

# 生物策略表

類別	生物策略 (Strategy)	
生物策略 STRATEGY	草原中的火災和野牛放牧導致多樣性 (Fire and Bison Grazing in Grasslands Lead to Diversity)	
生物系統 LIVING SYSTEM	北美大平原的濕地草原 (Great Plains mesic grasslands)	
功能類別 FUNCTIONS	#應付群落中的擾動 #維持生物多樣性 #Manage Disturbance in a Community #Maintain Biodiversity	
作用機制標題	兩種干擾的交互作用—野牛放牧模式和火災—透過在草原上形成植物群落的異質拼湊來增加生物多樣性 (The interaction of two disturbances—bison grazing patterns and fire—increases biodiversity by creating a heterogeneous patchwork of plant communities in grasslands.)	
生物系統/作用機制 示意圖		
作用機制摘要說明 (SUMMARY OF FUNCTIONING MECHANISMS)		
<p>北美大平原 (The Great Plains) 是位於美國和加拿大的密西西比河 (Mississippi River) 以西，以及洛基山脈 (Rocky Mountains) 以東的大片草原。數以百萬計的野牛 (bison) 在覆蓋大平原的高草草原 (tallgrass prairie) 上漫遊，並隨著牠們移動而在一片片的草地上放牧 (grazing)。雷電引起的野火或當地土著為了恢復草原而故意引起的火災都很常見。火和放牧方式之間的關係對高草草原上植物群落如何發展有很大影響。</p> <p>火災對生物多樣性 (biodiversity) 很重要，因為野牛較喜歡吃最近被焚燒過的草地區域上的草。野牛的放牧方式也會影響火勢的大小和強度。這兩種不同類型的干擾 (disturbance)—火災和放牧模式—之間的相互作用，有助於形成植物群落的異質 (heterogeneous) 或混合拼湊區塊 (patchwork)。舉例來說，這些相互作用導致植物高度、密度和物種混合的差異。這有助於在高草草原生態系統中支持更豐富的生物多樣性。</p> <p>科學家從三個層面來考量生物多樣性—遺傳多樣性 (genetic diversity) (物種中不同的基因和組合)、物種多樣性 (species diversity) (生態系統中不同物種的數量)，以及生態系統多樣性 (ecosystem diversity) (地區中有多少個不同的生態系統)。生物多樣性可幫助</p>		

生物適應環境變化、維持食物網 (food web) ，並提供生物所依賴的服務 (service) ，例如保存水資源和廢物分解。

現今，形成大平原的大部分土地都被作為牧場 (rangeland) 來生產牛隻。土地管理人員通常只管理牛隻的數量以及牠們在土地上放牧的地點和時間。很少再使用火災作為管理牲畜放牧的一種方式。取而代之的是，密集的輪流放牧 (rotational grazing) ，即動物在重度放牧的地塊之間快速移動，成為了一種較流行的管理方法。這種放牧方式可使牛隻最喜歡吃的植物在放牧時期之間復原。然而，這不會產生具有更豐富生物多樣性的植物區塊。

大自然保護協會 (The Nature Conservancy) 已成功使用火災和持續放牧牛群來管理其在俄克拉荷馬州 (Oklahoma) 的高草原保護區 (Tallgrass Prairie Preserve) 。這種方法有助於促進生物多樣性並提高農業生產率，並有助於支持原生植物及動物物種。甚至有證據表明這種方法在適當的情況下，可以在冬季減少牛隻對蛋白質補充劑的需求。這可能導致管理成本降低。

The Great Plains are a huge expanse of grassland located west of the Mississippi River and east of the Rocky Mountains in the United States and Canada. Millions of bison used to roam the tallgrass prairies that once covered the Great Plains, grazing in patches as they went. Fires caused by lightning or set intentionally by native peoples to renew the grasslands were also common. The relationship between fire and grazing patterns had a big impact on how plant communities developed in the tallgrass prairie.

Fires are important to biodiversity, because bison prefer to graze patches of grassland that have been burned recently. Bison grazing patterns also influence the size and intensity of fires. The interactions between these two different types of disturbances— fires and grazing patterns—helps create a heterogenous, or mixed, patchwork of plant communities. For example, these interactions lead to different plant heights, density, and mixtures of species. This helps support more biodiversity in tallgrass prairie ecosystems.

Scientists think of biodiversity on three levels—genetic diversity (different genes and combinations within a species), species diversity (the number of different species within an ecosystem), and ecosystem diversity (how many different ecosystems are found in a region). Biodiversity helps organisms adapt to environmental changes, maintain food webs, and provide services that life depends on, such as water retention and waste decomposition.

Today, most of the land that made up the Great Plains is managed as rangeland for cattle production. Land managers usually only manage the number of cattle and where and when they are grazing on the land. Fire is rarely used anymore as a way to manage cattle grazing. Instead, intensive rotational grazing approaches, where animals are moved rapidly between heavily grazed plots, have become more popular as a management approach. This style of grazing allows the plants that the cattle most like to eat to recover between grazing sessions. However, it does not produce the patchwork of plants that leads to greater biodiversity.

The Nature Conservancy has successfully used fires and continual cattle grazing to manage its Tallgrass Prairie Preserve in Oklahoma. This approach helps to promote biological diversity and increases agricultural productivity, and can help support native plant and animal species. There is even some evidence that this approach, where appropriate, could reduce the need for protein supplements in cattle during winter months. This would lead to lower management costs.

<b>文獻引用 (REFERENCES)</b>
<p>「野牛較喜歡靠近最近被焚燒過的區域，因為在火災後會有優質的再生草苗 (regrowth)。當只有提供給野牛的部分區域被焚燒，在焚燒區塊的密集放牧使未被焚燒區塊的放牧推遲，這導致燃料的累積，以及未被焚燒區塊發生火災的可能性提高。」</p> <p>“Bison prefer recently burned areas because of the high-quality regrowth after a fire. When only a portion of the area available to bison is burned, intense grazing of burned patches postpones grazing on unburned patches, which results in an accumulation of fuel and an increased probability of fire in unburned patches.”</p>
<b>參考文獻清單與連結 (REFERENCE LIST)</b>
<p>Fuhlendorf, S. D., D. M. Engle. (2001). Restoring heterogeneity on rangelands: ecosystem management based on evolutionary grazing patterns. <i>BioScience</i> 51: 625-632.  <a href="https://academic.oup.com/bioscience/article/51/8/625/220557">https://academic.oup.com/bioscience/article/51/8/625/220557</a></p>
<b>延伸閱讀: Harvard 或 APA 格式 (取自 AskNature 原文; 若為翻譯者補充, 請註明)</b>
<p>Carstens, A. (2021). Canopies enhance plant biodiversity. <i>AskNature</i>. Retrieved from:  <a href="https://asknature.org/strategy/canopies-enhance-plant-diversity/">https://asknature.org/strategy/canopies-enhance-plant-diversity/</a></p>
<b>生物系統延伸閱讀連結 (LEARN MORE ABOUT THE LIVING SYSTEM/S)</b>
<p><a href="https://asknature.org/system/flowering-plants?post-type=Biological%20Strategies">https://asknature.org/system/flowering-plants?post-type=Biological%20Strategies</a></p>
<b>撰寫/翻譯/編修者與日期</b>
<p>周聖祥翻譯 (2021/04/06) ; 譚國銻編修 (2021/06/23) ; 張勝凱 (2021/11/22) ; 陳柏宇編修 (2022/01/02)</p>
<b>AskNature 原文連結</b>
<p><a href="https://asknature.org/strategy/fire-and-bison-grazing-in-grasslands-lead-to-diversity/">https://asknature.org/strategy/fire-and-bison-grazing-in-grasslands-lead-to-diversity/</a></p>