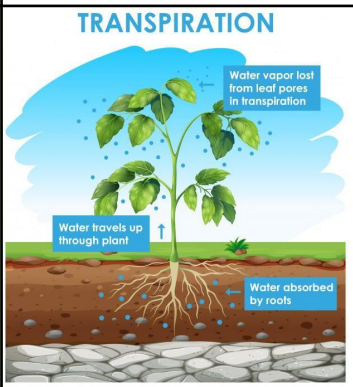
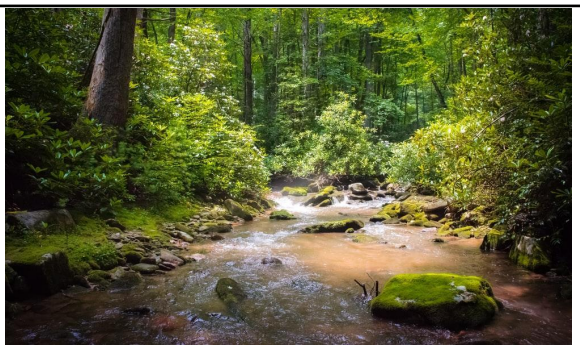
生物策略表

類別	生物策略 (Strategy)
生物策略 STRATEGY	葉片氣孔抽取水分穿透植株 (Leaf pores draw water through plants)
生物系統 LIVING SYSTEM	植物 (Plants)
功能類別 FUNCTIONS	#調控水分貯存 #Regulate Water Storage
作用機制標題	葉片中的氣孔使水分以蒸氣形式逸出，從而使根部抽取更多的水分穿透植株 (Pores in leaves allow water to escape as vapor, drawing more water up through the plant from the roots.)
生物系統/作用機制示意圖	 

作用機制摘要說明 (SUMMARY OF FUNCTIONING MECHANISMS)

森林中的樹木在水資源流動上有著重要作用。樹木，就像大多數植物，會經歷稱為蒸散作用 (transpiration) 的過程。根部吸收的水分流經植物體，在葉片中進行光合作用，接著水分會以水蒸氣形式從葉子釋放到空氣中。

這個過程對樹木不僅是個體層面的影響，如果以整片森林來看，這對整個生態系 (ecosystem) 的保水量都會造成影響。

在有大量樹木的森林中，很容易從河川流量 (streamflow) 和土壤水分含量變化中看出這過程的影響。舉例來說，木材採收 (harvesting) 或砍伐森林會大大增加河川流量，因為樹木砍伐後，剩下較少樹木能夠吸取水分並將其循環回大氣中。

不同類型樹木組成的森林吸收水分和蒸散能力各不相同。落葉樹 (deciduous tree) 會在不利條件下（例如太冷、水分不足等）落葉的樹種。由於蒸散過程透過樹木的葉片進行，因此落葉樹在休眠季節時蒸散作用會大大減少。這意味著落葉樹例如橡樹 (oak)、楓樹 (maple)，和山核桃 (hickory) 會使更多的雨水滲入土壤（而不是進入根部，並通過樹葉擴散到空氣中），並最終流向下游。相比之下，常綠樹 (evergreen tree)（如松樹pine）終年保留其葉片，並且顯示具有較高的年蒸發散量 (annual evapotranspiration)（結合植物的蒸散作用和土壤的蒸發作用evaporation），因此減少了河川流量。

落葉樹通過季節性產生更高的出水量 (water yield) 在維護生態系中發揮重要作用。土壤水分和河川流量的增加為社區提供了寶貴的資源。較高的流量可以幫助填充蓄水庫，減輕乾旱季節的缺水情況。因此，在都市流域 (municipal watershed) 和其他關注水資源的地區，考量森林轉變 (forest conversion) 造成的影響之非常重要。如果森林從落葉樹轉變為常綠樹，那麼當地社區肯定會看到某種形式的出水量下降。(Leon Wang, 2020)

Forest trees play a major role in influencing the flow of water resources. Trees, like most plants, undergo a process called transpiration. This is where water taken up from the roots moves through the plant to be utilized for photosynthesis in the leaves. The water is then released from the leaves into the air as water vapor.

This process has not only an effect on trees as individuals, but when compounded across an entire forest, it has an impact on the water retention of the ecosystem as a whole.

In forests with a large amount of trees, the effects of this process are readily seen in the changes in streamflow and soil water. For example, harvesting or cutting down forests substantially increases streamflow because fewer trees are able to draw up and cycle the water back into the atmosphere.

Forests with different types of trees vary in their capacity for water interception and transpiration. Deciduous trees are species that shed their leaves when conditions are unfavorable (such as too cold, not enough water, etc.). Since the transpiration process occurs through the trees' leaves, deciduous trees transpire much less during their dormant seasons. This means that deciduous trees such as oak, maple, and hickory allow more rain to seep into the soil (rather than into roots and through the leaves into the air) and eventually flow downstream. In contrast, evergreen trees (like pines) retain their leaves year-round, and have been shown to have higher annual evapotranspiration (combining transpiration through plants and evaporation from the soil) and therefore reduce streamflows.

Deciduous trees play an important role in ecosystem maintenance by seasonally generating higher water yields. This increase in soil water and streamflow provides a valuable resource to the community. The higher flow can help fill storage reservoirs and mitigate water shortages during drought seasons. Thus, in municipal watersheds and other areas where water resources are of concern, it is important to consider the effects of forest conversion. If forests are converted from deciduous trees to evergreen trees, then local communities will surely see some form of water yield reduction. (Leon Wang, 2020)

文獻引用 (REFERENCES)

參考文獻清單與連結 (REFERENCE LIST)

Baskin, Y. (1997). *Work of nature: how the diversity of life sustains us*. Diane Pub Co.

Swank, W. T. and N. H. Miner. (2008). Conversion of hardwood-covered watersheds to white pine reduces water yield. *Water Resources Research* 4: 947-954. (https://doi.org/10.1029/WR004i005p00947)

Swank, W. T. and J. E. Douglass. (2006). Streamflow greatly reduced by converting deciduous hardwood stands to pine. *Science* 185: 857-859. (https://science.sciencemag.org/content/185/4154/857)

延伸閱讀**: Harvard** 或 **APA** 格式（取自**AskNature**原文；若為翻譯者補充，請註明）

生物系統延伸資訊連結 (LEARN MORE ABOUT THE LIVING SYSTEM/S)

https://asknature.org/system/plants?post-type=Biological%20Strategies

撰寫/翻譯/編修者與日期

李志軒翻譯 (2021/04/04)；譚國鋆編修 (2021/06/24)；林有駿編修 (2021/12/27)；陳柏宇編修 (2022/01/02)

AskNature原文連結

https://asknature.org/strategy/leaf-pores-draw-water-through-plants/