

# Payments and markets for forest ecosystem services in the USA: lessons for Ireland

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## Abstract

The importance of ecosystem services (ES) to social and economic activity has long been recognised but these services, which are often recognised as public goods, are rarely accounted for directly in commercial forest management outside of meeting regulatory requirements. The Millennium Ecosystem Assessment (MEA) brought the importance of ES into focus and identified that the majority of services have been deteriorating in recent decades, which calls into question the effectiveness of existing conservation efforts. Payments for ecosystem services (PES) create financial incentives for landowners and natural resource managers to protect or enhance the goods and services that their forests produce. Such market-based mechanisms for conservation are recognised in international and EU policies as having significant benefits. A number of payments and markets for ES have been established in the USA for some time and include publicly funded schemes and voluntary and regulatory markets. Regulatory markets have been established to mitigate damage to water quality, wetlands and habitats of listed species guided by federal legislation. Voluntary markets for carbon have been successful in allowing private, non-industrial forest landowners to enter carbon markets on a limited basis. This review describes the development of the main PES schemes in the USA and provides a number of examples of their application. In addition the potential benefits, drivers and challenges of implementing PES are described, with regard to the perspective of smaller forest owners in Ireland.

**Keywords:** *Payments for ecosystem services, water markets, wetland mitigation banking, carbon trading.*

## Introduction

Ecosystem services (ES<sup>1</sup>) are commonly defined as the “benefits people obtain from ecosystems” (MEA 2005). They range from basic materials that come from the environment, such as timber, to complex processes related to nutrient cycling and soil formation that underpin the functioning of whole ecosystems. Although these benefits have long been recognised and studied, according to the Millennium Ecosystem Assessment (MEA) many of them are under threat, degraded or declining. As these services underpin economic activity and human welfare more generally, the impact of their decline extends far beyond the ecosystems from which they stem. Paying landowners to conserve or produce ecosystem services has been identified as one

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<sup>1</sup> A list of abbreviations used in this paper is included as an appendix.

of most promising approaches to addressing their continuing decline (MEA 2005). Essentially such payments address the failure of traditional markets to account for ES loss or damage by incentivising their protection or production (Jack et al. 2008). As payments are linked directly with production of the desired service, this approach is considered more effective when compared to more traditional conservation efforts which link supports to area or management measures (Ferraro and Simpson 2002). At EU level, the value of such payments in the protection of ES is recognised in both forest and biodiversity policy documents (European Commission 2011, Forest Europe 2011).

Numerous definitions of payments for ecosystem services (PES) can be found in the literature, but one of the most cited is from Wunder (2005) who describes a PES as “a voluntary transaction where a well-defined ES is being ‘bought’ by a ES buyer from a ES provider if and only if the ES provider secures ES provision”. However, this definition has been recognised as being too narrow, in particular given that it refers to “voluntary” transactions (Schomers and Matzdorf 2013). Although this is a necessary characteristic of any scheme developed in a country with well-defined private property rights, it may only relate to the payment mechanism itself. In reality, many PES schemes involve government regulation that requires behavioural changes or participation, particularly from the buyer’s perspective (Vatn 2010). Sellers too may be placed within the ‘market’ involuntarily. In Europe for example, land-owners in Natura 2000 areas (such as special areas of conservation) are generally obliged to comply with certain restrictions and may be automatically enrolled in environmental payment programmes and thus, are not voluntarily sellers (Sattler and Matzdorf 2013). Landowners within such sites in Ireland are obliged to adopt certain measures and could seek financial compensation through the appropriate scheme (the AEOS/Natura 2000 scheme has been in operation since 2011 to replace the Rural Environmental Protection Scheme (REPS)) or directly from the National Parks and Wildlife Service. A broader definition of PES is offered by Mercer et al. (2011) who recognise PES as “formal and informal contracts in which landowners are remunerated for managing their land to produce one or more ecosystem service; PES transactions must consist of actual payments between at least one willing buyer and one willing seller to produce or enhance a well-defined ecosystem service or bundle of services.” Under this definition, payments can come into existence through traditional public-funded land-use policies or by introducing private funding through the introduction of suitable legislation and the establishment of new markets or through voluntary purchases. Although the terms “market” and “market-based mechanisms” are often used in regards PES, it is important to note that such schemes rarely if ever occur in a true market environment, but rather adopt some of their principles (Wunder 2013).

This paper gives an overview of some of the most important, forest related, forms of PES available in the USA. In addition, the benefits and challenges of adopting

such an approach in Ireland are discussed, with emphasis on smaller, private owners. This research stems from a literature review and a series of unstructured interviews conducted between June and November 2014 in the Pacific Northwest of the USA. Interviews were conducted with a range of individuals including non-industrial and industrial forest owners and managers, representatives of a number of forest and environmental NGOs with staff of the USDA Forest Service, US Fish and Wildlife Service (USFWS), and Oregon Department of Forestry (ODF). Interview questions were generally open-ended and focused on the history, drivers and management of specific forest-related PES schemes. The literature review and interviews were used to develop an understanding of these schemes from the perspective of both the regulatory authorities who oversee them, and the NGOs and landowners who implement them. The following review uses this information to describe the development of the main PES schemes in the USA and presents a number of examples of their implementation, primarily from the Pacific Northwest.

#### *Markets and Payment Programmes in the USA*

The USA has been actively developing private markets for certain services and has a range of publicly funded schemes that focus on the production of specific benefits (Mercer et al. 2011). In contrast, approaches in the EU tend to rely on traditional practice-based regulations and incentives (e.g. area based management or land use restrictions) that are publicly funded. However, a number of examples of PES exist in the EU and their continuing expansion is expected (Maes et al. 2013). In general, PES can be divided into, regulatory or compliance driven markets and voluntary markets, including publicly-funded schemes (Table 1). Perhaps the most well-established USA example of a market-based approach to conserving ES is wetland mitigation banking which requires developers to offset damage to wetlands and habitats by purchasing credits linked to comparable areas offsite. Water quality trading, which in Oregon is often based on temperature, has increased as an approach to enhancing water quality in fish bearing streams. Voluntary carbon markets have existed in the USA for some time but the recent establishment of the Californian regulatory market has created a large and, thus far, stable market for carbon. More traditional publicly-funded schemes are increasingly focusing on specific services rather than broader management linked goals (Mercer et al. 2011). However, many also recognise that properly managed lands can produce multiple services and achieve greater economies of scale (Deal et al. 2012).

#### Conservation easements

One of the most important legal mechanisms underlying many PES are conservation easements (CE), which may be viewed as a form of PES in themselves. An analogy often cited when describing property in legal terms is that of a bundle of sticks, with each stick representing a separate right which can be removed or sold individually.

**Table 1:** *Overview of the main PES schemes in the USA.*

	<b>Payment for Ecosystem Service</b>	<b>Focus</b>
Regulatory	Wetland mitigation banking	Wetland habitats
	Species conservation banking	Habitats for endangered and threatened species
	Water quality trading	Chemical, biological and physical measures of water quality
	Carbon sales - California	Carbon sequestration, climate change mitigation
Voluntary	Federally funded schemes	Multiple goals, some linked to habitats for endangered and threatened species
	Carbon sales - over the counter	Carbon sequestration, climate change mitigation
	Conservation easements	Multiple goals laid out in a legally binding management plan

Conservation easements essentially remove the ability to develop land in the future by placing this right in the hands of a land trust or state agency. Rather than selling ownership of the land a private owner can sell or donate the development rights on their property, while maintaining ownership and often the right to continue to manage the land in a specified manner. Recent decades have seen an approximately 25-fold increase in the number of easements currently held in the USA, which now cover approximately 16.2 million ha (U.S. Endowment for Forestry and Communities 2015). The history of conservation easements dates back to the 19<sup>th</sup> century and initially they were used to protect public parks. However, the goal of CEs now covers a range of benefits including, but not solely, biodiversity or habitat conservation. For example, working forest CEs have been established where forests can continue to be managed for timber production following a given management plan but cannot be altered otherwise e.g. conversion to agricultural land or other land uses, sub-division of the land or intensification of harvesting.

The Nature Conservancy is one of the largest environmental organisations in the USA and established the Working Woodlands Program in 2006 in Pennsylvania (The Nature Conservancy 2015). The organisation works with landowners to develop a 100-year management plan that combines timber, carbon sequestration and conservation goals. In addition, the plan meets FSC standards and owners can certify their timber as sustainable. Landowners benefit by gaining access to voluntary carbon markets and a low cost route to SFM certification while attaining a quality inventory

and management plan and continuing to sell timber from their lands. A company specialising in carbon markets is a programme partner and assists with selling carbon offsets through the VCS (Verified Carbon Standard) registry. A conservation easement linked to the management plan underlies the programme.

Although restrictive, CEs offer a number of benefits to landowners. Landowners may be interested in maintaining their land in a certain condition due to their own sense of stewardship or due to their emotional attachment to it (Ma et al. 2012). An easement provides stability and certainty that their property will be preserved. However, landowners can also benefit financially from CEs. Although easements are normally donated, they can be sold to a land trust, or other NGO, or a public agency. Landowners can also benefit from a range of taxation measures depending on whether they donate or sell the CE and the tax laws of their state. These can include deductions in federal and state income taxes if the CE is donated (these may be spread out over a number of years, up to 15 in Oregon) and reductions in state property tax (based on the reduction in land value as a result of selling the development rights). From the purchasers' perspective, who are generally trusts or NGOs, they can ensure their mission or goals are being met without the associated costs of purchasing or buying land outright. Many organisations also have the support of rural communities as part of their mission and may wish to see the continued commercial management of land to support employment. In some circumstances, federal agencies will provide financial support for NGOs to purchase easements, e.g. an NGO raises 20% of the cost and the remainder is contributed by a federal agency.

#### Wetland mitigation banking

Wetland mitigation banking (WMB) is the most well-established of the markets for ES in the USA and involves the sale of wetland credits (this can include wetlands, riparian areas and streams) from bankers to developers to offset losses by land disturbances. This approach to conservation stems from the Clean Water Act (CWA) of 1972 that stipulates that there can be "no net loss" of wetlands, thus leaving potential for the development of offsetting. In particular, one section (Section 404) requires the attainment of permits for the discharge of material into wetlands, which can have requirements attached to them, giving significant power to the regulatory agencies. Although the Army Corp of Engineers (ACE) and the Environmental Protection Agency (EPA) are the agencies tasked with regulating the Clean Water Act and the associated banking system, the US Fish and Wildlife Service (USFWS) has played an important role in supporting and developing the programme.

Damage to wetlands generally takes place as a result of drainage or infill for purposes such as transportation infrastructure construction by state agencies or, commercial or residential development. Developers may be able to mitigate losses

within a development property itself or may be able to offset the damage through an in-lieu fee payment to a governmental or non-profit agency, but if not, they must purchase credits from a bank. Sellers must create, restore or enhance (conservation is accepted in some circumstances) a wetland to develop a bank and sales can only take place within a specified service trading area, generally the watershed in which the loss is taking place. The EPA and the ACE issued guidelines in 2008, which specified that banking was the preferred approach to mitigation, giving explicit support to the banking system (ACE and EPA 2008).

From a developers perspective one of the major advantages of the system is the transfer of liability, and the associated costs, to a third party (the banker) who specialises in wetland management. Regulators view banking as a more effective way of conservation than on-site mitigation as the bankers have a stronger incentive in maintaining the wetland and more experience than the developer. The ACE maintain the RIBITS (Regulatory In-lieu fee and Bank Information Tracking System) website which in November 2014 contained over 2,000 banks. It is estimated that the annual value of these banks was between \$1.3 and \$2.2 billion in 2008 (Ecosystem Marketplace 2008).

Forest harvesting is one of the activities that is exempt from the permit requirements of Section 404, although the impact of forest activities on water may be addressed through regional plans agreed by the EPA and individual State forest-practices legislation. However, forest owners may be able to become wetland bankers if they possess suitable sites on their property. This may be particularly relevant to large industrial owners who possess areas that are considered unproductive from a commercial forestry perspective. For example, Weyerhaeuser, one of the largest timber companies in the USA, sells wetland banks in the southern United States (Weyerhaeuser Company 2015).

#### Species conservation banking

Species Conservation banking (SCB) is a more recent development but stems from the development of WMB and adopts a similar approach. The 1973 Endangered Species Act (ESA), which is administered by the USFWS and National Oceanic and Atmospheric Administration, is the primary driver of this form of banking. Although the Act does not specifically identify banking as a mitigation measure, it does recognise that habitat conservation and enhancement can occur “off-site”. In addition, the ESA recognises the need to compensate private landowners and establishes a grant to assist states to fund projects that benefit listed species on non-federal lands. The USFWS published a “Guidance for the Establishment, Use, and Operation of Conservation Banks” in 2003 which is employed in their role in overseeing the development of banks.

Under the ESA, it is illegal to take a listed species, where “to take” is defined as “to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct” and “harm” includes “significant habitat modification or degradation”. Thus, the law has the potential to significantly affect land-use practices that have the potential to impact habitats of endangered species (Lueck and Michael 2003). However, in an effort to introduce some level of flexibility into the law an amendment was introduced in 1983 which allowed landowners and developers to be issued with an incidental take permit, i.e. permission to impact on a species, where they were undertaking a lawful activity and had developed a habitat conservation plan. One of the reasons this amendment was introduced was to encourage innovation in approaches to conservation (Mills 2003).

Similar to WMB, SCB is a form of off-site mitigation (i.e. that the damage from development is offset by conservation efforts in a different location) and bankers can create credits through the conservation, enhancement, restoration or creation of a suitable habitat.

Credits are specific to a particular listed species but can refer to (USFWS 2012):

1. An acre of habitat for a particular species;
2. The amount of habitat required to support a breeding pair;
3. A wetland unit along with its supporting uplands;
4. Some other measure of habitat or its value to the listed species.

The USFWS has approved over 105 banks for 60 threatened and endangered species across more than 90,000 acres of land (USFWS 2014). Bankers may be any landowner, including private owners, commercial and non-profit organisations and state and federal governments, although federal lands generally face greater existing regulation. For both WMB and SCB, bankers are generally obliged to transfer a conservation easement to an eligible third party, to develop a long-term management plan for the land and to establish a non-wasting endowment to fund the long-term monitoring and management of the site.

#### Water quality trading

Water quality trading or payments are some of the most recently developed markets for ES in the USA. The primary driver for this market is also the CWA, which requires any non-residential point source of pollution to acquire a permit to discharge into “navigable waters”. The CWA identifies minimum standards, which may be biological, physical or chemical in nature, that must be met but individual states can set more restrictive limits. Thus, the political and regulatory system in place in a state

can influence the number of water bodies considered impaired and different pollutants may be emphasised in different regions. For example, in the Pacific Northwest water temperature is considered a particular issue due to its potential impact on anadromous fish, including the seven salmon and trout species (*Oncorhynchus* spp.) native to the region which are considered of particular economic and cultural importance. Industries that use water for cooling purposes must attain discharge permits which generally require discharged water to meet a standard limit on temperature.

Utilities, such as power plants, are one of the major users of water for cooling. Water leaving a station is measured at the outflow before it enters a water body to ensure it meets a given temperature standard, which may be season specific. These standards are developed in relation to the maximum thermal daily load, essentially the maximum temperature input that doesn't significantly impact on biodiversity. Where standards are breached they may be required to build infrastructure, such as holding lakes and cooling towers, to meet the temperature guidelines. An alternative approach would be to reduce temperature loads in other parts of the river or water system to offset the impact of the discharge. In this context, a limited number of water quality trading programmes have been established in the USA. This involves utilities gaining some flexibility in how they meet water temperature targets by having landowners in the same watershed establish riparian woodlands to shade water bodies rather than employing a hard engineering solution.

Clean Water Services was the first water utility to be issued with a permit that included such an approach to dealing with effluent in 2004. The company manages waste water treatment in a watershed close to Portland, Oregon and would have faced costs of between \$60 and 150 million to construct refrigeration units to cool water before releasing it into the Tualatin River. Under the permit, the utility was able to use riparian planting and flow augmentation to reduce overall stream temperatures rather than building new infrastructure. This alternative approach was estimated to cost \$4.3 million for riparian planting along 35 miles of river (Cochran and Logue 2011). In addition, this approach provides a number of other benefits such as enhanced habitat provision. The Freshwater Trust (TFT) is one organisation that receives payments from utilities to work with landowners in establishing riparian vegetation. Rather than measuring the impact of the restoration directly, reductions in water temperatures are modelled using a tool, developed by the Oregon Department of Environmental Quality, which accounts for location and the width and height of vegetation adjacent to water bodies. Remote sensing, including the use of LIDAR, plays an important role in measuring the current conditions of the riparian areas. The reduction in temperature is modelled, comparing the current state with the expected reductions at the point of vegetative maturity, and the utility pays TFT based on a per-kilocalorie-reduction basis. The Trust, in turn, leases land for an annual fee from private landowners for a 20-year



period and establishes native riparian vegetation, including cotton wood, alder and willow species (*Populus*, *Alnus* and *Salix* spp.). Some landowners are motivated by a sense of stewardship and a desire to see invasive species removed and do not require payment for leasing the land. After the 20-year period existing legislation protecting riparian forests will ensure that protection is permanent. This programme is described as trading as it offsets the impact of point sources of pollution, such as industrial wastewater, by reducing the impact of non-point sources, such as poorly vegetated riparian areas. Although the impact of these measures will only be quantifiable in the future as vegetation develop, TFT estimate that non-point sources account for 86% of the current thermal load on rivers in Oregon. This suggests that there is significant scope to counteract point sources of temperature through appropriate management of riparian areas.

### Carbon trading

Markets for carbon emission trading are now the largest environmental markets globally (Newell et al. 2013). The USA lacks national policies around carbon offsets and trading but a number of voluntary carbon markets have been established with varying degrees of success. California has recently introduced a cap-and-trade system managed by the Air Resources Board (ARB) and carbon offsets have been traded through the system since 2013. Forests carbon credits can be generated for sale in this regulatory market system through reforestation, avoided deforestation and/or improved management, but only a limited number have been developed to date. A similar process is adopted in both voluntary and regulatory markets with sellers following an accepted protocol which sets out the process by which carbon is measured and how management impacts sequestration. The ARB protocol was developed from that of the Californian Climate Action Registry, a non-profit registry established in 2001 that specialised in emissions accounting. The Californian market is a regulated market, with price controls and is open to sellers across the USA and has links to Canadian markets. Price controls include a floor price, starting at \$10, and ceiling prices (at which point supply is increased), starting at \$40, both of which rise by 5% plus inflation per annum (Newell et al. 2013).

Voluntary carbon markets have been in place for some time in the USA and vary from complex agreements across industries or regions to over-the-counter sales between willing buyers and sellers. One example of the latter, of particular relevance to Irish forest owners, is Woodlands Carbon, a company established by the Oregon Small Woodlands Association (OSWA) to assist small, non-industrial forest owners to enter the carbon market. The process of measuring carbon for any credit is specific to the protocol being adopted and Woodlands Carbon employs a variation on the American Carbon Registry which compares an initial inventory to a baseline of standing carbon,

based on regional data from the USFS Forest Inventory and Analysis data. Owners can sell the difference between what they currently have and what forests in this region would be expected to have. However, once sold the level of carbon is required to be maintained over the lifetime of the project. Additional carbon can be sold essentially as the difference between growth and harvesting but landowners must maintain a buffer of 15-20% of their carbon pool to account for unintentional reversals. The protocol developed for OSWA differed somewhat in that the credit was based on net-present value (using a 5% discount rate) and linked to the loss of value that would be endured as a result of a change in management practices. The first Woodlands Carbon sale involved 11 owners and was purchased by a broadband company in Oregon.

#### Federal funded schemes

Schemes to plant forests on agricultural land have been in place in the USA for a number of decades, but the goals and design of such schemes has changed considerably over time and landowners can currently avail of an array of different supports for both afforestation and forest management (Mercer et al. 2011). Generally forest related federal schemes are funded by the Natural Resources Conservation Service (NRCS) under the Farm Bill.

The Healthy Forest Reserve Program was an example of a voluntary conservation programme under the 2008 farm bill established to encourage the production of ecosystem services (including the protection of listed species, carbon sequestration and forest health) from private forests. The NRCS oversaw the programme and worked with other agencies, both state and federal, in developing initiatives to promote the conservation of endangered species on private lands. For example, in Oregon the USFWS and ODF developed programmes aimed at northern spotted owl (*Strix occidentalis caurina*) habitat on private lands. Safe harbour agreements granted landowners some flexibility in how they managed their lands if they agreed to follow a management plan that they developed with the technical assistance of the agencies. Plans included a range of measures, such as longer rotations, which would enhance the services provided by the forests. Under the agreement the plans could be followed even if a new population of an endangered species was established. This meant that landowners would not be prosecuted for “taking” a listed species as long as the management plan was followed, i.e. it was assumed that the forest would provide a net benefit in terms of conservation even if a single specimen was impacted. Under the legislation, landowners had to enter the land into a CE which specified the management approach to be adopted and payments were made to landowners based on the length of the CE. For a permanent easement landowners could receive a payment equal to 95% of the full value of the land while maintaining a right to harvest timber from the forest.

#### *Drivers of Payments for Ecosystem Services (PES)*

Markets for ES can be created through environmental regulation or through private or commercial attempts to offset damage and enhance benefits motivated by ethical concerns and/or reasons related to corporate social responsibility and marketing. Payments may come from national or state governments, commercial and non-profit organisations or private individuals. The specific design of a payment scheme will be influenced by the nature and importance of the service of interest (Jack et al. 2008). One of the aspects of PES which has helped to create significant interest in such policies has been the recognition of achieving multiple beneficiaries and potential “win-win” scenarios where environmental improvements can be attained while minimising restrictions on economic activity (Engel et al. 2008). In reviewing the formation of PES a number of essential drivers are evident, as described below.

#### Supportive and innovative regulatory authorities and NGOs

The most established USA markets were created primarily as a result of regulatory authorities seeking innovative solutions to the challenge of implementing legislation. Agencies, such as the EPA, which are tasked with overseeing particular pieces of legislation, have to be supportive of the concept for some markets to be established. In addition, funding for the development of markets and the associated infrastructure often stems from public sources. Organisations which are viewed as independent and non-regulatory, such as NGOs, often play an important intermediary role between landowners and buyers. In addition, NGOs and representative groups can assist in the formation of cooperatives to enable smaller landowners to access markets, as was the case with Woodlands Carbon.

#### Recognition and quantification of ecosystem services

To link payments to outcomes, the services that flow from a particular location and the impact of management must be recognised, which may include multiple services or benefits (Deal et al. 2012). Information and tools that facilitate the quantification of ES are an essential part of any system as it is rarely possible to measure services in real time (Jack et al. 2008). This can be seen clearly in water quality trading where payments are linked to the expected reduction in thermal loads modelled using a tool developed at the state level.

#### Regulation, information and education

Some PES have a clear link to regulation, including mitigation banking and water quality trading which both stem from national legislation. One of the essential elements of this legislation is a recognition that some form of off-site mitigation can occur and, in terms of wetlands, that the goal is no net loss rather than strict conservation in-situ as stated in the CWA. Such an approach to target setting, particularly for biodiversity, is currently being reviewed at an EU level (European Commission 2015). The

adoption of no net loss targets would offer the potential to develop mechanisms for forest owners to trade habitats on their land. No regulatory carbon market for Irish forest carbon credits currently exists as they are excluded from the EU Emissions Trading System. Voluntary carbon markets can be viewed as being information driven as an increasing awareness of the impact of carbon emissions underlies their creation, rather than a regulatory requirement. However, this market appears to be relatively limited in Europe. A first step in their creation would be the development of protocols that outline how credits can be generated, bought and sold, and how the market can be managed, including the identification of the key agents in the process.

#### Motivated buyers and sellers

Buyers in US PES schemes generally come from industry or the public sector rather than private individuals (Engel et al. 2008). Some buyers may be direct users of an ES, such as a water company who pays upstream owners to manage their lands to enhance water quality, or indirect users, such as factory owners that purchase carbon credits. Other buyers include NGOs and government agencies that are tasked with the protection or enhancement of ecosystems. Aside from regulatory requirements, private sector purchasers may be motivated by a desire to reduce regulatory risk in the future by demonstrating the effectiveness of self-regulation (USFWS pers. comm.). This is most clearly demonstrated in conservation banks which are aimed at ensuring the protection of species to avoid their listing as threatened or endangered. Buyers may also desire to enhance their reputation and image for marketing reasons.

Sellers can come in a number of forms but are often limited to smaller private owners in federal funded programmes. Many private non-industrial sellers of ES may be motivated by a conservation ethic rather than a profit motive. Smaller private owners may be constrained from entering some markets directly, such as conservation banking, given the significant upfront investment required, which could potentially be greater than the resulting payment (Wunder 2013).

#### *Potential benefits of PES schemes*

One of the primary arguments in favour of PES is that conservation aims can be met more efficiently following set goals that are delivered in a targeted way based on where the highest value or lowest cost exists (Ferraro and Simpson 2002, Jack et al. 2008). From the perspective of regulatory agencies, PES schemes such as mitigation banking may be a preferred method of conservation as it requires the permanent management and protection of a habitat (ACE and EPA 2008). Mitigation, either on- or off-site, by developers may not produce the same outcome as they lack a long-term incentive. From the developer's perspective, purchasing an offset may speed up the licensing process and be more efficient than undertaking mitigation directly. Such an approach may also ensure that those involved in the exchange have higher levels of

knowledge and information than traditional regulatory approaches (Engel et al. 2008).

The willingness of landowners to supply services through active management or conservation is essential to protecting ES on private lands (Ma et al. 2012). In addition to rewarding owners for good practices, PES may help landowners to diversify their incomes and bring greater economic resilience to smaller landowners and rural economies (Jack et al. 2008). More generally, regulators often refer to the ability of PES to turn a perceived liability into an asset, e.g. possessing an endangered species on a property could be viewed as a means of increasing income rather than as a threat to the livelihood of the landowner (USFWS pers. comm.). Some USA landowners were viewed as having a negative view of regulations related to listed species in the past, particularly those that were seen to have a direct impact on their industry. Overly burdensome and costly regulation related to endangered species may result in some landowners attempting to remove the species from their property to avoid the problem, colloquially termed “shoot, shovel and shut-up” in the USA (Lueck and Michael 2003). Incentivising conservation with payments can, at least, address some of the associated costs. Tax-payers may also benefit from PES as conservation efforts may be more targeted and, in some cases, acquire funding from private sources rather than relying solely on public funds. A more general consumer benefit which may exist, but is difficult to quantify, is the influence of ES on the costs of electricity, water and consumer goods. Service providers must frequently resort to hard engineering solutions to ensure a quality service or to meet environmental or health guidelines. If landowners can be paid to deliver services that provide the same benefits at lower costs, as in the Clean Water Service example described previously, consumers may benefit.

PES schemes often provide benefits beyond the service they are targeting and thus multiple services may be enhanced through one payment (Deal et al. 2012). Although forest related PES may be viewed as having a negative impact on timber production, this may not always be the case as payments may stem from land that was already unproductive. For example, carbon sales may be made from conservation areas or riparian buffers which were already restricted in terms of timber harvesting. More generally sales of ES may be possible from forests which may not be harvested profitably due to high operational costs. Non-forest lands may be sold separately to provide new habitats, such as through wetland mitigation banking, which can produce an income from lands which would have been considered as unproductive otherwise. Thus, markets may be created for the conservation of lands which would not have generated income otherwise. Carbon credits may be created through an extension of the rotation age which may increase timber production, particularly of sawlog (Pohjola and Valsta 2007). The landowner would thus receive compensation for delaying timber harvesting

while production overall could be greater.

### *PES in Ireland*

From an Irish perspective, only publicly funded payments for forest services have developed thus far. In addition, these payments are rarely based on the provision of a service but rather on land use change or forest management practices. PES schemes, in theory, achieve greater efficiencies in terms of the production of ecosystem systems as they link the quantity of payments directly to the quantity of benefit produced. This has the advantage of ensuring the desired outcome is actually achieved. The existing afforestation scheme in Ireland can be considered a PES under some definitions as it recognises that multiple services flow from the forest estate (economic, social, environmental and recreational benefits), but payments are linked to land-use change rather than service delivery. Landowners receive funding based on the area planted, irrespective of whether they produce a given service or not. It is important to recognise that the development of PES in the USA took a number of decades and the introduction of such systems in Ireland could face a number of challenges including:

#### Achieving additionality

An important issue in any PES scheme is whether the programme is achieving true additionality beyond what is already required by law. One of the criticisms of the REPS, which focused on agricultural land in Ireland, was that it was difficult to prove that genuine improvements had been attained beyond what is achieved by standard management following existing regulations (Hynes and Murphy 2002). The forest environmental protection scheme did attempt to deliver multiple benefits through active management linked to specific practices but its success in achieving this has not been measured. The renewed Native Woodland Scheme requires the creation of specific woodland habitats based on site and soil suitability, an approach which places greater emphasis on the outcome of the policy. Although the theory of PES suggests linking payments to services, it should be noted that in practice payments are often area based as the quantification and surveillance of services poses a serious challenge (Engel et al. 2008). However, baseline inventories of existing service levels are required to identify any subsequent increases. In addition, a standardised method of measurement, such as those contained in carbon offset protocols, ensures transparency and equality in the quantification of benefits. Such concerns should be accounted for in the design of a PES scheme. Related to this, the mapping of ES is a growing area of research as location can play an essential role in understanding both the supply and demand of services (Maes et al. 2013). This could be integrated into the afforestation scheme by varying payments based on the supply of ES from a given location, as in the now-closed Woodland Grant Scheme in England (Forestry Commission England 2015) and the Forestry Grant Scheme in

Scotland (Forestry Commission Scotland 2015).

One of the major challenges for private landowners to achieve additionality is that legislation already protects the production of services to some degree. Any move towards more outcome-based payments would have to account for existing forestry and land-use policies to ensure that direct policy conflict does not arise (Jack et al. 2008). Many countries, including Ireland, impose restrictions on converting forest land and on how management is undertaken. Where such legislation is in place, landowners have already been obliged to absorb the costs of supplying ES to some degree and potential buyers are unlikely to pay for something which is already being produced.

#### Significant costs associated with sales

As previously discussed, even where a market exists, creating credits for sale can be costly. For wetland and conservation banking, bankers must initially undertake the restoration work but are also obliged to establish a non-wasting endowment to pay for their on-going management. Most schemes require an extensive inventory for the services to be initially quantified, which can involve employing a number of specialists. Where new markets are being established, protocols must be developed or management baselines must be described so that the expected increase in services can be quantified. In addition, there is often a requirement for third-party verification of service provision. Such costs are often a significant barrier to market entry by smaller owners and may require support by public agencies or NGOs.

#### Landowner ethic

It is recognised that forest owners are motivated by a range of factors and rarely focus solely on profit maximisation, which is considered to be one of the major challenges in promoting afforestation in Ireland (Howley 2013). Although PES may appear to be turning a liability into an asset, from the landowner's perspective a more important issue may be a loss in lifestyle or freedom of management rather than maximising income alone. Smaller forest owners in Oregon who have engaged with PES schemes have generally done so for ethical rather than commercial reasons (OSWA pers. comm.).

A related challenge faced by small private owners in entering environmental markets is the long-term nature of the restrictions. For example, carbon projects in the Carbon Action Reserve must enter long-term agreements, typically 100 years, from the year the specific carbon credit is sold. However, Woodlands Carbon was able to develop a protocol that required a shorter commitment period for small owners in Oregon. In addition, although restrictions may be long-term or even permanent, payments may take place only once. Research into the willingness of private forest owners to engage with PES schemes would be valuable in ascertaining the potential level of supply and how such schemes should be designed.

## Conclusion

PES can offer the potential to create additional income streams for forest owners and allow them to receive compensation for adopting less intensive management practices. Payments and markets for forest-related ecosystem services have existed in the USA for a number of decades and are increasing. Wetland mitigation banking is now well-established and recognised by regulatory authorities as a preferred form of mitigation. Conservation banking protocols have been developed for a number of species and new ones are under development. Water quality trading highlights directly the value of riparian woodlands in protecting and cooling water. The Californian cap-and-trade market has expanded the potential market for carbon credits beyond the existing voluntary markets. The size of these markets is expanding, but given the cost and complexity of entering many markets, questions exist as to how attractive they are to smaller private owners. Meanwhile industrial forest companies and NGOs appear to be amongst the primary beneficiaries.

Amongst the lessons Ireland might learn from this approach to conservation is the need to recognise and actively quantify forest-related ecosystem services. The potential exists to engage private industry in supporting PES schemes through appropriate legislation or the creation of voluntary markets. Regulatory authorities will play a central role in this process through the manner in which legislation is designed and enforced and by actively supporting market development. More generally, adopting a more outcome-based approach to supporting the production of services has the potential to achieve greater efficiencies and to benefit landowners, industry and citizens.

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**Appendix – Abbreviations used in this paper**

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ACE	Army Corp of Engineers
ARB	Air Resources Board
CE	Conservation easement
CWA	Clean Water Act
ES	Ecosystem services
ESA	Endangered Species Act
MEA	Millennium Ecosystem Assessment
NRCS	Natural Resources Conservation Service
ODF	Oregon Department of Forestry
OSWA	Oregon Small Woodlands Association
PES	Payments for ecosystem services
REPS	Rural Environmental Protection Scheme
SCB	Species conservation banking
TFT	The Freshwater Trust
USFWS	US Fish and Wildlife Service
WMB	Wetland mitigation banking

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