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Geological and Bioregional Assessment Program

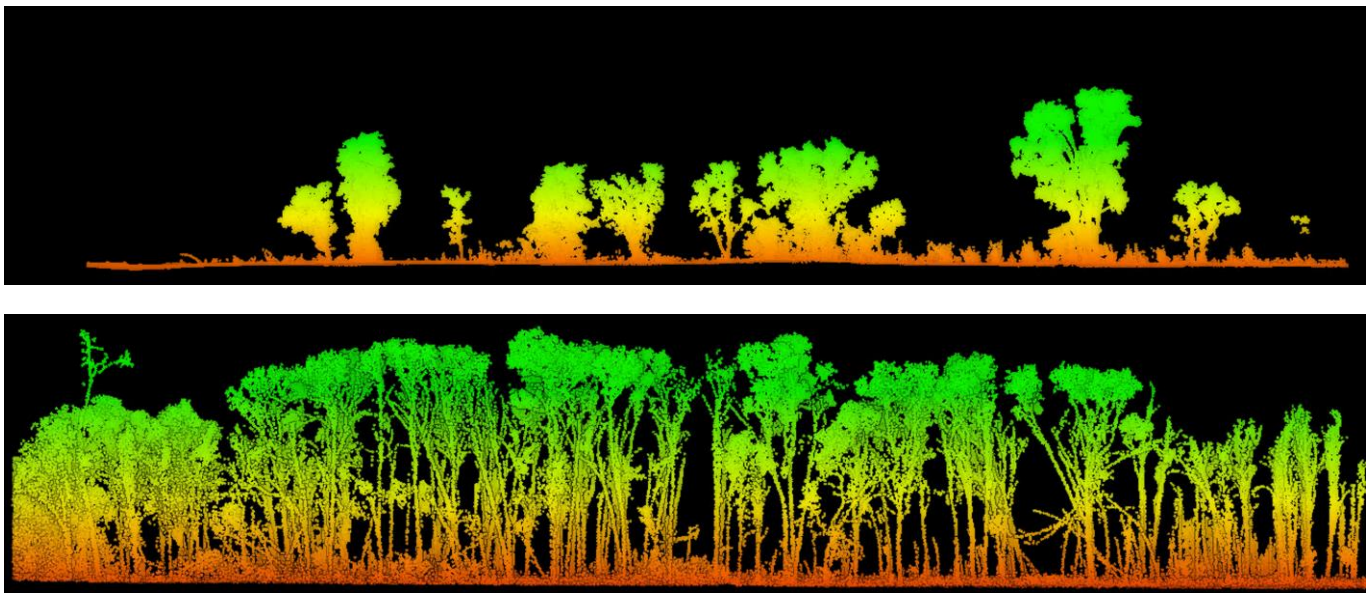
Fact sheet 29

Testing new remote sensing developments for the monitoring of protected matters in the Beetaloo GBA region

Advances in Earth Observation science are opening avenues for assessing changes in ecosystem condition at ecologically relevant spatial and temporal scales. These advances include developments in space technology that enable high quality imaging of spectral and structural properties at fine spatial (10-20 m) and temporal resolutions (every 5-10 days) through passive (multi-spectral optical imagery) and active (RADAR and LiDAR imagery) remote sensing, and the evolution of the field of 'Reality Capture' – which uses ground-based and/or low-altitude drone-based LiDAR to reconstruct ecosystems in three-dimensions (3D). With these advances in mind, this investigation sought to develop a remote sensing approach for assessing changes in habitat condition for key areas within the Beetaloo GBA region that are of potential biodiversity value. Here we focus on the habitat of three high priority threatened species (crested shrike-tit (northern), Gouldian finch and greater bilby).

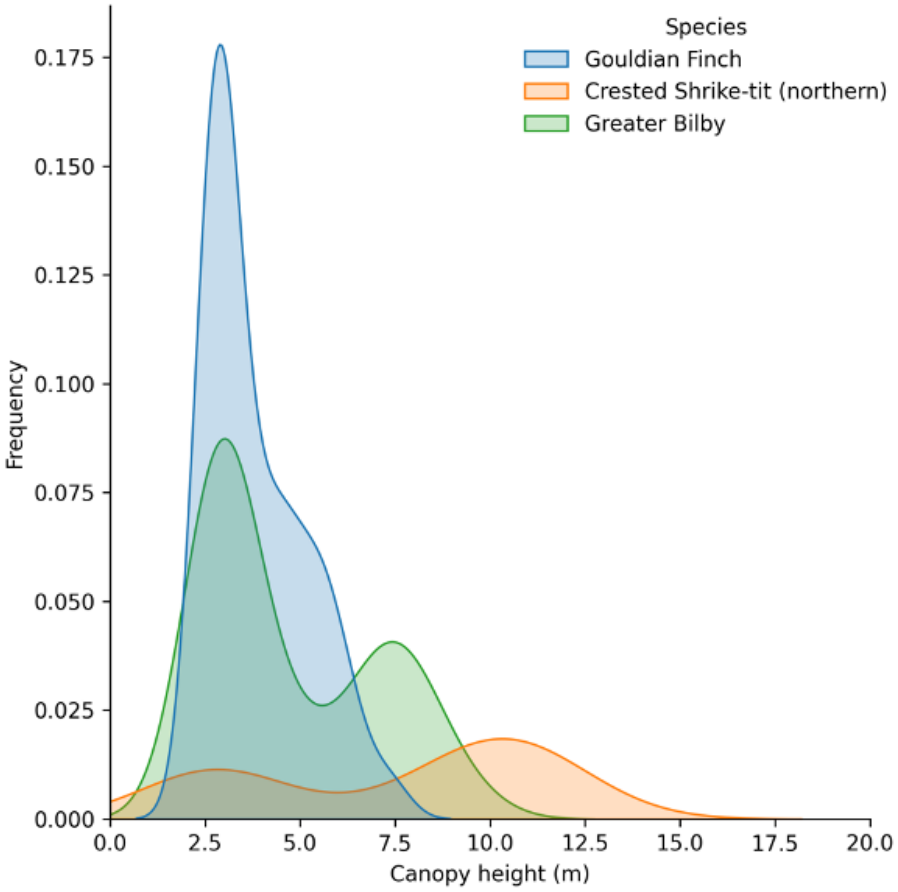
Multi-spectral remote sensing of landcover and landcover change is an advanced field. Using long-term satellite imagery from the Landsat and Sentinel-2 missions we showed that, despite a large degree of inter- and intra-annual variability, time-series of vegetation cover and productivity proxies such as kNDVI index show good potential for differentiating between the habitat of the three priority threatened species. Terrestrial LiDAR scanning across habitat types spanning a gradient in vegetation height and density from riparian forest, through eucalypt open-woodland, to lancewood and bullwaddy shrubland found a high degree of structural diversity across habitats. The scans generated a clear distinction between ground, herbaceous material and woody shrubs and trees for each habitat type (Figure 1).

Figure 1 Example of transects through terrestrial LiDAR point-clouds. Top scan is of eucalypt open-woodland; lower scan is bullwaddy shrubland. Ground-based LiDAR can capture the above ground elements of ecosystems in their entirety - providing avenues for assessing structural diversity and for quantifying changes over time.



These scans provided valuable calibration and validation data for interpreting satellite-based remote sensing products. We used the Global Dynamics Ecosystem Investigator (GEDI), a full waveform spaceborne LiDAR, to provide spatially comprehensive 3D measurement of vegetation structure. The GEDI canopy height distributions indicate distinct structural differences between the habitat in which the three priority threatened species were observed (Figure 2). The differences match predictions made at the outset of the study; crested shrike-tit (northern) occupy a taller canopy layer reflecting requirements for large trees in which to forage for invertebrates. The greater bilby habitat exhibits a prominent bi-modal pattern reflecting its use of Acacia shrubland as well as taller woodlands and open-woodlands.

Figure 2 Canopy height distribution across the habitat occupied by three priority threatened species; crested shrike-tit (northern), Gouldian finch and greater bilby



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.

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Find out more

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

- Geological and Bioregional Assessment Program (2020) Beetaloo Terrestrial LiDAR data [spatial].
- Geological and Bioregional Assessment Program (2020) Beetaloo GBA extended region spaceborne LiDAR data [spatial].

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