



Australian Government



Geological and Bioregional Assessment Program

Fact sheet 16

Has development impacted flood characteristics?

Flooding from headwater catchments, mainly the Thomson and Barcoo rivers, located north of the Cooper Creek floodplain provide important inflows to the waterholes and their associated riparian vegetation. We sought to determine if human development on the floodplain has altered key flood characteristics, such as flood extent and flood duration, observed by reflective satellite imagery from 2001 to 2018. As floods are associated with cloudy and rainy conditions, which adversely impact reflective satellite imagery, an important step was determining to what degree the flood characteristics depended on satellite imagery specifications, such as the spatial resolution and revisit frequency. Two long-term, freely available satellite data types were assessed: MODIS (250 m and daily) and Landsat (25 m and every 16-days).

Floods commenced when streamflow became overbank at streamflow gauges and flooding ceased when the area of standing water on the entire floodplain derived from reflective satellite imagery reverted to the same area just prior to flood commencement. These define the 'start-date' and 'end-date' of each flood. Time series analysis of reflective satellite imagery during each flood resulted in flood extent and flood duration images for the entire Cooper Creek floodplain.

For the 2010 flood, Figure 1 shows the flood extents measured by (a) MODIS, (b) Landsat and (c) where they agree and differ. Of the 31,619 km² Cooper Creek floodplain 51% of the area was detected as flooded by both MODIS and Landsat, 17% by MODIS only, 3% by Landsat only, with 29% not being flooded. Comparing (a) and (b) in the vicinity of Windorah illustrates the higher spatial resolution of Landsat when compared to MODIS, yet around Windorah and further south on the floodplain part (c) shows that Landsat misses large areas of flooding (the green areas) due to Landsat's 16-day repeat cycle.

Figure 1 Flood extent in 2010 detected by (a) MODIS and (b) Landsat satellites, and (c) where they agree and differ

(a) MODIS

(b) Landsat

(c) Agreement and Difference

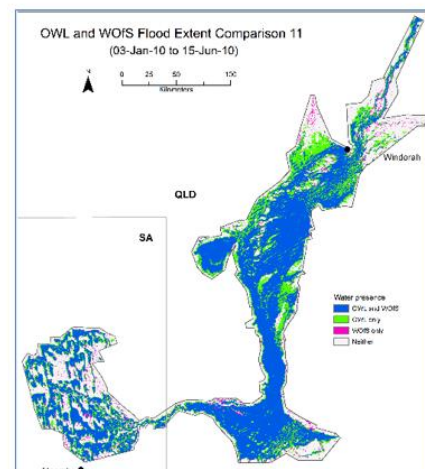
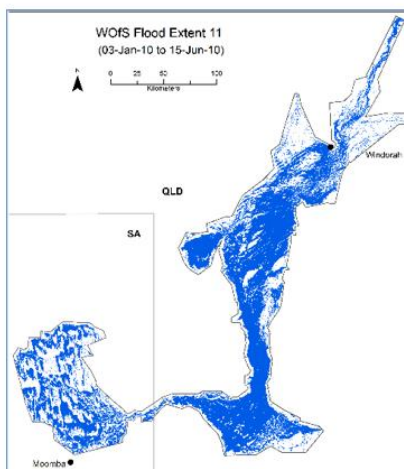
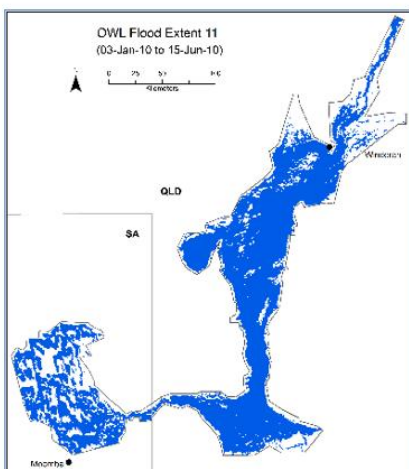
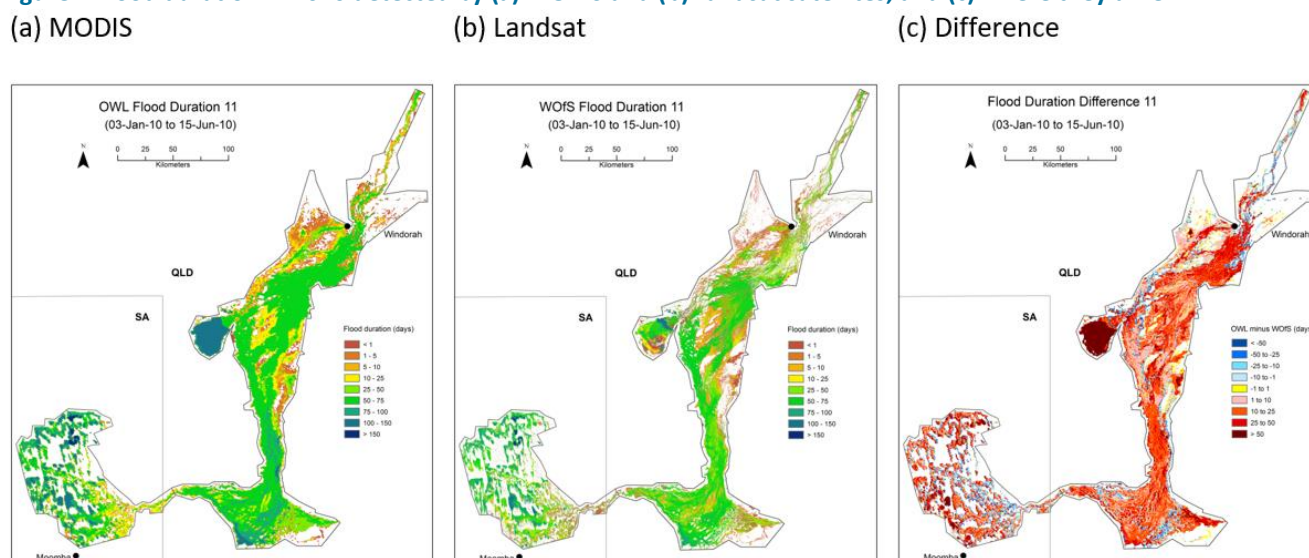


Figure 2 illustrates the flood duration calculated from (a) MODIS, (b) Landsat and (c) their difference for the same 2010 flood. Similar products are available for each of the 22 floods from 2001 to 2018. While the patterns are generally similar in Figure 2 (a) and (b), part (c) shows that MODIS based flood duration is at least 10 (or 25 or 50) days longer than the equivalent Landsat based metric for 36% (or 17% or 5%) of the 31,619 km² Cooper Creek floodplain. This is due to MODIS being acquired daily in comparison to Landsat having a 16-day repeat cycle.

Figure 2 Flood duration in 2010 detected by (a) MODIS and (b) Landsat satellites, and (c) where they differ



Assessing the impact of development given natural variability and uncertainty

To detect impact of development on flood characteristics, floods of similar magnitudes have been paired and between these two floods we know where and when developments on the floodplain occurred. We use this to investigate if differences in flood characteristics (i.e., flood extent and flood duration) of these 'pre-development' and 'post-development' paired floods are related to that development or not. Initial results suggest that natural variability of floods (e.g., each flood has different hydraulics and sediments are dynamic) and the inherent uncertainty in reflective-satellite-imagery-based observations of surface water hydrology on the Cooper Creek floodplain have more influence on flood characteristics than does development on the floodplain.

The GBA Program

The \$35.4 million Geological and Bioregional Assessment (GBA) Program is assessing the potential impacts of shale and tight gas development on water and the environment to inform regulatory frameworks and appropriate management approaches. The geological and environmental knowledge, data and tools produced by the GBA Program will assist governments, industry, land users and the community by informing decision-making and enabling the coordinated management of potential impacts.

How to cite

Geological and Bioregional Assessment Program (2021) Fact sheet 16: Has development impacted flood characteristics? [online document]. Fact sheet for the Geological and Bioregional Assessment Program.

Find out more

Datasets that support this work are available at data.gov.au:

- Geological and Bioregional Assessment Program (2021) [Cooper Creek multi-satellite flood inundation characterisation](#) [image].

More information is available at bioregionalassessments.gov.au/gba.