

# Indicators and trends

## Monitoring climate change adaptation

Indicator name		Version	
NB14: Natural Capital Asset Index		23/05/2018	
Indicator type:	Risk/opportunity	Impact	Action
		X	
SCCAP Theme	SCCAP Objective	CCRA risk/opportunity	
Natural Environment	N2: Support a healthy and diverse natural environment with capacity to adapt	Cross cutting	

### At a glance

- Nature provides services that underpin ecosystems and sustain our lifestyles. These free services of nature are not accounted for; therefore are undervalued and being degraded or lost.
- 'Natural Capital' provides a means to account for nature within a national balance sheet and capture the contribution of services that benefit people.
- The impacts of climate change are a threat to Scotland's natural capital.
- Scotland's Natural Capital Asset Index tracks changes in our natural capital.

Latest Figure	Trend
Not applicable	Stable (slightly increasing, though this is not statistically significant)

### Why is this indicator important?

Natural capital describes the resources provided by nature – air, water, soils, plants and animals – that provide benefits to people. These resources underpin our economy and our quality of life. They are keystones of Scotland's national competitive advantage in sectors including tourism, food and drink (The Scottish Government, 2018a).

The Economics of Ecosystems and Biodiversity (TEEB) report (2010) showed the importance of natural systems to economic development and the value of nature to people (Scottish Government, 2013).

There is considerable international concern that the value provided by nature and ecosystem services that underpin standards of living is not being adequately captured by markets. This can lead to undervaluation, degradation and loss.

The Natural Capital Asset Index (NCAI) has been developed by Scottish Natural Heritage (SNH) since 2009, and aims to guide sustainable economic growth through management that protects and builds natural capital for continued use into the future. It describes changes across Scotland's ecosystems since 2000 (SNH, 2018a).

The NCAI can be used to assess changes in natural capital over time, the success of strategy in the past and to inform future strategy. The NCAI should reflect the ability of Scotland's ecosystems to cope with a range of pressures, including climate change. A decline in natural capital would be expected if ecosystems were unable to cope with pressures such as a changing climate.

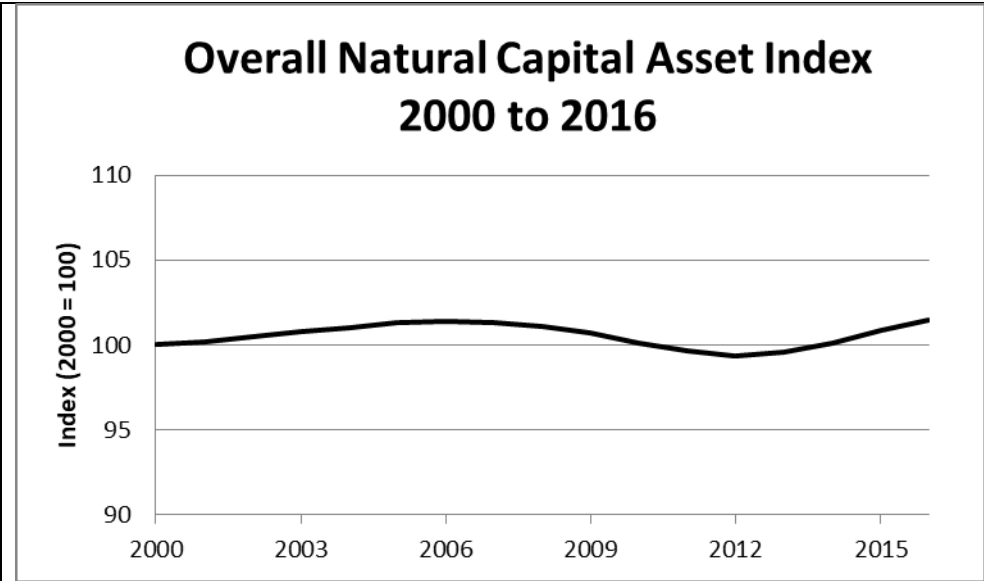
### What is happening now?

The latest figure (2016) for Scotland's NCAI is an Index of 101.5. As can be seen from Table 1 and Figure 1 below, which set this figure in the context of a series since 2000, Scotland's natural capital score has been stable over this period (SNH, 2018c).

Year	NCAI
2000	100.0
2001	100.2
2002	100.5
2003	100.8
2004	101.0
2005	101.3
2006	101.4
2007	101.3
2008	101.1
2009	100.7
2010	100.1
2011	99.6
2012	99.4
2013	99.6
2014	100.1
2015	100.9
2016	101.5

**Table 1: Natural Capital Asset Index for Scotland, 2000–2016**

Source: SNH, 2018c



**Figure 1: Overall Natural Capital Asset Index 2000 to 2016**

Source: SNH, 2018d

The NCAI is a composite index. It tracks changes in the potential of Scotland’s terrestrial ecosystems to provide services that benefit people. The ability of ecosystems to provide beneficial services, such as clean water and flood management, varies over time because of changes in the quantity and quality of habitats. Such changes are tracked by analysis of land cover change, together with a set of 38 indicators of habitat quality (SNH, 2018b). The ecosystem services provided by natural capital are divided into 3 main categories: provisioning services; regulating services and cultural contributions (SNH, 2018b).

Note: As the NCAI was substantially revised and developed in 2015, the data does not match that presented in the earlier version of this indicator (2016). See the Methodology for further details.

**What has happened in the past?**

The UK National Ecosystem Assessment (UKNEA) (2011) (cited in The Scottish Government, 2013) highlighted how Scotland’s natural environment has changed since 1950. While food production from agriculture has significantly increased, there have been declines in air, water and soil quality and other ecosystem services, especially those with lower market value or lower visibility. SNH note that there were decades of decline until the 1990s; however Scotland’s stock of natural capital has since stabilised (SNH, 2018d).

**What is projected to happen in the future?**

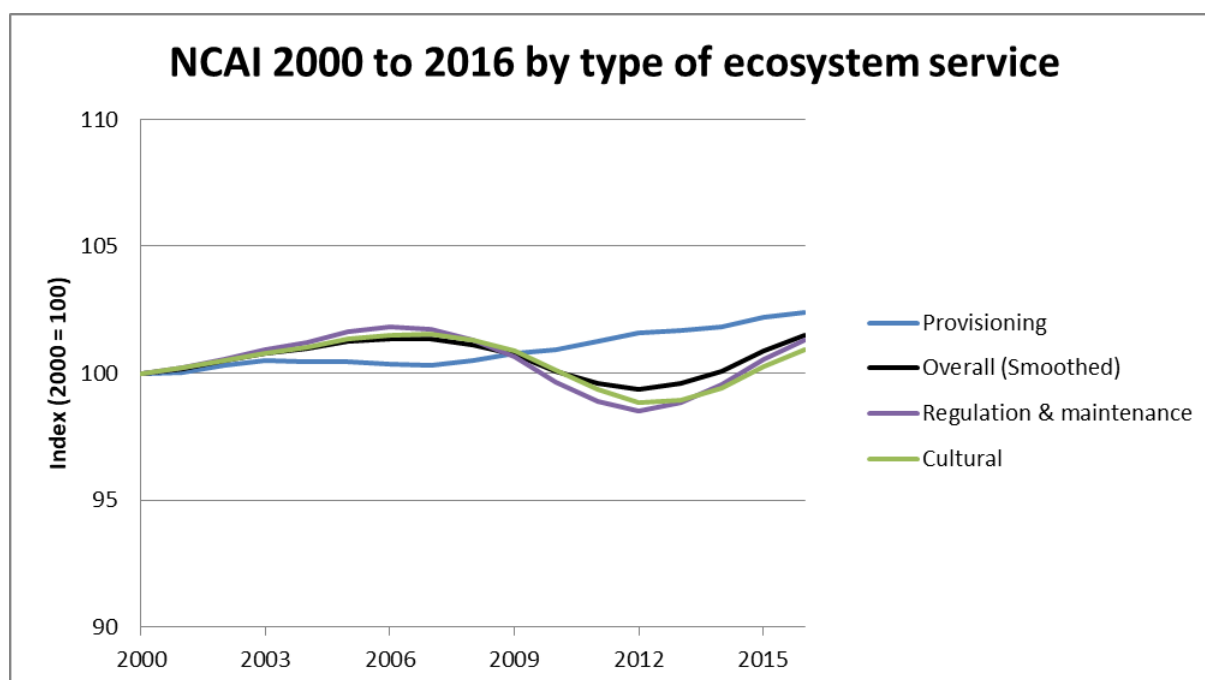
‘Scotland’s Biodiversity Strategy, The 2020 Challenge for Scotland’s Biodiversity’ (The Scottish Government, 2013) aims to ensure all habitats in Scotland begin to recover from past degradation. Peatlands are an especially important focus of attention as they play a critical role in storing carbon and have international conservation significance. Investment in natural capital is integral to key Scottish Government policies including the Climate Change Plan (The Scottish Government, 2018b) and ‘Scotland’s Biodiversity – a route map to 2020’ (The Scottish Government, 2015). The target to increase woodland cover from 18% to 21% of Scotland’s land area by 2032, set out in the Climate Change Plan (ibid), will contribute to natural capital, as will investment in green infrastructure projects (SNH, 2017). Particular future threats to Scotland’s natural capital include invasive non-native species as well as climate change (SNH, 2018d).

## Patterns of change

### Patterns of change 2000 to 2016

The NCAI uses ecosystem services to analyse how the resources provided by nature benefit people. This section describes the trends for each type of ecosystem service (provisioning, regulating, and cultural), shown in Figure 2, and also trends for the individual habitat types included in the NCAI, shown in Figure 3.

### Trends by ecosystem service



**Figure 2: NCAI 2000 to 2016 by type of ecosystem service**

Source: SNH, 2018c

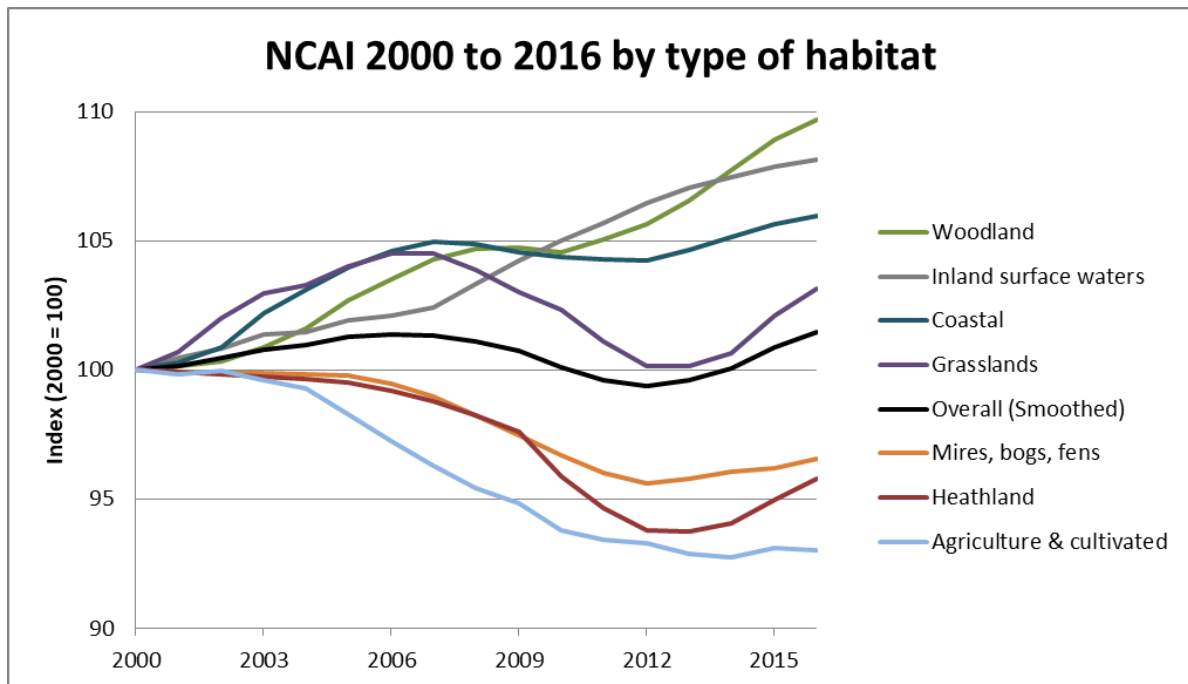
Examples of provisioning ecosystem services include: grass for livestock; dairy products; timber; soft fruits; wild salmon and venison; freshwater for drinking. Scotland's potential to deliver these services has generally increased since 2000, particularly for freshwater (SNH, 2018b).

Some examples of regulation and maintenance ecosystem services are: climate regulation; natural flood protection; pollination; soil formation. The trend shows Scotland's ability to produce these services has fluctuated, dipping from 2007 to 2012 then recovering to similar levels as in 2000 but below the 2006 peak (ibid).

Examples of cultural ecosystem services include: watching wildlife; recreational fishing; symbolic species and landscapes; information for education. This trend fluctuates in a similar manner to that for regulation and maintenance services; habitats in good condition are likely to have the ability to deliver both types of services (ibid). The increase in recent years reflects an increase in the number of outdoor visits, leading to more interactions with the environment (SNH, 2018d).

Regulation and maintenance ecosystem services are considered to provide the largest benefit to people in Scotland. The trend for this type of service is most closely correlated with the overall NCAI trend (ibid).

### Trends by habitat type



**Figure 3: NCAI 2000 to 2016 by type of habitat**

Source: SNH, 2018b

The seven Scottish habitat types included in the NCAI are Woodland; Inland surface waters; Coastal; Grasslands; Mires, fens and bogs; Heathland; Agriculture and cultivated.

Many habitat types show good progress overall. However there are declines in some individual components, e.g. upland bird populations, quality of designated woodlands.

**Woodland:** Extent of broadleaved woodland habitat has increased by 20% since 2000; there are increased numbers of woodland birds. However, the condition of some designated natural features has declined.

**Inland surface waters:** Ecological condition of rivers and lochs has improved; river pollution is less widespread; condition of designated natural features has declined but this has stabilised since 2009.

**Coastal:** these has been an improvement in designated natural features, and in bathing water quality.

**Grasslands:** there has been a reduction in numbers of cattle and sheep. Designated natural features have recovered following a decline up to 2011.

**Mires, fens and bogs:** Designated features have declined, but slight improvements have occurred in recent years. There are knowledge gaps around changes in upland habitats.

**Heathland:** Following a decline since 2000, Scotland's important heathland and peatland habitats have begun to recover after lows in 2012. The condition of designated heathland and peatland sites has also begun to recover. Peatlands are particularly important because of their potential to benefit people, including climate change mitigation through carbon storage. Upland birds have declined.

**Agriculture and cultivated:** Downward trends have been driven by loss of habitat extent. However cereal yields are now equal to their highest recorded levels and there has been some increase in farmland birds such as goldfinches and great tits (SNH, 2018b).

For data tables showing details of NCAI values for each habitat type see ‘Scotland’s Natural Capital Asset Index 2018 (data to 2016)’ (SNH, 2018c) <https://www.nature.scot/scotlands-natural-capital-asset-index-0>

### Interpretation of indicator trends

The NCAI is not designed to provide an absolute measure of the ‘amount’ of Scotland’s natural capital, but a picture of relative change over time and the drivers of that change (Albon et al, 2014). Also, there is no specific target. The base year is 2000 (with an Index of 100) but this is not intended to reflect the state of the environment at that point in time. It is the long term trend in the NCAI, and the drivers behind it, that are important.

Trends in the NCAI are evaluated within the National Performance Framework (The Scottish Government, 2018a). A change of 2 percentage points or more over 3 years is considered to be significant.

### Limitations

The NCAI is limited to the contribution of terrestrial habitats; it does not include Scotland’s marine habitats. It does not measure the resilience of habitats to outside pressures, or changes in biodiversity. Knowledge gaps remain, e.g. we have limited knowledge of uplands outside of protected areas (SNH, 2018d).

There are not many indicators for provisioning ecosystem services, as the available indicators (current flows of outputs) do not always reflect the underlying condition of the asset providing the service that underpins potential to maintain these flows in the future (SNH, 2018b).

While the NCAI can demonstrate the impacts of human activity on the natural environment (although it cannot distinguish between anthropogenic and non-anthropogenic driven change), it cannot always show the impact of individual policies on natural capital. Also, it is not sensitive to how changing levels of natural capital might result in ecological thresholds or ‘tipping points’ being crossed. Close to such thresholds a small difference in natural capital as measured in the NCAI could have a disproportionately large impact on ecosystem services. A small loss in natural capital that results in a threshold being crossed could result in ecosystem collapse and loss of services; equally a small gain might result in a dramatic improvement (Albon et al, 2014).

In composite indicators such as the NCAI, significant detail can be obscured in the overall headline figure. The NCAI can be broken down into different habitats to provide a more detailed picture. The overall index should therefore be interpreted with this in mind.

### References

Albon, S., Balana, B., Brooker, R., and Eastwood, A. (2014) A Systematic Evaluation of Scotland’s Natural Capital Asset Index. Scottish Natural Heritage Commissioned Report No. 751. [www.snh.org.uk/pdfs/publications/commissioned\\_reports/751.pdf](http://www.snh.org.uk/pdfs/publications/commissioned_reports/751.pdf)

European Environment Agency (2015) *About the European Nature Information System, EUNIS* <http://eunis.eea.europa.eu/about> (accessed March 2015)

SNH (2017) *£7.3m in funding for new green infrastructure projects across Scotland*. Scottish Natural Heritage. <https://www.snhpresscentre.com/news/gbp-7-3m-in-funding-for-new-green-infrastructure-projects-across-scotland> (accessed May 2018)

SNH (2018a) Natural Capital Asset Index (online) <https://www.nature.scot/professional-advice/planning-and-development/valuing-our-environment/natural-capital-asset-index> (accessed May 2018)

SNH (2018b) *Scotland's Natural Capital Asset Index. Information Note – Updated 2018*. <https://www.nature.scot/sites/default/files/2018-04/Scotland%27s%20Natural%20Capital%20Asset%20Index%20-%20Information%20Note%202018.pdf> (accessed May 2018)

SNH (2018c) *Scotland's Natural Capital Asset Index 2018 (data to 2016)* <https://www.nature.scot/scotlands-natural-capital-asset-index-0> (accessed May 2018)

SNH (2018d) *Scotland's Natural Capital Asset Index. 2018 Summary*. <https://www.nature.scot/sites/default/files/2018-04/Scotland%27s%20Natural%20Capital%20Asset%20Index%20-%20Two%20Page%20Summary.pdf> (accessed May 2018)

The Scottish Government (2013) *2020 Challenge for Scotland's Biodiversity. A strategy for the conservation and enhancement of biodiversity in Scotland*. [www.scotland.gov.uk/Resource/0042/00425276.pdf](http://www.scotland.gov.uk/Resource/0042/00425276.pdf) (accessed March 2015).

The Scottish Government (2015) *Scotland's Biodiversity – a route map to 2020*. <http://www.gov.scot/Publications/2015/06/8630/downloads#res-1> (accessed May 2018).

The Scottish Government (2018a) *Scotland Performs National Indicator: Increase Natural Capital*. <http://www.gov.scot/About/Performance/scotPerforms/indicator/naturalcapital> (accessed May 2018).

The Scottish Government (2018b) *Climate Change Plan. The Third Report on Proposals and Policies 2018-2032*. <http://www.gov.scot/Publications/2018/02/8867/downloads> (accessed May 2018).

## Further information

## Acknowledgements

SNH developed the NCAI and carried out all the analysis described herein.

This indicator was updated in May 2018 by Ruth Monfries (RBGE/CXC). Tom McKenna (SNH) provided review and guidance.

## Appendix One: Indicator metadata and methodology

**Table 1: Indicator metadata**

	Metadata
<b>Title of the indicator</b>	Natural Capital Asset Index (NCAI)
<b>Indicator contact:</b> Organisation or individual/s responsible for the indicator	Ruth Monfries (Royal Botanic Garden Edinburgh/ClimateXChange)
<b>Indicator data source</b>	SNH Natural Capital Asset Index
<b>Data link:</b> URL for retrieving the indicator primary indicator data.	'Scotland's Natural Capital Asset Index 2018 (data to 2016) <a href="https://www.nature.scot/scotlands-natural-capital-asset-index-0">https://www.nature.scot/scotlands-natural-capital-asset-index-0</a>

**Table 2: Indicator data**

	Indicator data
<b>Temporal coverage:</b> Start and end dates, identifying any significant data gaps.	2000-2016
<b>Frequency of updates:</b> Planned or potential updates	The index will be updated annually and released late March/early April (for the year 2 years previous).
<b>Spatial coverage:</b> Maximum area for which data is available	Scotland
<b>Uncertainties:</b> Uncertainty issues arising from e.g. data collection, aggregation of data, data gaps	See 'Limitations'.
<b>Spatial resolution:</b> Scale/unit for which data is collected	Habitat 'units'. Details are provided in SNH, 2018b.
<b>Categorical resolution:</b> Potential for disaggregation of data into categories	Seven EUNIS Level 2 habitat types, ecosystem service type. For details of the European Nature Information System, EUNIS, see European Environment Agency, 2015.
<b>Data accessibility:</b> Restrictions on usage, relevant terms & conditions	Publicly available, free of charge



**Table 3 Contributing data sources**

<b>Contributing data sources</b>
Data sets used to create the indicator data, the organisation responsible for them and any URLs which provide access to the data.
Data sources for each area of habitat are detailed in ‘Scotland’s Natural Capital Asset Index 2018 (data to 2016) (SNH, 2018c). This can be accessed here: <a href="https://www.nature.scot/scotlands-natural-capital-asset-index-0">https://www.nature.scot/scotlands-natural-capital-asset-index-0</a>
A number of indicators are used to assess changes in the quality of each habitat type, or the ability of each habitat to provide ecosystem services. They have varying data sources.

**Table 4 Indicator methodology**

<b>Indicator methodology</b>
The methodology used to create the indicator data
<p>The NCAI is a pragmatic attempt to compare and monitor our natural capital assets that benefit people. The NCAI model applies what is understood about ‘our habitats’ capacity to deliver flows of ecosystem services’ (SNH, 2018b); this capacity varies with changes in the quantity and quality of habitats. As there is no common unit for different assets, the NCAI uses habitats as units of natural capital. Each unit of habitat has potential to deliver a set of ecosystem services, and this potential ability is rated between zero and five for each relevant ecosystem service. The NCAI also accounts for the importance of each ecosystem service, and the area of each habitat, to assess the relative contribution of each habitat to human wellbeing. A mix of quantitative and qualitative methods are used.</p> <p>Habitat quality is tracked using 38 separate indicators.</p> <p>The NCAI is a work in progress and the methodology and data will both be further refined (SNH, 2018d).</p> <p>The NCAI was substantially reviewed and revised in 2015, including a change from using seven ‘broad habitats’ to seven habitats based on EUNIS Level 2 habitat types. Because of this, the data does not match that presented in the earlier version of this indicator (2016).</p> <p>More detailed information about the methodology of the NCAI is available in:</p> <p>Scotland’s Natural Capital Asset Index: Information Note – Updates 2018 <a href="https://www.nature.scot/sites/default/files/2018-04/Scotland%27s%20Natural%20Capital%20Asset%20Index%20-%20Information%20Note%202018.pdf">https://www.nature.scot/sites/default/files/2018-04/Scotland%27s%20Natural%20Capital%20Asset%20Index%20-%20Information%20Note%202018.pdf</a></p> <p>Scotland’s Natural Capital Asset Index: Technical guidance <a href="https://www.nature.scot/sites/default/files/2018-04/Scotland%27s%20Natural%20Capital%20Asset%20Index%20-%20Technical%20Guidance.pdf">https://www.nature.scot/sites/default/files/2018-04/Scotland%27s%20Natural%20Capital%20Asset%20Index%20-%20Technical%20Guidance.pdf</a></p>