Introduction

CSIRO welcomes the opportunity to contribute to this Inquiry.

Over the last 100 years, CSIRO has worked closely with farming communities and agricultural industries to improve the management of land, crops and stock, as well as working with agencies, industry and communities to protect, restore and manage natural vegetation. CSIRO has also developed digital tools and platforms that can monitor land condition from satellites, and thus provide timely advice on management decisions, and their consequences.

This document summarises CSIRO's capabilities and current research and development activities with regard to two of the Terms of Reference for the Inquiry. A Bibliography is also provided at the end of this document which includes a list of relevant publications authored or co-authored by CSIRO that are pertinent to our comments below.

Past and current practices of land and vegetation management by the agricultural sector and regional industries

CSIRO has a long history of research into grazing impacts on vegetation production. Vegetation management regulation has a clear impact on land condition – for example, land clearing can have an impact on the soil and nutrient resources available for agriculture, as well as on the sediment and nutrient loads delivered to the Great Barrier Reef lagoon.

Our research suggests that low or declining historical ground cover impacts on rainfall infiltration, nutrient availability, erosion rates and recovery following drought. Stream bank erosion is typically lower where natural stream side vegetation is largely intact, or where stream side revegetation has been restored. Sub-surface soil erosion features [i.e. gullies] are initiated during periods of poor vegetation cover, which itself is related to the intensity of grazing pressure. Hillslope erosion rates are also higher at lower levels of vegetation cover. Vegetation management is a cost-effective way to rehabilitate gully and stream bank erosion.

Factors that contribute to fire risk in regional, rural and remote areas

Fire risk

We have a deep understanding of contextual climate, local landscape and community behavioural factors that influence risk of life and building loss in rural landscapes. This knowledge is underpinned by an extensive life and building loss database as well as studies of the specific mechanisms and processes that lead to loss.

Critical infrastructure allows us to experimentally model the effects of air temperature, wind speed, humidity and fuel condition in controlled conditions, to either investigate the causes of historic fires (as we did for the 2009 Victorian Bushfires Royal Commission) or predict the trajectory and impact of future fire scenarios.

We extend this knowledge to understand and predict the impact of fire in native vegetation, be it for targeted weed management, biodiversity conservation, or carbon emissions avoidance; the latter has informed savanna burning projects with a net present value of about $119 million.

Bushfire smoke forecasting

Bushfire smoke includes carbon monoxide, nitrogen oxides, organic chemicals, black carbon, carbon dioxide, and particles that can penetrate the lungs and enter the bloodstream. It is known to trigger asthma and other respiratory problems in exposed populations and, occasionally, it can prove lethal. As our climate

warms the frequency and intensity of bushfire is expected to increase. The need to reduce the risk of catastrophic bushfires by controlled burning of public land competes with the need to avoid the harmful effects of smoke on communities.

Victoria's Department of Environment, Land, Water and Planning (DELWP) funded CSIRO to improve smoke emission and transport modelling to support their decisions on whether and where to safely conduct planned fuel reduction burns. We developed and delivered a multi-tiered quantitative smoke and air quality prediction system – AQFx – that has now also been operationalised by the Bureau of Meteorology. AQFx uses the Bureau of Meteorology's weather forecasting system and the ACCESS weather forecasting model to calculate smoke emissions from ongoing fires and planned burns using a simplified fire spread model. It then predicts how much smoke the planned burn will add to the airshed and where the smoke plumes will travel.

This research has led to the adoption of AQFx for fire and land management in Victoria and the recommendation by the Australasian Fire and Emergency Service Authorities Council to adopt AQFx nationally so that exposure to smoke from planned burns can be minimised across Australia.

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