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Climate Change, Biodiversity and the Australian Capital Region

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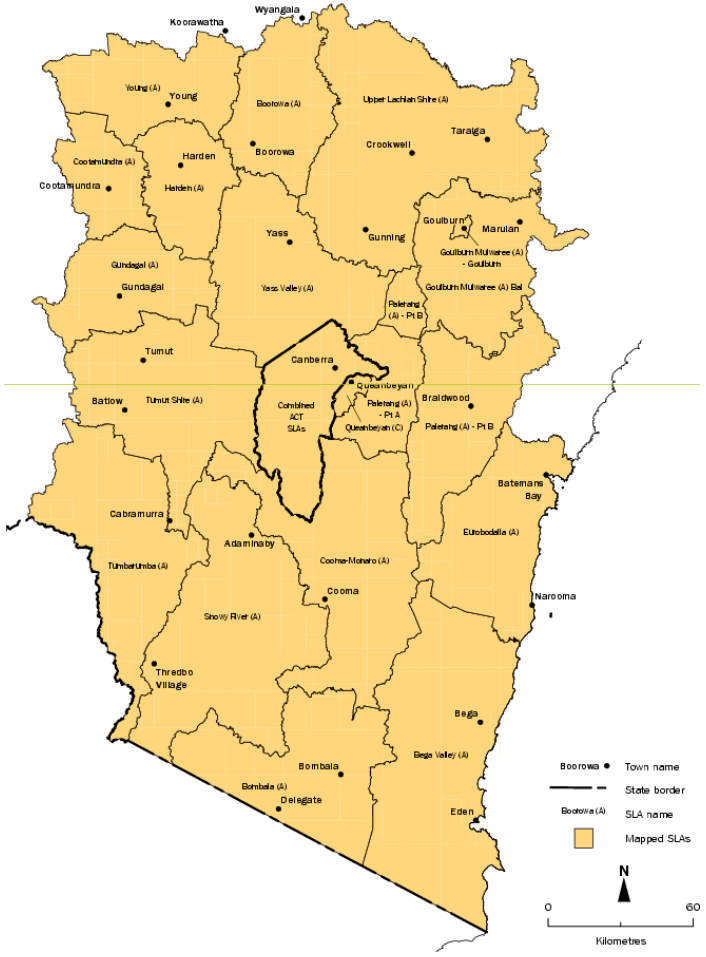
Australian Capital Region



Climate history and projections

- Long term historical record for the region
  - Temperatures clearly up
  - Rainfall variable but recent drought unusual
  - Climate drivers changing – SEACI research - consistent with global warming – but GCMs poor on rainfall

- Projections relevant to the region
  - At least 8 studies using climate projections in recent times
  - No consistency of assumptions, scenarios, GCM selection
  - Some consistent climate directions - increasing temperature, heatwaves, evaporation and dryness, storms, bushfire weather - less snow – but rainfall changes less clear
  - Changes in rainfall seasonal patterns very likely; likely increase in rainfall intensity; risk of decline in long term average – but this is the area of greatest uncertainty especially at regional/ local levels

Physical and biodiversity impacts

- Changed patterns of run-off and stream flows
- Reduced soil moisture and nutrients
- Increased erosion
- Increased soil salinity
- Increased drought severity
- Increased bushfire frequency and intensity
- Sea level rise, storm surges and inundation
- Many actual and potential biodiversity impacts from the above for the region (see for example NSW Climate Impact Profile 2010; various ACT Government documents; NPA ACT Symposia 2006, 2008, 2010)

Alpine/ subalpine

- Threat to cold climate adapted/ narrrow temperature range species (eg Fjaeldmark, short alpine herbfields, sphagnum bogs and fens, southern corroboree frogs, mountain pygmy possums)

- Fire risk to alpine ash and other fire sensitive species include sphagnum bogs, alpine herbfields, mountain plum pine and to ground cover. Invasion of more temperature and fire tolerant species including certain trees, heathlands, shrublands and weeds (eg ribbon gum, grevillea, wild parsnip)

- In subalpine grassy woodlands reduction in snow/ groundcover/grasses threatens some fauna (eg broad-toothed rat, alpine skinks and frogs, echidna); plus more invasives (eg rabbits/hares/cats) and grazing pressure (eg kangaroo/ wallabies, horses, hares)

- Changing seed germination/ regeneration/ recruitment periods (eg less cool time available for alpine ash, snow gums). Earlier flowering of annuals and shrubs will disturb synchronicity for migratory birds (eg flame robin, pink robin) and spring breeding season shortened (eg for Richard's pipit, some honeyeaters)

- Increasing loss of micro-habitats (eg tree hollows for yellow-bellied glider, leaf litter for ground dwelling fauna)

- Increased frost heave may decrease organic decomposition and soils nutrients; and nutrient cycling by invertebrates and soil fauna impacted by higher temperatures

Tablelands - woodlands

- Water stress plus pest/ insect/ disease risk to fragmented and less storm-buffered woodland trees (eg Box Gums, Blakely's Red Gum, Snow Gum) being more threatened than subalpine woodlands.

- Increased fire frequency/ fuel reduction burning reducing some fire sensitive species (eg blueberry ash)

- Further woodland habitat and micro habitat loss, lower plant/grasses growth, and reduced or changed timing on flowering/nectar/ pollen/ foliage/ seed increases risk to fauna
  - nectivorous and insectivorous woodland birds (eg hooded robin, diamond firetail; regent honey eater, superb parrot)
  - small mammals (eg possums/ sugar gliders/ squirrel gliders) including ground dwellers (eg antechinus, smoky mouse)
  - opportunity for invasives (eg common myna, native noisy miner)

- Reduced woodland habitat available for seasonal migratory birds from subalpine (eg gang gang cockatoos, robins in winter) and from the north (eg rainbow bee-eater, dollarbird in spring); as well as native refugee species from the even greater dryness further west (eg galahs and crested pigeons); plus asynchrony in arrival if responding to temperature cues

Tablelands - grasslands

- Increased impacts on already ‘non-climate’ stressed grasslands; summer growing C4 grasses (eg kangaroo grass) and weeds (eg scotch broom, blackberry, serrated tussock, St John’s wort; Chilean needlegrass, African lovegrass) replacing winter growing native C3 grasses and tussocks (eg poa), spring annuals and perennials

- Higher CO2, and some increase in growth season from higher temperatures and reduced frosts may promote some extra overall growth (including shrubs), with potentially reduced rain and increased grazing offsetting

- Temperate grasslands productivity decrease plus changes in species composition and weeds increases impacts on threatened grassland fauna (eg grassland earless dragon, striped legless lizard, golden sun moth). Decreased grass cover also increases susceptibility to predation by birds (eg kookaburras, brown falcon) and ferals (foxes, cats)

- Extra vulnerability through reduced habitat for already stressed species (eg spotted tree frogs) ; and for autumn and winter beeders dependant on moisture (eg common toadlet, Bibret’s toadlet). Loss of damper grassland cover and habitats threatens fauna requiring wetter environments (eg green and golden bell frogs)

Tablelands - dry sclerophyll forests

- Dry sclerophyll forests in tableland ridge-tops and hill-slopes are less vulnerable than other forests/ woodlands as less modified
  - but extra heat and dryness could mean lower ground level productivity (eg grasses) and more open structure which could impact fauna (invertebrates and granivorous species) and lead to more grazing impacts;
  - some eucalypts may be displaced by arid-adapted acacias

- Changed flowering frequency and timing (especially in eucalypts eg white box, mugga ironbark) impacting nectivorous species (eg regent honey eater and superb parrot) and insectivorous species (eg mammals, bats, birds), including those with synchronised spring breeding. Less resource for winter breeding fauna such as dasyurids (eg antechinus)

- More fires may not advantage shrubs so much because of poor soils and nutrients; but will reduce hollows (for bats, arboreals, birds) and logs, leaf litter protection from cat and fox predators (for small mammals)

Coastal and wetlands

- Sea level rise risk to inter-tidal and sub-tidal estuarine communities – seagrasses, mangroves and salt marshes; changed invertebrate food webs impact fish
- Storm surge, saline intrusion and erosion risk to coastal communities – littoral rainforest, dry sclerophyll on coastal dunes, grasslands, freshwater wetlands, salt marshes; decline of invertebrate and vertebrate fauna
- Risk to shorebirds roosting and foraging habitats
- Decline in inland wetlands habitats with risk to foraging, grazing and breeding habitats for dependant species

Adaptation response issues

- Significance of region is high
  - Extremely varied
  - High biodiversity values
- Uncertainties and knowledge gaps
  - Climate futures (GHG and temperature; especially rainfall)
  - Individual species responses
  - Changes to the small/ invertebrate species
  - Novel ecosystems and species interactions
  - Thresholds and tipping points

Adaptation response strategies

- Maintaining fundamental ecosystem processes and services
  - reducing pressures/ disturbances and restoration
- Enhancing resilience for self adaptation via multiple pathways
  - including habitat variety and connectivity
  - responding dynamically over time
  - changing conservation goals
- Knowledge development and adaptive management
  - Cumulative knowledge access and sharing

Regional initiatives and projects

- SE NSW Integrated Regional Vulnerability Assessment
- Great Eastern Ranges Connectivity initiative
- Ecological Connectivity for climate change in the ACT and surrounding region (for ACT TAMS)
- ACT Weathering the Change (Versions1 and 2)
- ACT Nature Conservation Strategy review; key Conservation Strategies; Canberra Nature Reserves Investigation; ACT NRM Plan
- Mulligan's Flat project
- etc

Knowledge and research issues

- Understanding the future regional/ local climate – how much more is feasible (essential) in the nearer term?

- Understanding the landscapes, communities, species and likely responses – some practical limits to this?

- Understanding how to best develop and implement the ecosystem support and resilience strategies?

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Thank you

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