

地景保育工作單位與資訊查詢網址：

- 農委會林務局
<http://www.forest.gov.tw>
- 高雄市政府農業局生態保育畜牧科
<http://agri.kcg.gov.tw/?who=animal>
- 國立高雄師範大學地理學系
<http://www.nknu.edu.tw/~geo>
- 國立台灣大學地理環境資源學系
<http://www.geog.ntu.edu.tw>
- 國立台灣大學地質科學系
<http://www.gi.ntu.edu.tw>
- 國立東華大學自然資源與環境學系
<http://www.nres.ndhu.edu.tw>

行政院農業委員會林務局 發行
地址/台北市杭州南路1段2號 電話/02-23615441
網址/ <http://forest.gov.tw>

 **國立高雄師範大學地理學系 編輯**
地址/高雄市苓雅區和平一路116號 電話/ 07-7172930
網址/ <http://www.nknu.edu.tw/~geo>

A large, circular, grey, viscous mud volcano erupting, with a person standing nearby for scale. The mud is thick and swirling, forming concentric rings around a central point. A person in a red shirt is standing on the edge of the mud flow, providing a sense of scale. The background shows a dense forest of green trees.



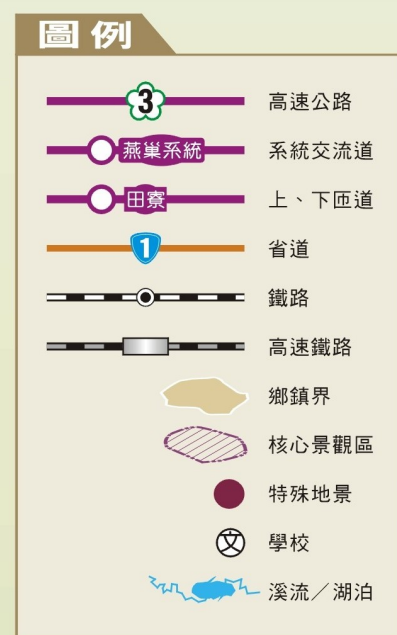
田寮月世界



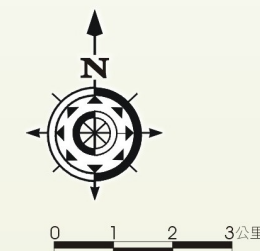
308高地西眺草山月世界



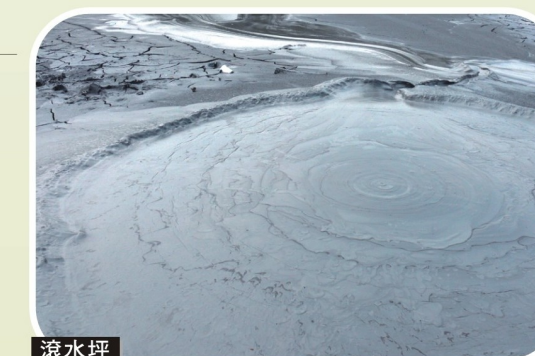
田寮月世



Design by Lusen 晉業 盧森 2011.10



草山月世界(二寮)東望308高坡



澆水坪



新養女



烏山頂泥火山

自然地景是指具保育價值的自然區域、地形、植物及礦物，自然物質與作用的認識、探討，是選定對象的著重原則。

自然保留區是為了保護具有代表性的生態體系或獨特地形、地質意義，或具有基因保存、永久觀察、教育研究價值及珍稀動、植物所劃定的區域。為嚴格保護自然地景，目前政府已經劃定、設立19處自然保留區。

自然地景具有不可復原性，被破壞後可能就永久消失；自然地景也具有科學及教育意義，可透過研究，瞭解大地形成的過程，進行環境教育；部份特殊的自然地景，還具有高度景觀欣賞、遊憩或地方文化意涵的價值。

推動地景保育工作，除了可以保護自然地景，免於遭受人為破壞外，更可藉由教育宣導，讓民眾認識、瞭解特殊地景的珍貴價值，教導民眾如何欣賞自然地景，進而提昇環境保育意識。

文化資產保存法是自然地景保育工作的依據和經營、管理的規範。

自然地景保育工作的權責單位，中央為行政院農業委員會；直轄市為直轄市政府；縣（市）為縣（市）政府。

出版教育、解說等宣導品，辦理相關宣導和人員培訓活動，及與地方人士、團體溝通、互動，讓大眾瞭解、欣賞地景的價值與珍貴性，進而主動參與保育行動，為推動自然地景保育的重要工作。

地景保育工作必須由個人做起，欣賞時應盡量避免直接接觸，以減少人為干擾及破壞。此外，介紹給周遭親友，讓更多人認識這些大自然的珍貴資產，也是對地景保育的重要貢獻。個人不但可以向主管機關推薦具有保育價值的自然地景，而且若私有土地有具價值的自然地景，所有人也可以向主管機關申請指定為保育的地景。

來到保育區～腳步請放慢，輕輕的～聆聽大自然的呼吸聲....

● 泥岩惡地地景

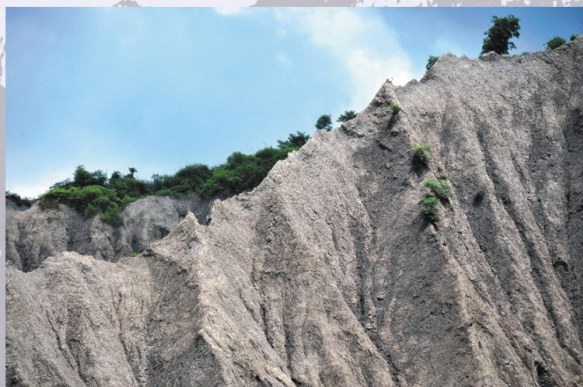
■ 惡地丘陵

台灣的泥岩惡地丘陵，主要分布於台南至高雄一帶，面積廣大，是南部地區的特殊地形景觀。泥岩軟弱，降雨與逕流容易造成地表侵蝕、崩塌，植被稀疏，甚至裸露、密佈V型侵蝕溝的陡峻坡地，則是泥岩惡地的主要特徵。



■ 侵蝕溝

河川在泥岩丘陵地區下切後，形成陡峻的河谷斜坡。泥岩相對不透水，大部分的降水形成地表逕流，進而發展出細密的排水網路，也在坡面刻劃出細密的小紋溝。逕流沿著紋溝匯集、流動，坡面侵蝕、崩塌產生的岩石碎屑，更增加流水的侵蝕能力，在坡面發育出規模更大的V形侵蝕溝。



■ 泥岩的濕膨脹、乾收縮與崩塌

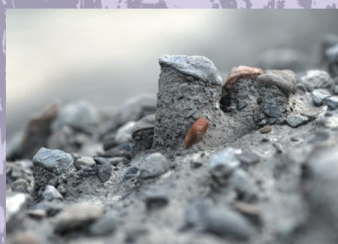
降水落於坡度陡峻、滿佈侵蝕溝的惡地丘陵，裂隙發達的泥岩因吸水而膨脹，並阻止水份繼續沿著裂隙滲入地下；雨後，泥岩再因水分蒸發而收縮，並恢復顆粒間的黏著力。重複的膨脹、收縮過程，使泥岩風化而變得疏鬆、裂隙擴大。陡峻斜坡表面的薄層風化泥岩，最後終會於降雨時因吸水、膨脹，沿著斜坡發生崩塌。



■ 土指與天然橋等小地形

土指是鬆軟土壤表面的指狀突起，頂上經常覆蓋堅硬物質，如小礫石等。這是因為堅硬物質抵抗雨滴打擊、侵蝕能力較強，保護了下部泥土，故於地表形成突出地面的土指。

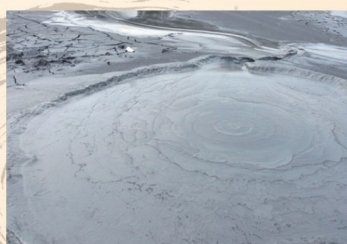
此外，泥流乾縮後，不僅本身產生裂隙，與地面間也會因為不等量收縮產生裂隙，再次降下雨水形成的逕流流動於裂隙中，可侵蝕出小規模地下河道，進一步發展出天然橋等小地形。



● 泥火山地景

■ 泥火山體形狀

台灣地區常見的泥火山有五種不同的外形，包括噴泥錐、噴泥盾、噴泥洞、噴泥盆和噴泥池。烏山頂泥火山自然保留區內目前可以看見典型的噴泥錐、噴泥盆和間歇性噴發的噴泥洞殘跡，新養女湖泥火山可見噴泥盾和噴泥池，滾水坪泥火山則有一個噴泥盾。



■ 噴泥活動

泥火山持續或間歇性噴發泥漿和可燃的石油氣。因此，可觀察的「泥漿噴發活動」包括噴發的泥漿泡泡、氣泡大小、噴發頻率或氣體流量、氣體成分、聲音、泥漿含水量、泥漿水位高低、泥漿粒徑大小、泥漿流量等等。



■ 泥漿流動與乾縮

泥漿流動與乾縮景觀包括泥漿噴濺、滴流於噴泥口形成宛如蠟燭蠟油滴垂般的景觀，和在較大規模泥流在流動中逐漸乾燥、擠壓，形成的類似繩狀熔岩、塊狀熔岩的景觀，和最後泥漿乾縮、龜裂，形成的各種縱、橫交錯線形紋路等等。



■ 侵蝕景觀

乾裂的泥漿會因為雨點打擊和逕流侵蝕，產生各式各樣的小景觀。如受小礫石或樹葉保護的地面，會形成多樣形狀的土指；乾裂泥漿會發育網狀的紋溝系統，較平坦的地面則會發育類似水系的紋溝系統；多次噴發、堆疊的泥漿地面，有時還會發育迷你伏流、天然橋和小峽谷地形。



● 河川與池塘

■ 下切曲流

許多人認為的二仁溪中、上游的丘陵地原來是平原，後來陸地抬升、河川下切，就形成了下切曲流地形。曲流彎曲河道的凹岸又稱攻擊坡，水流較快、侵蝕力高、河岸坡度較陡而常造成河岸崩塌，所以凹岸的惡地地形發育最明顯；另一側的河岸稱之凸岸或滑走波，水流流速較緩而常發生堆積，常形成大片淺灘地，是河階地主要分布的區位。



■ 河階地

河階地是河谷邊坡似樓梯般的地形，平坦的地面後倚、前臨較陡的斜坡，平坦面上可見河川沈積的沙、礫石層，是河谷的平原面，因陸地抬升等原因造成河川下切而殘存於河谷邊。河階地的平坦面，遠離河床而較無洪水、山崩災害，是山區重要的農業土地利用、聚落等的重要位置。



■ 曲流心、曲流頸、牛軋湖、環流丘

受曲流彎曲河道圍繞著的高地稱為曲流心，兩側河川攻擊坡所夾的最窄地帶稱為曲流頸。隨著曲流逐漸發展，曲流頸愈來愈窄，最終使得曲流頸被切穿、河川改道。遺留的曲流廢棄舊河道常堵塞成池，稱為牛軋湖，地勢較高的曲流心則稱為環流丘。大滾水就是環流丘地形，周圍的池塘則是牛軋湖。

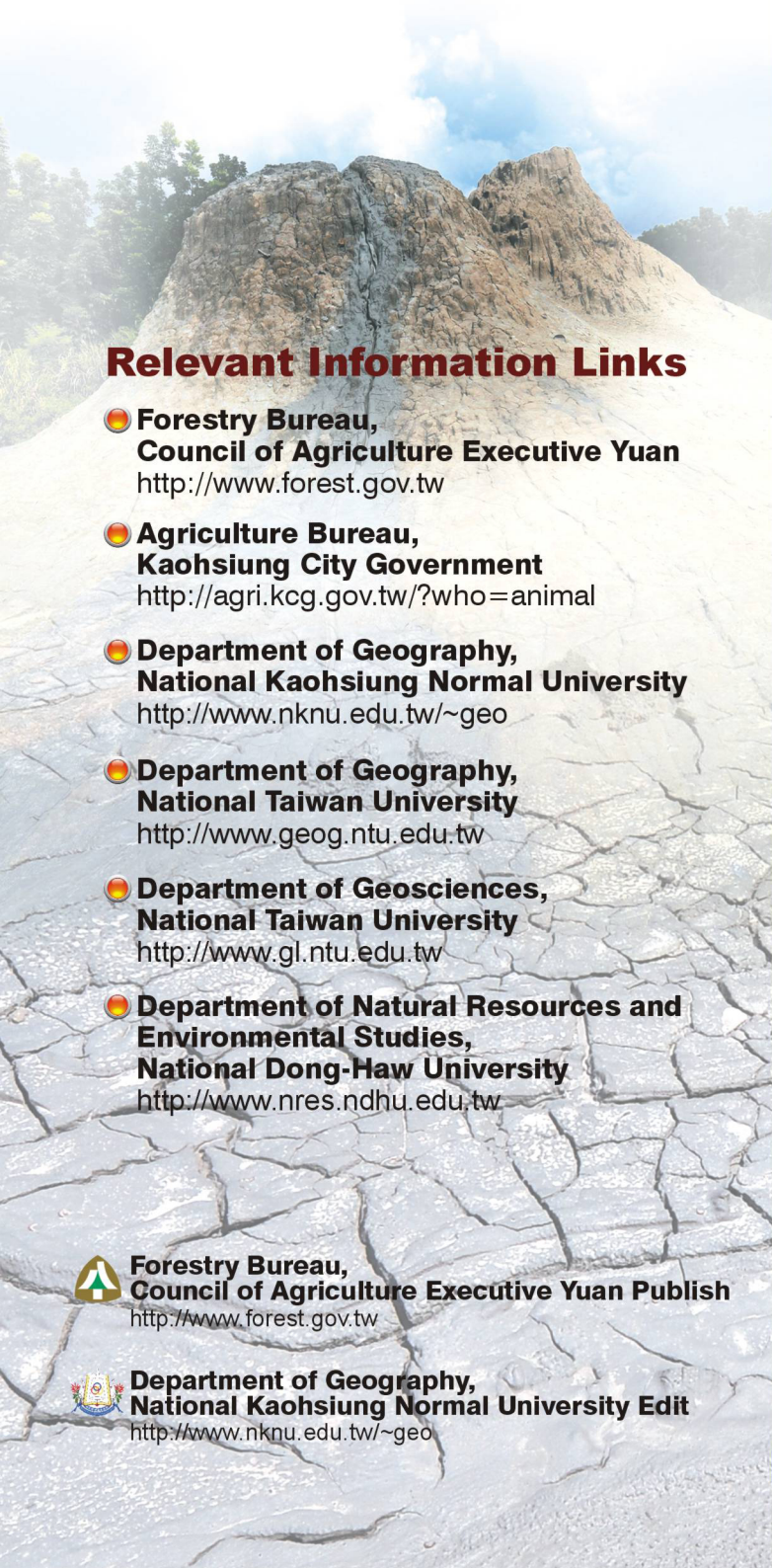
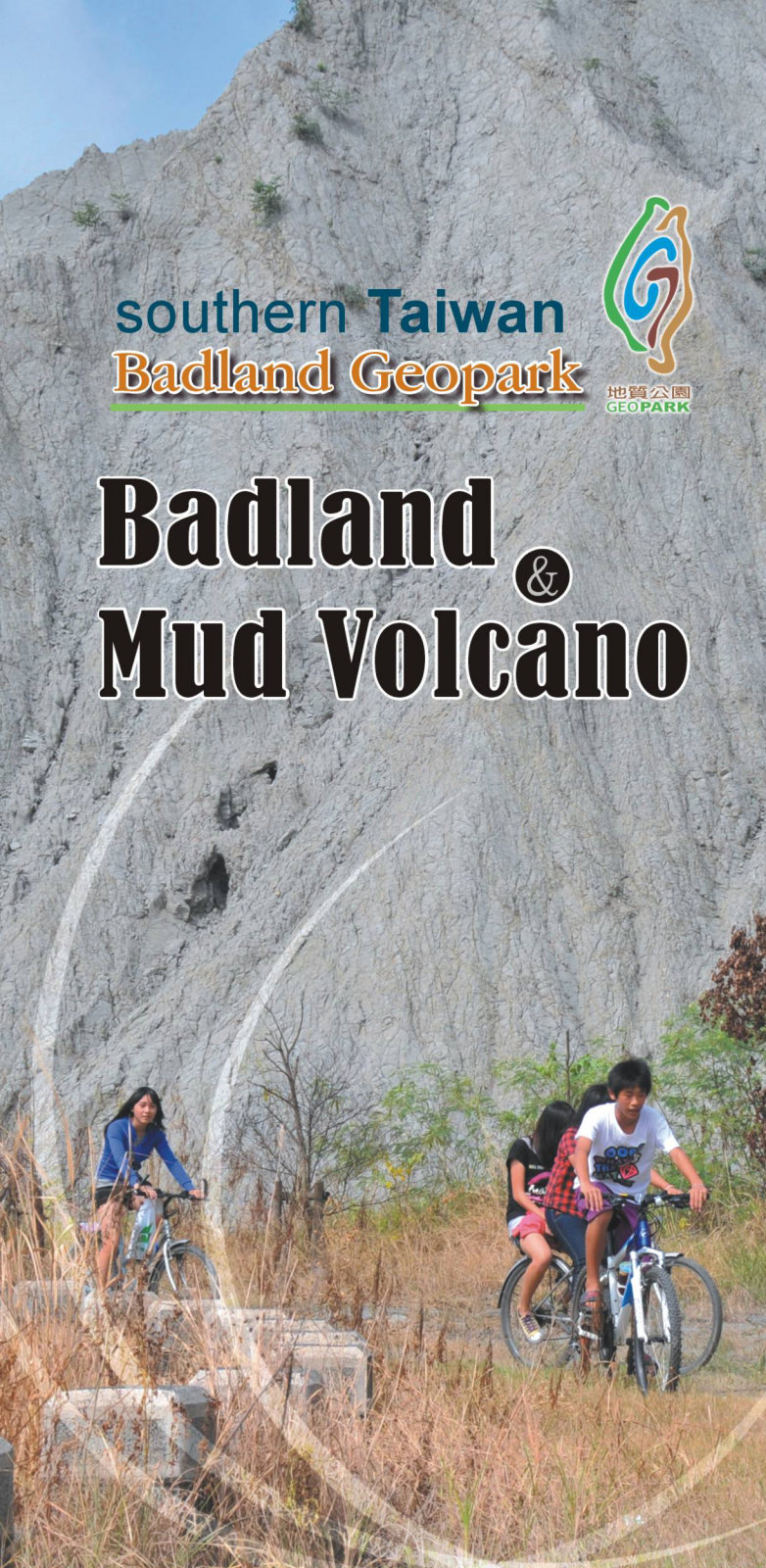


■ 池塘

惡地溝谷密布，缺乏平坦的可耕地，也少有地下水，再加上南部地區濕季和旱季的降水比約9：1，旱季時水資源非常缺乏。居民為了發展農業，最常用的方法就是在狹窄溝谷建造低矮土堤，一方面蓄水成池，提供水源，另一方面池塘淤滿後就形成河谷平地。惡地池塘，是充滿自然與文化意涵的地景，展現人們適應泥岩環境的特殊文化活動。



Badland & Mud Volcano



Relevant Information Links

- Forestry Bureau,
Council of Agriculture Executive Yuan
<http://www.forest.gov.tw>
- Agriculture Bureau,
Kaohsiung City Government
<http://agri.kcg.gov.tw/?who=animal>
- Department of Geography,
National Kaohsiung Normal University
<http://www.nknu.edu.tw/~geo>
- Department of Geography,
National Taiwan University
<http://www.geog.ntu.edu.tw>
- Department of Geosciences,
National Taiwan University
<http://www.gl.ntu.edu.tw>
- Department of Natural Resources and
Environmental Studies,
National Dong-Haw University
<http://www.nres.ndhu.edu.tw>

Forestry Bureau,
Council of Agriculture Executive Yuan Publish
<http://www.forest.gov.tw>

Department of Geography,
National Kaohsiung Normal University Edit
<http://www.nknu.edu.tw/~geo>

Southern Taiwan | Badland Geopark 《 Landscape Location 》



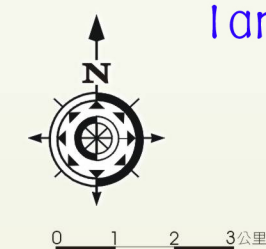
Tian-Liao Badland



To look Cao-Shan badland from a high place



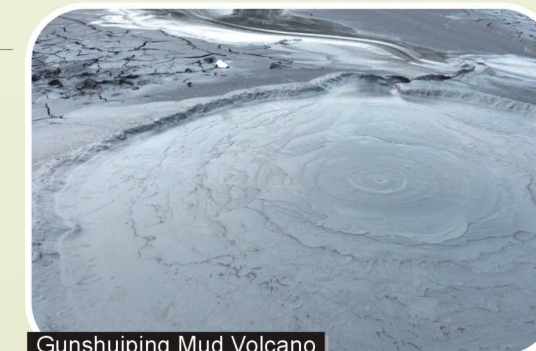
Tian-Liao Badland



二處紅線單字改為
landforms



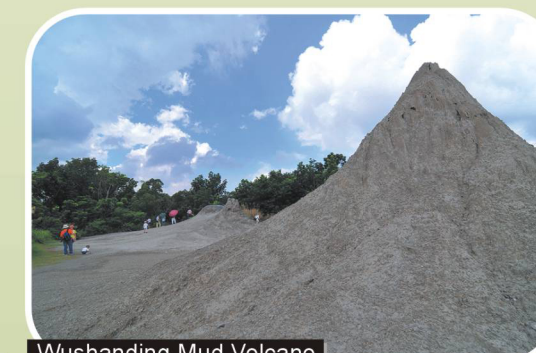
To look 308 high land from Cao-Shan badland



Gunshui Mud Volcano



New Yangnuhu Mud Volcano



Wushanding Mud Volcano

Natural Landscape Conservation

Natural Landscape refers to the natural areas, landscapes, plants, and minerals with conservation values, designated with criteria for understanding and exploration of nature materials and functions.

A Natural Reserve is a designated area of importance for representative ecological system, unique land formations, geological significance, precious wildlife, flora, fauna or other special interest, which is reserved and managed for fundamental gene conservation, long-term observation and to provide special opportunities for study or research. In order to carefully protect our natural landscapes, our government has already planned and established 19 Natural Reserves.

Significance of Natural Landscape Conservation

Natural landscapes are known for their irreversibility, and might be forever disappeared after damage. Natural landscapes are imbued with scientific and educational significance, and we can fully understand the process of land formation via research in order to conduct environmental education. Additionally, some unique natural landscapes provide a high degree of landscape for appreciation, leisure, and local cultural value.

Promotion of landscape conservation not only impedes natural landscapes from vandalism but also allows the public to understand and appreciate the precious value of unique landscapes. Consequently, it helps educate the public how to appreciate natural landscape and eventually helps increase our conservation consciousness.

Management Regulations and Agencies

Cultural Heritage Conservation Law is the standardized law by which all enforcements, managements and regulations of natural landscape conversation activities are abided.

The responsible agency in charge of natural landscape conservation is Council of Agriculture, Executive Yuan for the central government, municipality government for the municipality level, and county/city government for county/city level.

Promotion of Landscape Conservation Activities

Promotion of landscape conservation activities consists of publishing educational and explanatory pamphlets, setting up activities for related advertising, conducting staff trainings, and communicating and interacting with local representatives and groups. All the efforts aim to allow the public to understand and appreciate the value and uniqueness of natural landscapes, leading them to actively join in conservation activities and take an important role in promoting natural landscape conservation.

Personal Contribution

Natural landscape conservation starts from us. While appreciating the beauty, we should avoid direct touch in order to reduce human disturbance and damage. In addition, we should try to engage our relatives, friends, and the like in exploring the nature, allowing more people to appreciate the precious resources imbedded in the nature. This is also an important contribution to the natural landscape conservation. Everyone is welcome to recommend any natural landscape with conservation value to the supervisor of each agency. Any private property owner with natural landscape value can also apply for designated conservation landscape from the supervisor of the agency.

Appreciation ✧ The Magnificent Breath of the Nature

Exploration ✧ The Amazing Geological Beauty of the Nature



Mudstone Badland Landscape

Badland Hill

The famous mudstone badland hills in Taiwan are mainly found in Tainan and Kaohsiung area, marking a unique landscape in the south. Badlands form in soft mudstones, rainfalls, and surface runoffs. The major features of mudstone badland contain surface erosion, collapse, sparse vegetation or steep slopes with scant massive erosion gullies.



Erosion Gully

After deep cut of mudstone hill, rivers are formed into steep valley hillsides. Mudstones are impermeable and most of the waterfalls cause surface runoffs and consequently form into dense drainage network and compact grooves on the slope surface. While surface runoffs accumulate and flow along with the grooves, the debris formed in the process of slope erosion and collapses consequently increase the erosion ability of running water and form subsequent



larger scale of V-shaped erosion gullies on the slope surface.

Saturated Swelling, Drying and Shrinkage and Collapse of Mudstone

When rain falls on the steep badland hills full of erosion gullies, mudstones are swollen after absorbing water, impeding moisture from getting into the ground through crack. After rain, mudstones shrink after moisture evaporation and restore adhesion between the particles. Repetitive shrink-swell process

results in mudstone weathering, loose mudstones, and subsequent bigger cracks. The thin layer of weathering mudstones on the steep slopes ultimately becomes swollen during the rainfalls and results in collapses along the slope.



Mudflow

The collapsed debris on the slope contains large amount of water and forms mudflow along with erosion gully. Some mudflows, moving slowly in short distance, accumulate in the erosion gullies and form tongue-shaped debris; some mudflows, mixing with large amount of surface runoff flow along with the erosion gully, increase erosion ability and trigger more debris accumulated in the gullies, leading to deepen and expand the erosion gullies.



Earth Finger and Nature Bridge

Earth fingers refer to the finger-shaped bumps found on the loose soil, often covered with hard and firm materials, such as small gravels and the like. These hard and firm materials resist the rain drops, often with stronger erosion ability to protect the underneath soil. Hence, the surface forms earth fingers standing above the ground. In addition, after the shrink-swell process, mudflow not only produces cracks but also generates cracks



with the surface owing to the different amount of contractions. Additionally, the surface runoffs formed after rainfall flowing in the cracks can erode and form small scale of underground rivers and further develop into natural bridges.

Mud volcano

Shapes of Mud Volcano

Five different shapes of mud volcano are found in Taiwan, including mud cones, mud shields, mud holes, mud marrs, and mud basins. Typical mud cones, mud basins, and periodic eruption mud holes are found in Wushanding Mud Volcano Nature Reserve. Mud shields and mud basins are found in New Yangnuhu Mud Volcano, and there is a mud shield in Gunshuiping Mud Volcano.



Mud Activity

紅線字刪除改為include

Mud volcanoes continuously or periodically emit mud and flammable gas. Hence, the observable “mud eruption activities” consist of mud bubbles, size of bubble, eruption frequency or volume of gas flow, content of gas, sound, mud water content, mud water level, mud particle size, and volume of mud flow.



Mudflow and Dry Shrinkage

Mudflow and dry shrinkage landscape include mud splash and the candle-like formation dripping down on the mud mouth, which eventually dry and compress with larger scale of mudflow to form ropy surface lava and blocky lava, creating various kinds of horizontal and vertical line patterns in the process of mud drying and cracking.



Erosion Landscape

Rain drops and surface runoff erosion help dry and crack mud to form all kinds of landscapes. For example, surface protected by pebbles or tree leaves forms various shapes of earth fingers. Dry and crack mud develops into netted groove system, and flatter surface creates water-like groove system. Furthermore, multi-splash and accumulated mud surface may form mini-lava, natural bridges, and small canyon landscape.



River & Pond

Incised Meander

The well-known hill located in the upper stream and middle of the Erren River used to be a plain, which was later with uplifted land and incised river to form the current incised meander. The under-cut slope of the curved meander stream is known as “attack slope” with faster water flow and higher erosion ability. Since the slope of the stream bank is steeper, the bank often collapses. Hence, the under-cut slope has faster and more obvious development of badland formation. The slip-off slope on the other side has slower water flow and easily accumulates mud to form large shallow area, leading to the major distribution area of river terrace.



River Terrace

River terrace is the ladder-like formation adjacent to valley slope. The back and the front of the flat land is next to and facing the steeper slope, and the accumulated sand, pebble layer can be found on the flat plain surface. The elevated land causes the incised river and left on the valley side. Located away from the river bank and free from flood and landslide/avalanche hazards, the flat surface of river terrace has become the most important location for agricultural use and village settlement.



Meander Loop, Meander Neck, Oxbow Lake, and Meander Core

Meander loops refer to the highland circulated by the curved meander river channel; the narrowest area pressed by the two sides of the under-cut slopes is known as meander neck. When the meander neck is growing narrower along with the gradual development of meander, the meander neck is incised through and a new river channel is created. The left meander and the abandoned old river channel are often blocked to form a pond, known as Oxbow lake. Dagunshui is a meander core formation and its neighboring pond is the Oxbow Lake.



Pond

Badland valley is densely covered in the area, lacking flat land and underground water for agriculture purpose. In addition, the waterfall ratio for raining season and dry season in the south is approximately 9 to 1, short of water resources in the dry season. While developing agriculture, the civilians are prone to building low clay mounds in the narrow valleys, partly using it as a reservoir pond for water supply. Yet, when the pond is overwhelmed with sand, it forms flat land. Badland pond is replete with natural and cultural landscape, mirroring unique cultural activities via which people adjust to the mudstone environment.



刪除紅線的字改為filled