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ORIGINAL PAPER

Global plight of native temperate grasslands: going, going, gone?

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Abstract The indelible imprint of humanity is credited for the major degradation of natural systems worldwide. Nowhere are the transforming qualities of mankind more apparent than in the native temperate grassland regions of the world. Formerly occupying some 9 million km^2, or 8% of the planet's terrestrial surface, native temperate grasslands have been reduced to vestiges of their former glory. Only 4.6% are conserved globally within protected areas—a testament to being the least protected and the most extensively transformed of the world's terrestrial biomes. The aim of this paper is to continue promoting the conservation value of native temperate grasslands, and reiterate the need for further protection and sustainable management before further losses and inadequate protection undermine ecological integrity any further. A new strategic direction is presented for the next decade, underpinned by ten key focus areas. The most realistic opportunities to improve protection lie in central, eastern and western Asia where landscape-scale tracts of native temperate grassland remain in reasonable condition. Such a course necessitates a strong reliance on integrating sustainable use and conservation by promoting concepts such as Indigenous and Community Conserved Areas as legitimate and recognized forms of protected areas. Here the conservation value of working rangeland landscapes utilised by

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nomadic pastoralists comes to the fore. The naive and short-sighted approach to viewing native temperate grasslands merely as a palette for transformation and intensive utilisation should be weighed more objectively against an understanding of the myriad benefits they provide.

Keywords Cultural landscapes · Improved awareness · Indigenous and Community Conserved Areas · Nomadic pastoralists · Rangelands · Revised strategic direction · Sustainable utilisation

Introduction

The indelible imprint of humanity on natural systems has become the hallmark of the modern age. This profound impact is such that the Holocene Epoch post 1800, when the Industrial Revolution gripped Europe, has been dubbed the Anthropocene (Crutzen 2002; Steffen et al. 2007; Syvitski 2012). The need to reverse trends of degradation towards a sustainable trajectory of social-ecological change, to enhance ecosystem resilience and human well-being, is the essence of good 'Earth Stewardship' (Chapin et al. 2000; Ehrlich and Kremen 2001; Chapin et al. 2011).

Nowhere are the transforming qualities of mankind more apparent than in the native temperate grassland regions of the world (Figs. 1, 2). These grasslands have been variously defined as a discrete global terrestrial vegetation 'unit', viz. as an International Vegetation Classification (IVC) world grassland type (Faber-Langendoen and Josse 2010; Dixon et al. 2014), a global ecoregion (Olson et al. 2001), and a global terrestrial biome, or at least a

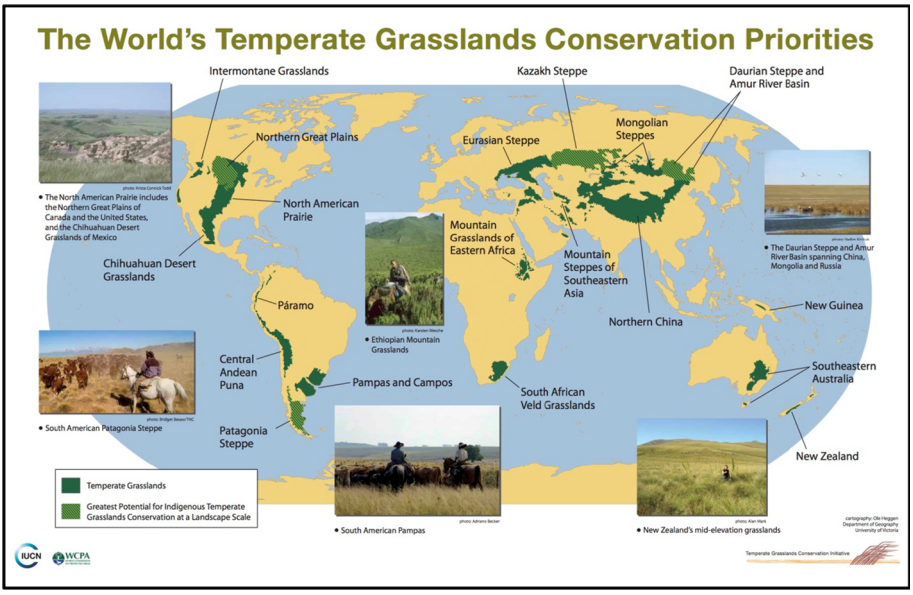

Fig. 1 Global distribution of native temperate grasslands, including the four conservation priority areas where the largest and least transformed tracts of native temperate grassland remain

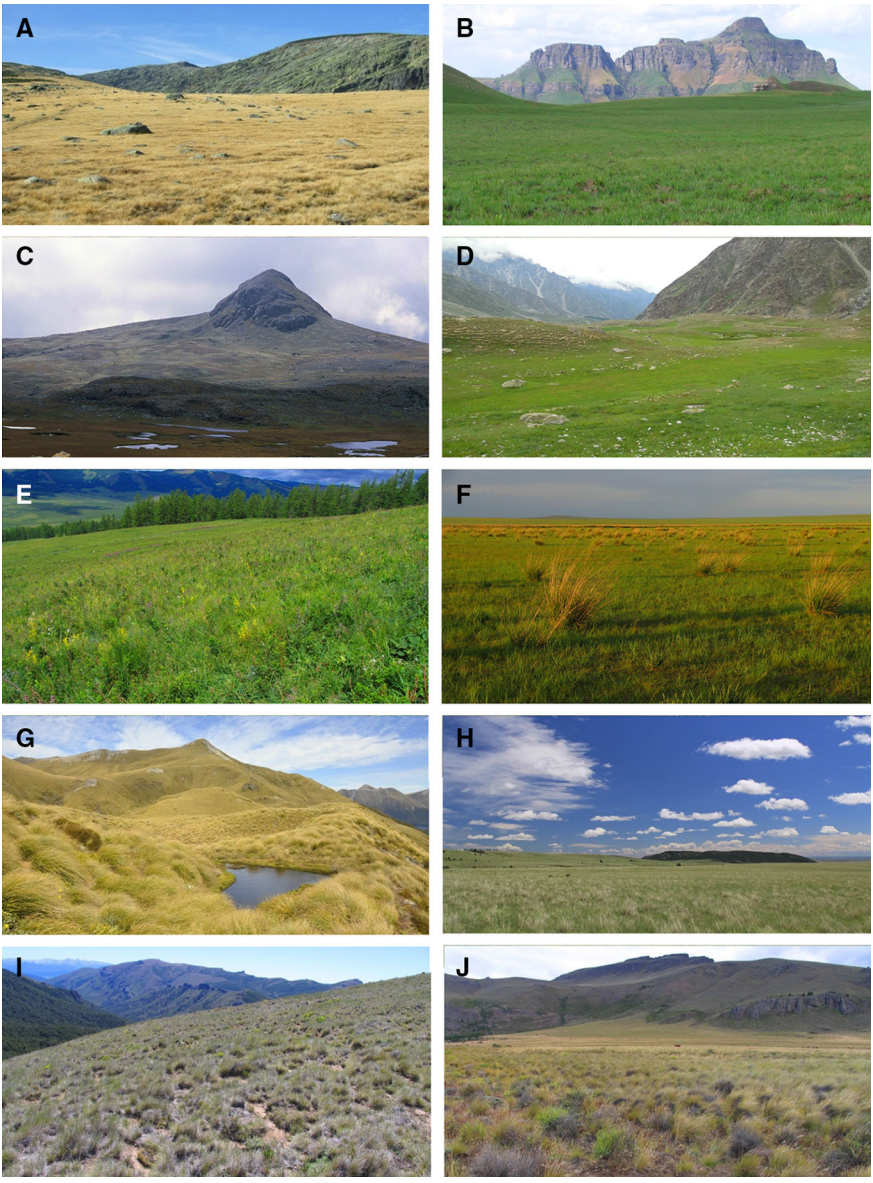

Fig. 2 Photographic sample of representative native temperate grassland landscapes from around the world. Photographs are arranged by country increasing in latitude. **a** Western European grasslands of the Sistema Central, Spain © C. Carbutt; **b** Sub-escarpment grasslands of Ntsikeni Nature Reserve, South Africa © C. Carbutt; **c** Afroalpine grasslands of tropical Africa, Ethiopian Highlands © C. Carbutt; **d** Short alpine meadow grasslands of the Miyar Valley, northern Indian Himalayas © C. Carbutt; **e** High-meadow grasslands of Kanas National Geopark, north-western China © C. Carbutt; **f** Asian steppe grasslands of Inner Mongolia, northern China © C. Carbutt; **g** Low-alpine snow tussock grassland, Fiordland National Park, New Zealand © C. Carbutt; **h** Short-grass prairie of the Northern Great Plains, central Montana, USA © B. Henwood; **i** Summer-dry alpine grasslands of the Patagonian Andes Mountains above the *Nothofagus pumilio* tree-line, Argentina © C. Carbutt; **j** Patagonian steppe grasslands, Argentina © C. Carbutt

major part of one, together with temperate savannas and shrublands (Hoekstra et al. 2005). Depending on the spatial scale of the analysis, however, temperate grasslands are not always differentiated from other grassland types (see Sayre et al. 2014). Dixon et al. (2014) explicitly define temperate grassland as a non-wetland type with at least 10% vegetation cover, dominated or co-dominated by graminoid and forb growth forms, and where low-stature trees or erect shrubs form a single-layer canopy with less than 10% cover and 5 m height. They generally reflect global macroclimatic factors also heavily influenced by altitude, seasonality of precipitation, substrates, fire history, and herbivory (Bond et al. 2003; Faber-Langendoen and Josse 2010).

Formerly occupying some 9 million km^2, or 8% of the planet's terrestrial surface (White et al. 2000; Henwood 2010), the native temperate grassland biome (Figs. 1, 2) is heavily predisposed to the irreversible conversion to non-natural environments. In short, native temperate grasslands have become the botanical 'beasts of burden' given that they are a rangeland of sorts, a working landscape most heavily utilised by the agricultural industry (Mark and McLennan 2005; Carbutt et al. 2011; Mark 2012; Carbutt and Martindale 2014), and more recently for the extraction of mineral resources and biofuel production (Wright and Wimberly 2013). Ironically, native temperate grasslands are also rich in both floral and faunal species (including many endemics), many of which are Red Data listed. Native temperate grasslands are also important breeding grounds and habitat for migratory species, and are important in the evolution of many plant foods of economic significance (Henwood 2010).

It is a great travesty how a world grassland type that has nurtured the needs of humans for millennia has received so little appreciation, attention and protection. Such contempt is short-sighted given their significantly high economic value and how they underpin the wellbeing of humanity through the provision of *inter alia* ecological infrastructure, carbon sinks, albedo surfaces, plant-based medicines, progenitor food plants and livestock grazing, among a wide range of ecosystem services (Mark et al. 2013). This travesty is not limited to the public domain. From a conservation perspective, many temperate grassland protected areas suffer neglect—they are generally more poorly funded than protected areas of other biomes and often less effectively managed (Carbutt and Goodman 2010). These shortcomings in native temperate grassland conservation are highlighted in Appendices A–C.

The International Union for Conservation of Nature (IUCN), the world's authority on conserving biodiversity and protecting natural resources, was therefore compelled to launch the 'Grasslands Specialist Group', rebranded in 2008 as the Temperate Grasslands Conservation Initiative (TGCI), to redress this temperate grassland conservation crisis. The task is a weighty one, given that temperate grasslands lead the charge in terms of being at greatest risk—they are being permanently lost at a rate more than eight times greater than the rate at which they are being protected. Their dubious distinction of being the least protected and most extensively transformed terrestrial biome on the planet (Hoekstra et al. 2005; Henwood 2010), dubbed by Hoekstra et al. (2005) as a 'biome crisis', may contribute to global-scale shifts or 'tipping points' in ecological systems (Barnosky et al. 2012). Progress almost a decade later is slow and the pressures on native temperate grasslands are ever increasing—the remaining vestiges are further at risk due to heavy utilisation pressure (White et al. 2012).

The aims of this paper are threefold: (1) continue to highlight the intrinsic and applied value of native temperate grasslands to society; (2) continue to draw attention to the grave situation facing this terrestrial biome and advocate the need for further protection; and (3) emphasize the future approach of the TGCI in its quest to expand the protected area

footprint and ensure sustainable management of one of the world's great terrestrial biomes before further losses and inadequate protection further compromise ecological integrity. This includes documenting the 10 focus areas that are central to the IUCN TGCI's revised strategic direction over the next decade, as determined at the 2014 World Parks Congress hosted in Sydney (Australia), as well as a framework outlining the approaches to securing more land in the private and public domains.

The Temperate Grasslands Conservation Initiative at the World Parks Congress 2014: an opportunity for introspection and charting a new course

The IUCN World Parks Congress is the premier global forum on protected areas, aiming to set the agenda for protected area conservation for the decade to come. Building on the theme *"Parks, People, Planet: Inspiring Solutions"*, the sixth congress held in November 2014 established a platform to discuss and create original approaches for conservation and development, helping to address the gap in the conservation and sustainable development agenda (Andersen and Enkerlin-Hoeflich 2015; Cullen 2015; McNeely 2015). The TGCI, taking its strength from a diverse and multi-skilled team of volunteers involved in the conservation of native temperate grasslands from around the world, capitalised on the opportunity by hosting congress delegates at a side event focussing specifically on native temperate grassland conservation. Collective thinking and endorsements were shaped through consensus into a revised strategic direction that would best serve the mandate of the TGCI in the next decade. Simultaneously, deliberations amongst temperate grassland practitioners culminated in a succinct statement as a contribution to the 'Promise of Sydney':

> Temperate grasslands, at only 4.5% protection status (at the time), are the most threatened and least protected of global terrestrial biomes. Significantly advancing conservation requires multiple flexible strategies that embrace both critical biodiversity protection and adaptive management approaches that respect cultural and economic livelihoods. Achieving success demands innovative strategies at all scales but particularly through large landscape-scale conservation efforts.

This congress and co-event, representing the most recent gathering of the TGCI, provided an ideal opportunity to revisit the approach to the conservation and protection of the world's temperate grasslands established in 2008 (see Henwood 2010). The realisation that the current <5% protection level was nowhere near the target of 10% by 2014 was a sobering one. A strong consensus was therefore reached to amplify efforts in a bid to rectify the dire status quo—and the means by which this may be achieved would have to harness new and unchartered opportunities for protection, particularly in the community-based cultural landscape arena given the vast swathes of native temperate grassland under communal land tenure, and the host of challenges to implementing further protection in the State and private arenas (Carbutt and Martindale 2014).

The final product emanating from the World Parks Congress 2014-affiliated temperate grassland workshop was a revised mission statement:

> To reverse the trend of biodiversity loss and degradation in the temperate grassland biome by pursuing the identification of opportunities for, and the creation of, new or expanded protected areas that conserve and protect areas of special importance for biodiversity, ecosystem services and sustainable use, consistent with the principles as

outlined in Aichi Target 11, with the short-term goal of at least doubling the current level of protection by 2020.

The conservation value of rangelands and nomadic pastoralism: central to the TGCI's revised strategic direction (2016–2025)

Reality dictates that the protected area estate can only grow within the confines of a finite planet constrained by a steadily increasing population. The spillover of people into protected areas, once revered as ivory towers, continues to grow. Dynamic management models will therefore have to increasingly incorporate the 'humanity factor' to address the twin pillars of adequate protection and sustainable utilisation. It is no surprise, therefore, that the newest territories sought for protected area expansion are located in remote areas long occupied by politically marginal indigenous peoples and subsistence-based nomadic pastoralists who have co-existed with their environment for millennia and who continue to rely on the natural resources these grasslands provide (McNeely 2015). Many of these grassland environments have evolved with transhumance grazing or nomadic pastoralism. The significant shortfall in native temperate grassland protection status will have to be met in the rangeland arena—therefore securing grassland habitat within working landscapes is unavoidable. However, securing gains in a production-oriented and highly fragmented biome is very challenging. Either land is privately owned and utilised for commercial purposes; or land is of communal tenure, supporting the subsistence needs of indigenous peoples and nomadic pastoralists. The challenge is to secure the few remaining vast swathes of native temperate grassland in a way that fully integrates biodiversity conservation and sustainable use to the benefit of biodiversity, the local communities and ultimately all humanity. Good relationships between protected area management and local people are critical to the achievement of protected area objectives, particularly when local communities are demanding greater profile in how these areas are managed (Borrini-Feyerabend et al. 2014; McNeely 2015; Smyth 2015). The role of conservation not-for-profits in this arena has increased dramatically in the past two decades (Agrawal and Gibson 1999).

Indigenous and Community Conserved Areas (ICCAs), a largely untapped and unexplored mechanism not previously considered by the TGCI, is the fourth governance type ('D') recognised by the IUCN and the Convention on Biological Diversity (CBD) (Borrini-Feyerabend et al. 2014; Smyth 2015). Setting a new course which considers territories under alternate management approaches, radically different from previous approaches employed by the TGCI, places a strong reliance on IUCN Protected Area Management Categories V and VI (and to a lesser extent Category IV), accompanied by an acceptance of ICCAs as legitimate and recognised protected areas (see Table 1: point #5). Here, decision-making responsibilities lie with indigenous peoples or local communities even though the emphasis is on conservation outcomes (Borrini-Feyerabend et al. 2014; Smyth 2015). The ICCA Global Support Initiative, which aims to improve the recognition, support and effectiveness of ICCAs for biodiversity conservation, sustainable livelihoods and climate change resilience (IUCN 2015), may be the best route to follow given that sustainability is one of the most relevant issues facing society (Chapin et al. 2012) and conservation (Borrini-Feyerabend et al. 2014). The vital contribution that rangelands and sustainable pastoralism can make towards the conservation of native temperate grasslands

Table 1 Strategic focus areas identified by the TGCI for the next ten years for the fulfilment of its mandate (2016–2025)

Strategic intervention	Description
#1 Leadership	Two spheres of leadership are urgently required. Firstly, the TGCI is proceeding with new leadership and a revised approach to regional representation among the grassland regions of the world. Secondly, the TGCI needs to prioritise succession planning for the next generation. A key challenge is to identify and inspire a new generation of temperate grassland enthusiasts and leaders. All leadership appointments will be endorsed by senior IUCN management
#2 Funding	Fundraising and private and government resourcing—the TGCI urgently requires adequate resources to fulfil its mandate and mission statement. To this end, the TGCI needs to clearly demonstrate the value of native temperate grasslands to society
#3 Demonstrating value and changing perceptions	A stronger narrative is required that clearly demonstrates (and where possible assigns a monetary value to) the value of temperate grasslands, both from an intrinsic biodiversity/conservation value and natural capital perspective. This includes changing public opinions and perceptions, and raising awareness. The value of native temperate grasslands to human life, particularly in terms of ecological infrastructure; ecosystem resilience; albedo (cooling surfaces, analogous as a blanket of snow); carbon sinks; and natural disaster risk mitigation all have to be demonstrated in greater detail to the appropriate audiences (expanded in Table 3)
#4 Developing key strategic partnerships	Formation of stronger ties and synergies with other key role players such as the Global Rangelands Initiative (incorporating the Global Rangelands Knowledge System), the International Arid Lands Consortium, the IUCN Holarctic Steppes Group, the IUCN Global Drylands Initiative, and the World Initiative for Sustainable Pastoralism. Such partnerships should aim to support landscape-scale gains in native temperate grassland protection, particularly in the TGCI's four priority regions, namely the Daurian Steppe (eastern Asia), Kazakh Steppe (western Asia), Patagonian Steppe (South America), and the Northern Great Plains (North America)
#5 Integrating conservation and sustainable use	Developing a sustainable conservation and management model illustrates the significant role of IUCN governance 'type D' protected areas, such as in the steppes of Mongolia. This serves the purpose of protecting the culture, rights and livelihoods of communities while also conserving grassland biodiversity and retaining vital ecosystem services at (potentially) a landscape scale. Pursuing closer working relationships with traditional pastoralists and indigenous peoples is envisaged. The issue of sustainability in livestock grazing and biodiversity-friendly stocking rates in countries like South Africa is gaining increasing attraction

Table 1 continued

Strategic intervention	Description
#6 Government-private sector partnerships (Biodiversity Stewardship)	Further work is needed to identify and collaborate with a range of private and communal land stakeholders. Global support for Biodiversity Stewardship and the development of novel financial and non-financial incentives for landowners engaging in this programme need to be developed and adequately resourced. It is vital to ensure that communities are not disadvantaged and that there is an equitable distribution of benefits. The successful role of Biodiversity Stewardship in formally establishing temperate grassland protected areas has been highlighted in countries such as South Africa (Carbutt and Martindale 2014) and New Zealand (Mark 2012), however these gains are relatively trivial at a global scale
#7 Impacts of climate change	Further global (especially climate) change-orientated research is required (see White et al. 2012)
#8 Carbon offsets	Pursuing carbon offset mechanisms such as Avoided Grasslands Conversion (AGC)
#9 Accuracy assessment	Refining the distribution limits of native temperate grasslands, as well as the area of native temperate grassland under protection. We make an appeal to all relevant practitioners for updates on native temperate grassland protected areas recently established or expanded; and
#10 Setting explicit biodiversity targets	It is very important to set more scientifically defendable and explicit biodiversity targets for individual species. In South Africa, we have begun to undertake an exercise to set explicit targets for a range of temperate grassland biota

took a major step forward through endorsement of 'the Cancun Statement' at the CBD Conference of Parties 13 in Mexico, December 2016.

Furthermore, the TGCI should over the course of the next 10 years also focus on nine other strategic areas that include good leadership, securing of funding, changing false perceptions, developing strategic partnerships, and assessing the potential impacts of climate change (Table 1). Although the foundations for this revised strategic direction were laid at the 2014 World Parks Congress, a leadership hiatus only recently resolved through the appointment of a new TGCI director in 2016 has meant that the revised strategic direction can only commence in 2016.

A shining light in a dark tunnel: the Daurian Steppe of Central Asia

Geographically, where should the TGCI focus its efforts to expedite its mandate? The significant shortfall in protection of native temperate grasslands means that any further interventions have to be 'land hungry' and good value to justify the future investment of resources such as time and finances. Given the vastness of the temperate grassland biome and poor level of formal protection, an additional ca. 930,000 km^2 (or 93,000,000 ha) of effectively managed protected area estate is still required to address the Aichi Target 11 shortfall. This is probably the largest conservation target deficit in the world, equivalent in area to the size of France and Italy combined. This quantum of land can only be found in a few select regions of the world where grand-scale, landscape-level native temperate grassland regions offering tens of millions of hectares are to be found. Few greater opportunities to conserve large contiguous tracts of untransformed temperate grassland exist than in central, eastern and western Asia (Fig. 1; Tables 1, 2), where the Gobi-Steppe Ecosystem, for example, occupies some 827,000 km^2 and is the largest intact steppe in the world (Batsaikhan et al. 2014).

An exciting and potentially viable opportunity within this ecosystem is the Dauria International Protected Area and its proposed expansion. This potential mega-reserve is located in one of the TGCI's four priority regions, namely the Daurian Steppe Ecoregion (an international transboundary steppe region straddling the southern Russian Federation, eastern Mongolia and northern China; Fig. 1). The core conservation area of the Daurian Steppe is located in the Daursky State Nature Biosphere Reserve (Russian Federation), Mongol Daguur (Mongolia) and Dalai Lake National Nature Reserve (Inner Mongolia, China). Its inclusion on the World Heritage (WH) Tentative List, under consideration for WH listing, bears testament to its significant biological value. When concluded, this transboundary protected area will be in excess of 1,000,000 ha (or 10,000 km^2, including its buffer zone) and will make a significant contribution to the protection of native temperate grassland habitat and associated biodiversity, particularly migratory species such as Mongolian Gazelle, as well as Hooded and White-naped Cranes (Natural Protection Heritage Fund 2013). Such native temperate grassland regions were once home to some of the largest animal migratory events on the planet (Henwood 2010). Threats to the steppes in this region include habitat transformation through cropping, mining and energy industries, over- and under-grazing by livestock, afforestation, hunting, climate change, inappropriate use of fire, expansion of human settlements, irrigation projects, and invasive alien species (UNDP/GEF 2015). The TGCI's other three priority regions are the Kazakh Steppe (western Asia), Patagonian Steppe (South America), and the Northern Great Plains (North America) (Fig. 1; Tables 1, 2).

Table 2 Approaches proposed by the TGCI for the creation or expansion of temperate grassland protected areas in a bid to address the largest conservation target deficit in the world

	Detail
Approach A	
Where native temperate grasslands are owned by the *private sector*, a number of approaches to the conservation and protection of their biodiversity values may be applied, including	#1 The acquisition of lands by government for the creation or expansion of traditional protected areas, as has occurred in many countries around the world #2 The acquisition of lands by independent non-government organizations such as The Nature Conservancy, The Nature Conservancy of Canada, the World Wildlife Fund and Conservation International, often for eventual transfer to governments for the creation or enhancement of traditional protected areas #3 The acquisition of lands by independent non-government non-profit organizations, largely through purchase and donation, and often then combined with adjacent public lands, for the creation of private conservation areas, such as the ongoing creation of the American Prairie Reserve in Montana, USA #4 The acquisition of lands by independent non-government but for-profit organizations or companies, where lands are managed for hunting or adventure tourism on a commercial basis, while retaining and conserving biodiversity values (e.g. the NamibRand Nature Reserve in Namibia) #5 The acquisition of lands by wealthy and philanthropically-minded individuals or families for the conservation, protection and restoration of grassland ecosystems formerly under commercial operations, such as the work of *Conservacion Patagonica* and the ongoing creation of what will become 'Patagonia National Park' in southern Chile #6 The use of biodiversity stewardship units in a government/non-government partnership to formally and permanently secure private and communal lands for conservation, as has been successfully applied and is ongoing in South Africa; and #7 The purchase of conservation covenants (or easements) by independent non-government organizations that are placed on title of privately owned lands to ensure the retention in perpetuity of biodiversity values and ecosystem services on this land, with or without continued commercial operations

Table 2 continued

	Detail
Approach B	
Where native temperate grasslands are in the *public domain* and managed by the government of the relevant jurisdiction, the possibilities for creating new temperate grassland protected areas are greater in scope but more limited in approach, including	#1 The allocation or re-allocation of public lands from their previous use (usually tenured for commercial ranching) to that of conservation and protection; this has been a common approach utilised by governments in many countries from Canada to Australia to Mongolia to create traditional protected areas #2 The re-allocation of some public lands, previously under tenure for commercial purposes: this has occurred with great success in south-central New Zealand with the recent covenanting and destocking of ca. 53,000 ha in exchange for the transfer of other public lands deemed to have less conservation value to the ownership of the tenure holder #3 The revision of policy through management planning of areas of public land where management priority and the scope of permissible land uses shift from a commercial emphasis to one focused on the conservation and protection of biodiversity values, with no change in land ownership or administration; a good example of this is the designation of Wilderness Areas within some of the National Grasslands and other federal land designations in the western USA; and #4 The integration of objectives for the conservation of biodiversity on a landscape scale and of ongoing sustainable use by resident (but often nomadic) pastoralists and indigenous peoples; there is great potential for this approach in the vast grasslands throughout central, eastern and western Asia

The greater of evils: croplands, gaslands and treescapes

It would be remiss to not single out some of the most current and highly topical threats posing the greatest danger to native temperate grasslands. The alarming rate of conversion to croplands, not seen since the early 20th century, is primarily due to high commodity prices for corn, soy bean, wheat, alfalfa and canola (Wright and Wimberly 2013; WWF 2016). In the Great Plains of North America, ca. 53 million acres (21.5 million ha) of intact temperate grassland have been converted since 2009—equivalent to an area the size of Kansas (WWF 2016). To put this into a conservation perspective, this area is equal to almost 50% of the global temperate grassland protected area estate (UNEP-WCMC and IUCN 2016).

The relatively recent phenomenon of hydraulic fracturing ('fracking') is a notable threat responsible for a host of environmental ills (Osborn et al. 2011). Furthermore, the planting of trees in the native temperate grassland biome as a means of locking up carbon (see Veldman et al. 2015), and biofuel production, are other significant threats. Recent evidence has shown that the temperature-lowering benefits of natural grassland surfaces due to their high reflectance properties (i.e., high albedo) far outweigh the carbon-fixing benefits derived from afforesting grasslands (Loranty et al. 2011; De Wit et al. 2014). Tree planting, not just for carbon financing schemes, should rather be limited to reforestation efforts where naturally occurring trees have been previously cleared (Veldman et al. 2015).

Conclusion

According to the 2016 Protected Planet Report, only 4.6% of native temperate grasslands are conserved globally within protected areas (UNEP-WCMC and IUCN 2016). This is only a slight increase from the 4.5% protection reported at the World Parks Congress in 2014 (Juffe-Bignoli et al. 2014) and falls considerably short of the Aichi Target 11 of 17% protection for all terrestrial ecosystems by 2020 (CBD 2012). Therefore, for native temperate grasslands, the profound shortfall in area under protection necessitates the need to urgently secure the largest remaining native temperate grasslands that are of particular importance for biodiversity and ecosystem services. In other words, temperate grassland conservation is still preoccupied with where and how large parcels of land can be secured. In general terms, global efforts to conserve most other biomes are far more advanced, requiring only a modest increase in terrestrial protected areas estate to achieve the CBD Aichi Target 11 of 17% protection by 2020 (CBD 2012). This breathing space allows attention to be drawn to other issues such as management effectiveness, good governance, equity, retention of ecological services and connectivity.

The TGCI's role should therefore be clearly focused on the identification, and where possible the facilitation, of opportunities to create new protected areas and other forms of conservation management regimes in the temperate grassland biome (Table 2). It is envisaged that with new areas under protection, the provisions for management effectiveness, good governance, equity, connectivity and other important parameters will all be developed during the establishment phase and incorporated into the management regime from the onset of the process. Such a course necessitates a strong reliance on integrating sustainable use (a central tenet to the TGCI's mandate) and conservation by promoting concepts such as ICCAs as legitimate and recognized forms of protected areas. Secondarily, the TGCI would continue to support a wide range of other efforts on both public and

private land in the other native temperate grassland regions around the world for the continued enhancement of the conservation and protection of this biome (Table 2).

The appreciation and profile of native temperate grasslands must be raised on the international conservation agenda (Table 3). Perhaps one mechanism should be an appeal to the United Nations General Assembly for the establishment of an 'International Year of Grasslands' or an 'International Year of Rangelands and Pastoralists' (IYRP), as is now being actively promoted by a consortium of interested parties, including the TGCI. Such recognition would be akin to the many other international celebrations observed, such as the 'Fascination of Plants Day' (18 May, annually), International Mountain Day (11 December, annually) and the International Year of Soils (2015). Many more effectively managed native temperate grassland protected areas are required, hopefully managed at a suitably high standard befitting of the 'Green List' of protected areas—the global standard of good practice for defining success of protected areas (IUCN 2014). Equally important is the establishment of a representative sample of native temperate grassland protected areas securing some of the most iconic and biodiverse temperate grasslands landscapes of the world, and for those meeting the criteria, as World Heritage Sites with a secure conservation outlook.

The naive and short-sighted approach to viewing native temperate grasslands merely as a palette for transformation and intensive utilisation should be weighed more objectively against an understanding of the myriad benefits they provide (see also Appendices A–C), for example: (1) grassland diversity enhancing ecosystem function, productivity, stability and sustainability (Tilman et al. 1996); (2) healthy intact ecosystems contributing to the physical, mental and spiritual wellbeing of humanity (Parks Victoria 2015); (3) sustainably managed grasslands having immense economic value as rangelands for livestock grazing; and (4) for the carbon storage and watershed services they provide (Asian Development Bank 2014). We therefore advocate the need for improved and less biased land-use and decision support systems that take greater cognisance of these benefits upon which the long-term survival of humanity depends. Halting further losses on a grand scale, changing

Table 3 Clarifying the false perceptions and attitudes towards native temperate grasslands

False perceptions/uses	True value
Easily disposable; amenable for transformation and development; of little value to society other than for food production; unimproved rangelands and 'wastelands'; opportunities for agroforestry (afforestation, including forest landscape restoration opportunities) and crop production; barren and devoid of life; formless and unstructured; recent and derived (historically forested landscapes)	Hyper-diverse ecosystems of plant and animal species, habitats and communities, including numerous endemics and threatened species and habitats; high biomass, particularly below-ground; complex and dynamic natural ecological systems; often forming part of critical watershed areas such as mountain catchments (providing key ecosystem services such as water production); key carbon sinks; well-structured matrix of grasses, forbs and some shrubland communities; essential for societal health and wellbeing; high conservation potential; confer resilience to climate change and reduce disaster risk; important stop over for migratory birds and mammals; analogous to blankets of snow (high albedo)—due to high surface reflectance properties, grasslands have high albedo and therefore temperature lowering properties

public and corporate opinion, and influencing governance and policy are other key areas requiring urgent interventions.

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Appendix A

The Hohhot Declaration signed at the World Temperate Grasslands Conservation Initiative Workshop, 21st International Grasslands Congress/8th International Rangeland Congress, 28th–29th June 2008, Hohhot, Inner Mongolia, China.

We, the participants of the World Temperate Grasslands Conservation Initiative, recognize that:

Considering that temperate indigenous grasslands provide environmental services essential for life on earth as a source of food, fibre, human livelihoods and well-being, cultural and biological diversity, the recharge of aquifers and the sequestration of carbon, particularly in the face of global climate change;

Agreeing that temperate indigenous grasslands are terrestrial ecosystems dominated by herbaceous and shrub vegetation, maintained by grazing, fire, drought and/or low temperatures and that all of these processes are dynamic and display great variability in terms of time, extent, intensity and place;

Recognizing the opportunities that temperate indigenous grasslands provide in feeding people, it is imperative to maintain the genetic diversity of grassland systems;

Realizing the importance of temperate indigenous grasslands to the life and cultural survival of mobile indigenous peoples and the value of indigenous knowledge as well as the accumulated experience of traditional indigenous temperate grasslands users;

Acknowledging that temperate indigenous grasslands are currently considered among the most imperiled ecosystems on the planet, having been modified by human activity to such a degree that most grasslands have been transformed and very little remains in a natural state;

Recognizing that the remaining areas of natural grassland continue to be threatened by inappropriate policies that lead to loss of grassland, as well as unsustainable land use and management practices;

Acknowledging that success will require participatory management approaches and partnerships among all sectors to ensure the integration of production and biodiversity conservation outcomes for the continued provision of grassland ecological goods and services;

Recognizing the importance of strengthening indigenous territories, community conserved areas and the establishment of new protected areas;

Recognizing that one of the most important opportunities for collaboration is ensuring worldwide societal recognition of the enduring value of natural grasslands;

Developing and implementing incentives for good land stewardship, restoration and the sustainable management of indigenous temperate grasslands is essential to guaranteeing their sustainable use as healthy working environments.

Therefore, we the participants of the Hohhot World Temperate Grasslands Conservation Initiative Workshop from five continents and 14 countries, declare that temperate indigenous grasslands are critically endangered and urgent action is required to protect and

maintain the services they provide to sustain human life. We call upon all sectors of society to collaborate towards this goal.

Signatories to the Hohhot Declaration

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Dr Clinton Carbutt, South Africa
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Appendix B

The Bariloche Declaration signed at the World Temperate Grasslands Conservation Initiative Workshop, 6th Southern Connection Congress, 17th February 2010, Bariloche, Río Negro, Argentina.

We, the contributors and/or participants of the all-day Symposium “Progress with conservation and sustainable management of the Southern Hemisphere’s indigenous

temperate grasslands: developing a strategic plan", organized by the Temperate Grasslands Conservation Initiative (TGCI); an initiative of the World Commission of Protected Areas (WCPA) of the International Union for the Conservation of Nature (IUCN), recognize that:

Agreeing that the Hohhot Declaration[1] (June, 2008) sets up a strong case for conservation and sustainable management of indigenous temperate grasslands and closely associated ecosystems at a global level, given that these ecosystems are currently considered among the most imperilled on the planet;

Recognizing that since the Hohhot Declaration, new pressures and threats to indigenous temperate grasslands preservation have emerged and former threats are now pressures;

Considering that indigenous temperate grasslands still occupy significant areas in the world, and play a key role in national economies;

Realizing that exploitation or replacement of indigenous temperate grasslands might have increased as a result of the global financial crisis and to counterbalance its impact on development and economy, although the link between cause and effect has not been analyzed on a global level;

Acknowledging that climate change can seriously affect biodiversity and the provision of goods and services by indigenous temperate grasslands, thus having a negative impact on people that depend on them for sustaining their lives and livelihoods;

Considering that mitigation recommendations made at the 15th Conference of the Parties (COP) of the United Nations Framework Convention on Climate Change (UNFCCC, Copenhagen, 2009) focus on the reduction of deforestation and restoration of degraded forests, but no mitigation approach deals with indigenous temperate grasslands whatsoever;

Realizing that indigenous temperate grasslands whether sustainably grazed or ungrazed have a great potential to mitigate climate change effects through significant carbon capture and storage, and that such potential has not been fully understood or explored;

Considering that vulnerable communities living in temperate grasslands are already suffering from the impacts of climate change, and that urgent actions need to be taken to enhance their adaptation capability and to reduce their vulnerability to climate change effects;

Realizing that the exploitation of indigenous temperate grasslands to produce new/alternative energy sources (biofuels, wind farms, etc.) is sometimes essential for development and economic growth, but that the impact of such activities can further compromise the conservation and sustainable management of these grasslands;

Considering that at the 9th COP to the United Nations Convention to Combat Desertification (UNCCD) in Buenos Aires, 2009, it was stated that sustainable land management can make a critical contribution to fortify our ability to adapt to a changing climate because it strengthens resilience and enhances agricultural production, food security and economic development through carbon sequestration and efforts to combat soil loss and restore plant cover;

Acknowledging that many indigenous temperate grasslands play an important role in poverty and hunger alleviation and food production, and thus they are strategic for the accomplishment of Millennium Development Goals (MDG) at a national level;

[1] The Hohhot Declaration outlines the value of the world's temperate grasslands, why they are endangered and how important it is for citizens of the world to work together to protect them. It was endorsed by the participants of the first global workshop of the Temperate Grasslands Conservation Initiative (Hohhot, China, June 2008).

Considering that the 10th COP of the CBD will soon be held (Nagoya, Japan, October 2010) and taking into account that we are celebrating the International Year of Biodiversity, which brings a new opportunity to raise awareness of society and decision makers on the relevance of biodiversity to human well-being;

Therefore,

We the contributors and/or participants of the Temperate Grasslands Conservation Initiative Symposium in Bariloche from three continents and eight countries of the Southern Hemisphere, plus Canada, the United States of America and England:

Declare that the temperate indigenous grasslands require urgent and targeted action to protect, maintain and restore their many valuable social, cultural, economic and ecological services they provide to sustain human life and well-being;

Encourage the CBD Conference of the Parties reunited at the 10th meeting in Nagoya, Japan, in October 2010, to adopt specific measures to protect temperate grasslands within the revised and updated Strategic Plan for the Convention, including new targets for temperate grasslands conservation for the post-2010 period;

Recommend to the COP to increase funds through the Global Environmental Facility (GEF), the funding mechanism of the CBD, for temperate grasslands conservation and sustainable management;

Encourage other donors to increase funding for temperate grasslands conservation and sustainable management;

Encourage the 16th COP for the UNFCCC to value the potential of temperate grasslands to mitigate climate change effects and to propose new mechanisms and tools for mitigation based on sustainable management;

Strongly suggest that, in light of the International Year of Biodiversity, IUCN Secretariat, institutional members and expert commissions adopt specific communication actions to raise the awareness of the need to improve the conservation and sustainable management of indigenous temperate grasslands of the world;

Encourage the United Nations to declare before 2012, a UN International Day of Temperate Grasslands for the promotion of conservation of the biome;

Recommend that the IUCN Secretariat, in preparation to the next World Conservation Congress (Jeju, Republic of Korea, 2012) include temperate grasslands as one of the key issues for the meeting;

Encourage government and non-government organizations working in temperate indigenous grasslands to design and/or test innovative tools, methodologies and research for sustainable management, stewardship, climate change adaptation, economic assessment and social well-being;

Encourage markets that commercialize goods and services produced from temperate indigenous grassland resources to utilise sustainable production practices that maintain ecosystem functions, connectivity and local identity, and restrict the spread of biosecurity threats.

We call upon all sectors of society to collaborate towards the implementation of the recommendations proposed herein.

Signatories to the Bariloche Declaration

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Andrea Michelson, Quito, Ecuador

Katharine Dickinson, Dunedin, New Zealand
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Stephan Beck, La Paz, Bolivia
Juan Carlos Ledezma, La Paz, Bolivia
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Appendix C

Motion 083 tabled at the World Conservation Congress, at its session in Jeju, Republic of Korea, 6–15 September 2012.

M083

The conservation and protection of the world's indigenous temperate grasslands

CONSIDERING that indigenous temperate grasslands provide a wide range of ecological services for life on Earth: as a source of food, water and fibre for human livelihoods and well-being; for cultural and biological diversity; and the sequestration of carbon, particularly in the face of global climate change;

ACKNOWLEDGING that indigenous temperate grasslands, that occur on every continent except Antarctica, have been modified by human activity to such a degree that very little remains in its natural state and that they are currently considered by the IUCN World Commission on Protected Areas (WCPA) as one of the most at-risk ecosystems in the world;

CONFIRMING that indigenous temperate grasslands have a global level of protection of only 4–5%, the lowest of all terrestrial biomes, and that many new, large and ecologically viable protected areas need to be established to achieve conservation and protection on a landscape scale to reach the Aichi Biodiversity Target of 17%;

RECOGNIZING that the remaining areas of indigenous temperate grasslands continue to be threatened by inappropriate policies that lead to further loss through conversion and unsustainable land use and management practices;

ACKNOWLEDGING that many indigenous temperate grasslands play an important role in poverty and hunger alleviation and food production, and thus are not only strategic ecologically but are essential for contributing to the achievement of the Millennium Development Goals (MDGs);

REALIZING the importance of indigenous temperate grasslands to the life and cultural survival of mobile indigenous peoples and, in turn, the value of the accumulated knowledge and experience of traditional temperate grasslands users to their on-going conservation and management;

ACKNOWLEDGING that climate change seriously affects the biodiversity of, and the provision of goods and services by, indigenous temperate grasslands, thus having a negative impact on biodiversity and people that depend on these grasslands for sustaining their lives and livelihoods;

CONSCIOUS that developing and implementing effective incentives for good land stewardship, restoration and the sustainable management of indigenous temperate grasslands is essential to guaranteeing their long-term sustainable use as healthy and living environments; and

RECOGNIZING that the Temperate Grasslands Conservation Initiative (TGCI) of the WCPA Grasslands Specialist Group is focused on achieving the conservation and

protection of the world's indigenous temperate grasslands to meet the CBD targets and to contribute to the MDGs and the UNCCD, in coherence with the IUCN Drylands Programme, having achieved the following goals over the past decade:

a. Assembled an international network of grasslands professionals to address the issues surrounding their conservation and protection;
b. Improved communications on the subject through workshops, a newsletter, publications and website;
c. Compiled a list of existing protected areas in the grasslands biome and identified priorities for future conservation and protection;
d. Assessed the current state of knowledge on the economic value of intact indigenous temperate grasslands; and
e. Observed an increase in the level of protection for this biome of 600%, from 0.69 to 5%, since the TGCI's inception in 1996;

The World Conservation Congress, at its session in Jeju, Republic of Korea, 6–15 September 2012:

1. REQUESTS the Director General and the IUCN Commissions to:

a. Acknowledge that indigenous temperate grasslands are one of the most imperilled and the least protected ecosystems and are under-represented in the world's protected area system and, as a consequence, include this issue in the implementation of the Global and Regional Programmes
b. Encourage governments, non-government organizations and private interests to protect indigenous temperate grasslands, with the aim of achieving Aichi Target 11, with a minimum of 10% by 2014, as proposed at the IVth World Congress on National Parks and Protected Areas in 1992 in Caracas, Venezuela
c. Recognize that indigenous temperate grasslands require urgent and targeted action to protect, maintain and restore their biodiversity and the many valuable social, cultural, economic and ecological services they provide to sustain human life and well-being under the *IUCN Programme* 2013–2016; and
d. Support the work of the *Temperate Grasslands Conservation Initiative* and the WCPA Grasslands Specialist Group;

2. REQUESTS relevant governments to:

a. Increase the efforts to designate protected areas within indigenous temperate grassland regions, and integrate them into broader, multiple use landscapes; and
b. Promote the sustainable use of indigenous temperate grasslands through the development of incentive mechanisms and certification schemes; and

3. REQUESTS international funding mechanisms, including the Global Environment Facility, to support a targeted increase in funds available for temperate grassland conservation, protection and sustainable management.

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