Response to Comment on “The extent of forest in dryland biomes”

J.-F. Bastin,1,2, D. Mollicone,1 A. Grainger,3 B. Sparrow,4 N. Picard,1 A. Lowe,4 R. Castro1

Griffith et al. do not question the quality of our analysis, but they question our results with respect to the definition of forest we employed. In our response, we explain why the differences we report result from a difference of technique and not of definition, and how anyone can adapt—as we did—our data set to any forest definition and tree cover threshold of interest.

We thank Griffith et al. (1) for their thoughtful comments on our article (2), which question our results from an ecological perspective. Griffith et al. do not challenge the importance of our study in providing more reliable information on the distribution of tree cover in dry areas based on empirical data. Where they do have concerns is over the classification of certain areas as “forest” (e.g., “As a consequence of applying the FAO forest definition, Bastin et al. misclassify as dry forest many tropical regions that are in fact savannas” (3)). We would respond to this in five ways:

1) We did not aim to discuss the definitions of “forest” and/or “savanna,” nor to impose these terms on any area. Our database is built to be adaptable to any definition, as shown by the multiple comparisons illustrated in our table 2 and supplementary information. This was made possible as a result of the amount of information that we can gather through “augmented visual interpretation” using Collect Earth (3), the Food and Agriculture Organization of the United Nations (FAO) software that is recognized to be adaptable to various forest definitions (4). Our aim was not to show and discuss differences in forest area due to differences in forest definition, but rather to show differences in forest area due to differences in tree cover detection and land use characterization.

2) Even if the distinction between forests and savannas is not relevant for the results of our study, we do recognize that vegetation ecosystems in sites with savannas encompass a diversity of structures ranging from open forest to steppe, with all intermediate mixtures of trees and grasses. Although discussing the management policies for these ecosystems was outside the scope of our study, we did not equate low tree cover with degradation. The later would require assessing the “potential” tree cover, which was not the purpose of our study. Nor did we assume that dryland savannas were once widely forested. Indeed, there are current forest areas that were once covered with savannas, such as the Sangha corridor in central Africa. The dynamics of the forest/savanna transition are bidirectional and complex, and this has long been the case; as shown in figure 2 of Griffith et al., some sites that were once covered with grass-dominated habitats are now in the ocean.

3) In our analysis, we felt it essential to use a widely used and globally accepted forest definition. Many of the areas classified as forest under the FAO definition could also be accurately classified as tropical savannas; the two terms are not mutually exclusive. We are also aware that this definition also includes large areas of what would be classified as woodlands in Australia, leading to estimates significantly higher than those published by the Australian government, which were based on the local definition of forest. Using the definition of Griffith et al. for savannas—that is, considering a savanna as an ecosystem with tree cover up to 80%—our database could actually be used to show that many new areas of wooded savannas exist in many parts of the world.

4) In our paper, we chose to report numbers using internationally understood terms, such as those used for official country statistics, country reporting, and various assessments in the framework of the FAO, the United Nations Framework Convention on Climate Change, etc. We also compared our data with studies using higher-percentage tree cover thresholds for forest (e.g., in Glocover (5)) and with maps, such as those of Hansen et al. (6) and Sexton et al. (7), that focus on reporting tree cover rather than forest.

5) Griffith et al.’s comment is useful for revealing how ecologist research takes a different approach from efforts to estimate national, regional, and global distributions of forest. We treat Griffith et al.’s comment as reflecting an honest difference of opinion between different groups of scientists about which terms to use in describing landscapes in dry parts of the world. Nonetheless, the allocation of these dryland ecosystems into the ecological category of “savannas,” on the assumption that these are dominated by grasslands, may have contributed to the historic neglect of their tree cover—something that our study has tried to remedy.

On the basis of these five arguments, and given our clear definitions of forest and dryland biomes, we believe that our study does not “inflate forest estimates” nor “undermine conservation goals, leading to inappropriate management policies and practices in tropical grassy ecosystems.” It is worrying that Griffith et al. disregard the use of the internationally accepted land cover term of “forest” as a reason for assuming that our study “implies that dryland systems were once widely forested,” or for fearing that this has implications for “support for afforestation, modification of mammalian grazer and browser regimes, and fire suppression policies.” Our paper suggests that the findings have management implications, but it makes no mention of what those management actions should be. Land management is conducted at a local scale, hopefully planned by those with skills and experience in managing those lands. Although we hope that they make use of our findings to investigate further areas that may not have been given much attention previously, we do not make specific management recommendations (afforestation or otherwise) for any particular area. We hope that Griffith et al. will use our study as one of many investigations that encourage further focus on savanna ecosystems globally.

We have just entered into an exciting new phase of planetary measurement. Following the pioneering work on global forest mapping of Townsend et al. (8), Hansen et al. (6), and Sexton et al. (7), it has become possible to undertake a step-by-step process of increasingly accurate measurement. By assessing the dryland biomes through “augmented visual interpretation” (3), we take advantage of this recent work combined with very-high-resolution data and transparently report the land cover and land use. We believe that such initiatives offer tremendous opportunity for ecologists to use empirical data to classify and map the actual planetary distribution of several ecosystems.

REFERENCES AND NOTES
5. O. Arino et al., Global Land Cover Map for 2009 (GlobCover 2009) (European Space Agency and Université Catholique de Louvain, 2012).

ACKNOWLEDGMENTS
This work was conducted under the Global Forest Survey project of FAO, supported by the International Climate Initiative of the Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety of Germany, and under Action Against Desertification, an initiative of the ACP (Africa, Caribbean, and Pacific) group of states, implemented by FAO and funded by the European Union in support of Africa’s Great Green Wall and the United Nations Convention to Combat Desertification action programs and south–south cooperation in ACP countries.

20 July 2017; accepted 15 August 2017
10.1126/science.aao2079
Response to Comment on "The extent of forest in dryland biomes"

Science 358 (6365), 881.
DOI: 10.1126/science.aao2079