

Ecosystem Marketplace



State of Biodiversity Markets Offset and Compensation Programs Worldwide



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Cover & layout by Wenceslao Almazan.

Acknowledgements

The following pages represent a compilation of the resources, insights and knowledge of dozens of individuals. They include: Dr. Naoki Adachi, Ricardo Bayon, Todd BenDor, Michael Bennett, Steve Bosak, Andrew Bovarnick, Rafael Burgos, David Brand, Susie Brownlie, Curtis Chullick, Sally Collins, David Cooley, Michael Crowe, Marianne Darbi, Maria del Mar Zavala, Tim Dendy, Craig Denisoff, Michelle Desilets, Melissa Dixon, Andrew Dodd, Marta Echavarria, Christopher K. Fong, Jessica Fox, Toby Gardner, Todd Gartner, Juan Carlos Gonzalez, Ben Guillon, Tom Hammond, MaryKate Hanlon, Al Hanson, Stephen Harris, Tommie Herbert, Cassie Hoffman, Marian Honeczy, Brad Jakowyna, Martin Juniper, George Kelly, Rebecca Kihslinger, Kristine Koster, Valerie Layne, Daniela Lerda, Patrick Maguire, Edward Maillott, Steve Martin, Rodrigo Martínez, Betsy McCorkle, Bruce McKenney, Deblyn Mead, Alex Moad, Brian Monaghan, Ivo Mulder, Carlos Muñoz Piña, David Nicholson, Holger Ohlenburg, Artur Paiva, Patricia Pérez, Bob Pett, David Primozich, Sarah Prinsloo, Jason Quigley, Jeannicq Randrianarisoa, Ramsay Ravenel, James Remuzzi, Cara Roderick, Talia Romero Jurado, Alice Ruhweza, Ken Sanchez, Joanna Silver, Jon Soderberg, Eric Sprague, Theo Stevens, Kerry ten Kate, Phuc Xuan To, Al Todd, John Tynan, Katrina Valerio, Amrei Von Hase, Dr. Steven Ward, Wayne White, Jessica Wilkinson and Kristine Young. Thank you also to the entire staff of Forest Trends for your continued support and contributions.



State of Biodiversity Markets: Offset and Compensation Programs Worldwide

Preferred Citation

Madsen, Becca; Carroll, Nathaniel; Moore Brands, Kelly; 2010. State of Biodiversity Markets Report: Offset and Compensation Programs Worldwide. Available at: <http://www.ecosystemmarketplace.com/documents/acrobat/sbdmr.pdf>

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About Ecosystem Marketplace

Ecosystem Marketplace, a project of the non-profit organization Forest Trends, is a leading source of information on environmental markets and payments for ecosystem services. Our publicly available information sources include annual reports, quantitative market tracking, weekly articles, daily news, and newsletters designed for different payments for environmental services stakeholders. We believe that by providing solid and trustworthy information on prices, regulation, science, and other market-relevant issues, we can help payments for ecosystem services and incentives for reducing pollution become a fundamental part of our economic and environmental systems, helping make the priceless valuable.

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Introduction



To the Readers

As more and more governments and businesses consider market-like instruments as tools for biodiversity footprint management, it is increasingly important to understand what is happening, where, and how those tools work. It is also critical to provide reliable information free to the public to enable all market participants to make more informed decisions, learn from the experiences of others, and ultimately allow stable, equitable and effective conservation markets to develop. To address this compelling need for more and better information we have written this status and trends report on biodiversity markets. Within the broad spectrum of ‘biodiversity markets,’ we aim to provide a succinct answer to the question ‘What is happening in biodiversity offset and compensation programs around the world?’

There are both mature and nascent payment systems for biodiversity compensation around the world. Each one is a bit different and they often go by different names: biodiversity offsets, mitigation banking, conservation banking, habitat credit trading, fish habitat compensation, BioBanking, complementary remediation, conservation certificates, and many more. Some are based on compliance with regulation while others are done voluntarily for ethical, competitive, or pre-compliance reasons. But they are all efforts to reduce biodiversity loss and build the cost of biodiversity impacts into economic decisions through markets or market-like instruments and payments.

Michael Jenkins
President, Forest Trends

While a ‘biodiversity offset’ program may be preferable from an ecological and social standpoint, more flexible and less arduous forms of impact compensation, in which funds are set aside for biodiversity management or valuable biodiversity is protected elsewhere, can be a first step towards better biodiversity footprint management or even eventually a regulated offset system. It is this movement towards better compensatory mitigation and effective payments and markets for mitigation that is of interest to the report.

To meet those ends, this report provides the status and trends of biodiversity offset and compensatory mitigation programs by geographical region. In each section, the report summarizes the total active programs and developing activities, and broad metrics like total known payments and land area protected or restored. In each region, we also analyze the characteristics of offset programs—what drives the program, how offsets are created, who the buyers and sellers are, and what the unit of credit is. Finally, we look at recent developments in nascent and existing programs in the region.

The reliable, consistent and transparent information provided in this report will enable both experienced and new market participants to make more informed decisions and learn from the experience of others; ultimately allowing fair, stable and transparent conservation markets to develop.

Kate Hamilton
Director, Ecosystem Marketplace

List of Acronyms and Abbreviations

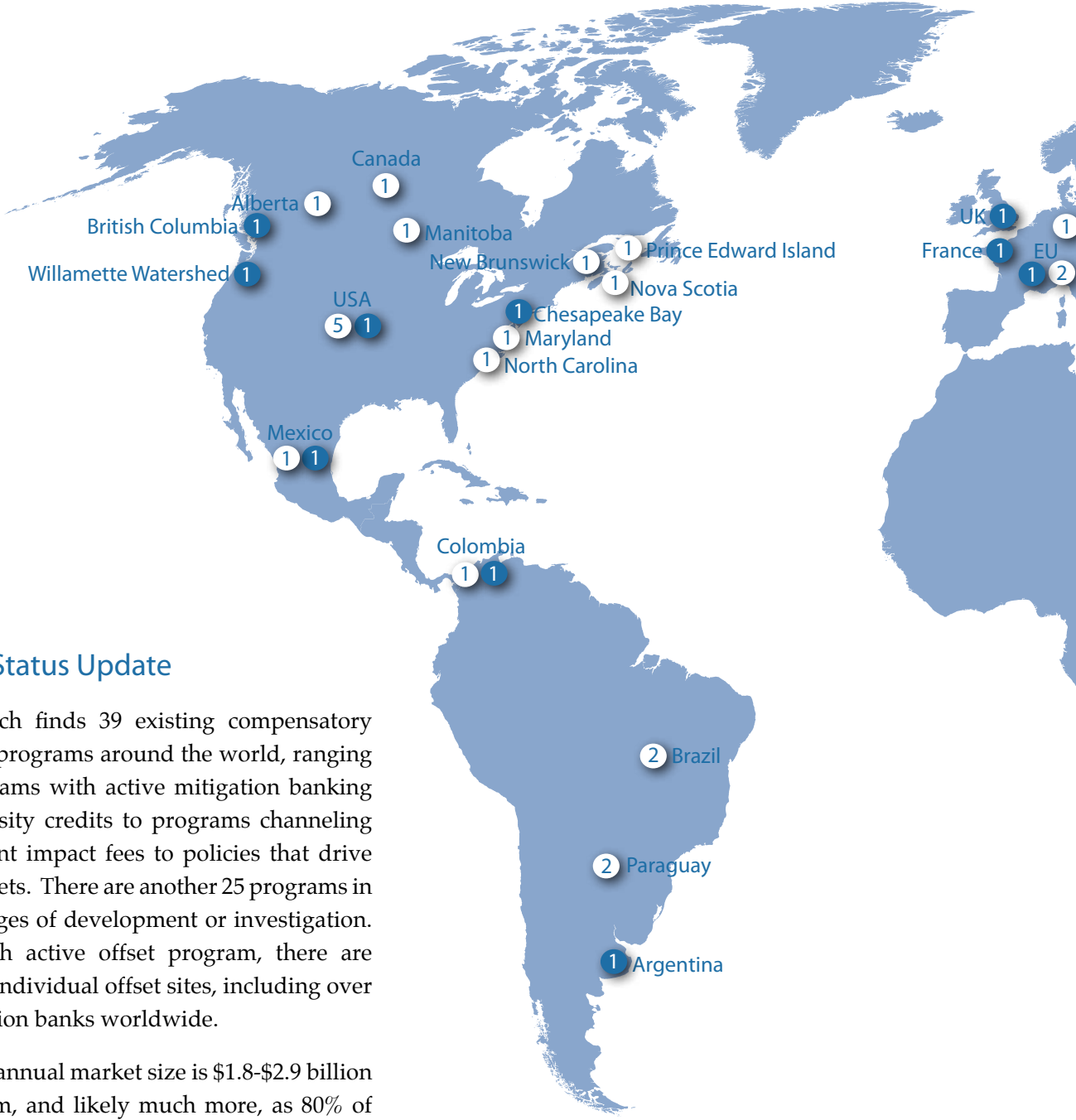
ABP	Associated British Ports	IUCN	International Union for the Conservation of Nature
BBOP	Business and Biodiversity Offsets Program	LGA	Ley General del Ambiente (Argentina)
BCC	Biodiversity Conservation Certificates (Malaysia)	LGEEPA	Ley General de Equilibrio Ecológico y Protección al Ambiente (Mexico)
BLM	Bureau of Land Management (US)	LOTs	Large old trees (Australia)
BTAU	Biodiversity Technical Assistance Units	LPNMA	Lei da Política Nacional do Meio Ambiente (Brazil)
CA DFG	California Department of Fish and Game	MHHC	Manitoba Habitat Heritage Corporation
CBD	Convention on Biological Diversity	NEMA	National Environmental Management Act (South Africa)
CONABIO	Comisión Nacional para el Conocimiento y Uso de la Biodiversidad (Mexico)	NGO	Non-governmental organization
CONAFOR	Comisión Nacional Forestal (Mexico)	NMFS	National Marine Fisheries Service (US)
DbD	Development by Design (TNC)	NOAA	National Oceanic and Atmospheric Association (US)
DFO	Department of Fisheries and Oceans (Canada)	NSW	New South Wales (Australia)
EEAA	Egyptian Environmental Affairs Agency	NSW DECCW	NSW Department of Environment, Climate Change and Water
EIA	Environmental Impact Assessment	OEM	Office of Environmental Markets
ELD	Environmental Liability Directive (EU)	PAE	Plan d'Action Environnementale (Madagascar)
ELI	Environmental Law Institute	PEMEX	Petróleos Mexicanos
EM	Ecosystem Marketplace	PES	Payments for Ecosystem Services
EMP	Environmental Management Plan (Mexico)	PRC	People's Republic of China
EPBC	Environmental Protection and Biodiversity Conservation Act (Australia)	PROFEPA	Procuraduría Federal de Protección Ambiental (Mexico)
EPE	Environmental Protection Enactment (Malaysia)	PVP	Property Vegetation Plan (Australia)
ESA	Endangered Species Act	QMM	QIT Madagascar Minerals
ESC	Environmental Services Certificate (Paraguay)	REDD	Reducing Emissions from Deforestation and Degradation
ESIA	Environmental and Social Impact Assessment	RVMC	Regional Vegetation Management Code (Australia)
EU	European Union	SANBI	South African National Biodiversity Institute
EVC	Ecological vegetation class (Australia)	SEB	Significant Environmental Benefit (Australia)
FCA	Fundo de Compensação Ambiental (Brazil)	SEMARNAT	Secretaría de Medio Ambiente y Recursos Naturales (Mexico)
FOIA	Freedom of Information Act (US)	SNUC	Sistema Nacional de Unidades de Conservação (Brazil)
HADD	Harmful alteration, disruption or destruction (Canada)	TNC	The Nature Conservancy
HCT	Habitat credit trading (US)	UCTF	Uganda Conservation Trust Fund
HCV	High Conservation Value	US ACE	US Army Corps of Engineers
ICMBio	Instituto Chico Mendes de Conservação da Biodiversidade (Brazil)	US EPA	US Environmental Protection Agency
IDEA	Instituto de Derecho y Economía Ambiental (Paraguay)	US FWS	US Fish and Wildlife Service
IFC	International Finance Corporation	UWA	Uganda Wildlife Authority
ILF	In-lieu fee	WCS	Wildlife Conservation Society
IMR	Impact Mitigation Regulations (Germany)	WWF	World Wildlife Fund
INE	Instituto Nacional de Ecología (Mexico)		
INFOR	Instituto Forestal (Chile)		
IPBES	Intergovernmental Platform on Biodiversity and Ecosystem Services		
IPCC	Intergovernmental Panel on Climate Change		

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Mapping the World's Biodiversity Markets





General Status Update

Our research finds 39 existing compensatory mitigation programs around the world, ranging from programs with active mitigation banking of biodiversity credits to programs channeling development impact fees to policies that drive one-off offsets. There are another 25 programs in various stages of development or investigation. Within each active offset program, there are numerous individual offset sites, including over 600 mitigation banks worldwide.

The global annual market size is \$1.8-\$2.9 billion at minimum, and likely much more, as 80% of existing programs are not transparent enough to estimate their market size. And the conservation impact of this market includes at least 86,000 hectares of land under some sort of conservation management or permanent legal protection per year.



By the numbers		
Number of active programs:		39
Number of programs in development:		25
Total known regional payments per annum:		US\$1.8 - \$2.9 billion
Land area protected or restored per annum:		>86,000 ha

Executive Summary



Since 2004 the Ecosystem Marketplace's Biodiversity Program has been investigating and reporting on biodiversity markets - markets that can be: hard to define, fragmented, swiftly changing, and opaque. Given these challenges, we wrote this State of the Markets report to provide current and relevant information to help policy makers, practitioners, investors, and other market participants make more informed decisions, learn from the experience of others - and ultimately enable fair, stable, and effective conservation markets to develop.

This report focuses on the spectrum of biodiversity markets that are designed to reduce development impacts to biodiversity, a practice known as **compensatory mitigation**. The spectrum of practices range from rigorous and measurable biodiversity offsets to less direct efforts to compensate for impacts through financial contributions and land protection.

Our research finds 39 existing programs around the world, and another 25 in various stages of development or investigation. The global annual market size is **\$1.8-\$2.9 billion at minimum**, and likely much more, as about 80% of existing programs are not transparent enough to estimate their market size. And the conservation impact of this market includes at least 86,000 hectares of land placed under some sort of conservation management or permanent legal protection each year.

Some countries are in early stages of adoption or investigation of compensatory mitigation, while others have sophisticated and mature systems. But in all regions, compensatory mitigation is developed or developing around

unique economic, political, institutional, and cultural circumstances that give rise to a variety of programs.

In **North America**, biodiversity offset and compensation programs are well-developed, particularly the US wetland and species compensation programs and Canada's fish habitat compensation program. In total there are 14 active programs and 5 in development in North America. The region sees a minimum of \$1.5-\$2.5 billion in compensation payments per annum. This region also hosts the most offset credit banks of any region in the world.

The United States has seven active programs and three in development. Payments total \$1.5-\$2.4 billion annually. Around 700,000 cumulative acres (283,280 hectares) have been restored or protected through US programs. The two largest offsetting programs, wetland and species mitigation, offer three mechanisms for achieving compensation: do it yourself, pay into a fund, or buy a third-party credit. Within this third form of offset credit banking there are 615 active and sold-out banks in the country.

Canada's compensation programs are focused on fish habitat and wetland compensation, driven by a combination of compliance with federal and provincial policies, with varying levels of implementation. Six programs exist in Canada, with one in development. These programs cover five ecosystem/species types and protect around 180 hectares per year. Regional investment totals \$6-\$145 million annually, and there are currently 17 active and sold-out banks.

Offset programs in Mexico are not as developed

as those of its neighbors in North America. Yet, with programs compensating landowners for conserving forest cover and requiring payment for deforestation due to industrial development, Mexico is well on its way to developing a sophisticated program, ensuring a more direct link between development impacts and biodiversity conservation.

Five compensation programs exist in **Central and South America**, with two in development. Most South American countries have developed Environmental Impact Assessment (EIA) laws that address impact mitigation, including Brazil, Argentina, and Chile. However, the majority of Central and South America has not developed biodiversity offset programs. The exception is Brazil, with Colombia and Paraguay in the early stages of development. These programs have varying degrees of enforcement, market infrastructure and institutional capacity.

There are currently no active offset programs in **Africa**, but six are in development. South Africa is the leader in African offset policy development, with a national and two provincial policies in the works. While other countries have developed EIA law and some voluntary offset projects, the majority of the continent has little in the way of offset and compensation program creation.

In **Europe**, biodiversity markets are still a developing idea. Four programs have had offsets implemented, and an additional three programs are in early stages of development. The largest European program, Germany's Impact Mitigation Regulation, has at least 2,600 hectares conserved in compensation pools. Habitat banking has been piloted in France and is under investigation in the United Kingdom and in the European Union.

Four offset programs exist in **Asia**, with another four in early development. Annual payments equal \$390 million and roughly 26,000 hectares are protected or restored annually. Asian offset-like programs come mostly under the

Environmental Impact Assessment, with EIA laws in Japan, South Korea, China, Mongolia, Pakistan, Thailand, Malaysia, Russia and India. The presence of EIAs in the region may lay a framework for biodiversity markets - two offset programs/projects already in existence are located in Malaysia and Saipan. In addition to government-led actions, voluntary and industry initiatives, driven by increasing public criticism, are arising. At least one industry group has been exploring the use of biodiversity offsets in the agricultural industry.

Between **Australia and New Zealand**, there are twelve biodiversity offset programs and five in development; the majority of those are compliance-based State or regional programs implemented at the project level during the planning process, although two programs offer in-lieu fee payment. About \$1.3 million goes to regional payments annually, with 523 habitat hectares restored or preserved each year; there are 42 ecosystem/species credit types in Australia's offset programs.

Overall, our research shows significant activity around the world with many compensatory mitigation programs in early stages of development. The global economic downturn of 2008 may have slowed market growth in regions with developed mitigation systems, but they continue to see credit sales; while regions without developed mitigation laws and markets are showing strong interest.

And while these trends of activity and interest are exciting, perhaps even more important are the many signs that where offset markets exist, regulators, practitioners, and service providers are tackling the challenging and sometimes unpopular issues like quality assurance, accounting, and transparency. These are the fundamental building blocks that will lay the foundation for fair, stable, and effective markets - in both existing and future biodiversity offset programs.

Background, Scope & Methods



In August of last year, scientists lowered themselves into an extinct volcanic crater in the remote Southern Highlands region of Papua New Guinea to discover creatures unknown to the world. This expedition alone yielded the discovery of over 30 species new to science¹ and the final tally for 2009 is nearly 100.² At the same time as scientists are discovering new species on our planet, we are losing biodiversity at up to 1000 times the natural rate³ to make way for roads, urban development, and the raw materials that power our homes and make up the products we buy.

In essence, we are creating a built infrastructure at the expense of our natural infrastructure. This natural infrastructure, made up of species, ecosystems and their processes, has been so vast and has supported human life for so long that its loss was scarcely considered as a cost in the price of development. It has been a public good with no price and no market. But the effect of this undervaluation is now catching up with us. Governments and businesses are increasingly feeling the costs of biodiversity loss, climate change, water scarcity, flooding, disease, and other consequences of failing ecosystem services. Because we can no longer afford to ignore the value of the natural infrastructure provided by biodiversity, society is beginning to incorporate the biodiversity externalities in our economic and policy decision making.

Biodiversity markets are a potentially powerful tool to internalize these traditionally externalized costs. The thinking behind market (or market-like) instruments for biodiversity conservation is that if positive and negative impacts on biodiversity can be measured and

represented as credits and debits, they are more easily integrated as benefits or costs in economic decision-making. For example, if a business has to pay to mitigate its residual impact on a rare animal or plant, it will either choose to develop elsewhere or bear the costs of mitigation. Likewise, if a landowner can gain a profit from protecting or enhancing rare animal or plant habitat, they may provide more habitat than they would have done without compensation.

Many programs, products, and activities have been categorized under the term “biodiversity markets,” admittedly stretching “markets” beyond the economic definition of a place where buyers and sellers regularly meet to exchange goods and services. In the broadest sense, biodiversity markets include any payment for the protection, restoration, or management of biodiversity. Just a small sample includes: biodiversity offsets, conservation easements, certified biodiversity-friendly products and services, bioprospecting, payments for biodiversity management, hunting permits, and eco-tourism.



Drivers of biodiversity markets

Three broad categories of drivers of biodiversity markets are: regulatory compliance, government-mediated payments, and voluntary provisioning.

In a **regulatory compliance** setting, the government sets a limit on the impact to a species or habitat and then allows the market to resolve the cost of offsetting impacts above the limit or ‘cap.’⁴ For example, in the United States (US), the Endangered Species Act limits harm to federally-listed endangered species and requires a mitigation hierarchy: first avoidance, then minimization of harm, and finally mitigation for impacts to species. Mitigation obligations could be fulfilled by purchasing a credit from a private conservation bank that has restored and/or managed or preserved habitat for the species. Through regulation, government creates a demand for biodiversity that government, the private sector, or non-profits can supply. Because the suppliers can sell credits to regulated parties that need to find appropriate mitigation for their impacts, the law thus provides a financial incentive to permanently protect endangered species habitat. Governments may also require mitigation on a case-by-case basis, as regulated by Environmental Impact Assessment (EIA) or other regulations integrated in planning permissions. For example, developers in Tasmania, Australia must present a proposal to offset impacts to threatened species and native vegetation communities during the planning approval process; the regulator reviews and approves or rejects the proposals on a case-by-case basis.

Government-mediated payments can also be a driver of biodiversity goods and services. The government (and/or a non-profit organization) acts as a sole “buyer” when it fulfills public demand for biodiversity goods and services by purchasing land or conservation easements

Definitions

Compensatory Mitigation– the restoration, creation, enhancement, and/or in certain circumstances preservation of natural resources for the purposes of offsetting adverse impacts which remain after all appropriate and practicable avoidance and minimization has been achieved. For the purposes of this report, compensatory mitigation represents a spectrum of practices that range from rigorous and measurable biodiversity offsets to less direct efforts to compensate for impacts through financial donations and land protection.

Mitigation Hierarchy – avoidance, minimization, rehabilitation / restoration (sometimes termed mitigation), offset. (see Box 1)

One-off offset – ‘do-it-yourself’ offsetting conducted by the developer or a subcontractor. Known as ‘permittee responsible mitigation’ in the United States.

Compensation Fund – a third-party mechanism that collects and administers fees from developers to offset their impacts to biodiversity. The money may go directly towards compensating biodiversity loss, or to more indirect biodiversity-related projects (i.e. funding protected area management, research).

Mitigation Bank (“bank”)–a site, or suite of sites, where resources (e.g., wetlands, streams, habitat, species) are restored, established, enhanced and/or preserved for the purpose of providing compensatory mitigation for impacts. In general, a mitigation bank sells compensatory mitigation credits to developers whose obligation to provide compensatory mitigation is then transferred to the mitigation bank sponsor.

Credit – a unit of measure representing the environmental commodity that is able to be traded (this can be functional or measure of area), based on the environmental activity.

No Net Loss - A target for a development project in which the impacts on biodiversity caused by the project are balanced or outweighed by measures taken to avoid and minimize the project’s impacts, to undertake restoration and finally to offset the residual impacts, so that no loss remains. Where the gain exceeds the loss, the term ‘net gain’ may be used.

Like-for-Like - conservation (through the biodiversity offset) of the same type of biodiversity as that affected by the project. Also referred to as in-kind.

Environmental Impact Assessment - a formalized process, including public consultation, in which all relevant environmental consequences of a project are identified and assessed before authorization is given.

Adapted from BBOP, 2009,⁵ Gane, 2009,⁶ US EPA, US ACE 2008⁷

or creating payment programs for biodiversity stewardship activities. For example, a partnership between the non-profit organizations World Wildlife Foundation (WWF) and Fondo Mexicano para la Conservación de la Naturaleza established a Monarch Butterfly Conservation Fund to pay local landowners for butterfly habitat conservation.⁸

And finally, ‘voluntary’ markets have a variety of drivers from ethics and philanthropy to profit and consumption motives. Examples include: certified biodiversity-friendly products, donations for biodiversity conservation or research, positive public relations, eco-tourism and recreation, and others. There are also voluntary activities that resemble compliance-based biodiversity offset schemes, but are conducted either in advance of coming regulations (pre-compliance), and/or for various goodwill and business-case reasons.⁹ And while these market activities may be related to biodiversity, it is not necessarily the case that profits will be reinvested in conserving or restoring the biodiversity on which they depend.

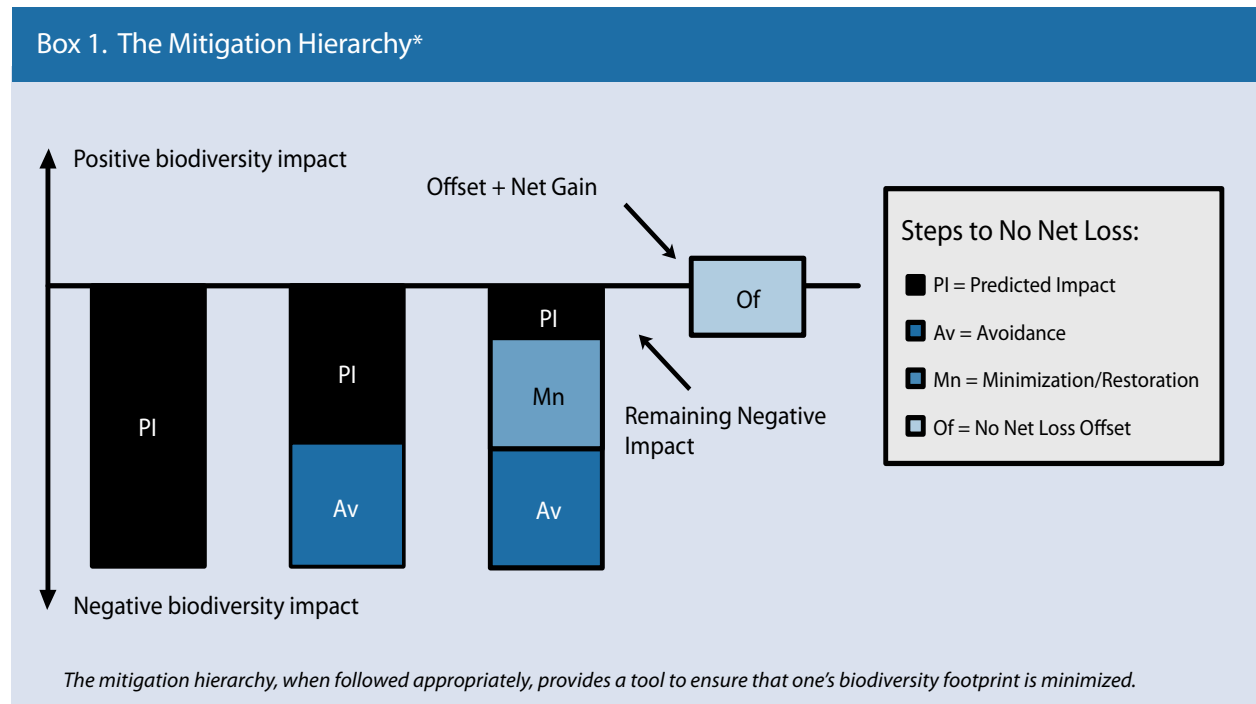
Scope of the Report

While there is a wide range of economic instruments for biodiversity protection, analysis of every type of market-based instrument for biodiversity conservation is beyond the scope of this report. Indeed, a great overview of market-based approaches for biodiversity conservation is the IUCN/Shell report “Building Biodiversity Business.”¹⁰

Instead, this report focuses specifically on programs which are structured around the ‘mitigation hierarchy’ (avoid, minimize and mitigate impacts to biodiversity) (see Box 1). **Compensatory mitigation** is a spectrum of practices that range from rigorous and measurable biodiversity offsets to less direct efforts to compensate for impacts through financial donations and land protection.

The Business and Biodiversity Offsets Programme (BBOP, a sister initiative of Forest Trends) is an international partnership that is developing and trialing best management

Box 1. The Mitigation Hierarchy*



*Adapted with permission from BBOP, 2009.



practices at a portfolio of biodiversity offset pilot sites; disseminating guidelines, methodologies and ultimately standards for biodiversity offsets; and supporting governments in the development of policy on biodiversity offsets. BBOP's definition of biodiversity offsets demonstrates the rigorous end of the spectrum:

“Biodiversity offsets are measurable conservation outcomes resulting from actions designed to compensate for significant residual adverse biodiversity impacts arising from project development after appropriate prevention and mitigation measures have been taken. The goal of biodiversity offsets is to achieve no net loss and preferably a net gain of biodiversity on the ground with respect to species composition, habitat structure and ecosystem function and people’s use and cultural values associated with biodiversity.”¹¹

While the “biodiversity offset” form of compensatory mitigation that attempts to achieve no net loss is preferable from an ecological and social standpoint, less comprehensive forms of impact compensation, in which funds are set aside for biodiversity management or valuable biodiversity is protected elsewhere, can be a first step towards better biodiversity footprint management or even eventually a regulated offset system.¹² Some of the programs reviewed in this report are: biodiversity offsets, mitigation banking, conservation banking, habitat credit trading, fish habitat compensation, BioBanking,

compensation fund programs, conservation certificates, offsets within an Environmental Impact Assessment framework, and many more.

Further information on the fundamentals of biodiversity offsets is available in the work of BBOP, and Ecosystem Marketplace’s (EM) book “Conservation and Biodiversity Banking: A Guide to Setting up and Running Biodiversity Credit Trading Systems.”^{13,14} Also, while the report covers US offset programs, more in-depth background can be found in reports by Environmental Law Institute, Electric Power Research Institute, and the Institute for Water Resources of the US Army Corps of Engineers.^{15,16,17,18} And further reading on environmental impact assessment regulations is available in the report “International Approaches to Compensation for Impacts on Biological Diversity.”¹⁹

Methodology

Information about the 54 international biodiversity offset programs covered in this report was collected from personal communication with over 60 key contacts in states/provinces, countries, or regions of the world; online research; and published articles and reports. A detailed methodology of information collection for US programs is noted in the Methods Appendix. The ‘By the Numbers’

figures in each region represent the total number of programs and metrics for the programs that our research uncovered. Details on ‘By the Numbers’ figures are laid out in the Methods Appendix.

It should be clear that while we’ve striven to make this report as comprehensive as possible in regards to biodiversity offset and compensation activities, we are aware that there may be programs that we have not captured. As well, while we made every attempt to access quantitative figures for each program to give a sense of the scale of the program, many of the offset programs covered either do not track national payment or area figures or could not provide them.

Despite its shortcomings, the report provides the first step towards global transparency of biodiversity compensation programs. We plan

to produce follow-up reports to build on the groundwork established in this report. We hope readers will contribute to future analyses in our attempt to provide much-needed information on existing and developing programs addressing biodiversity loss.

In addition, it should be highlighted that biodiversity offset and compensation programs are tools in addition to, not a replacement for, traditional biodiversity conservation approaches. And it is absolutely critical any compensation activities take place within the framework of a ‘mitigation hierarchy:’ first avoiding any impact to biodiversity, then once unavoidable impacts are determined, impacts should be reduced as much as possible, and then finally, only after impacts have been avoided and minimized should an offset be considered.

Features of Compensatory Mitigation Programs Worldwide			
	Compensation Funds	One-Off Offsets	Mitigation Banking
Driver	Compliance	Compliance or Voluntary	Compliance
Policy Examples	China’s Forest Revegetation Fee; Brazil’s Industrial impact compensation (‘developer’s offsets’)	Offsets under various Environmental Impact Assessment laws	US Compensatory Mitigation (aka wetland mitigation); BioBanking in New South Wales, Australia
Implementation Complexity	Low	Medium	High
Required Market Infrastructure	Low	Low to medium	High
Broad-Scale or Strategic Conservation	Dependent on program design	Less likely	More likely
Ecological Effectiveness	Dependent on design and enforcement	Dependent on design and enforcement	Dependent on design and enforcement
Who supplies the compensation?	Government	The developer	Third-party, government, or the developer
Transparency	Moderately likely	Less likely	More likely

North America



By the numbers	
Number of active programs:	14
Number of programs in development:	5
Total known regional payments per annum:	\$1.5 - \$2.5 billion
Total known land area protected or restored per annum:	> 50,000 hectares
Total known active and sold out banks:	632

General Status Update - North America

Biodiversity offsets and compensation programs are well-developed in North America, particularly with the United States’ wetland and species compensation programs and Canada’s fish habitat compensation program. This region also hosts the most mitigation banks of any region in the world. Programs are driven by national, state, and/or regional policy.

Each of the three traditional compensation instruments are used in North America:

compensation funds, one-off offsets, and mitigation banking. The US mitigation market (wetland, stream, and species) allows all three, although recent regulation favors credit banking. Canada prefers habitat compensation provided by the developer, perhaps because of lessons learned from the early challenges in the US system. And Mexico currently allows offsetting through compensation funds and developer responsible offsetting, but is beginning to explore mitigation banking.

General Status Update - United States

One of the most striking features of US offset programs is the private actor participation in creating and selling offsets. With the basic ingredients of strong regulatory drivers and legal transference of offset liability, the US has created an environment where entrepreneurs can, and do, create and sell environmental services for profit. This system supports a niche industry which combines expertise in environmental restoration, finance, law, real estate, construction, and knowledge of local market conditions, as the programs only allow trading within areas defined by watershed or habitat boundaries.

By the numbers - United States	
Number of active programs:	7
Number of programs in development:	3
Total known regional payments per annum:	\$1.5 - \$2.4 billion
Known credit types:	168
Total known land area protected or restored per annum:	24,000 acres (700,000 acres cumulatively)
Total known active and sold out banks:	615

Wetland and Species Compensation in the US

The US has two major national offset programs, one directed at wetland and stream ecosystems and the other at endangered species. The US has a long history with offset programs, with wetland mitigation starting in the early 1970s and more sophisticated mitigation credit banking systems emerging in the 1980s and 1990s. Since its emergence in California, endangered species credit banking has become known as conservation banking. Both programs have the greatest amount of wetland or conservation banks in the world. The US is perhaps the most market-like offset program in the world, featuring price signals that indicate to the developers the scarcity of the resource, third-party investment and involvement in offset creation, as well as units of credit standardized enough to allow trading. Despite the advanced level of the US programs, there remains little transparency and accessing information is time consuming and costly.

The US also has considerable institutional infrastructure for biodiversity offsets: strong policy drivers, enforcement, detailed regulations (for compensatory mitigation), industry association (the National Mitigation Banking Association), and an annual conference – the National Mitigation and Ecosystem Banking Conference – and non-profit and academic analyses of the system. Although US wetland and species compensation is driven by federal policy, implementation occurs at a regional level in 38 ‘Districts’ of the US Army Corps of Engineers (for wetland mitigation), in seven regional offices and fifteen field offices of the US Fish and Wildlife Service (US FWS), and the National Marine Fisheries Service (NMFS). One can see a range of differences in the regional interpretation of national regulations. Characteristics that vary across regions include the level of supply from private parties versus

US Terminology

Conservation Bank – the US term for a parcel of land approved by regulators to sell mitigation credits for endangered, threatened or other imperiled species or habitat

In-Lieu Fee (ILF) – a permittee pays a fee into a compensation fund program in lieu of creating their own offset or buying a credit. ILFs are run by government or non-profit organizations which use the funds to undertake offset activities.

Mitigation Banking – a term used colloquially in the US to refer to wetland and stream mitigation banking; in the global setting the term includes the banking of any environmental credit including species, habitat, ecological function or other.

Permittee – the entity (e.g., developer) requesting a permit to impact a wetland, stream, or endangered species.

Permittee-Responsible Mitigation – offset activities that are created by the permittee (e.g., ‘do it yourself’)

Umbrella Bank – a banking instrument sponsored by a single entity to establish and operate a regional banking program with multiple sites.

in-lieu fee programs, methods of measuring impacts and offsets (e.g., area-based with ratios versus functional assessments), and level of enforcement.

Another signature of the US system is the preservation and long-term management of offsets. Offsets must be preserved ‘in perpetuity’ via a conservation easement agreement, which basically restricts the use of land for conservation purposes on the title that is legally tied to the piece of property. In addition, offsets are required to have funding set aside for long-term management.

Other Biodiversity Offsets or Compensation Programs in the US

While wetland and stream mitigation and conservation banking dominate the offset world in the US, there are also several smaller biodiversity offset programs, including: a national Recovery Credit System, Maryland’s

US Programs Not Covered in This Report

Natural Resource Damage Law Compensation is not covered because compensation occurs after an illegal impact on the environment, which is a philosophically different perspective than a system that uses offsets to comply with the law and careful consideration of alternatives (e.g., avoidance and minimization). As well, compensation required under this law is not specific to an ecosystem or species, but to a general environmental injury.

'**Grass banking**,' which provides ranchers with alternative grazing land while they perform restoration, is closer in character to a government-mediated program because it does not include an aspect of measuring an impact and 'making good' by offsetting it.¹

The '**South Carolina Conservation Bank**' is essentially a conservation acquisition program financed by a portion of a deed recording fee.¹

i Tynan, personal communication, 2009

Forest Conservation Law, North Carolina's buffer mitigation program, a voluntary 'Acres for America' program run by the retail giant Walmart, and a Bureau of Land Management Offsite Mitigation Policy. Additionally, a new voluntary Habitat Credit Trading (HCT) system is being developed by the US FWS that would work similar to conservation banking system. Finally, two multi-credit watershed-scale markets are developing in the Northwest (Willamette Partnership) and the Chesapeake Bay on the East coast (Bay Bank) that will incorporate species or habitat in their credit accounting. See more on these programs below.

United States - Wetland and Stream Mitigation: Context

In a nutshell, compensatory mitigation in the US is a national wetland and stream offsets program (called 'compensatory mitigation') driven by compliance to the Clean Water Act (§404) and the principle of 'no net loss.' After following the mitigation hierarchy, applicants filing for permits to drain, fill, or dredge a

wetland (or stream) may offset their impact. Permittees may create their own offsets (called permittee-responsible mitigation), or pay for offsets via third-party mitigation banks or ILF programs. The agency in charge of oversight is the US Army Corps of Engineers (US ACE), who interprets and implements regulations at the regional level (38 'Districts').

Wetland and stream offsets in the US are created via: restoration, enhancement, creation, and preservation;² indirect offsets (e.g., payments to fund research) are not allowed. Offsets must be located within the same watershed ('service area') as the impact, usually designated by US Geological Survey Hydrologic Unit Codes (i.e., HUC 0166900 indicates the Lower Rappahannock watershed in northern Virginia).

Previous guidance on compensatory mitigation created differing drivers and standards for the three categories of offset supply (permittee-responsible, mitigation bank, ILF). New regulations ('new rules') that came into effect in June of 2008 have a watershed focus and give a preference to larger, landscape-scale offsets created before the impact (versus previous guidance favoring on-site restoration).³ The new rules give a stated preference hierarchy of offsets from mitigation banks (first preference) or

The 'New Rules' – The 1-Minute Run-Down*	
WHAT'S IN	WHAT'S OUT
Regulations	Guidance
Mitigation banks & newly certified in-lieu fee programs	Permittee-responsible mitigation (it's down, but not completely out)
Watershed-scale	Practicing random acts of mitigation
Playing-field more level among suppliers of mitigation	Easy approval of ILF/ permittee-responsible mitigation
Streamlined approval process	Ad-hoc approval process

*Adapted with permission from EBX, 2008.⁴

ILF programs (second) as opposed to permittee-responsible offsets (third). The new rules also provide equivalent standards for all categories of supply credits. Now, anyone creating credits – be it a developer, non-profit, government, or for-profit organization – will have to create most of their credits before they can sell them and will have long-term funding requirements. The new rules have the promise to shake things up in compensatory mitigation, but it may be a bit too soon to tell.

Methodology for US Wetland and Stream Mitigation Data

Three types of data were collected for this section of the report:

1. National-level data on area and type of wetland and stream mitigation, which was collected via a Freedom of Information Act (FOIA) request;⁵
2. Data on mitigation bankingⁱⁱ collected by Ecosystem Marketplace; and
3. Credit price data, which is based on our dataset of 140 price points or ranges, including 33 prices provided anonymously by mitigation bankers.

For more information on data collection methods, see Methods Appendix.

Offset Creation and the Buyer

The buyer of an offset under this program is anyone impacting a stream or wetland. The most common buyers are government transportation agencies, residential and commercial developers (which account for about a third of demand), the Department of Defense, extractive industries, and utilities.⁶

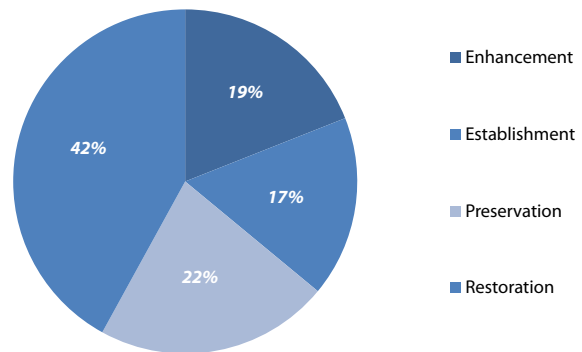
National regulations give a preference for restoration and enhancement to reflect the

ⁱ All aggregate bank information presented in this section represents active and sold-out banks unless otherwise noted.

inherent ecological uncertainty of wetland creation and the ‘no net loss’ policy. This preference should be evidenced by fewer credits for creation and preservation, but data from the US ACE below show a large portion of credits being created by these methods.

While there is this general guidance in national regulations, there is no standard method dictated for determining impact and offset requirements nationwide. Consequently, differing methods have been adopted in different US ACE Districts across the US. Methods range from acre-based, acre-based with ratios, to functionally-based methods.⁷ Thus, a credit may represent acres of restoration in one District and wetland functions in another.

National Breakdown of Method of Credit Creation (2008)

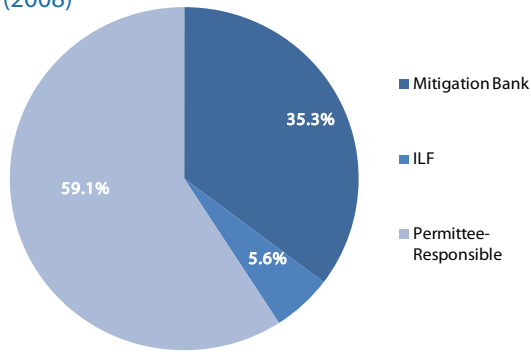


Note: This reflects the breakdown of credits created in permittee-responsible mitigation. ‘Restoration’ refers to both re-establishment and rehabilitation.
Data Source: US ACE FOIA request for 2008⁸

The Sellers

Because the US system allows third-party development of offsets, wetland mitigation has a wealth of participants involved in creating offsets, including environmental consultants, engineers, and lawyers hired by permittees; private mitigation bankers; non-profit organizations and government agencies running mitigation banks for commercial or their own use; and government and non-profit organizations collecting funds and providing

National Breakdown of Suppliers of Credits (2008)



Data Source: US ACE FOIA request for 2008⁹

mitigation. The US divides suppliers into the following categories: mitigation banks, in-lieu fee programs (ILFs), and permittee-responsible mitigation. The divisions are important, because past rules had steered mitigation towards on-site permittee-responsible mitigation and had given more stringent standards to mitigation banks than to ILFs. This resulted in a majority of offsets being created by permittees and the momentum of this trend continues today, with close to 60% of mitigation still coming from permittees. There has been a slight increase in credits from mitigation banks (35.3%, up from 31.4%ⁱⁱ in 2005), and a slight decrease in credits from ILFs (5.6%, down from 8.4%ⁱⁱⁱ in 2005).¹⁰

The Sellers-In-Lieu Fee Programs (ILF)

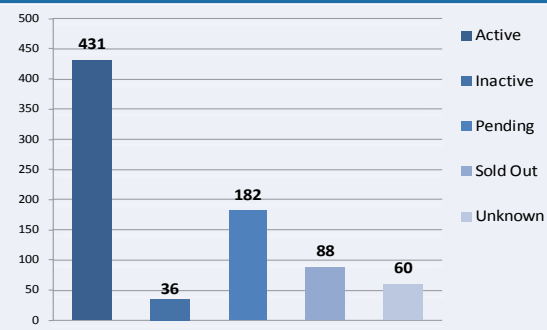
An ILF is set up to consolidate multiple offsets by a government or non-profit organization that can collect fees and use the fees to provide the offset. ILFs require authorization from the US ACE that documents legal, financial, and long-term management details of this type of offset program.¹¹ The new rules also stipulate that most credits be created in advance of credit sales, although rules are somewhat more relaxed for ILFs to allow entities like non-profits to get around the initial hurdle of upfront costs. The Environmental Law Institute (ELI) has conducted the only studies tracking ILF programs in the US and has found 42 approved,

active programs in 2005 (as reported by USACE Districts).¹² Evidence collected by a Government Accountability Office analysis in 2001 indicated that the fees collected by ILFs were not always used to fund on-the-ground offsets in a timely manner, which was one of the main arguments used to raise the standards of ILFs in the 'new rules.'^{13,14}

The Sellers-Mitigation Banks

Wetland mitigation banks have been providing offsets in the US since the early 1980s. Our data collection effort resulted in a database of 797 banks.^{iv} Banks fall into the following status categories: active, inactive,^v sold out, pending, and unknown (see graphic).

Status of US Wetland and Stream Mitigation Banks (2009)



Data Source: Ecosystem Marketplace wetland mitigation database.¹⁵

Wetland and stream banking in the US grew substantially in the mid-1990s, by which time official Federal Banking Guidance had been released (in 1995) and disputes between federal agencies over interpretation of wetland mitigation guidance had been resolved. These events gave mitigation bankers a degree of consistency and confidence for investing and

ii Information in ELI's 2005 report was collected by a different means. Their data represents estimates reported by US ACE Districts.

iii See note above.

iv This report includes individual banks and umbrella banks. Individual bank sites within an umbrella bank were not considered to ensure that there was no double-counting. For more information on methods for wetland mitigation bank data collection, see Methods Appendix.

v "Inactive" includes the following categorizations that we collected from the USA ACE: inactive (21), suspended (7), terminated (1), or failed (1).

creating mitigation banks.¹⁶ The growth of banking in recent years is less clear, as US ACE Districts were unable to verify or update about 40% of our dataset.

The Credit

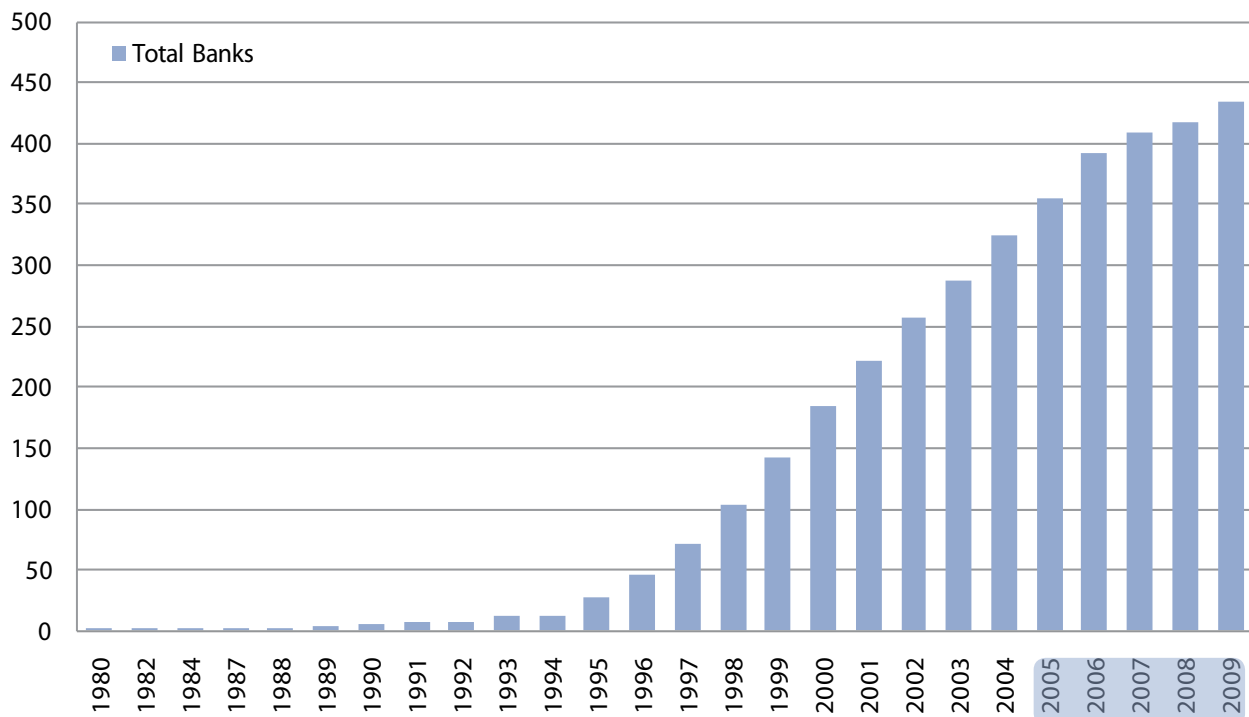
At the most basic level, the types of ecosystems covered in the US wetland mitigation program are wetlands and streams. Each District decides which wetland classification system to use to determine more specific ecosystem types. One of the most common classification systems, Cowardin et al.,¹⁷ identifies the following major types: palustrine (non-tidal wetlands), estuarine, riverine, marine, and lacustrine (lakes). These classifications are further subdivided by the types of species found – non-vegetated, emergent, scrub/shrub, forested, aquatic beds, etc.

We identified twenty-six types of credits in

our research, including the following sample: wetland, stream, tidal wetland, palustrine forested wetland, bottomland hardwoods, riparian willow scrub, riparian buffer, and eelgrass. Some credits are classified by the type of method used to create them: restoration, rehabilitation, creation, preservation.

Credit calculation methods, which are used to measure and quantify credits, are also decided at the regional level. ELI reported that a majority of bank credits are based on: acreage, a functional assessment method, a combination of acreage and functional assessment, or some measure of functionality combined with best professional judgment.¹⁸ The differentiation in methods creates a situation where it is impossible to compare “credits” regionally because there is no standard unit. We know of no effort to provide equivalency calculations that would enable comparison of standardized units nationally.

Rate of Wetland and Stream Mitigation Bank Establishment



Note: Graph represents active and sold-out banks with known date of establishment (there are an additional 77 active and sold-out banks without dates). Shaded data is more uncertain because the most recent information available for about 40% of our dataset was from 2005.¹⁹
 Data Source: Ecosystem Marketplace wetland mitigation database.²⁰

Area of Wetland and Stream Mitigation per Annum (2008)

Total area of wetland loss:	18,800 acres
Total area of compensatory wetland mitigation:	24,178 acres
Total linear distance of stream mitigation:	312 miles

Data Source: US ACE FOIA, 2008;²¹ Soderberg, personal communication, 2009.

Total Payment for Wetland and Stream Mitigation per Annum (2008)

Wetlands:	\$1.1 - \$1.8 billion
Streams:	\$240 - \$430 million
TOTAL:	\$1.3 - \$2.2 billion

Data Source: Ecosystem Marketplace wetland mitigation database.²²

Wetland and Stream Credit Pricing

WETLANDS (per credit)

National Range: \$3,000 - \$653,000

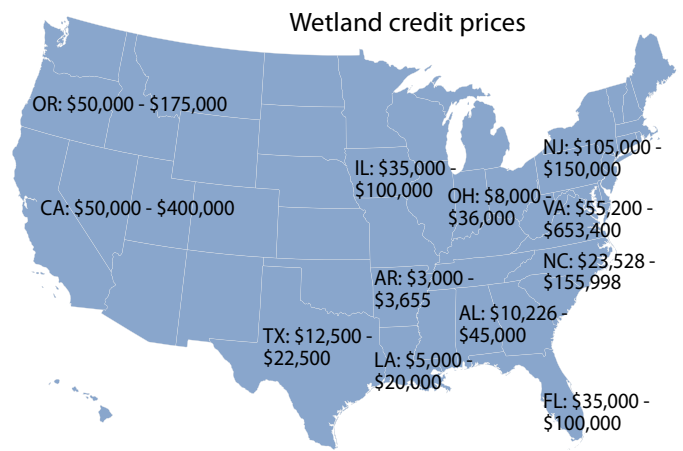
Average: \$74,535*

*Note: If tidal or vernal pool credit prices were included, the average would be \$112,449.

STREAMS (per credit)

National Range: \$15 - \$700

Average: \$260



Wetland and Stream Mitigation Banks

Active banks: 431

Sold-out banks: 88

Pending banks: 182

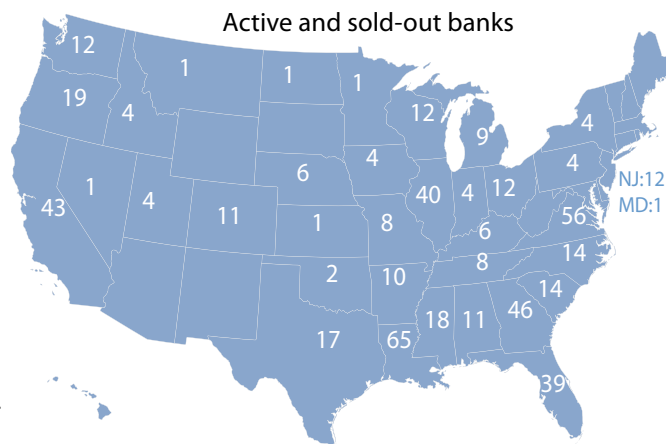
ILF programs: 42

Total known cumulative area of active and sold out banks: 166,051 acres*

Median bank size: 174 acres

Known credit types: 25

*Note: Represents acreage data that we have for 233 banks (of a total of 519 active and sold-out banks).



Data Source: Ecosystem Marketplace wetland mitigation database,²³ ELI, 2005²⁴ (for number of ILF programs)

Scale of the Program

We gained national-level information on compensatory mitigation from a formal Freedom of Information Act (FOIA) Request to the US ACE to find area of wetland loss and area of compensatory mitigation (see table above). Wetland credit prices range from \$3,000 in Arkansas to \$653,000 in Virginia. As noted above, credits in different regions of the US use different metrics - acres, fractions of an acre, or ecosystem function - to calculate credits. Therefore, the price of a credit in one region cannot be compared 'apples to apples' to a credit price in another region. Nevertheless, we present the results of our pricing data collection as 'per credit.' The high end of credit prices in our dataset was predominantly for credits in tidal wetlands. The average price of non-tidal credits is \$74,535. We estimate the total yearly dollar volume to be \$1.3 - \$2.2 billion. Of this total, wetlands account for \$1.1 - \$1.8 billion and streams account for \$240 - \$430 million.

Regional Variations

As seen in the maps and tables on the previous page, the West, Southeast, and Chicago area have the most wetland mitigation banks. Six states have more than 20 banks: CA, FL, GA, IL, LA, and VA. All of these states were 'early adopters' of compensatory mitigation, with at least one bank in 1995. Other interesting characteristics these states have in common are:

- High percentage of coastal area (with the exception of IL),
- States with rapid development²⁵ (with the exception of IL and LA), and
- A less-than-average amount of mitigation coming from ILFs (with the exception of CA).²⁶

Developments

The 'new rules' were supposed to have given a clear advantage to mitigation banks, but 2008 data is not showing this trend yet. As well, a national survey of mitigation bankers recently showed that local offices of the Army Corps of Engineers were unevenly enforcing the 'new rules.'²⁷ For a breakdown of how offsets are being supplied by mitigation banks vs. ILFs vs. permittee-responsible mitigation in each US ACE District, see Methods Appendix. Bankers are prepared to apply pressure to ensure that the US ACE implements the new rules and applies them consistently across the US.²⁸

The downturn in the economy may have put a damper on compensatory mitigation needs, as development and therefore impacts on wetlands slowed.

Transparency of banking may get a boost from a renewed effort to spread the use of the US ACE's RIBITS online bank-tracking portal to more Districts, although the development and adoption of RIBITS has been long in the making. Finally, ELI and the US Environmental Protection Agency are designing a study that will shed light on the ecological performance of mitigation banks.



United States - Conservation Banking (Species)

Impacts to US threatened, endangered, or other imperiled species are regulated by the national Endangered Species Act (ESA) of 1973. Like US wetland and stream mitigation, any impact to endangered species must be permitted and approved by the US FWS or NMFS, and must follow the mitigation hierarchy after which permittees may offset their residual impacts by either developing their own offset, paying into an in-lieu fee fund, or buying a credit from a conservation bank.

Of the three options for offsetting impacts, only conservation banking is tracked at a national scale, so this section covers conservation banking only. While there may be activity within a broader species offset context in the US, we are only able to report on this part of the market.

Conservation banking was modeled after the US wetland mitigation banking system, so there are many similarities between the two programs. However, unlike the wetland mitigation system, species offsets do not have a stated 'no net loss' principle, but rather a species recovery goal.

Like wetland mitigation, conservation banking is regulated by federal agencies – the US FWS and NMFS. Additionally, the California Department of Fish and Game (CA DFG) regulates conservation banking of species listed as threatened or endangered in California. Conservation banking is primarily prominent in California, with more and more activity happening in the US Northwest and Southeast. There are not yet official regulations for conservation banking like wetland and stream mitigation, but agency guidance was created in 2003 to allow public and private conservation banks or in-lieu fee programs.²⁹

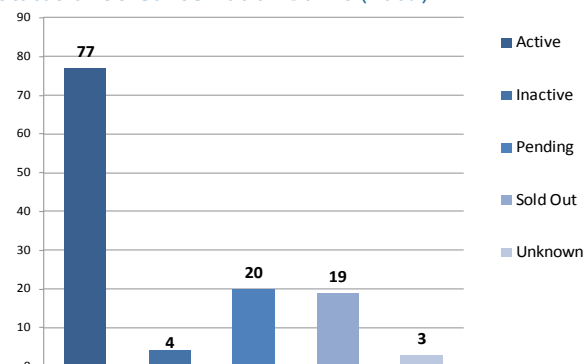
Methodology for Conservation Banking

Data for this section of the report was collected from: Ecosystem Marketplace's www.SpeciesBanking.com project, and our credit price dataset of 51 price points or ranges, including 35 prices provided anonymously by mitigation bankers. National-level data on area of conservation banks or total area of offsets under the ESA is not available from the US FWS (but this information is expected to be available from the US FWS by the end of 2010). For more information on data collection methods, see the Methods Appendix.

Offset Creation and the Buyer

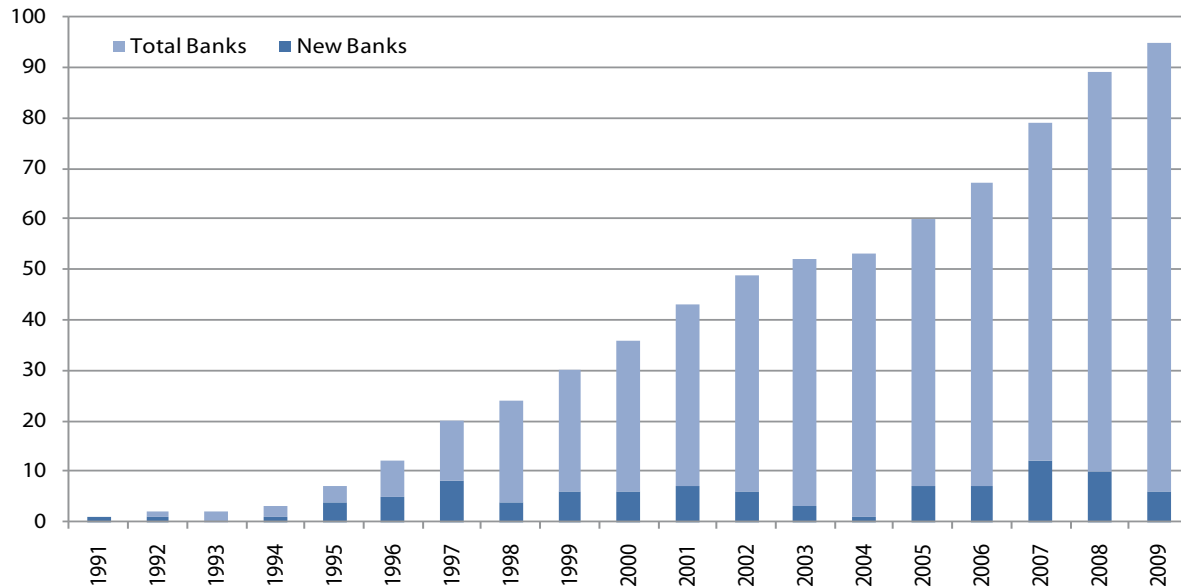
Developers or others with projects that may impact a threatened or endangered species require an authorization (called 'incidental take') under section 7 or 10 of the ESA through consultation with the regulating agency – US FWS or NMFS, depending on which agency has jurisdiction for the species likely to be impacted. If the regulating agency determines the impact can be offset at a conservation bank, the agency then determines the number of credits needed to offset the impact should the permittee choose to offset the impact at a bank. The 'buyers' of species offsets are the same as buyers of wetlands offsets: organizations developing infrastructure projects like roads and bridges, residential and commercial developers, the Department of Defense, extractive industries, and utilities.

Status of US Conservation Banks (2009)



Note: includes one active bank in Saipan
Data Source: SpeciesBanking.com³⁰

Rate of Conservation Bank Establishment



Note: Graph represents active and sold-out banks. Note: From 1991-2001, all but one bank were located in California.
Data Source: SpeciesBanking.com³¹

Species offsets are primarily created through preservation and management of habitat. The US system of conservation banking is based on the idea that if you conserve large enough tracts of high quality habitat, provide habitat connectivity to other preserved sites, and manage the land to support species recovery, the species will persevere and thrive despite a net loss of habitat.³² All conservation bank offsets are created in advance of impacts. Like compensatory mitigation, offsets in the conservation banking system must be permanently protected and include a non-wasting endowment fund for management activities to maintain the species.

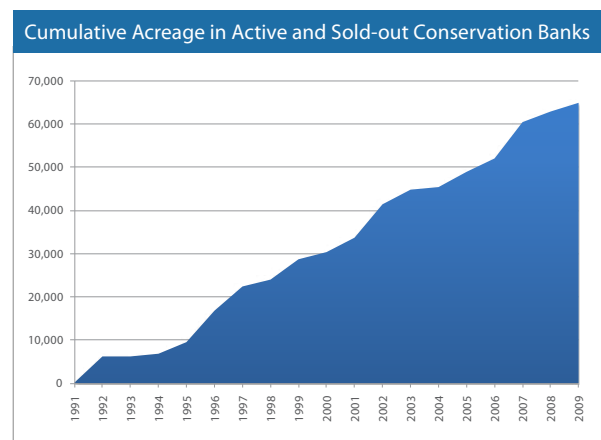
The Sellers

Our research indicates that there are currently 123 total conservation banks^{viii} in the US, 96 of which are active or sold out. There has been a fairly steady growth of conservation banks from the early 1990s to the present.

The Credit

ii Note: This report only considers 'conservation banks' with permanent protection.

The unit of credit is most often an acre of habitat. Occasionally, due to specifics of an organism's ecology the unit may be a breeding pair or combination of habitat and the actual species, or in the case of aquatic species, the unit may be a liner foot of riparian habitat.³³ US FWS guidance does not provide individualized guidance on credit calculation for impacts or credit creation for every endangered species. The first conservation bank to offer credits for a species generally sets a precedent for future banks. When a recovery plan exists for a species (which is true for about 86% of endangered



Data Source: SpeciesBanking.com³⁴

species³⁵), some scientific information may point to how much area would be sufficient to support a species, but the banker has to come to an agreement with the federal or state regulator. There are theoretically over 1,000 methods of credit calculations – one for each threatened or endangered species.

Our research has found 92 species credit types and 51 habitat credit types. Some of the most common credits are: Burke’s goldfield, California red-legged frog, California tiger salamander, Coastal California gnatcatcher, coastal sage scrub, Giant garter snake, San Joaquin kit fox,

Sebastopol meadowfoam, Sonoma sunshine, Swainson’s hawk, Valley elderberry longhorn beetle, Vernal pool fairy shrimp, Vernal pool habitat, Vernal pool tadpole shrimp, Western burrowing owl.

Impacts must be located within the conservation bank ‘service area,’ an area approved by the regulating agency at the time the bank is approved, unless otherwise approved by the agency. Service areas are usually defined by recovery plan units for threatened or endangered species, watersheds, or other criteria based on the conservation needs of the species.

Total Payments for Conservation Banking per Annum (2009)

TOTAL	\$200 Million
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Note: Figure is only for conservation banking, and not for species compensation through in-lieu fee funds or permittee-responsible mitigation.
Data Source: SpeciesBanking.com³⁶

Conservation Banking Credit Pricing

ACREAGE-BASED CREDIT	Species	Credit Price Range	State
National Range: \$2,500 - \$300,000 Median: \$15,000 Average: \$31,683* *Note: If vernal pool and unit-based credit prices were included, the average would be \$33,027	Black-capped vireo	\$5,000-\$5,500	TX
	Bone Cave Harvestman and Coffin Cave Mold Beetle (per acre in 'moderate impact zone')	\$10,000	TX
	Bone Cave Harvestman and Coffin Cave Mold Beetle (fixed price in 'irrevocable impact zone')	\$400,000	TX
	Burrowing owl	\$5,000-\$15,000	CA
	California red legged frog	\$15,000-\$90,000	CA
	California tiger salamander	\$4,500-\$15,000	CA
	Chaparral	\$8,000-\$15,000	CA
	Coastal sage**	\$15,000-\$25,000	CA
	Delhi sands flower-loving fly	\$100,000-\$150,000	CA
	Delta smelt/native fisheries	\$100,000-\$150,000	CA
	Fairy shrimp	\$150,000-\$300,000	CA
	Giant garter snake	\$30,000 - \$45,000	CA
	Golden-cheeked warbler	\$2,750-\$7,000	TX
	Gopher tortoise (relocation)	\$1,500 - \$3,000	SE US
	Gopher tortoise	\$12,000 - \$20,000	SE US
	Least vireo breeding pair	\$125,000	CA
	Salmonids	\$80,000-\$120,000	CA
	Sandhills habitat	\$326,700	CA
	San Joaquin kit fox	\$2,500-\$15,000	CA
	Swainson's hawk	\$5,000-\$25,000	CA
Utah prairie dog	\$1,836	UT	
Valley elderberry longhorn beetle	\$3,500	CA	
Vernal pool (preservation)	\$50,000-\$325,000	CA	

* Prices are approximate and based on both anonymous and public sources. Prices range widely due to local land value, credit scarcity and demand.
** Non-occupied by the California coastal gnatcatcher.

Conservation Banks

Active banks: 77

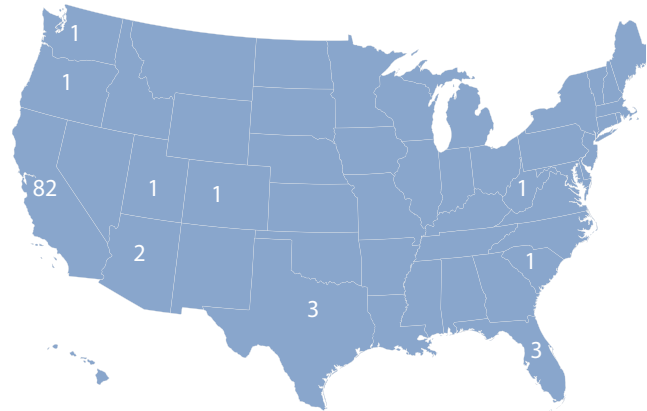
Sold-out banks: 19

Pending banks: 20

Total known cumulative area of active and sold-out banks: 65,078 acres (101,158 acres* total)

Median bank size: 333 acres

Known credit types: 143



Data Source: SpeciesBanking.com³⁷

*Note: Represents acreage data for all but 4 conservation banks.

Scale of the Program

A recent US Government Accountability Office review of endangered species permits³⁸ (Section 7 on consultations) noted that the US FWS does not have a systematic method to track permitted impacts (or 'take') of most endangered species. Thus, we cannot address the total area of impact to endangered or threatened species in the US. At the same time, there is not yet centralized tracking of conservation banks by the US FWS, although they have begun to explore the use of a tracking system similar to that of the US Army Corps of Engineers. California's Department of Fish and Game is required to report on conservation banks every two years, but this report does not include the amount of offsets that have occurred. Our research indicates that there has been a cumulative total of about 65,078 acres conserved in active and sold out conservation banks (or 101,158 acres in banks of all types of status). Habitat protection has grown fairly steadily since 1997.

Pricing and volume of conservation banking is difficult to aggregate because there are many types of credits and credit prices vary both within species and across different species. For example, California red-legged frog credits

ranged from \$15,000 - \$90,000. This is likely due to regional differences in land values and credit demand. Credit prices of all types of species and habitat that we collected ranged from \$1,836 for Utah prairie dog habitat to \$400,000 for impact to Bone Cave Harvestman and Coffin Cave Mold Beetle in an 'irrevocable impact zone' (see table).

Despite the wide price ranges, we have estimated a rough figure for the total yearly dollar volume of the conservation banking market at \$200 million. This figure *only* represents estimated annual sales of credits through conservation banks. Using a different methodology, ELI's 2007 study of spending on habitat conservation under the ESA estimated an annual dollar volume of \$370.3 million, a figure that includes mitigation from conservation banks as well as in-lieu fee programs and permittee-responsible mitigation.³⁹

A sample of 20 banks in Northern California shows a steady increase in sales (number of transactions) from 2005 to 2008 at which point they dropped by nearly 20% in 2009. The volume of credits sold per year also grew robustly (over 100%) from 2005 to 2007, but growth had nearly leveled off by 2009. This stagnation in volume is likely due to the collapse of the housing bubble

and the global financial crisis that began in 2007. Of course, this sample is geographically isolated and shaped by regional trends like market saturation and local economics, but anecdotal evidence supports that these trends are common throughout the country.

Regional Variations

As seen in the map above, California has the overwhelming majority of conservation banks, with a bit of activity in the Northwest, Texas, and the Southeast. Prior to 2002, all but one conservation bank was located in California. We also know of additional banks pending approval in the following states: California (14), Florida (2), Oregon (2), Mississippi (1), and Washington (1). The reason for California's dominance is a strong state law and high number of California-listed species. California was an early adopter of conservation banking, and both state and federal regulators are knowledgeable about conservation banking as a tool for use in permitting. Finally, California has a lot of species listed as endangered or threatened; there are 309 federally-listed species and 61ⁱⁱⁱ state-listed species.⁴⁰ The other states with the nation's

ⁱⁱⁱ This figure excludes species that are both state-listed and federally-listed.

highest amount of listed species are: Hawaii (330), Alabama (117), Florida (115), Texas (94), Tennessee (90), Virginia (65), and North Carolina (64).⁴¹ The number of species alone does not predict conservation banking, however, as other factors come into play, for example: high growth in the state, listed species are present on private land (e.g., Hawaii's endangered species may reside in areas not likely to be developed), and – as already mentioned – regulator comfort with conservation banking.

Developments

Conservation banking may see more growth as use of the tool expands in Oregon and Washington. Conservation banking may also soon be expanding in the East. Two of the major California conservation bankers, Wildlands and Westervelt, have offices in the Southeast. Florida is also a state to watch, as an FWS official noted in a May 2009 presentation that nine banks were in early stages of review. As of January 2010, two of these nine banks had been approved.

On a national scale, there are developments towards more acceptance of conservation banking nationwide. Within the US FWS,

Transparency and Registries

While the US may boast a large estimated volume of sales of wetland and conservation bank credits, figuring out the *exact* volume is not possible at the present time. The US has no centralized source of information on the number and location of wetland and species bank credits (issued or available), credit ownership, or the number of transactions. Although regulators are moving in this direction, the market currently lacks key information, leading to the following **transparency challenges**:

- 1) Difficulty in analyzing, reporting, or simply accessing and providing information on credits;
- 2) Potential of double-selling credits; and
- 3) Market credibility and investments seen as high risk.

As the carbon market evolved, registries were created to track each ton of carbon with unique serial numbers. Registries were a critical infrastructure milestone in the development of the carbon market, and they could play a part in the development of biodiversity markets as well. Ecosystem Marketplace's project SpeciesBanking.com initiative is teaming up with registry provider Markit to develop a **pilot registry for conservation bank credits** in the Sacramento, California region. Markit is working with the US Fish and Wildlife Sacramento field office and local mitigation bankers to create a registry and upload bank and credit data. Over the next year, bankers and regulators will be able to test the tools for new efficiencies in tracking and reporting.



Michael Bean, a leader in conservation incentives, accepted a counselor position with the Assistant Secretary's office where he will advise on endangered species policy.⁴² Additionally, conservation bank coordinators have been informally identified in each of the US FWS regional offices.^{iv} The National Mitigation Banking Association recently published a white paper with recommendations for implementing conservation banking and promoted these recommendations to top US FWS officials in October of 2009.⁴³

Finally, there was some wrangling over changes to the ESA between the last presidential administration and the present one.^{44,45} Because the new administration issued an Executive Order to reverse the changes, conservation banking has not felt a change. There is, however, a requirement that the ESA go through a formal rule-making process, and there is some discussion of expanding a provision in Section 7 to make mitigation a *requirement* rather than a potential requirement as it currently stands.^v

iv White, personal communication, 2009
v Ibid.

US – Other Offset Programs

Recovery Credit System and Habitat Credit Trading System

The recovery credit system gives federal government agencies the flexibility to offset temporary impacts for threatened and endangered species found on federal lands by undertaking short-term or permanent conservation actions on non-federal lands. The goal is to keep species from becoming endangered or threatened by partnering with private landowners to manage and protect species for a specified timeframe. The program is similar in concept to the conservation banking program, but it temporarily offsets temporary impacts and is only an option for federal agencies. Guidance for the program was published in July 2008. There has been one pilot project in Texas at the US Department of Defense site Fort Hood to protect the golden-cheeked warbler and the black-capped vireo. About 1,400 acres were enrolled in the pilot program in 2007.⁴⁶ Critics say the program lacks the accountability of the conservation banking system because the program does not reveal information about the projects because of the concern of privacy of the private landowner partners.^{47,48,49}

Habitat credit trading (HCT) is an umbrella term for all market-based conservation programs approved by the US FWS. HCT guidance, now in development, will describe standards for all new voluntary credit trading programs developed by stakeholder groups for management, restoration, and preservation activities for imperiled species and habitat. While conservation banking or recovery crediting are applicable for most species and habitat types, the US FWS recognizes that new, innovative market-based approaches may have conservation value, particularly for use with species that are not federally listed as threatened or endangered, but are otherwise imperiled. Voluntary HCT programs for these

species and their habitat may preclude future regulatory obligations. There is one pilot project in the Southeast for gopher tortoises spearheaded by the American Family Forest Foundation and the Longleaf Alliance.⁵⁰

Multi-Credit Watershed Markets: Willamette Partnership, Bay Bank

Two multi-credit watershed-scale markets are developing in the US. The Willamette Partnership is leading the development of a multi-credit ecosystem marketplace (‘Marketplace for Nature’) in the Willamette watershed in Oregon. The project was originally initiated to address water temperature issues, but grew with the ideal to apply a more holistic, multi-credit approach to strategic investment in environmental restoration in the watershed. The Partnership’s ‘Counting on the Environment’ initiative intends to develop a function-based accounting system for multiple credits, with buy-in from the multiple regulators who oversee the trading of those credits. The initiative achieved a major milestone, gaining consensus from stakeholders for a ‘General Crediting Protocol’ which creates a single process for creating four credit types: salmonid habitat, upland prairie habitat, wetland, and water quality/temperature. The initiative has not yet had an official ‘trade’ but is currently enrolling participants to take part in a test-market during a two-year pilot.^{51,52,53}

In the Northeast/Mid-Atlantic region, a program called the Bay Bank (www.thebaybank.org) is being developed to serve as a centralized multi-credit marketplace for the six-state Chesapeake Bay watershed. Bay Bank emphasizes the development of the supply-side of the market, particularly focusing on issues of market access for small landowners. The program builds on existing regulatory- and voluntary-driven markets for carbon sequestration, water quality protection, forest conservation, habitat conservation, and traditional conservation



programs. The habitat aspect of the program credits actions that implement State Wildlife Action Plans, with an initial focus on eastern brook trout, early-successional wetlands present in the range of bog turtle, and ancient sand ridge forests. Bay Bank has partnered with the Willamette Partnership in the crediting initiative mentioned above. The program will test their infrastructure, including an online LandServer tool that identifies market-based opportunities for landowners, via several conservation projects in the spring of 2010.^{54, vi}

Bureau of Land Management Offsite Mitigation Policy and TNC ‘Development by Design’

In September of 2008, the US Bureau of Land Management (BLM) issued an instructional memorandum broadening the scope of offsite mitigation in conjunction with BLM oil, gas, geothermal, and energy rights-of-way authorizations. The BLM is an agency that oversees the mineral rights on over 700 million acres of public land, and requires mitigation ‘to an

.....
vi Sprague, personal communication, 2009

acceptable level' that lasts as long as the impact. While the BLM still has a preference to mitigate on-site through avoidance, minimization, remediation, or reduction of impacts over time, off-site mitigation may be allowed on a case-by-case basis.⁵⁵ Off-site mitigation may be appropriate in mitigating impacts from larger developments, like oil and gas fields, roads, pipelines, transmission lines, mining, wind or solar energy development projects, etc.

To support effective implementation of BLM's offsite mitigation policy, the Nature Conservancy (TNC) is working with partners to apply its 'Development by Design' framework at several project sites in the western US. Development by Design is a science-based approach that blends conservation planning with the mitigation hierarchy to address the key challenges of: (a) determining when project impacts should be avoided, and when offsets are appropriate; (b) identifying offsets that deliver ecological equivalence, contribute to landscape-level conservation goals, and are located at an acceptable proximity from the impact site; (c) assessing which offsets can deliver the highest conservation value at the lowest cost and risk; and (d) evaluating the extent to which offsets compensate for project impacts. 'Development by Design' was first applied to guide disbursement of mitigation funds in the Jonah Natural Gas Field in Wyoming. In this area, the BLM approved the development of additional wells in 2006 with the stipulation that the permittee had to set aside an off-site mitigation fund of \$24.5 million.^{56,57} Follow-on pilots in the US West are incorporating the framework earlier in development planning to support proactive thinking about how to avoid siting conflicts with conservation priorities, maintain biodiversity, and determine suitable mitigation responses, including offsets.

State of Maryland Forest Conservation Act

The State of Maryland's Forest Conservation Plan establishes a threshold on forest land and requires either retention on-site, afforestation on-site, afforestation off-site, or a payment to a county compensation fund when development impacts forests. Conserved or afforested areas are permanently conserved in a conservation easement. Off-site forest mitigation banking is authorized in five counties. The law is compliance-driven and comes into play during the development review process.⁵⁸

State of North Carolina's Buffer Mitigation Program

Along with meeting federal regulations on wetlands and streams, developments in specific watersheds in North Carolina impacting riparian buffers must meet mitigation requirements under the state's Riparian Buffer Protection Rule.⁵⁹ Credit banking is allowed under the program.

Wal-Mart's 'Acres for America' Program

The retail giant Wal-Mart voluntarily introduced a program to permanently protect an acre for every acre of land developed for its stores. Although the program is offset in nature, the impact is not measured, and there is no specific intention to match the offset with the type or quality of habitat impacted by development. Wal-Mart uses a competitive grant process to distribute funds to non-profit and government organizations to make the conservation take place. Wal-Mart pledged \$35 million for land acquisition to offset the store footprint for all of its development from 2005-2015 and had conserved a total of 412,000 acres in the US as of 2009.⁶⁰

Canada

Canada's compensation programs are directed at fish habitat and wetland compensation. Compensation for 'harmful alteration, disruption or destruction' of fish habitat is driven by compliance with the Fisheries Act and is implemented across the country. Wetland compensation, however, is driven by a mosaic of national and provincial policy with varying levels of implementation.

By the numbers - Canada	
Number of active programs:	6
Number of programs in development:	1
Total known regional payments per annum:	CAN\$7 - \$150 million
Known credit types:	5
Total known land area protected or restored per annum:	180 hectares
Total known active and sold out banks:	17

Canada does not allow monetary payments for fulfillment of compensation obligations, so compensation must be provided by the project proponent (although there are exceptions^{vii}). There are no private habitat banks, but there are seventeen banks used by the government department of transportation, and harbor or port agencies to consolidate fish habitat compensation requirements. The buyers of fish habitat and wetland compensation are predominantly from urban and industrial development, roads and highways, harbors and marinas, forestry, agriculture, hydropower, and extractive industries.

vii The exceptions we found were: use of fish habitat enhancement funds' (Quigley and Harper 2005), a BC Port Authority providing compensation via habitat banks for its tenants, two government agencies in Nova Scotia partnering in habitat banks which would provide compensation for both agencies, and a crown corporation being compensated for the costs of restoration by a road-building agency in Manitoba.

Fish Habitat Banks in Canada

Nova Scotia: Ten habitat banks were created by Nova Scotia's Department of Transportation and Public Works for their own use. Two of these banks, Cheverie Creek Habitat Bank (Halifax, NS) and St. Francis Harbour Bank were created in partnership with another government entity needing compensation, the DFO's Small Crafts and Harbours Branch. The banks have restored or will restore over 62 hectares.

Quebec: There are two habitat banks in the Montreal area in Quebec: Graise River Habitat Bank and the Ouareau River Habitat Bank.

Manitoba: In Manitoba, there is a Pipestone Creek Habitat Bank. Manitoba Hydro and DFO are investigating the feasibility of using habitat banking as a compensation tool for hydropower generation projects.

Alberta: In Alberta, the Yarrow Creek Habitat Bank was established in a joint initiative between Shell Oil, DFO, and Alberta Sustainable Resource Development, Fish and Wildlife Division.

British Columbia: Three more habitat banks are located in the Vancouver area: North Fraser Harbour Habitat Bank (partnership between Port Metro Vancouver and DFO), North Fraser Harbour Commission's Burnaby Habitat Bank (partnership between the City of Burnaby and DFO), and the Timberland Basin Habitat Bank (privately owned by Vancouver Fraser Port Authority). The Vancouver Airport Authority and Richmond Airport Vancouver rapid transit line purchased fish habitat credits at a cost of CAN\$150 per square meter.

Data Sources: TAC, 2006 ; Koster, pers comm, 2009 ; DFO, 2005 ; DFO, 1993 ; Vivek et al., 2009 .

Fish Habitat ('HADD') Compensation

At the national level, the Fisheries Act and the 1986 Policy for the Management of Fish Habitat require compensation for impacts to fish habitat, or more specifically 'harmful alteration, disruption, or destruction' (HADD) of fish habitat. Fish habitat compensation is regulated by the Department of Fisheries and Oceans' (DFO) Fish Habitat Management Branch.⁶¹ The Fisheries Act includes the principle of no net loss (of the productive capacity of fish habitats), and authorization for impacts to fish habitat require

Fish Habitat Compensation Metrics*

Estimated area of fish habitat compensation per annum: 1,836 hectares

Estimated national investment in fish compensation per annum: CAN\$7 - \$156 million

*Note: See Methods Appendix for information on figure calculation.
Data Source: Quigley and Harper, 2006 ; DFO, 2008 ; OAG, 2009 ; Quigley and Harper, 2005 ; Pett, pers comm, 2009 .

a permit. In applying for a permit, the applicant must show adherence to a mitigation hierarchy by 'relocation, redesign, and mitigation' and then compensation of net residual loss.⁶² Impacts on fish habitat arise from: urban and industrial development, roads and highways, harbors and marinas, forestry, agriculture, hydropower, and extractive industries.

In addition to a mitigation hierarchy, the guidance for habitat compensation in Canada provides a 'Hierarchy of Compensation Options,' with the following method and placement of compensation listed in order of preference:

1. Create or increase the productive capacity of like-for-like habitat in the same ecological unit;
2. Create or increase the productive capacity of unlike habitat in the same ecological unit;
3. Create or increase the productive capacity of habitat in a different ecological unit;
4. As a last resort, use artificial production techniques to maintain a stock of fish, deferred compensation, or restoration of chemically contaminated sites.⁶³

Cudmore-Vokey et al.⁶⁴ found that the first and third options were used the most (roughly 50% and 25%, respectively). Although the Practitioners' Guide provides the compensation hierarchy noted above, the guidance does not suggest what activities could create the compensation (i.e., what activities create or increase the productive capacity). A sample

of compensation activities includes: replacing or upgrading culverts, breaching a dyke, establishing restrictive covenants, and offering compensation through habitat enhancement funds.^{65,66} Guidance clearly states that cash in lieu of compensation is not acceptable.⁶⁷

An audit by Canada's Auditor General in 2009 reported that the policy on fish habitat compensation provides little guidance to regulators as to how to calculate impact and compensation; there is "no national guidance on what compensation ratio to use under various habitat conditions or how to calculate habitat negatively affected."⁶⁸ As a result, fish habitat compensation also suffers from regional differences in calculations and compensation ratios which makes accurate compensation difficult if not impossible.



Although like-for-like habitat compensation is stipulated in the policy, there is no mention of particular types of habitat. In our research, we found mention of seven major ‘habitat types’: salt marsh, high salt marsh and floodplain, tidal river, riverine, freshwater streams, lakes, intertidal and subtidal habitat. We also found mention of a number of further classifications: rearing, spawning, in-channel, off-channel, intertidal channel, intertidal marsh, intertidal mudflat, intertidal rocky, subtidal mudflat, subtidal rocky, lacustrine, estuarine, marine, riparian.⁶⁹

There is also mention of ‘ecological units’ within which compensation can occur, for example: Atlantic coast, Bay of Fundy, and Gulf of St. Lawrence.⁷⁰ DFO also identifies habitat as critical, important, or marginal.⁷¹

Because the guidelines state that compensation cannot be purchased, the supplier of the offset is the permit applicant. Compensation can be consolidated in habitat banks, although the policy requires that applicants must explore all on-site compensation options before being allowed to consider a habitat bank. Our research uncovered 17 fish habitat offset banks in Canada, primarily created by government agencies for their own use (see above).

Research did not uncover national figures on the scale of habitat compensation in Canada. We did, however, find elements of area and price from published sources that we used in ‘back-of-the-envelope’ calculations to determine the metrics above.

Wetland Compensation

Unlike Canada’s fish habitat compensation, wetland compensation in Canada is not regulated by one centralized agency. Instead, a mosaic of national and provincial law and policy exists with no standardized approach or centralized transparency.⁷² On the whole, Canadian



compensation policies have been informed by the faults of its neighbor, with critics pointing to the US system’s ineffectiveness in meeting no net loss goals. Wetland banking is not practiced in Canada, but the authors of a recent review of wetland mitigation policy recommend the use of banks or in-lieu-fee programs to consolidate compensation requirements.⁷³

Because of this fragmented implementation of wetland offset requirements, we touch on the national or provincial policies that most closely resemble an offset approach (i.e., policies with a mitigation hierarchy and some kind of compensation calculation guidelines). For a comprehensive review of all Canadian wetland mitigation policies, see the excellent *Wetlands Ecology and Management* article by Rubec and Hanson.⁷⁴

While the 1991 **Federal Policy** on Wetland Conservation includes a mitigation hierarchy of avoidance, minimization, and compensation, it does not include a clear set of calculations to determine compensation required, so the large projects regulated by this policy are reviewed on a case-by-case basis by the regulatory agency – the Canadian Wildlife Service of Environment Canada.

Alberta has a 2007 Provincial Wetland Restoration/Compensation Guide that provides guidance on the permit process, mitigation hierarchy, and compensation process under the 2000 Water Act. Although the Guide was developed in 2005 (and revised in 2007), it has been used in practice for longer. Compensation occurs through restoration of degraded wetlands.

New Brunswick's Wetlands Conservation policy of 2002 commits to no loss of 'provincially significant wetland habitat' and no net loss of wetland functions of all other wetlands greater than one hectare. The policy also includes a mitigation hierarchy of avoid, minimize, and mitigate.

Prince Edward Island has a policy that includes both 'no net loss' and a mitigation hierarchy in its 2003 Wetland Conservation Policy for Prince Edward Island. The policy also includes guidelines for how to compensate.

Nova Scotia's Operational Bulletin Respecting Alteration of Wetlands guides regulators making decisions on proposed impacts to wetlands under the 2007 Environment Act. The Bulletin uses the mitigation hierarchy and gives preference to restoration and enhancement projects to create compensation. Mitigation via creation or preservation of wetlands is allowed if used in conjunction with another mechanism.

Manitoba's Infrastructure and Transportation agency is party to an agreement with crown corporation Manitoba Habitat Heritage Corporation (MHHC) to source compensation needs through MHHC. When roads impact a North America Waterfowl Management Plan area, the transportation agency compensates MHHC with funds to restore or rehabilitate wetlands and place a conservation easement on the land.^{viii,75}

viii Chullick, personal communication, 2009.



Developments in Canada

The national fish habitat compensation program in Canada suffers from a lack of detailed guidance and a lack of staff time allocated to enforcement and compliance monitoring.^{76,77} Overall, the program has been criticized for not being able to achieve its goal of 'no net loss;' in a field audit of 52 HADD compensation projects, 86% of authorized permits had larger impacts and/or smaller compensation than authorized.^{78,79} Canada's Office of Auditor General found that only about a quarter of authorized impacts had compensation plans (2009). In response to the 2009 audit, DFO has accepted recommendations from the Auditor's office, including taking measures to implement a "quality assurance system to verify that documentation standards are being applied consistently by staff."⁸⁰ **National guidance for wetland compensation** practitioners is in the works, but is only in very early stages of development. Implementation may not be seen for another two to three years.^{ix}

One new program on the horizon is **British Columbia's** "wetland mitigation and compensation strategy that supports no net loss (and where appropriate, net gain) of wetlands where wetland losses from development have resulted in impaired watershed hydrology."⁸¹

ix Hanson, personal communication, 2009.

Mexico

Mexico has a very complex institutional and regulatory framework for biodiversity compensation. At the national level, the General Law of Ecological Equilibrium and Protection of the Environment (Ley General de Equilibrio Ecológico y Protección al Ambiente, LGEEPA) establishes the need for Environmental Impact Assessment (EIA), and the Secretary of Environment and Natural Resources (Secretaría de Medio Ambiente y Recursos Naturales, SEMARNAT) implements this law and determines if an EIA is required for any given development project. If an EIA is required, an Environmental Management Plan (EMP) is issued, consisting of separate mitigation, compensation and follow-up measures for development activities, and distinguishing on-site and off-site actions.⁸²

The current system allows a project developer the choice of creating the offset themselves or paying into a compensation fund managed by the National Forestry Commission (Comisión Nacional Forestal, CONAFOR). An example of a developer-implemented offset is the Mexican petroleum company's (PEMEX) Jaguarundi project, in which they aggregated their required offsets into a single 961 hectare tract of tropical rainforest near their refineries.⁸³

If the developer chooses to pay into the CONAFOR fund, Mexican legislation requires a compensation ratio greater than 1:1; CONAFOR is responsible for setting that ratio. CONAFOR then uses the resulting funds to complete reforestation activities on behalf of the developer.⁸⁴ The compensation amount per hectare is calculated using the average costs of reforestation activities (not including the cost of purchasing the land) instead of using estimates of the value of the environmental service affected.^x What the current system does not

make transparent is if the reforestation activities linked to compensation are successful or not, and if their location and timing truly compensate for the environmental services lost. In addition, CONAFOR has several programs in place related to reforestation that are not easily (or at all) separated, and thus cannot be evaluated for effectiveness by the developers, public or civil society organizations involved. In order to help solve part of this problem, the Instituto Nacional Ecología (INE) is preparing an initiative for SEMARNAT to develop a system of banking and trading biodiversity offset credits.^{xi}

Another important source of compensation in Mexico results from damages to biodiversity due to accidents or regulation violations. Compensation paid either in kind or in cash, is overseen by the Federal Environmental Attorney (Procuraduría Federal de Protección Ambiental, PROFEPA). An agreement between PROFEPA and the National Commission for the Knowledge and Use of Biodiversity (Comisión Nacional para el Conocimiento y Uso de la Biodiversidad, CONABIO) launched an offset-like program (the Program for Environmental Restoration and Compensation, Programa de Restauración y Compensación Ambiental) that aims to compensate for regulation violations and accidents through the planned restoration or recovery of ecosystems and natural resources on site, and then if that is not possible, avoiding or mitigating damage elsewhere.⁸⁵

x Muñoz, personal communication, 2009.

xi Ibid. 2010.

Central & South America



By the numbers

Number of active programs:	5
Number of programs in development:	2

General Status Update

Most countries in Latin America have existing Environmental Impact Assessment (EIA) laws that address impact mitigation and many also feature examples of voluntary compensation schemes. A majority of the programs tend towards government compensation rather than a market-based system for offsetting impacts to biodiversity. Only a few countries are developing offset programs, but the existing programs are laying a foundation for a future where we may see more market-like mechanisms (e.g., Colombia).

Existing Programs - Brazil

Home to such biologically diverse areas as the Amazon, Cerrado, and Atlantic Forest, Brazil is a party to the Convention on Biological Diversity and has a long history of enacting legislation for maintaining biodiversity. The basis for Brazil's environmental policy is the National Environmental Policy Act (Lei da Política Nacional do Meio Ambiente, LPNMA) and the National Biodiversity Policy;¹ the latter applies specifically to environmental compensation² and the "no net loss" principle applies. In some cases, specific legislation against cutting native vegetation has been enacted, such as the Lei da Mata Atlântica, particular to the Atlantic Forest.³

EIAs and environmental impact studies are

conducted in order for development projects to obtain an environmental license; the EIA stipulates that the mitigation hierarchy be followed, and offsets are seen as a last resort.⁴ In Brazil, mitigation usually takes the form of indirect compensation through taxation.

Brazil's laws present two types of offset-like mechanisms to help compensate for negative environmental impacts, relating to: (i) projects complying with the Forest Code, and (ii) industrial development.

Forest Code offsets

The Brazilian Forestry Code (Codigo Florestal, enacted 1965) stipulates that landowners must keep a certain percentage of natural vegetation on their land, depending on the region (80% Amazon, 35% Cerrado Savannah, 20% all other areas).⁵ In areas where deforestation and vegetation clearance will exceed the legal quota, compliance with the law can still be met in part through off-site conservation.⁶ Landowners that are unable to meet the minimum requirement of native vegetation on their own land can compensate another landowner (theoretically within the same watershed) to retain more than the minimum percentage of native vegetation cover. These Forest Code offsets have the potential to evolve into a formal bank, which is under discussion at the state level.⁷ In one of a number of pilot projects, The Nature

Conservancy has helped facilitate farmers in the municipality of Lucas do Rio Verde, Mato Grosso, to achieve legal compliance through the purchase of 91,000 hectares of retained forest land to compensate for past deforestation.⁸

Despite the potentially promising opportunities presented by these offset mechanisms, Fearnside (2000) notes that Brazil faces considerable law enforcement and implementation problems to ensure that they are effective and do not lead to perverse outcomes.⁹ These problems include difficulties in regulation and monitoring of offset areas, a lack of clear guidelines as to what determines an “ecological equivalence” in selecting appropriate candidate offsets, and the lack of a single approved authority in each state to judge the merit of individual cases.

Industrial impact compensation (developer’s offsets)

Industrial impact compensation, also known as **developer’s offsets**, is mandated by the National Protected Areas System Law (9985/00), which originally required that a maximum of 0.5% of the capital costs of the development go to the Protected Areas System (Sistema Nacional de Unidades de Conservação, SNUC) through the Environmental Compensation Fund (Fundo de Compensação Ambiental, FCA). The Environmental Compensation Fund is to be used solely for protection of existing protected areas (categories I and II according to the IUCN), unless a protected area itself is directly affected by the development work.^{10,11} The program, therefore, does not fund additional land conservation. Some examples of the application of funds include: solving land tenure issues, revising or implementing management plans, purchase of goods and services related to managing and monitoring the protected area and research necessary for creating and managing the protected area and its buffer zone.

Another aspect of the program that diverges from a prototypical offset scheme is that there are no criteria available for determining compensation nor the application of funds paid by the developers, even though funds are usually paid. Furthermore, a number of administrative bottlenecks exist that make it difficult for moneys paid by developers to be efficiently spent on priority activities for protected areas.

There is some movement to reform the program, but effort has been focused on changing the fee rather than making a more direct link between impacts and compensation. The Environmental Compensation Fund (Fund) is currently being reviewed and reformatted by the federal government to improve its design. The previous system of a fixed minimum amount (0.5% of total development costs) for industrial impact compensation has been declared illegal by the Supreme Court. A new decree was published in May 2009 ruling that a *maximum* of 0.5% will be paid for impact compensation.¹² This Supreme Court ruling has put much of the program into legal limbo.ⁱ

The Chico Mendes Institute for Biodiversity Conservation (Instituto Chico Mendes de Conservação da Biodiversidade, ICMBio) reported that from 2000 to 2008 the Fund equaled approximately R\$500 million (US\$214 millionⁱⁱ) from 300 compensation requests.¹³ However, of this R\$500 million, almost R\$209 million are waiting for the Supreme Court decision to determine whether past amounts will need to be re-assessed based on the new formula for calculating payment amounts.ⁱⁱⁱ Only about R\$143 million (US\$61 million) is deposited and available for use in protected areas, and R\$49.5 million (US\$21.2 million) of the compensation has been executed.

i Lerda, personal communication, 2009.

ii US figures are converted to 2008 dollars.

iii Lerda, personal communication, 2009.

Existing Programs - Colombia

Environmental compensation is practiced at a national level through the national environmental legislation, *Decreto 1753*, which called for environmental licensing.¹⁴ To obtain an environmental license from the Ministry of Environment or local environmental authority (Corporaciones), any new development project must offset their impacts based on a simple calculation of trees per hectare that the project will affect in that particular ecosystem.^{iv} The developer is then required to compensate via reforestation close to the project site. Alternatively, the developer may pay into a reforestation fund. There currently is no credit banking system, so the developer usually works with local farmers to plant trees or restore habitats. There is no detailed guidance on the types of trees required for reforestation (they could be exotic, invasive species). Guidance on monitoring is also lacking, so there is no proof that trees are actually planted.

The Nature Conservancy (TNC), Conservation International and WWF are working with the Colombian Ministry of Environment to apply TNC's 'Development by Design' (DbD) framework. The DbD approach will identify development impact and determine appropriate offsets with ecological equivalence. The scheme will also determine where the offsets might be sited to deliver rigorous and robust biodiversity benefits. TNC is implementing the **DbD approach to offset impacts** of coal mining in the Cesar region in Colombia.¹⁵

Existing Programs - Paraguay

Paraguay has a few different ways in which compensation can be made for impacts to biodiversity. The **Paraguayan Constitution** states that "Any damage to the environment will entail the obligation to restore and pay for



damages," but currently this mandate is mainly enforced by criminal law (and is therefore neither strategic nor voluntary); thus there is no positive incentive for compensation. The mitigation hierarchy is recognized in Paraguay, but in practice, there is little attention to avoiding and minimizing damages. Additionally, enforcement is a challenge – damages are more often punished instead of being strategically resolved through environmental planning and compensation. The Environmental Crime Area of the Public Prosecutor's office gathered approximately US\$80,000 in 2008 from developer compensation for environmental damage.^v

The Instituto de Derecho y Economía Ambiental (IDEA), has created a Conservation Trust whereby project developers can pay into a fund to compensate for damages as required by the Paraguay Constitution.^{vi} The money is used for conservation purposes on priority areas (land acquisition, drafting of management plans, park ranger salaries, etc.). IDEA works with fiduciary Financiera Atlas S.A.E.C.A to manage the trust and has set aside two areas in the Pantanal, totaling 3,096 hectares, with the resulting funds. Enforcement is guaranteed by Law 921/96.

Additionally, a recent law¹⁶ (PES Law 3001/06) provides a mechanism for compensation for environmental damage. Similar to Brazil's Forest Code, Paraguay's **Forestry Law** (422/73)

iv
Gonzalez, personal communication, 2010.

v
del Mar Zavala, personal communication, 2009.

vi
Ibid.

requires 25% of land be maintained in natural forest for private landowners.¹⁷ If 25% is not met, damage must be compensated through reforestation, by purchasing Environmental Services Certificates (ESCs) provided by landowners exceeding the 25% minimum forest cover required.^{vii} Owners of large impact projects must also invest 1% of their total project budget in ESCs as compensation. In the future, the market will decide the prices of ESCs, as it is not set by government and is not a tax system.

In reality, however, the law is only infrequently applied, and some forests have been cleared almost entirely. WWF has been working in Paraguay on the development of a Tradable Development Rights Mechanism, used in the past to adapt market-based tradable permit systems to conservation, to help enforce the Forest Law. So far 8,435 hectares of land have been restored under the pilot program and as of November 2008, almost 25% of the farms in one pilot region have signed up to comply with the law.¹⁸

Developments

While the above countries have a more concrete system of compensatory conservation schemes, other Latin American countries are beginning to develop their own programs that have the potential to turn into offset-like regulation.

Argentina has a short history of environmental compensation laws through their Civil Code (Article 1083) and EIA, but there is very little enforcement and regulation. Their EIA law (no. 25,675, written in 2002), the **Environmental Framework Law** (Ley General del Ambiente, LGA), defines the standards and implementation practices for development projects that will impact biodiversity, although it does not clearly call for offsets for those impacts.¹⁹ Developers must only submit an Environmental Impact

Study, which is then rejected or approved. If the project is approved, and it has been shown that restoration for environmental impacts is not possible, the project must pay into the Environmental Compensation Fund (Fondo de Compensación Ambiental) which is used to compensate for and prevent future losses to biodiversity (i.e. establishing protected areas). The practical operation of this fund, however, is unknown.

An adaptation to the mitigation hierarchy is followed under the LGA (minimize, prevent and mitigate, then restore), but real application is absent. One example cites a compensation ratio of 5:1 (five trees planted for every one cut down), but there is not a consistent ratio across the board, and compensation in practice is difficult to find.²⁰

Chile's EIA law explicitly requires avoidance, minimization, reparation and compensation, along with preventive measures.²¹ At least one voluntary offset example exists in the mining industry, and Instituto Forestal (INFOR) is researching compensatory conservation.

Venezuela's Brisas Gold and Copper Project in the Orinoco Basin is a voluntary compensatory conservation project creating and expanding a protected buffer zone adjacent to a national park, planting trees, creating agroforestry and ecotourism projects, and establishing a biological reserve station.²²

Costa Rica and **Panama** both have Payments for Environmental Services strategies related to the reduction or avoidance of adverse biodiversity impacts that could lay the groundwork for future offset programs.

The UNDP is currently conducting a study assessing the outlook for habitat banking and wetland mitigation in Latin America and the Caribbean, hoping to identify those areas with the most potential. It is focusing on nine case study countries including Panama, Chile, Peru, Costa Rica and Mexico.²³

vii del Mar Zavala, personal communication, 2009.



By the numbers	
Number of active programs:	0
Number of programs in development:	6

General Status Update

While there have been cases of oil and mining companies voluntarily compensating for impacts to biodiversity in Africa (Ghana, Guinea, Madagascar and South Africaⁱ), there are few examples of biodiversity offset or compensation programs. Our research identified only one country with provincial guidelines developed, but these have not been officially adopted by the government as of yet. This chapter will therefore shed light on what has been happening so far to lay the groundwork for biodiversity offset programs in Africa, including developments in EIA law, national biodiversity laws, and voluntary programs.

ⁱ For more information on these projects see: Business and Biodiversity Offsets Programme (BBOP), 2009, Compensatory Conservation Case Studies, available at www.forest-trends.org/biodiversityoffsetprogram/guidelines/non-bbop-case-studies.pdf.



There are a few factors that hinder biodiversity market development in Africa. These include the fact that there are financial barriers, political instability, and disagreements within the conservation community on how and if biodiversity markets should be structured.¹ However, there are opportunities in the greater attention on, concern for, and scrutiny of the link between business and biodiversity. In addition, countries are creating new regulations that leave space for economic instruments like biodiversity offsets.

Developments - South Africa

South Africa is at the forefront of biodiversity offsetting in Africa. Its history stems from the Environmental Impact Assessment (EIA) regulations promulgated by the National Environmental Management Act 107 of 1998 (NEMA). The national environmental principles contained in Section 2 of this Act specify that significant negative impacts on biodiversity must be avoided and, if they cannot altogether be avoided, must be minimized and remedied. There is currently no explicit legal definition of what “remedy” means in the context of the Act. However, in practice it is interpreted as the need to compensate for any residual negative impacts on biodiversity after efforts to minimize these impacts have been taken into account, through the use of offsets.ⁱⁱ

ⁱⁱ Brownlie, personal communication, 2009.

Although offsetting is still an emerging practice, draft guidelines have been prepared in two provinces, and a national offsets framework policy is currently being drafted. In the province of [Western Cape](#), a [Provincial Guideline on Biodiversity Offsets](#)² was first drafted in 2007. [Draft biodiversity offset guidelines](#) are just being developed in [KwaZulu-Natal](#), and offset measures are additionally required in the province’s draft Biodiversity Conservation Management Bill (2009).ⁱⁱⁱ

The approach to biodiversity offsets in *both* the Western Cape and KwaZulu-Natal provinces draws on scientifically defensible conservation targets for different biotopes (using vegetation types as surrogates) to calculate a ‘basic offset ratio;’ i.e., the number of hectares of that biotope that would need to be secured for conservation purposes for each hectare of biotope residually impacted, in order to ensure that conservation targets would be met in the long term.³ Both provincial guidelines stipulate like-for-like offsets and focus on habitat provision in preference to fees paid into a dedicated biodiversity offsets fund. ‘Trading up’ to secure habitat of a greater conservation priority may be allowed in some cases where deemed appropriate by the conservation agency. Where it is impracticable to secure ‘on the ground’ habitat, however, the guidelines specify that developers must contribute up-front costs equivalent to acquiring and managing physical habitat for at least the duration of residual negative impacts on biodiversity. This money is to go into a dedicated biodiversity offsets fund managed either by a government conservation agency or by an accredited Public Benefit Organization.

Draft guidelines in both the Western Cape and KwaZulu-Natal provinces are awaiting formal adoption by their provincial governments; the timing of their adoption depends in part on

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iii Ibid.

ensuring that they are aligned with the content of the national offsets policy framework currently being drafted.^{iv} Development of the [national biodiversity offsets policy](#) was required by the 2009 National Biodiversity Framework, set to be in place by 2012.

There are several other programs in South Africa that will provide references for future biodiversity offset schemes in the country, whether at a national or provincial level. For example, the Grasslands Programme of the South African National Biodiversity Institute (SANBI) is currently developing a wetland mitigation banking program with a pilot project set to begin in the coalfield area of the Mpumalanga province.⁴ South Africa also has a voluntary program in which landowners can, in exchange for management support, legally reserve their land for conservation purposes. A future offset scheme could modify this current voluntary program to allow landowners to develop biodiversity credits and sell them to developers requiring biodiversity offsets.^v

In addition, there are several voluntary offset projects in South Africa, including:

- The Anglo American platinum mine in Potgietersrust, a BBOP pilot project offsetting impacts on 2,262 hectares by protecting, managing, rehabilitating, and restocking with wildlife 5,398 hectares of land;⁵
- Compensatory conservation in Western Cape Province (the Mount Royal Golf Estate) and KwaZulu-Natal Province (Pulp United Pulp Mill);⁶ and
- A planned Ingula Resource Reserve, a 10,000 hectare biodiversity offset of a hydropower project in the province of Free State.⁷

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iv Ibid.
v Ibid.

Developments - Uganda

Uganda is in the early stages of developing offsets. The country's EIA law provides a supporting framework for compensation schemes, and a few pilot projects are in the works.⁸ The Uganda Wildlife Authority (UWA) is in the early stage of developing a [biodiversity offset policy](#), although the Department of Energy has reservations regarding the financing of the scheme in as far as it involves oil companies.^{vi} The UWA is also investigating voluntary offsets with oil companies (particularly Tullow Oil) with an aim to catalyze national law for compliance-based offsets in the future.⁹ Current pilot projects include efforts by the Wildlife Conservation Society (WCS) to protect fisheries as a potential site for a voluntary offset by offshore oil drilling companies¹⁰ and a voluntary compensatory conservation project for the Bujagali hydropower plant on the Victorian Nile.¹¹

vi Prinsloo, personal communication, 2009.



A potential future development is to channel payments for biodiversity offsets through the Uganda Conservation Trust Fund (UCTF), which has been proposed by a coalition of government, NGOs, and civil society organizations and would be run independently of the government. This fund would not be exclusively for biodiversity compensation; it is envisioned as a sustainable financial mechanism for protected areas in Uganda. The UWA and WCS are spearheading the effort to create the UCTF; so far about \$95,500 have been raised for the project.

Developments - Madagascar

Madagascar, with high levels of endemism and biodiversity, has a long history of efforts to conserve its unique biomes. EIA regulations play an important role in Madagascar, providing guidelines for major projects and requiring the hierarchy of avoidance, minimization, and restoration, although there is no law requiring offsets for residual impacts to biodiversity.^{vii}

The Environmental Action Plan (Plan d'Action Environnementale, PAE) was established in 1992 to address the threats to its biological resources. Within the PAE, Madagascar aims to develop a [biodiversity offset policy](#) for mining and logging companies along with other incentives for environmental protection.^{viii}

Although there is no national offset program, some voluntary projects have taken place, laying the groundwork for a future scheme. Two mining companies, Ambatovy and Rio Tinto, are currently creating biodiversity offsets for their projects on a voluntary basis in Madagascar. The first, the Ambatovy nickel mining project, is a BBOP pilot project hoping to produce net positive conservation outcomes by establishing a corridor between the existing Ankeniheny-Zahamena Corridor and the forest surrounding

vii Randrianarisoa, personal communication, 2009.
viii Ibid.

the mine area, supporting the management plan for the Torotorofotsy Ramsar wetland ecosystem, expanding reforestation activities along the pipeline it will build and planning to replace forest that was removed on the mine footprint after closure of the mine.¹² QIT Madagascar Minerals (QMM), a subsidiary of Rio Tinto, has produced offsets for its three ilmenite mines (1,217 hectares) located in rare littoral forest containing threatened and endemic species.¹³ The offsets will attempt to compensate for opportunity costs of local community impacts and claims a net gain of 5,095 hectares.

Developments - Other Countries

In addition to the details presented above, other African countries may see offset development in the near future. Like South Africa, the future of **Ghana's** biodiversity offsets are based in the Environmental Impact Statement, which commits projects to avoid, mitigate, and compensate for impacts. However, Ghana is much less advanced than South Africa in developing offsets. The country has at least one voluntary program proposed as a BBOP offset pilot project for the Akyem gold mine in Birim North District of the Eastern Region. Newmont Ghana Gold Ltd. intends to offset its footprint in this moist semi-deciduous forest and achieve no net loss of biodiversity. Potential offset sites and appropriate conservation activities are being determined.¹⁴

Although **Guinea** has no formal biodiversity offset policy, the country has at least one voluntary offset program, the Rio Tinto Simandou project. Because the project area is within an internationally recognized biodiversity hotspot, the mine developers are working with the Guinea Government and the International Finance Corporation (IFC) to achieve a “net positive impact” on biodiversity. The project has implemented baseline studies in order to assess

the biodiversity values of the region and identify which of those are most important to local communities, governments, and conservation organizations (they have been supported by BirdLife International, Conservation International, Earthwatch Institute, Fauna & Flora International, and Royal Botanic Gardens, Kew).¹⁵

The World Wildlife Fund (WWF) is exploring the prospect of biodiversity offsets, including a potential offset in **Mozambique** and “indirect” offsets, piloted by WWF-Netherlands, with Dutch companies.¹⁶

Current **Egyptian** laws have laid a framework for future biodiversity offset schemes through the Law for the Environment (Law 4/1994), and EIA/ESIA (Environmental and Social Impact Assessment). The Law for the Environment considers impacts from development projects and compensation issues within the mitigation hierarchy under an EIA; before a permit is issued, development projects and existing establishment expansion must submit to an EIA. The Environment Protection Fund (EPF) is a government-controlled fund financed in part by fines from environmental damage. The EPF is used for work conducted by the country's Environmental Affairs Agency (EEAA) including funding nature reserves. Although over 12,000 EIAs are conducted annually, current policies allow development to occasionally take priority, weakening opportunities for compliance-driven biodiversity compensation.¹⁷



By the numbers	
Number of active programs:	4
Number of programs in development:	3
Total known area protected or restored per annum:	> 2,600 hectares
Total known active and sold out banks:	1

General Status Update

Biodiversity markets are still a developing idea in Europe. Only one country, Germany, has a well-developed formal system for compensating for damage to biodiversity, and this is largely run by the public sector, although it is developing more market features and involving private operators. Elsewhere in Europe activity is limited to some specific offset requirements either for protected areas, or under planning laws. However, offsets have been undertaken through commercial contracts, and interest in using market-based instruments for biodiversity compensation is growing. There are some case-by-case offsets in countries such as the UK and Sweden, and a pilot habitat banking experiment in France. Detailed policy research has been undertaken for the UK Government, and a study for the European Commission looking at the application of habitat banking across the European Union (EU) is due to report.

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¹ Corresponding Author: ian@eftec.co.uk. This chapter has been prepared from material researched for the European Commission "The use of market-based instruments for biodiversity protection - Habitat Banking", which is the collective effort of a wider group of authors, and is available at <http://ec.europa.eu/environment/enveco/index.htm>.

Existing Programs

In 2001 the EU Heads of State and Government undertook to halt the decline of biodiversity in the EU by 2010 and to restore habitats and natural systems. However, biodiversity continues to decline in the EU and it is clear that the 2010 target will not be met.^{1,2} There is currently some regulation requiring compensation of biodiversity impacts in the EU, but its application in individual Member States is varied.

EU Habitats and Birds Directives, and Environmental Liability Directive

A network of protected sites (Natura 2000 sites) has been established under the Habitats (1992/43/EEC) and Birds (1979/409/EEC) Directives. Impacts in these protected areas are strictly regulated. However, should development that damages them be deemed to have overriding public interest, it can be allowed only with strict like-for-like compensation of loss. The implementation of these Directives in some countries also requires compensation for damage to habitats of threatened species. One example of such compensation is restoration of grassland habitat completed to compensate for impacts from wind farm development in Italy.³

The more recent Environmental Liability



Directive (ELD; 2004/35/EC) harmonizes previous liability regimes and implements the polluter pays principal: making the parties responsible for environmental damage financially responsible for preventing and remediating that damage. The equivalency requirements under the ELD are not limited to strictly like-for-like.

European Country-Level Programs

Beyond EU-level legislation, efforts for the protection of biodiversity among Member States are limited. There are regulations which have a purpose to identify and compensate for damage to the environment (e.g. Environmental Impact Assessment), but they do not contain specific provisions requiring compensation. Instead they contain ambiguous language (e.g. “have regard for”) or enabling clauses, and as a result compensation is not usually required by authorities or undertaken in practice. The main reason for such limited activity is that laws and regulations do not stimulate demand for compensation actions, due to:

- The limited conditions under which impact is allowed and the strict like-for-like requirements of the Habitats Directive;
- Limited enforcement of most national compensation regulations (including slow

transposition and limited enforcement of the ELD into national laws);

- Varying levels of protection and enforcement (e.g. through impact assessments and planning processes) in different parts of the EU for biodiversity that is not strictly protected by EU legislation; and
- Low levels of voluntary activity.

Nonetheless, current developments in Europe indicate that the region could be poised to make greater use of offsets and habitat banking. Interest in habitat banking is growing in Europe as evidenced by changes to the German compensation system, and pilot projects exploring its role, such as in France. Research in the UK and for the European Commission has examined adapting offsets and habitat banking (respectively) to the land management situation in the EU. Additionally, private enterprises for habitat banking are starting to appear.

The review below starts with the main example of compensation requirements, in Germany. Experiences with compensation in other countries that are relevant to the development of biodiversity markets are also summarized.

Germany – Impact Mitigation Regulations (Eingriffsregelung)

The 1976 Federal Nature Conservation Act in Germany introduced the Impact Mitigation Regulations (IMR).ⁱ This law is mandatory and precautionary, aiming to ensure “no net loss” by avoiding any damage, and restoration and replacement compensation for residual unavoidable impacts. It covers all natural assets under the German Federal Nature Conservation Act, including projects at the levels of both urban planning and sectoral planning. The IMR has strict additionality requirements and is regulated

ⁱ For a review of the program, see Chapter 3 in Darbi, M.; Ohlenburg, H.; Herberg, a.; Wende, W.; Skambracks, D.; Herbert, M.; (2009) International Approaches to Compensation for Impacts on Biological Diversity. Final Report. Accessed online in August 2009 at: http://www.forest-trends.org/documents/files/doc_522.pdf

by public (state) nature conservation agencies. It was integrated with Federal Building and Spatial Planning regulations in the 1990s, which introduced greater market-style flexibility, and this is continuing through current reforms.

Increased flexibility led to the use of compensation pools, collectively providing compensation areas and measures. Compensation is undertaken as a result of damage identified in planning (and other) processes, and is generally organised through state planning authorities. Development of these within German states has established the basis for dedicated private providers of compensation services. At present, the control of the compensation process via the state means it is not a fully functioning market, and as a result the volume of the market is unknown. However, data from the state register in Bavaria (one of 16 German states, but accounting for 20% of the land area) identify over 1,000 new sites in the six months to September 2009 resulting from the German Impact Mitigation Regulation. Compensation sites in Bavaria conserve an average of about 2,600 hectares per year (for 2008-2009)ⁱⁱ.

The compensation pools approach has brought a number of advantages, overcoming obstacles to IMR implementation,^{4,5} but also introduced various risks and problems:

- Compensation not secure in perpetuity;
- Long-term monitoring required;
- Land availability constraints;
- Loose spatial and functional equivalence between debit and credit;
- Wide variety of methods used to assess equivalence;
- Disputed evidence on additionality; and
- Targets for different habitat types not always established.

ii
Ohlenburg, personal communication, 2010

Reforms to the Nature Conservation Law are planned which intend to standardize the use of compensation measures, the reconnection of habitats, long term management and maintenance, and the level and calculation of compensation payments. Reforms will also weaken the distinction in the mitigation hierarchy between in-kind and on-site restoration and compensation (out-of-kind and off-site). Finally, reforms intend to provide state level regulation of the storage of 'credits' in compensation pools, trading of credits, and their long-term management. These reforms, and the recent involvement of private agents in the compensation pools process, suggest that biodiversity compensation practices in Germany may develop into more market-based systems in the near future.

United Kingdom

There is extensive experience in the UK of determining compensation requirements under the EU Habitats Directive. Examples in the UK that reflect features of a more developed biodiversity offsets program (see 'Developments' below) include several schemes compensating for loss of inter-tidal habitats in relation to Port developments and flood protection works. Several of the credit sites are managed by a large biodiversity NGO, the Royal Society for the Protection of Birds, which has extensive experience of habitat creation and management. Their compensation deals to date have typically involved selling a small part of a large biodiversity enhancement project, the majority of which they manage to deliver net biodiversity gain.

Some innovative actions are emerging in relation to these compensation activities in the UK. For example, at Alkborough in the East coast of England, Associated British Ports (ABP, a major port operator in the UK) have sold 25 hectares of land it owned within what is now a larger habitat

creation site to the Environment Agency,ⁱⁱⁱ in what can be described as an option contract. In exchange, ABP will be able to secure a credit of 25 hectares of intertidal habitat, with the exact nature of the credit (i.e. the exact area within the larger site) being flexible in order to deliver the specific equivalency to the debit (expected from forthcoming developments at its nearby port of Goole), as required under the Habitats Directive.

Development plans for coastal industries such as ports mean that operators in the UK are investigating purchases of land to hold in reserve for further compensation actions in the future. In this sense, they are beginning to operate land 'banks' within their development strategies. A current limitation on this approach is uncertainty over the geographical range across which compensation can be delivered.

Sweden

The concept of environmental offsets has been discussed in Sweden since the middle of the 1990s, but the country's Environmental Code incorporates offsets that are mandatory in only a few cases. Legal regulations that provide for offsets attached to different permits, approvals and exemptions granted are not used extensively by the licensing authorities, even though some compensation measures for road building are undertaken by the Swedish Roads Administration.⁶ With the exception of certain nature reserves including Natura 2000 areas, Sweden presently does not have strong legally binding requirements for environmental offsets. There have been several voluntary attempts in Swedish municipalities to implement environmental offsets in urban development planning (Gothenburg, for example).⁷ To date, there have been no proposals for the implementation of banking or compensation pool schemes in Sweden.

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ⁱⁱⁱ The Environment Agency for England and Wales, an implementation agency of Defra.

Developments

United Kingdom

There has been recent research conducted by the UK Government on **biodiversity offsets**,⁸ which is also attracting interest from the main opposition political party.⁹ Therefore significant developments of biodiversity markets in the UK are a realistic short term prospect.

France

France has had an environmental protection law on the books since 1976 (Loi n° 76-629 du 10/07/76 relative à la protection de la nature) which requires avoidance, minimization, and compensation of impacts to the environment. The law, however, had not catalyzed offset activities until 2009. In May of last year, CDC Biodiversité (a subsidiary of the French financial institution Caisse des Dépôts et Consignations) launched the first **biodiversity bank** in France, and intends to sell biodiversity credits in advance of impacts from development.^{10,11} The site is comprised of 357 hectares of abandoned orchards near Saint Martin de Crau in the south of France, which will be restored to semi-arid steppe.

Switzerland and the Netherlands

While **Switzerland**¹² and **the Netherlands**¹³ have laws enabling compensation, we were unable to find information details of the programs or information to indicate the scale of activity in the programs.

Eastern Europe

Biodiversity markets are poorly developed in Eastern Europe, and the limitations to compensation drivers in Europe described above are prevalent here. A variety of different land use and economic conditions across the EU, in particular in newer Member States in Eastern Europe, may inhibit the

development of biodiversity markets. There are, however, examples^{iv} of experience relevant to biodiversity markets indicating some very early developments:

- In **Poland**, two national funds,^{v,vi} support biodiversity projects (but mainly targeting infrastructure, e.g. water management).
- Fieldfare,¹⁴ a company that invests in habitat creation by a private enterprise in **Romania**, **Bulgaria** and **Ukraine**.
- Biodiversity Technical Assistance Units (BTAU)¹⁵ have been developing a business-biodiversity banking framework in **Poland**, **Hungary** and **Bulgaria** for several years. BTAUs provide a pool for expertise from within public, private and third sectors to assess and evaluate biodiversity impacts. The expertise is engaged as needed for projects through standing contracts for call-off work. They can thus supply monitoring skills for biodiversity projects. They also have access to relevant information (e.g. species population trends) necessary to put project impacts in context.

Overall biodiversity markets are not an immediate prospect in much of Eastern Europe, but there are several factors that suggest they are a realistic future prospect:

- The polluter pays principle is widely accepted;
- The legal and institutional capabilities required for offsets exist in many countries;
- There is generally sufficient data available on biodiversity distributions and targets;

iv Based on information gratefully received from: Zbig Karpowicz, European Country Programmes, Royal Society for the Protection of Birds (RSPB); Mark Hughes, European Bank for Reconstruction and Development; Lars Lachmann, Polish Society for the Protection of Birds /RSPB; Paul Goriup, Fieldfare.

v The National Ecofund, established through a debt for nature swap in the 1990s, totalling several \$100m, www.ekofundusz.org.pl/us/ecoact.htm

vi Polish National Fund for Environment Protection & Water Management (NFOSIGW) which hypothecates fees and fines from industry to finance environmental measures www.nfosigw.gov.pl



- The skills (in public or private sectors) to undertake biodiversity enhancements, and manage and monitor these are available (although may be limited in scale); and
- There has been hypothecation^{vii} of public funds into compensation actions (e.g. in Poland).

European Union

Research has been undertaken for the European Commission during 2009 to examine the potential use of **habitat banking**^{viii} in the **European Union** (EU) as an economic instrument for biodiversity protection.^{ix}

After comparing habitat banking to other market-based instruments, the research conducted for the European Commission concluded that habitat banking could offer a useful additional instrument to help biodiversity policy move towards a 'no net loss' objective.

vii "Allocation of public funds raised from sources of environmental damage"

viii The research defined habitat banking as "a market for the supply of biodiversity credits and demand for those credits to offset damage to biodiversity (debts). Credits can be produced in advance of, and without ex-ante links to, the debits they compensate for, and stored over time".

ix Led by Economics for the Environment Consultancy (eftec) and the Institute for the European Environmental Policy (IEEP). The resulting reports are expected to be published on the European Commission's website.

Habitat banking is an attractive option for the EU because while the most threatened biodiversity is already strictly protected, biodiversity loss continues, often through low-level, cumulatively-significant impacts. Offsets consolidated in habitat banks could align with land-use planning at a strategic level to optimize the type and location of offset measures within EU constraints of limited land available.

Three potential types of compensation systems were proposed in the research conducted for the European Commission:

- Option 1: Providing a supply of habitat/species (credits) which may, in specific circumstances, be used to compensate for adverse impacts on Natura 2000 sites.
- Option 2: Enabling, through impact assessments and planning regulations, a system of compensation for significant adverse residual impacts on other important biodiversity in Europe, in particular effects on species populations and their habitats outside Natura 2000 sites.
- Option 3: Providing a mechanism for offsetting cumulative impacts on biodiversity (other than that covered in options 1 and 2, and thus likely to be less endangered) that are minor when considered in isolation, but which are cumulatively a significant factor in ongoing biodiversity decline and loss in the EU and mostly not compensated for at present. This would represent a new compensation obligation for biodiversity damage, covering biodiversity impacts that do not qualify under options 1 and 2 above because a) the biodiversity is not endangered enough (i.e. widespread and common species), or b) the impacts are not significant enough.

Option 1 could occur under current laws, but would likely need additional guidance (e.g.

on Habitats Directive Article 6(4)). For options 2 and 3 to be effective, there would need to be additional laws and/or regulations, guidance, or monitoring capacity to create the obligation to compensate for unavoidable residual damage to biodiversity, and therefore an incentive to purchase credits.

The potential for habitat banking in the EU is limited at present as the demand for credit will be low due to the limited scope of current compensation requirements for damage to biodiversity in relevant supporting laws. If the current requirements are strengthened or new requirements are created in line with objectives for no net loss of biodiversity, then a viable habitat banking market could be developed in the EU.



By the numbers	
Number of active programs:	4
Number of programs in development:	4
Total known regional payments per annum:	> US\$390 million
Total known area protected or restored per annum:	> 26,000 hectares
Total known active and sold-out banks:	2

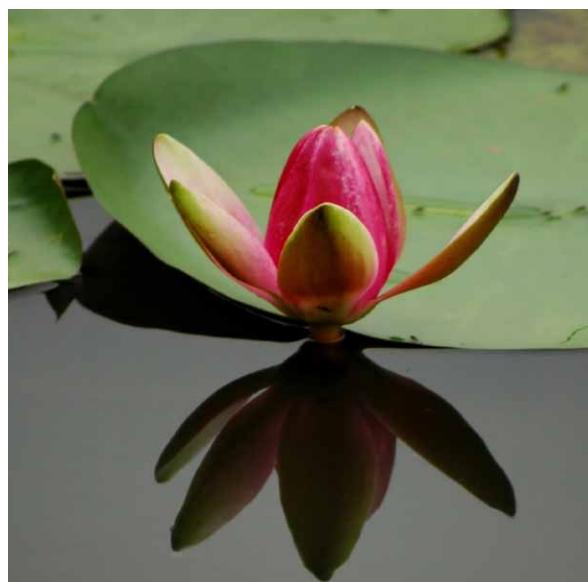
General Status Update

At present, the majority of offset-like programs in Asia fall within the category of Environmental Impact Assessment (EIA). Countries with EIA laws or policies are: China, India, Japan, Malaysia, Mongolia, Pakistan, Russia, South Korea, and Thailand.ⁱ There are two examples of offset programs that our research uncovered: China’s Forest Vegetation Restoration Fee and Saipan’s Upland Mitigation Bank (see below). The region’s EIA policies may lay a framework for biodiversity markets by requiring adverse environmental impacts to be mitigated, but so far no third-party mitigation systems are known to be operating in Asia. Our research found mention of a 2001 municipal compensatory mitigation ordinance in the Japanese city of Shiki requiring re-vegetation on a one-to-one basis for impacts from public projects, but information on the current status of the program is not available.² We also found information on two individual compensatory conservation projects: a Biodiversity Conservation Area of 393,618 hectares established in Laos to compensate for impacts from development of a hydropower facility, and the Sary-Chat Ertash Zapovednik nature reserve created in Krygystan in part to mitigate the effects of an open pit gold mine.³

i McKenney, personal communication, 2009.

Beyond government-led actions, voluntary and industry initiatives are arising in Asia, driven primarily by increasing public criticism of the environmental and social impacts of extractive and agribusiness industries. The Roundtable for Sustainable Palm Oil, an industry group, has been exploring the use of biodiversity offsets to allow plantations established between November 2005 and November 2007 to meet the criteria of the Roundtable on Sustainable Palm Oil certification program, even where the High Conservation Values (HCVs) of the land’s pre-plantation condition are unknown.ⁱⁱ

ii Desilets, personal communication, 2009



Existing Programs

China's Forest Vegetation Restoration Fee

While China has a multitude of 'eco-compensation' schemes, the majority of schemes fall under the category of government-mediated payments for ecosystem services.⁴ Many of the programs are focused on water quality and flood mitigation services rather than biodiversity. The one program with a biodiversity compensation focus is the Forest Vegetation Restoration Fee, a national regulatory program that requires developers impacting lands zoned for forestry to avoid, minimize, and then pay a Forest Vegetation Restoration Fee. The program has its basis in the Forest Law of the PRC (1998), with details provided in the 2002 Forest Vegetation Restoration Fee Levy, Use and Management Provisional Measures. The funds from the fee are used by the government for tree-planting and forest restoration activities at a minimum ratio of one square meter mitigated for every square meter impacted. An interesting aspect of this program is that the categories of forest that must be compensated and the fee specified for each are not ecosystem-based, but rather are based on the forest-use zoning. For example, there are differing fees for impacts to 'economic forestland', 'non-mature plantation forests', and 'national key protected forestland'. It is unknown whether the fee collected must be used to offset with a 'like' category of forest. The program collected a total of RMB 8.044 billion from 2003-2005, or around RMB 2.7 billion annually (about US\$393 million).⁵ To our knowledge, this program does not attempt to account for the ecological quality of the forest.

Saipan's Upland Mitigation Bank

Saipan, part of the US Commonwealth of the Northern Mariana Islands, is the location of the Saipan Upland Mitigation Bank. The bank sets a precedent as the first mitigation bank in the

region and follows the US mitigation banking system. Established in 1998 to protect the habitat of the Nightingale Reed-Warbler, a bird on the Endangered Species List since 1970, the bank's surrounding areas are under pressure from homestead development. The bank has 418.9 hectares under protection, with a proposed expansion of 62.4 hectares.^{6,7}



Voluntary Malua BioBank

In 2008, the government of Sabah, Malaysia teamed up with the Eco Products Fund, a private equity investment vehicle jointly managed by New Forests Inc. and Equator Environmental, LLC, to invest up to US\$10 million in the restoration and maintenance of 34,000 hectares of rainforest in a project called the Malua BioBank. The project sells "biodiversity conservation certificates" (BCCs) for the biodiversity benefits of 100 square meter plots of restoration as well as for the maintenance of the habitat for at least 50 years. The project is unique for enabling the long-term (and potentially permanent) protection of biodiversity via a voluntary purchase. Additionally, the project provides transparency through a third-party registry.⁸ Early buyers have included businesses and non-profits from a range of industries, such as tourism, timber, and palm oil. The Malua BioBank is offering

to link the conservation credits to companies' specific products or supply chains, and the BioBank is also starting to develop biodiversity offset products where a company is seeking to quantify and offset measurable conservation impacts.^{9,10}

Developments

While there are only two known government-based offset programs in Asia, there are very early indications that offset programs or policies may be developing in **Indonesia**, **Malaysia**, **Vietnam**, **Mongolia**, and possibly Taiwan and South Korea.

Developing offsets programs in **Indonesia** are strongly focused on carbon, particularly Reducing Emissions from Deforestation and Degradation (REDD). However, with deforestation from the forestry and oil palm industries affecting charismatic animals like the orangutan, some non-profit, government, and multilateral organizations have identified an opportunity to use offsets with a specific focus on biodiversity.^{11,12} In addition, Indonesia's 'ecosystem restoration' license, which allows license-holders to restore previously logged forest concessions and develop carbon or REDD credits, could form the basis for future biodiversity offset projects.

In the **Malaysian state of Sabah**, there has been recent interest in implementing a third-party mitigation system that could include habitat and biodiversity compensatory mitigation. Such a program could be based on the Environmental Protection Enactment (EPE) of 2002, which includes the first steps towards creating a habitat mitigation banking market by requiring mitigation for environmental impacts. To date, there is no approval process for or a clear pathway to utilize third-party mitigation to fulfill the environmental requirements of the EPE.

Vietnam passed a biodiversity law that went into effect July 1, 2009 that covers Compensation for Damage to Biodiversity (article 75) and stipulates that damage payments or compensation will be required and "reinvested in biodiversity conservation and sustainable development."¹³ Details of the implementation of Vietnam's Biodiversity Law will be spelled out in a forthcoming decree – expected sometime in 2010.

Mongolia's government has shown interest in biodiversity offsets, particularly around future developments in oil, gas, and mining. The Nature Conservancy has been working with the government on the 'Development by Design' approach to prioritize areas suitable for offsets. The approach will be tested in Eastern Steppe Region.ⁱⁱⁱ

Finally, we have seen dated references to political proponents of 'no net loss' of wetlands and wetland banking in **South Korea** (prior to 2008) and **Taiwan** (in 2007), but it is unknown whether activity has moved beyond the investigation stage.^{14,15}

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iii McKenney, personal communication, 2009.

Australia & New Zealand



By the numbers	
Number of active programs:	12
Number of programs in development:	5
Known credit types:	42
Total known active and sold out banks:	3

Co-Authored by Michelle Gane (Institute for Sustainable Resources, Queensland University of Technology) and Becca Madsen (Ecosystem Marketplace)

General Status Update

Australia does some of the most advanced research and design on market-like mechanisms for biodiversity conservation in the world. The region has a rich history of experimentation with biodiversity offsets, payments, and pilot projects. A number of factors make this country fertile ground for biodiversity markets: a general acceptance of market-like instruments for conservation, highly unique and endangered biodiversity, and great biological data and research capacity (i.e. CSIRO's Ecosystem Services Project and Markets for Ecosystem Services¹). Although, there seems to be little coordination between programs, making it a challenge to monitor how this part of the world is developing.

Australia and New Zealand have twelve biodiversity offsets programs and five in development. All but one of the Australian programs are state or regional programs. At this point, all of the Australian and New Zealand offsets are compliance-based with most offsets determined on a case-by-case basis during the planning process.

The 'buyers' of offsets are: urban residential and commercial developers, road-building agencies, water infrastructure (dams and pipelines), extractive industries, energy companies, and agricultural landowners. The providers of offsets are the development proponent, landowners, and the government.

Market data like area, price, or transactions of offsets were difficult to track. Most programs could not provide this information, and some programs admittedly did not track this information. One notable exception was the BushBroker program – which tracks transactions, average prices, and price ranges (see below in the BushBroker section). Another exception is the BioBanking program, which will make all trades and offers of offsets available on their website. As of this writing, however, information is not available as trades have not yet occurred.

There is a considerable lack of private sector involvement in current market-based instruments in Australia and New Zealand. While many of the policies and programs allow third-party involvement there are disincentives to do so. For example, the BioBanking program requires that the BioBanking Trust Fund be

paid before the landowner. The lack of legal severance from liability is also a barrier to private sector involvement (with the exception of BioBanking). A developer needing an offset has the responsibility that the offset occurs and is managed according to requirements whether or not the developer creates its own offset or purchases an offset from a third party.

A number of legal issues arise with regard to offset programs in Australia. First, most offsets are permanently protected, but without sufficient funds for long-term management. This is a significant issue in a country where invasive pests which must be actively managed are a major threat to native species. Second, the majority of rural land in Australia is 'leasehold land', where permanent protection cannot occur. Third, there is a possibility that offsets may not provide additional environmental gains over what is already occurring on the land or what may be occurring due to competing incentive programs (e.g., double-counting). Finally, some of the mining legislation in Australia has the power to override all other legislation, which erodes the power of compliance-based programs to require offsets.

Existing Programs - Victoria

BushBroker and Native Vegetation Offsets

BushBroker is a program to facilitate native vegetation offsets in the State of Victoria. The program is compliance-driven as permits are required to clear native vegetation. Victoria's 2002 *Native Vegetation Management Framework: A Framework for Action* policy sets a 'net gain' objective and provides the framework for offsets. In 2006, the BushBroker program was initiated to help those clearing native vegetation find offsets.²

The BushBroker program works primarily on the supply-side, identifying landowners willing

'Habitat Hectares'

Habitat Hectares is a term frequently used in Victoria. It refers to units of measurement that takes into account the area affected and the quality or condition of the biodiversity impacted (determined by the quantities of a number of chosen attributes related to the structure, composition and function of that habitat).³

to preserve and manage native vegetation. A government representative of the BushBroker program then assesses the site and determines the number and type of credits available. Both credits created and needed from development impacts are assessed using the same 'habitat hectares' methodology. Credits are created through conservation gains from management actions, protection, maintenance of quality, and improvement. The BushBroker website notes that potential buyers of credits would be able to search for credits on the Native Vegetation Credit Registry. However, in practice this is not a publicly accessible online database.¹

While a mitigation hierarchy of avoidance and minimization (before offsets) is required in the Native Vegetation Regulations under the Planning and Environment Act of 1987, much of the detail of the demand-side of biodiversity offsets in Victoria is laid out in the 2002 *Native Vegetation Management* policy. The Framework details impacts that must be offset (and which impacts must or should be avoided), 'like-for-like' conditions, and requirements for the proximity of offset relative to the impact site. Neither impacts nor offsets are allowed in areas of 'very high' conservation significance except in 'exceptional circumstances.' Clearing in 'high' or 'medium' areas of conservation significance is generally not permitted, but some clearing may be permitted in areas of 'low' conservation significance.⁴

i Juniper, personal communication, 2010

The credit traded can be defined by three possible units: vegetation or habitat; ‘large old trees’ (LOTs); and ‘new recruits’ (i.e., tree planting). The first of these credit types, offsetting of vegetation or habitat, is based on area and site-quality measured by the ‘habitat hectares’ methodology (see box above). These credit types are based on ecological vegetation classes (EVCs) within Victoria’s 28 bioregions, accounting for 2,500 possible types of EVC credits. However, due to the location of development and associated impacts, only 50-100 EVC credits are used in practice. To date, BushBroker has worked well to match buyers with sellers of offsets, despite the large number of credit types that could be required for impacts.ⁱⁱ A sample of ‘wanted’ EVCs listed on the BushBroker website are: Plains Grassy Woodland, Damp Heathy Woodland, Banksia Woodland, and Stony Knoll Shrubland.⁵

Credit demand generally comes from road building, housing development, water supply pipeline development, and landholder vegetation clearance. Demand has been modest, with vegetation clearing applications only totaling a few hundred hectares of land annually. However, planned expansion of Melbourne is expected to impact 5,200 hectares of native vegetation and the Victorian government is proposing a new reserve of over 10,000 hectares that will provide credits through BushBroker over the next decade.ⁱⁱⁱ In effect the government will be creating a consolidated bank of credits.

Offset supply has generally been from agricultural landowners, but in limited circumstances the government accepts payments in lieu of offsets with money used to purchase credits. To date, there are three active and sold-out banks and there may be an additional two to three banks that will be developed over the next year or so:^{iv}

- One active bank for scattered trees (about 20,000 plants),
- One sold-out bank to offset scattered trees (6,000 plants), and
- One bank in operation selling credits of habitat hectares (130 hectares) and LOTs.

The Victorian government will increase their role as a broker in the BushBroker program by providing online tools, hands-on outreach and facilitation with landowners. The government is also planning to facilitate the creation of banks in bioregions with sufficient credit demand. Additionally, a trial auction will be held to generate competition for new credit supply in banks.⁶

While landowners in Victoria have the ability to sell offsets to developers within the BushBroker program, there are other financial incentive programs for native vegetation protection and management in Victoria that have become



.....
 ii Crowe, personal communication, 2009
 iii Ibid.
 iv Ibid.

popular. BushTender and PlainsTender have four- or five-year agreements (versus the permanent protection required by BushBroker) and have delivered more financial incentives and hence more hectares protected or improved than BushBroker. Currently, BushTender has delivered 17,000 hectares, PlainsTender 5,000 hectares, while BushBroker has delivered 700 hectares.^v

.....
v Ibid.

BushBroker Data

The BushBroker program, which measures the success of its brokering services by transactions, tracked 35 offset transactions in 2007/2008 and 63 in 2008/2009. In BushBroker, there is a current assessed stock of about 2,750 hectares (or 600 habitat hectares credits) of supply available within BushBroker, with more than twice this amount listed as unassessed 'expressions of interest.' Other metrics tracked by the BushBroker program are summarized below.

BushBroker Data				
Total habitat hectares of offsets: 522.75 (cumulative, from May 2006 - November 2009)				
Estimated dollar volume of offsets (for 2008/2009): AUS\$1,406,915				
Estimated dollar volume of offsets (cumulative, from May 2006 - November 2009): AUS\$11,358,720				
Transactions				
2007/2008*		2008/2009*		
35 offset transactions		63 offset transactions		
49.2 habitat hectares		11.23 habitat hectares		
264 'large old trees'		166 'large old trees'		
6,959 'new recruits'		13,140 'new recruits'		
Credit pricing for habitat hectares alone or habitat hectares + Large Old Trees (LOTs) between May 2006 -November 2009**				
Bioregion	Average price per habitat hectare***	Habitat hectare price range****	Total number of habitat hectares	Estimated AUS\$ volume of offsets
Goldfields	\$39,000	\$17,000 - \$86,000	35.8	\$1,396,200
Victorian Volcanic Plain	\$167,000	\$36,000 - \$293,000	49.28	\$8,229,760
Gippsland Plain	\$156,000	\$85,000 - \$250,000	4.91	\$765,960
Other bioregions	\$80,000	\$16,000 - \$157,000	6.76	\$540,800
Credit pricing for LOT credits between May 2006 - November 2009**				
Bioregion	Average price per habitat hectare***	Habitat hectare price range****	Total number of habitat hectares	Estimated AUS\$ volume of offsets
All bioregions	\$1,000	\$300 - \$2,900	426	\$426,000

* Note: Variation in habitat hectare figures between 2007/2008 and 2008/2009 reflects some pent-up demand in 2007/2008 and delays in signing contracts for trades that were agreed in 2008/2009 but will be attributed to 2009/2010.

**Note: Adapted from VIC DSE, 2009. Prices are negotiated between landowners and permit holders and are inclusive of costs of a 10-year management agreement and permanent protection. Prices may be solely for habitat hectares or habitat hectares + Large Old Trees

***Average of total agreements.

****Price range of 80% of agreements

Data Sources: Crowe, personal communication, 2009; VIC DSE, 2009⁷

Existing Programs - New South Wales

In New South Wales (NSW) approval authorities have increasingly sought offsets over the last 20 years where projects would have significant effects on biodiversity values. Traditionally the size, type, and location of NSW offsets were negotiated with approval by authorities on a case-by-case basis. Negotiation on biodiversity offsets is still frequent within NSW, but there are increasing regulations and offset schemes. These range from the local to the state level. A number of local authorities, such as Liverpool City Council, have now introduced offset policies.^{vi}

BioBanking

The New South Wales (NSW) Biodiversity Offsets and Banking Scheme (BioBanking) is a state program driven by regulatory requirements to offset impacts from urban development. As the name implies, the BioBanking program allows offset activities to occur in a 'biobank' site by third parties or by those needing credits themselves. The program calls itself a biodiversity credit market because the scheme creates: 1) a demand for credits; 2) a financial incentive to create credits; and 3) a 'trading floor' (public registry) for buyers and sellers to find one another. The BioBanking program also has an associated Assessment Methodology, Credit Calculator, and Trust Fund.^{8,9}

The BioBanking program was born in 2007 from several pieces of legislation: the Environmental Planning and Assessment Act of 1979 (NSW), the Threatened Species Conservation Act of 1995 (NSW), and the Threatened Species Conservation (Biodiversity Banking) Regulation of 2008 (NSW). Up until the fall of 2009, the program has existed as a pilot program, testing the BioBanking Assessment Methodology and process. As BioBanking has only been officially

vi Ward, personal communication, 2010

'live' since the fall of 2009, no trades have occurred but there are six BioBank sites in the application process.^{vii} Cost and price points are not yet available.

Developers can voluntarily use the BioBanking program to minimize and offset biodiversity impacts. To participate in the program, development projects must meet an 'improve-or-maintain' test that requires adherence to a mitigation hierarchy (avoid, minimize, offset), and then determines the project's impact on biodiversity. Impacts and required offsets are calculated with the BioBanking Assessment Methodology and its associated Credit Calculator software. Credits are created through protection and management (i.e., managing grazing, fire, weeds, and human disturbance) of ecological communities, threatened species, and habitat corridors. BioBanking requires a 'like-for-like' trade of credits associated with a complex number of ecosystem and species types related to 50-100 vegetation types and over 1,000 threatened species in 13 bioregions.^{10,11}

A search of the BioBanking registry 'expressions of interest' for the creation of BioBank sites yielded 15 potentially available credit types, including the following sample:^{viii} dry sclerophyll forests (shrub/grass); grassy woodlands; semi-arid woodlands (shrubby); wet sclerophyll forests (grassy).¹²

The pilot BioBanking program was set up with a public registry of available and retired credits.¹⁴ The only aspect of the registry with available information at the time of publication is the 'expressions of interest.' Experience during the pilot showed that the intended 'trading floor' – the listing of available credits – was not actually used. Instead, developers lined up the offsets

vii Nicholson, personal communication, 2009

viii Note: these credit types are a broad aggregation of all the ecosystem types that exist within them. For example, 'grassy woodlands' might encompass: white pine narrow-leaved ironbark shrubby and grassy open forest; pilliga box/poplar box/white cypress pine grassy open woodland on alluvial soils; grassy white box woodland; or other ecosystem types.¹³ See Methods Appendix for full list of credit types.



themselves. Early experience in BioBanking has shown that high upfront costs (of AUD \$50,000 - \$60,000) may dampen speculative offset development by landowners. Payments to landholders for management of offset sites are centralized through a government-managed BioBanking Trust Fund, which distributes annual payments to BioBank owners for management of the BioBank site. Landholders can charge those purchasing credits any agreed sum, but will only receive funds after the Trust Fund is paid (note that these monies or 'profits' are separate from the management funds deposited in the Trust Fund).

So far, the players in the BioBanking market are the regulator (NSW Department of Environment, Climate Change and Water, or DECCW), the buyers (developers, transportation, wind farms, and extractive industry), consultants accredited to conduct BioBanking assessments of sites, and offset brokers (e.g. Eco Logical Australia). A shift in energy policy may result in a much larger demand from wind farm development. Also NSW DECCW is considering a catchment-wide offset development strategy and sees themselves in the role of broker. As noted before, developers have been supplying their own offsets so far, but landowners could also supply offsets.

Property Vegetation Plan Offsets

While BioBanking applies to offsets for development, agricultural clearing is regulated

under NSW's Native Vegetation Act of 2003, and includes an offset scheme through the Property Vegetation Plan (PVP) process. The PVP scheme was the fore-runner to Biobanking, but the scheme applies mainly to agriculture and offsets are normally created on the landowner's land.^{ix} Because offsets within this program are 'internal' trades, there are no purchase values available. NSW DECCW keeps a register¹⁵ of the area of land cleared and offset, amongst other information. From 2005 through the end of 2009, there have been 421 PVPs approved, with 8,865 hectares of cleared or thinned land and 25,564 hectares of offset (in 2009, there were 1,983 hectares of cleared or thinned land and 7,341 hectares of offset).

Existing Programs - South Australia

Native Vegetation and Scattered Tree Offsets

South Australia features a Native Vegetation and Scattered Tree Offsets program driven by requirements in the Native Vegetation Act of 1991 and the Native Vegetation Regulations of 2003. The former requires a permit for native vegetation clearing, and the latter requires offsets, called a 'significant environmental benefit' (SEB), after a mitigation hierarchy is followed.¹⁶

When a development impacts native vegetation or scattered trees, offsets can be provided either on-site by the developer or by a payment to a government fund (Native Vegetation Fund), which then creates the offset. The offset occurs either on the property or in the same Natural Resource Management Region (with 8 regions in the state) and is created by managing, restoring, or re-vegetating areas of native vegetation. The greatest demand-driver for offsets in the region is mining, with landowners, state government, and extractive industries supplying the offsets.

^{ix} Ward, personal communication, 2010.

The program encourages ‘like-for-like’ or ‘like-for-better’ offsets. The unit of credit is based on either area or individual ‘scattered trees’ using a simple ratio system (from 2:1 to 10:1, depending on the quality of vegetation being cleared). There are three sets of guidelines for offsets for: 1) mining (which is generally applied to all broad-acre impacts), 2) clearance of scattered trees, and 3) less formal guidelines for clearing of native vegetation for individual house sites.¹⁷

South Australia is in the middle of changing legislation of the program to give preference to locating offsets in priority areas. The state is also investigating developing a new credit quantification system as well as a monitoring and evaluation framework for the offsets program. The state has one unique offset project that has allowed a tourism operation company to pay a levy to the government over a ten-year period instead of using a one-time offset. The levy is expected to bring in around AUS\$50,000 annually, with funds directed for use in biodiversity offsetting.^x

Another program being termed ‘biodiversity trading’ is the Drainage Levy-Biodiversity Conservation trading program (aka USE Project Levy/Biodiversity Offset Scheme), although the program does not require an offset for an impact to biodiversity, but rather promotes the protection and management of biodiversity as an alternative to paying a levy for drainage services. The South Australian Farmer’s Federation runs the levy offset program and conducts the assessments.^{18,19}

Existing Programs - Queensland

Queensland wins the prize for the most offset policies. There are currently three specific-issue offset programs running in Queensland: vegetation offsets, marine fish habitat offsets, and koala habitat offsets. There is also an

x Dendy, personal communication, 2010.

overarching environmental offsets policy to guide the implementation of the specific-issue offset programs, a draft biodiversity offset policy (on hold as the state government goes through an election cycle), and a draft waste water discharge offsets policy that amounts to a water trading program.²⁰ None of the Queensland programs had information available to indicate scale.

One interesting aspect of Queensland is that approximately seventy percent of the land is leasehold – meaning it is owned by the government and leased out for periods of 10-30 years, making ‘in perpetuity’ conservation associated with offsets virtually impossible in a great portion of the state. Currently the driver for all the policies in Queensland is urban development (particularly in the southeast), followed by water infrastructure (dams and supply pipelines) and coal mining.

Environmental Offsets Framework Policy

The Queensland Government Environmental Offsets Policy of 2008 does not implement a particular offset requirement, but establishes an overarching framework for a specific-issue offset policy development and implementation. The policy stipulates that a loose mitigation hierarchy (avoid and, if not possible, then minimize impacts) should be incorporated into all offsets.^{21,22}

Vegetation Management Offsets

The Vegetation Management Offsets policy (amended September 2007) was enacted to “maintain the current extent” of native vegetation.^{23,24} After following a mitigation hierarchy, the policy allows offsets to compensate for clearing native vegetation and includes a standard method for determining ecological equivalence of offsets and a standard set of offset options. The Vegetation Management Act of 1999 regulates the clearing of vegetation over

all land tenures in Queensland. Development applications that require vegetation clearing are assessed against a Regional Vegetation Management Code (RVMC). Offsets can be used to meet some of the performance requirements under the RVMC.²⁵

Applicants for native vegetation clearance may create their own offsets within a 20-km radius of the impacted vegetation. Financial donations to a compensation fund are not allowed. Impacts are measured by the area cleared and offsets are required at ratios of 1:1 to 4:1 (offset to impact). Vegetation Management Offsets are created by maintenance and protection of particular ecosystem types. Offset option guidelines are provided in table format, focusing on the differing ratios of offset to impact and 'ecological equivalence.' The offset must consider characteristics like: comparable vegetation (community attributes and condition), area, location, strategic position, regaining remnant status, and landscape context attributes.

Ecosystems are categorized by their status, 'endangered' (less than 10% of the ecosystem remaining), 'of-concern' (10-30% remaining), 'essential habitat' (vegetation in which a species that is endangered, vulnerable, rare, or near threatened has been known to occur), vegetation associated with wetlands, vegetation associated with watercourses and ecosystems at risk of falling below critical cut-offs. As of March 2009, there have been 62 native vegetation offsets required, but only eight have been finalized.²⁶ No figures are available as to the area of the offsets.

Marine Fish Habitat Offsets

The first offset policy implemented in Queensland, the marine fish habitat offsets program, is driven by compliance for impacts to activities causing fish habitat loss under the 2002 policy Mitigation and Compensation

for Activities and Works causing Marine Fish Habitat Loss FHMOP 005. The policy covers impacts on mangroves which essentially affects all coastal development in the state. It also contains a 'no net loss' statement and requires permit applicants to follow the mitigation hierarchy before offsetting the loss of fish habitat.²⁷

Direct offsets are preferred; however, the regulator (the Department of Primary Industries and Fisheries) does accept an 'offset amount' in lieu of the direct offset. Direct offsets are created through enhancement, restoration, rehabilitation, or creation of fish habitat, or the exchange or securing of fish habitat in certain circumstances. Indirect offsets include applied research and education, training, or extension related to fish habitats.²⁸



The policy includes mention of 'like-for-like' in terms of habitat types (mangrove, seagrass, saltcouch, and bare areas), habitat status, and habitat functions. There is a fish habitat impact/offset metric in development which will be based on a field assessment of fish habitat condition and the area of disturbance/gain at the impact site and offset site.^{xi}

xi
Dixon, personal communication, 2009

Koala Offsets

Queensland's Koala Offsets program is driven by compliance for impacts to koalas and koala habitat under the *Nature Conservation (Koala) Conservation Plan of 2006 and Management Program 2006-2016, Policy 2: Offsets for Net Benefit to Koalas and Koala Habitat*,^{29,30} enforced by the Nature Conservation Agreement of 1992. Activities which result in habitat loss in Koala Conservation Areas and Koala Sustainability Areas must be offset by activities such as planting of cleared habitat or securing vegetated habitat that is under threat from development.³¹ The policy allows indirect offsets like projects to reduce vehicle mortality on koalas. Fees to a compensation fund, however, are not allowed. The policy requires a net benefit to koala habitat, with offset ratios of greater than 5:1.

Existing Programs - Western Australia

The State of Western Australia has a policy and guidance for environmental offsets: *Guidance for the Assessment of Environmental Factor: Environmental Offsets – Biodiversity Guidance Statement No. 19 and Environmental Offsets Position Statement No. 9*.^{32,33} A project proponent proposes a biodiversity offsets package during the Environmental Impact Assessment process when projects impact 'high' or 'critical' value biodiversity assets. Offsets can only be considered after following a mitigation hierarchy of avoidance, minimization, rectification, and reduction. The Environmental Protection Authority reviews the 'significance' of the impact, the extent and type of offset required on a case-by-case basis; there are no standard

Some Comparative Notes on Australia's Programs

- BioBanking is the only program that requires offset activities in advance of impacts.
- All programs have at least a like-for-like preference, but the specificity of the species or ecosystem types varies by program.
- Most offsets within Australia are not converted to credits that can be traded. Some of the more definable units of trade include: ecosystem credits and threatened species credits (BioBanking); habitat hectares of ecological vegetation classes (BushBroker); 'large old trees' (BushBroker); hectares of koala habitat (Queensland); and hectares of regional ecosystems (Queensland).
- Many of the programs have loose metrics for determining impact and offset activities and generally review offsets on a case-by-case basis. Only the BioBanking (New South Wales), BushBroker (Victoria), and Native Vegetation and Scattered Tree Offsets (South Australia) have more specific impact and offset calculation methods.
- All programs also have a preference for offset activities implemented in the same area (i.e., bioregion or river catchment) as the impact.
- Two programs offer the option of paying a government entity in lieu of providing a direct offset (South Australia's Native Vegetation and Scattered Tree Offsets program and Queensland's marine fish habitat offsets).
- Government agencies act as brokers in the BioBanking, BushBroker, South Australian Native Vegetation and Scattered Tree Offsets program, Queensland's multiple offsets programs (via the new ecoFundQ initiative), and possibly other programs in a more informal capacity. Consultants may also act as formal or informal brokers, although our research only identified two – Eco Logical and EarthTrade (for BioBanking and Queensland offsets respectively).

metrics for calculating impacts and determining offsets. Priority is given for offsets in the context of 'like-for-like' or 'like-for-better', but indirect ('contributing') offsets are allowed. The policy goal is a 'net environmental benefit.' The 2008 guidance document states that offsets must be publicly registered, but to date, a registry has not been implemented.

Existing Programs - Tasmania

Development proposals in Tasmania require a 'natural values assessment' as part of the planning approval process. Developers present biodiversity offset proposals for impacts to threatened species and native vegetation communities to the regulator (the Department of Primary Industries, Parks, Water and Environment) for approval. Offsets are determined on a case-by-case approach, as there is no standard method for calculating impact and determining offsets. Developers are required to follow the mitigation hierarchy. The offset can be created via conservation measures or management activities, some examples of which are: improved conservation status of a site, management actions, restoration or revegetation, and research or surveys. Direct offsets are preferred, but indirect offsets may be allowed. At one point, payments to the regulator were allowed, but this practice is no longer preferred.^{34,35}

Offsets are also negotiated under different guidance specific to dam construction and forest clearing proposals. Also in Tasmania, Kingborough Council (local government) has been using offsets through the development application process for several years in an informal manner. Offsets are negotiated on a case-by-case basis. The Council has a draft biodiversity offset policy in place and is developing a new metric and implementation framework for the policy. As of 2008, there were 15 offset negotiations underway.³⁶



Existing Programs - New Zealand

The Resource Management Act of 1991 (NZ) and the Conservation Act of 1987 (NZ) implicitly suggest that biodiversity compensation may be required on private land and public land (respectively).³⁷ However, in practice the mitigation hierarchy of 'avoid, then remedy, then mitigate' has been described as being implemented in parallel: 'avoid OR remedy OR mitigate.'^{xii} There is concern in New Zealand that the current form of offsets may be used as a means to leverage development projects that would not otherwise be allowed.³⁸ To counter this threat, the Department of Conservation is leading a cross-department research program to both explore barriers to implementation of biodiversity offsets in New Zealand and to pilot offset measurement and accounting methods. As well, case law is moving in the direction of biodiversity compensation but rigorous offsets have yet to emerge, with one exception: a BBOP pilot project, Solid Energy New Zealand's Strongman Coalmine, includes measurement of impact and offset.

xii
Stephens, personal communication, 2009

Developments

Commonwealth Government

The Australia Federal government under the Environmental Protection and Biodiversity Conservation Act (EPBC) of 1999 released a draft policy statement and a discussion paper for the use of environmental offsets in November 2007.³⁹ Offsets can be used to meet the ‘maintain or enhance’ requirement under the EPBC, and it is proposed that they will be considered on a case-by-case basis, taking into consideration the scale and intensity of the impact. The offsets should be ‘like-for-like’ and be in the general vicinity of the development site.^{40,41} To date there has been no further public progress of this policy.

Queensland

Queensland is developing a ‘specific-issue’ **biodiversity offsets policy** under the Environmental Offsets framework.⁴² A consultation draft was made available in December of 2008, with a public comment period extending until March 2009. However, the final policy was postponed due to a state government election. After the March election, several government departments were amalgamated and the newly combined agency – the Department of Environment and Resource Management – will be releasing a new proposal for a State biodiversity offsets policy.^{xiii}

Further, Queensland local government authorities are also implementing their own local **offset policies in the planning process** in addition to the state government policies, such as the South East Queensland Regional Plan 2009 – 2013 and the South East Queensland Natural Resource Management Plan 2009 – 2013.⁴³ As the plans have only recently been released, the details of the new ‘offset’ programs are not yet known.

xiii Gane, personal communication, 2009

Another aspect of offset programs in Queensland is **ecoFundQ** – an initiative that is focusing on establishing an environmental offset market. ecoFundQ is a project of the Queensland Government that aims to find and secure offsets for Queensland government agencies (a broker), but with a broader aim of working on environmental offsets’ supply-side infrastructure. The initiative was launched in March of 2008 with initial work focusing on voluntary carbon offsets, but language suggests the program intends to be used for multiple environmental offsets.⁴⁴

Northern Territory

There is no biodiversity offset program in Northern Territory but within the recent draft **Darwin Harbour Regional Management Strategic Framework 2009-2013**, there may be a role for offsets. The draft plan states that economic development should not impose a net negative environmental impact and mentions offsets as a means of minimizing unavoidable impact. At this point offsets are in a very early stage of development.⁴⁵

New Zealand

In the **Waikato region**, there is interest in **biodiversity offsets**, and the concept is being advanced in a review of the Regional Policy Statement. The region will adopt the principles of avoiding or mitigating before offsetting, and it will reserve the right to reject offsets in areas of high significance.^{xiv}

xiv Bosak, personal communication, 2009

World Trends



Introduction

There was a day when a farmer sitting in his kitchen selling corn futures on an electronic trading platform would have sounded as futuristic as Buck Rogers, but as we all know, that scene is relatively commonplace these days. Biodiversity markets are on that same trajectory from futuristic to unremarkable. Already governments and industry are increasingly looking toward market-like systems for biodiversity compensation and offsetting to better manage and minimize their impacts on biodiversity.

Our research finds 39 existing programs around the world, and another 25 in various stages of development or investigation. The global market size is \$1.8-\$2.9 billion at minimum, and likely more, as 80% of existing programs are not transparent enough to estimate their market size. And the conservation impact of this market includes at least 86,000 hectares per annum of land under some sort of conservation management or permanent legal protection.

While these numbers are encouraging, perhaps even more important are the many signs that the industry is tackling the critical and sometimes unpopular issues that surround these markets: quality assurance, accounting, transparency; all issues that will allow a fair, stable, and effective market to form, one that may be as ordinary as commodity futures are today.

Global Activity and Interest

Despite the global economic downturn that buffeted world markets in 2008, we are still seeing steady activity and strong interest in biodiversity markets. Regions with developed mitigation systems are not experiencing much market growth, but continue to see credit sales, perhaps because of the consistent mitigation needs of government and public infrastructure development. In regions without developed mitigation laws and markets, there is strong interest.

At the global scale, institutions are exploring market-like mechanisms to reduce biodiversity loss. In preparation for the Convention on Biological Diversity's 10th Conference of the Parties this year in Nagoya, Japan, workshops are being held to consider how biodiversity offsets and innovative financial mechanisms might fit into the Convention. There is a recently formed Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES)¹ to consider strategies to strengthen the science-policy interface for biodiversity and ecosystem services, much the way the IPCC (Intergovernmental Panel on Climate Change) supported policy development on climate change and carbon markets.

At the regional scale, we're also seeing interest in developing and improving biodiversity offset policy. Research has been undertaken for the European Commission during 2009 to examine the potential use of habitat banking in the European Union (EU) as an economic instrument for biodiversity protection. The United Nations Development Program is

leading an investigation into the potential for biodiversity mitigation markets in Latin America and the Caribbean. The United Kingdom is researching the potential of habitat banking to improve biodiversity protection. And in the US, the Environmental Protection Agency (EPA) and the US Army Corps of Engineers (USACE) have begun implementing 2008 regulations to improve the functioning of the mitigation markets in the US.

Quality Concerns and Strategic Planning

All the activity and interest in biodiversity markets has led to greater scrutiny of market design, practice, and outcomes. And rightly so. Markets are complex tools and only as beneficent as those who wield them... as we learned recently from Wall Street and the financial markets.

We are seeing NGOs and governments alike taking steps to ensure a strategic and landscape-scale approach to biodiversity offsets and compensation. Efforts in North America include the Environmental Law Institute's and The Nature Conservancy's recommendations for strategic placement of wetland and endangered species mitigation.² In countries like Mongolia and Colombia, TNC is beginning to implement its Development by Design landscape planning methodology.³ And in Australia, New South Wales is considering a catchment-wide offset development strategy for their BioBanking program,⁴ while South Australia is in the middle of changing legislation of the program to give preference to offsets in priority areas.¹

Ensuring that compensation efforts contribute to broader landscape-level planning goals may be considered a best practice principle for biodiversity offsets. One initiative in

¹ Tim Dendy, personal communication, 2009



particular has been developing, testing and disseminating best practice on biodiversity offsets since 2004. The Business and Biodiversity Offsets Programme (BBOP, a sister initiative to Ecosystem Marketplace) is an international partnership of more than 40 leading conservation and civil society organizations, companies, governments and financial institutions. BBOP's work is based on on-the-ground experiences on biodiversity offset design with pilot projects around the world. At the completion of its first phase of work in 2009, the BBOP partners unanimously agreed to a set of biodiversity offset best practice principles and published a toolkit with methodologies for biodiversity offset design and implementation. The complete toolkit can be found at <http://bbop.forest-trends.org/guidelines/>.

Over the next several years, BBOP aims to make biodiversity offsets a more routine aspect of public and private infrastructure development projects. To do this it will involve more partners developing more pilot projects in order to improve offset design and implementation guidelines based on broader practical experience. BBOP will support a handful of governments at the national and state levels to develop policy frameworks that incorporate no net loss. A training and capacity-building program will help ensure there are enough professionals to support

companies as they design and implement high quality biodiversity offsets. BBOP is also developing tools to provide assurance that biodiversity offset projects are adhering to best practice principles, and eventually hopes to establish internationally agreed standards for biodiversity offsets.

Metrics and Accounting

In addition to efforts to improve compensation and offset strategy, the very units and systems we use to calculate ecological performance and success are under review. In New Zealand, there is an initiative to develop a measurement system based on susceptibility to loss.ⁱⁱ Similarly, Mandel et al. from Cornell University recently proposed a market for derivatives based on species decline or extinction risk. The derivatives market would provide a financial incentive to keep species from getting close to extinction and decrease the high costs of last-minute recovery for those that do.⁵ And finally, we've heard of the first example of an adaptive management financial security for a mitigation bank in the US. If a regulator finds new evidence that changes the habitat or restoration necessary for a species from what was originally agreed upon in the conservation banking agreement, the adaptive management security would provide finances for additional measures.ⁱⁱⁱ

It is also becoming apparent that we must soon deal with multiple ecosystem service credits and the issue of stacking credits. We are beginning to see conflicts arise because of ambiguity and lack of consensus in this area of credit accounting. In the US, a new office called the Office of Environmental Markets has been created to provide technical guidance and develop methods of measurement for all ecosystem services in the US. In an effort

ii Stephens, personal communication, 2009
iii Monaghan, personal communication, 2009

to gain some clarity on stacking in the US a coalition of organizations, including Electric Power Research Institute and World Resources Institute, has just launched a national survey to compile protocols, case studies, and opinions on credit stacking. There are also several scalable methods being developed in the US to calculate credits for multiple ecosystem credit types, including the Willamette Partnership's multiple credit accounting system, a related Defenders of Wildlife's Habitat/Biodiversity Metric Project, and the Northwest Habitat Institute's HAB Accounting and Appraisal System.^{iv}

Infrastructure and Capacity

In response to accounting challenges and economic and environmental opportunities, a number of efforts to bring transparency, credibility, and access to the markets are developing. Publications such as this one and those of groups like the Environmental Law Institute and World Resources Institute aim to provide information and understanding of the markets. However there is still much to be done. In almost all cases, basic information is fragmented and requires collection and analysis. SpeciesBanking.com, for example, is the first comprehensive information clearinghouse for an industry that is more than 15 years old. Like in all markets, increased transparency will inform decision making, improve accountability, and raise investor confidence.

Information tracking systems and credit registries are being adopted by regulators and industry alike to ensure better accounting of credits - and ultimately the credibility of the products and marketplace. Market Environmental Registry (formerly TZ1) has launched an integrated multi-credit registry that serves multiple programs, including: the

iv Vickerman, personal communication, 2010, O'Neill, personal communication, 2010

Malua BioBank, the Willamette Partnership's multi-credit marketplace, the Bay Bank, and will soon add a pilot registry for conservation banks in the Sacramento area in California. On a national scale, the expansion of the USACE's tracking system RIBITS promises administrative efficiencies and greater transparency for both regulators and practitioners. While on the other side of the globe, the Australian states of New South Wales, Victoria, and Queensland also have tracking systems in place or in development.^{6,7} Together these and other initiatives are forming the institutional infrastructure and capacity for effective and efficient biodiversity markets.

The Days Ahead

While the day that a farmer gives up the tractor to become an eco-day trader may not be around the corner, we are encouraged by the ideas, institutions, and tools under development around the world to provide any land steward a compelling financial incentive to restore or preserve biodiversity on their property.

We look forward to seeing what the future holds and hope that 2010, the International Year of Biodiversity, is an auspicious start.

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