

# Poaceae

This article is about plants in the family Poaceae known as grasses. For other uses and meanings of “grass”, see [Grass \(disambiguation\)](#).

**Poaceae** or **Gramineae** is a large and nearly ubiquitous family of monocotyledonous flowering plants known as **grasses**. Poaceae includes the cereal grasses, bamboos and the grasses of natural grassland and cultivated lawns (turf) and pasture. Grasses have stems that are hollow except at the nodes and narrow alternate leaves borne in two ranks. The lower part of each leaf encloses the stem, forming a leaf-sheath. With ca 780 genera and around 12,000 species,<sup>[4]</sup> Poaceae are the fifth-largest plant family, following the Asteraceae, Orchidaceae, Fabaceae and Rubiaceae.<sup>[5]</sup>

Grasslands such as savannah and prairie where grasses are dominant are estimated to constitute 40.5% of the land area of the Earth, excluding Greenland and Antarctica.<sup>[6]</sup> Grasses are also an important part of the vegetation in many other habitats, including wetlands, forests and tundra. The Poaceae are the most economically important plant family, providing staple foods from domesticated cereal crops such as maize (corn), wheat, rice, barley, and millet as well as forage, building materials (bamboo, thatch, straw) and fuel (ethanol).

Though commonly called “grasses”, seagrasses, rushes, and sedges fall outside this family (see [Grass \(disambiguation\)](#)). The rushes and sedges are related to the Poaceae, being members of the order Poales, but the seagrasses are members of order Alismatales.

## 1 Etymology

The name Poaceae was given by John Hendley Barnhart in 1895,<sup>[7]:7</sup> based on the tribe Poeae described in 1814 by Robert Brown, and the type genus *Poa* described in 1753 by Carl Linnaeus. The term is derived from the Ancient Greek *πόα* (*póa*, “fodder”).

## 2 Evolutionary history

Grasses include some of the most versatile plant life-forms. They became widespread toward the end of the Cretaceous period, and fossilized dinosaur dung (coprolites) have been found containing phytoliths of a variety that include grasses that are related to modern

rice and bamboo.<sup>[8]</sup> Grasses have adapted to conditions in lush rain forests, dry deserts, cold mountains and even intertidal habitats, and are currently the most widespread plant type; grass is a valuable source of food and energy for all sorts of wildlife and organics.

A cladogram shows subfamilies and approximate species numbers in brackets:<sup>[9]</sup>

Before 2005, fossil findings indicated that grasses evolved around 55 million years ago. Recent findings of grass-like phytoliths in Cretaceous dinosaur coprolites have pushed this date back to 66 million years ago.<sup>[11][10]</sup> In 2011, revised dating of the origins of the rice tribe *Oryzoideae* suggested a date as early as 107 to 129 Mya.<sup>[11]</sup> A multituberculate mammal with “grass-eating” adaptations seems to suggest that grasses were already around at 120 mya.<sup>[12]</sup>

The relationships among the three subfamilies Bambusoideae, Oryzoideae and Pooideae in the BOP clade have been resolved: Bambusoideae and Pooideae are more closely related to each other than to Oryzoideae.<sup>[13]</sup> This separation occurred within the relatively short time span of about 4 million years.

## 3 Description

Diagram of a typical lawn grass plant.

Grasses may be annual or perennial herbs,<sup>[14]:10</sup> generally with the following characteristics (the image gallery can be used for reference): The stems of grasses, called culms, are usually cylindrical (more rarely flattened, but not 3-angled) and are hollow, plugged at the nodes, where the leaves are attached.<sup>[14][15]</sup> Grass leaves are nearly always alternate and distichous (in one plane), and have parallel veins.<sup>[14]:11</sup> Each leaf is differentiated into a lower sheath hugging the stem and a blade with entire (i.e., smooth) margins.<sup>[14]:11</sup> The leaf blades of many grasses are hardened with silica phytoliths, which discourage grazing animals; some, such as sword grass, are sharp enough to cut human skin. A membranous appendage or fringe of hairs called the ligule lies at the junction between sheath and blade, preventing water or insects from penetrating into the sheath.<sup>[14]:11</sup>

Flowers of Poaceae are characteristically arranged in spikelets, each having one or more florets.<sup>[14]:12</sup> The spikelets are further grouped into panicles or spikes. The part of the spikelet that bears the florets is called the rachilla. A spikelet consists of two (or sometimes

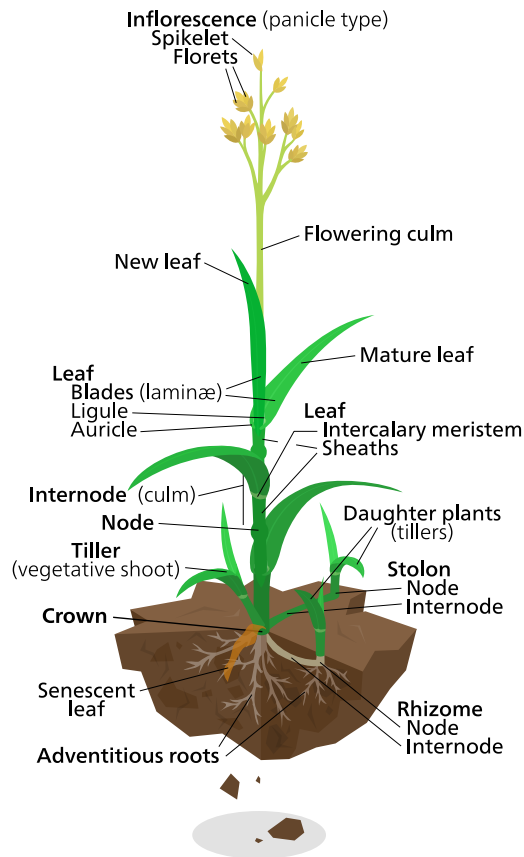
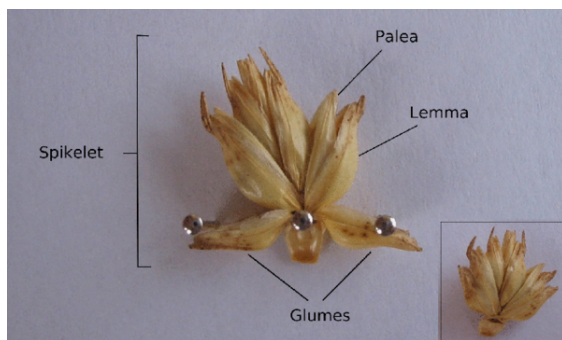


Diagram of a typical lawn grass plant.



Parts of a spikelet

fewer) bracts at the base, called glumes, followed by one or more florets.<sup>[14]:13</sup> A floret consists of the flower surrounded by two bracts, one external—the lemma—and one internal—the palea. The flowers are usually hermaphroditic—maize being an important exception—and anemophilous or wind-pollinated. The perianth is reduced to two scales, called lodicules,<sup>[14]:11</sup> that expand and contract to spread the lemma and palea; these are generally interpreted to be modified sepals. This complex structure can be seen in the image on the right, portraying a wheat (*Triticum aestivum*) spikelet. The fruit of grasses is a caryopsis, in which the seed coat is fused to the fruit wall.<sup>[14]:16</sup> A tiller is a leafy shoot other than the

first shoot produced from the seed.<sup>[14]:11</sup>

## 4 Growth and development



Grass flowers

Grass blades grow at the base of the blade and not from elongated stem tips. This low growth point evolved in response to grazing animals and allows grasses to be grazed or mown regularly without severe damage to the plant.<sup>[16]:113–114</sup>

Three general classifications of growth habit present in grasses: bunch-type (also called caespitose), stoloniferous, and rhizomatous. The success of the grasses lies in part in their morphology and growth processes and in part in their physiological diversity. Most of the grasses divide into two physiological groups, using the C<sub>3</sub> and C<sub>4</sub> photosynthetic pathways for carbon fixation. The C<sub>4</sub> grasses have a photosynthetic pathway, linked to specialized Kranz leaf anatomy, which allows for increased water use efficiency, rendering them better adapted to hot, arid environments and those lacking in carbon dioxide.

The C<sub>3</sub> grasses are referred to as “cool-season” grasses, while the C<sub>4</sub> plants are considered “warm-season” grasses.<sup>[14]:18–19</sup>

- Annual cool-season - wheat, rye, annual bluegrass (annual meadowgrass, *Poa annua*), and oat
- Perennial cool-season - orchardgrass (cocksfoot, *Dactylis glomerata*), fescue (*Festuca* spp.), Kentucky bluegrass and perennial ryegrass (*Lolium perenne*)
- Annual warm-season - maize, sudangrass, and pearl millet
- Perennial warm-season - big bluestem, Indiangrass, Bermudagrass and switchgrass.

## 5 Distribution

The grass family is one of the most widely distributed and abundant groups of plants on Earth. Grasses are found on almost every continent,<sup>[17]</sup> and are absent only from Antarctica.<sup>[18]</sup>

## 6 Ecology



*A kangaroo eating grass*



*Wind-blown grass in the Valles Caldera in New Mexico*

Grasses are the dominant vegetation in many habitats, including grassland, salt-marsh, reedswamp and steppes. They also occur as a smaller part of the vegetation in almost every other terrestrial habitat. Grass-dominated biomes are called grasslands. If only large, contiguous areas of grasslands are counted, these biomes cover 31% of the planet's land.<sup>[19]</sup> Grasslands include pampas, steppes, and prairies. Grasses provide food to many grazing mammals—such as livestock, deer, and elephants—as well as to many species of butterflies and moths. Many types of animals eat grass as their main source of food, and are called *graminivores* – these include cattle, sheep, horses, rabbits and many invertebrates, such as grasshoppers and the caterpillars of many brown butterflies. Grasses are also eaten by omnivorous or even occasionally by primarily carnivorous animals.

Grasses are unusual in that the meristem is located near the bottom of the plant; hence, they can quickly recover from cropping at the top.<sup>[20]</sup> The evolution of large grazing animals in the Cenozoic contributed to the spread of grasses. Without large grazers, fire-cleared areas are quickly colonized by grasses, and with enough rain, tree seedlings. Trees eventually outcompete most grasses. Trampling grazers kill seedling trees but not grasses.<sup>[16]:137</sup>

## 7 Taxonomy

There are about 12,000 grass species in about 771 genera that are classified into 12 subfamilies.<sup>[21]</sup> See the full list of Poaceae genera.



*Setaria verticillata from Panicoideae*

- Anomochlooideae Pilg. ex Potztal, a small lineage of broad-leaved grasses that includes two genera (*Anomochloa*, *Streptochaeta*)
- Pharioideae L.G.Clark & Judz., a small lineage of grasses of three genera, including *Pharus* and *Lep-taspis*
- Puelioideae L.G.Clark, M.Kobay., S.Mathews, Spangler & E.A.Kellogg, a small lineage of the African genus *Puelia*
- Pooideae, including wheat, barley, oats, brome-grass (*Bromus*), reed-grasses (*Calamagrostis*) and many lawn and pasture grasses
- Bambusoideae, including bamboo
- Ehrhartoideae, including rice and wild rice
- Aristidoideae, including *Aristida*
- Arundinoideae, including giant reed and common reed
- Chloridoideae, including the lovegrasses (*Eragrostis*, about 350 species, including teff), dropseeds (*Sporobolus*, some 160 species), finger millet (*Eleusine coracana* (L.) Gaertn.), and the muhly grasses (*Muhlenbergia*, about 175 species)



*Tragus roxburghii* from *Chloridoideae*

- Panicoideae, including panic grass, maize, sorghum, sugarcane, most millets, fonio, and bluestem grasses
- Micrairoideae
- Danthonioideae, including pampas grass

## 8 Uses

Grasses are, in human terms, perhaps the most economically important plant family. Their economic importance stems from several areas, including food production, industry, and lawns. They have been grown as food for domesticated animals for up to 6,000 years and the grains of grasses such as wheat, rice, maize (corn) and barley have been the most important human food crops. Grasses are also used in the manufacture of thatch, paper, fuel, clothing, insulation, timber for fencing, furniture, scaffolding and construction materials, floor matting, sports turf and baskets.



cattle on a pasture near Hradec nad Moravicí in Czech Silesia.

### 8.1 Food production

Agricultural grasses grown for their edible seeds are called cereals or grains (although the latter term, agriculturally, refers to both cereals and legumes). Three cereals – rice, wheat, and maize (corn) – provide more than half of all calories eaten by humans.<sup>[22]</sup> Of all crops, 70% are grasses.<sup>[23]</sup> Cereals constitute the major source of carbohydrates for humans and perhaps the major source of protein, and include rice in southern and eastern Asia, maize in Central and South America, and wheat and barley in Europe, northern Asia and the Americas.

Sugarcane is the major source of sugar production. Additional food uses include sprouted grain, shoots, rhizomes and sugar), drink (sugarcane juice, plant milk, rum, beer, whisky, vodka).

Lemongrass is used as a culinary herb for its scent.

Many species of grasses are grown as pasture for forage and fodder for livestock, particularly for sheep and cattle. They may be cut and stored in the form of hay, straw or silage for use during the winter. Hay and straw are used for animal bedding.

### 8.2 Industry

Grasses are used as raw material for a multitude of purposes, including construction and in the composition of building materials such as cob, for insulation, in the manufacture of paper and board such as Oriented structural straw board. Grass fiber can be used for making paper, and for biofuel production. Bamboo scaffolding is able to withstand typhoon-force winds that would break steel scaffolding.<sup>[19]</sup> Larger bamboos and *Arundo donax* have stout culms that can be used in a manner similar to timber, *Arundo* is used to make reeds for woodwind instruments, and bamboo is used for innumerable implements.

Phragmites australis (common reed) is important for thatching and grass roots stabilize the sod of sod houses. Reeds are used in water treatment systems, in wetland conservation and land reclamation in Afro-Eurasia. Mar-ram grass (*Ammophila arenaria*)

### 8.3 Lawn and ornamental use

Main article: [Lawn](#)

Grasses are the primary plant used in lawns, which them-



*A lawn in front of a building*

selves derive from grazed grasslands in Europe. They also provide an important means of erosion control (e.g., along roadsides), especially on sloping land. Grass lawns are an important covering of playing surfaces in many sports, including football (soccer), American football, tennis, golf, cricket, softball and baseball.

Ornamental grasses, such as perennial bunch grasses, are used in many styles of garden design for their foliage, inflorescences, seed heads. They are often used in natural landscaping, xeriscaping and slope stabilization in contemporary landscaping, wildlife gardening, and native plant gardening.

### 8.4 Sports turf

See also: [Turf management and Sand-based athletic fields](#)  
Grass playing fields, courses and pitches are the tradi-



*Forms of grass are used to cover baseball fields, like this one in Citi Field, home of the Mets.*

tional playing surfaces for many sports, such as American football, association football, baseball, cricket, and rugby and golf. Sports such as golf, tennis and cricket are particularly dependent on the quality of the grass on which

the sport is played. In some sports facilities, including indoor domes and other places where maintenance of a grass field would be difficult, grass may be replaced with [artificial turf](#), a synthetic grass-like substitute.

#### 8.4.1 Cricket



*The gray area is the **cricket** pitch currently in use. Parallel to it are other pitches in various states of preparation which could be used in other matches.*

Main article: [Cricket pitch § Preparation and maintenance of the playing area](#)

In cricket, the pitch is the strip of carefully mowed and rolled grass where the bowler bowls. In the days leading up to the match it is repeatedly mowed and rolled to produce a very hard, flat surface for the ball to bounce off.

#### 8.4.2 Golf

Main article: [Golf course](#)

Grass on golf courses is kept in three distinct conditions: that of the *rough*, the *fairway*, and the *putting green*. Grass on the fairway is mown short and even, allowing the player to strike the ball cleanly. Playing from the rough is a disadvantage because the long grass may affect the flight of the ball. Grass on the putting green is the shortest and most even, ideally allowing the ball to roll smoothly over the surface. An entire industry revolves around the development and marketing of grass varieties for golf courses.

#### 8.4.3 Tennis

Main article: [Grass court](#)

In tennis, grass is grown on very hard-packed soil, and the bounce of a tennis-ball may vary depending on the grass's health, how recently it has been mowed, and the wear and tear of recent play. The surface is softer than hard courts

and clay (other tennis surfaces), so the ball bounces lower, and players must reach the ball faster resulting in a different style of play which may suit some players more than others. Among the world's most prestigious court for grass tennis is Centre Court at Wimbledon, London which hosts the final of the annual Wimbledon Championships in England, one of the four Grand Slam tournaments.

## 8.5 Economically important grasses

## 9 Role in society



*Grass-covered house in Iceland*

Grasses have long had significance in human society. They have been cultivated as feed for people and domesticated animals for thousands of years. The primary ingredient of beer is usually barley or wheat, both of which have been used for this purpose for over 4,000 years.

In some places, particularly in suburban areas, the maintenance of a grass lawn is a sign of a homeowner's responsibility to the overall appearance of their neighborhood. One work credits lawn maintenance to:

...the desire for upward mobility and its manifestation in the lawn. As Virginia Jenkins, author of *The Lawn*, put it quite bluntly, 'Upper middle-class Americans emulated aristocratic society with their own small, semi-rural estates.' In general, the lawn was one of the primary selling points of these new suburban homes, as it shifted social class designations from the equity and ubiquity of urban homes connected to the streets with the upper-middle class designation of a "healthy" green space and the status symbol that is the front lawn.<sup>[24][25]</sup>

Many US municipalities and homeowners' associations have rules which require lawns to be maintained to certain specifications, sanctioning those who allow the grass to grow too long. In communities with drought problems, watering of lawns may be restricted to certain times

of day or days of the week.<sup>[26]</sup> The smell of the freshly cut grass is produced mainly by cis-3-Hexenal.<sup>[27]</sup> Some common aphorisms involve grass. For example:

- "The grass is always greener on the other side" suggests an alternate state of affairs will always seem preferable to one's own.
- "Don't let the grass grow under your feet" tells someone to get moving.
- "A snake in the grass" means dangers that are hidden.
- "When elephants fight, it is the grass which suffers" tells of bystanders caught in the crossfire.

A folk myth about grass is that it refuses to grow where any violent death has occurred.<sup>[28]</sup>

## 10 In popular culture

- In John Christopher's *The Death of Grass* (1956, published in the United States as *No Blade of Grass*), a plague that kills off all forms of grass threatens the survival of the human species.
- In Ward Moore's novel *Greener Than You Think*, the world is slowly taken over by unstoppable Bermuda Grass.
- Alice Munro's story "Save the Reaper" (1998) contains an important allusion to the idiomatic saying, "To hear the grass grow"; the aging protagonist remembers her grandfather's telling her when she was young that "at night you could hear the corn growing" in the region where the story is set.<sup>[29]</sup> The protagonist hears the grass grow in ways that are central to the story's significance on the topic of retelling, or rather, in an act of self-censorship, of leaving untold certain experiences of the recent past.<sup>[30]</sup>
- The title of Walt Whitman's poetry collection *Leaves of Grass* (1855) contains two puns: "leaves", referring to the pages on which the book was written, and "grass", a term given by publishers to works of minor value.

## 11 Image gallery



- Leaves of *Poa trivialis* showing

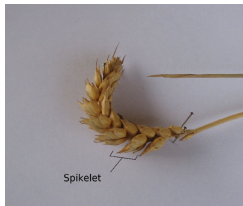
the ligules



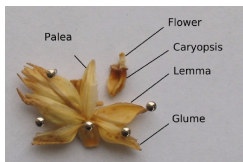
- Bamboo stem and leaves, nodes are evident



- A *Chasmanthium latifolium* spikelet



- Wheat spike and spikelet



- Spikelet opened to show caryopsis



- Haretail grass



- Grass



- Sugarcane (*Saccharum officinarum*)



- Roots of *Bromus hordeaceus*



- Barley mature spikes (*Hordeum vulgare*)



- Illustration depicting both staminate and pistillate flowers of maize (*Zea mays*)



- A grass flower head (meadow foxtail) showing the plain-coloured flowers with large anthers.



- Anthers detached from a meadow foxtail flower



- *Setaria verticillata*, bristly

foxtail



- *Setaria verticillata*, bristly foxtail




- *Oryza sativa*, Kerala, India

## 12 See also

- Agrostology
- Bunch grass
- Forbs
- Ornamental grass
- Sedges
- Rushes
- PACMAD clade

## 13 References

- [1] Piperno, Dolores R.; Sues, Hans-Dieter (2005). "Dinosaurs Dined on Grass". *Science*. **310** (5751): 1126–8. doi:10.1126/science.1121020. PMID 16293745.
- [2] Angiosperm Phylogeny Group (2009). "An update of the Angiosperm Phylogeny Group classification for the orders and families of flowering plants: APG III" (PDF). *Botanical Journal of the Linnean Society*. **161** (2): 105–121. doi:10.1111/j.1095-8339.2009.00996.x. Retrieved 2013-06-26.
- [3] HASTON, ELSPETH; RICHARDSON, JAMES E.; STEVENS, PETER F.; CHASE, MARK W.; HARRIS, DAVID J. (October 2009). "The Linear Angiosperm Phylogeny Group (LAPG) III: a linear sequence of the families in APG III". *Botanical Journal of the Linnean Society*. **161** (2): 128–131. doi:10.1111/j.1095-8339.2009.01000.x.
- [4] Christenhusz, M.J.M.; Byng, J.W. (2016). "The number of known plants species in the world and its annual increase". *Phytotaxa*. Magnolia Press. **261** (3): 201–217. doi:10.11646/phytotaxa.261.3.1.
- [5] "Angiosperm Phylogeny Website". Retrieved 20 March 2016.
- [6] Reynolds, S.G. "Grassland of the world". *www.fao.org*. Retrieved 2016-10-04.
- [7] Barnhart, John Hendley (15 January 1895). "Family nomenclature". *Bulletin of the Torrey Botanical Club*. Lancaster, PA, USA. **22** (1): 1–24. Retrieved 5 June 2016.
- [8] Piperno, Dolores R.; Sues, Hans-Dieter (18 November 2005). "Dinosaurs Dined on Grass". *Science*. **310** (5751): 1126–1128. doi:10.1126/science.1121020. PMID 16293745.
- [9] Grass Phylogeny Working Group II (2012). "New grass phylogeny resolves deep evolutionary relationships and discovers C<sub>4</sub> origins". *New Phytologist*. **193** (2): 304–312. doi:10.1111/j.1469-8137.2011.03972.x. PMID 22115274. 
- [10] Prasad, V.; Stroemberg, C.A.E.; Alimohammadian, H.; Sahni, A. (2005). "Dinosaur coprolites and the early evolution of grasses and grazers". *Science*. **310** (5751): 1177–1180. doi:10.1126/science.1118806. PMID 16293759.
- [11] Prasad, V.; Strömberg, C.A.; Leaché, A.D.; Samant, B.; Patnaik, R.; Tang, L.; Mohabey, D.M.; Ge, S.; Sahni, A. (2011). "Late Cretaceous origin of the rice tribe provides evidence for early diversification in Poaceae". *Nature Communications*. **2**: 480. doi:10.1038/ncomms1482. PMID 21934664.
- [12]
- [13] Wu, Z.Q.; Ge, S. (2012). "The phylogeny of the BEP clade in grasses revisited: Evidence from the whole-genome sequences of chloroplasts". *Molecular and Phylogenetic Evolution*. **62** (1): 573–578. doi:10.1016/j.ympev.2011.10.019.
- [14] Cope, T.; Gray, A. (2009). *Grasses of the British Isles*. London, U.K.: Botanical Society of Britain and Ireland. ISBN 9780901158420.
- [15] Clayton, W.D.; Renvoise, S.A. (1986). *Genera Graminum: Grasses of the world*. London: Royal Botanic Garden, Kew. ISBN 9781900347754.
- [16] Attenborough, David (1984). *The Living Planet*. British Broadcasting Corporation. ISBN 0-563-20207-6.
- [17] Sarandón, Ramiro (1988). "Biología poblacional del graminon (*Cynodon* spp., Gramineae)": 189. Retrieved 22 April 2014.
- [18] "Angiosperm phylogeny website". Retrieved 2007-10-07.
- [19] George Constable, ed. (1985). *Grasslands and Tundra*. Planet Earth. Time Life Books. p. 20. ISBN 0-8094-4520-4.



- [20] “Chapter 1: How grasses grow”. Farmwest.com. Retrieved 2013-08-26.
- [21] Soreng, Robert J.; Peterson, Paul M.; Romschenko, Konstantin; Davidse, Gerrit; Zuloaga, Fernando O.; Judziewicz, Emmet J.; Filgueiras, Tarciso S.; Davis, Jerrold I.; Morrone, Osvaldo (2015). “A worldwide phylogenetic classification of the Poaceae (Gramineae)”. *Journal of Systematics and Evolution*. **53** (2): 117–137. doi:10.1111/jse.12150. ISSN 1674-4918. 
- [22] Raven, P.H.; Johnson, G.B. (1995). Carol J. Mills, ed. *Understanding Biology* (3rd ed.). WM C. Brown. p. 536. ISBN 0-697-22213-6.
- [23] George Constable, ed. (1985). *Grasslands and Tundra*. Planet Earth. Time Life Books. p. 19. ISBN 0-8094-4520-4.
- [24] Matthew J. Lindstrom, Hugh Bartling, *Suburban sprawl: culture, theory, and politics* (2003), p. 72, quoting Virginia Scott Jenkins, *The Lawn: A History of an American Obsession* (1994), p.21.
- [25] Paul Robbins and Julie T. Sharp, “Producing and Consuming Chemicals: The Moral Economy of the American Lawn”, *Economic Geography* **79**:4 (2003), p. 425-45; reprinted in William G. Moseley, David A. Lanegran, Kavita Pandit, *The Introductory Reader in Human Geography* (2007), p. 323-36.
- [26] “Lawn Sprinkling Regulations in Metro Vancouver, BC, Canada”. Metrovancouver.org. 2011-02-21. Retrieved 2013-08-26.
- [27] “hexenal”. School of Chemistry, University of Bristol. Retrieved 2013-08-26.
- [28] Olmert, Michael (1996). *Milton's Teeth and Ovid's Umbrella: Curiouser & Curiouser Adventures in History*, p. 208. Simon & Schuster, New York. ISBN 0-684-80164-7.
- [29] For publication details of “Save the Reaper” by Alice Munro see List of short stories by Alice Munro.
- [30] Miller, Judith Maclean (Spring 2002). “Deconstructing Silence: The Mystery of Alice Munro”. *Antigonish Review* (129). pp. 43–52.
- *Poaceae Classification* from the online *Catalogue of New World Grasses*
  - Poaceae at the online *Flora of China*
  - Poaceae at the online *Guide to the Flora of Mongolia*
  - Poaceae at the online *Flora of Taiwan*
  - Poaceae at the online *Flora of Pakistan*
  - Poaceae at the online *Flora of Zimbabwe*
  - Poaceae at the online *Flora of Western Australia*
  - Grasses of Australia (AusGrass2) - <http://ausgrass2.myspecies.info/>
  - Gramineae at the online *Flora of New Zealand*
  - NZ Grass Key An Interactive Key to New Zealand Grasses at *Landcare Research*
  - The Grass Genera of the World at *DELTA intkey*
  - GrassBase - The Online World Grass Flora at the *Royal Botanic Gardens - Kew*
  - GrassWorld - <http://grassworld.myspecies.info/>

## 14 External links

- The dictionary definition of **grass** at Wiktionary
- Need a Definition of Grass?
- Vegetative Key to Grasses
- Poaceae at *The Plant List*
- Gramineae at *The Families of Flowering Plants (DELTA)*
- Poaceae at the *Encyclopedia of Life*
- Poaceae at the *Angiosperm Phylogeny Website*

## 15 Text and image sources, contributors, and licenses

### 15.1 Text

- **Poaceae** *Source:* <https://en.wikipedia.org/wiki/Poaceae?oldid=773337323> *Contributors:* Youssefsan, Toby Bartels, PierreAbbat, BenZin~enwiki, Azhyd, Jaknouse, Ewen, Stevertigo, Ellywa, Stan Shebs, Glenn, Rob Hooft, Hashar, Piolinfax, Tjunier, Marshman, Imc, Morwen, Renato Caniatti~enwiki, Wetman, Jason M, Donarreiskoffer, Robbot, 1984, Nurg, Blainster, UtherSRG, GerardM, Alan Liefiting, Lady Tenar, DocWatson42, MPF, Brockert, Knutux, JoJan, Vina, Karl-Henner, Kahkonen, Famartin, Kate, DanielCD, Bender235, El C, Mauler, RoyBoy, Fir0002, Smalljim, Hesperian, Anthony Appleyard, Eric Kvaalen, Pion, Wtmitchell, Dinoguy2, Tony Sidaway, Cmapm, Gene Nygaard, Redvers, Brookie, Weyes, Pekinensis, Alvis, LOL, Miaow Miaow, Dustball, Sonelle, Miss Madeline, Sin-man, Richard-Weiss, BD2412, Rjwilmsi, STarry, Watcharakorn, Vuong Ngan Ha, Mike Dallwitz~enwiki, FlaBot, Ground Zero, Nihiltres, GünniX, Chobot, Gdrbot, Bgwhite, Dj Capricorn, Huw Powell, BerneyBoy, RussBot, Qwertzy2, Eleassar, Curtis Clark, Dymorodrepanis~enwiki, Joel7687, Marknesbitt, Lockesdonkey, Lt-wiki-bot, Caballero1967, GrinBot~enwiki, Brya, Hardyplants, Yamaguchi🇯🇵, Skizzik, Eug, DHN-bot~enwiki, Paalexan, Mike hayes, Abyssal, Alphathon, Grover cleveland, Friendlyliz, Kingdon, RandomP, Jóna Pórunn, Zeamays, Lambiam, MrDarwin, Euchiasmus, J 1982, Mlgiganteus1, IronGargoyle, Smith609, Munita Prasad, GorillazFanAdam, Tau'olunga, Alexei Kouprianov, Falconfly, WeggeBot, Phatom87, Viscious81, Casliber, Rosser1954, Thijs!bot, Sobreira, CTZMSC3, RoboServien, AntiVandalBot, Fayenatic london, Smartse, Nipsisquit, Aelwyn, Storkk, Sluzzelin, JAnDbot, Plantsurfer, Geniac, Easchiff, Magioladitis, Connormah, VoABot II, Xb2u7Zjzc32, Think outside the box, Michael Goodyear, Lenticel, Robin S, Keith D, Nono64, J.delanoy, FrummerThanThou, Richard New Forest, Idioma~bot, VolkovBot, DrMicro, Pedro Onativia, Oshwah, Rei~bot, Dendodge, AlleborgoBot, Logan, Atubeileh, Bmackcw, Britzingen, SieBot, Gerakibot, Hxhbot, Graminophile, ClueBot, Jmgarg1, Wysprgr2005, TheOldJacobite, Masterthomas, Michaplot, DragonBot, Excirial, CohesionBot, Taranet, SoilMan2007, NotTires, SilvonenBot, Jhorthos, Addbot, DOI bot, Neodop, NjardarBot, Glane23, Blokenarexeter, IOLJeff, TheAZAndyman, Erutuon, OIEnglish, Zorrobot, Folyeelarks, Legobot, Luckasbot, Yobot, Amirobot, Eric-Wester, AnomieBOT, DemocraticLuntz, Rubinbot, Materialscientist, Citation bot, ArthurBot, Quebec99, Lil-Helpa, Xqbot, Gigemag76, GrouchoBot, Jhbde1, RibotBOT, Shattered Gnome, Peanutcactus, Hamamelis, FrescoBot, Dankarl, Eagle4000, Citation bot 1, Serols, Jauhienij, Tim1357, Robvanvee, Orbicule, TobeBot, Trappist the monk, Weedgarden, Benchamas, Alph Bot, Wild-Bot, EmausBot, Nick Moyes, Look2See1, Dadaist6174, Jkadavor, Wikipelli, Dcirovic, BCM NZ, H3llBot, Ngstanton, Julienvr, NTox, ClueBot NG, Satellizer, Helpful Pixie Bot, Gob Lofa, Plantdrew, BG19bot, CitationCleanerBot, Fylbecatulous, BattyBot, RichardMills65, 12345benz, Nusaybah, CNWG, Kelvin13, Dexbot, Sminthopsis84, Wuerzele, Gruekiller, PapiDimmi, AfadsBad, Kind Tennis Fan, AddWittyNameHere, Noyster, Coreyemotela, Joseph Laferriere, Melcous, Aqnat, Clubjustin, Nickwilso, Gonzalo.villarreal, A guy saved by Jesus, Henryscut, Julietdeltalima, Sangdeboeuf, Tylototriton, MetazoanMarek, Infinite0694, Takefatman, KasparBot, Adam9007, CAPTAIN RAJU, Silver Samuraj, CLCStudent, Entranced98, Sheephunt2000, Chrisgorecki5, Panda and and and katniss, White Lives Don't Matter, SkyWarrior, AsianCurry, Butttr, Lmcd1999, Dipentodon, Smartguy79, Bilbohedgehog, Adelanosotros, CatLover2k12, Study friend, Solarsystembith, Higgypug, Iambic Pentameter, Doggy171, Rhubutin, Maxspace64, AARONORTEGA, Griprap, COCOMO123, Booty crumbs, MATTCARRIER, SevenEight9, RiverHawk1 and Anonymous: 161

### 15.2 Images

- **File:Australia\_vs\_India.jpg** *Source:* [https://upload.wikimedia.org/wikipedia/commons/5/5c/Australia\\_vs\\_India.jpg](https://upload.wikimedia.org/wikipedia/commons/5/5c/Australia_vs_India.jpg) *License:* CC BY 2.0 *Contributors:* <http://www.flickr.com/photos/icc-cricket/324545382/> *Original artist:* Rick212
- **File:Bamboo\_DSCN2465.jpg** *Source:* [https://upload.wikimedia.org/wikipedia/commons/9/97/Bamboo\\_DSCN2465.jpg](https://upload.wikimedia.org/wikipedia/commons/9/97/Bamboo_DSCN2465.jpg) *License:* CC BY-SA 2.5 *Contributors:* No machine-readable source provided. Own work assumed (based on copyright claims). *Original artist:* No machine-readable author provided. Michele~commonswiki assumed (based on copyright claims).
- **File:Bromus\_hordeaceus\_unten.jpeg** *Source:* [https://upload.wikimedia.org/wikipedia/commons/6/6d/Bromus\\_hordeaceus\\_unten.jpeg](https://upload.wikimedia.org/wikipedia/commons/6/6d/Bromus_hordeaceus_unten.jpeg) *License:* CC-BY-SA-3.0 *Contributors:* photographed by myself *Original artist:* Kristian Peters -- Fabelfroh 09:01, 16 June 2006 (UTC)
- **File:Chasmanthium\_latifolium-spikelet.jpg** *Source:* [https://upload.wikimedia.org/wikipedia/commons/9/9e/Chasmanthium\\_latifolium-spikelet.jpg](https://upload.wikimedia.org/wikipedia/commons/9/9e/Chasmanthium_latifolium-spikelet.jpg) *License:* Public domain *Contributors:* <http://www.backyardnature.net/n/08/080811.htm> *Original artist:* Jim Conrad
- **File:Citi\_Field\_Day.jpg** *Source:* [https://upload.wikimedia.org/wikipedia/commons/4/45/Citi\\_Field\\_Day.jpg](https://upload.wikimedia.org/wikipedia/commons/4/45/Citi_Field_Day.jpg) *License:* Public domain *Contributors:* Mets Game *Original artist:* Sam Smith
- **File:Commons-logo.svg** *Source:* <https://upload.wikimedia.org/wikipedia/en/4/4a/Commons-logo.svg> *License:* PD *Contributors:* ? *Original artist:* ?
- **File:En\_Anatomia.png** *Source:* [https://upload.wikimedia.org/wikipedia/commons/b/b6/En\\_Anatomia.png](https://upload.wikimedia.org/wikipedia/commons/b/b6/En_Anatomia.png) *License:* CC-BY-SA-3.0 *Contributors:* Own work *Original artist:* Aelwyn
- **File:En\_Aperta.png** *Source:* [https://upload.wikimedia.org/wikipedia/commons/0/0e/En\\_Aperta.png](https://upload.wikimedia.org/wikipedia/commons/0/0e/En_Aperta.png) *License:* CC-BY-SA-3.0 *Contributors:* Own work *Original artist:* Aelwyn
- **File:En\_Spica\_spiculae.png** *Source:* [https://upload.wikimedia.org/wikipedia/commons/2/28/En\\_Spica\\_spiculae.png](https://upload.wikimedia.org/wikipedia/commons/2/28/En_Spica_spiculae.png) *License:* CC-BY-SA-3.0 *Contributors:* Own work *Original artist:* Aelwyn
- **File:Flowering\_Grass.JPG** *Source:* [https://upload.wikimedia.org/wikipedia/commons/4/4c/Flowering\\_Grass.JPG](https://upload.wikimedia.org/wikipedia/commons/4/4c/Flowering_Grass.JPG) *License:* Public domain *Contributors:* Transferred from en.wikipedia to Commons by Sreejithk2000 using CommonsHelper. *Original artist:* Rosser1954 at English Wikipedia
- **File:Folder\_Hexagonal\_Icon.svg** *Source:* [https://upload.wikimedia.org/wikipedia/en/4/48/Folder\\_Hexagonal\\_Icon.svg](https://upload.wikimedia.org/wikipedia/en/4/48/Folder_Hexagonal_Icon.svg) *License:* Cc-by-sa-3.0 *Contributors:* ? *Original artist:* ?
- **File:Grass.jpg** *Source:* <https://upload.wikimedia.org/wikipedia/commons/f/f8/Grass.jpg> *License:* CC BY-SA 2.5 *Contributors:* „own work“ *Original artist:* Tobias Geberth
- **File:Grass\_Anthers.JPG** *Source:* [https://upload.wikimedia.org/wikipedia/commons/d/d4/Grass\\_Anthers.JPG](https://upload.wikimedia.org/wikipedia/commons/d/d4/Grass_Anthers.JPG) *License:* Public domain *Contributors:* I created this work entirely by myself. Roger Griffith *Original artist:* Rosser (talk)

- **File:Grass\_covered\_house\_in\_Iceland\_1972.jpg** *Source:* [https://upload.wikimedia.org/wikipedia/commons/a/a8/Grass\\_covered\\_house\\_in\\_Iceland\\_1972.jpg](https://upload.wikimedia.org/wikipedia/commons/a/a8/Grass_covered_house_in_Iceland_1972.jpg) *License:* CC-BY-SA-3.0 *Contributors:* No machine-readable source provided. Own work assumed (based on copyright claims). *Original artist:* No machine-readable author provided. Roger McLassus 1951 assumed (based on copyright claims).
- **File:Grasses\_in\_the\_Valles\_Caldera\_2014-06-26.JPG** *Source:* [https://upload.wikimedia.org/wikipedia/commons/8/89/Grasses\\_in\\_the\\_Valles\\_Caldera\\_2014-06-26.JPG](https://upload.wikimedia.org/wikipedia/commons/8/89/Grasses_in_the_Valles_Caldera_2014-06-26.JPG) *License:* CC BY-SA 3.0 *Contributors:* Own work *Original artist:* Dustin V. S.
- **File:Grassflowers.jpg** *Source:* <https://upload.wikimedia.org/wikipedia/commons/0/09/Grassflowers.jpg> *License:* Public domain *Contributors:* Transferred from en.wikipedia to Commons by Nomarcland using CommonsHelper. *Original artist:* Hardyplants at English Wikipedia
- **File:Grassy\_grass\_plant.svg** *Source:* [https://upload.wikimedia.org/wikipedia/commons/4/44/Grassy\\_grass\\_plant.svg](https://upload.wikimedia.org/wikipedia/commons/4/44/Grassy_grass_plant.svg) *License:* CC BY 3.0 *Contributors:* Own work *Original artist:* Kelvinsong
- **File:GrazingCowsPasture.jpg** *Source:* <https://upload.wikimedia.org/wikipedia/commons/2/21/GrazingCowsPasture.jpg> *License:* CC BY-SA 3.0 *Contributors:* Own work *Original artist:* Multimoty1
- **File:Harestail\_grass.jpg** *Source:* [https://upload.wikimedia.org/wikipedia/commons/0/0e/Harestail\\_grass.jpg](https://upload.wikimedia.org/wikipedia/commons/0/0e/Harestail_grass.jpg) *License:* GFDL 1.2 *Contributors:* Own work *Original artist:* **fir0002 | flagstaffotos.com.au**
- **File:Kangur.rudy.drs.jpg** *Source:* <https://upload.wikimedia.org/wikipedia/commons/2/22/Kangur.rudy.drs.jpg> *License:* Public domain *Contributors:* Own work *Original artist:* Drs
- **File:Koeh-283.jpg** *Source:* [https://upload.wikimedia.org/wikipedia/commons/e/e3/Zea\\_mays\\_-\\_K%C3%B6hler%E2%80%93Medizinal-Pflanzen-283.jpg](https://upload.wikimedia.org/wikipedia/commons/e/e3/Zea_mays_-_K%C3%B6hler%E2%80%93Medizinal-Pflanzen-283.jpg) *License:* Public domain *Contributors:* List of Koehler Images *Original artist:* Franz Eugen Köhler, Köhler's Medizinal-Pflanzen
- **File:Ohra.jpg** *Source:* <https://upload.wikimedia.org/wikipedia/commons/0/0f/Ohra.jpg> *License:* Public domain *Contributors:* Originally from fi.wikipedia; description page is (was) here *Original artist:* User Veli Holopainen on fi.wikipedia
- **File:Open\_Access\_logo\_PLoS\_transparent.svg** *Source:* [https://upload.wikimedia.org/wikipedia/commons/7/77/Open\\_Access\\_logo\\_PLoS\\_transparent.svg](https://upload.wikimedia.org/wikipedia/commons/7/77/Open_Access_logo_PLoS_transparent.svg) *License:* CC0 *Contributors:* <http://www.plos.org/> *Original artist:* art designer at PLoS, modified by Wikipedia users Nina, Beao, and JakobVoss
- **File:Oryza\_sativa\_in\_Kadavoor.jpg** *Source:* [https://upload.wikimedia.org/wikipedia/commons/a/ae/Oryza\\_sativa\\_in\\_Kadavoor.jpg](https://upload.wikimedia.org/wikipedia/commons/a/ae/Oryza_sativa_in_Kadavoor.jpg) *License:* CC BY-SA 4.0 *Contributors:* Own work *Original artist:* **Jeevan Jose, Kerala, India**
- **File:People\_icon.svg** *Source:* [https://upload.wikimedia.org/wikipedia/commons/3/37/People\\_icon.svg](https://upload.wikimedia.org/wikipedia/commons/3/37/People_icon.svg) *License:* CC0 *Contributors:* Open-Clipart *Original artist:* OpenClipart
- **File:Portal-puzzle.svg** *Source:* <https://upload.wikimedia.org/wikipedia/en/f/fd/Portal-puzzle.svg> *License:* Public domain *Contributors:* ? *Original artist:* ?
- **File:Question\_book-new.svg** *Source:* [https://upload.wikimedia.org/wikipedia/en/9/99/Question\\_book-new.svg](https://upload.wikimedia.org/wikipedia/en/9/99/Question_book-new.svg) *License:* Cc-by-sa-3.0 *Contributors:* Created from scratch in Adobe Illustrator. Based on Image:Question book.png created by User:Equazcion *Original artist:* Tkgd2007
- **File:Rose\_Amber\_Flush\_20070601.jpg** *Source:* [https://upload.wikimedia.org/wikipedia/commons/3/37/Rose\\_Amber\\_Flush\\_20070601.jpg](https://upload.wikimedia.org/wikipedia/commons/3/37/Rose_Amber_Flush_20070601.jpg) *License:* CC BY-SA 3.0 *Contributors:* Own work *Original artist:* Georges Seguin (Okki)
- **File:Ruwbeemdgras\_Poa\_trivialis\_ligula.jpg** *Source:* [https://upload.wikimedia.org/wikipedia/commons/d/db/Ruwbeemdgras\\_Poa\\_trivialis\\_ligula.jpg](https://upload.wikimedia.org/wikipedia/commons/d/db/Ruwbeemdgras_Poa_trivialis_ligula.jpg) *License:* CC-BY-SA-3.0 *Contributors:* Own work *Original artist:* Rasbak
- **File:Saccharum-officinarum2.JPG** *Source:* <https://upload.wikimedia.org/wikipedia/commons/4/47/Saccharum-officinarum2.JPG> *License:* CC-BY-SA-3.0 *Contributors:* ? *Original artist:* ?
- **File:Setaria\_verticillata\_W\_IMG\_1083.jpg** *Source:* [https://upload.wikimedia.org/wikipedia/commons/2/24/Setaria\\_verticillata\\_W\\_IMG\\_1083.jpg](https://upload.wikimedia.org/wikipedia/commons/2/24/Setaria_verticillata_W_IMG_1083.jpg) *License:* CC BY 3.0 *Contributors:* Own work *Original artist:* J.M.Garg
- **File:Setaria\_verticillata\_W\_IMG\_1084.jpg** *Source:* [https://upload.wikimedia.org/wikipedia/commons/6/6f/Setaria\\_verticillata\\_W\\_IMG\\_1084.jpg](https://upload.wikimedia.org/wikipedia/commons/6/6f/Setaria_verticillata_W_IMG_1084.jpg) *License:* CC BY 3.0 *Contributors:* Own work *Original artist:* J.M.Garg
- **File:Setaria\_verticillata\_W\_IMG\_1085.jpg** *Source:* [https://upload.wikimedia.org/wikipedia/commons/4/4c/Setaria\\_verticillata\\_W\\_IMG\\_1085.jpg](https://upload.wikimedia.org/wikipedia/commons/4/4c/Setaria_verticillata_W_IMG_1085.jpg) *License:* CC BY 3.0 *Contributors:* Own work *Original artist:* J.M.Garg
- **File:South\_Lawn.jpg** *Source:* [https://upload.wikimedia.org/wikipedia/commons/e/e2/South\\_Lawn.jpg](https://upload.wikimedia.org/wikipedia/commons/e/e2/South_Lawn.jpg) *License:* CC BY-SA 3.0 *Contributors:* Dixon Gallery and Gardens *Original artist:* Dixon Gallery and Gardens
- **File:Tragus\_roxburghii\_W\_IMG\_1725.jpg** *Source:* [https://upload.wikimedia.org/wikipedia/commons/e/ea/Tragus\\_roxburghii\\_W\\_IMG\\_1725.jpg](https://upload.wikimedia.org/wikipedia/commons/e/ea/Tragus_roxburghii_W_IMG_1725.jpg) *License:* CC BY 3.0 *Contributors:* Own work *Original artist:* J.M.Garg
- **File:Wikispecies-logo.svg** *Source:* <https://upload.wikimedia.org/wikipedia/commons/d/df/Wikispecies-logo.svg> *License:* CC BY-SA 3.0 *Contributors:* Image:Wikispecies-logo.jpg *Original artist:* (of code) cs:User:-xfi-

## 15.3 Content license

- Creative Commons Attribution-Share Alike 3.0