COMMENTS FROM ASSOCIATE EDITOR: Dr Cristina García

Associate Editor: This is a Review piece that aims to provide empirical-based guidelines to improve the success of tree planting programs, particularly those entailing a massive number of trees. The topic is timing, relevant, and both authors have an ample experience in this matter. The review includes useful guidelines that will be very welcome by managers and policymakers alike and authors illustrate some examples of good and bad practices with some case study programs on tree planting. Overall, I enjoyed this MS which is well-written and well-structured, but I agree with the reviewers that the text needs some improvements before its acceptance for publication in JAE. One of the reviewers have kindly included a pdf with useful comments to improve the MS.
Authors: *Thanks for your positive feedback and assistance in editing our manuscript. We have accepted all comments on the pdf file and incorporated, as detailed ahead, most of the suggestions made by you and the three reviewers.*

Associate Editor: I will highlight the main points raised by the reviewers and myself: 1. Authors made a good work in highlighting important issues that should considered before considering a tree planting program. Yet, it is surprising that none of them includes forecasting the impact of climate change on the outcomes tree planting. To what extent will climate warming or increase in sea level impact afforestation success? I think authors should include this important aspect that I am afraid is typically ignored in spite the fact that these programs are aimed to last several decades. Here, the notion of adaptive restoration should be introduced and explained to explicitly recognised that climate change should be taken into account when planning these actions. It would be great that one take home message of this piece would be the application of adaptive restoration measures and the recognition that climate change is expected to impact in our ecosystems and our plans.
Authors: *Thank you for this valuable suggestion. Adaptively managing for changing climatic conditions and other unexpected occurrences is an important aspect that should be reinforced in our paper. Following your recommendation, we substantially revised the text associated with principle 2 to briefly include considerations of climate change and adaptive management. We have also added or modified a few questions in table 3 to address these issues.*

Associate Editor: 2. Afforestation or increasing woody/tree cover improves the provision of ecosystem services in the mid- to long-term as discussed here. Yet, it might also entail a number of important disservices such as the increase of risk of massive fires. Therefore, authors should develop on important and already well-known disservices (such as fires) because disservices should be part of the discussion among the stakeholders to define a tree planting programs.
Authors: *We think we have presented many disservices in this manuscript and make the point that these disservices vary depending on how and where tree planting is done, as illustrated in Figure 1. Differently than the Science paper where we aimed to stimulate a critical reflection on the pros and cons of tree planting with a focus on the disservices of this activity, in this paper our goal was to be more forward thinking and provide guidance on how to do tree planting better, so we avoided spending too much space on the disservices. However, per your comments, we have included the term 'disservice', a new citation that present an overview on ecosystem disservices (Shackleton et al. 2016) and a couple of new sentences about it throughout the manuscript and mention fire risk as an additional example of a disservice (lines*

116-118). We spend approximately two pages in the current version of the manuscript discussing the complex and contradictory outcomes of tree planting.

Associate Editor: 3. It would be useful to see a workflow with all different points that should be taken into account when designing a tree planting program, including the possibility of disregarding tree planting as an explicit option, as well as the possibility of mixed programs where tree planting can be suggested in some specific locations while opting for other actions for other areas, such as natural regeneration. Additionally, the possibility of preserving a non-forest environment (grasslands or shrublands) in areas where climate change is expected to become more arid should be also an explicit option. One of the reviewers made the point to avoid underestimating non-forested ecosystems. Please, have this in mind when reviewing the MS.

Authors: *We have added a workflow figure of some of the most important decisions about tree planting. We have tried to keep it as straightforward as possible and have discussed the much more complex set of questions involved in tree planting in Table 3. We have included in both the figure and table the question of whether tree planting is necessary to achieve project goals and the consideration of both historic and likely future suitability of the site as forested habitat.*

Associate Editor: 4. Similarly, it seems to me that including preliminary study/surveys and/or pilot studies should be a sensible goal at the beginning of any of these programs, particularly when large amounts of public/private money are going to be spent for a long time. Again adaptive restoration makes sense here.

Authors: *Good point. As mentioned above, we have expanded guideline 2 to discuss adaptive management. In this section we highlight the value of pilot sites/studies and of the 'staged-scale restoration' approach for more successful tree planting initiatives (and cited an excellent paper on this topic – Baker et al. 2018). We have also added a couple of questions to Table 3 and mentioned it in Figure 3.*

Associate Editor: 5. Some reviewers ask for clarification on some terms such as "success", "regional vs local vs global", and "seed and seedling production procedures".

Authors: *We agree these terms and examples need to be more clearly defined. We explain how we have clarified each of these points in response to reviewers' specific comments below.*

Associate Editor: 6. A reviewer suggested an interesting point: including a section with future research topics that would help to clarify some current unclear points (such as the impact of climate change on afforested lands). After all, this MS will be of interest to researchers not only policy makers or practitioners.

Authors: *We have highlighted specific areas for research in a few places, which are detailed in response to reviewer 3. However, given that our focus throughout the paper is on providing guidance on tree planting efforts and we are at the word limit, we have not added a separate research directions section which would require considerable space for such a broad and multidisciplinary field as tree planting. Moreover, Dr. Holl wrote a review on research directions in tropical forest restoration, which addresses this topic in considerable detail (Holl 2017). We have highlighted a few of the most relevant research areas in the current paper (lines 141-145, 211-212, 326-329, 376-377) and refer the reader to Holl 2017 for a more detailed discussion.*

Holl, K.D. (2017) Research Directions in Tropical Forest Restoration. Annals of the Missouri Botanical Garden, 102, 237-250.

Associate Editor: I am aware that including these main points and other minor points suggested by the reviewers might exceed the required length of the MS. Yet, some parts of this review overlap with the recent opinion piece in Science. Authors can refer to that publication when is relevant and reduce the text to add the points highlighted here.

Authors: *Thank you for recognizing that thoroughly addressing all of the suggestions would indeed increase the number of words substantially beyond the word limit of review papers. We have done our best to address most of your and the other reviewer comments as succinctly as possible and have reorganized and condensed some of our existing text to keep within the 8000-word limit.*

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REVIEWERS' COMMENTS
Reviewer: 1

Reviewer 1: The authors set out to review the literature on global tree planting efforts, summarise the decisions that need to be made, and offer guidelines to increase the success of such programmes. Much of the paper covers the same ground as their excellent perspective piece in Science published just a few weeks ago. So what's different about this paper? I suppose they might point to the list of questions that should be asked and the diagrammatic instructions in the Figures. There is much of value in their discussion but the paper touches only lightly on key issues and, in parts, tries to cover the whole of silviculture in a few sentences.

Authors: *Thank you for the positive words about our previous paper and also about this new study in review. We have tried to clarify (lines 60-62) how this new manuscript builds on the first paper on the Science paper by offering guidance on how to undertake tree planting more thoughtfully and successfully, rather than just critiquing current efforts. We have used your helpful comments to expand the discussion on some key and have done so as succinctly as possible to keep the manuscript with the word limit of review papers. We aimed minimize repetition of topics and examples addressed in our recent Science paper.*

Reviewer 1: Tree planting is controversial and that controversy is growing. Questions are being asked about why trees? Will they solve the problem? Which tree species? and where will you plant them? The why question, is largely about planting trees to reduce greenhouse gases and is the motivation behind big funding from industrial countries. But that motivation is only lightly touched on in this paper. What questions should be asked and how will you find answers on the efficacy of tree planting in soaking up carbon (plantations won't work according to several estimates)? What if tree planting promotes warming by changing the albedo? How does tree planting compare with emissions reduction programmes (see e.g. Smith et al 2016)?

The where to plant trees is also muted in this paper. The enormous targets for tree planting were set without evaluating what areas were available. How come there are such vast areas readily available for planting billions of trees? The authors must be aware of the concerns of those wishing to protect the fauna and flora of ancient open ecosystems. Large scale afforestation in the next decade or two could destroy the habitat of many thousands of sun-loving plants and animals. How do you really go about establishing whether you are planting ancient open ecosystems or reforesting deforested ones? You would think this would be a

prominent part of the paper given Brancalion et al's 2019 important paper showing how suitable areas might be selected for greatest gains at the least cost.

Authors: *Thank you again for such valuable comments. We recognize the many controversies about tree planting and that tree planting limitations and unintended consequences have to be critically considered by decision makers. We tried to make these important points in our Science paper, but we decided to adopt a more forwarding thinking approach in this new paper to guide initiatives that have already decided for tree planting. Unfortunately, the word limit of 8,000 words for all parts of the manuscript including the references prevent us from a more detailed discussion on the several important topics you have raised, yet most of them are presented some way in the manuscript: we have a whole section about tree planting motivations, highlight the risks of tree planting for non-forest ecosystems (Fig. 1, sentence associated with Veldman et al. 2015 and Bond 2016 citations), and describe the importance of spatial prioritization for successful initiatives (citing Brancalion et al. 2019, which have employed cost-effective approaches to guide decision making). In addition, we complemented the sentence in which Brancalion et al. 2019 was cited and added a new sentence to inform readers about the limitations of tree planting to mitigate climate change (lines 143-145, 302-305), an cited an excellent new review about it published in Science (Anderegg et al. 2020).*

Reviewer 1: The emphasis on forests as being the pinnacle of creation, conserving a rich biodiversity, is disappointing in just perpetuating a forest-centric view. That 'non-forests' are extraordinarily rich in species is well known, e.g. for Brazilian cerrado, African savannas, Eurasian steppes, Australian and Cape heathlands etc. The biota of open ecosystems enriches our planet and contributes greatly to several African economies. Surely this is now accepted by the tree-planting community? A recent example in Britain required removal of newly planted trees because they had been planted in grasslands of high conservation value threatening rare sun-loving species. For an insightful article in how cultural perceptions of 'forest' as the pinnacle of nature can distort open-minded recognition of ancient ecosystems, see Noss et al. 2015 on the southern grasslands of the USA, or Abreu et al. 2019 on how increasing tree cover reduced the diversity of cerrado species, or Durigan and Ratter, on how legislation in Brazil prohibiting fire caused large scale conversion of savanna to scrub forest with subsequent loss of the diversity the parks were set up to conserve. We need a balanced account of the 'where to plant trees' question and it is disappointing that these authors have not included it.

Authors: *We fully agree with your comment and have personally worked with the restoration of non-forest ecosystems too (Brancalion in the Brazilian cerrado and Holl in California grasslands and chaparral). We hope that our previous Science paper and this new paper help to better balance this forest-centric view. As such, we noted in the original version of this manuscript "planting trees can also be a threat to biodiversity if done … in non-forest ecosystems (Veldman et al. 2015)" and complemented this sentence with " Tree planting can destroy… fires (Bond 2016)", presents this issue in figure 1, and in the question "Was the area forested historically?" of table 3 and Figure 2. However, per your comment we have more thoroughly addressed 'where to plant trees' by including a couple of more sentences about this issue (lines 119-125).*

Reviewer 1: Working out whether an area has been deforested is not trivial. The word 'forest' has multiple definitions including the notorious FAO definition of any ecosystem with >10% tree cover. Fairhead and Leach (1996) showed years ago how estimates of 'deforestation' in Africa were greatly distorted because of changing definitions of 'forest'. So what are the questions you'd ask and your guidelines for planners on how to establish historical deforestation?

Authors: *We agree that defining forest cover is challenging and have briefly addressed this in lines (123-125) and in the definition of 'forest' we included in Table 2. We have also expanded our question in Table 3 to consider what the natural density of tree cover was. A lengthy discussion of the complex topic of defining forest cover is beyond the scope of the paper.*

Reviewer 1: 'Degradation' also needs defining. The World Resources Institute definition of any process that reduces tree cove or biomass has been criticized in the literature as it automatically condemns mammal browsers as agents of degradation. It is ridiculous to label fire, a 400 million year old process shaping vegetation, as a 'degrading process'. In several places in the paper livestock and fire are noted as degradation processes that have to be stopped to restore the forest and protect the trees. Yet these same processes are essential for maintaining the diversity of non-forest ecosystems (e.g. Pausas and Bond 2019).

Authors: *We agree with your comment and have added the term to Table 2. We use the definition from the recent Society for Ecological Restoration Standards (Gann et al. 2019) that focuses on deleterious human impacts that reduce biodiversity and ecosystem services, rather than focusing on biomass reduction, which we agree is problematic.*

Whether fire or any other type of disturbance (e.g. hurricanes, frost, flooding) are considered "degradation" or a natural disturbance depends on what disturbance regime an ecosystem has adapted to over evolutionary time. Certainly, fire is part of the ecology of many forested systems, particularly in arid and semi-arid regions, but wet tropical forests are not adapted to fire so it does degrade these ecosystems.

Reviewer 1: Which trees? The authors must know that the news-making efforts, the record numbers of trees planted, are made by planting eucalypts and pines. Madagascar's programme of tree planting sounds good since there is active deforestation, but in reality, consists of planting eucalypts and pines in grasslands, not the challenging task of growing native trees and reclaiming natural forest patches.

Authors: *We agree and addressed the issue of species composition in our initial manuscript both in the text and figure 1. We have added a new sentence to address this comment: "Yet most of the expected outcomes described above may rely on planting a reasonable diversity of native trees, a large number of tree planting initiatives are based on industrial monocultures of exotic trees, mostly pines and eucalypts (Lewis et al. 2019), which may exacerbate ecosystem disservices."*

Reviewer 1: The authors do not list the increased fire risk of tree planting. Stands of eucalypts and pines were responsible for the huge fires in Chile in 2017 (e.g. Bowman et al. 2019), in Portugal, and in parts of California. The silviculture of traditional plantation trees is well known, there are existing markets for the wood, so they are favoured. The fact that they burn more fiercely than grasslands should be of major concern, not only for carbon sequestration but for the developing countries that want to score funds by planting up their land to plantations for generations to come. The most developed and well-equipped firefighting organizations in the world have been unable to control fires in eucalypt and pine forests in the USA, Australia or in southern Europe. Who will control the forest fires burning plantations in the poorer countries of the south? More discussion needed please.

Authors: *Thank you for pointing out this important omission. We have included a new sentence to note the problem of massive fires promoted by tree planting in drier ecosystems (lines 116-*

118).

Reviewer 1: There have been several papers exploring grassland conservation as a safer means of maintaining or increasing carbon storage since the above-ground carbon is vulnerable to forest fire. With global warming, the fire problem is likely to get worse.

Authors: *We have added a sentence noting that above-ground carbon is vulnerable to disturbances, such as fire, drought, and insect outbreaks. This is true for both forest and grassland ecosystems. We had previously noted (lines 143-145, 302-305), that estimates of the amount of carbon that can be sequestered above-ground in forests vary at least an order of magnitude. A detailed comparison of how much carbon can be stored in different types of forest, shrub, and grassland ecosystems both above- and below-ground is well beyond the scope of this paper.*

Reviewer 1: The title: Define success? Fit for purpose? Ie.to reduce global warming? Or successful in that trees were grown and survived. How you define success should structure the paper.

Authors: *Good point. We have now defined "success" early on in the manuscript, as being 'achieving pre-set objectives'. We have also included "success" in the definitions table.*

Reviewer 1: Abstract. Points 1-3 good. Point 4. Assumes deforestation hence 'addressing the underlying drivers of deforestation'. There is an earlier, critical question which is whether tree planting is afforestation or reforestation.

Authors: *We agree with this point and discuss it in the text, but lengthy definitions are not appropriate for the abstract.*

Reviewer 1: l.30. This is a contentious statement. The human lineage left the trees and stepped into the open and that preference for open landscapes may be deeply embedded in our psyche. Planting trees is supported by some cultures, not others. Nor are forests universally seen as the pinnacle of nature's creation. Cultural blinkers still distort scientific understanding of non-forested ecosystems.

Authors: *We agree that some cultures prefer nonforest ecosystems, but our point in the introduction is to lay out the basis behind the current obsession with tree planting in many locations globally. That said, at multiple points throughout the paper we have expanded our discussion of the risk of tree planting to nonforest ecosystems and note that non-forest ecosystems 'are often overlooked by restoration and conservation policies'.*

Reviewer 1: l.44-45. A critical issue is to ask what the consequences of this fashion will be. What will be the repercussions if the trees do grow, ecological, social, economic? WHY is forestry being supported? To what end? Will those ends be met by planting trees? If the authors do not wish to address these questions, then they need to circumscribe the objective of the paper much earlier. For example, 'we focus solely on how to plant trees in areas known to be deforested within the last century'.

Authors: *We are puzzled by this comment. We spent a whole section of the paper discussing that people plant trees for different reasons, which means that it is critical to clearly define the general goals and specific objectives of each project in order to evaluate whether the project has achieved those. We have further explained that once those goals and objectives have been set then the most appropriate approach to achieving them should be chosen accordingly, which*

may or may not be planting trees. We contend that we thoroughly address these questions, as they are central points of our paper.

Reviewer 1: l.104-106. This seems to be the only reference to the potential for tree planting to lead to costly invasion of trees into unwanted areas and to the loss of thousands of plant and animal species adapted to non-forested habitats.
Authors: *As mentioned above, we expanded this sentence and some others to address this comment.*

Reviewer 1: l.166-177. How about the Forest Stewardship council as an example of a market-driven attempt to promote responsible forestry – it's been going for over 25 years. The controversies surrounding the FSC and its accreditation system also illustrate some of the likely controversies and allegations of corruption facing the massive expansion proposed for global tree planting.
Authors: *We do refer to a number of principles and efforts to improve reforestation efforts (lines 221-227) to illustrate that our suggestions are part of a larger effort to improve tree planting endeavors. We appreciate the suggestion of the Forest Stewardship Council as an example, but it focuses primarily on the production of timber and other non-timber forest products rather than the broader questions regarding reforestation that we address. Moreover, as the reviewer and Burivalova et al. (2017) note the outcomes of FSC efforts have been highly mixed. We simply do not have sufficient space in the paper at this point to provide a sufficiently nuanced discussion of their efforts so we have elected to not use this example.*

*Burivalova, Z., F. Y. Hua, L. P. Koh, C. Garcia, and F. Putz. 2017. A critical comparison of conventional, certified, and community management of tropical forests for timber in terms of environmental, economic, and social variables. Conservation Letters **10**:4-14.*

Reviewer 1: l.193. Degradation is a value laden term. See comments above on WRI definition and its tragicomic results when mapped. For that matter, 'forest' is also a definitional nightmare. But at least have a stab at what you mean by the word in the glossary.
Authors: *We agree that is important to clearly define terms and have added "degradation", "success", and 'forest" to the definitions table.*

Reviewer 1: l. 197. See Aleman et al 2018 for tropical Africa where gains and losses are about equal, though varying by region.
Authors: *Thank you for the suggestion of reference, but we are already above the allowed number of citations and preferred to keep only the previous citation that present results from multiple regions of the world.*

Reviewer 1: l.207-213. Your 'drivers of environmental degradation' Fires, cattle grazing, are major ecological processes maintaining non-forested ecosystems and their rich biodiversity. Protection from fire and grazing was practiced for most of the 20th century and, in countries like Brazil, legislation suppressing fires has only changed in the last decade. Fire suppression was disastrous for the biota of open ecosystems (see e.g. Durigan and Ratter ; Noss et al. 2015). It may also be disastrous for forests since when fires do occur after long fire suppression, they are more likely to be of high severity and more damaging to forest margins.

Authors: *You are right, and we have complemented this paragraph to address your comment (lines 247-250).*

Reviewer 1: l. 214. Guideline 2. Yes, absolutely. Need to evaluate over the long term. Here that is given as 20 years but for carbon sequestration projects, one is looking at much longer periods for effective carbon storage. But the points made are all good.

Authors: *We appreciate that the reviewer agrees with this guideline. We would like to clarify that the 20-year time limit to which the reviewer refers is specific to monitoring compliance with forest restoration legislation in São Paulo State, Brazil rather than a general guideline we recommend. We say that "most tree planting goals require many years to centuries to achieve." We are intentionally vague in the time frame given the difference in the rate of recovery of different forests and the time needed to achieve different goals. For example, providing merchantable timber may only require 5-7 years for fast growing species, whereas recovering full forest species composition may take centuries.*

Reviewer 1: l.246 to 250. This is a major cause of the problem. Eucalypts and pines are best known in terms of silviculture and can be planted en masse. They are both invasive and highly damaging to water resources while also promoting fire. They are disastrous for wildlife in many areas where they have bene planted and are effectively bio-deserts. They should not be considered 'forest restoration' projects – it just confuses the public. They are commercial ventures.

Authors: *We have included a new sentence (lines 114-116) to highlight that many tree planting initiatives count exotic species in monoculture plantations, which is problematic for achieving the multiple outcomes targeted by tree planting. As noted previously, the goal of this paper is to be more forward-looking to suggest principles for improving reforestation efforts, rather than provide a critique of the problems of tree planting, which we did in our recent Science paper.*

Reviewer 1: l. 272. Assumes that ecologically sensitive and/or marginally productive land should be forest, rather than an open ecosystem such as grassland, moorland, savanna.

Authors: *Good point. We have clarified this sentence. "…ecologically sensitive and/or marginally productive lands that were previously occupied by native forests…'*

Reviewer 1: l.279 to 280. This is the sensible way to do it. More on this please. Where to target afforestation attempts. Brancalion et al 2019 is a good guide and the basic ideas are worth repeating here.

Authors: *As noted previously, we have expanded this section slightly.*

Reviewer 1: L286-289. Given the failure of top-down projects why are tree planting programmes supported from the top? Follow the money? Not the universal human psyche to plant trees. Internationally funded tree planting programmes enrich the rich? Who decides on the millions of hectares to be allocated to trees? Who pulls the strings? Related issue of corruption addressed in lines 337-340. Yes. Very tricky to get regional coordination group. I know of one example where advice on threats of tree planting made by experienced staff of a major conservation agency were ignored and told their views did not count because they did not represent central government!! The reality of tree planting can be ugly. Who pulls the strings?

Authors: *We completely agreed with the point about the problems associated with top-down reforestation projects (e.g. see Holl 2017 Science). That said, the funding for reforestation*

projects has to come from somewhere and often that means a transfer of money from the global north to the global south. Our point in this section is to highlight the need to coordinate the efforts so that the goals of both the donor and recipient are met. Likewise, we note in the paper and agree about the challenges of pervasive corruption in the transfer of money. We are not suggesting that overcoming these issues easy and we do not have simple solutions. But, they need to be acknowledged and addressed for tree planting efforts to succeed.

Reviewer 1: l.346-347. Can we get away from this forest-centric prejudice? Its not just forests that are being destroyed and 'degraded'
Authors: *Good point, we changed "forest" to "habitat"*

Reviewer 1: Table 1. Cultural spiritual. Providing visual barriers. Tree planting has been criticized in Ireland for blocking the view so that neighbours cannot see each other anymore!
Authors: *We agree that "beauty is in the eye of the beholder" and have removed that rationale from the table. There are many other rationales for tree planting in the table to make the point that tree planting motivations vary greatly.*

Reviewer 1: Legislative. Brazilian legislation prohibiting fire is just one example of disastrous ignorance on the ecological importance of fire, leading to negative biodiversity and hydrological consequences. In some countries with long-term catchment experiments, tree planting is strictly controlled because of the proven negative impact of trees on water supply.
Authors: *The comment is correct, but in this table, we are addressing the legal demand/motivation for tree planting. We agree that the Brazilian legislation is damaging for savanna ecosystems, but it would be tangential to mention that point here.*

Reviewer 1: TABLE 2. Potentially useful table but lacks the crucial definitions of 'forest', and 'degradation'. Both terms are contested.
Authors: *As noted, we have added the requested definitions to the table.*

Reviewer 1: Table 3. Was the area forested previously? How would you tell? And what do you mean by 'previously'? This is important at Global scale too given the claims and ambitions of global tree planting.
Authors: *We have changed the term 'previously' to 'historically' to be more consistent with the literature on ancient grassy biomes (Veldman et al. 2015) and expanded the question to include the question of the density of trees due to concerns about savannas being densely planted with trees. Typically, historic distribution of forest cover is based on the available historic data on land cover, as well as biophysical (e.g. soil, climate) potential. Certainly, the time period one chooses for quantifying historic cover (e.g. a decade, a century, or thousands of years ago) will affect the distribution and involves some subjectivity. However, a lengthy discussion of methodologies for assessing historic forest cover is outside the scope of paper. We could spend a paragraph expanding upon any single question in Table 3, but do not have the space.*

Reviewer 1: What are the goals of tree planting? Are they achievable for e.g. C sequestration has been questioned and may contribute very little to carbon accumulation relative to reduction in emissions? How will commercial value of plantations change if billions of new trees mature and their carbon needs to be taken up rather than left to rot.
Authors: *We have emphasized throughout the text and in table 3 that the first step is to identify*

the goals of tree planting and then determine the best location and approach to achieve those goals. We have modified the questions in table 3 to note that it is important assess whether the identified goals are feasible in the selected location.

Reviewer 1: How much will it cost? One could ask is it feasible? For example, the forest fire threat is enormous for plantation forestry grown in fire-prone areas. Fire protection may not be possible since even the most technically advanced and richest countries have failed to stop fires burning into eucalypt and pine plantations.
Authors: *We have added new questions and modified existing questions to better address feasibility, cost, and uncertainty in the future.*

Reviewer 1: Implementation. Trying to compress forestry handbook into a few lines? Perhaps raise the issue by asking whether there is a competent forest department engaged in tree planting with decades of experience?
Authors: *We agree that we are trying to condense a lot of forestry information into a single table. Our goal here is to highlight the most important decisions and illustrate the complexity of the decisions involved in tree planting. We appreciate the excellent suggestion about whether there is a competent forestry department and have broadened that idea in a new question about what resources are available locally or regionally to inform the reforestation effort.*

Reviewer 1: Figure 1. Is this really necessary? It looks like a figure for a tree planting brochure.
Authors: *We think this figure addresses many of the points raised by you and reviewer 1. It points out a number of the potential disservices that can result from poorly planned reforestation projects and illustrates how those can be transformed into more constructive outcomes if well planned. It also highlights the reviewer's earlier point, with which we heartily agree, that outcomes of tree planting depending on where, how, and when it is done. Since we hope that practitioners will use this paper for guidance, we strategically created this figure using a 'brochure' style to make it more appealing to non-academic readers. We prefer to keep the figure and the other reviewers seem to have found it useful.*

Reviewer 1: Figure 2. Where do the goals come from? E.g. Latin-American goal of 20 Mha by 2020. Or Brazil, 12 Mha by 2030? Thumb suck? Contested WRI map? Or measured approach of multilayering as per Brancalion et al. 2019? How can you set goals before evaluating likely successful areas for planting of forests? Or working out which areas were forests? Surely this needs critical discussion in this paper if only a paragraph in this short review.
Authors: *We agree that some of these large-scale goals are overly ambitious. Our point with this figure was to show that the goals and motivations at different scales are often conflicting, rather than to provide a detailed evaluation of whether the goals are reasonable. We have added a sentence to clarify that point: "This dialogue is especially important because the reforestation goals are determined based on organizational or policy decisions, without necessarily considering the feasibility of these goals (Fagan et al. 2020) or their appropriateness for achieving expected outcomes (Brancalion et al. 2019b)."*

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Reviewer 2: There has been much call among the community for work such as this and this is an important and timely paper. The same authors recently had a short perspective in science, whereas this work is needed to flesh out the details of these often ignored but essential guidelines and details. The manuscript is a literature review of a huge body of work crucial

aspects of restoration that are all too often seen as details. This literature review may help increase the success of tree restoration work. In essence, the 'problem' is that overselling of tree planting initiatives, makes this management practice sound much easier than it is. This unfortunately could be detrimental to the success of restoration programmes, and potentially even increase funding towards ill-thought out programmes, leaving well planned initiatives forgotten Even more important is the danger that excitement over tree planting can distract from ongoing deforestation. The authors have addressed the 'problem' well and I appreciate that the authors don't directly refer to research or headlines from the culprits.The paper is well written. The figures and tables are useful. The guidelines are on point. I particularly appreciate the reiteration that also focussing on the drivers of deforestation is crucial and It's therefore appropriate that this deforestation is highlighted in the conclusions. The comparison to natural forest regrowth is well presented and discussed. I appreciate the point that tree numbers is not the end goal.

Authors: *We greatly appreciate the kind and thoughtful comments of Dr. Philipson which captured well our intention in writing this review. As scientists with a long trajectory on forest restoration, we felt compelled to write a review like this to better balance peoples' expectations of tree planting, as well to better use the resources available and not distract people from the hard decisions to be made when planning tree planting initiatives.*

Reviewer 2: Lines 89 – 93. Great. This links with literature on trade-offs among ecosystem services that could be mentioned here.

Authors: *We have added three citations on this topic and have highlighted that the abundant literature on ecosystem services trade-offs offer robust evidence of the limitation of maximizing all targeted benefits from tree planting.*

Reviewer 2: Assisted regeneration. Line 150. Its good that you highlighting how natural regen is much more cost-effective. This is a minor point, but I wonder if there could be slightly more discussion of the idea that some active restoration may not require tree planting (e.g climber cutting perhaps?), but may increase natural regeneration. In some ways there is a scale of natural regen to active restoration. In fact, you later mention work where planting is not blanket across the landscape, such your patch planting somewhere on this scale (cheaper, but quite effective).

Authors: *Good point, we have expanded this paragraph with more information on the varied strategies to support natural regeneration, in order to better inform readers on the large suite of alternatives to standard, plantation-style tree planting.*

Reviewer 2: Lines 162 – this is even more difficult in south east asia where the the majority of dominant canopy species mast fruit, and so investment in nurseries is even more important yet costly . Eg. C. J. Kettle et al., Mass Fruiting in Borneo: A Missed Opportunity. Science. 330, 584.1–584 (2010).

Authors: *Good suggestion, we added this citation and another one about the challenges of planting a high diversity of native tree species.*

Reviewer 2: Guidelines 1. 196. This is great. I like that you also mention to deforestation in the conclusions. The authors summarise the complexities well, without being unduly negative. Spot on. Thank you. Christopher Philipson

Authors: *Thank you again for the positive comments and valuable suggestions.*

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Reviewer 3: This review paper provides both an overview of the multi-faceted decision-making process required for successful tree planting initiatives, and guidance for increasing success. In particular, it highlights the need for both biophysical and socioeconomic goals to be addressed. I found this to be an interesting contribution that was well-written and presented. However, as well as providing guidance, I would like to see the review provide further emphasis on areas for future research. I note this has been done in some cases (L122-123) but could be expanded upon. Based on the comments below, I suggest the manuscript be accepted for publication following minor revisions. I have also marked a number of minor comments on the pdf version of the manuscript.

Authors: *Thank you for the positive comments and helpful suggestions. We accepted all the corrections on the pdf file. Please see response to associate editor comment 6 regarding adding a future research suggestions section.*

Reviewer 3: Main comments. As stated above, I suggest highlighting the areas for future work more clearly in each section or as relevant. For example, L92-93 The authors state that "Although tree planting may contribute to achieving many goals, it is impossible to simultaneously maximize them all". While I agree with the authors, perhaps an area for future work may be to use/develop tools to analyse the tradeoffs and optimize outcomes?

Authors: *We have added a sentence noting the need for better tools to analyze the tradeoffs and outcomes (lines 157-158). We have also highlighted several other priority areas for research at various locations throughout the manuscripts (e.g. lines 141-145, 211-212, 326-329, 376-377) where they follow on the existing discussion. We have also referred the reader to Holl 2017 for a more detailed discussion. We have not added a new research directions section given word limits.*

Holl, K.D. (2017) Research Directions in Tropical Forest Restoration. Annals of the Missouri Botanical Garden, 102, 237-250.

Reviewer 3: Table 1 – Provisioning ecosystem services. While many of the examples listed may have positive economic effects, they are largely regulating services. Examples of provisioning services would include provision of wood products (timber, firewood etc.) or improved animal production (from reduced heat stress due to shade) in agricultural landscapes.

Authors: *We appreciate the terminology correction and have modified the table accordingly.*

Reviewer 3: L162-163 "…seed and seedling production procedures…" it is unclear what this means. Does it relate to the point mentioned in L169-171? Reword to clarify.

Authors: *Yes, it relates to the point you mentioned, but we reworded this sentence for clarification, and changed it to "genetic diversity and provenance of seeds, …."*

Reviewer 3: One of the key guidelines to successfully increase tree cover includes integrating decision-making across scales from local to global. This is an important point, however, in several areas it is unclear what is meant by the terms local and regional. For example, L327 "…regional, often sub-national organizations…" and Figure 2 Regional – Latin America. I suggest these need to be defined and kept consistent throughout the manuscript. Following on

from this, in Table 3, I found the terms global, regional and local scale confusing given the scales shown in Figure 2. I initially assumed both local and regional in the context of Table 3 were at sub-national scale. However, do they relate to the scales shown in Figure 2? if so, what is considered local in this context?

Authors: *We agree that our terminology for scales was somewhat confusing and inconsistent. We have moved the guideline about integrating across scales (formerly guideline 6) earlier in this section (now guideline 2) and have better explained how we are defining the scales there, so that we can then build on those scales in subsequent guidelines. We note that the "regional" scale is used to refer to a range of spatial scales, but that organizations operating regionally serve the same role of interfacing between the global and local scales. We have made a number of minor changes to the text and Figure 2 to make the wording more consistent.*