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Purchase, protect, resell, repeat: an effective process for conserving biodiversity on private land?

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Biodiversity on private land

Global conservation efforts are increasingly focused on expanding the amount of permanently protected private land, with the aim of preserving biodiversity. These efforts are often constrained by financial resources, particularly where land acquisition is expensive, or where landowners are reluctant to enter into conservation agreements. Purchase–protect–resale

(PPR) programs are used by conservation organizations in a number of countries to facilitate the purchase, resale, and protection of private land. We conducted the first systematic review of the literature on PPR and collated information on its use around the world. In total, we found that funds exceeding US$384 million were available for PPR, and over 684,000 ha have been protected to date. We identify the unique attributes of this approach and the challenges of its implementation, and discuss its potential for protecting land unsuitable for other conservation approaches. Our analysis highlights the importance of selecting appropriate properties, and we suggest that insights from the economics literature could help to improve the effectiveness of PPR programs.

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In a nutshell:

- Purchase–protect–resale (PPR) programs allow conservation organizations to acquire private land with conservation value and resell it with an agreement to protect biodiversity, enabling cost recovery
- Globally, more than US$384 million is available in PPR funds, with over 684,000 ha protected to date
- PPR approaches can potentially be financially self-sustaining
- Implementation of PPR can be complex and uncertain, and subject to fluctuations in the market for conservation properties
- Identifying property types that meet conservation objectives and recover costs within a reasonable time frame, and drawing insights from economics to assist decision making, could increase the effectiveness of PPR and improve conservation outcomes

Setting aside privately owned land is an important component of global efforts to conserve biodiversity. While voluntary short-term and non-binding mechanisms can provide temporary protection for biodiversity (Mayer and Tikka 2006; Santangeli *et al.* 2016; Prado *et al.* 2018), permanent protection mechanisms are often preferable due to the heightened certainty that ecological values will remain safeguarded into the future. In addition, many permanent protection mechanisms enable the establishment of "privately protected areas" (PPAs) – protected areas under private governance – that are seen as increasingly important instruments for achieving Convention on Biological Diversity Aichi Biodiversity Targets for ecologically representative protected area networks (Stolton *et al.* 2014).

Two approaches currently predominate for creating PPAs and permanently protecting biodiversity on private land. Perhaps the most prominent is the outright purchase of land with conservation value and its ongoing management for biodiversity ("acquisition"). This approach allows conservation organizations to strategically purchase land of high conservation value and manage it over time, a strategy that may be particularly effective for conserving biodiversity where development pressures are high and land supply is tightly constrained (Armsworth and Sanchirico 2008). However, acquiring land can be expensive, especially in landscapes with competing land uses and high land values (eg peri-urban areas; Newburn *et al.* 2005), and funding for long-term management can be difficult to obtain (Pasquini *et al.* 2011). Although important for conservation, the acquisition approach alone is unlikely to be a viable solution for conserving biodiversity on private land at large scales (Fairfax *et al.* 2005).

The second predominant approach for creating PPAs is for conservation organizations to establish permanent agreements with landowners (eg conservation covenants and easements) (Fishburn *et al.* 2009; Fitzsimons 2015). These types of agreements are voluntary for landowners, but legally bind current and future owners to either active management or restricted use of their land to conserve biodiversity (Fitzsimons and Carr 2014); this approach is becoming more common in a growing number of countries, including Australia, Canada, New Zealand, and the US (Ewing 2008; Fishburn *et al.* 2009; Fitzsimons 2015; TNC 2016). Such agreements offer an enduring approach to protection (Hardy *et al.* 2017) that reduces development pressures on biodiversity (Pocewicz *et al.* 2011) and is less costly to conservation organizations than land acquisition and ongoing management (Parker 2004; Comerford 2013), while avoiding the potential social disruptions that are often associated with large-scale land acquisitions (see Mansergh *et al.* 2008). However, implementing permanent agreements relies on landowners being willing to volunteer their property for protection, limiting the application of these agreements to a subset of landowners (Comerford 2013). Sometimes, financial incentives accompany permanent agreements as a way of encouraging uptake (Rissman *et al.* 2013). Each new permanent agreement also requires conservation organizations to take on the long-term costs (Figgis *et al.* 2005) associated with administration, monitoring and compliance, and enforcement activities (Rissman *et al.* 2013), and in some cases the provision of ongoing stewardship support to landowners (Adams *et al.* 2012). Where such agreements are difficult for the managing organization to establish, monitor, or enforce, these costs may make acquisition a preferable strategy (Parker 2002), provided the property is available for purchase.

Conservation using purchase–protect–resale

An alternative to the outright acquisition of land is for conservation organizations to purchase private land and then sell it to conservation-minded buyers, in the process adding an in-perpetuity conservation covenant or easement to protect the conservation value of the property. This approach is broad and not yet well defined (we refer to it here as "purchase–protect–resale"; PPR), and is currently achieved by organizations in one of several ways. One is to use a dedicated fund (a "revolving fund") to purchase private land with conservation value and then resell it to new owners with a permanent conservation agreement attached to the property title (Fitzsimons and Wescott 2001; Hardy *et al.* 2018). Fund capital is replenished primarily by reselling purchased properties (Figure 1), ideally at prices that recover all purchase, transaction, and ongoing costs (Brewer 2003; Cowell and Williams 2006), with replacement capital raised if needed. The replenished capital is then used to purchase and protect additional properties (Safstrom 1996). A second and similar approach is to use a "revolving loan fund", whereby fund capital is distributed for the same purpose,

either within a conservation organization (an "internal" revolving fund) or to a separate organization or individual (an "external" revolving fund), with an agreement for the borrower to return the money (often with low or zero interest) within a given time frame (McBryde *et al.* 2005; Clark 2007). A third approach is to buy and resell land using part of a large capital fund (eg an endowment fund) that is not marked exclusively for PPR purposes and that may be used for other conservation activities or expenses.

The PPR approach is closely related to "conservation buyer" programs (LTA 2008), in which a conservation organization acts as a broker linking the seller and purchaser, except that in PPR, the conservation organization assumes direct, albeit interim, ownership of the property. The PPR approach is also similar to "pre-acquisition", where a conservation organization takes interim ownership before transferring the land to a public agency (Hunter and Kohring 2009), although instead of a public agency, PPR properties are resold to private buyers. Depending on how the approach is applied, PPR could also be considered part of "conservation development", whereby the land undergoes controlled development while also protecting conservation resources and generating revenue (Milder 2007).

Despite the growing interest in PPR and its potential to protect biodiversity on private land in a financially self-sustaining way, its role in conservation has received little attention. Focusing broadly on the PPR process (whether implemented via revolving funds, revolving loan funds, or as part of a larger capital fund), we provide the first global summary and analysis of PPR for private land conservation. This was done by collating information from past research, web searches, and practitioner knowledge about current and past PPR programs. We also reviewed previous studies on PPR to identify the benefits and challenges of its use for permanently protecting private land. With a particular focus on conservation policy, we describe how PPR fits alongside the other main approaches to protecting biodiversity on private land, and assess the potential for modifications that may improve conservation outcomes.

Gathering information on PPR

We conducted a systematic review of scholarly databases (Web of Science, Google Scholar, ProQuest, and Scopus) and general internet-based searches for published and gray literature (mainly reports, and excluding webpage content) relating to the process of purchasing unprotected private land and reselling it with a permanent conservation agreement (search terms used are listed in WebTable 1). An article was included only if it contained specific mention of the use of revolving funds or revolving loan funds, and/or the process of purchasing and reselling private land to conserve biodiversity. We also included reports and book chapters that we already knew contained information about PPR but had not been identified in the search. We extracted identified benefits

and challenges of using PPR from each of the articles that met our criteria and then coded these based on emerging themes (see WebTable 2 for coding framework).

Drawing from an exhaustive search of the literature, web searches, and practitioner knowledge, we also compiled the first comprehensive global list of current and past PPR programs that have been used to purchase and resell private land. Only programs that involved purchasing, protecting, and reselling private land for biodiversity were included in the analysis. Where such information was available, we recorded total fund size, area protected, start date, end date, number of loans or properties protected, and the total value of all purchases or loans.

History and current state of PPR

Full details of all of the PPR programs we collated for each country are presented in WebTable 3. We identified 21 PPR programs currently in operation globally, and noted that rapid growth in the number of such programs has occurred since 1990 or so (Figure 2; WebTable 3). There has been a slight decline in the number of programs since around 2010, however, although in the absence of an established definition or naming convention it is not clear whether this represents a true reduction. It is also unlikely that all PPR programs in existence were identified in our search.

The first PPR fund was established in 1955, in the US, where the majority of current programs operate (13 out of the 21 we evaluated), along with an additional two programs that are based in the US but operate in both the US and Canada. In Australia, the first of six revolving fund programs was established in 1989, with five currently in operation. In Chile, one program has been established and has been operating for 9 years. We identified a total of eight PPR programs that have ceased operating after they were established.

The PPR approach has facilitated the protection of almost 684,000 ha worldwide, 66% (450,000 ha) of which are in the US (Figure 3; WebTable 4). Almost $384 million (all dollar amounts hereafter are in US$) are held in PPR funds globally; average PPR program size is ~$12.8 million. By country, PPR programs that spanned the US–Canada border were the largest on average ($30 million), with the US having the highest amount available in total (almost $214 million; Figure 3). These figures are underestimates, however, because data were not available for all programs.

Outcome of comprehensive review

We identified a total of 72 documents that met our criteria for inclusion in the review. Of these, 47 were journal articles, books, or book chapters, with the remainder comprising gray literature. Very few documents focused solely on PPR, with the vast majority mentioning this approach as part of a broader topic. The full list of articles is provided in WebTable 5.

Benefits of the PPR approach

A wide range of benefits were attributed to PPR (Figure 4), some of which appear unique to this approach, such as the ability to recover costs and recycle money for continual land purchase and protection – the most frequently cited benefit identified in our review (39% of all articles). Surprisingly, there were only three specific mentions of the potential for PPR to be self-sustaining (4%), and two of these came from the gray literature.

There were several benefits identified for PPR that also apply to other approaches for protecting private land. These included the ability to strategically target important properties with high conservation value (36%) – for instance, land under threat of development, or land close to, complementing, or linking protected areas. The idea that PPR could be used to conserve expensive land was mentioned in 15% of all articles, particularly where costs could be recouped through resale, as was the ability to act quickly and purchase land as opportunities arise (14%), the beneficial development of the conservation property market (14%), and the shifting of land ownership to conservation-minded owners (14%). The process was stated as having particular benefit where voluntary protection or acquisition approaches were unlikely to be feasible (15%), for example where landowners had been unwilling to participate or where acquisition without resale was too expensive.

Challenges for the PPR approach

A summary of the challenges attributed to using PPR discussed in the documents we identified is provided in Figure 5. Some of these were unique to PPR, the most frequently cited of which was the limited demand for conservation properties (15% of all articles). Related to this was the pressure for organizations to continually buy and resell (turn over) properties to achieve conservation (10%).

A number of challenges were raised for PPR that also apply to other protection approaches. These included the pressure to recover costs through property sales (15% of all articles), the supply of conservation properties (10%), the consequences of bad decisions (6%), the risks associated with operating in dynamic property markets (6%), having to make decisions based on incomplete information (13%), the difficulty of operating with limited staff resources and expertise (10%), the potential for negative community perceptions regarding the organization's participation in the property market (10% of articles), managing opportunity costs (7%), and the constraints of operating with limited fund capital (7%).

The role for PPR in private land conservation

Our review indicates that PPR approaches have several beneficial attributes that make them useful for permanently protecting private land and increasing the contribution of PPAs. We have provided a summary of these in Table 1 and compared them to other approaches. Some attributes are unique to PPR, most notably the ability to recover costs (eg purchase costs, as well as holding, protection, and resale costs) through property resale, which facilitates the protection of further properties. Our review identifies heightened potential for PPR to protect expensive land (often in landscapes that are valuable for other productive uses and that contain threatened ecosystems) due to the ability to recover some, if not all, costs. This suggests that PPR may be particularly useful in cases where land values are too expensive for acquisition programs, and/or where landowners are reluctant to enter into permanent conservation agreements. However, many of the articles included in our analysis contained only limited information about PPR. Although evaluations of the impacts of conservation development (eg Pejchar *et al.* 2007; Milder *et al.* 2008) and the cost-effectiveness of the pre-acquisition approach (Armsworth and Sanchirico 2008) have been presented in several studies, we found very few formal assessments in either the academic or the gray literature that focused specifically on PPR, with Clark (2007), McBryde *et al*. (2005), and Binney and Whiteoak (2010) providing the most detailed accounts. Alongside its growing use, the unique attributes of PPR as a conservation tool highlight the need for further research, aimed in particular at evaluating the contribution of this approach to private land conservation and the creation of PPAs.

Our review also revealed numerous challenges that limit the capacity for PPR to protect private land. Being reliant on the property market means PPR is constrained by the demand for and supply of properties with conservation value, and especially those that will enable cost recovery through resale. Attaching a permanent conservation agreement that restricts options for future land use would likely reduce the number of potential buyers, impacting resale times and prices. Moreover, a conservation agreement that restricts development rights has the potential to diminish property values, suggesting that managers would have to consider selling properties at a financial loss on occasion, although the effects of these types of agreements on property values are uncertain (Winfree *et al.* 2006). Social factors are also likely to influence the success of PPR programs, partly in relation to the characteristics of individual properties (eg aesthetics, location) but also in terms of how buyers perceive the relative novelty of owning property of high conservation value (Corcuera *et al.* 2002) as well as behavioral aspects that might influence their decision to purchase, such as social norms (eg knowing others who own conservation properties) (Adamowicz and Olewiler 2016). To some extent, PPR programs can minimize resale challenges by focusing on properties attractive to conservation-minded buyers, and designing agreements that allow for some residential

or recreational use while simultaneously protecting ecological values (Hardy *et al.* 2018). At present, little guidance is available about what types of properties are most suitable for PPR programs beyond general statements on conservation value and market attractiveness (Whelan 1997), a deficiency that must be addressed.

In addition, managers of PPR programs need to deliver conservation outcomes despite limits on fund capital and the need to maintain funds over time. Similar to other conservation acquisition approaches (Parkhurst and Shogren 2005), purchasing a property for later resale results in foregone opportunities to use those funds for alternative conservation actions (especially where the PPR process is undertaken using parts of a larger capital fund that is also used to finance other types of activities). In the resale process, there are likely to be substantial opportunity costs for managers to consider; for example, an opportunity may arise to sell a property at a loss, forcing the manager to decide whether to accept the offer on the table or hold on to the property in the hope of obtaining a better offer in the future. Such a decision may not be straightforward; for instance, in a weak or declining property market the decision to reject the offer and keep the property results in funds remaining tied up in the land, thereby foregoing opportunities to buy and conserve additional land while market conditions are favorable. On the other hand, if a manager declines an offer in a strong or rising market, the chance of receiving higher future offers increases but so too do the prices of properties of interest for potential purchase. Constraints on resources, expertise, and information likely limit the capacity for managers to account for the complex dynamics of the property market and assess opportunity costs (Naidoo *et al.* 2006), leading to considerable uncertainty over the timing or nature of outcomes. Presumably a larger PPR fund (relative to the cost of conservation properties) would help mitigate these challenges, providing greater capacity to purchase a mix of different properties (ie a “portfolio”), flexibility to absorb greater risks with recovering costs and resale times, and the ability to regularly buy and turn over (“revolve”) properties. Nonetheless, policy makers and practitioners should note that these challenges make it difficult for PPR programs to achieve large conservation gains quickly (Binney and Whiteoak 2010), although how these challenges impact the effectiveness of PPR programs is not yet clear. This could also be a subject for future research, particularly in regard to how PPR compares to other permanent protection approaches.

Employing a mix of approaches is likely to be beneficial for implementing private land conservation (Doremus 2003) and may also boost participation rates (see Greiner *et al*. 2008). The capacity of PPR programs to take advantage of conservation property markets and proactively create PPAs, makes PPR a useful part of the private land conservation policy mix, alongside binding and non-binding approaches, financial incentive payments, and acquisition. However, because PPR shares attributes with other permanent protection approaches (see Table 1), policy

makers need to be aware of the potential for overlap. For example, because both PPR and acquisition can be used to target specific properties, with opportunities limited by landowners willing to sell, there is potential for properties to be concentrated in the same area, which could inflate land prices or push development into unwanted areas (Armsworth *et al.* 2006). In such cases, collaborative approaches between conservation agencies would be beneficial (Jansujwicz and Calhoun 2010; Gordon *et al.* 2013), but the issue highlights the need to identify a role for PPR in the conservation policy mix. On the basis of the results of our review, we suggest the most effective role for PPR would be in protecting private land with conservation value where (1) conservation values are compatible with and attractive for private ownership, (2) an acquisition-to-hold approach or permanent agreement with existing landowners is unlikely or infeasible, and (3) resale is likely to recover (at least most) costs within a reasonable time frame. Policy makers considering the use of PPR should also note that due to their constraints, the likely contribution of this approach is incremental protection of private land rather than rapid gains (see also Cowell and Williams 2006), and therefore PPRs should be viewed as longer-term investments that facilitate gradual increases in the number of further PPAs.

It is also important for policy makers to understand that PPR programs are unlikely to be appropriate in all regions. All of the programs identified in this review were operating in countries with predominantly neoliberal economic systems, and it is unlikely that PPR would be suitable without an existing market for private conservation properties, or where demand for conservation properties is weak. This limitation may also apply to the type of fund (eg internal or external revolving loan fund); perhaps due to the large number of land trusts, and the market for conservation properties, all external revolving loan funds were based in the US. Regardless of the type of fund, conservation organizations need a pool of initial capital (usually raised through government, philanthropic, or private investment sources) of sufficient size to buy important conservation properties. The start-up capital of the revolving fund programs in Australia (which are dedicated to the purchase and resale of high-value conservation land, and in some cases are also used to cover staff and operational costs) is derived primarily from government sources (Cowell and Williams 2006). Furthermore, the reliance on permanent conservation agreements reduces the effectiveness of PPR in areas where property rights are not well defined or enforced (Pasquini *et al.* 2011). Organizations would also need to have the authority to purchase land and establish conservation agreements, and employ individuals with expertise in ecological assessment, real estate markets, and staff resourcing in order to adequately assess, purchase, protect, and resell properties.

Improving PPR implementation

Our review suggests that complex, cross-disciplinary decision making is required for implementing PPR programs. Property selection is a particularly difficult challenge, as it involves elements of economics, social science, policy, ecology, and conservation; moreover, decisions must often be made under conditions of limited information and high uncertainty, and have sequential impacts on future success. Despite the importance of property selection, our review did not uncover research identifying which types of properties are most appropriate for PPR; presumably, some properties have a mix of ecological, amenity, and financial characteristics that make them more suitable for PPR than others. Identification and prioritization of high conservation value sites can be accomplished in several ways (Wilson *et al.* 2006; Tulloch *et al.* 2015), and a socioecological approach could help identify regions attractive to conservation buyers that will also benefit biodiversity (Ban *et al.* 2013). But which mix of characteristics makes a property suitable for fast resale and a high likelihood of recovering costs? How do we trade off among these characteristics to find the most important ones? And how can we ensure both conservation and resale goals are met within the dynamic and uncertain nature of real estate markets?

There are also broader questions about the use of PPR as an approach to conservation, for which insights from economic theory may be particularly useful. For instance, portfolio theory could help develop strategies to manage risk and uncertainty, relating to both the mix of properties bought by PPR programs and the place of PPR programs within the broader range of conservation policy options (Doremus 2003; Ando and Shah 2014). Return on investment analysis could be used to explore the relative benefits of different purchasing strategies (Boyd *et al.* 2015), taking into account the net financial outcome of the PPR process (ie resale price minus purchase and all transaction costs). Furthermore, real options analysis could help managers of PPR programs to assess the timing of purchases (eg relative to property market trends) and understand the impacts of associated sequential decisions (Ando and Shah 2014).

The ongoing implementation and improvement of PPR programs would benefit from additional research, and we suggest five key questions as starting points: (1) to what extent can PPR programs leverage the capital of conservation organizations, does this vary between different types of PPR programs, and how does this compare to other conservation finance tools? (2) How do conservation outcomes scale with increased size or risk profiles of PPR programs, and would pooling PPR funds across organizations provide greater leverage of capital and enhanced conservation outcomes? (3) How should PPR programs define a portfolio of purchase decisions to balance their financial risk, and how much financial risk should a PPR program take on? (4) How much of a financial loss should PPR programs be willing to absorb, given the limited market for conservation properties and likely opportunity costs? (5) What are the sequential impacts of

different purchasing strategies? For example, is it more effective to purchase properties with exceptional conservation values and delayed resale than to purchase properties with lower conservation values but a greater likelihood of rapid turnover, and thus provide faster incremental gains?

Conclusions

Increasing the amount of private land permanently protected for biodiversity is likely to remain an important focus of global conservation efforts. Where suitable conditions exist, and with appropriate property selection, PPR programs show promise as a self-sustaining approach for permanently protecting biodiversity on private land. Of interest to policy makers, PPR programs may be complementary to other approaches for conserving private land, protecting properties where acquisition is expensive or otherwise infeasible (eg that are attractive for resale), or where landowners are unwilling to enter into permanent conservation agreements. This potentially frees up capital for other acquisition funds to buy other types of properties. Nonetheless, implementation of PPR is a complex process, and arguably drawing insights from economics into decision making could help to streamline use of this tool, so that trade-offs between conservation values and financial sustainability can be explicitly considered. Beyond these immediate questions, a number of general issues with PPR remain unexplored, such as: which properties are more suitable for private owners and which are better for conservation organizations over the long term? How does the social landscape change with the ongoing implementation of PPR – as permanent agreements become more common in the real estate market, do they become more acceptable, or is there a social or political ceiling to this approach? Can PPRs be used to encourage other sustainable land uses beyond biodiversity conservation? And finally, what is the likely financial ceiling for setting up PPR programs, given the limited funding available for conservation? Resolving these issues will allow for more effective application of PPR programs in conjunction with other approaches, thereby enhancing conservation of biodiversity on private land.

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Supporting Information

Additional, web-only material may be found in the online version of this article at

Figure 1. *A property for sale in Tasmania, Australia, through the Tasmanian Land Conservancy revolving fund program.*

Photo credit:
M Newton

Figure 2. *Time lines showing the years of operation of purchase–protect–resale (PPR) programs and the total number of programs worldwide that are conserving private land. Most of the 21 programs currently operating have emerged over the past 15 years. The "×" symbols indicate programs that have ceased operations. Data were collated based on a review of academic and gray literature, as well as consultation with experts on PPR programs. Details for all programs shown in the figure are presented in WebTable 3.*

Figure 3. *Number, average time of operation, and average fund size of PPR programs. Globally, more than $384 million (all values in US$) are available in PPR programs, which have protected more than 684,000 ha (see WebTable 4 for summary program data). These figures are almost certainly underestimates, as there are likely instances of PPR not captured in our search, and because data were not available for all identified PPR programs.*

Figure 4. *The frequency of articles mentioning each of the PPR benefits that arose from the literature review. Shown as a percentage of all articles found.* **Benefits unique to PPR.*

Figure 5. *The frequency of articles mentioning each of the PPR challenges that arose from the literature review. Shown as a percentage of all articles found.* [*] *Challenges unique to PPR.*

Table 1. Comparison of PPR approaches to other types of programs commonly used in the permanent protection of private land with conservation value[*]

Conservation approach	Main costs to organization	Key benefits	Key challenges
Voluntary covenants and easements	Initiation, administration; compliance, monitoring, and enforcement; stewardship support	Little or no acquisition or management costs; conservation by existing landowners	Requires voluntary participation from landowners; maintaining landowner participation
PPR	Purchase and re-sale; administration; compliance, monitoring, and enforcement; stewardship support	Self-replenishing fund; target important properties; protect expensive land and recover costs; speed of intervention; develop conservation property market	Recovering costs through resale; purchasing resalable properties; market demand for conservation properties; requires landowners willing to sell; requires property turnover; maintaining new landowner participation
Acquisition-to-hold	Purchase and ongoing management	Specialist management; target important conservation properties; acquiring properties difficult to resell; speed of intervention	Requires landowners willing to sell; purchase and management costs; funding absolute property costs

Notes: [*]A more detailed version of this table is available in WebTable 6.

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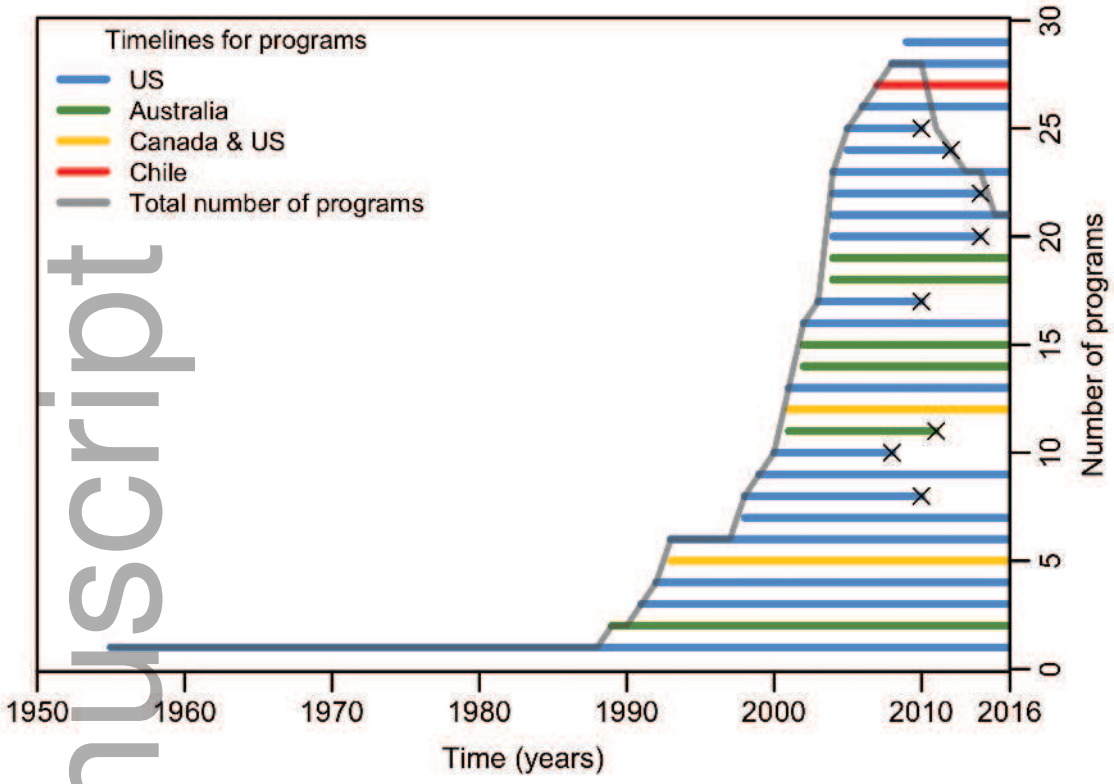

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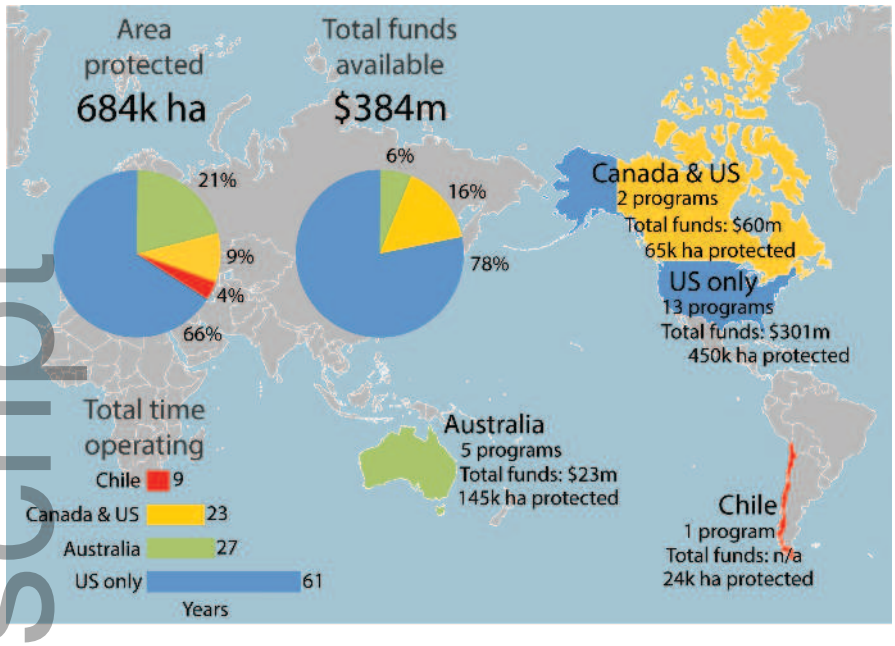

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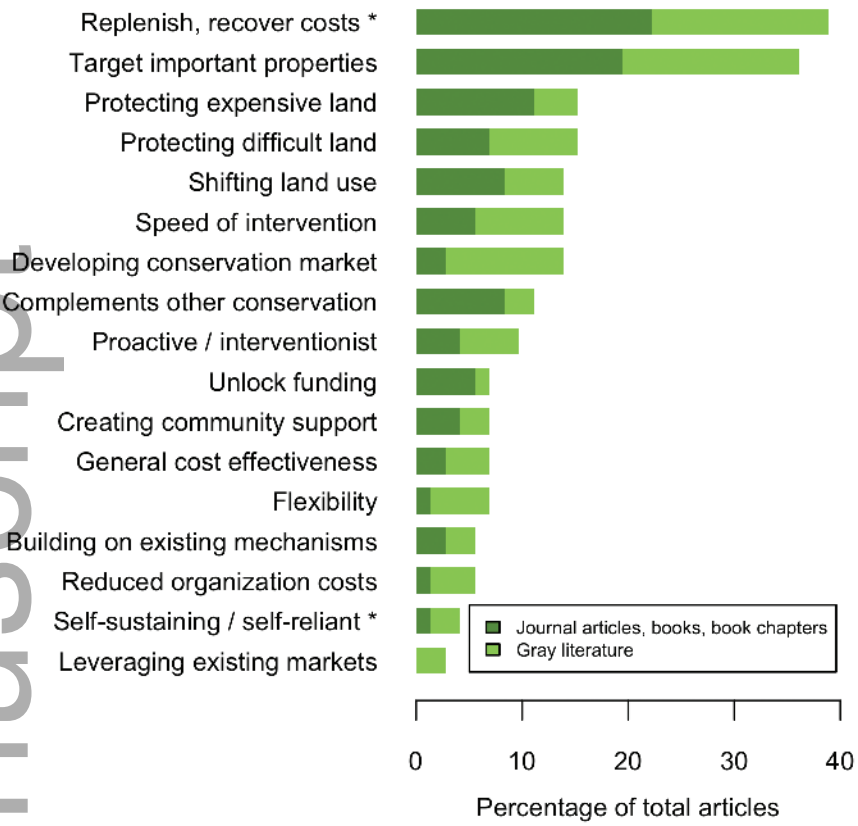

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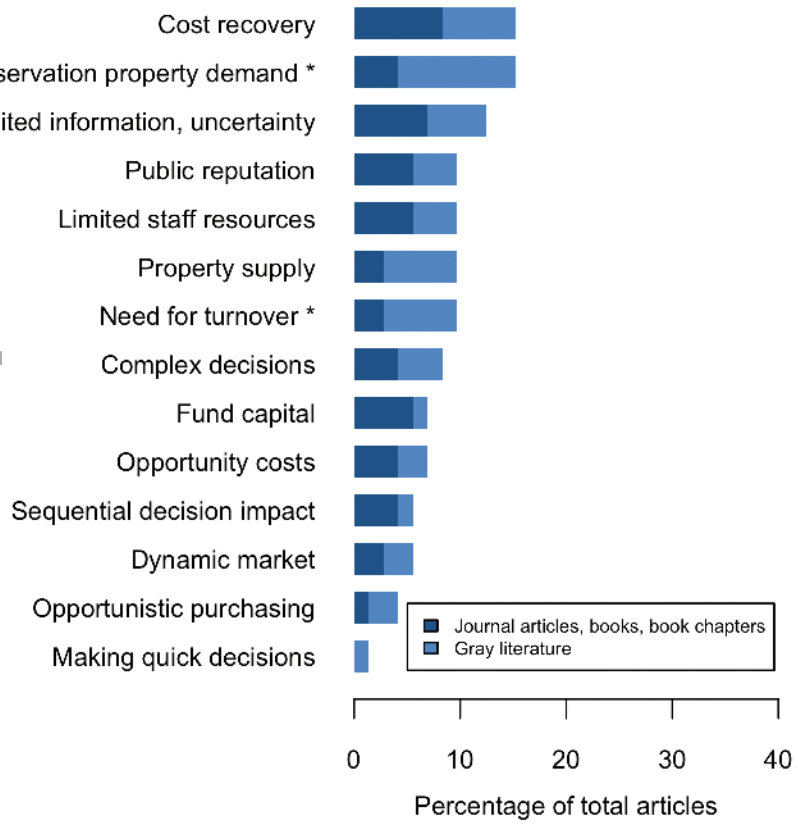

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