

# **Topographical Linkages for Sustainable Forests**

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Higher biodiversity = **More sustainable**



Biodiversity

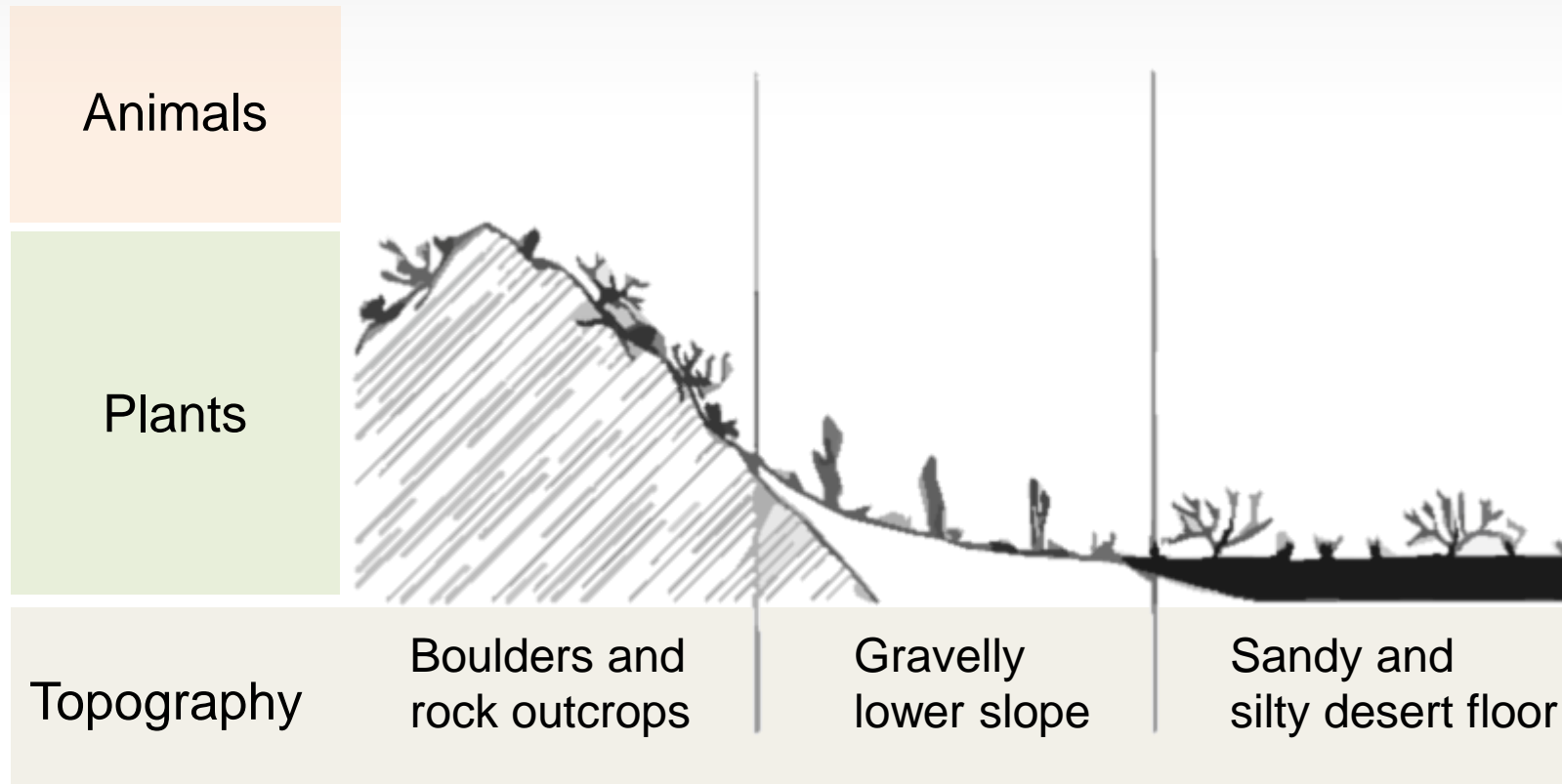


Sustainability of  
Forest Ecosystem

## Threatened biodiversity by **Climate Change**

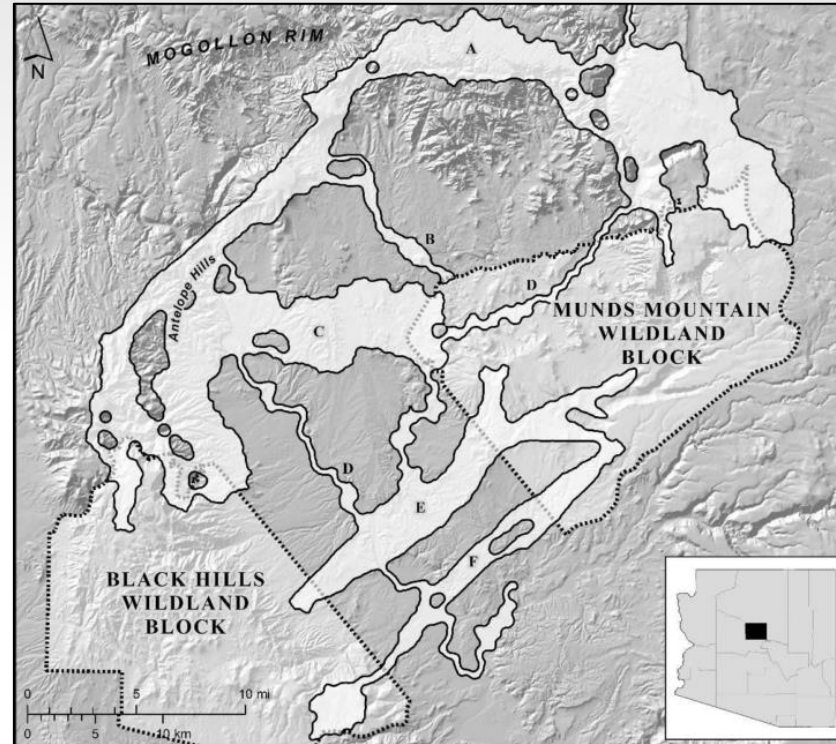


## Physical environments as “arena” of biological activity (Hunter, 1988)



Influence of topography and soils on distribution of plants and animals (revised by Hugget, 2004)

## Securing the Ecological Connectivity

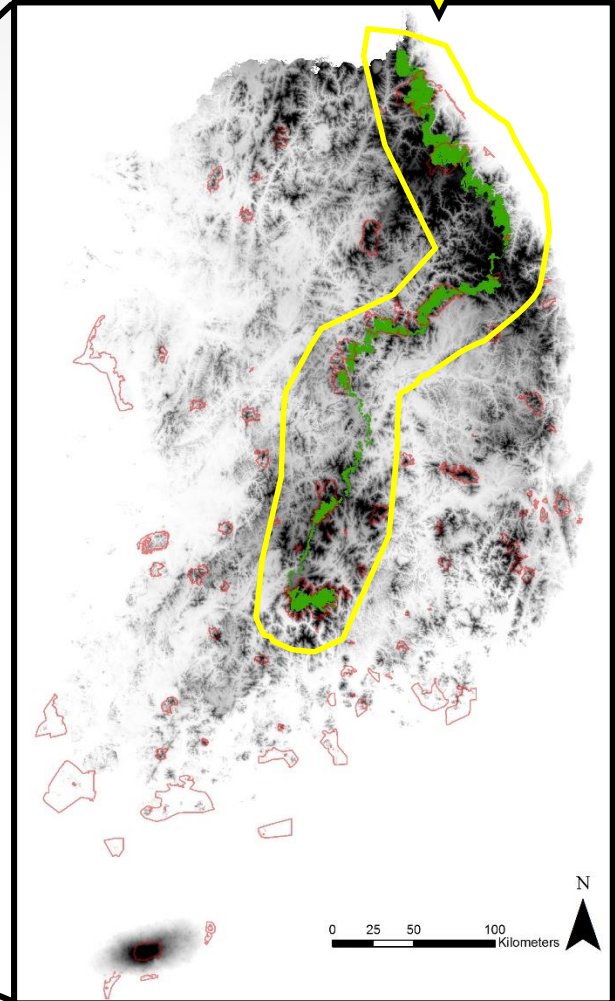
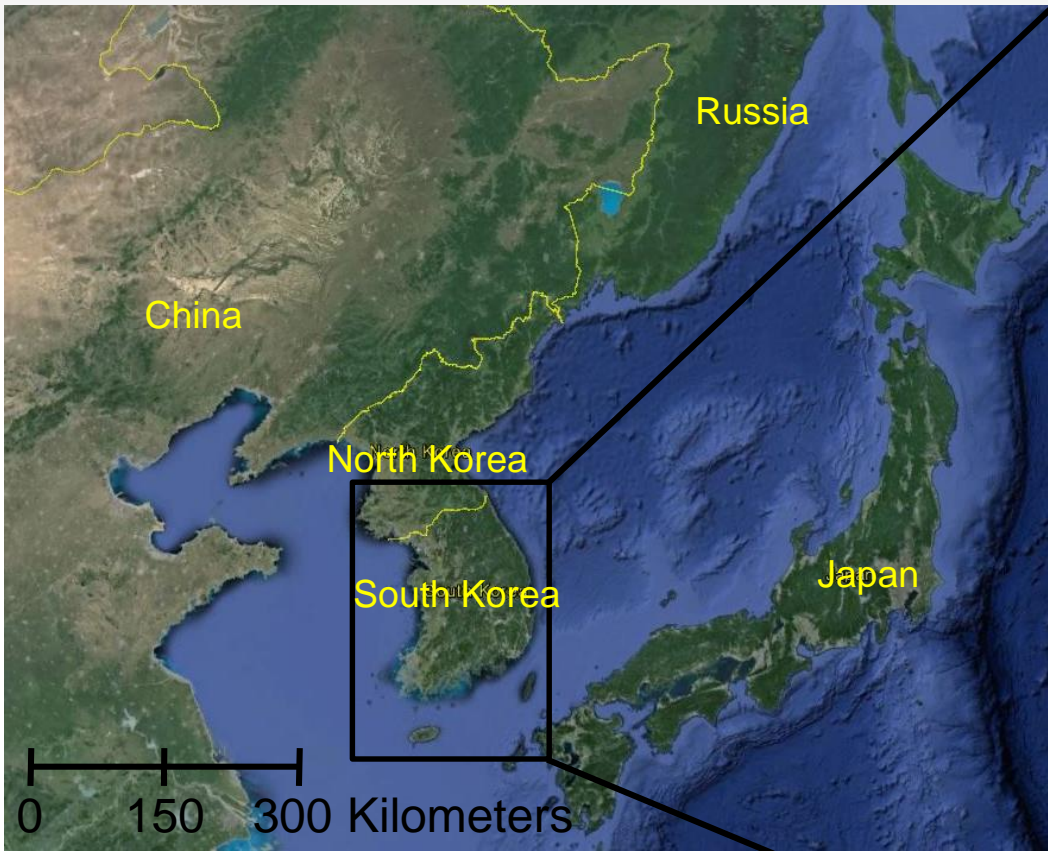


Map of the land facets linkage design  
(outlined in black) (Brost and Beier, 2012)

## Topographical linkages

“to support movement by species associated with land facet (based on topography), today and in the future.” (Brost and Beier, 2012)

## Key Ecological Linkage : 백두대간 Protected area (PPA)



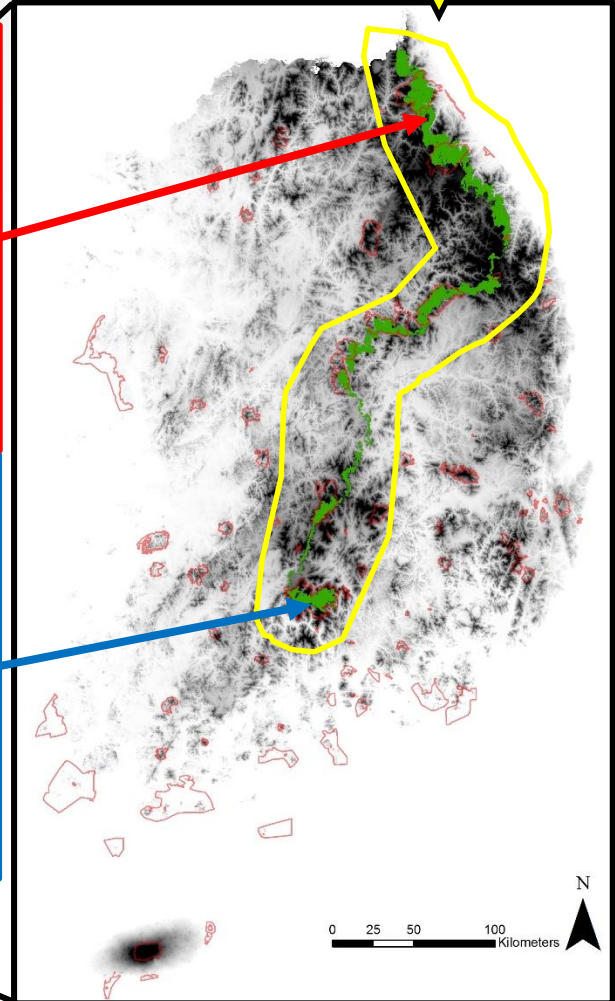
**Legend**

- National Parks (Red outline)
- PPA (Green fill)
- Elevation Value
- High : 1950
- Low : -5

0 25 50 100 Kilometers

N

## Key Ecological Linkage : 백두대간 Protected area (PPA)



**Legend**

- National Parks (red outline)
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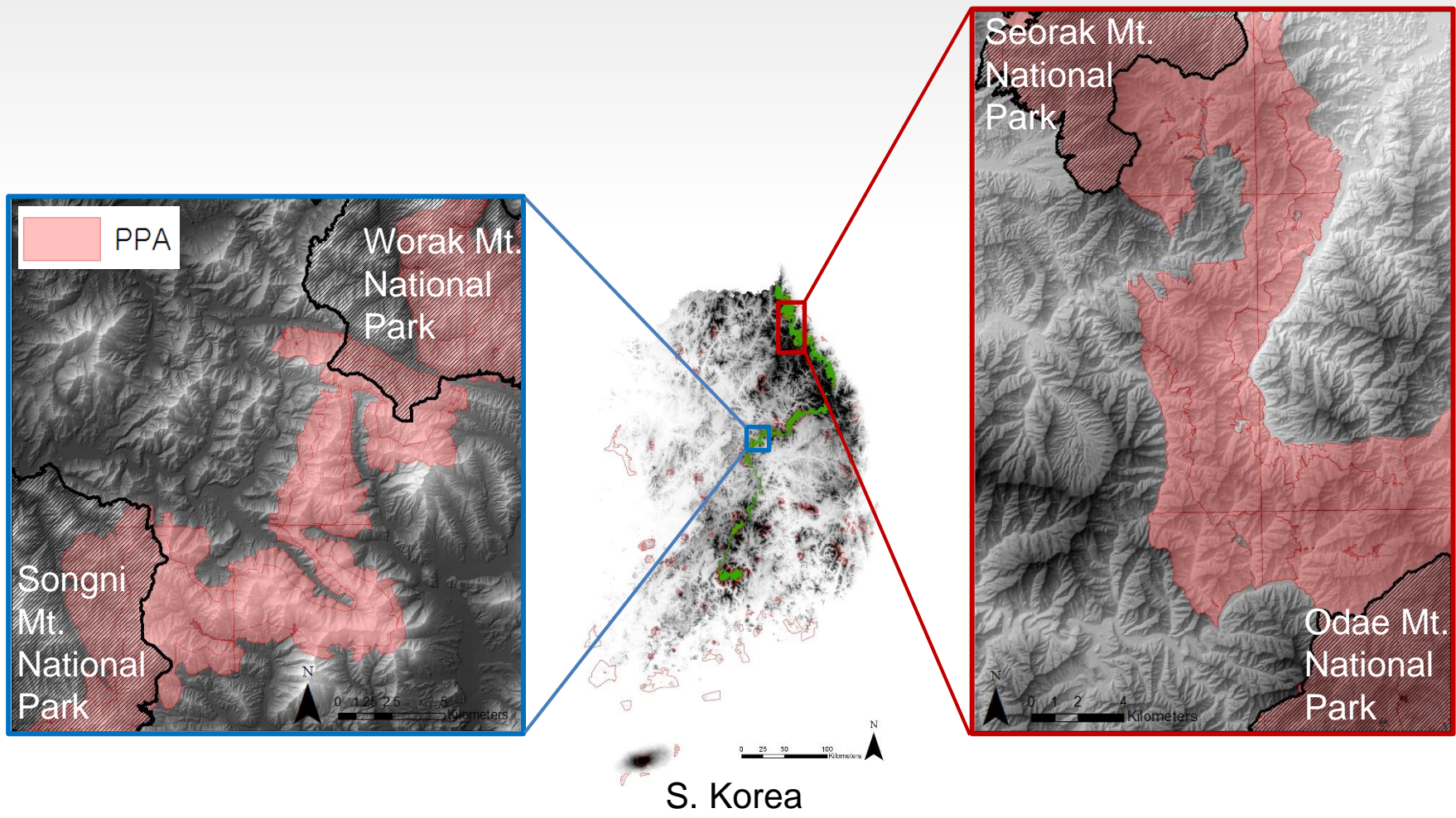
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**Does the current PPA include topographical linkages or not?**

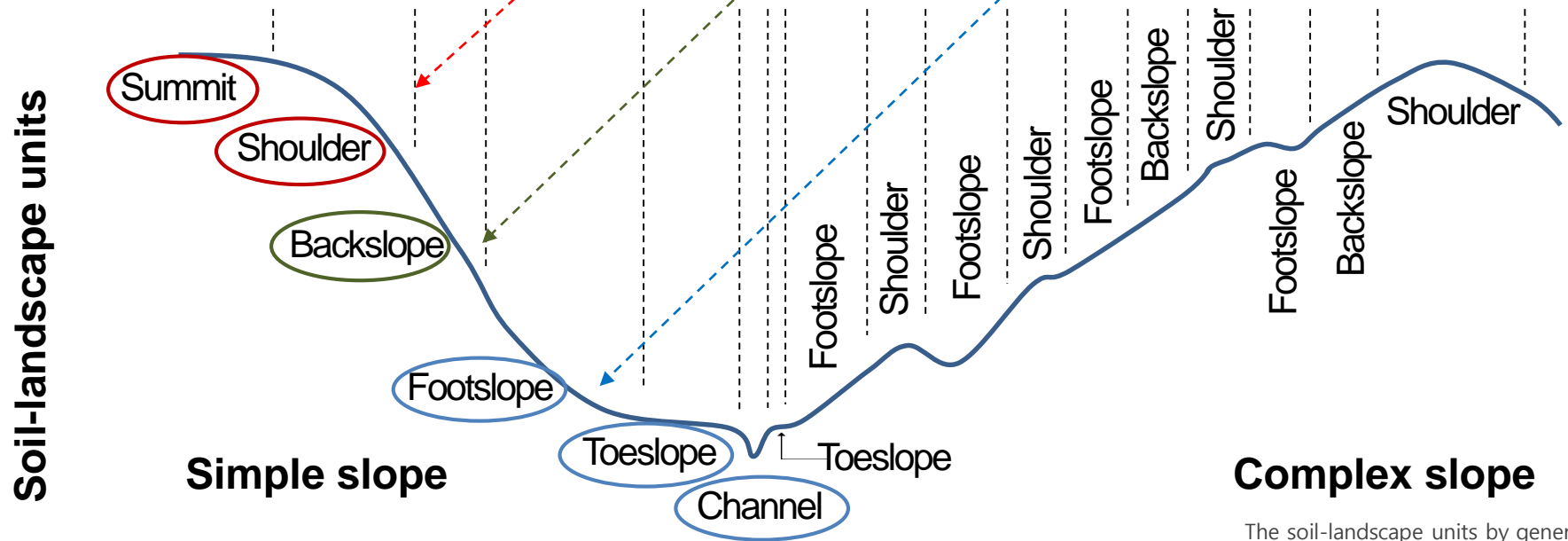
# Methods

## Study Sites



## 1. Generic Topographic Classification Concept

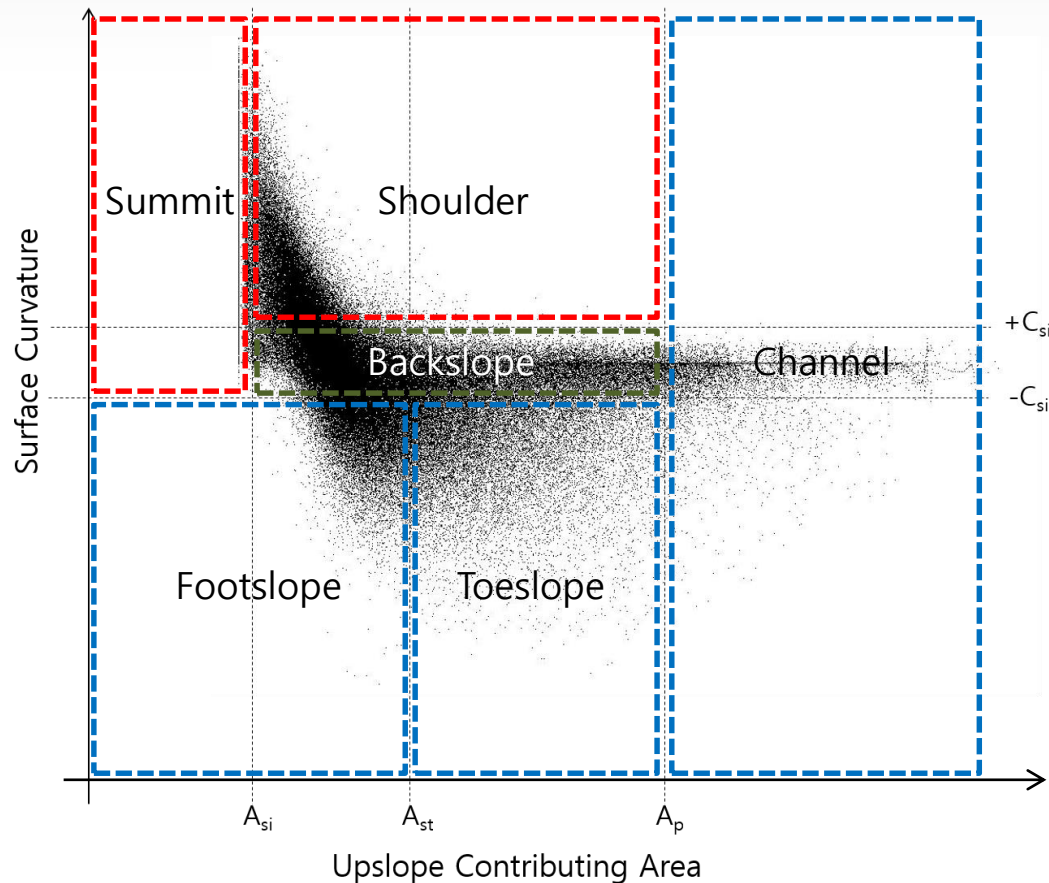
- The process of terrain formation : **erosion**, **transport** and **sediment** processes



The soil-landscape units by generic classification (revised by Park et al., 2001)

## 1. Generic Topographic Classification Method

- Relationship between **Upslope contributing area ( $A_s$ )** and **surface curvature ( $C_s$ )**



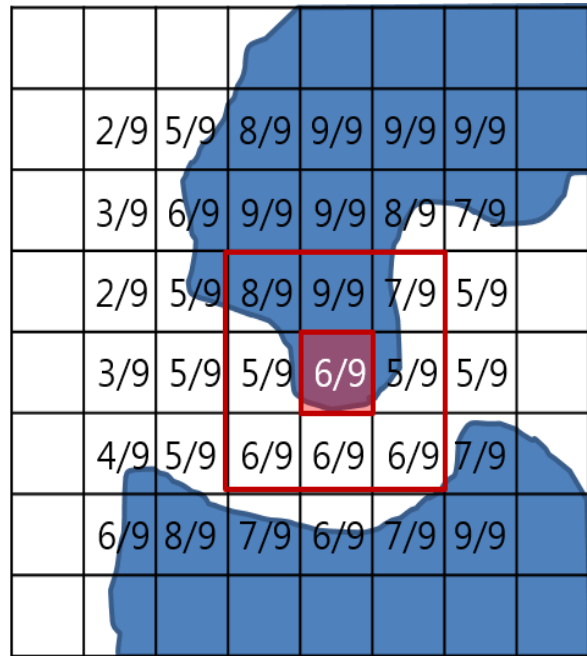
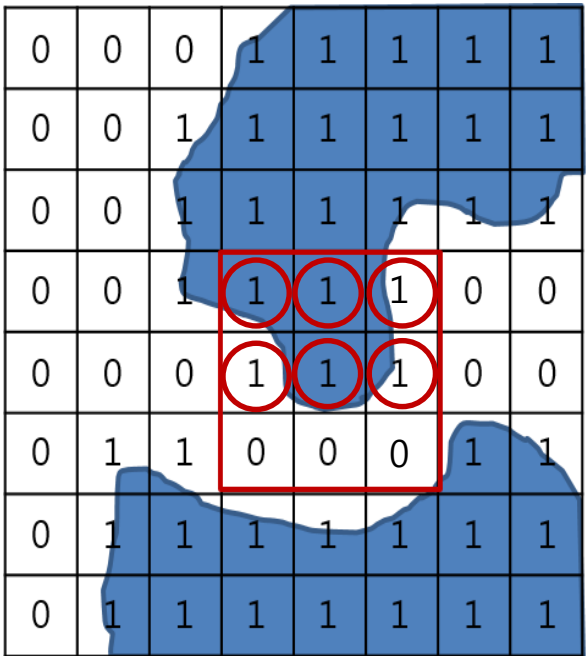
(SAGA & ENVI 4.5)

## 2. Designing linkages in PPA

### Identifying termini

#### Density Concept for zoning

(Focal Statistics of ArcGIS 9.3)



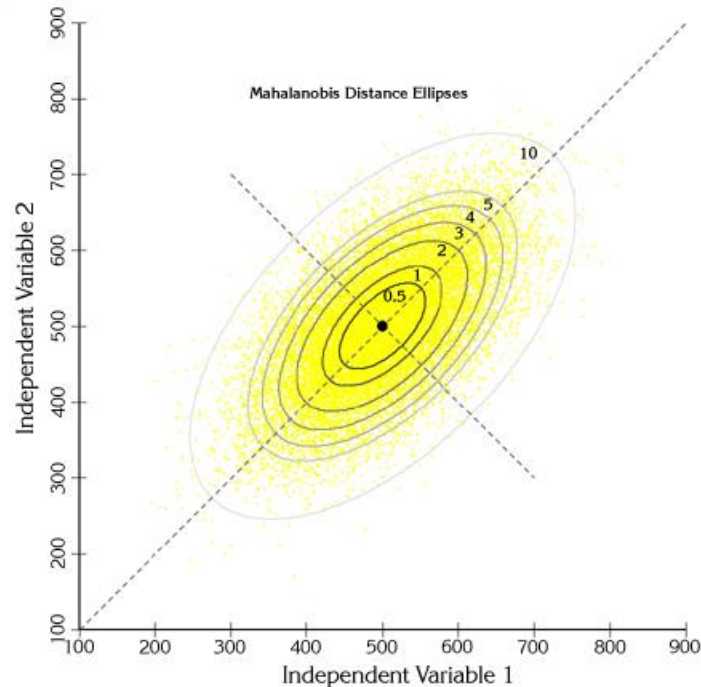
Density Concept (revised by Lee et al., 2005)

## 2. Designing linkages in PPA Least-cost path analysis

Cost surface

= Mahalanobis distance

: relative distance from a parameter point in a multi-dimensional space (Hayashi et al., 2001)

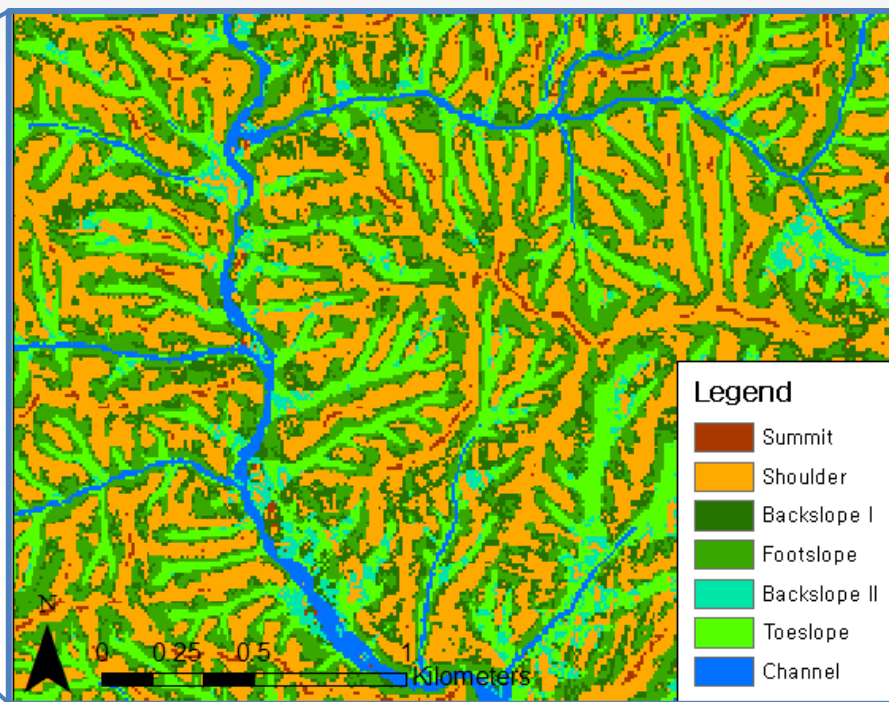
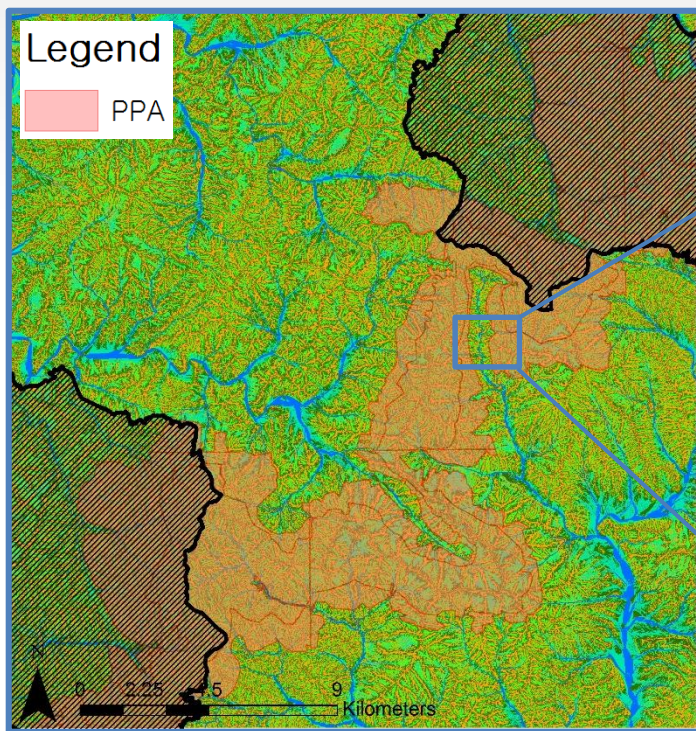


Mahalanobis distance ellipse (Jenness et al. 2013)

# Results



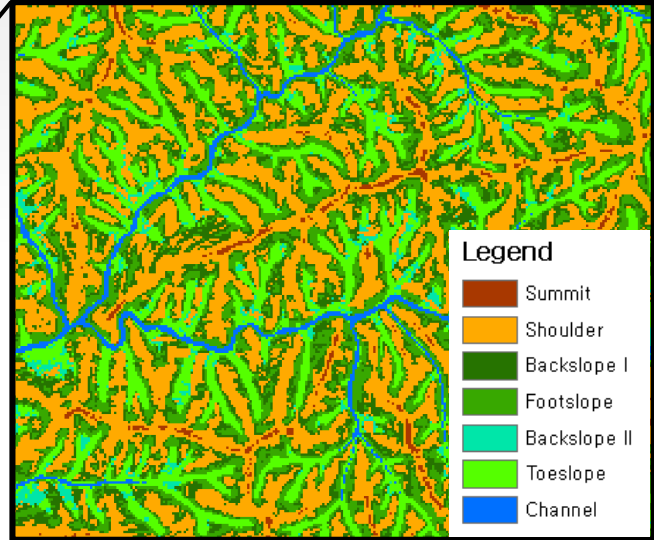
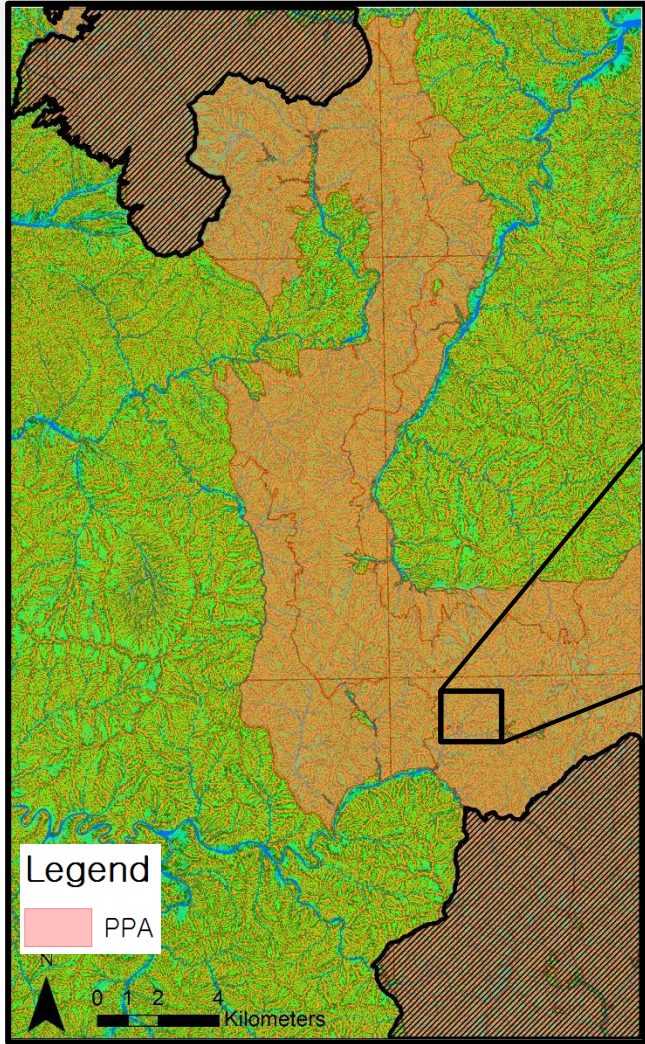
## 1. Result of Generic Topographic Classification Songni/Worak Mt.



List	Summit	Shoulder	Back Slope I	Foot slope	Back Slope II	Toe slope	Channel
PPA	1.51%	37.21%	19.42%	17.69%	4.19%	17.68%	2.29%

# 1. Result of Generic Topographic Classification

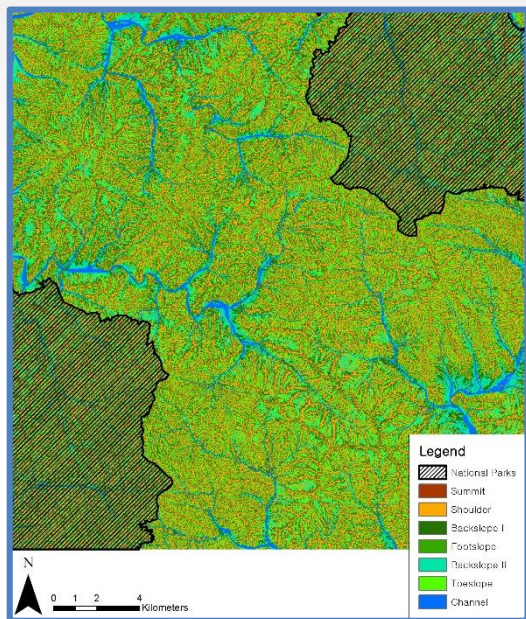
## Seorak/Odae Mt.



List	Summit	Shoulder	Back Slope I
PPA	1.67%	35.72%	16.97%
Foot slope	Back Slope II	Toe slope	Channel
22.67%	3.49%	17.84%	1.65%

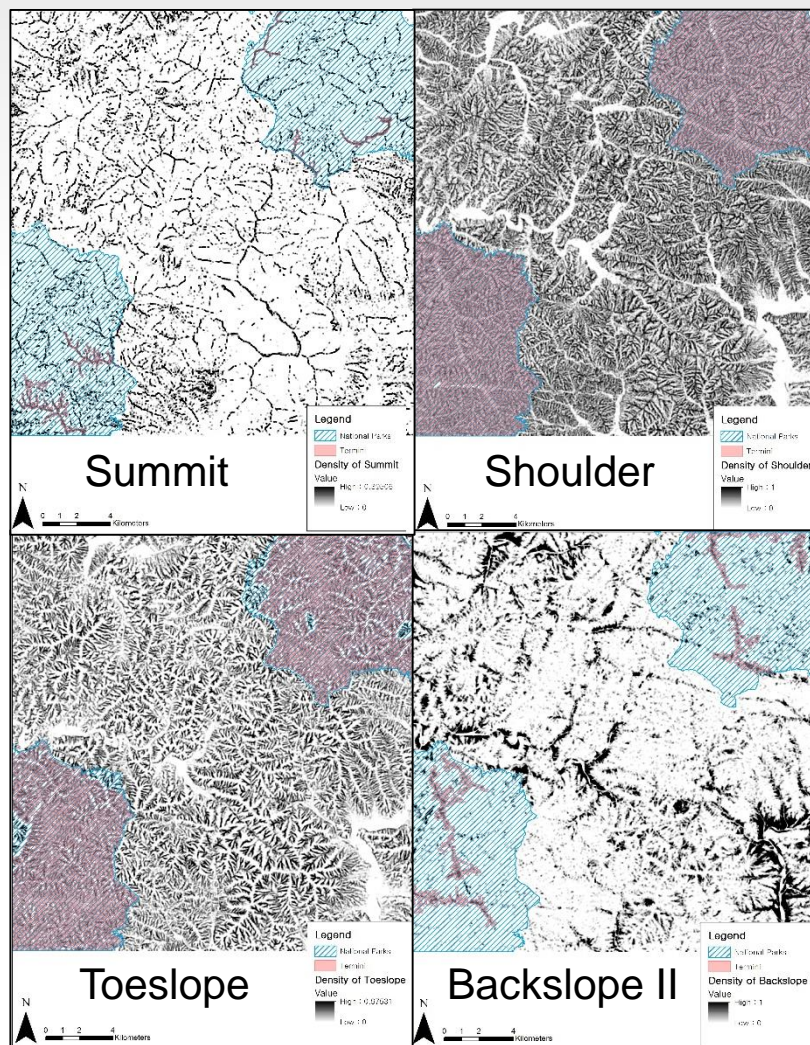
## 2. Designing linkages in PPA

### Identifying Termini



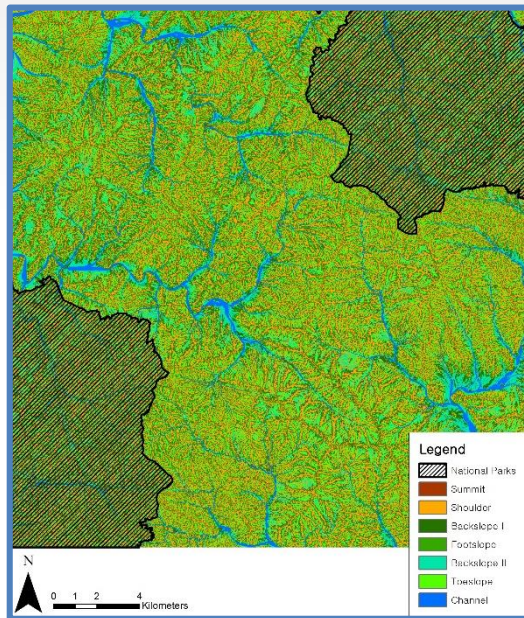
Songni/Worak Mt.

 = Higher density



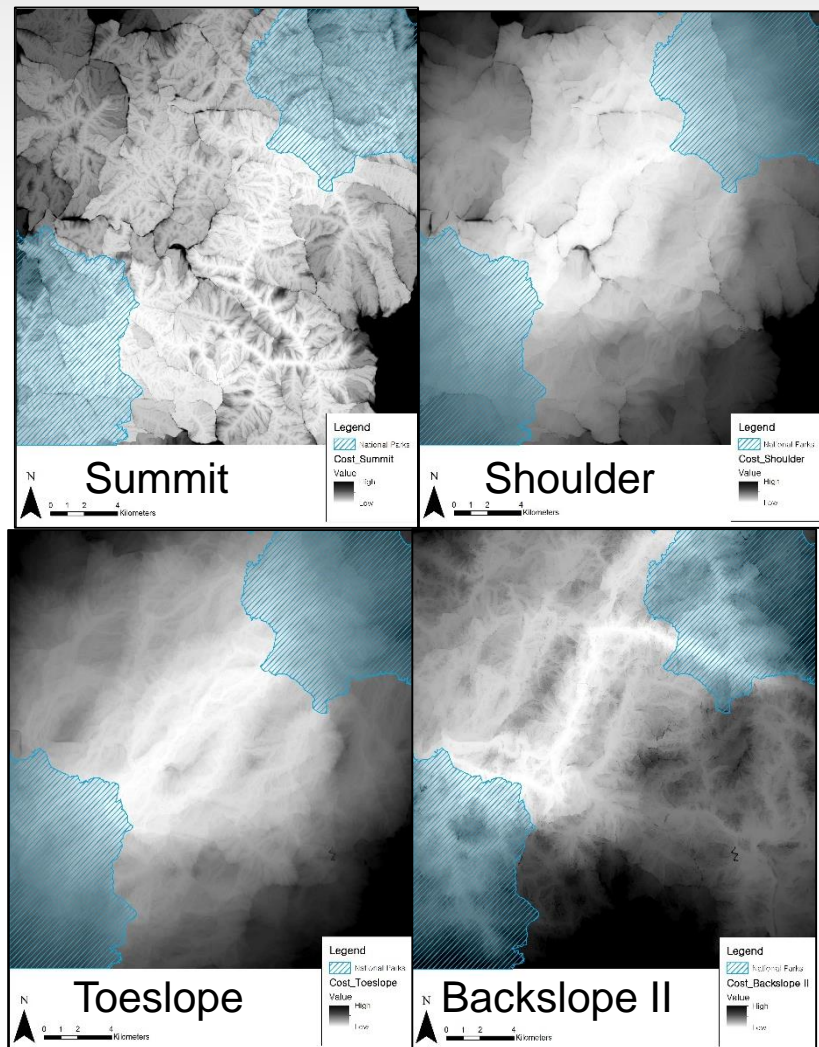
## 2. Designing linkages in PPA

### Cost surface results



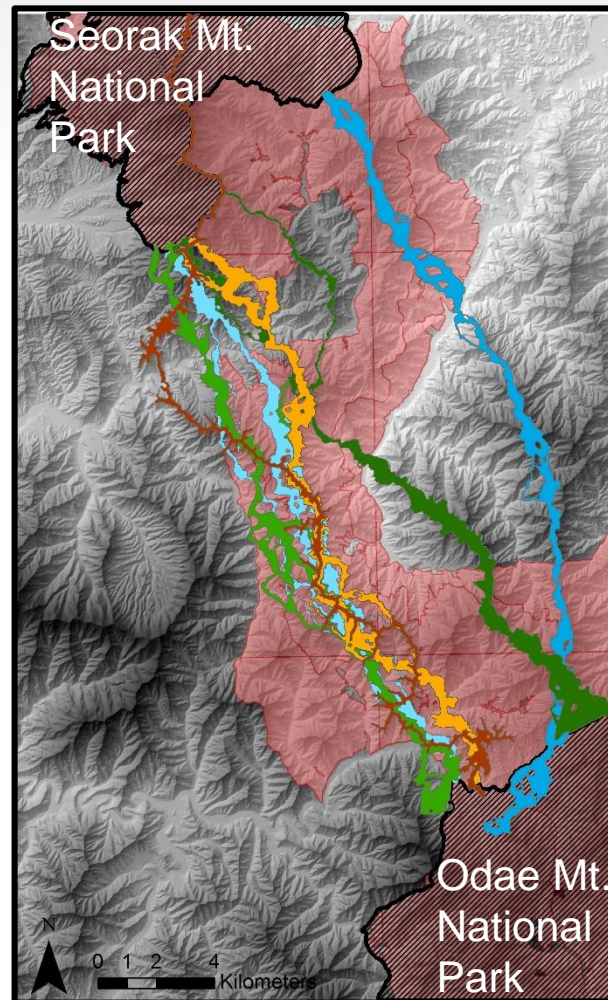
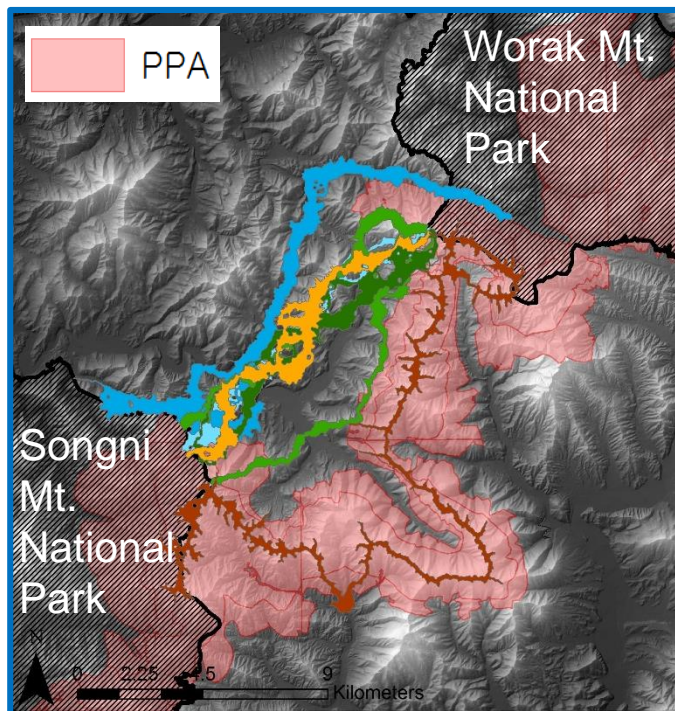
Songni/Worak Mt.

= Smaller differences from target topographic class



## 2. Designing linkages in PPA

Least-cost Path Analysis results



### Legend of Linkages

- Summit
- Shoulder
- Backslope I
- Footslope
- Backslope II
- Toeslope

# **Conclusions & Implications**

The PPA does not include topographical linkages, except summits

Shoulder (erosion) is the largest portion in the PPA

Lowland topography has to be reconsidered....

Extend the PPA to include the topographical linkages...

Include topographical linkages to conserve biodiversity in the forests

Support the sustainability of forest ecosystem from climate change



# Implications

One day, link North and South Korean forest and mountains.....



*Thank you for your attention :)*