FULL REPORT

FOREST AND LAND USE POLICIES ON PRIVATE LANDS: AN INTERNATIONAL COMPARISON

ARGENTINA, BRAZIL, CANADA, CHINA, FRANCE, GERMANY, AND THE UNITED STATES

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The Land Use Initiative (INPUT – Iniciativa para o Uso da Terra) is a dedicated team of specialists who work at the forefront of how to increase environmental protection and food production. INPUT engages stakeholders in Brazil's public and private sectors and maps the challenges for a better management of its natural resources. Research conducted under INPUT is generously supported by the Children's Investment Fund Foundation (CIFF) through a grant to the Climate Policy Initiative. www.inputbrasil.org

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INTRODUCTION

Under the Paris Climate Agreement, Brazil has committed to taking concrete steps to restore land and protect its forests. The new Brazilian Forest Code (Law No. 12.651/2012) governs the use and protection of public and private lands in Brazil and is one of the most significant pieces of legislation with the potential to drive efficient land use in the country and become an effective tool against climate change.

Other important agricultural producing countries are also striving to develop their rural economy while protecting their natural resources.

This exploratory legal analysis compares forest protection and land use legislation of some of the world's top ten exporters of agricultural products, including Argentina, Brazil, Canada, China, France, Germany and the United States, in order to understand:

- What does compliance with the Brazilian Forest Code mean compared to what other countries are required to do by law?

- What, aside from regulation, are the other tools available to achieve conservation of vegetation?

This study primarily focuses on answering the first question by investigating whether other countries have limitations on the use of private rural properties similar those imposed by the Brazilian Forest Code. It does this by establishing a comparative legal framework that analyzes:

(i) riparian buffer zones and other ecological buffer policies; and

(ii) biodiversity conservation policies.

The results of this comparison are expected to benefit countries with relevant climate and environmental commitments, providing transparency about each country's contributions to the development of a low-carbon development pathway. In addition, instruments used by other countries provide lessons learned and shed light on tools that could be applied to improve forest conservation and compliance with the Forest Code in Brazil.

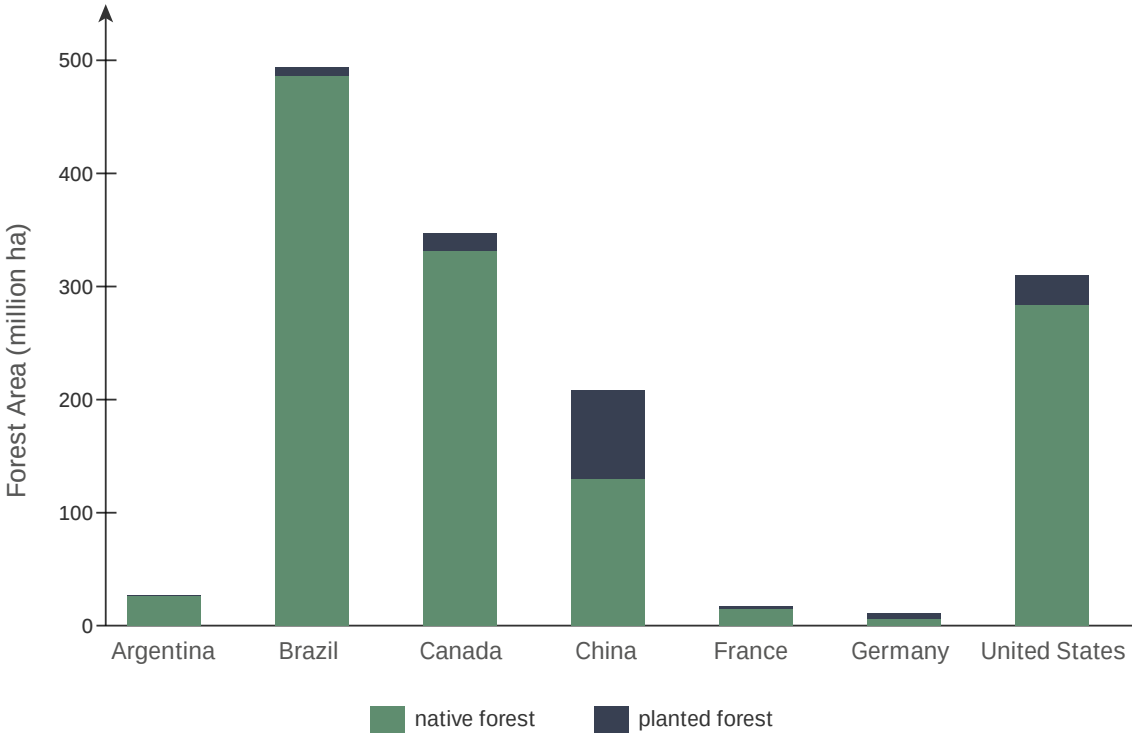
What emerges from this analysis is that although the new Forest Code has, to some degree weakened, the parameters of native vegetation protection, particularly in areas illegally used for agricultural activities before 2008, it still retains a relatively stringent set of rules for private lands compared to the regulations of other reviewed countries. Nevertheless, the Forest Code will only be able to promote the sustainability of Brazilian agricultural production if it is fully and effectively implemented and enforced.

This full report provides a brief overview of the forestry landscape as well as the methodology and major findings of the analysis. It includes two tables that summarize key differences among the countries in how they govern riparian buffer zones and biodiversity conservation. The appendix provides a more detailed legal analysis of each country's policies.

FORESTRY LANDSCAPE

The countries in this study differ greatly in their geography and amount of forest cover.[1] Figure 1 shows that, amongst the compared countries, Brazil has the most extensive forest area, roughly 490 million hectares. Another important characteristic of the Brazilian forests is the predominance of native forests, with only a minimal percentage of planted forests (FAO 2015).

Figure 1: Total Forest Area per Country, 2015

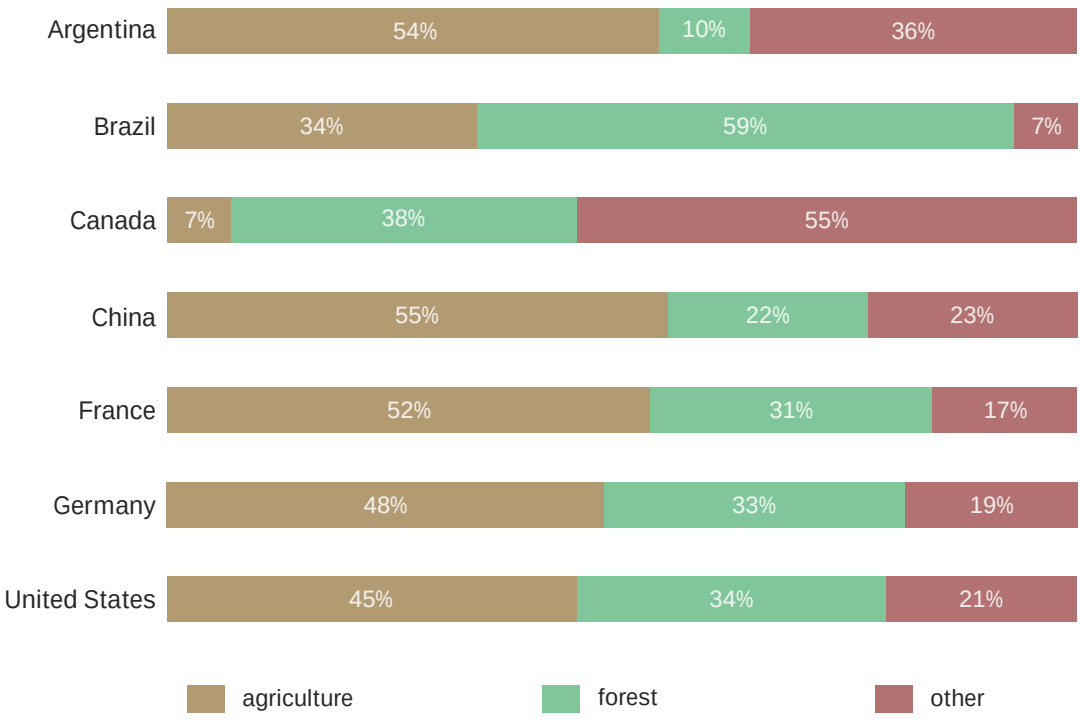


Source: FAO, 2015

1 The forest data used in this study covers forests as defined by FAO: land spanning more than 0.5 hectares with trees higher than 5 meters and a canopy cover of more than 10 percent, or trees able to reach these thresholds in situ. It does not include land that is predominantly under agricultural or urban land use (FAO 2012).

Figure 2 shows that the area of productive land also varies greatly among selected countries. For instance, although Brazil has an average forest cover of 59%, almost double that of the other countries, agriculture land occupies just 34% of its territory, most of which is used for cattle production. In France, on the other hand, forest areas cover 31% of its territory, but agriculture land covers over 52% of the country.

Figure 2: Land Use by Country, 2014



Source: FAO, 2017

How land is divided in countries creates different pressures for how countries address conservation, leading to distinct policy approaches.

While some of the assessed countries still have vast extensions of preserved native vegetation and forest policies focused on conservation, such as Brazil and Canada, other countries have enacted policies focused on recovering and protecting forests, often including some sort of compensation, such as China, France and Germany.

For example, China, after losing almost all its native forests, is now striving to increase the amount of area covered by forests. For a long time, the official government policy encouraged the planting of exotic rapid-growth species to supply raw industrial materials. However, the Chinese government recently adopted a new forest policy that aims to repopulate areas that are deemed more ecologically sensitive with native species and to protect the remaining natural forests (Zhang et al. 2000).

Western Europe's forest history differs substantially from most other countries covered in this project. Traditional agricultural practices, shaped over the centuries, have created rich landscape diversity and many of the semi-natural habitat types in Europe are dependent on the continuation of appropriate farm management (European Commission 2012). Moreover, traditional agricultural landscapes form part of the cultural European heritage. The conservation of farmed ecosystems is an explicit objective of the European Union's (EU) environment and rural development policies (European Commission 2017). To achieve biodiversity protection goals in rural areas, the EU provides economic incentives and advice to landholders for a continuation of wildlife-friendly forest and farming practices.

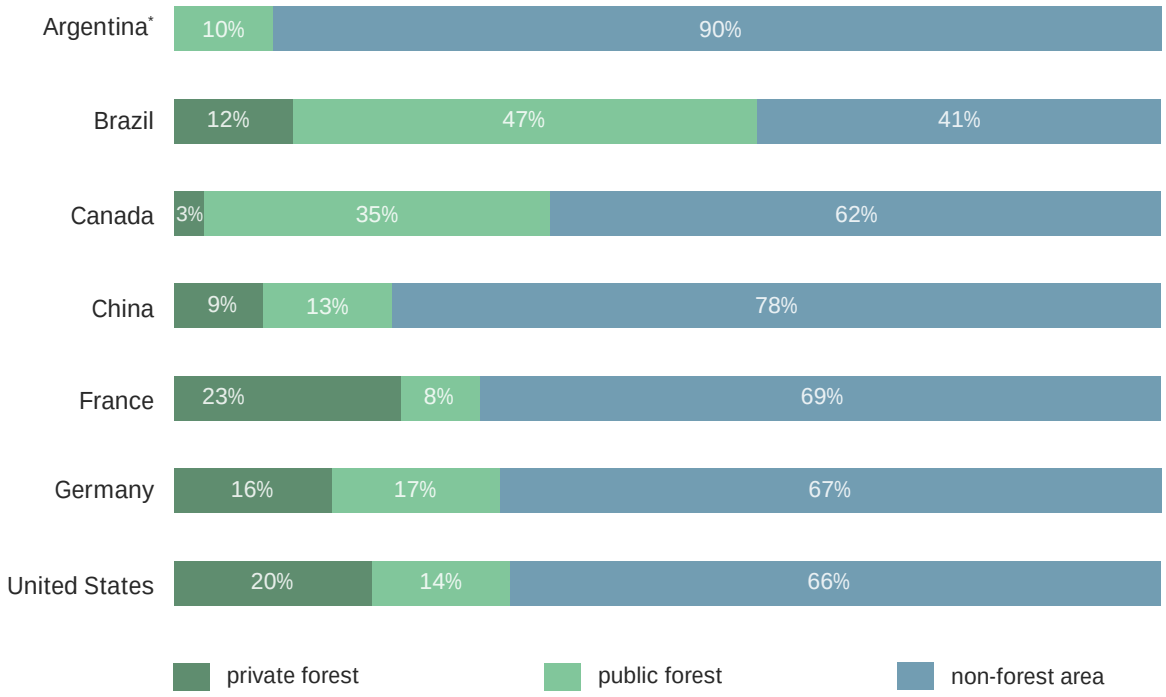
Brazil's approach to forest preservation has evolved over the years, responding to an evolving landscape with new pressures for conservation. In 1934 Brazil passed its first Forest Code, which was motivated more by the demand to regulate logging activities than to protect the forests' environmental benefits. A more modern version of the code was enacted in 1965, which increased forest protection substantially; however, enforcement of these tougher rules languished (Chiavari and Lopes 2015).

In the early 1990s, the rate of deforestation in the Amazon was once again on the rise, peaking in 1995. The imminent publication of the official deforestation statistics showing the rise of deforestation in the Amazon and worries about the national image abroad arguably pushed the Brazilian government into adopting tighter controls (Benjamin 2000 and Cunha 2013). The result was the Provisional Measure 1511 of July 25, 1996, which altered the 1965 Forest Code to increase protection of natural vegetation in rural properties in the Amazon. This change in legislation generated strong reactions from the productive sector and from its representatives in Congress, and ended up stimulating a movement in favor of its revision (Chiavari and Lopes 2016).

After more than a decade of intense dispute and after concessions by both environmentalists and rural producers, the new Forest Code was enacted in 2012. It retains the same structure and basic concepts as the old code but offers greater leniency for areas that were deforested prior to July 2008. Small landholders with these areas inside their properties receive even more benefits than large landholders. It also establishes new instruments to help ensure compliance with the legislation (Chiavari and Lopes 2015).

In addition to the different pressures countries face in their land use, they also vary in how forest is divided between public and private lands. Figure 3 shows that, in most countries, forests are divided evenly between public and private lands. Forest ownership in Canada is mostly public, unlike in France where most of the forests are located primarily on private land (FAO 2015).

Figure 3: Percentage of Public and Private Forest Cover by Country, 2015



* Data on private forest area not available

Source: FAO, 2015

Many countries adopt different forest policies depending on whether landownership is public or private. In Brazil, the rules of the Forest Code are equally applicable to public and private lands. On the other hand, the French Forest Code establishes two different juridical procedures, one for public and the other for private forests. The French public forests follow a stricter legal regime than the private ones. Canada has a particularly strict legal regime that is applicable only in public forestlands, which represent the majority of forestlands in the country.

Results from the legal analysis should be interpreted in the light of these differences and the peculiarities of each country regarding forest extension, forest ecosystems, and forest characteristics (e.g., native or planted).

METHODOLOGY

Countries for comparison were selected from the world's top ten exporters of agricultural products based on data from Food and Agriculture Organization of the United Nations (FAO). These include Argentina, Brazil, Canada, China, France, Germany, and the United States.

The study does not assess the application and compliance of the rules imposed by the examined legislation, nor does it evaluate the effectiveness of the identified policies. It strictly provides a legal analysis of forest protection and land use legislation in force in the selected countries, and it presents a framework with a series of indicators to compare countries' policies.

Challenges for mapping the legislation

CPI researchers conducted an ample literature review and examined the applicable legislation from every one of the selected countries. This information was supplemented with data collected through a questionnaire distributed to agricultural attachés working in Brazilian embassies and to a network of local law firms based in selected countries covered in the study. A large number of specialists provided valuable feedback and input to the legal analysis presented in this study through a peer review process.

The different languages of some of the selected countries created an obstacle in this review. Researchers had to rely on the English translation of the legislation, which was not always available. In these cases, analysis was based on existing literature and experts' consultation.

Another barrier was identifying the most recent status of the legislation and whether it was actually in force – in other words, whether it was legally operative. Environmental legislation is dynamic and evolves quickly, and it has recently been amended in several countries.

A relevant issue that arose from the mapping exercise was that in several countries, especially those with a federal structure, such as the United States, Argentina, and Germany, the police powers and regulation of health, safety, environment, and land-use planning are the realm of the states and/or local governments. In the United States, for example, anything not specifically assigned to the federal government under the Constitution is in the hands of the state, but the tension between the states and the federal government is long-standing and the contours are hard to determine. Even in countries with a more centralized structure, provinces and regions are often granted administrative and normative autonomy, as is the case of China and France. Therefore, in addition to reviewing the pertinent national legislation, it was also important to analyze legislation from key states and provinces from each of the selected countries.

Analysis for member countries of the EU required an additional layer of consideration. Since the legal framework of the EU includes several directives on environmental and agricultural matters that are binding on all member states, CPI researchers also reviewed these directives so that CPI could, a posteriori, analyze how each of the selected European countries implemented the guidance from the European Union within their national laws.

Challenges in comparing forest protection and land use laws and policies

The comparison of forest laws and policies from different countries is very challenging, especially when this analysis involves countries from different legal traditions, such as civil law (Romano-Germanic legal family) and common law.

It is particularly difficult to identify common trends among policies that govern land use and forest protection since these are commonly defined by national and sub-national governments in very different ways. For example, forest and land use policies can be set through voluntary or mandatory rules. In addition, policies may focus exclusively on procedural rules or may be 'substantive,' specifying on-the-

ground behavior (MacDermott et al. 2010). For example, requiring that certain management objectives, such as riparian protection, be addressed in management plans is different from prescribing specific on-the-ground practices, such as the establishment of a 30-meter buffer zone. This does not imply that one approach is necessarily better than the other. However, it imposes non-trivial comparison challenges.

KEY FINDINGS

Over recent years, most of the countries assessed significantly changed their national forest policies, adopting a more stringent posture and assigning greater importance to the environmental value of forests. While an environmental component is present in all forest policies analyzed, in most countries these policies focus mainly on economic activity. Most countries adopt other kinds of policies, such as water resources, soil, biodiversity, protected areas, at-risk species, and landscape protection policies to protect forests and natural habitats with the objective of preserving biodiversity, aquatic ecosystems, and soil.

Key findings from the two analyses are summarized below and Tables 1 and 2 provide a synthesized overview.

Riparian buffer zones and other ecological buffers (see Table 1)

Of all the countries considered in the study, Brazil has the most stringent rules on private land regarding riparian buffer zones and other ecological buffers. Most of the analyzed countries allow some degree of forest management and agricultural activities. Some countries do not establish minimum widths for riparian buffer zones, and in many countries, landowners can apply for compensation due to income loss.

Countries adopt rules on riparian buffer zones and other ecological buffers for different reasons. Depending on the objective of the riparian buffer zones, the size of vegetation strip varies greatly. In Brazil, riparian buffer zone policies aim at protecting both water resources and biodiversity. Therefore, vegetation in that zone must be fully preserved as a no-harvest zone, and, if destroyed for any reason, it must be recovered using only native species. On the other hand, in countries where riparian buffer zone policies aim exclusively at protecting water quality, such as nitrate reduction, legislation merely requires landowners to keep a strip of grass, shrubs, or tree vegetation.

Examples from selected countries

- Brazil's riparian buffer zones are by far the largest of all the countries studied. The Brazilian riparian no-harvest zone varies from 30 to 500 meters wide depending on the width of the river. However, landowners who fall under a special regime are allowed to maintain and restore smaller areas. Under this special regime, riparian zone protection varies from five to 100 meters wide.

• In Germany, the Federal Water Act prescribes a minimum width of five meters for compulsory buffer zones, which is applicable only to non-built-up areas. Agriculture and the application of fertilizers are still allowed in these zones as long as good agricultural practices are adopted. However, the conversion from grassland to cultivated land is forbidden and sustainable forest management is permitted. Removing naturally occurring trees and bushes is prohibited unless done in accordance with good forestry practice. Regulations in federal states can be stricter than the federal law.

• Canada does not have any federal legislation establishing mandatory riparian buffer zones, but almost all provinces have developed substantive rules for buffer zone protection. The province of Quebec, for example, has a protection policy for lakeshores, riverbanks, littoral zones, and floodplains. The width of the shore or bank to be protected varies from 10 to 15 meters, and cultivation of soil for agricultural purposes may be permitted provided that a strip of vegetation, at least three meters wide, is preserved.

• In the United States, no comprehensive federal statutory law exists that deals directly with riparian buffer width, since the federal government, at least in theory, cannot engage in land-use planning. This is identified as the realm of the states. Some states developed guidelines to protect and manage forest riparian resources. In general, states have no mandatory buffer rules. Some develop riparian zone guidelines applicable only to forestlands and almost none regulate agriculture riparian buffers. Very few states have no-harvest riparian zones. A commonly recommended riparian management zone is 15 meters wide, but the specific guidelines in each state vary tremendously. Riparian rules are often regulated not only at state level but also at county and local government level. Many states have water or public utility districts that establish such rules, which means that there are several layers of government regarding riparian zones. In fact, to identify a riparian setback for a particular river, it is necessary to look at federal, state, county, and water district rules.

• In France, the protection of riparian areas stems from the eco-conditionality rules of the Common Agricultural Policy (CAP), from the EU Nitrates Directive, and, more recently, from the “Grenelle II Law”. According to the French Rural and Maritime Fishing Code, farmers who receive financial aid from the EU must keep a strip of vegetation (grass, shrubs, or trees) of at least five meters along watercourses, serving as buffer zone between watercourses and plantations. The areas classified as nitrate vulnerable zones must also keep a riparian vegetated strip of five meters. The “Grenelle II Law” has expanded the application of mandatory riparian buffer rules to water bodies listed by an administrative authority. Furthermore, the French Environmental Code establishes the protection of a network of ecological corridors, known as Trame verte et bleue (TVA), that can also play an important role in the protection of riparian zones. The water bed and the terrestrial ecosystems on each side of the water body identified by the authorities in the scope of the TVA must have its riparian area preserved.

- Chinese law establishes that the holders of land rights have the general obligation to build plant protection bands on both sides of rives and in the areas surrounding lakes and reservoirs. However, the law does not establish the width, vegetation or legal regime of the plant protection bands. Moreover, the law does not assign legal responsibility and sanctions for non-compliance.

- Argentina does not establish mandatory riparian buffer zones.

Biodiversity conservation (see Table 2)

Biodiversity conservation has been established as a core goal of sustainable forest and land management in all of the reviewed countries' policies. The main policies adopted by assessed countries to protect biodiversity in private lands include: protected areas, the identification and protection of species at risk and their habitats, forest zoning, and the conversion of forest land to non-forest land. Among the cases covered in this study, Brazil is the only country that requires all private properties to set-aside land for biodiversity protection (known as Legal Forest Reserves) without any compensation. In the other reviewed countries, limitations on the use of private properties do not apply equally to all properties. For example, in these countries, forest zoning policies and the conversion of forestland for other uses only apply to forestland properties. Agricultural lands are not necessarily subject to these regulations and limitations as in Brazil.

The concretization and implementation of the biodiversity conservation measures in federal countries lies mainly with the states, provinces, and local authorities. In consequence, regulations, concepts, methods, and land use limitations within the countries are diverse. In Germany, the Federal Forest Act is the legal basis for the states to enact their own legal provisions regarding the legal status of forests. For instance, Bavaria adopted ten different classifications for forest reserves, each with its own legal status. These include areas that forbid any kind of forest activity; forests where forest activity is admitted, but cannot be converted to other uses; and forests where conversion to other uses is permitted but must be previously authorized. Canadian provinces have enacted legislation that specially protects biodiversity and endangered species. Provincial legislation varies greatly. While some provinces do not have specific legislation to protect endangered species, the Quebec Act Respecting Threatened or Vulnerable Species requires the protection of both species and habitat on all lands, public and private.

Protected areas: Although most of the fully preserved protected areas fall under public domain, in some countries, such as Brazil, Canada, Germany, and the United States, they can also be created on a voluntary basis by private owners. Less strictly protected areas on private lands can be instituted by law or by legal agreements such as easements or covenants. Some countries, such as Argentina, Canada and the Unites States, provide economic incentives to promote the creation of privately protected areas, while other countries, such as France and Germany, do not provide any incentives since the creation of protected areas is regarded as a state responsibility.

Examples from selected countries

- In Brazil, two of the more common categories of protected areas in private properties are: Private Natural Heritage Reserves (RPPN) and Areas of Environmental Protection (APA) (IUCN category V). RPPN are created voluntarily by the landowners and provide a high level of biodiversity protection. APA are the most common typology of protected areas in private properties. They can be created by the federal, state and local governments, and in these areas agriculture and livestock activities are permitted provided that they are carried out on a sustainable basis.

- Conservation easements are one of the primary tools used in the United States for conserving biodiversity on private land. Conservation easements permanently limit uses of the land in order to protect its conservation value and prevent development. The hallmark of a conservation easement in the United States is that they are all different. Many of them may allow farming, forestry, and ranching, but others might be very specific and set rules about habitat conservation and riparian buffers.

- In Canada, protected areas in private lands are usually voluntary and landowners receive government incentives. Canada also uses conservation easements as a tool to protect biodiversity on private lands.

- Natura 2000, a network of protected areas, which also allows the interchange of species, is the core pillar of the EU's biodiversity conservation policy, besides international obligations like the Bern Convention, Bonn Convention, and Ramsar Convention. The network is established and managed according to the legally-binding provisions of the EU Birds Directive and the EU Habitats Directive. Natura 2000 sites include public and privately owned lands, as well as both strictly protected nature reserves and protected areas where human activities are allowed. It can allow for the continuation of land uses (e.g., agriculture, forestry) as long as they do not significantly compromise conservation objectives for habitats and species within and beyond the network. In France, , the government can create protected areas, such as national parks and nature reserves, on private lands without any compensation. In Germany, the Federal Nature Conservation Act contains strict conservation areas as nature reserves, national parks, or prospected landscapes. Conservation areas can be designated on public as well as on private lands.

Species at Risk policies: All assessed countries adopt species at risk policies as an important instrument to conserve biodiversity, including prohibitions on killing endangered species and requirements to protect their habitat.

Examples from selected countries

- In Canada, at the national level, the Species at Risk Act (SARA) is the main policy to protect biodiversity that imposes some degree of limitation on private land use. The

main objectives of the act include prohibiting the killing of extirpated, endangered, or threatened species and the destruction of the critical habitats of designated species anywhere in Canada. On private lands, the general prohibitions apply mainly to aquatic species and migratory birds. However, there are other norms which can be issued pursuant to SARA to protect critical habitat on private land.

- The United States Endangered Species Act (ESA) aims at protecting and recovering imperiled species and the ecosystems upon which they depend. The ESA requires the government to list species as endangered or threatened and to undertake steps to bring about the recovery of that species. The law prevents the federal government from undertaking or approving any activity that will risk the continued existence of a species or adversely modify critical habitat. In private lands, the act protects endangered and threatened species and their habitats by prohibiting the harm, hunt, capture or collection of listed animals, as well as interstate or international trade of listed plants and animals, except under federal permit. Such permits generally are available for conservation and scientific purposes. However, private landowners can apply for a permit that allows them to conduct activities that may damage endangered and threatened species and their habitats, provided that they submit a habitat conservation plan to minimize their impacts and perhaps create another habitat. The US Healthy Forests Reserve Program helps landowners restore, enhance, and protect forestland resources on private lands through easements and financial assistance and aids in the recovery of endangered and threatened species under the ESA.

- Brazilian legislation also establishes a list of endangered and threatened species and bans their capture, harm, commercialization, among other actions, without a permit.

- In the EU, the Natura 2000 network is the core policy for the conservation, restoration, and monitoring of endangered and threatened species and their habitats. Member states may have stronger national frameworks. For instance, in France, the protection of species at risk relies on the Law on Nature of 1976 that establishes the mechanism to list endangered and threatened species at national and local levels.

- China also has a policy to protect endangered and threatened species and their habitats. The Nature Reserve System draws a certain area for typical ecosystems and concentrated areas of endangered wild fauna and flora, allowing only protection, scientific research, and tourist appreciation activities with prior permission. In addition, the Wildlife Conservation Law of the People's Republic of China, revised in 2016, establishes a list of endangered and threatened wild animals, prohibiting their capture, harm, and commercialization without a permit.

Forest zoning policies: Forest zoning policies of assessed countries impose different types of forest land limitations, ranging from fully protecting forests to granting permission to convert forests into other land uses.

Examples from selected countries

- The Chinese Forest Law classifies Chinese forests into five categories: (i) protection forests; (ii) timber forests; (iii) economic forests; (iv) fuel forests; and (v) special-purpose forests. These categories can be further classified as either for public benefit or commercial use. If a forest is identified as a public benefit forest (protection forest or special-purpose forest), it is supposed to remain in a natural state to provide ecological and human health benefits.

- Argentina's Forest Law classifies existing forest into three conservation categories. Category I is comprised of areas with a high conservation value and must be fully preserved, allowing only protection, research, and tourism. Category II relates to areas with a medium conservation value where their resources can be exploited in a sustainable manner. Category III is made up of areas with a low preservation value, thus allowing for the conversion of woods into other land uses, such as agriculture, raising livestock, and planting exotic species. Every Argentinian Province must promote forest zoning in its territory, establishing different conservation categories.

- Forest areas can be designated as protection forest in Germany, if this is necessary to avert or avoid hazards, significant detriment, or significant nuisance for the public. Moreover, federal states usually promote forest zoning policies to manage their forests. For instance, Bavaria adopted ten different classifications for forest reserves, each with its own legal status.

- In Brazil, the Brazilian Forest Law requires that rural landowners designate and maintain a percentage of their property area, under forest cover, as Legal Forest Reserve. The goal is to preserve the remnants of native vegetation on rural lands and to conserve biodiversity. This protected percentage varies from 20 to 80% depending on the type of vegetation present and the property's geographical location in the country. The Brazilian Forest Code framework requires all landowners to restore deforested areas on their properties. However, landowners who fall under a special regime have the option to offset their own Legal Forest Reserve requirements through a different property. Furthermore, landowners with small properties are given extra leniency—under the special regime they are allowed to designate their Legal Forest Reserve based on the native vegetation existing on that land prior to July 2008. States in the Amazon basin have special forest zoning regulations. Properties within the Atlantic Forest biome must follow stricter rules.

Regulations on the conversion of forest lands to non-forest lands: Most countries have adopted regulations on the conversion of forest lands to non-forest lands. Some policies are very restrictive aiming at preserving the total remaining forests of the country.

Examples from selected countries

- The Chinese Forest Law prohibits the conversion of forest lands into non-forest lands.

- In Germany, the Federal Forest Act requires government permission to convert forest lands to agriculture and other uses, and it prohibits the granting of deforestation permits

if the use is considered to be against the public interest. However, in some cases where deforestation is considered to be against the public interest, the government does have a margin of discretion to allow it. The rights, duties, and interests of the forest owners are weighted against the needs of the general public.

- The conversion of forest into other land uses in areas not designated as Permanent Preservation Areas (APP) or Legal Forest Reserve in Brazil depends on a previous authorization by the competent environmental authority. Forest compensation is required based on the area and type of vegetation suppressed. Forest conversion policy in Brazil applies to all types of native vegetation, including tropical forests, cerrado (Brazilian savanna) and grasslands. The conversion of Atlantic forests to non-forest uses follow stricter rules, including the interdiction to convert forest into other land uses depending on the stage of forest succession.

- Similarly, per France's Forest Code, the deforestation of an area greater than four hectares depends on previous authorization, and the conversion of areas equal to or greater than 25 hectares is subject to an environmental impact assessment and public hearing. However, deforestation does not require authorization if the land in question was a former agricultural land, no matter the surface.

Financial compensation and incentives: Most of the reviewed countries use some type of financial compensation or government incentive to promote the conservation of natural resources and biodiversity.

Examples from selected countries

- The United States Department of Agriculture offers a portfolio of incentive programs to assist producers and landowners who wish to practice conservation of agricultural and forest lands. Under the 2014 Farm Bill, approximately U$29 billion went toward conservation programs for the period 2014-2018. The Conservation Reserve Program (CRP), for example, provides 10- to 15-year contracts to remove land from agricultural production and replace it with grasses or trees to conserve and improve soil, protect water quality, and provide wildlife habitat. The Forest Legacy Program (FLP), another federal program, supports the protection of sensitive forest lands, through the acquisition of conservation easements in privately owned forestlands. Most FLP conservation easements restrict development, require sustainable forestry practices, and protect other values. In addition to gains associated with the sale or donation of property rights, many landowners also benefit from reduced taxes associated with limits placed on land use.

- A number of EU funds co-finance the conservation of biodiversity. In France, for example, the Natura 2000 contract, an agreement between the government and the landowner, establishes management measures to conserve or restore the natural habitat and it gives rise to financial compensation. In Germany, some states already apply compensation instruments, such as nature conservation contracts (e.g., Bavaria and Hesse) or lump sum payments (e.g., North Rhine Westphalia and Baden–Württemberg).

Table 1: Riparian buffer policies

	ARGENTINA	BRAZIL	CANADA	CHINA	FRANCE	GERMANY	UNITED STATES
Riparian buffer rules: mandatory or voluntary	No federal riparian buffer rules. In some provinces, protection forests are instituted to protect riverbanks and lakes on a case-by-case basis.	Mandatory riparian buffer rules for all rural properties, including agriculture and forest activities.	No federal legislation. However, almost all provinces have developed rules for riparian buffer zone protection.	No national riparian buffer rules. Central government can designate a protection forest to protect water resources on a case-by-case basis.	Mandatory riparian buffer rules for farmers receiving EU financial aid; nitrate vulnerable zone properties; and water bodies listed by an administrative authority. Ecological corridors also protect riparian zones.	Mandatory riparian buffer rules at federal level. State regulations can be more strict than the federal law.	No federal riparian buffer rules. State rules, guidelines vary widely. Some develop forest riparian zone protection guidelines; some have mandatory forest riparian rules; almost none regulate agriculture riparian buffers.
Riparian buffer width	Not applicable.	Varies from 5-500 m.	Varies from 10-15 m. (e.g., Quebec Province)	Not applicable.	Minimum width of 5 m.	Minimum width of 5 m. (Federal Law)	Common state width guidelines range from15-25 m.
Riparian buffer legal regime	Forest sustainable management permitted.	No-harvest zone. Sustainable family and community forest management permitted.	Forest sustainable management permitted. Agriculture may be permitted if a strip of vegetation >3 m wide is preserved. (e.g., Quebec Province)	Not applicable.	Forest sustainable management permitted. Grassy strips can be used as pasture.	Forest sustainable management permitted. Agriculture allowed with good practices. Voluntary no-harvest buffer zone adoption under financial compensation.	Very few states (e.g., Washington and Oregon) have no-harvest riparian zones. Most states establish sustainable management guidelines.
Riparian vegetation	Not applicable.	Native vegetation.	Plants, shrubs, or trees. (e.g., Quebec Province)	Not applicable.	Grass, shrubs, or trees.	Native vegetation to the extent that it is possible	Grass, shrubs, or trees.
Landowner financial compensation	Yes	No	Yes	Yes	Yes	Yes	Yes
Other ecological buffers	Protection forests.	Native vegetation on hilltops, slopes, top of mountains, mangroves, sandbanks.	Not identified.	Protection forests and hillsides with slope > 25 degrees.	Protection forests on hilltops, slopes on a case-by-case basis.	Non-built-up areas in a 50 m zone next to big waterbodies. Forest areas can be designated as protection forests when applicable.	Some states have buffer zone regulations to protect wildlife (e.g., to protect nest sites).

Table 2: Biodiversity policies

	ARGENTINA	BRAZIL	CANADA	CHINA	FRANCE	GERMANY	UNITED STATES
Protected areas in private lands	Private owners can voluntarily create less strictly protected areas. Some provincial regulations provide tax and financial incentives.	Private owners can voluntarily create fully preserved protected areas. The government, at federal, state and local level, can institute less strictly protected areas in private lands. Landowners receive tax exemptions.	Landowners voluntarily create and may receive government incentives to protect areas in private lands.	Private individuals or organizations cannot own land, but can lease it from the state or community and create privately protected areas.	Protected areas on private lands can be created by government or regions based on national legislation or EU directives (Natura 2000 network). Recently a NGO volunteered to create wildlife reserves in private lands.	Protected areas on private lands can be created by federal states based on national or state legislation, or on EU directives (Natura 2000 network). Despite lack of legal provision, privately protected areas have been created by NGOs and private foundations.	Private owners can voluntarily create protected areas, including: freehold private reserve (full ownership); conservation easements; and less-binding (time-limited) conservation tools, (Conservation Reserve Program). Also public incentives, support for voluntary land conservation.
Species at risk policies	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Forest zoning policies	Every province must promote forest zoning in their territory and establish conservation areas of high, medium, or low conservation value.	Compulsory set-aside land in all private properties of 20-80% area for biodiversity protection (Legal Forest Reserve). Amazon basin states have special forest zoning regulations. Properties within Atlantic Forest biome must follow stricter rules.	Forest zoning policies adopted at provincial and local level, such as special management zones (e.g., British Columbia).	The Chinese Forest Law classifies Chinese forests into five categories.	Environmental agricultural, urban, and forest zoning policies (e.g., espaces boisés classes, zones spéciales de conservation et protection) directly or indirectly affect private property activities.	Forest zoning policies can be adopted at state level. Bavaria, for example, adopted 10 different classifications for forest reserves, each with its own legal status.	Zoning regulations are the most common state and local government forest and land use policies.
Conversion of forest lands policies	Depends on forest classification. Category I is a no-harvest zone. Category II allows sustainable management. Category III allows conversion of forests to other land uses.	Depends on previous authorization and requires forest compensation.	Not identified.	Prohibited by law.	Deforestation of area > 4 ha depends on previous authorization; deforestation of area ≥25 ha is subject to environmental impact assessment, public hearing.	Depends on previous authorization. The law prohibits granting deforestation permits if deemed against public interest.	Regulated at state and sub-state level. According to California forest rules, conversion of forest lands outside timberland production zones require Timberland Conversion Permit.

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CONCLUSION

Brazil's environmental legislation stands out in an international context, particularly given the nation's prominence in global efforts to guarantee food security and mitigate climate change. Its new Forest Code (Law No. 12.651/2012), governing the use and protection of public and private lands, sets stringent rules on private land regarding riparian buffer zones and other ecological buffers and requires all private properties to set-aside land for biodiversity protection without any compensation. Nevertheless, the Forest Code has yet to be fully implemented, and it is only through the effective implementation and enforcement of these rules that Brazil will be able to truly emerge as leader in environmental protection and create the necessary conditions to reconcile increasing agricultural productivity while also protecting its forests.

APPENDIX
DETAILED LEGAL ANALYSIS

This appendix provides a more detailed comparative legal framework that elaborates on different countries' policies related to:

(i) riparian buffer zones and other ecological buffer policies; and

(ii) biodiversity conservation policies.

Riparian buffer zones and other ecological buffers policies

Brazil

In Brazil, riparian buffer zones and other ecological buffers, known as Permanent Preservation Areas, are regulated by the Brazilian Forest Code, Law No. 12.651, as of May 25, 2012.

Permanent Preservation Areas (APP) are areas of vegetation that have been designated for protection because they have been identified as critical to the preservation of essential ecosystem functions, such as ensuring a clean and steady water supply, regulating hydrological and weather cycles, protecting geological and soil stability, or conserving biodiversity. APPs include banks of rivers, springs, and lakes (riparian zones), mangroves, vereda (a type of wetland), the top of mountains above 1,800 meters, hilltops and slopes with inclinations steeper than 45 degrees, and sandbanks. The code requires that the vegetation in APP be fully preserved, as a no-harvest zone, and if destroyed for any reason, they must recover using only native species. Only sustainable family and community forest management is permitted. Landowners are not entitled to compensation, and they receive no governmental aid for the protection of the APPs (Chiavari and Lopes 2015).

Under the Forest Code framework, the protection of the Brazilian riparian buffer zones is related to the size of the water body; larger water bodies require larger buffer zones. The riparian zone protection varies from 30 to 500 meters wide depending on the width of the river. However, landowners under a special regime are allowed to maintain and restore smaller areas. Small landowners, under the special regime, are allowed to maintain and restore riparian zones that vary from five to 15 meters wide, according to their property size. Larger landowners, under the special regime, can maintain and restore a riparian zone protection that varies from 30 to 100 meters wide (Chiavari and Lopes 2015).

Argentina

The Argentina Forest Law No. 13.273, as of November 24, 1995, establishes a national legal regime, and the provinces may adhere to the general regime, by enacting a provincial act (Burkart et al. 1996). The law establishes five different categories of forests: protection, permanent, experimental, special, and production.

The law does not set rules for riparian buffers; however, protection forests can be instituted to protect the banks of rivers and lakes. Protection forests can also be instituted to protect the soil, prevent erosion in plains and declining plots, fix dunes, and protect certain species of flora and fauna. The establishment of a protection forest depends on provincial regulation and relies on a case-by-case analysis. Sustainable management is permitted and landowners can apply for compensation for income losses. In addition, there is the "Camino de Sirga" that is an area 15 meters wide on each side of watercourses, for navigation purposes, having a positive side-effect of protecting the vegetation along the water board (Argentina 2014).

Canada

Canada does not have any federal legislation establishing mandatory riparian buffer zones. However, almost all provinces have developed substantive rules for buffer zone protection (Lee et al. 2004). The province of Quebec, for example, has a protection policy for lakeshores, riverbanks, littoral zones, and floodplains (Quebec 2017). According to this policy, lakeshore or riverbank refers to a strip of land bordering a lake or watercourse and extending inland from the high-water mark. The width of the shore or bank to be protected is measured horizontally and varies from 10 to 15 meters wide. All structures, undertakings, and works are, in principle, prohibited on lakeshores and riverbanks. Cultivation of soil for agricultural purposes may be permitted provided that a strip of vegetation at least three meters wide is preserved. It is important to note that municipal authorities can adopt stricter rules for the protection of the riparian buffer zones, including the prohibition of agriculture practices (Quebec 2016).

China

The Forest Law of the People's Republic of China, adopted in 1984 and revised twice in 1998 and 2009, classifies Chinese forests into five categories, among them the protection forests. Protection forests promote the protection of water sources, conservation of water and soil, shelter against wind, and to fix sand and the protection of riverbanks and areas along the highway and railway. However, Chinese law does not establish a legal regime or specify the requirements and procedures necessary to classify a forest area as a protected forest. On the other hand, local government has its own standard of delineation, which includes both crown density and forest coverage.

The Law of the People's Republic of China on Water and Soil Conservation adopted in 1991 and revised in 2010 establishes that all individuals shall have the obligation to protect water and soil resources, and all levels of local government shall organize afforestation and grass planting. The law establishes that in areas with serious water and soil loss or in ecologically vulnerable areas, production and construction activities that may cause water and soil loss should be restricted or prohibited, and vegetation shall be strictly protected. The law also establishes that the holders of land rights have the general obligation to build plant protection bands on both sides of rivers and in the areas surrounding lakes and reservoirs. However, the law does not establish what the width, vegetation and legal regime of these plant protection bands should be. Although the law foresees that protection bands should be built, there is not any legal responsibility or sanctions in case of non-compliance. The law also prohibits the cultivation of crops on hillsides with slopes over 25 degrees. Anyone who

cultivated crops on the forbidden slopes before the law entered into force should, according to the law, gradually stop cultivation and instead plant trees, grow grass, restore the vegetation, or build terra fields.

Local governments can also designate some specific waterbodies riparian buffer zones, such as the regulations on the protection and management of Erhai Lake, the Dianchhi Lake, and the Fuxian Lake, in the Yunnan Province.

The Chinese Water Law, adopted in 1988 revised twice in 2016, does not specifically establish the protection of riparian zones. However, the law may have a positive effect since the state shall protect water resources and adopt effective measures to preserve vegetation, plant trees, grow grass, conserve water sources, prevent and control soil erosion and water pollution, and improve the ecological environment.

The Chinese Water Pollution Prevention and Control Law, enacted in 1984 and amended twice in 1996 and 2008, was recently revised again in 2017 and will go into effect in January 2018. The law vaguely stipulates that local governments have the obligation to construct buffer belts along rivers and lakes, on a case-by-case analysis.

France

France has established different instruments for the protection of riparian areas and other sensible zones. The protection of riparian areas stems from the eco-conditionality rules of the Common Agricultural Policy (CAP), from the European Union Nitrates Directive and, more recently, from the "Grenelle II Law." According to the French Rural and Maritime Fishing Code, farmers who receive financial aid from the EU must keep a strip of vegetation (grass, shrubs, or trees) of at least five meters along watercourses. According to the French Environmental Code, the areas classified as nitrate vulnerable zones must also keep a riparian vegetated strip of five meters. The Law No. 788, of July 12, 2010, on National Commitment for the Environment, also referred to as the "Grenelle II Law," has extended the application of mandatory riparian buffer rules to include water bodies listed by an administrative authority. Furthermore, the French Environmental Code establishes the protection of a network of ecological corridors, known as Trame verte et bleue (TVA), that can also play an important role in the protection of riparian zones. The water bed and the terrestrial ecosystems on each side of the water body identified by the authorities in the scope of the TVA must have its riparian area preserved.

The French Forestry Code, fully revised in 2012, instead, allows the constitution of protection forests: forests needed for the conservation of hilltops and slopes (protection against avalanches or erosion); forest in the vicinity of big agglomerations; and forest located in zones where their maintenance is imposed ecological reasons or for the well-being of the population. The French Forestry Code also imposes another conservation and protection instrument for mountain forests – the temporary interdiction of use (mise en défens) – to allow for the recovery of degraded soil. The interdiction may last up to 10 years and the landowner receives an indemnity. The French law does not institute objective parameters to define what will be safeguarded as a protection forest and relies on a case-by-case analysis. The areas classified as protection forests

are submitted to a special regime, determined by an Act from the State Council, that establishes the rules relating to their use, exploration of forest resources, herding activity, usage rights, and the excavation and extraction of materials. The protection is enacted over existing forests and may grant indemnities to the landowners whenever it implies a loss of income.

Germany

In Germany, the Federal Water Act, revised in 2009, requires the presence of riparian buffer strips to preserve and improve the ecological functions of surface water bodies, increase water retention capacity, safeguard water run-off, and reduce nutrient discharges from diffuse sources. The law establishes that the minimum width of a buffer zone amounts to five meters shoreside from the mean water level line. The compulsory five-meter zone applies only to non-built-up areas. The competent authorities can make some exceptions. Whereas the water law prescribes a minimum width of five meters for compulsory buffer zones, agriculture and the application of fertilizers is still allowed in these zones, provided that sustainable agriculture practices are adopted (Balzer and Schulz 2012). The conversion from grassland to cultivated land is forbidden and sustainable forest management is allowed. It is also not allowed to remove native trees and bushes unless done in accordance with good forestry practice.

Furthermore, the federal states can pass their own ordinances concerning the restrictions regarding the width and the use of fertilizers and pesticides, as well as exceptional rules for the implementation of riparian buffer zones. Federal states' regulations can only enhance the legal requirements.

Agri-environmental measures, which provide payments to farmers who subscribe, on a voluntary basis, to environmental commitments related to the preservation of the environment and maintaining the countryside, also play an important role in reducing agriculture pressures on the environment. They are more popular among farmers because they include compensation payments for restrictions placed on agricultural practices. The measures are voluntary but normally farmers commit themselves to apply the measure for the following five years (Balzer and Schulz 2012).

Germany is bound by the Water Framework Directive, which requires programs of measures containing numerous actions, one of which is the establishment of buffer zones. These buffer zones are normally set-aside, which means that no agricultural use is permitted, increasing the provision of ecological services that aim to improve biodiversity and enhance water quality and landscape aesthetics. Farmers receive financial support to compensate them for their loss of income (Balzer and Schulz 2012).

United States of America

The United States of America does not have any federal laws that mandate riparian buffer rules (Mayer et al. 2005) since the federal government, at least in theory, cannot engage in land-use planning and this is identified as the realm of states. Riparian rules are often regulated not only at state level but also at county and local government level. Many states have water or public utility districts that establish such rules, which means that there are several layers of government

regarding riparian zones. In fact, to identify a riparian setback for a particular river, it is necessary to look at federal, state, county, and water district rules.

In most of the states, riparian buffer policies have been established as a result of federal regulations on water pollution or biodiversity protection. For example, the US Clean Water Act establishes water quality standards and regulates the discharge of pollutants into water bodies. In order to achieve compliance, states are required to implement voluntary best management practices, such as guidelines to protect and manage riparian buffer zones (Mayer et al. 2005). A commonly recommended riparian buffer strip ranges from 15 to 25 meters, however, the specific guidelines in each state vary widely (Mayer et al. 2005). In general, states have no mandatory buffer rules and almost none regulate agriculture riparian buffers (Lee at al. 2004). Very few states (e.g., Washington and Oregon) have no-harvest riparian zones. Most states establish sustainable management guidelines (McDermott et al. 2010).

The presence of endangered species has also served as a driver to implement riparian buffer policies. For example, states on the Pacific Coast (e.g., Washington and Oregon) have adopted stricter forest riparian buffer rules to protect fish-bearing streams, mainly those that contain salmon and other anadromous fish (McDermott et al. 2010).

Federal and state programs and financial incentives are the primary ways to preserve and restore riparian buffers. The Conservation Reserve Program, for example, offers yearly rental payment for farmers who agree to remove environmentally sensitive land from agriculture production and restore it with appropriate plant species (Merrill 2015).

Other ecological buffer zones can be established at the state level. Some states have buffer zone regulations to protect wildlife, such as the California Code of Regulations that institutes rules to protect nest sites (California 2017).

Biodiversity Conservation Policies

Brazil

Biodiversity protection on rural private landholdings in Brazil depends on two main policies: the mosaic of protected areas and the Forest Code.

The Brazilian National Protected Areas System (SNUC) defines and regulates protected area categories, classifying them into two types: strictly protected areas and sustainable-use conservation reserves (IUCN categories I-VI). Strictly protected areas have biodiversity conservation as their main objective, only permitting scientific research and, in some cases, tourism and environmental education activities. Sustainable use areas allow different types and levels of human use with biodiversity conservation as a secondary objective. In these areas tourism, environmental education, and the extraction of timber and non-timber forest products are permitted in specific areas and under a standard of sustainable management (Brazil 2000).

Most of the Brazilian fully protected areas fall under the public domain (Brazil 2017). However, fully preserved protected areas, known as Private Reserve of Natural Heritage (Reserva Particular do Patrimônio Natural - RPPN), can be created on a voluntary basis by private owners. Less strictly protected areas on private lands can be instituted by the government. Areas of Environmental Protection (Área de Proteção Ambiental- APA) (IUCN category V) make up the main sustainable use protected area category in private properties (Brazil 2017). In these areas, agriculture and livestock activities are permitted provided that they are carried out on a sustainable basis.

The Brazilian Forest Code represents one of the key instruments to achieve biodiversity protection. It requires that rural landowners designate and maintain a percentage of their property area under forest cover as Legal Forest Reserve. The goal is to preserve the remnants of native vegetation on rural lands and conserve biodiversity. This protected percentage varies from 20 to 80% depending on the type of vegetation present and the property's geographical location in the country. In general, properties located within the Amazon must conserve a much higher percentage of land as Legal Forest Reserve than properties outside of that region. On every Legal Forest Reserve, clear-cutting is prohibited and only sustainable forest management is allowed. Landowners do not receive any type of compensation to preserve this set-aside land (Chiavari and Lopes 2015).

The Forest Code sets the size of designated areas for Legal Forest Reserve as a standard percentage, regardless of the property size. The Forest Code framework requires all landowners to restore deforested areas on their properties. However, under the special regime, landowners have the option to purchase credits from landowners who have kept more forest than required by law and thereby offset their own Legal Forest Reserve requirements through a different property. The Brazilian Forest Code establishes four paths for landowners to offset these requirements: (i) designate surplus areas in their other properties as Legal Forest Reserve to compensate for a property that lacks sufficient restored area; (ii) establish a Conservation Easement Agreement; (iii) buy land from a private owner in a Protected Area and donate it to the government; and (iv) buy an Environmental Reserve Quota. Furthermore, landowners with small properties are given extra leniency—under the special regime they are allowed to designate their Legal Forest Reserve based on the native vegetation existing on that land prior to July 2008 rather than on their overall property size, which could be much lower than 20% (CRA) (Chiavari and Lopes 2015).

Conversion of forest to other land uses depends on the previous authorization by the competent environmental authority and forest compensation is based on the area and type of vegetation suppressed. Forest conversion policy in Brazil applies to all types of native vegetation, including tropical forests, cerrado (Brazilian savanna) and grasslands (Brazil 2012). The conversion of Atlantic forests to non-forest uses follow stricter rules, including the interdiction to convert forest into other land uses depending on the stage of forest succession (Brazil 2006).

Argentina

Protected areas in Argentina fall under provincial or federal jurisdiction. In the past, protected area initiatives were exclusively a federal undertaking, but today, those under provincial authority account for more than 80 percent of the total protected areas (Burkart 2007). Less

strictly protected areas can be created on a voluntary basis by private owners (Red Argentina de Reservas Naturales Privadas 2017). Some provincial regulations provide tax and financial incentives (Moreno et al. 2008). Argentina adopted the National Law No. 26.331, as of December 19, 2007, for the protection of native vegetation, establishing minimum requirements for the conservation, exploitation, restoration, and sustainable management of native forests. It classifies existing forest into three conservation categories. Category I is comprised of areas with a high conservation value that must be fully preserved, allowing only protection, research, and tourist appreciation activities managed by a conservation plan. Category II relates to areas with a medium conservation value, where their resources can be exploited in a sustainable manner, while also allowing the activities of scientific research and tourism. Category III is made up of areas with a low preservation value, thus allowing for the conversion of forests into other land uses, such as agriculture, raising livestock, and planting exotic species. The Law applies to public and private properties and establishes a system of compensation for landowners to offset the costs of conserving native vegetation.

Every province must promote territorial planning of native forests in their territory through a participative process, establishing different conservation categories (Argentina 2015). The law has created a national fund for the enrichment and conservation of native woods with the goal of compensating the jurisdictions that possess native forests in their territory. Seventy percent of the fund's resources must be employed to help landowners with native protected woods, according to their conservation category. Their benefit consists of an annual sum (renewed annually) and binds the landowner to create and adequately maintain a conservation and management plan that must be approved by the competent authorities.

The Argentine law protects only the native forests that existed at the moment of the provincial forest zoning. Since the country, throughout the years, has removed most of its native vegetation (at present, Argentina has less than 10% of its native vegetation [FAO 2015]), the restrictions of the law protecting the native woods have a limited impact on private properties.

Canada

At the national level, the Species at Risk Act (SARA) (2002) is the main policy to protect biodiversity in Canada that imposes some degree of limitation on private land use (McDermott et al. 2010). The main objectives of the act include prohibiting the killing of extirpated, endangered, or threatened species and the destruction of their residences and prohibiting the destruction of the critical habitats of designated species anywhere in Canada. On private lands, the general prohibitions apply mainly to aquatic species and migratory birds (Canada 2014). However, there are other norms which can be issued pursuant to SARA to protect critical habitat on private land.

At the provincial level, many Canadian provinces have enacted legislation that specially protects biodiversity and endangered species. Provincial legislation varies greatly. Quebec statutes are stronger than Ontario's, and some provinces do not have specific legislation to protect endangered species (Bourdages and Labelle 2003). The Quebec (1989) Act Respecting Threatened or Vulnerable Species requires the protection of both species and habitat on all lands, public and private. However, owners of private land on which a habitat of a threatened or

vulnerable plant species is listed cannot be convicted unless they had prior notification of the existence of the habitat.

As in many federated countries, protected areas in Canada are administrated at multiple levels. Federally protected areas, such as national parks, are public lands. Provincial protected areas can be public lands (Quebec) or private lands (Ontario) (McDermott et al. 2010). Protected areas in private lands are usually voluntary and landowners receive government incentives (Stolton et al. 2014). Although private protected areas usually account for less than 1% of the total area protected in southern jurisdictions, these areas are often located on lands with significant biodiversity values (Canada 2015 and Stolton et al. 2014).

China

For several decades Chinese forest policy was based on cutting timber and promoting commercial plantations. This policy led to disastrous consequences, including the degradation of forest lands, loss of biodiversity, extremely high levels of soil erosion, and catastrophic flooding (Zhang et al. 2000). Only recently has China made an effort to revert this situation, publishing the first Chinese Forest Law in 1984 and other correlate legislation. They published the Administrative Measures for Forest and Wildlife Type Nature Reserve (1985) and the Regulation on Nature Reserves, issued in 1994 and revised in 2011, which established fundamental applicable rules for natural reserve management.

The Forest Law of the People's Republic of China, revised twice in 1998 and 2009, prohibits the conversion of forest lands into non-forest lands. According to the law, the state shall carry out protection measures with respect to forest resources; establish annual cutting quotas; promote afforestation, and close hills and mountains to facilitate afforestation and expand forest coverage; promote financial support or long-term loans to collectives and individuals for afforestation; and establish the system of forestry fund.

The Forest Law classifies Chinese forests into five categories: (i) protection forests; (ii) timber forests; (iii) economic forests; (iv) fuel forests; and (v) special-purpose forests. Chinese forests can be also classified as either for public benefit or commercial use. If a forest is identified as a public benefit forest (protection forest or special-purpose forest), it is supposed to remain in a natural state to provide ecological and human health benefits. Commercial forests (timber, economic, and fuel forests), on the other hand, are intended for revenue producing activities (China 2003). It is required that protection and special-purpose forests shall not be less than 30 percent of the total forest area of each province.

The Chinese forest laws use vague and aspirational language. Typically, actions are encouraged but rarely required, and even where concrete duties area are stated, little guidance is provided on procedures and specific goals (Beyer 2006).

In the late 1990's, the Chinese government adopted two programs: the Natural Forest Conservation Program (NFCP) and the Sloping Land Conversion Program. The NFCP instituted a logging ban on natural forests in several provinces, and the Sloping Land Conversion Program

aimed at reforesting smallholder cropland on sloping lands while compensating farmers with payments for their lost income (Rodriguez et al. 2015). There is limited evidence on impacts that the Chinese programs have had on biodiversity; however, studies suggest negative effects have resulted from the establishment of inappropriate species and/or monoculture plantations (Rodriguez et al. 2016).

Finally, China has recently created a number of protected areas that aim to reverse the loss of biodiversity. However, according to literature, China's protected areas are places protected in name only and on paper but with no real connection to conservation purposes (Jim and Xu 2004). Private individuals or organizations cannot own land in China, but they can lease land from the state or the community and institute privately protected areas (Stolton et al. 2014).

European Union

The EU's directives on the environment drive the European countries' conservation policies, including those of France and Germany. Natura 2000, a network of protected areas, is the core pillar of the EU's biodiversity conservation policy. The network is established and managed according to the legally-binding provisions of the EU Birds Directive and the EU Habitats Directive.

Natura 2000 sites include public and privately owned lands as well as strictly protected nature reserves and protected areas where human activities are allowed. It can allow for the continuation of land uses (e.g., agriculture, forestry) as long as they do not significantly compromise conservation objectives for habitats and species within and beyond the network (Sotirov et al. 2017).

In France and Germany, among other countries, many Natura 2000 sites were designed in remote and less populated areas. These include higher mountains and areas with unproductive plains and rivers and low-yield forests where socioeconomic development and (forest) land use is not affected (Sotirov et al. 2017).

France

In France, the protection of the forests and of the general biodiversity is somewhat recent. Only after the 1960's were environmental questions progressively considered when managing the country´s forests (Boutefeu 2005). The law of July 10, 1976, for the first time, established principles and rules for the protection of nature in general, including the conservation of natural spaces, the landscape, animal and vegetal species, and the protection of the natural resources against every cause of environmental degradation. Currently, France possesses an ensemble of legal instruments tackling different areas (environment, forestry, and urbanism) that directly or indirectly protect the forests and biodiversity (Guignier and Prieur 2010). The global protection of natural spaces is accomplished through the institution of protected areas, like national parks and natural reserves; the protection of sensible areas, like shorelines and mountains; and the protection of landscapes (rural, urban, or peri-urban) (IUCN 2013). The government can create different types of protected areas on private lands, but usually, they have a weak protection regime. Only recently, fully preserved protected areas (wildlife reserves) in private lands were created on a voluntary basis by a French NGO (ASPAS).

The transposition of Natura 2000 policy into French national law took into consideration socio-economic interests, especially from private forest owners, hunting associations, and farmers. Although this societal approach reduced the network coverage, it was a successful "bottom-up participatory" approach. Although the French Natura 2000 management plans are drafted vaguely and are even voluntary for forest and landowners, studies described the Natura 2000 policy enforcement in France as being rather positive. Furthermore, voluntary Natura 2000 contracts between government authorities and private landowners were seen to ensure implementation through the provision of financial incentives. However, when looking more critically from a biodiversity conservation perspective, the added value for nature conservation appears to be rather modest (Sotirov, M, et al. 2017).

According to the French Environmental and Forest Codes, the conversion of forest lands to non-forest lands in areas larger than four hectares depends on previous authorization, and the conversion of areas equal to or greater than 25 hectares is subject to an environmental impact assessment and public hearing.

Germany

In Germany, the protection of forests and biodiversity is assured through several legal instruments. The Federal Forest Act (enacted in 1975 and last amendmended in 2017)) requires governmental permission to convert forestlands to agriculture and other uses, and it prohibits the granting of deforestation permits if they are considered to be against the public interest. The rights, duties, and interests of the forest owners are weighed against the needs of the general public. The permission is denied if the conservation of the forests is predominantly in public interest (McDermott et al. 2010). However, in some cases where deforestation is considered to be against the public interest, the government does have a margin of discretion to allow it.

The legislation of German federal states can contain more stringent rules on forest protection. For instance, Bavaria adopted ten different classifications for forest reserves, each with its own legal status. These include areas that forbid any kind of forest activity; forests where forest activity is permitted, but cannot be converted to other uses; and forests where conversion to other uses is permitted but must be previously authorized. In effect, forest conversion is deemed generally undesirable (Mann 2012).

Under the Federal Nature Conservation Act (2009), also known as the German Impact Mitigation Regulation, intervening parties shall primarily avoid any significant adverse effects on nature and landscape, even outside specifically protected areas. The regulation is designed to secure and preserve the functionality of the balance of nature and the quality of the landscape (Albrecht et al. 2014). Unavoidable significant adverse effects are to be offset via compensation measures or substitution measures; or, where such offset is not possible, via monetary substitution. The core idea of the regulation is that the party causing the derogation of nature and the landscape carries the responsibility for avoidance, mitigation, and compensation for its effects (Albrecht et al 2014). The use of soil for agricultural, forestry, and fishing purposes is not be deemed an intervention, provided the purposes of nature conservation and landscape management are taken into account.

In Germany, the federal states and regions hold jurisdiction over protected areas, but can only enhance federal regulation. The Federal Nature Conservation Act serves as an orientation guide, however, the authority for the concretization and implementation of the conservation measures lies mainly with the states. In consequence, the concepts, methods, and status of implementation within the states are diverse. Some states already apply compensation instruments, such as nature conservation contracts (e.g., Bavaria and Hesse) or lump sum payments (e.g., North Rhine Westphalia and Baden–Württemberg). Others are just now developing compensation instruments (Rosenkranz et al. 2014).

The federal states legally designate protected areas, irrespective of landownership. Protected areas on private lands allow some types of land use, as long as they are not contrary to the protection purpose.

The implementation of the Natura 2000 network, under the Birds and Habitat Directives of the European Union, has had a strong influence on the protection of biodiversity, imposing restrictions and limitations that go beyond those established by national and state forest legislation (McDermott et al. 2010 and Mann 2012). The Germany transposition of the Natura 2000 policy was marked by the conflict between environmental groups and landowners and sectoral authorities in charge of land use (e.g., agriculture, forestry, water management). As a result, Natura 2000 management plans were typically worded vaguely and/or remained non-mandatory for private forest owners (Sotirov, M, et al. 2017). Since nature conservation and forest management come under the responsibility of the federal states, Natura 2000 implementation approaches differ substantially within the country.

United States of America

Protected areas play an important role in biodiversity conservation in the United States. The country has a long tradition of protected areas development, since the creation of the first national park in 1872. Private owners can voluntarily create protected areas. The three most common legal means are freehold private reserve (full ownership); conservation easements; and less-binding (time-limited) conservation tools, such as agreements under Conservation Reserve Program (CRP). Also, there are public incentives and support for voluntary land conservation (Stolton et al. 2014).

The conservation easements permanently limit uses of the land in order to protect its conservation value and prevent development. The hallmark of a conservation easement in the Unites States is that they are all different. Many of them may allow farming, forestry, and ranching, but others might be very specific and set rules about habitat conservation and riparian buffers.

The US Endangered Species Act (ESA), adopted in 1973, was a turning point in the conservation legislation. The ESA requires the government to list species as endangered or threatened and to undertake steps to bring about the recovery of that species. The law prevents the federal government from undertaking or approving any activity that will risk the continued existence of a species or adversely modify critical habitat. A critical habitat designation must be based

both on scientific data and economic impact, along with any other relevant impact on private property. The ESA prohibits the "take" of endangered and threatened species by anyone under the jurisdiction of the United States. According to the act, "take" includes killing, pursuing, hunting, collecting, harming, etc. The act has a strong impact on private land since it prohibits any activity or any action that would adversely affect a listed species in a negative way. This includes conversion or destruction of all species' habitat, not just that habitat designated as "critical" by law. However, private landowners can apply for a permit that allows them to conduct activities that may damage endangered and threatened species and their habitats, provided that they submit a habitat conservation plan to minimize their impacts and perhaps create another habitat. The US Healthy Forests Reserve Program helps landowners restore, enhance, and protect forestland resources on private lands through easements and financial assistance and aids in the recovery of endangered and threatened species under the ESA (McDermott et al. 2010 and Meltz 2013).

The federal government has played a significant role in protecting and restoring biodiversity on public as well as private lands. However, public lands do not necessarily coincide with the country's most biodiverse areas. Due to this, the federal government also administers a number of conservation programs that significantly affect biodiversity on private lands (Wilkinson 1999).

USDA conservation programs help farmers, ranchers, and forest owners to adopt practices and activities to increase wildlife habitat. Under the 2014 Farm Bill, approximately U$29 billion went toward conservation programs for the period 2014-2018 (USDA, 2017). The Conservation Reserve Program (CRP), for example, provides 10- to 15-year contracts to remove land from agricultural production and replace it with grasses or trees to conserve and improve soil, protect water quality, and provide wildlife habitat. The Environmental Quality Incentives Program (EQIP) provides financial and technical assistance for agricultural producers to improve or create wildlife habitat, among other environmental benefits. The Healthy Forests Reserve Program (HFRP) helps landowners restore, enhance, and protect forestland resources on private lands through easements and financial assistance. HRFP aids the recovery of endangered and threatened species under the Endangered Species Act, improves plant and animal biodiversity, and enhances carbon sequestration. Participation in all USDA conservation programs is voluntary (USDA). The Forest Legacy Program (FLP), another federal program, supports the protection of sensitive forest lands, through the acquisition of conservation easements in privately owned forestlands. Most FLP conservation easements restrict development, require sustainable forestry practices, and protect other values. In addition to gains associated with the sale or donation of property rights, many landowners also benefit from reduced taxes associated with limits placed on land use.

Policies on the conversion of forest lands to non-forest lands are regulated at the state and sub-state level and vary widely. According to California forest rules, for example, the conversion of forest lands outside timberland production zones require a Timberland Conversion Permit (California 2017). Zoning regulations at the local level also play an important role in the protection of forests. They can significantly augment state and national forest policy.

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