

Background

The problem of Protected Area by land use change

- After the Saddle Island and Sapgyo Lake watersheds were designated as Wildlife Protected Areas(WPA), the risk of habitat disconnection increased due to the opening of the West Coast double-track railway in the nearby area.
- Significant damages are being caused to protected areas by various land uses. For example, there are uncertainties regarding the boundaries of protected areas, unauthorized dumping of garbage due to illegal fishing by residents, nearby shopping malls, residential areas, and cultivated land.

The Relationship between Climate Change and Land use change

- If forests are destroyed, soil erosion will occur. At this time, precipitation also increases, and it will have a great impact on the rate of soil erosion.

Objectives

We aim to find out the impact on the surrounding land use of the wildlife protection area through the analysis of land use changes. We also try to find out the relationships between climate change and land use change.

Study Site

Wildlife Protection Areas in the Republic of Korea, including the Jinyangho wildlife special protection area. The analysis range is 1 km from the boundary of the protection area.

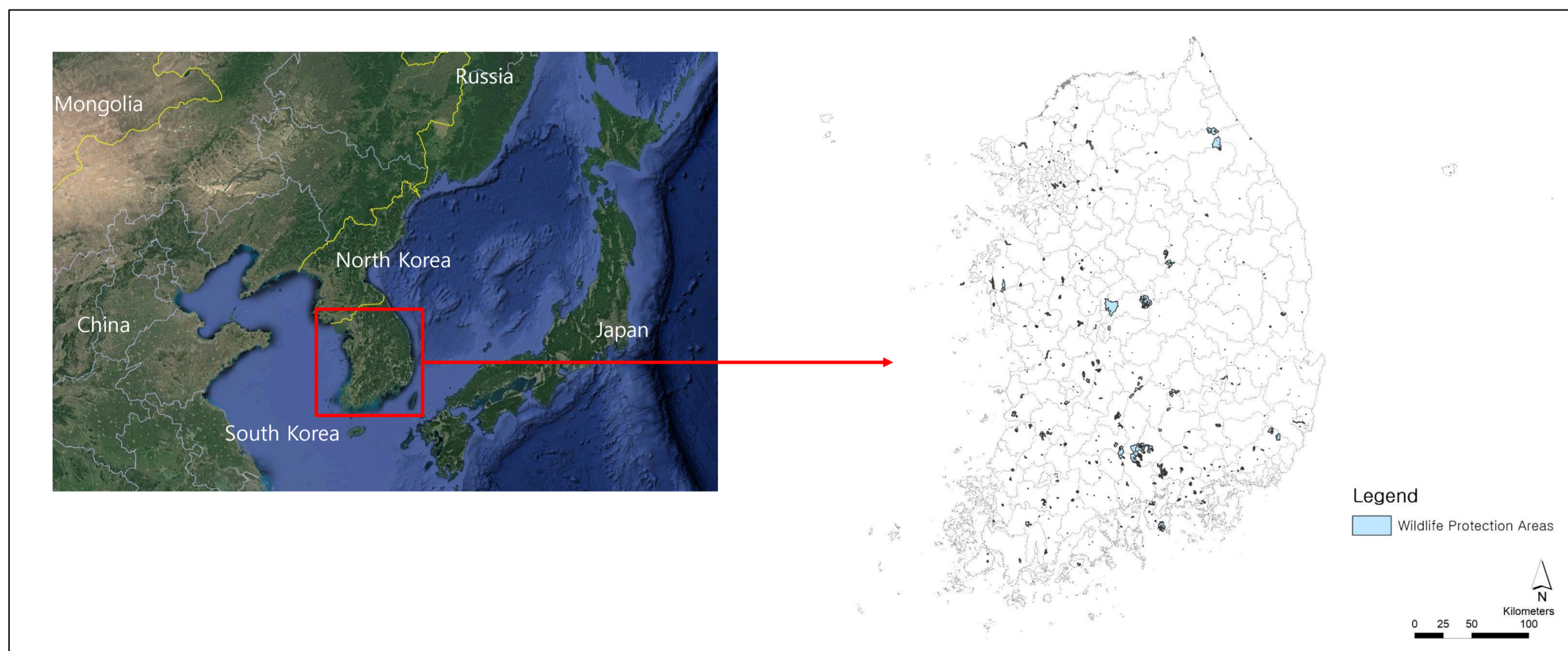
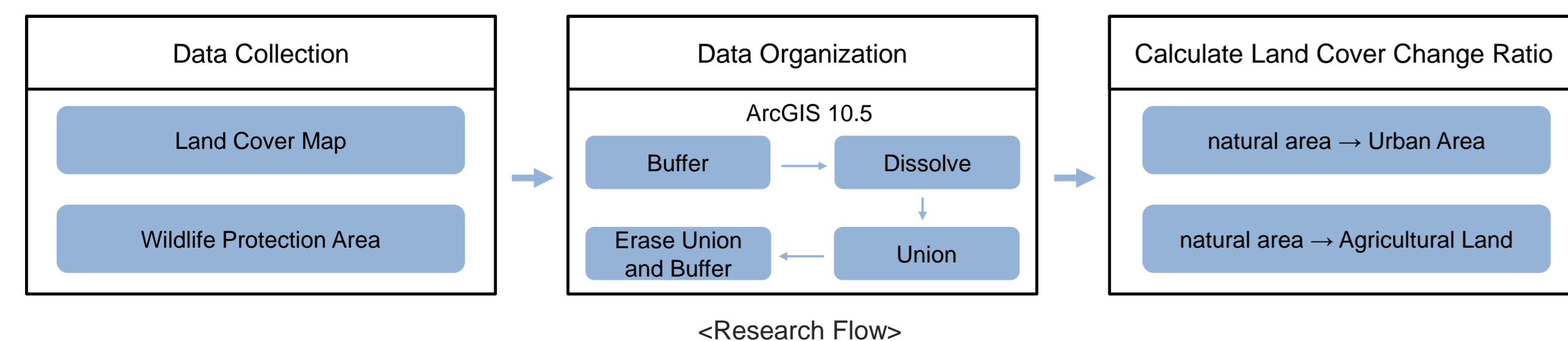


Figure1. Study Site

Methods



Data Collection

- Land cover map: Environmental Geographic Information Service(EGIS)
- Wildlife Protection Area: National Geographic Information Institute, Korea Database on Protected Areas(KDPA)

Organizing the Space Data of Wildlife Protection Area

Although it's a single WPA, it's separated into several small sections. We determined that it was reasonable to treat adjacent WPA as one. Therefore, using ArcGIS 10.5 spatial analysis tools(Buffer, Dissolve, and Union), we re-designated as one WPA if they were within 1 km of each other.

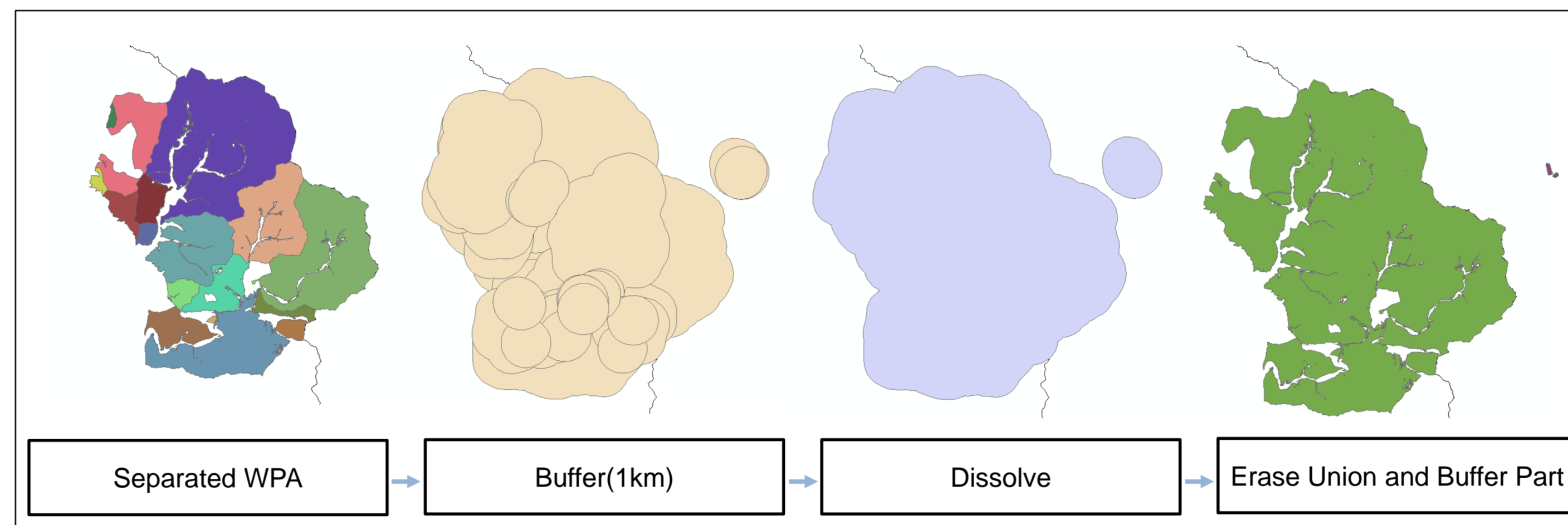


Figure2. The process of organizing the space data of the Wildlife Protection Area

Extract Land Cover Map by period

Land cover maps for the 1980s, 1990s, 2000s and 2010s were extracted with a buffer of 1km from each WPA boundary using ArcGIS 10.5 analysis tools(Buffer, Clip).

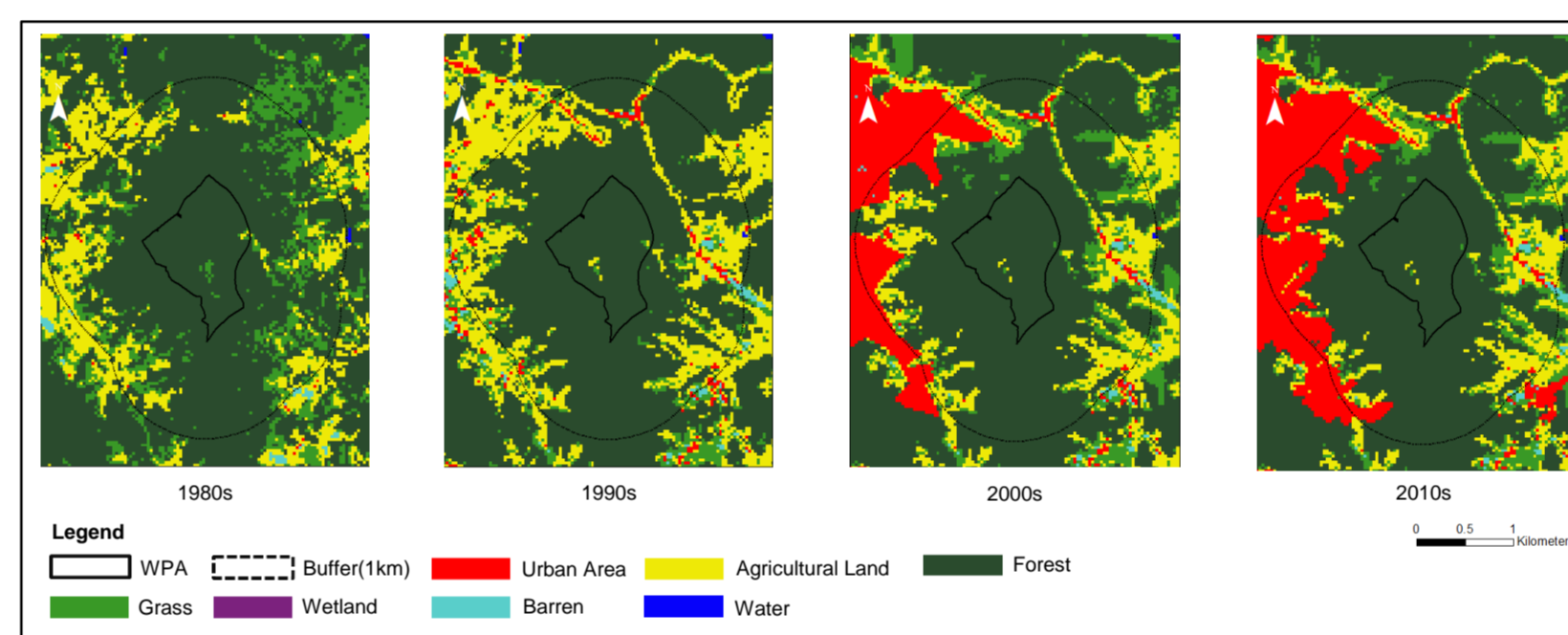


Figure 3. Example of land cover maps by year

Calculate Land Cover Change Ratio

- Using tabulate area(ArcGIS 10.5), we identified the areas that have changed from natural area covers(Forest, Grass, Wetland, Water) to Urban Area or Agricultural Land.
- Calculation Formula

$$\text{Rate of change from natural areas to Urban Area/ Agricultural Land(\%)} = \frac{\text{Area of change to the Urban Area/ Agricultural Land of period B}}{\text{Area of natural area of period B}} \times 100$$

A: Past year, B: Recent year

- Example (Figure4)

The rate of change from natural areas in the 1980s to Urban Area in the 2010s

$$\frac{(2+0+0) \times 900m^2}{(5+1+2) \times 900m^2} \times 100 = \frac{1800m^2}{7200m^2} \times 100 = 25\%$$

A: 1980s, B: 2010s

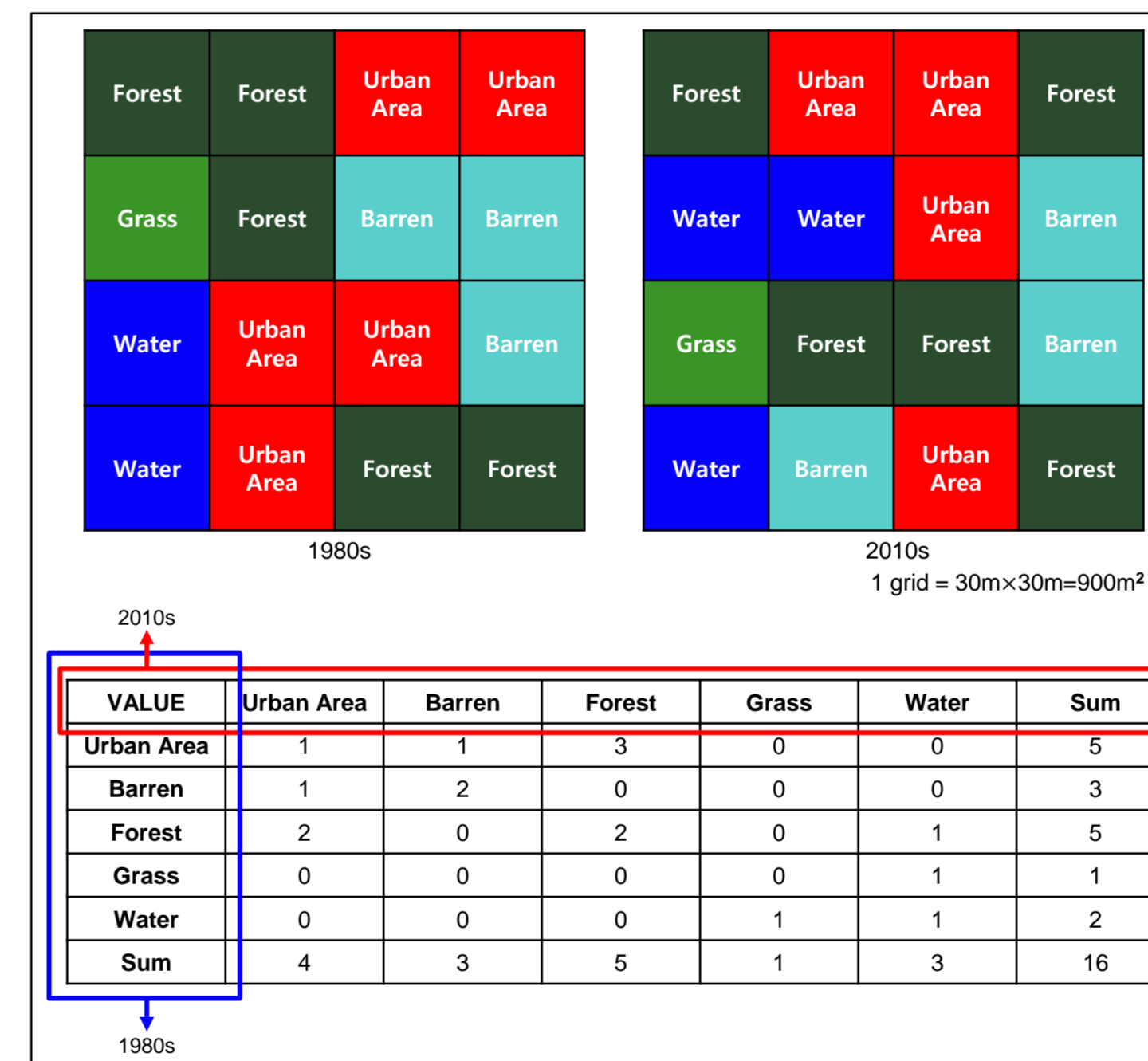


Figure4. tabulate area explanation

Rate of change in land cover before and after designation of Wildlife Protection Area

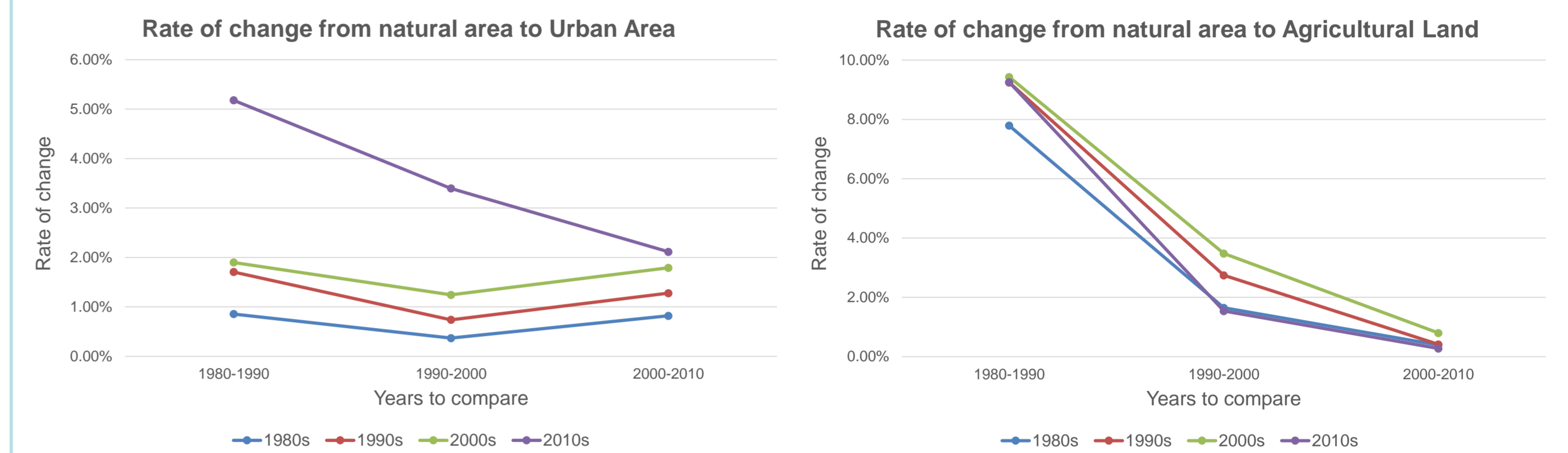
We identified the rate of change from natural areas to Urban Area and Agricultural Land by the designated period of the WPA.

Results

Rate of change in land cover before and after designation of Wildlife Protection Area

Table1. Mean Rate of Change in land cover before/after designation of wildlife protected area.

Designated year	1980s		1990s		2000s		2010s	
	Urban Area	Agricultural Land	Urban Area	Agricultural Land	Urban Area	Agricultural Land	Urban Area	Agricultural Land
1980-1990	0.85%	7.79%	1.71%	9.24%	1.90%	9.43%	5.18%	9.25%
1990-2000	0.37%	1.65%	0.74%	2.74%	1.24%	3.48%	3.40%	1.54%
2000-2010	0.82%	0.39%	1.28%	0.41%	1.79%	0.80%	2.11%	0.28%



- The rate of change from natural areas to Agricultural Land has decreased across all designated periods.
- The rate of change from natural areas to Urban Area decreased and then increased in protected areas designated between the 1980s to 2000s. This suggests ongoing pressure to develop the surrounding areas even after the designation of the protected areas.
- The WPA designated in the 2010s had a high rate of conversion to Urban Area before its designation.

Examples

- Although it was designated as a WPA in 1980, there was a conversion from natural areas to Urban Area between the 2000s and 2010s(11.8%).
- Location: Gyeonggi Hwaseong Namyang-eup Eunseok-ri 99

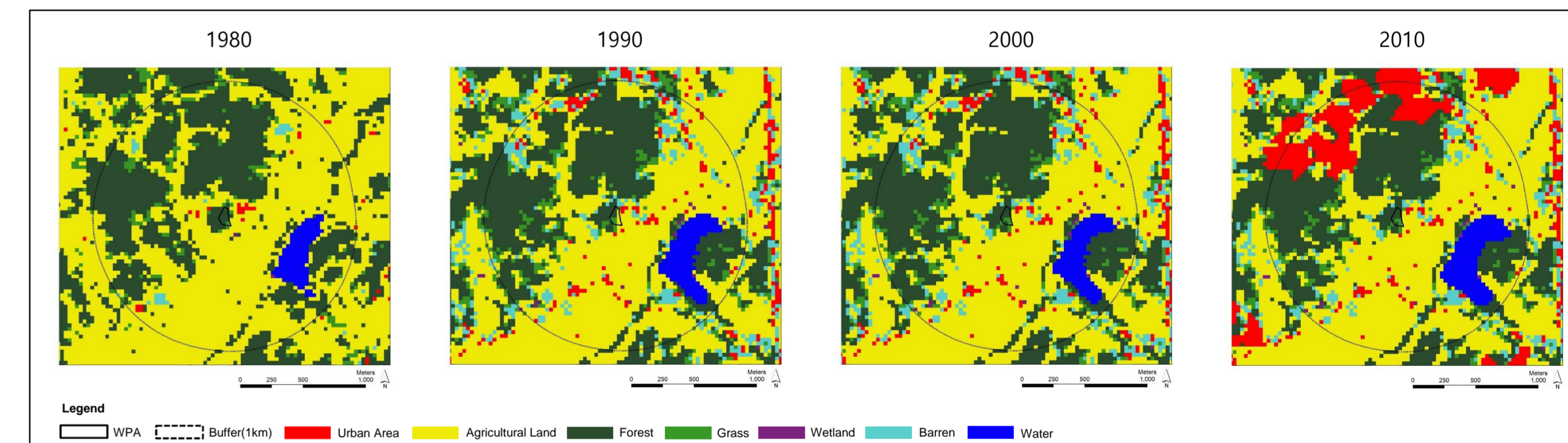


Figure 5. Example of sites with land use change since the designation of the WPA

Table 2. Rate of change from natural areas to Urban Area/Agricultural Land by period

Land Use	Years to compare		
	1980-1990	1990-2000	2000-2010
Urban Area	1.17%	0.40%	11.80%
Agricultural Land	17.86%	10.30%	0.00%

- Even though it was designated as a WPA in 1997, there was a conversion from natural areas to Urban Area between 2000s and 2010s(15.57%)
- Location: Jeonbuk Gunsan Soryongdong Mountain 120

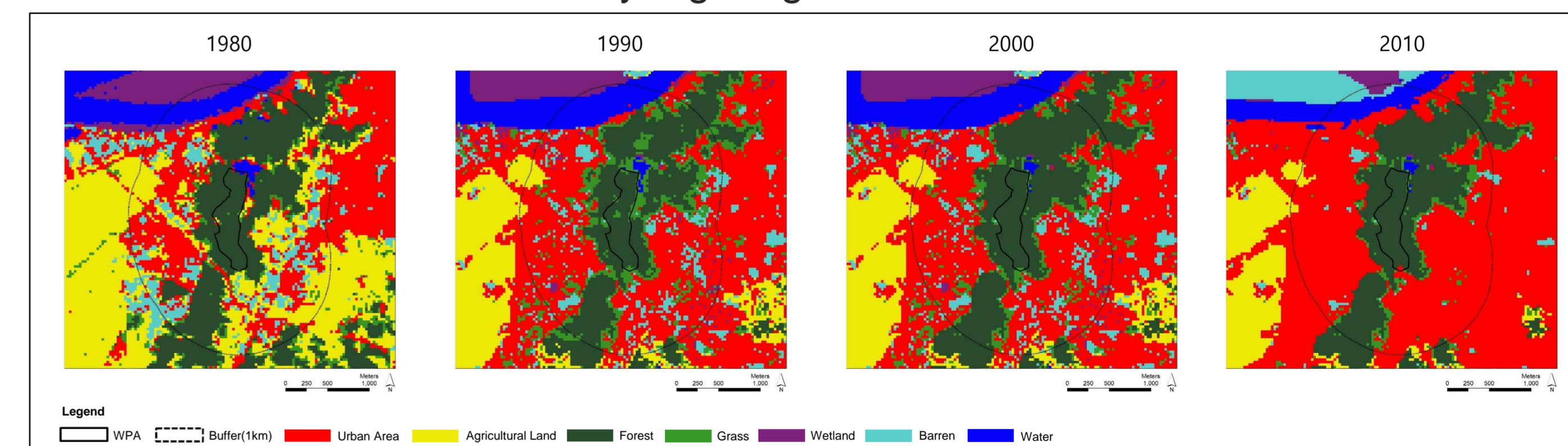


Figure 6. Example of sites with land use change since the designation of the WPA

Table 2. Rate of change from natural areas to Urban Area/Agricultural Land by period

Land Use	Years to compare		
	1980-1990	1990-2000	2000-2010
Urban Area	5.78%	0.00%	15.57%
Agricultural Land	0.20%	0.00%	0.00%

Conclusion

- Even after being designated as a Wildlife Protection Area, there was development pressure, such as changing the area around the protected area into Urban Area.
- When climate change occurs, land use change around protected area is expected to worsen the damage of climate change.