World Heritage Sites

Protected Areas and World Heritage

ILULISSAT ICEFJORD
DENMARK

The Ilulissat Icefjord is an outstanding example of an actively calving ice sheet. It is one of the fastest and most productive ice-streams in the world, moving at 19 meters a day and annually calving over 35 cubic kilometres of ice: 10% of the calf ice of Greenland's ice-cap - more than any other glacier outside Antarctica. The wild combination of ice, rock and sea, with the dramatic sounds produced by the moving ice, are a memorable spectacle. The glacier is relatively easy to reach and has been well studied for 250 years.

COUNTRY
Denmark

NAME
Ilulissat Icefjord

NATURAL WORLD HERITAGE SITE
2004: Inscribed on the World Heritage List under Natural Criteria vii and viii.

STATEMENT OF OUTSTANDING UNIVERSAL VALUE [pending]
The UNESCO World Heritage Committee issued the following statement at the time of inscription:

Justification for Inscription
Criterion (viii): The Ilulissat Icefjord is an outstanding example of a stage in the Earth's history: the last ice age of the Quaternary Period. The ice-stream is one of the fastest (19m per day) and most active in the world. Its annual calving of over 35 cu. km of ice accounts for 10% of the production of all Greenland calf ice, more than any other glacier outside Antarctica. The glacier has been the object of scientific attention for 250 years and, along with its relative ease of accessibility, has significantly added to the understanding of ice-cap glaciology, climate change and related geomorphic processes.

Criterion (vii): The combination of a huge ice sheet and a fast moving glacial ice-stream calving into a fjord covered by icebergs is a phenomenon only seen in Greenland and Antarctica. Ilulissat offers both scientists and visitors easy access for close view of the calving glacier front as it cascades down from the ice sheet and into the ice-choked fjord. The wild and highly scenic combination of rock, ice and sea, along with the dramatic sounds produced by the moving ice, combine to present a memorable natural spectacle.

IUCN MANAGEMENT CATEGORY
Unassigned

BIOGEOGRAPHICAL PROVINCE
Greenland Tundra (1.16.9)

GEOGRAPHICAL LOCATION
Ilulissat Icefjord is located 250 km within the Arctic Circle approximately 1,000 km up the west coast. of Greenland in the bay of Disko Bugt. The geographic co-ordinates of the site are 68° 48'N to 69° 31'N and 48° 28' to 51°16'W.

DATES AND HISTORY OF ESTABLISHMENT

The area is protected and conserved by an established framework of government legislation and protective designations and by local planning policies:

1980: The Nature Conservation Act for Greenland enacted. This act is the foundation and framework for the protection of species, ecosystems and protected areas; a new act is being prepared;

2002: Management Plan for the site adopted by the Ilulissat Municipal Council;

2003: The Greenland Home Rule Executive Order No.5 passed for the Protection of Archaeological Sites and Buildings within the area; this order prohibits mining within the Protected Area.

LAND TENURE

Public. Administered by Qaasuitsup Kommunia, the Municipality of Ilulissat, under the Greenland Ministry of Environment and Nature.

AREA

Approximately 402,400 ha, comprising 319,900 ha of glacier ice, 39,700 ha of land, 38,600 ha of fjord and 4,200 ha of lakes. The site encloses the fjord, the glacier and its immediate watershed.

ALTITUDE

Sea level to the 1,200m contour of the ice sheet.

PHYSICAL FEATURES

The Ilulissat Icefjord is a tidewater ice-stream located 1,000 kilometres up the west coast of Greenland. It drains into the bay of Disko Bugt (bight) which is partially blocked by the large island of Disko. The Icefjord (locally called Kangia) is the sea mouth of Sermeq Kujalleq, one of the few glaciers through which the ice of the Greenland ice cap reaches the sea. It is the fastest moving glacier in the world outside Antarctica and the most prolific ice-calving tidewater glacier in Greenland, producing a constant procession of icebergs and still actively eroding the fjord bed. In 2002 the glacier was moving at a rate of 30 metres a day and the area of melting broke all previous records. Since then the glacier has been breaking up. By May 2003 its front was 11 kilometres east of its normal winter position (IUCN, 2005). The surroundings are low heavily glaciated PreCambrian gneiss and amphibolite rocks extending some 50 kilometres inland to the ice cap with flanking lateral moraines and ice-dammed lakes; also lakelets, glacial striations, roches moutonées, and perched erratics typical of glaciated landscapes.

The Greenland icecap, 1.7 million square kilometers in area, is the only remnant in the Northern Hemisphere of the continental ice sheets of the last Quaternary Ice Age. The icecap formed during the Middle and Late Pleistocene over a once temperate landscape, the south central part of which drained through large rivers to Disko Bugt, still marked as channels under the ice and submarine troughs. The ice cap's oldest ice is estimated to be 250,000 years old, maintained by the annual accumulation of snow matched by loss through calving and melting at the margins. The icecap holds a detailed record of past climatic change and atmospheric conditions (in trapped air bubbles) for this entire length of time, and shows that during the last ice age the climate fluctuated between extreme cold and warmer periods. This ended around 11,550 years ago, since when the climate has been more stable. Around Ilulissat Icefjord, the evidence of glaciation is mainly of the last 100,000 years. This culminated in the 'Little Ice Age' 500–100 years ago when the ice expanded in pulses to a maximum during the 19th century. A glacial recession has occurred during the 20th century. In 1851 the ice front across the fjord was 25 kilometres east of the sea. By 1950 it had retreated some 26 kilometres further east.

Sermeq Kujalleq is a river of crevassed ice with a catchment area of about 6.5% of the Greenland ice cap (~110,000 km). The ice stream is a narrow well-defined channel approximately 3-6 km wide. It stretches from the nose of the glacier to the 1,200m contour (about 80–85 km inland) which is just below the point where ice accumulation is balanced by ablation. Near the ice sheet, it has a

hummocky smooth surface with relatively few crevasses. The extensive summer melt is drained by large meltwater rivers often running in deep canyons and disappearing through moulins (glacial holes) into a sub-glacial drainage system sometimes termed ice karst. 50 kilometres from the glacier front the ice becomes increasingly rugged; lakes and water-filled crevasses disappear. Marginal crevasses extend 5 km or more to each side of the ice stream. About 45 km inland from the front, the surface funnels towards the main outlet. About 10 km behind the front, a tributary ice stream joins. At the junction that is created at this point an ice rumple above the centre of a subglacial sill restricts the main stream to a width of only 4 km. At the grounding line the glacier has, since an acceleration in 2002, been consistently moving at the unusually fast rate of 19m a day or about 7 km per year.

In ice sheets, movement can locally increase to several kilometers a year due to factors such as the subsurface topography, the nature of the outlet, the ice margin in deep trenches, diminished basal friction or increased basal sliding. Movement may be some hundreds of metres per year if there is little bottom stress. Sermeq Kujalleq flows in a deep trough of eroded rock that varies from about 1.9 km deep near the glacier grounding zone, with an ice surface of some 400m a.s.l. to over 2.5 km deep 40 km behind the grounding zone where the ice surface is about 1,000m a.s.l. The height above sea level of the 7.5 km-long calving front is 40-90m along the north-south flank and 20m along the east-west flank. The average height of the calving front is 80m and the ice is estimated to be approximately 700m thick. The outermost 10 km of the glacier is mostly a floating mass of ice except at an ice rumple on the southern edge over a sub-glacial sill. The floating part of the glacier moves up and down with the tide, with a maximum range of 3m, decreasing towards the grounding zone. This tidal variation results in a diurnal fluctuation of the grounding line, and ice-quake activity, varying in intensity with the tidal cycle, which can be felt up-glacier about 8 km from the grounding zone. The fjord is frozen solid in winter and covered with floating brash and by massive ice in summer.

Large-scale calving of the Greenland ice-cap occurs at only a few points along the approximately 6,000 km-long coastline, mainly on the west coast. The annual calving through Ilulissat Icefjord of 46 cu.km of ice is 10% of the production of the Greenland ice-cap and more than any other glacier outside Antarctica (Barolo & Posakony, 2002). It is caused by the expansion of bottom crevasses and tidal flexure along grounding lines, supported by water pressure in the crevasses. In summer, a thin surface layer is formed in Disko Bugt by melting glacier ice. Due to the vertical stratification of salinity the sun's heat is stored in this layer, resulting in high summer surface temperatures. The tides also cause de-coupling of the glacier from the cliffs on the fjord sides. Stresses in the ice plate set up by the bending of floating ice on its way out cause parts of the front to detach. In major events large tabular icebergs of up to 0.4 cu.km. break off. Calving is continuous and one estimate of the calving rate is around 35 cu.km a year. In July 1985 during a pulse of tabular iceberg detachment, the calving front retreated almost 2 km in only 45 minutes but such a high rate of glacier movement occurs rarely, and it is only in summer that such large ice discharges occur.

Generally bergs take 12 to 15 months to push through the ice-brash cover of the fjord and if sufficiently deep, accumulate over a sill in the bedrock at the fjord mouth until pushed or floated off. They are extremely variable in size and shape, from small pieces to mountains of ice more than 100m above sea level, often with pointed peaks. The whitish ice is often cut by bands of transparent bluish ice formed by the freezing of melt water in the marginal crevasses. Once at sea, the icebergs travel both south and north of Disko Island before entering Davis Strait between Greenland and Canada where they are first carried north by the West Greenland Current, then towards Canada, and then southwards with the Baffin and Labrador Currents, many not melting before they reach latitude 40°N.

In Sermeq Kujalleq (previously named Jakobshavn Isbræ) the relatively high speed of the ice flow results from the funnelling of ice from a large drainage basin into a narrow stream. The large calf production and high velocities imply a relatively fast response to climatic change, but the causes are still debated. The 'Jakobshavn effect' has been suggested to explain the high discharge rates and the stability of the ice sheet next to the glacier. It is primarily a relationship between crevasse creation due to increased melting and high exterior stress in a heavily fissured ice stream. Surface melting is greatly enhanced by surface crevassing, increasing the surface area many-fold. When surface meltwater

refreezes internally, it releases huge amounts of latent heat thus softening the ice column. Meltwater, which reaches the bottom, increases the basal sliding rate by lubricating the ice-rock interface. This and other processes in the glacier increase the flow.

The increased movement of Sermeq Kujalleq started around 1850 when higher temperatures after the end of the Little Ice Age increased surface melting on the lowermost parts of the ice sheet. The meltwater drained into cracks and moulins, warmed the ice internally and lubricated the bed, which started the surge-like movements that continue today, transforming the ice surface into the jumble of crevasses and seracs which characterise surging glaciers. There are other explanations, but it is assumed that the Jakobshavn effect could explain the present relatively high speed of the disintegration of the surviving ice sheets of Greenland and Antarctica. The area of the Greenland Ice Sheet that is melting increased about 16 percent between 1979 and 2002. According to a recently released Arctic Climate Impact Assessment the melt area is roughly the size of Sweden. A major melting of the ice sheet will have a large effect on the water levels of the world's oceans (IUCN, 2005).

CLIMATE

Ilulissat Icefjord is located 250 km above the Arctic Circle, and has sunless winters and nightless summers only two to three months long. The July mean temperature is 7.5°C, and maximum 10.3°C; the March mean is -19.9°C. Rainfall averages only 266mm, mostly in August and September. A persistent high pressure system exists over the Greenland icecap; conditions are often calm though there are occasional fierce storms and short-lived dry fohn winds off the icecap which can raise temperatures by 10°C in a few hours.

VEGETATION

The flora of the area is a low-arctic type, typical of the nutrient-poor silicaceous soil which, where humid, shows solifluction effects such as frost boils. Colonisation of the margins of retreating ice also provides examples of plant succession. The main plant communities of the area are heath, fell-field, snow-patch, herb-slope, willow-scrub, fen, river-bank, seashore and aquatic.

Heath dominated by dwarf-shrubs is the most widespread plant community. Typical species are dwarf birch *Betula nana*, Arctic crowberry *Empetrum nigrum* ssp.*hermaphroditum* and Arctic blueberry *Vaccinium uliginosum* ssp.*microphyllum*. Conspicuous are the aromatic narrow-leaved white-flowered Labrador-tea *Ledum palustre* ssp.*decumbens* and, on richer drier soils, the purple-flowered Lapland rose-bay *Rhododendron lapponicum*. Fell-fields are found on dry wind-swept areas with open soil between tussocks. Several colorful species thrive here owing to low competition: white-flowered snow whitlowgrass *Draba nivalis*, diapensia *Diapensia lapponica*, yellow-flowered Arctic poppy *Papaver radicatum*, snow cinquefoil *Potentilla nivea* and the grass-like northern wood-rush *Luzula confusa.* In snow-patches the growing season is only four to six weeks long but matted cassiope *Harrimanella hypnoides* and dwarf willow *Salix herbacea* thrive. Late snow-patches with only some four weeks growing period have pigmy buttercup *Ranunculus pygmaeus*, dandelion *Taraxacum* sp.,mountain sorrel *Oxyria digyna* and island purslane *Koenigia islandica.*

The herb-slope is the lushest plant community, with species-rich vegetation. The slopes are usually south to southwest-facing under steep mountains where they receive melt water all summer when the microclimate is mild. In winter, snow protects the slope. As many as 30 different species grow, among them Alpine bartsia *Bartsia alpina,* Alpine bistort *Polygonum viviparum*, Unalaska fleabane *Erigeron humilis* and thick-leaved whitlow grass *Draba crassifolia.*

Willow scrub can reach 1.5 metres, though one metre is more frequent. It shelters species such as interrupted clubmoss *Lycopodium annotinum* ssp. *alpestre,* common horsetail *Equisetum arvense* and in the drier parts round-leaved wintergreen *Pyrola grandiflora.* The more fertile fens have a thick vegetation of grass-like plants, often dominated by Arctic water sedge *Carex stans* and mountain bog-sedge *Carex rariflora*. Arctic marsh willow *Salix arctophila* and flame-tipped lousewort *Pedicularis flammea* are frequent, Lapland buttercup *Ranunculus lapponicus* less frequent. Stony river shores are widespread, clothed only by pioneer species like willowherb *Chamaenerion latifolium*.

Characteristic sandy seashore plants are sea sandwort *Honckenya peploides* and lyme-grass *Elymus mollis.* On rocky and gravelly beaches there are gravel sedge *Carex glareosa*, sea plantain *Plantago maritima*, Greenland scurvygrass *Cochlearia groenlandica* and low stitchwort *Stellaria humifusa*. Salt marshes occur here and there in protected inlets, their lower parts dominated by creeping saltmarsh grass *Puccinellia phryganode*s, the upper parts by Pacific silverweed *Potentilla egedii.* Among aquatic plants, mare's-tail *Hippuris vulgaris* is frequent along the shores of many ponds, smaller lakes and slow flowing streams. Quite common are northern bur-reed *Sparganium hyperboreum*, small pondweed *Potamogeton pusillus* ssp. *groenlandicus*, dwarf water-crowfoot *Ranunculus confervoides* and occasionally awlwort *Subularia aquatica*, which only blooms if the pond is totally desiccated (where the mudworm *Limosella aquatica* also thrives). Found here is the quite rare autumnal water starwort *Callitriche hermaphroditica*.

Approximately 160 species of phanerogams, three club-mosses *Lycopodium annotinum, Diphasiastrum alpinum* and *Huperzia selago*, two horsetails *Equisetum arvense* and *E. variegatum*, and four ferns *Cystopteris fragili*s, *Dryopteris fragran*s, *Woodsia ilvensis* and *Woodsia glabella* occur in the nominated area. Among the rarest species are Porsild's catspaw *Antennaria porsildii,* Greenland woodrush *Luzula groenlandica* and whitish bladderwort *Utricularia ochroleuca*.

FAUNA

The upwelling caused by calving icebergs brings up nutrient-rich water which supports prolific invertebrate life and attracts great numbers of fish, seals and whales that feed on the generated nutrients. Twenty species of fish have been recorded in the area, the dominant species is the flatfish Greenland halibut *Reinhardtius hippoglossoides* which feeds mainly on northern shrimp *Pandalus borealis* and euphausid crustaceans, also on capelin *Mallotus villosu*s, polar cod *Boreogadus saida* and eelpouts *Lycodes* spp. The halibut migrates seasonally in and out of the fjord, living both on the benthos and in the open sea. Warmer waters bring the Atlantic cod *Gadus morhua* (VU) and ringed seal *Phoca hispida* and Greenland shark *Somniosus microcephalu*s to the area. The former two species live in the icefjord all year. All three species are hunted by man and feed on the halibut. Harp seals *Pagophilus groenlandicus*, fin and minke whales *Balaenoptera physalis* (EN) and *B. acutorostrata* occur in summer at the fjord mouth with very occasional blue and bowhead whales *B. musculu*s (EN) and *Balaena mysticetus* (EN). Beluga *Delphinapterus leuca*s and narwal *Monodon monocero*s visit Disko Bugt in autumn and winter.

The sea birds are typical for the area, with numerous breeding colonies attracted by the high primary productivity of the glacier front, and by fish discarded by the local fishery. Large flocks of northern fulmar *Fulmarus glacialis* and gulls feed among the grounded icebergs. These are mainly Iceland gulls *Larus glaucoides*, glaucous gulls *L. hyperboreus* with lesser numbers of great black-backed gulls *L. marinus,* kittiwakes *Rissa tridactyla* and guillemots *Cepphus grille* with great cormorant *Phalacrocorax carbo*. Birds visiting the area include Brent goose *Branta bernicla,* common eider *Somateria mollissima*, red-breasted merganser *Mergus serrator*, pomarine skua *Stercorarius pomarinus*, Arctic skua *Stercorarius parasiticus,* Arctic tern *Sterna paradisaea* and thick-billed guillemot *Uria lomvia.*

Land birds are fewer and also typical for the area, they include: Canada goose *Branta Canadensis,* wheatear *Oenanthe oenanthe*, snow bunting *Plectrophenax nivalis*, Lapland longspur *Calcarius lapponicus*, redpoll *Carduelis flammea* and raven *Corvus corax*. The Greenland white-fronted goose *Anser albifrons flavirostris* summers only in west Greenland. Peregrine falcon *Falco peregrinus*, gyrfalcon *Falco rusticolus,* and rock ptarmigan *Lagopus mutus* are believed to occasionally breed in the area, while Arctic redpoll *Carduelis hornemanni* is a winter visitor. The red-throated loon *Gavia stellata,* great northern diver *Gavia immer,* mallard *Anas platyrhynchos,* long-tailed duck *Clangula hyemalis,* red-necked phalarope *Phalaropus lobatus* and the purple sandpiper *Calidris maritima* are believed to nest in the area, but at present no information is available to confirm this.

There are few mammals within the locality. Arctic fox *Alopex lagopus* is believed to be common, while Arctic hare *Lepus arcticus* occur mainly in the higher land near the inland ice. Reindeer *Rangifer*

tarandus groenlandicus live only to the south of the icefjord, and polar bears *Ursus maritimus* are very rare visitors.

CONSERVATION VALUE

The Ilulissat Icefjord is an outstanding example of an actively calving ice sheet which illustrates glacial conditions characteristic of the last Ice Age of the Quaternary. The ice-stream is the fastest and most productive in the northern hemisphere, annually calving at the high velocity of 7 km per year up to 46 cu.km of ice, 10% of the calf ice of the Greenland ice-cap, and more than any other glacier outside Antarctica. Its other distinctive characteristic is the intensive erosion by the ice stream which is the world's outstanding example of a large-scale fjord-forming process. The wild and dramatic combination of rock, ice and sea in the ice-choked fjord, with the sounds of moving ice, is a memorable spectacle. The glacier is also unusually well studied and, being relatively accessible, has added much to the understanding of ice-cap glaciology. It is designated a WWF Global 200 Freshwater Eco-region.

CULTURAL HERITAGE

Greenland has been inhabited for 4,500 years, settlers migrating from Asia via the Bering Straits and northwest Greenland in three main waves, known as the Saqqaq, Dorset and from 1000 BP, the Thule peoples. Their middens are shown in clear section at the Thule settlement of Sermermuit near Ilulissat. Norsemen inhabited southwest Greenland between 985-1450 AD. During the 16th-18th centuries explorers followed by whalers inhabited the area. The nominated area includes the archaeologically valuable sites of Sermermuit, abandoned in 1850, and Qajaa on the south side of the fjord, abandoned earlier. The early settlers summered in tents but used stone and turf hovels in winter. The first local Danish settlement was in 1742 at Jakobshavn, now Ilulissat.

LOCAL HUMAN POPULATION

There are no inhabitants living within the boundaries of the nominated area. The local population of the Municipality is estimated at 4,800, spread over an area of 47,000 sq. km. Approximately 4,200 people inhabit Ilusissat (the third largest town in Greenland) the remaining population inhabits four villages: Ilimanaq, Oqaatsut, Qeqertaq and Saqqaq. Apart from the Danes, the local people are Inuit and their economy is almost entirely dependent on fishing and hunting. Their main prey are reindeer, seal, ptarmigan, hare, fox, geese, ducks, seabirds and birds eggs. Nowadays the local population are more sedentary but still move out to hunting grounds in summer to fish or hunt, especially for reindeer. There is a population of 4,000 sledge dogs. Winter hunting for ringed seal is undertaken at holes in the ice and by stalking. Since 1900 professional long-line fishing has centred on the Greenland halibut which flourishes in the turbulence around the calving bergs, the highly productive source of invertebrate prey for seals and fish. The halibut is fished in great concentrations round the fjord mouth. Some income is also beginning to accrue from tourism partly as an insurance against lean years in the fishing industry.

VISITORS AND VISITOR FACILITIES

The scenery, Inuit culture and history attract a third of all Greenland's visitors to the Ilulissat and Disko areas. However it is the icefjord that is the main attraction. The government discouraged tourism until mid-century. It has only been actively promoted since 1992. In 1998 Ilulissat was designated by the Greenlandic Board of Tourism as the centre for development in Greenland. Visitor facilities are improving, although they remain somewhat limited. Access is by air, ferry and cruise ship (each carrying between 20 and 500 passengers). In 2000 an estimated 10,660 tourists visited Ilulissat (34% of all visitors to Greenland) but numbers soared with World Heritage status. In 2001 only 18 cruise ships called, but in 2005 235 ships docked. By 2008 12,000 tourists visited the area, chiefly on cruise ships (IUCN, 2008). Local expeditions are made in to the surrounding environment, including the Icefjiord, by boat, helicopter, dog-sledge and by foot. Cross-country skiing and sailing are offered, with restrictions, but snow scooters can only be used outside the nominated area. To contain impacts, tourism is to be limited to certain areas, two helipads and one cabin area. There are four hotels, a hostel, a museum of local history and guided tours. A visitor centre is being planned in the town.

SCIENTIFIC RESEARCH AND FACILITIES

Scientific researches over 250 years have made Ilulissat Icefjord and surroundings one of the best observed ice-streams in the world. A significant and unique set of glaciological records and many scientific publications have been written about the site which displays most of the surface characteristics of the Greenland ice margin clearly, compactly and accessibly. From the relatively ice-free mid 18th century onwards, the Icefjord interested many scholars, including Rink, Nordenskjiold, Hammer, Peary and Wegener, who noted its fluctuations over the years. Study, especially over the last 10-20 years using aerial photography, core drilling, deep radar sounding and satellite monitoring, has been intensive. Such research has enlarged understanding of ice-stream dynamics, glacial erosion and deposition, Quaternary geology and prehistoric climates through the examination of ice cores. In monitoring future global climate change, changes in the state of the glacier at Ilulissat will be valuable. By contrast, research into the local fauna and archaeological sites has been far less. However, the latter valuably illustrate the area's 4,500 years of human history and the interaction between glacial movements and human migration.

MANAGEMENT

The overall management and responsibility for the protection of nature in Greenland rests with the Greenland Parliament. The Ministry of Environment and Nature is responsible for managing nationally protected areas, including the supervision of local management by municipalities. As a World Heritage site, the area is administered by a board of representatives from the Ministry and from the former municipality of Ilulissat, now Qaasuitsup Kommunia. Management plans are approved by Greenland Home Rule and Qaasuitsup where the municipal Department of Technics has overall responsibility for managing the site and appointment of the site manager. The Ministry of Culture and the Danish UNESCO authorities are advisory and take part in a yearly board meeting (UNESCO, 2009).

A management plan for the property for 2009-2014 drawn up in consultation with key local stakeholders was submitted in 2008, and a comprehensive monitoring plan for the property prepared. The plan aims to protect the natural and cultural values of the area and improve the area's presentation to visitors by providing information and infrastructure, by controlling building development and waste disposal, by regulating travel within the Ilulissat Icefjord area and by protecting its natural and cultural resources. The nominated area is currently wilderness with few signs of man. The present extensive hunting (mainly of ptarmigan) and fishing of mackerel will be regulated by the authorities to ensure a conservative yield. Tourism cabins will not be built within the site. A Monitoring Plan was adopted in 2007 covering the rate of ice-front calving, the pressures on biological resources and the numbers and impacts of tourists, especially the effects of cruise ships which since that date have been prohibited from entering the property.

In 2007 five nations – Denmark, Norway, Canada, U.S.A.and Russia - signed the Ilulissat Declaration for responsible management of the Arctic within each nation's 200 nautical mile limits. This was based on the Law of the Sea and repudiated any other international agreements on the subject although the Law did not address the effects of climate change. In 2009 an agreement was suggested that World Heritage sites with glaciers collaborate to monitor the comparative impacts of global climate change and to develop strategies for adaptive management and black carbon mitigation (UNESCO, 2009).

MANAGEMENT CONSTRAINTS

The fast increase in the disintegration and retreat of the glacier since 2002 is an increasing source of concern. Locally, overhunting of sea birds is evident, such as the virtual eradication of the Artic tern population on Green island in Disko Bay and the decimation there of wintering King eider. But, at present, tourism is the main potential threat to the site itself, by degradation and erosion of vegetation at archaeological sites and by disturbance to wildlife. Physical damage to the property from increasing numbers of visitors and noise from vehicles, vessels and helicopters are important threats to the property which like the issue of climate change will be addressed in the revised management plan.

STAFF

Game wardens employed by the Greenland government are responsible for the control of fishing and hunting along the coast. Additional staff from the Municipality work on a part-time basis. Other staff trained in conservation and natural resource management are present in Greenland. These include trainees from the Greenland Institute of Natural Resources. This Institute has a thorough understanding of national wildlife and provides expert advice for the Greenland Home Rule administration concerning the exploitation of living resources. The Institute has also established a number of training positions to train young Greenlanders in biological research and management. Training and education initiatives have been started that could benefit the site. These include the Greenlandic Outfitter Education focussing on outdoor tourism, particularly ecotourism, and the Takuss initiative which provides an education in tourism in Greenland.

BUDGET

Financial information about the nominated area is not available. At present funds to support the daily management of the area by the Municipality of Ilulissat come from the state via the Ministry of the Environment and Greenland Home Rule.

LOCAL ADDRESSES

Greenland Home Rule, Ministry of Environment and Nature, Box 1614, DK-3900 Nuuk, Greenland.

Municipality of Ilulissat, Noah Molgardswej 9, DK-3952, Ilulissat, Greenland.

REFERENCES

The principal source for the above information was the original nomination for World Heritage status.

AMAP (1997). *Arctic Pollution Issues.* Oslo.

Barolo, S. & Posakony, J. (2002). *Genes Dev*. 16: 1167.

Born, E. & Bocher, J. (2001). *The Ecology of Greenland.* Ministry of Environment. Nuuk. 429 pp.

CAFF. (2002). *Protected Areas of the Arctic-Conserving a Full Range of Values*. Ottawa;

----------(1994). *Protected Areas in the Circumpolar Arctic*. Directorate for Nature Management, Norway

Greenland Tourism Website: http://www.greenland.com/Front_Page.php

Hansen, K. (2002). *A Farewell to Greenland's Wildlife.* Copenhagen. 154 pp.

IUCN / UNESCO (2008). *State of Conservation of World Heritage Properties - Ilulissat Icefjord (Denmark).* Report of the 31st Session of the World Heritage Committee, Paris.

IUCN (2005). Alarming meltdown at Ilulissat Icefjord World Heritage site. *IUCN News*, March.

---------- (2003). *Global Strategy for Geological World Heritage sites.* Draft.

IUCN/WCU (2004). *Evaluation of Nominations of Natural and Mixed Properties to the World Heritage List.* IUCN, Gland, Switzerland.

Nikkelsen, N.(ed.) (2003). *Nomination of the Ilulissat Icefjord for Inclusion in the World Heritage List.* Geological Survey of Denmark and Greenland, Ministry of the Environment, Copenhagen. [This contains a bibliography of 267 references.]

Nowlan, L. (2001). *Arctic Legal Regime for Environmental Protection.* IUCN Environmental Policy and Law Paper 44.

Nordic Council of Ministers (1996). *The Nordic Arctic Environment-Unspoilt, Exploited, Polluted?;*

---------- (1999). *Nordic Action Plan to Protect the Natural Environment and Cultural Heritage of the Arctic.* Oslo. 95 pp.

Thorsell, J. (2003). *World Heritage Nomination - IUCN Technical Evaluation. Ilulissat Icefjord (Denmark).* IUCN, Gland, Switzerland.

UNESCO World Heritage Committee (2009). *Report of the 33rd Session of the Committee*. Paris.

DATE

April 2004. Updated 3-2005, 8-2009, May 2011.