MAAP #34: New Dams on the Madeira River in Brazil Cause Forest Flooding

The Amazon lowlands have been connected to the Andes Mountains for millions of years by only six major rivers: the Caqueta, Madeira, Maranon, Napo, Putumayo, and Ucayali* (see **Image 34a**). This intimate connection allows rich Andean nutrients to fuel the Amazon floodplain and enables long-distance catfish migration between feeding grounds in the lowlands and spawning grounds in the highlands.



Image 34a. Data: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo

However, one of these six major Andean tributaries has recently been dammed on its main channel: the **Madeira River in western Brazil** (See Inset A). The **Santo Antônio dam** was completed in 2011, followed by the upstream **Jirau dam** in 2013.

Note in Image 34a that these dams are are located downstream of the Madre de Dios River in southern Peru. Thus, major ecological impacts -- such as blocking the route of **migratory catfish****-- are also very relevant to Peru.

Here in **MAAP #34**, we describe the forest loss—over **36,100 hectares—**associated with the **flooding caused by these two dams** (with a focus on the Jirau dam).

Zoom A: Forest Loss due to Flooding

Image 34b shows the forest loss due to flooding immediately upstream of the Jirau dam. As of 2015, the **total flooded area** for both dams is **36,139 hectares** (89,301 acres). Major flooding was first detected in 2010, rose substantially in 2011-12, and peaked in 2014.

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According to Fearnside 2014, although much of the forest along the Madeira is seasonally flooded, it dies when permanently flooded.*** Therefore, the flooded area is an appropriate measure of forest loss.

Further below, we show a series of satellite images of the areas indicated by **Inset B** (see Images 34c-e) and **Inset C** (see Image 34f).

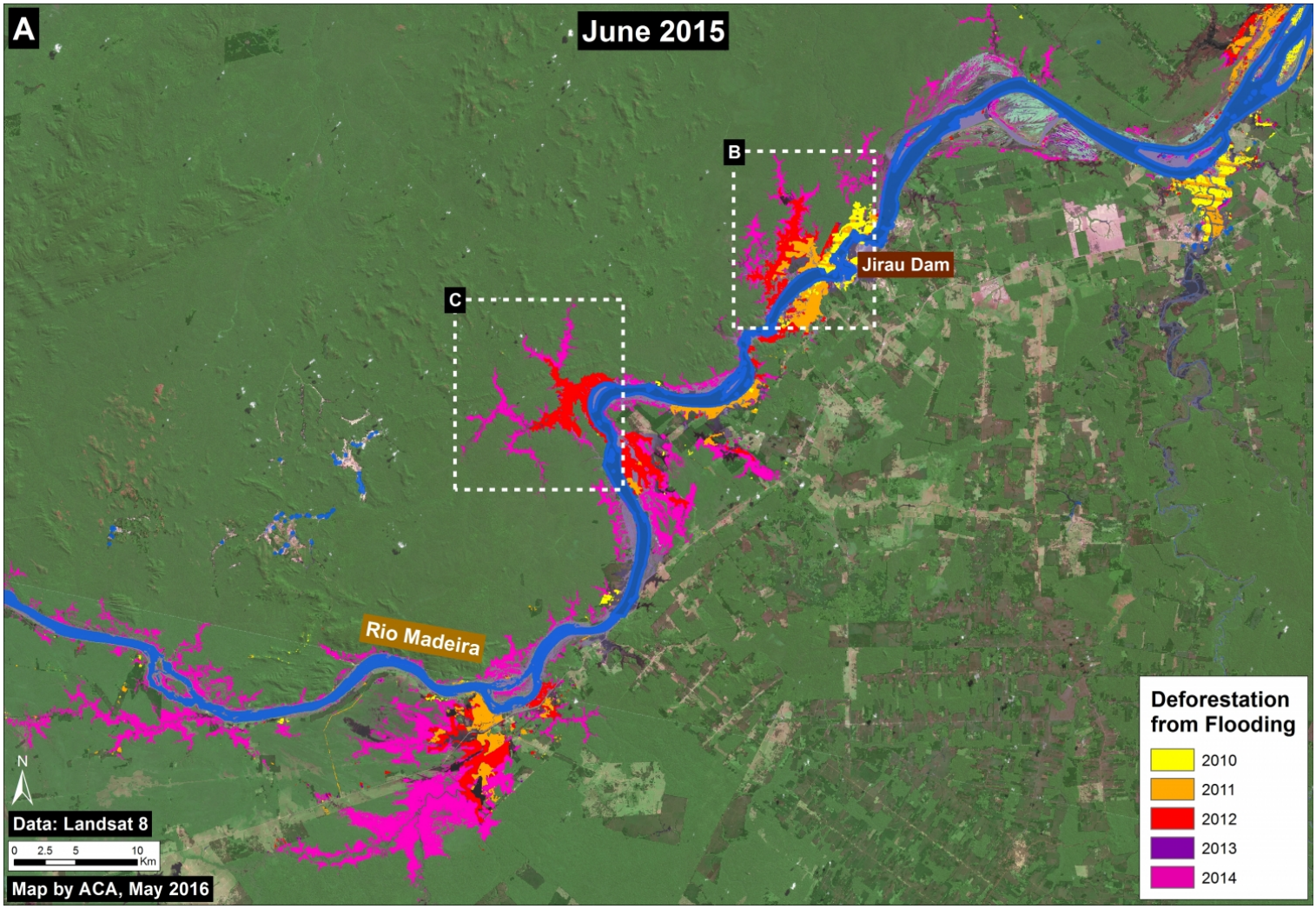


Image 34b. Flooding-related forest loss along the Upper Madeira River. Data: USGS, CLASlite, Hansen/UMD/Google/USGS/NASA.

Zoom B: Flooding Immediately Upstream Jirau Dam

Image 34c shows the flooding immediately upstream of the Jirau dam between 2011 (left panel) and 2015 (right panel). The red dot is a point of reference that indicates the same place in both images. Below, we show high-resolution images of the areas indicated by Insets B1 and B2.

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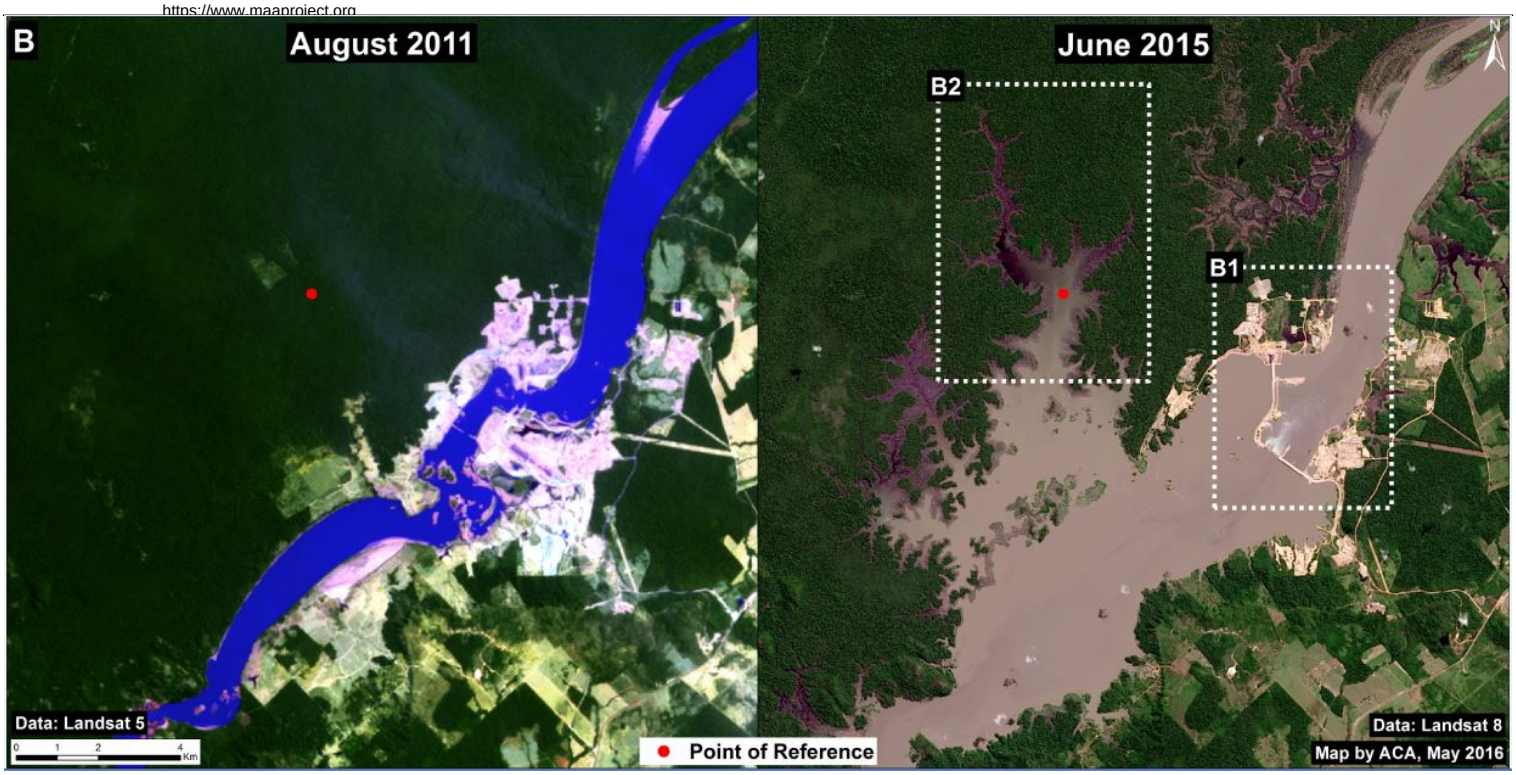


Image 34c shows the flooding immediately upstream of the Jirau dam between 2011(left panel) and 2015 (right panel).

Zooms B1 and B2: Jirau Dam and Flooding

Image 34d shows a high-resolution view of the Jirau dam in July 2015. **Image 34e** shows a high-resolution view of a portion of the flooded area immediately upstream of the Jirau dam in August 2015. The red dot is a point of reference that indicates the same place in both panels.

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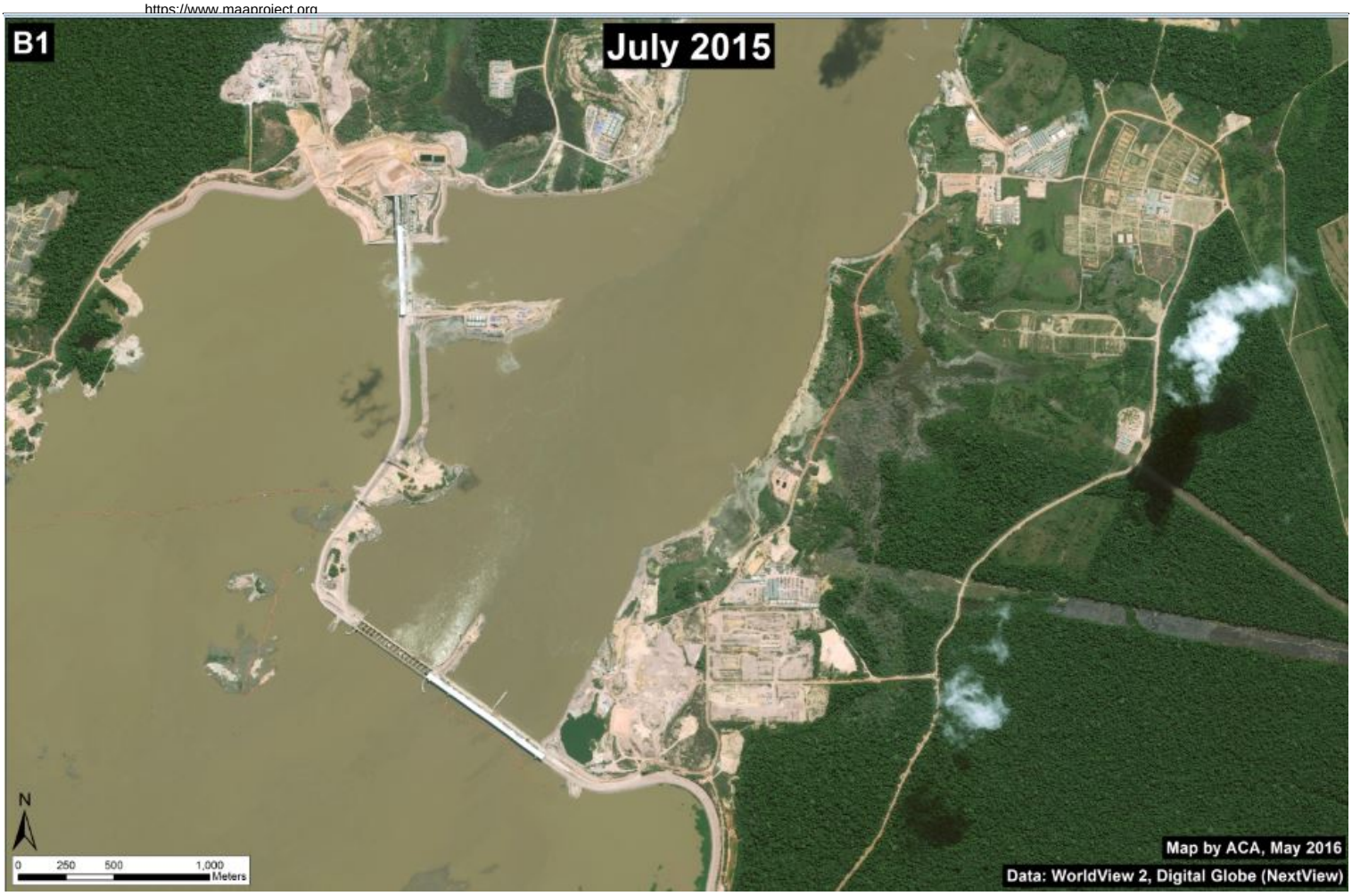


Image 34d. High-resolution view of the Jirau dam. Data: WorldView-2 from Digital Globe (NextView).



Image 34e: High-resolution view of flooded area immediately upstream of the Jirau dam. Data: WorldView-2 from Digital Globe (NextView).

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Zoom C: Flooding Further Upstream of Jirau Dam

Image 34f shows the flooding further upstream of the Jirau dam between 2011 (left panel) and 2015 (right panel). The red dot is a point of reference that indicates the same point in both images.

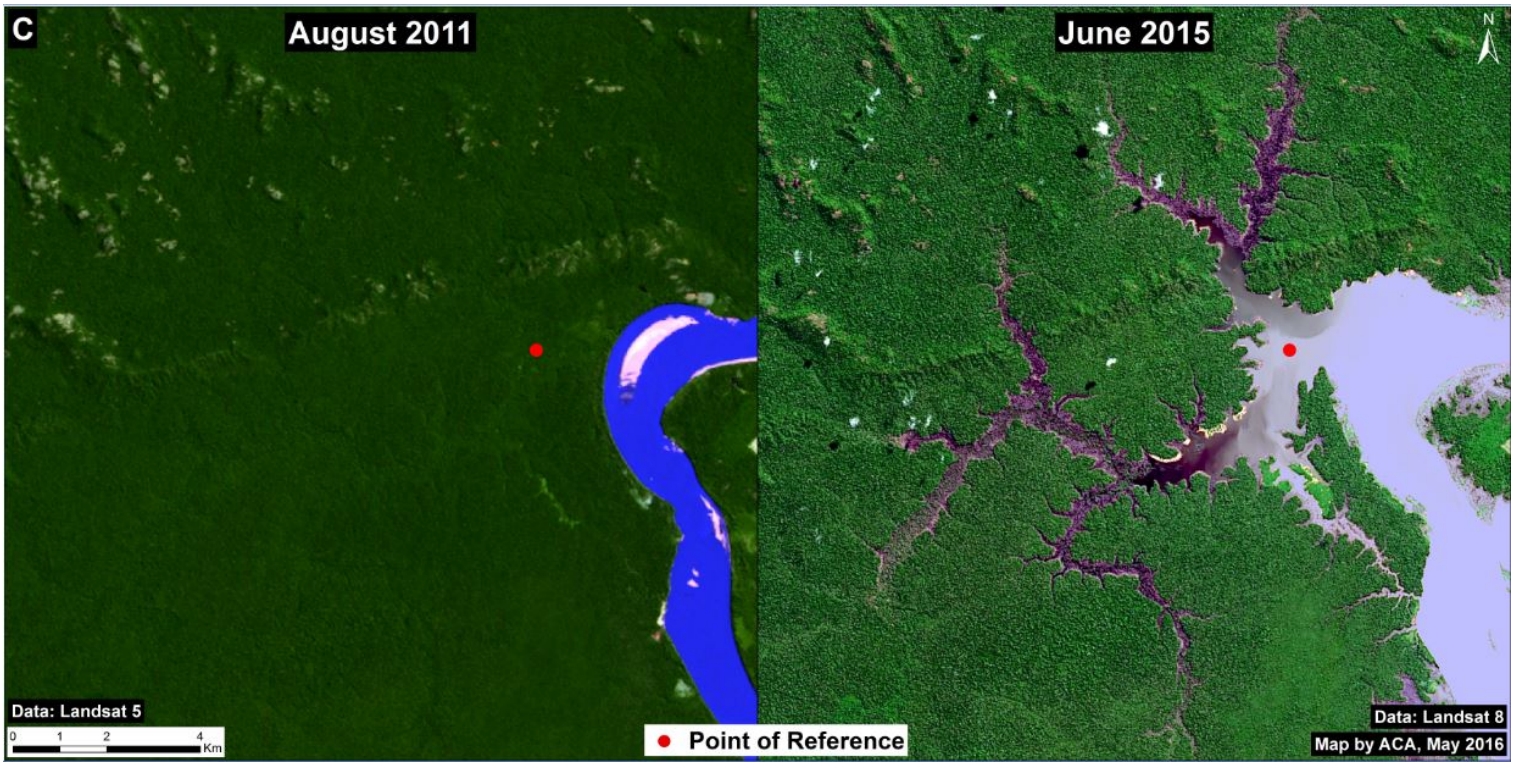


Image 34f. Forest flooding further upstream of the Jirau dam between 2011 (left panel) and 2015 (right panel). Data: USGS

References

*Finer M, Jenkins CN (2012) Proliferation of Hydroelectric Dams in the Andean Amazon and Implications for Andes-Amazon Connectivity. PLOS ONE: 7(4): e35126. Link: http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0035126

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Citation

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