ENVIRONMENTAL SCIENCE

Perpetuating the myth of the return of native forests

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Viña *et al.* imply that native forests account for China's marked increase in tree cover and that tree plantations play a minimal role. All 71 tweets linked to the article reinforce the idea that China's native forests are returning, whereas a review of their methodology indicates that it is not likely accurate. Referring news articles (*n* = 19) were dominated by terms associated with native forests, whereas tree plantations were rarely mentioned.

The results presented by Viña *et al.* (*1*) relating to China's marked forest recovery are interesting but beg many questions. Surprisingly, the authors use "tree cover" and "forest cover" interchangeably, and they do not mention "plantations" at all in their paper, which implies that the increased forest cover is entirely recovered native forests. However, we know that this cannot be true. It is possible for Viña *et al.* (*1*) to make this claim because they use the Food and Agriculture Organization (FAO) definition of forest that aggregates tree plantations and native forests, because FAO does not classify tree plantations as an "agricultural" land use (*2*). This aggregation is worrisome and even more so because it was not explicitly explained in the article by Viña *et al.* (*1*). We are not the only scientists concerned about China's reforestation efforts and the focus on plantations to replace tree cover that was originally natural forests (*3*).

Even a plantation with a very large number of trees and a closed canopy does not make a forest. Given that monocultural plantations are so distinct from native forests in terms of their role in the biosphere, and the important ecosystem services that native forests provide to human beings that are not provided by plantations, these two
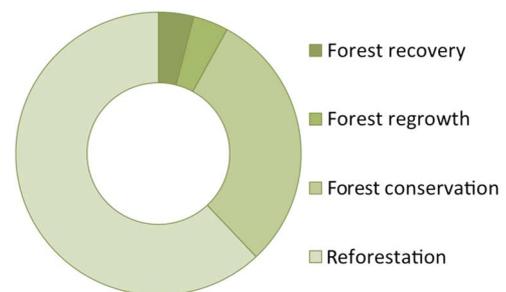

Fig. 1. Classification of tweets associated with Viña *et al.* (*1*). All tweets (*n* = 71) refer to forest regrowth, forest recovery, reforestation, and forest conservation, and there was no mention of tree plantations. [Note: percentage of tweets per category shown]

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Table 1. All the tweets associated with Viña *et al.* (*1*) were associated with native forests and not tree plantations.

Tweets classified by category	Number of tweets
Forest regrowth	**44**
Logging bans are helping to boost China's forest regrowth	42
China's forest regrowth may be receiving a boost from logging bans via @ScienceAdvances	1
50New #ScienceAdvances: Logging Bans Are Working to Boost China's Forest Regrowth	1
Forest recovery	**20**
#Effects of conservation policy on China's forest recovery	3
China is increasing tree cover. Effects of conservation policy on China's forest recovery	15
Conservation policy has increased forest recovery in 1.6% of China's territory via @ScienceAdvances	1
China gov logging bans & monitoring to prevent illegal logging has been instrumental in enhancing forest recovery	1
Reforestation	**3**
Encouraging on China's reforestation gains since 2000	2
Dinamiche di ricostituzione della foresta in Cina	1
Forest conservation	**3**
Look at the #forests conservation policy in China over the past decade plus #IntForestDay	2
In #China, #forest conservation policy appears to be working. Important @ScienceAdvances study	1

Table 2. Examples of how news articles referring to Viña et al. (1) were coded. Note that the codes are in bold.

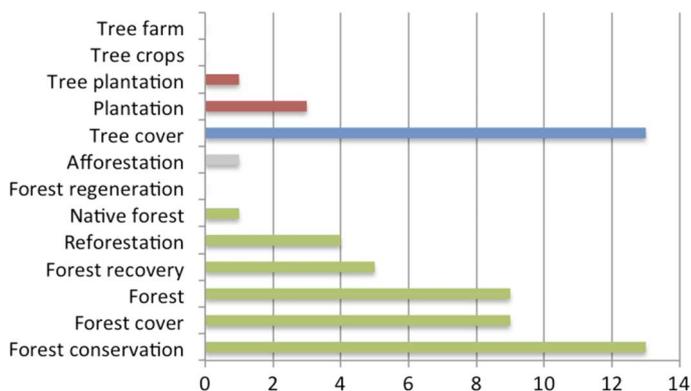| Classification	Example quotes
Native forest	"China's success in **forest conservation**" (14) "The president has pledged to increase **forest cover** by 40 million hectares by 2020" (15) "The national logging ban has boosted **forest** growth" (16) "As the Chinese government has contended, the program is working and **forests** are recovering" (17) "Government intervention—in the form of logging bans and monitoring activities to prevent illegal logging—was instrumental in enhancing **forest recovery**" (18) "The government in Beijing set about a massive program of **reforestation**" (19) "The national logging ban has boosted **forest** growth." (16)
Tree cover	"The program is working and forests are recovering, with about 1.6 percent, or nearly 61,000 square miles, of China's territory seeing a significant gain in **tree cover**." (17) "According to Tim Forsyth, the paper's focus on **tree cover** offers only 'a very reduced vision of forests,' because it does not take account of the quality of the forest or its impact on biodiversity" (20)
Plantations	"Note that **tree plantations** as well as natural forests figured into this analysis" (18) "Laurance added that from a biodiversity and climate perspective, the forest regrowth represents mixed results because many of the trees that have been planted are not native to the country. In addition, many of the new trees are part of single-species **plantations**, often replacing biologically diverse forests" (16) "WWF's director of forests Rod Taylor says the news is positive for China, but agrees this kind of satellite imagery analysis 'can miss lots of shades of grey.' For instance, it can't differentiate single species **plantations** from rainforest or identify selective logging of high-value wood in tropical forests, he says." (20)
Afforestation	"Low resolution could hide even greater success of **afforestation** policy" (20)

Fig. 2. News articles (n = 19) that referred to Viña et al. (1) were mainly characterized by native forest terms (green), whereas tree plantations were rarely mentioned (red); tree cover, which can refer to both tree plantations and native forest, occurred as well (blue), and afforestation, which is ambiguous, occurred once (gray).

types of tree cover need to be carefully differentiated. Remote sensing experts struggle to find techniques that differentiate native forest from tree plantations, especially at large scales. However, despite this challenge and because FAO does not consider tree farms as agriculture based on its particular typology, scientists must be very clear about the difference between a fiber farm and a forest. Otherwise, researchers, the public, and policy makers may mistakenly claim victory for native forest recovery when the victory is in fact for the tree plantation industry.

Definitions matter, which has compelled many scientists to call for greater consistency in the use of words like "forest" (4–6). Van Holt et al. (7) showed that ecological models can be wrong when these two classes are aggregated. Many researchers acknowledge the problem—even experts such as Hansen et al. (8) aggregate these tree farms and forests in one category because separating these classes at large scales is problematic. In response, researchers interested in the theories that explain the recovery of native forests have begun to address this basic methodological issue (9–12). The lack of clarity in the Viña et al. (1) paper about the distinction between tree plantations and native forests led to misinterpretation by the public, specifically the public that is tracked by Science's AltMetrics tool.

MATERIALS AND METHODS

We classified the content of the 71 tweets available as of Friday, 15 April 2016, that linked to this article, which, according to Science's AltMetrics tool, had an upper bound of 783,000 followers. We then recorded for the presence of tree cover (a neutral term that can include native forests and/or plantations), native forest (including forest conservation, forest cover, forest, forest recovery, reforestation, and forest regeneration), and plantation (plantation, tree plantation, tree crops, and tree farm) in the news articles linked to Viña et al. (1). We also searched for afforestation and regeneration, although these terms are ambiguous.

RESULTS

Most media coverage of the work of Viña et al. (1) reported that native forests are recovering in China. All the tweets implied that this article refers to the return of China's native forests (Table 1 and Fig. 1). Of the 71 tweets, 44 referred to "forest regrowth," 20 were about "forest recovery," and 3 each were about "reforestation" and "forest conservation."

News articles referring to Viña et al. (1) (Table 2 and Fig. 2) only referred to tree plantations 4 times in total, whereas native forest terms were far more prominent (41 times); tree cover, a more general term that can refer to native forests or tree plantations, was mentioned 14 times, and afforestation, an ambiguous term, was mentioned once. The few that mentioned that plantations were also likely part of the story included the well-known tropical forest scientist, William Laurance, and the former director of forests from World Wildlife Fund (WWF) International, Rod Taylor.

CONCLUSIONS

Fiber farms are farms, not "recovering forests." We need tree plantations, but if we lump them with forests, then we are incorrectly modeling, studying, and analyzing forest and landscape change dynamics, and their effects on people and the environment. To develop and test improved approaches, we need to know the conditions under which incentives to regenerate native forests fail and when tree-planting programs succeed (13). If native forests are not differentiated from plantations in official definitions and research, we will fail to address challenges in the Anthropocene, which require us to understand linkages across different components of the biosphere.

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