



**AL-FARABI KAZAKH NATIONAL UNIVERSITY
FACULTY OF BIOLOGY AND BIOTECHNOLOGY
DEPARTMENT OF BOTANY AND AGROECOLOGY**

**LECTURE 3
Endemic and relict species of herbaceous
grasses in the southern zones**



**Lecturer: Doctor of Biological Sciences, Professor
Kurmanbayeva M.S.
Course title: Conservation of Rare and Endangered
Plant Species**

LESSON PLAN (50 MIN)

1. Introduction (5 min)

- Topic and goals.
- Importance of grasses in southern ecosystems.

2. Main part (35 min)

- **Key concepts (5 min):** endemic, relict, herbaceous plants.
- **Environment (5 min):** hot, dry climate; sandy and saline soils.
- **Examples (20 min):**
 - *Endemic: stipa karatavica, festuca sulcata, poa bulbosa.*
 - *Relict: eremopyrum orientale, cleistogenes songorica.*
 - Adaptations: drought resistance, deep roots, narrow leaves.
- **Conservation (5 min):** threats, protected areas (karatau, altyn-emel).

3. Conclusion (10 min)

- Summary and discussion: “why protect endemic grasses?”
- Short quiz / homework: choose one endemic grass and describe it.



Southern Grasslands: A Diverse and Vanishing Landscape

Southern grasslands once encompassed millions of acres across diverse ecosystems—from expansive prairies and savannas to isolated glades and barrens. These habitats exhibited remarkable variation, ranging from lowland marshes with lush vegetation to windswept high-elevation balds where hardy species clung to rocky slopes. Each distinct environment supported unique grass communities adapted to its particular climate, soil, and disturbance regime.

Today, over 90% of these irreplaceable grasslands have vanished due to agricultural conversion, urban development, and suppression of natural fire regimes. This catastrophic loss has devastated populations of endemic and relict species that evolved nowhere else on Earth. The fragmentation of remaining patches further isolates populations, preventing gene flow and accelerating extinction risks.



What Are Relict and Endemic Grasses?



Endemic Species

Plants found exclusively in specific southern regions, restricted by geographic boundaries or highly specialised habitat requirements. These species have evolved in isolation, representing unique evolutionary lineages.



Relict Species

Survivors of ancient ecosystems now extinct elsewhere, such as alpine tundra grasses persisting on Southern Appalachian balds since the Ice Age. Living fossils of bygone climates.



Ecological Significance

These grasses provide critical ecosystem functions including soil stabilisation, water filtration, and wildlife habitat. They represent millions of years of evolutionary history compressed into vulnerable populations.

The Southern Appalachian Balds: Living Relics of the Ice Age

Southern Appalachian balds represent extraordinary botanical time capsules, small treeless grasslands perched above 5,000 feet elevation. These windswept summits are living remnants of alpine tundra that blanketed the region 18,000 years ago during the Last Glacial Maximum. When climate warmed and forests advanced upslope, these isolated high-elevation patches remained frozen in ecological time.

Today's balds host remarkable endemic grasses including Cain's reed grass and mountain golden-heather, species found nowhere else globally. These habitats maintain surprisingly stable conditions despite surrounding forest, though they remain exquisitely sensitive to disturbance. Climate change poses unprecedented threats, as warming temperatures allow trees to encroach upslope, shrinking bald habitats. Recreational pressure and atmospheric deposition further stress these vulnerable communities.

Endemic Grasses of the Juan Fernández Archipelago

Isolated Island Evolution

The Juan Fernández Archipelago, situated approximately 670 kilometres off Chile's Pacific coast, harbours endemic grass genera found nowhere else—Megalachne and Podophorus. These remote islands have functioned as evolutionary laboratories for millions of years, generating unique species through isolation and environmental selection.

Conservation Crisis

Podophorus bromoides, once present on these islands, is now considered extinct. Surviving Megalachne species remain critically rare and isolated, with populations restricted to tiny refuge areas. Genetic analysis reveals striking affinities to relict Pampean-Ventanian fescues, suggesting deep biogeographic connections to ancient southern grassland communities.



Festuca thurberi Vasey



Passiflora foetida L

Iconic Native Southern Grasses: The "Big Four"

1

Little Bluestem

A mid-height bunchgrass prized for autumn colouration and exceptional drought tolerance, forming the foundation of many southern prairie communities.

2

Big Bluestem

A tall, deeply-rooted grass capable of reaching 2 metres, dominating mesic prairies and creating distinctive three-pronged seed heads.

3

Indiangrass

A warm-season bunchgrass with beautiful plume-like inflorescences, supporting numerous wildlife species and improving soil structure.

4

Switchgrass

A rhizomatous species valuable for wildlife forage, erosion control, and biomass production, thriving in marginal upland soils.

These four foundational species epitomise southern grassland character, displaying remarkable drought tolerance and providing backbone structure for entire prairie and savanna communities. Their collective decline starkly illustrates the broader grassland loss crisis.



Passiflora foetida L



Muhlenbergia capillaris (Lam.) Trin.

Sensitive Plant Communities and Conservation Challenges

Many southern grassland communities are officially classified as sensitive due to rarity, restricted ranges, and ecological vulnerability. These designations reflect their irreplaceability and precarious conservation status.

→ Habitat Fragmentation

Remaining grasslands exist as isolated patches surrounded by development, preventing species movement and reducing genetic diversity.

→ Invasive Species

Aggressive introduced plants outcompete natives, fundamentally altering community composition and ecological function.

→ Fire Regime Alteration

Fire suppression allows woody encroachment, whilst inappropriate burn timing disrupts breeding cycles of grassland specialists.

→ Climate Shifts

Warming temperatures alter precipitation patterns and growing seasons, stressing species adapted to historical conditions.

Contemporary conservation emphasises habitat restoration, reintroduction of appropriate fire regimes, invasive species removal, and direct protection of endemic populations through seed banking and population monitoring.

Herbaceous Grasses in Southern Forest Ranges

Southern pine and hardwood forests support diverse herbaceous grass communities that play vital ecological roles often underappreciated by land managers. Species like various bluestems, panicums, and muhly grasses thrive in forest understories, creating structural complexity and botanical diversity.

These forest grasses contribute significantly to forage availability for deer, wild turkey, and other wildlife species. Their deep root systems stabilise soil and enhance infiltration, reducing erosion and improving water quality. During controlled burns—essential for maintaining southern forest health—herbaceous grasses respond vigorously, creating resilient, fire-adapted understories.

Understanding the distribution, ecological requirements, and population dynamics of forest grassland species proves essential for sustainable forestry and ecosystem management throughout the southern region.



Veronica spicata — L.

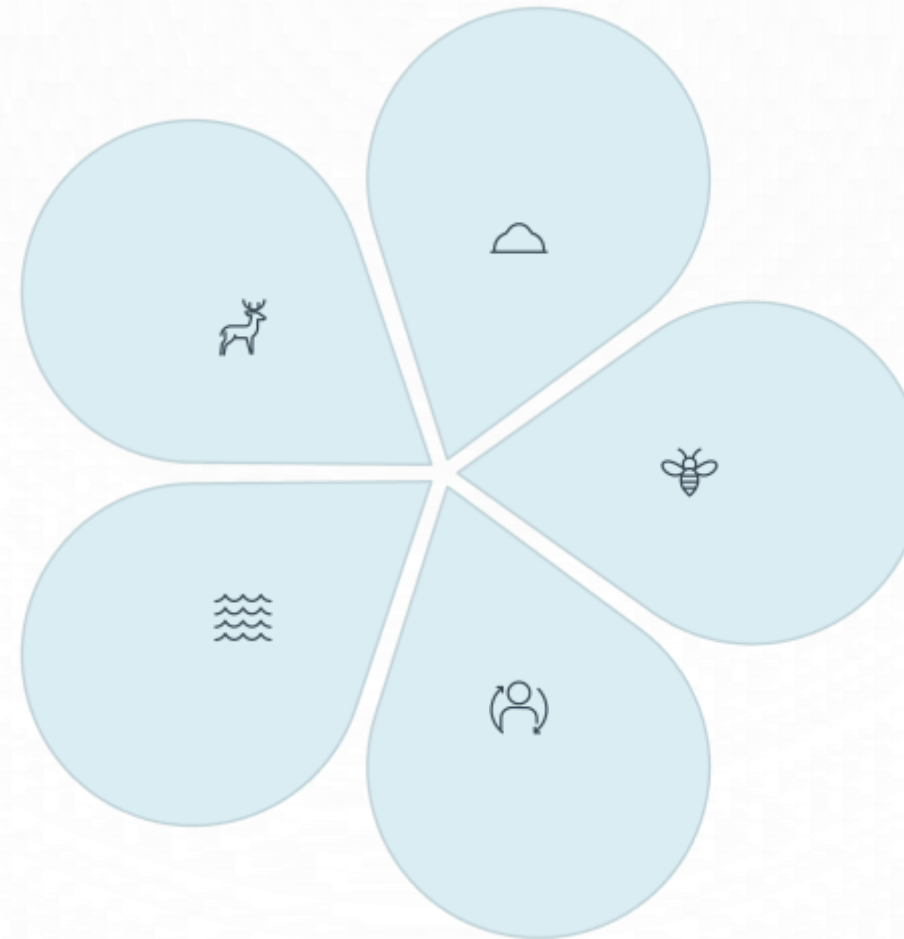
The Ecological and Cultural Value of Southern Grasses

Wildlife Support

Grasses provide essential forage for ungulates, birds, and invertebrates throughout year-round.

Water Quality

Dense vegetation filters runoff and recharges groundwater aquifers effectively.



Soil Health

Extensive root systems build soil structure, enhance organic matter, and stabilise slopes.

Pollinator Resources

Grassland flowers and seeds sustain diverse pollinator and beneficial insect communities.

Indigenous Heritage

Native peoples utilised grasses for medicines, fibres, and ceremonial purposes for millennia.

Endemic and relict southern grasses represent irreplaceable links connecting contemporary ecosystems to ecological communities spanning tens of thousands of years. Their protection ensures preservation of both natural heritage and essential ecosystem services upon which human communities depend.

Conclusion: Protecting Southern Grassland Legacy

Irreplaceable Heritage Endemic and relict grasses are living evolutionary treasures, irreplaceable links to ancient climates and ecosystems now vanished.	Survival Strategy Species persistence depends upon informed conservation action, habitat protection, legal safeguards, and adaptive management.	Collective Responsibility Successful recovery requires collaboration between scientists, land managers, policymakers, and engaged communities working toward shared conservation goals.
---	---	---

Southern endemic and relict grasses face unprecedented challenges from habitat loss, invasive species, altered disturbance regimes, and climate change. Yet restoration remains achievable through dedicated conservation effort. By restoring grassland patches, reintroducing appropriate fire regimes, controlling invasives, and protecting endemic populations, we can stabilise these vulnerable species and ensure their survival. Together, we can restore and safeguard southern grasslands, preserving this irreplaceable botanical heritage for generations yet to come.