies that biodiversity results cannot be made public until a National Biodiversity Board determines that publication will not jeopardize in-country commercialization efforts? Such a stipulation can, among other things, wreak havoc with the career development of an academic being considered for tenure—unless, of course, the academic evaluation scheme changes to take such events into consideration as it long ago did in such academic fields as chemistry and engineering.

Another question is whether the state can represent the private person as well as it can the custodians of state-owned conserved wildlands. The answer depends heavily on the national view of who owns national biodiversity. Pathbreaking new policies on this

issue are needed immediately. It is not obvious, for example, th "the state owns all" policies so often applied to subsurface mine als are appropriate in the case of biodiversity. On the other hand, may be highly appropriate for the state to issue "biodiversit prospecting concessions" for its conserved wildlands or even f the entire country, as Costa Rica has laid the legal groundwork t do. In effect, the government may delegate custodianship for n tional biodiversity management to private groups, just as it cu rently does for many other public service sectors.

Biologists and biotechnologists in the developed world, as we as many national private land owners in developing countries, wi protest loudly that such legislation transgresses individual right The howl will be even louder if a private contract must be ap proved by government on grounds that conserved wildlands ar considered public goods. However, computer technology, militar hardware, and other complex products are commonly covered b government-granted licenses, and government approval of spe cific contracts covering such goods throughout the develope world is required as a "national security" measure. In a tropica country rich only in biodiversity, the unrestricted and untaxed ex port of biodiversity-related information from the government o private sector can seriously threaten national economic securit especially when the area covered by wildlands drops below 20 t 30 percent. Currently, a tropical country can invest heavily in de veloping its biodiversity greenhouses only to discover that a pri vate entrepreneur has meanwhile sold most or all of it to some for eign biotechnology company. Does this not undermine a nation' economy and, thus, ultimately, its security?

When the research and development of wildland biodiversit information becomes an affair of the state, it moves into the realm o big-time politics and national planning. Such socio-political consid erations as industrial competitiveness, health, education, nationa security, etc., all come into play. Accordingly, the traditional staff and administrative structures for departments of game and fish, na tional parks, refuges, endangered species, and the like will requir major restructuring, greatly increased budgets, and novel depart ments so they can handle research agreements. Consider the case o

the professor who suddenly learns that his or her research on caterpillars represents a national secret and that conducting business as usual in the local university's biology department threatens national security. Even if there is good will all around, dealing with such problems will be financially and politically expensive.

As it contributes ever more to a nation's GNP, Ministries of Planning in developing countries will increasingly want a say in biodiversity research. Scientists and other kinds of biodiversity managers are not prepared for this, but a research agreement will help by making the aims of research projects clear and the projects themselves highly visible. The social benefits and impacts of research on biodiversity should become more visible. Certainly, all is not bleak for the researcher. To the extent that wildland biodiversity management becomes a money-maker, the public will offer it tax breaks, roads, electric lines, and funding—just as it does for other development activities.

5) Protecting Biodiversity Information

Confidentiality clauses will often turn out to be essential elements in research agreements between researchers and the custodians of conserved tropical wildlands. Certain classes of commercial collaborators will also demand confidentiality. A conservation area manager may require that a plant ecologist not divulge the locations of plants in a study of mineral accumulation by plants. An ornithologist may want the information on the location of an endangered species' nesting sites on private lands to be restricted, registered as confidential in the national biodiversity data base. Or a drug company may not want to purchase research samples collected in a conservation area unless it can be certain that the conservation area staff will not tell the drug company's competitors which species were sampled. Such guarantees, which help the country to protect its biodiversity as a commercial resource, are already commonplace in mining, biotechnology, chemistry, computer science, and other industries.

Even though applied academic and industrial science has a long-established system of patents, direct research compensation,

delayed publication, and employee-employer agreements designed to allow the person or organization sponsoring the research to protect a costly investment, university or museum-based researchers in whole-organism biology still feel that the free and unimpeded flow of information and the exchange of data through symposia, publications, discussions, etc., are essential to keeping their discipline alive. Even so, much of such information doesn't begin to "flow" until its initial possessors have extracted what they need for their own research. True unimpeded information flow, such as will occur when scientists and others begin to put their information freely into public domain electronic networks, will require the academic research community to rethink the concept of privacy as it applies to information. Also, this information is used as a form of barter for salary, research grants, prestige, professional advancement, and access to other information. Each researcher is in effect a tiny company, often in an unspoken joint venture with a university or other institution.

In the context of whole-organism biology, and especially of the study of wild tropical organisms, academic studies were long viewed as having no direct commercial value and involving no management costs that needed to be compensated. The public didn't consider itself an investor, and it didn't expect any immediate commercial returns. In this setting, confidentiality and other devices that maintain value in the open marketplace were scarcely issues.

In fact, maintaining tropical biodiversity requires a major investment by a tropical country. First, the management budget for a national system of conservation areas is in large part a biodiversity research budget (as well as an ecotourism budget and watershed management budget). Second, when as much as 10 to 30 percent of a country has been designated as conservation areas, these wildlands must contribute at least as much to a country's intellectual and financial capital as they would if used in other ways. If they don't, these areas will rapidly be put to other kinds of land use. Then too, biodiversity researchers from developed countries shouldn't forget that their tropical host countries simply don't have the tax base that their own countries have to cover conservation and wildland-management costs.

Considering how valuable an open information flow is to researchers, confidentiality—both temporary and permanent—should be accorded a high value at the negotiation table. Since stale research information loses value in many ways, any delays caused by meeting the requirements of confidentiality are expensive for the researcher (and other users). If combined with bureaucratic delays, they may prompt researchers to scrap a project or move it to another country.

What constitutes a pilfering, larceny, leak, sale, or possession of biodiversity from a conservation area, from private land, or from a country, etc., depends greatly on circumstance. The price of excessive possessiveness by biodiversity custodians is a debilitating isolation from the world of collaborators. The tropical country that plans to close its borders and re-invent biodiversity science for itself will lose out, and no nation can be made leak-proof anyway. On the other hand, the free-forage ethic followed in the tropics for the last several centuries offers the custodians of a conserved wildland very little in return for their investments.

Taxonomists will have great difficulty working in an environment where every taxonomic specimen that moves out of a country might constitute a genetic and chemical information leak. Simply by depositing a specimen in an international museum or someone else's private collection, the scientist can easily and unwittingly become a "mule" for pharmaceutical and biotechnology industries that still want to treat biodiversity information as a free good. The only practical solution is a thorough system of research agreements whereby taxonomic specimens and information are clearly destined for taxonomic purposes, and commercial sampling is identified as such, to the best of the researcher's ability.

Tropical countries must also come to recognize the work of the taxonomist as a very beneficial form of technology transfer to the developing world. In addition, these nations must realize that though they have an attractive product in their complex biodiversity, it is their responsibility to bring it to the bargaining table with the intention of making sales rather than simply complain when others develop an "unused" resource. And finally, institutions trying to establish institutional norms aimed at keeping biodiversity information in trust for tropical countries deserve encouragement and support.

Success will also depend on the conscientious consumer. Before long, consumers of biodiversity information will demand the same sort of source certification that many developed-world consumers of tropical hardwood timbers are now demanding. Producers of biodiversity-based drugs and other chemical products, for example, could easily increase their sales in competitive marketplaces by displaying certification that the product's source country receives a royalty on the sale. Except in the case of one-of-a-kind drugs, consumer choice can thus help to protect biodiversity information and return benefits to the source country.

In efforts to protect biodiversity, demands by major granting agencies (such as the U.S. National Science Foundation and the National Cancer Institute) that in-country research permits be obtained for all projects that they fund in tropical countries are critical. So is the U.S. Patent Office's requirement that an applicant provide the pedigree of all the raw materials used to make a new drug. A complementary need now in most developing countries is for a legal framework regulating access to biodiversity and establishing requirements for the management and transfer of biodiversity information.

6) Violating, Re-evaluating, and Terminating Research Agreements

The same parties that sign a research agreement must be responsible for evaluating it periodically and determining whether it has been violated. Unconscious violation is all too easy where the subject matter is so new, and where parties on both sides of the bargaining table have very different goals and mores. Prime considerations are the investments made by both the researcher and the wildland custodian, and such externalities as the duration of secure funding. (Few researchers will establish a research project costing hundreds of thousands of dollars under an agreement that a wildlands custodian can break capriciously.) Also,

the researcher's greatest concern is that the cooperating government is stable and reliable since no researcher wants to be buffeted by political change or to fall victim to inter-agency struggles for jurisdiction. For their part, wildland administrators don't want to construct facilities for researchers or conserve large wildlands for users, only to have the research funds suddenly taken elsewhere. And all parties should see the wisdom in the emerging principle that signers from the developing and developed worlds are equally responsible for their parts in an agreement.

In general, when two or more entities enter into a potentially risky activity, they commonly deposit some kind of collateral or purchase an insurance policy to cover repairs or compensation should a party default. Mining contracts and construction contracts and loans all call for such safety nets. (For the academic biodiversity researcher with a limited budget, professional reputation functions as a form of collateral.) If such a bond—whether cash or barter—became a standard budget item for many classes of research agreements, biodiversity prospecting research agreements would be taken much more seriously and their consequences more carefully planned.

Currently, the most that can be asked is that the researcher take all pains to avoid damaging conserved wildlands. This means collaborating closely with the managers and technical advisors charged with taking care of conserved wildlands and making a best effort to insure that the source country benefits from the income generated by contemporary research on wildland biodiversity. It also means avoiding unevaluated transoceanic introductions of species or genes (e.g., the African honey bee into the New World, Australian *Melaleuca* trees into Everglades National Park, Florida, Central American *Mimosa pigra* bushes and buffalo into Kakadu National Park, Australia), and not reintroducing animals to the wild after they have become infected with diseases in zoos or homes. Finally, it means willingly conducting research on the impact of users and on the comparative resilience of wildlands research sites at various levels of use. Such measures do much to eliminate concern about breaking research agreements.

7) Who Pays for Tropical Research and its Management and in What Coin?

Research generally benefits the host institution and society. Research budgets from government granting agencies and many private foundations typically include overhead for institutional support. Equipment purchased with grant funds also amounts to an institutional subsidy since it generally remains in use long after the grant expires. Many project personnel perform various services for the institution—whether teaching, advising, serving on committees, or providing psychological support for other researchers and management staff. Also, the research project itself eventually generates information products that can be sold to replenish the public tax base and other income streams that support the cooperating institution. And, finally, when a researcher in a developed country commercializes a finding, direct returns from commercialization presumably repay the various investors along the way.

While all of these "payments" theoretically apply to research in a tropical conserved wildland, many foreign researchers (academic or commercial) and even many national biodiversity researchers working in tropical countries seem to forget to make an explicit effort to compensate the custodians of the conserved wildlands that are so vital to their research. Even less thought goes to compensation for the *national* opportunity costs of conserving a wildland rather than converting it to some other kind of land use.

Explicit and direct contributions to the costs of maintaining tropical wildland biodiversity must be part of any research budget, whether the researcher is non-profit (government or private) or commercial. But if the contribution is forced, acrimony can poison negotiations, especially because traditionally biodiversity has been viewed as a free good. Researchers in developed-country institutions have long been taught by experience to scrimp, cheat, bend, twist, and otherwise modify their research budgets to extract the maximum for themselves or their project. In wealthy institutions, such behavior seems a small enough price to keep research staff happy. However, in a tropical biodiversity research system, at least at its current state of development and financial

security, the same behavior can do great harm to both the researcher and the system.

An even greater psychological impediment to including wildland maintenance costs in research budgets is that such monies usually disappear into cavernous general government budgets and have no visible impact on the wildland where the researcher works. Worse, if researchers put the funds directly into the management budget of "their" wildland, they often see them being misused or stolen. Most biodiversity researchers have generally grown used to working on tight budgets, so it hurts to see a significant percentage of hard-won funds wasted. The answer? Wildland conservation administrations can win many friends by using research contributions efficiently and demonstrating routinely how they were spent.

In developed countries, most researchers are trained to contribute to the institutions that support their work, especially those in their own countries. But today, the nature of such contributions is changing very rapidly, and both scientists and businesspeople seem unprepared to respond to new needs, especially in a foreign land. Friction and misunderstanding intensify when the developing country grudgingly views compensation by researchers as simply a partial repayment of a long-overdue debt rather than as a form of collaboration. But a little perspective is needed here: virtually the whole taxonomic system on which tropical biodiversity information management is based was transferred directly from developed countries, as was most of the ecological science and philosophy that has informed the construction of tropical national parks and other conserved wildlands.

Another problem is that the wildland manager may not recognize or value some of the many kinds of biodiversity information that the researcher passes on to the public. A national park manager in tropical Costa Rica has little use for an analysis of leaf chemistry published in German in a German journal, even though an alert biodiversity prospecting program in some other Costa Rican institution might be able to use it. Unfortunately, the kinds of payments most useful to present-day tropical wildland management—cash or

time invested in in-country training—may also be those hardest for the international researcher on a two-week visit to give.

Mixed messages further frustrate attempts to compensate countries for use of, or access to, their biodiversity and related information. Biodiversity information is managed at many different levels within a country, and each may give a researcher different signals or harbor different expectations. For instance, for the Minister of Natural Resources sufficient payment may be public remarks by a researcher at international meetings on the virtues of doing research in the Minister's home country, or the researcher's help in evaluating priorities for resource allocation. However, to the biodiversity research administrator in the conservation area where that researcher works, such contributions are often invisible. Worse yet, the technically-oriented biodiversity research administrator may not agree with the politically-oriented Minister of Natural Resources on the decisions that the researcher helped the ministry make. Conversely, a researcher's many small direct contributions to management activities in a given conservation area may be ignored by the Ministry if the researcher fails to cultivate the right communication channels. To complicate things even more, some national and foreign researchers working in the tropics have manipulated the national research management process to impede their competitors.

Given the plentiful pitfalls of managing biodiversity research in general and of defining and allocating research costs in particular, government offices of biodiversity research management—both at the conservation areas and in central bureaucracies—clearly need diplomatic staff with a crystal-clear vision of national and international biodiversity management goals at many levels.

8) How Should Research Gains and Compensations be Distributed?

"To the investor goes the profits"? Yes, but tropical sources or custodians of biodiversity information have not been viewed as investors, and few custodians and academic researchers understand what the profit is, much less who gets it. Commercial researchers

have a clearer sense of where profits are to be made, but they aren't eager to acknowledge the investors or—on pain of losing stockholders—to pay more than the market forces them to. In other words, there is little incentive to pay for what appears to be a free good, and the easiest and most lucrative kind of distribution of gains and compensations is no distribution at all.

The recipients of the diverse gains and compensations from biodiversity research in public and private conserved wildlands need to be negotiated case-by-case, as will the kinds of gains, compensations, investments and evaluations to be made. On the one hand, the barter system ingrained in tropical biodiversity research and research management is highly subjective and variable. On the other, in the no-nonsense exchange of money, certain social "goods" are certain to be overlooked. For instance, the amount of conserved wildland in a tropical country is currently ignored when the World Bank gives a country a credit rating. In Costa Rica, it is far easier to take out a loan using a cattle pasture as collateral than using uncut forest.

If a rancher sells a cow to a slaughterhouse, he gets the profits (less any tax imposed by the government to cover public services to the rancher). But if the rancher sells the genes of a tree on his ranch, he has sold a piece of common national property. Shouldn't some of the returns from such a sale be distributed more broadly and be nationally regulated? And does a transaction tax represent a fair contribution to the enormous national cost of maintaining the whole tree population? (Recall that the genetic material on the individual's ranch might not be able to survive if other populations of that species and supporting species were not thriving outside the boundaries of the ranch.) The problem is that if the profits are broadly distributed, individual farmers may receive so little that they will not value the tree. The solution—at least in part—is for ranchers to sell *services*. Getting the sample and insuring the survival and health of the tree from which it came are part of these services. However, if these services require subsidy from the public sector, as is the case with the tree's genes, then the commercial agreement should insure a return to the public. The INBio-Merck and Co. agreement discussed below contains this element explicitly.

Since a biodiversity research agreement will not serve every landowner's needs, biodiversity information is probably best managed, commercialized, protected, etc., through networks of institutions or by complex companies that understand that the bulk of the market cost of a given bit of biodiversity information (and thus the compensation for the provider) is largely for excavating and manipulating or preserving the information rather than for the item itself. If this approach is taken, most biodiversity research agreements would be among institutions or individuals representing institutions, and most immediate national gains and compensations would go to the custodial institution—whether government or private, non-profit or profit.

In the well-known contract between INBio and Merck & Co., Inc., what is unique is not only that the company is paying something approximating the true cost of the samples it receives. Also unique is that all of the initial payments and all of the royalties go either directly into management budgets and endowments for Costa Rica's conservation areas as a whole or cover the actual costs of collecting the samples. (The administrative headache lies in determining which fractions should be used to cover such traditional conservation costs as land purchase, infrastructure, and staff salaries; which used for development costs, such as biodiversity inventories, facilitation of further biodiversity prospecting, and the distribution of information to the public and various other user industries; and which used as endowments for the conservation areas and INBio.) *(See Chapter II.)*

The question of how to distribute the pay-offs from biodiversity research raises the larger issue of how to distribute all of the income generated by a conservation area. History provides few precedents, but it is nonetheless now clear that a conservation area *is* simply another kind of productive land use, one with costs and benefits like any other sector. For this reason, the biodiversity researcher should be a major participant—along with ecotourism companies, water users, timber harvesters, education ministries, planning ministries, regular citizens, etc.—in any discussions over how to allocate the costs and the gains for a conservation area. In this context, a tropical conservation area has much in common with a highway system or health system.

9) Biodiversity Information in the "Public Domain"

With several centuries of biodiversity information collection behind us, and most of this information already made "public" in the libraries, museums, seed banks, gardens, greenhouses, zoos, and other information storehouses in developed countries, the widespread assumption is that most such information is also freely available to the tropical world. In fact, most of it is not and much of it is not even known by most people to exist. This sad fact is only too obvious to the national researcher returning home to the tropics—in an act of technology transfer—with a fresh degree from a developed-country institution. It is even more evident to the administrators of conservation areas far from national centers of higher education, research institutes, national museums, botanical gardens, etc.

In the cost-benefit analysis that is part of today's biodiversity research agreement, what value should be assigned to public information? And what ownership prerequisites? It is tempting to view this handed-down wealth as an ancient aqueduct established (and paid for) with the labor of some previous society and to declare the water flowing within to be a public good to be cared for and used like the water in a natural river. But even natural rivers have maintenance costs, as any protector of a watershed can confirm. The problem is much like that confronting the large museums in developing countries, museums that are storehouses are processing centers for much of tropical biodiversity information.

INBio's policy is that all basic inventory information (what species are where, and their natural history) gathered by INBio has been extracted from the public domain. All new biodiversity inventory information is likewise harvested from Costa Rica's conservation areas, which are also in the public domain. This information therefore belongs to the public domain and will be placed there. However, this decision entails substantial operating costs for INBio and other institutions, costs that are unlikely to be covered by the national tax base. Indeed, the only way to meet them is through international taxes—in the form of service fees charged to all commercial users, in the form of collaborative arrangements for

identifications and other services with researchers, and in the form of the INBio endowment established through bilateral international government assistance.

To open the world-level "public domain" to developing countries, researchers can voluntarily serve as librarians and reference librarians for the huge amount of tropical biodiversity information already gathered. Taxonomists, ecologists, physiologists, natural products chemists, and other such wardens and traditional purveyors of this information can provide (as some now do) taxonomic services, ecological analyses, clues to biodiversity prospecting, literature searches, etc., as retroactive "payments" on a long-term debt. And there may even be cases where the researcher offers so much service to the biodiversity source country that he or she should be compensated from the national research budget. We are not far from the day when the administration of a tropical conservation area will pay a taxonomist a hefty consultancy fee to generate, for example, a field guide to the species of moths or mushrooms that the conservation area will then use to promote itself to pharmaceutical companies or ecotourists.

10) Market Forces and Research Agreements on Tropical Biodiversity

Every area rich in tropical biodiversity is gradually becoming more accessible to foreign and national researchers, thanks to new communication technologies, greater ease of travel, and increasing international collaboration. As a result, every biodiversity research opportunity in the tropics increasingly competes with every other one to attract international field researchers, biodiversity prospectors, taxonomists, etc.

This is not to say, however, that all tropical countries have equal opportunities to collaborate. Some tropical countries have almost nothing biologically unique and will therefore fare better by specializing in support services. Others are veritable supermarkets of species and specimens. While abiding by its own laws and cultural mores, each tropical country will have to find its own niche.

Since high-quality field research often amounts to a long-term investment in planning and in time spent in the biodiversity-rich area, the researcher may initially be able to pick from many venues. Once research is under way, however, changing locations can be expensive, if not disastrous. For this reason, capricious changes in policy or in a research-management plan can be lethal for research, and—so effective is the researcher grapevine—just a few such changes are enough to blackball a conservation area or country for a very long time. Conversely, tropical countries that predicate their national research management process on collaboration can count on recurring investments by researchers who find the socio-political environment comfortable.

Two pitfalls of the free market deserve the last word here. First, biodiversity information (including samples) can all too easily become contraband sold on international black markets. It is easy to foresee one painful situation in particular: two adjacent tropical countries share a large block of unique biodiversity, and one sells the resources' genes on the cheap or puts information on the genetic material into the public domain, thereby keeping the neighboring country from realizing any economic gains from developing the resource. A war over biodiversity is not as far-fetched as it might first appear.

Second, in a free market, unscrupulous businesspeople deliberately pick the least-protected or least-organized countries for their operations so they can quickly mine the nation's biodiversity and sell it to the highest or most convenient international bidder before the unsuspecting country can do anything about it. Motivated solely by personal profit, they will sell cheap with no concern about a "genetic leak" into the public or international private domain. On such economic "frontiers," even well-written research agreements won't stop the raiding. More effective for now would be an immediate regional and even pan-tropical consensus on the *need* for research agreements that address the kinds of concerns touched in this document. The end user of tropical biodiversity research can also help by deciding to accept only information from sources fully covered by adequate research agreements with the source country. This could amount to a self-imposed tax by the biodiversity user and consumer. In any case, developed country users should be encouraged to take this first step and bear its initial burden so as to help save the future treasures that tropical biodiversity can yield.