Landscape Fragmentation in the Brazilian Amazon

An analysis based on deforestation data derived from Landsat imagery

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A Milênio LBA/NASA LC-34 joint experiment

- **Summary:**

  Basic ideas:

  Investigate the concentration and diffusion of deforestation by reconstructing the distributions of INPE deforestation for different levels of percent cleared during the 1978-2004 period:

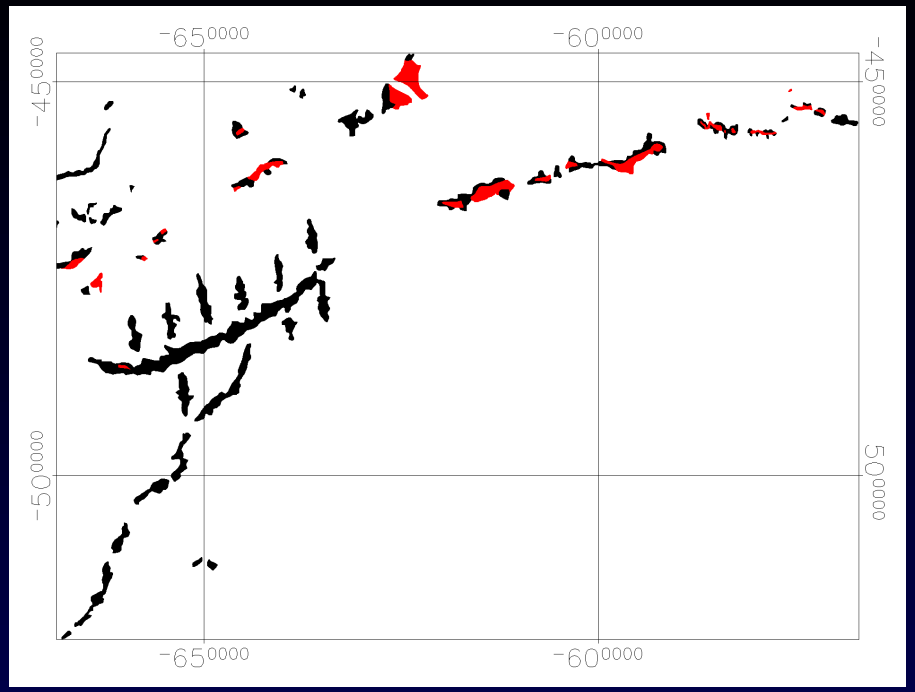
  "Has deforestation continually increased or stabilized in the areas of deforestation concentration"

  Develop an exercise in landscape percolation:

  "What kind of landscape connectivity do areas of deforestation concentration show"

  Area of study from LC34 project (PA & RO)

  Investigation based on INPE deforestation datasets stratified by ¼-degree grid cells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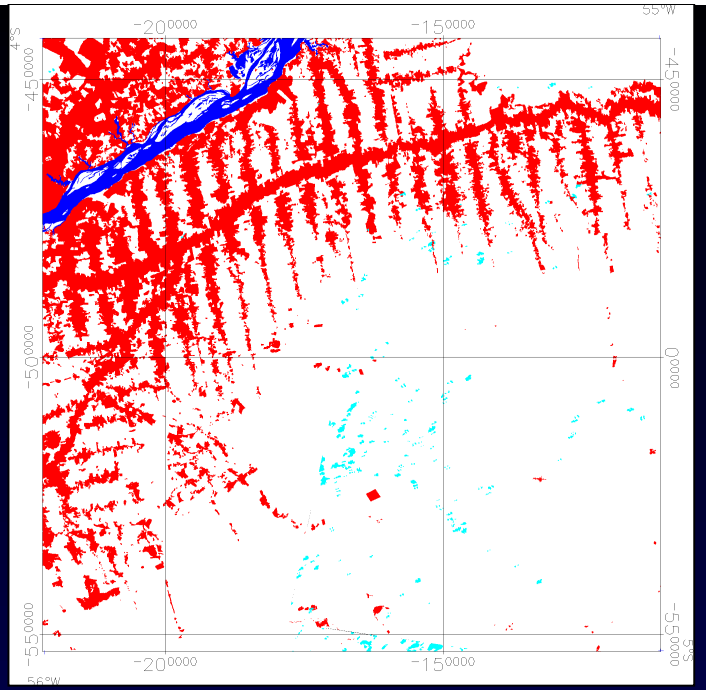
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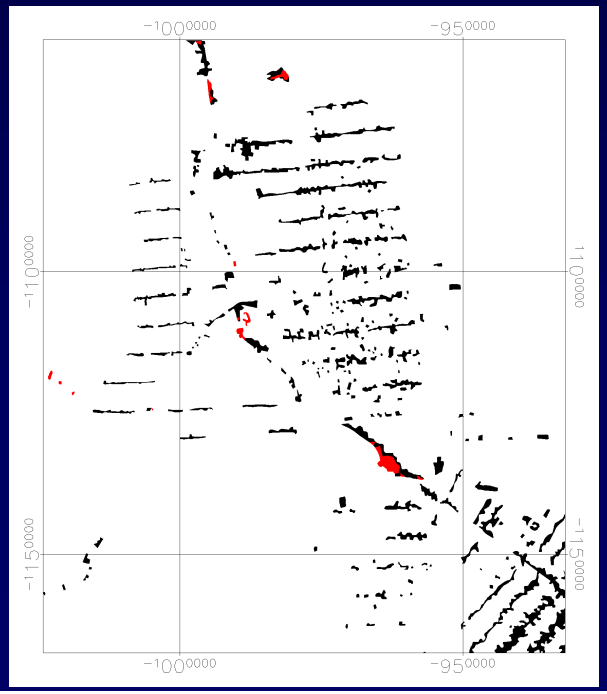
55°W
4°S
5°S
56°W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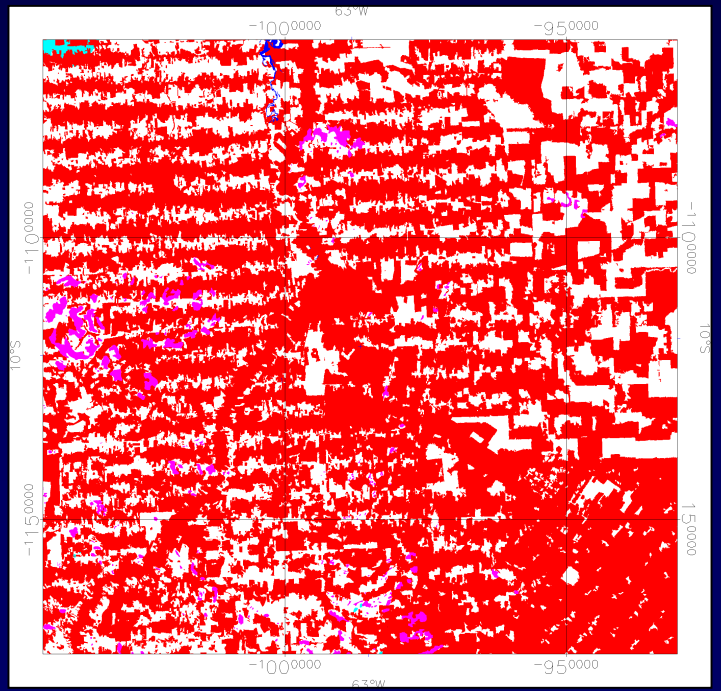
-100.0000
-95.0000
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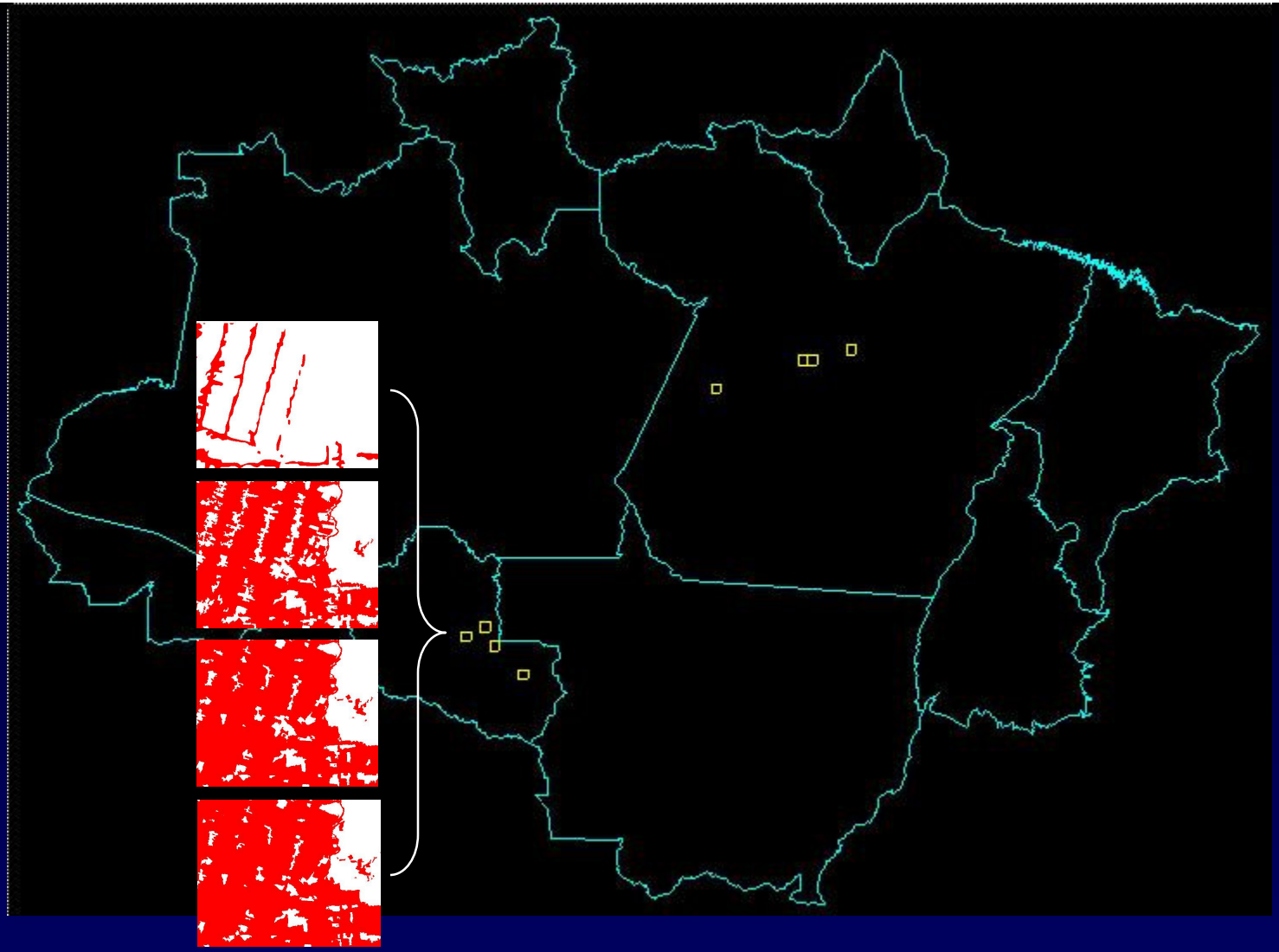
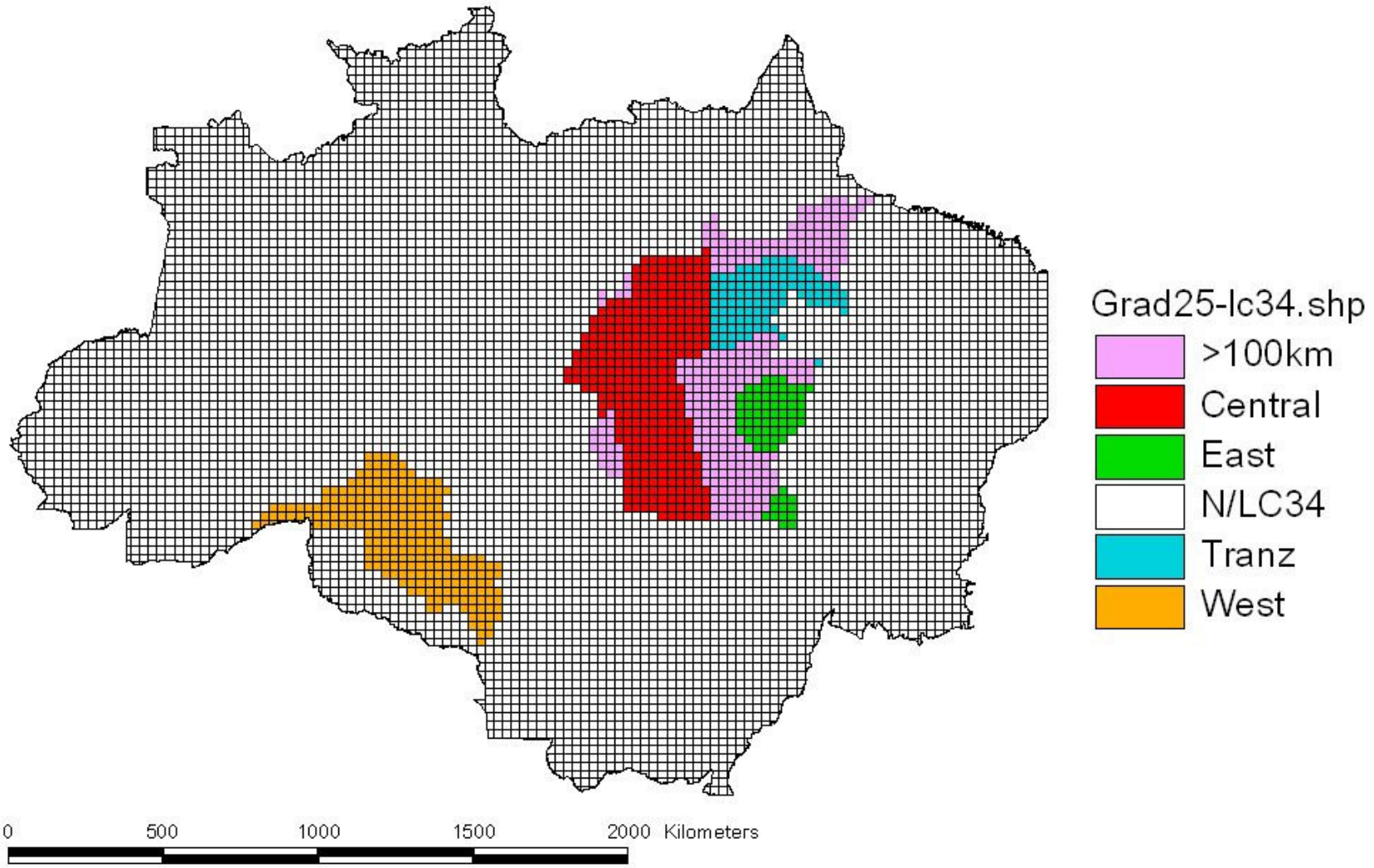
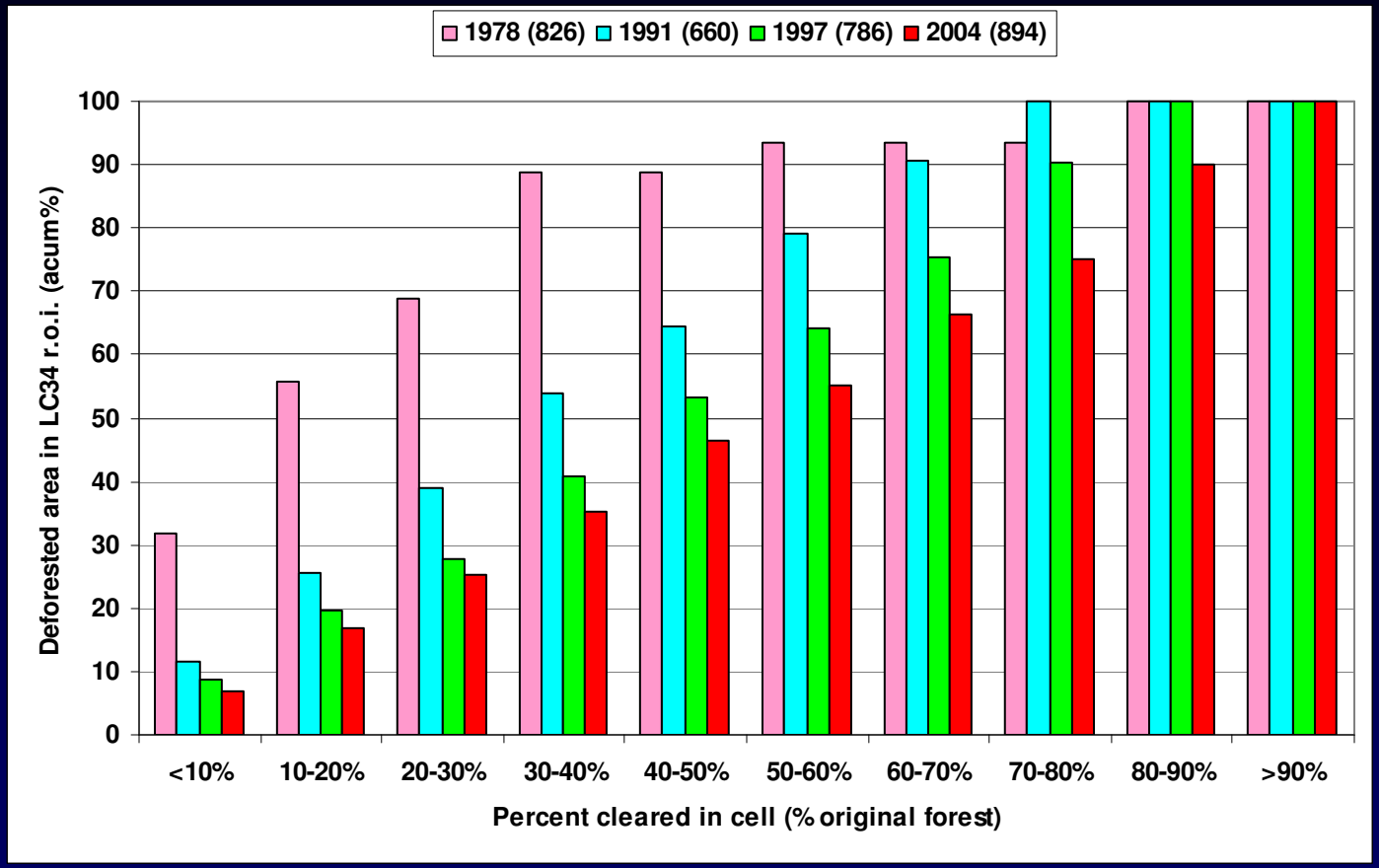
-115.0000
10°S
63°W
67°W

1978

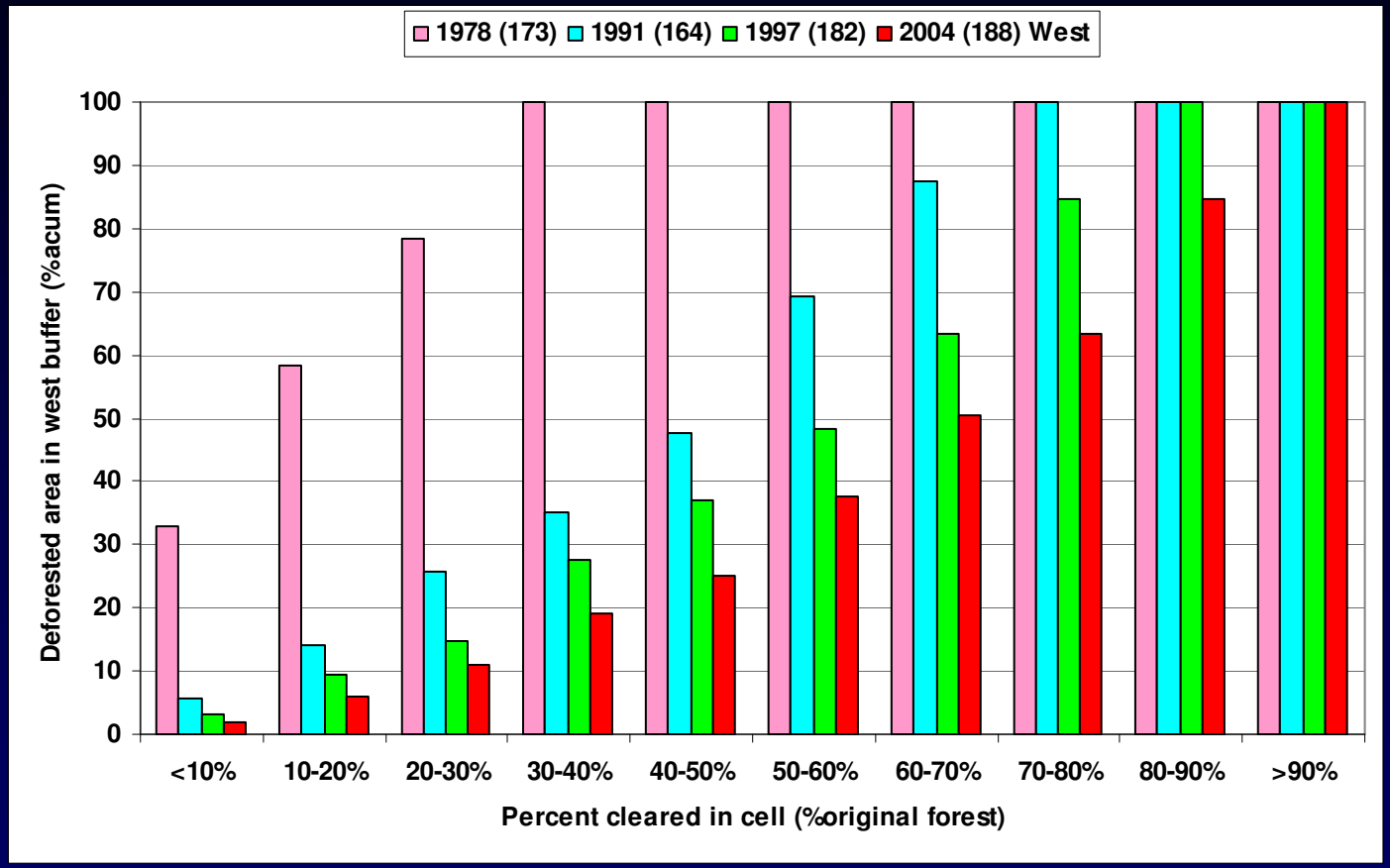


Road influence areas

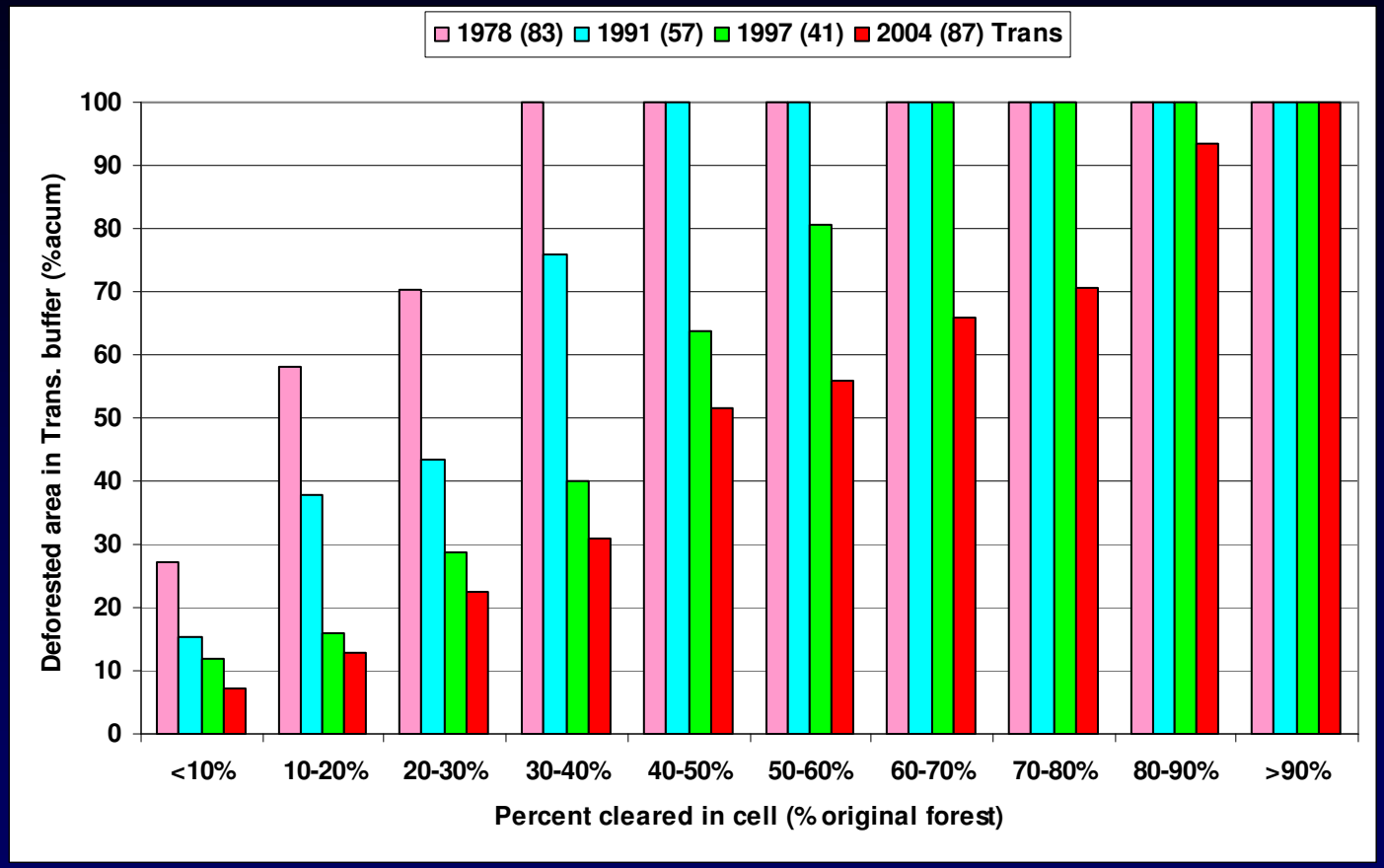




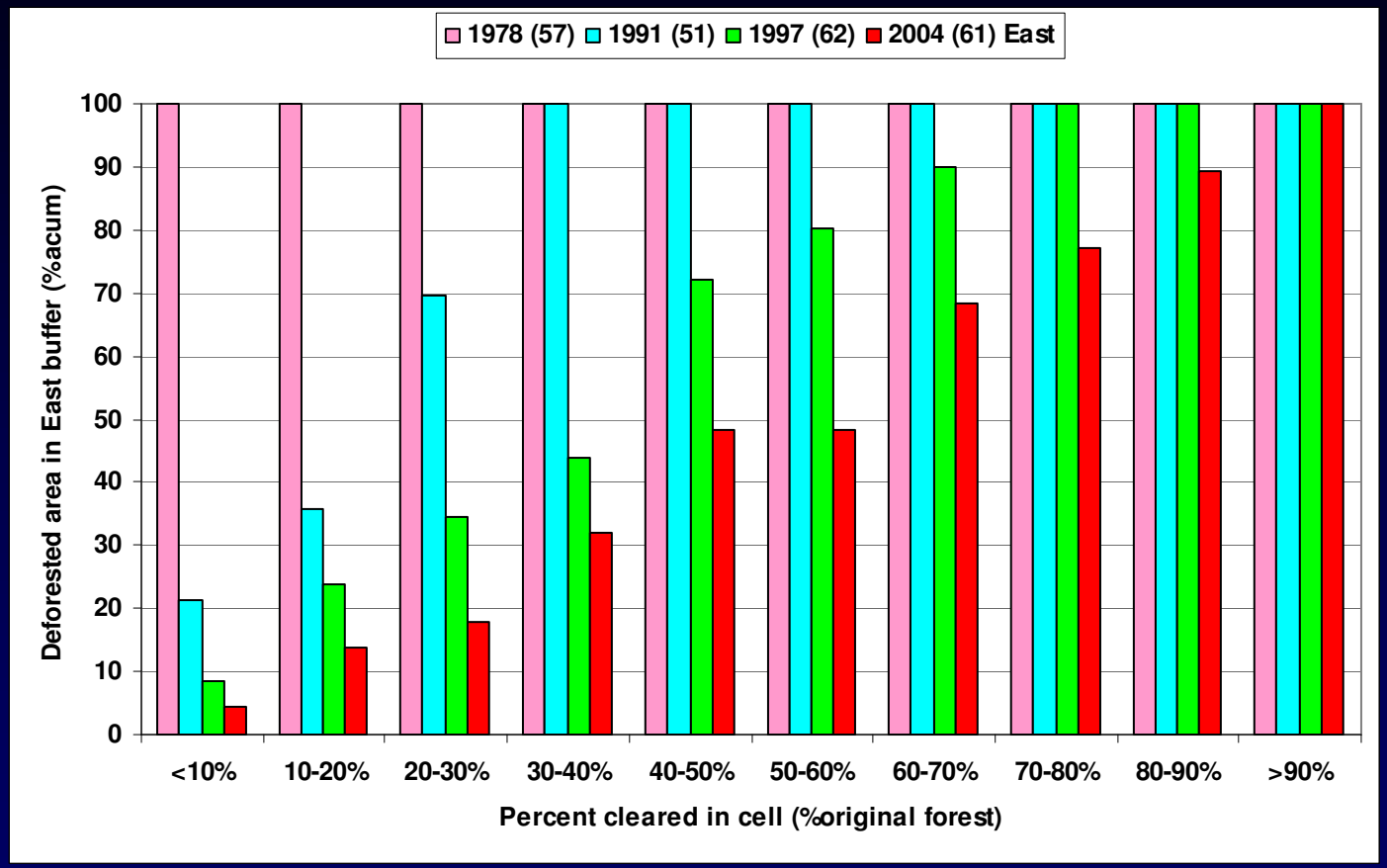
50% after 1991, before 1997



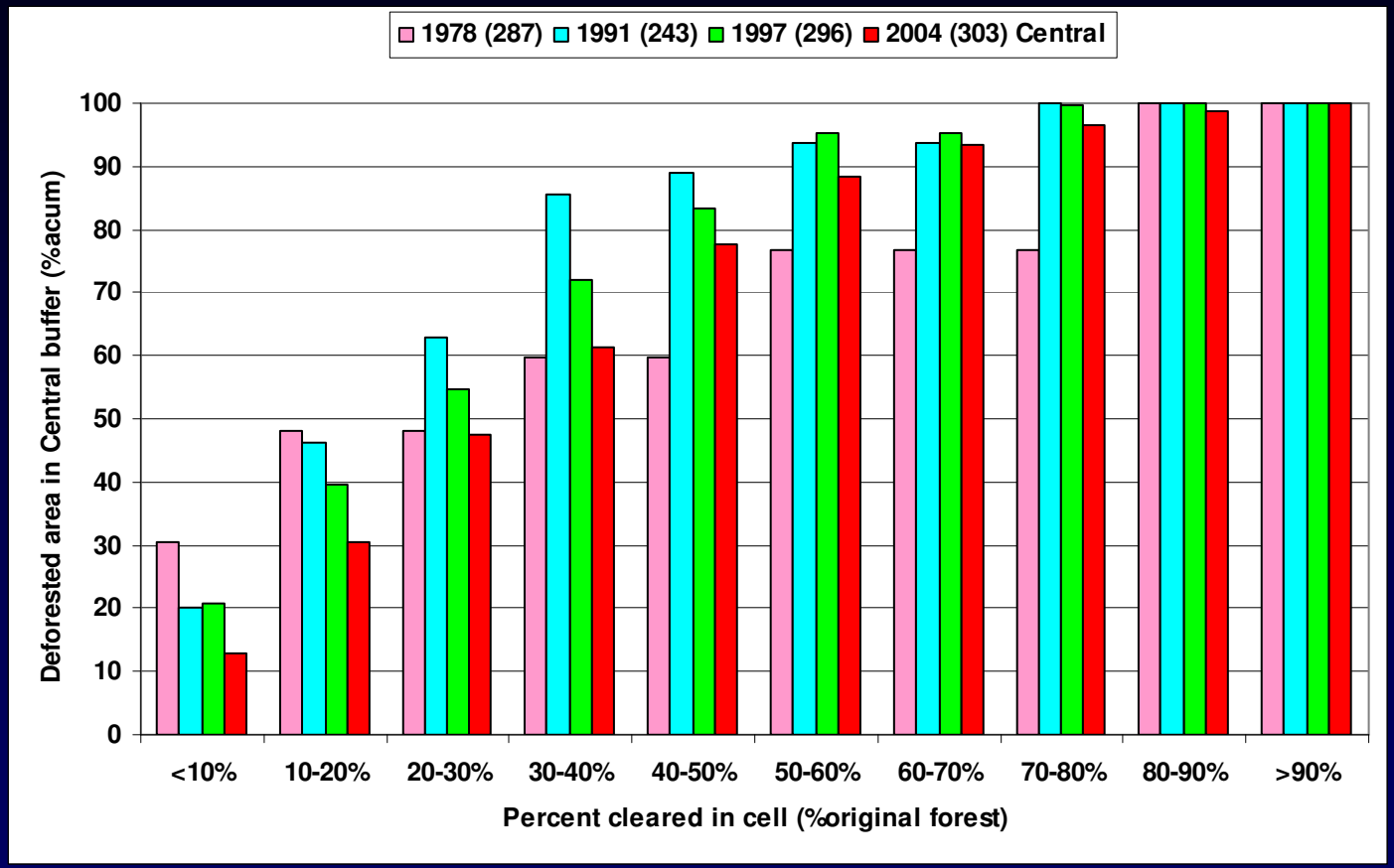
50% before 1991


1978 (83)
1991 (57)
1997 (41)
2004 (87) Trans
Deforested area in Trans. buffer (%acum)
100
90
80
70
60
50
40
30
20
10
0
<10%
10-20%
20-30%
30-40%
40-50%
50-60%
60-70%
70-80%
80-90%
>90%
Percent cleared in cell (% original forest)

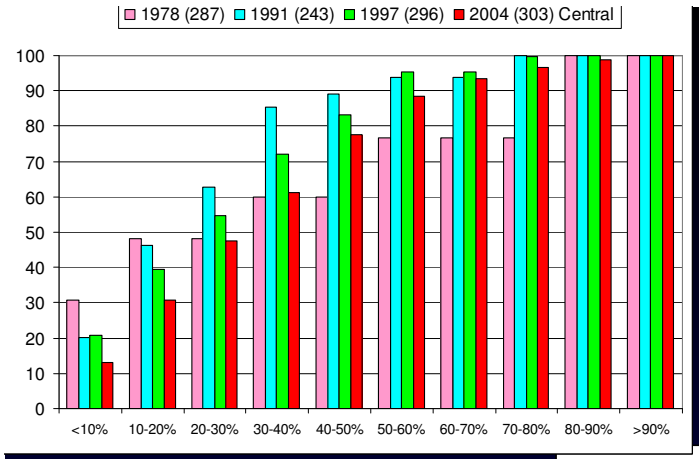
50% by 2004

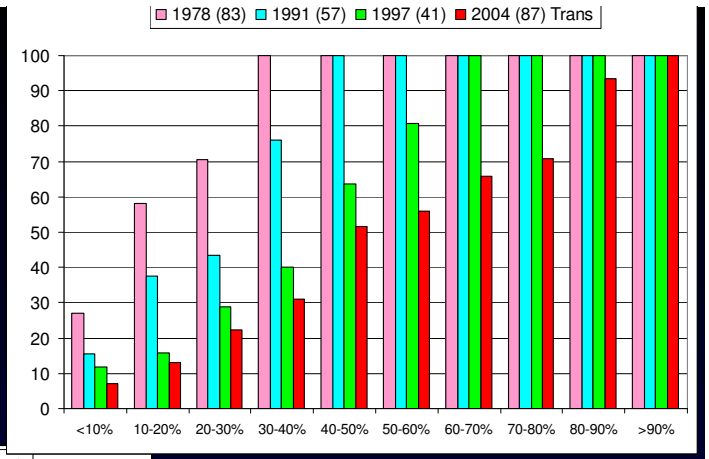

1978 (57)
1991 (51)
1997 (62)
2004 (61) East
Deforested area in East buffer (%acum)
100
90
80
70
60
50
40
30
20
10
0
<10%
10-20%
20-30%
30-40%
40-50%
50-60%
60-70%
70-80%
80-90%
>90%
Percent cleared in cell (%original forest)

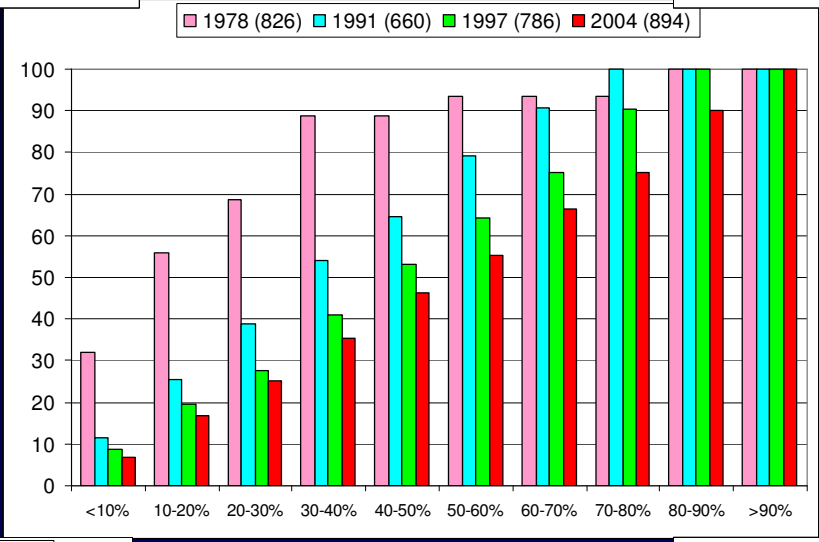
50% by 2004

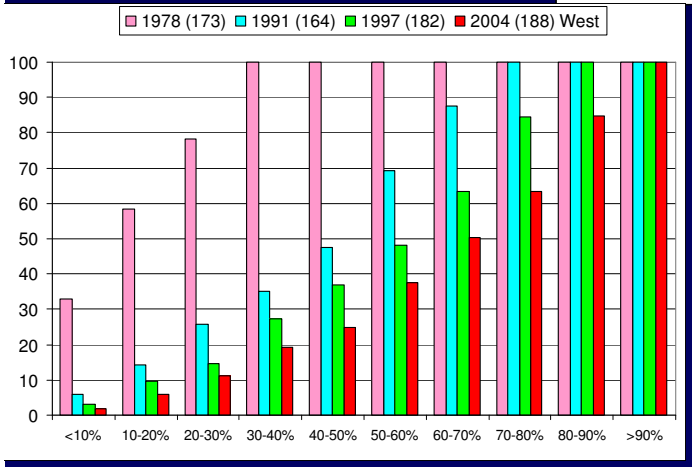


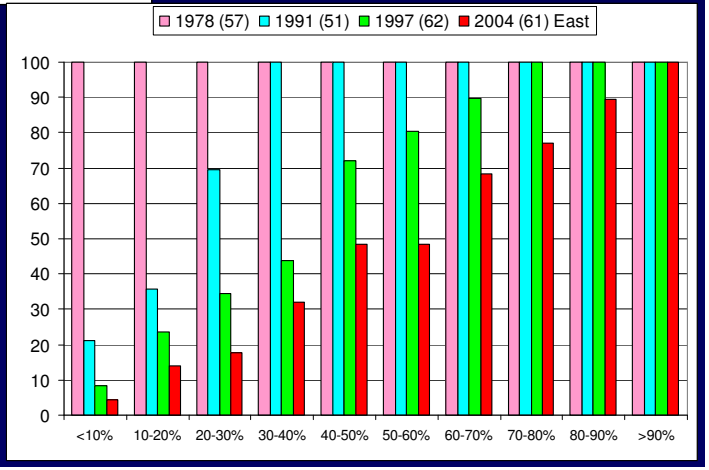
Less than 50% by 2004


1978 (287)
1991 (243)
1997 (296)
2004 (303) Central
100
90
80
70
60
50
40
30
20
10
0
<10%
10-20%
20-30%
30-40%
40-50%
50-60%
60-70%
70-80%
80-90%
>90%


1978 (83)
1991 (57)
1997 (41)
2004 (87) Trans
100
90
80
70
60
50
40
30
20
10
0
<10%
10-20%
20-30%
30-40%
40-50%
50-60%
60-70%
70-80%
80-90%
>90%


1978 (826)
1991 (660)
1997 (786)
2004 (894)
100
90
80
70
60
50
40
30
20
10
0
<10%
10-20%
20-30%
30-40%
40-50%
50-60%
60-70%
70-80%
80-90%
>90%


1978 (173)
1991 (164)
1997 (182)
2004 (188) West
100
90
80
70
60
50
40
30
20
10
0
<10%
10-20%
20-30%
30-40%
40-50%
50-60%
60-70%
70-80%
80-90%
>90%


1978 (57)
1991 (51)
1997 (62)
2004 (61) East
100
90
80
70
60
50
40
30
20
10
0
<10%
10-20%
20-30%
30-40%
40-50%
50-60%
60-70%
70-80%
80-90%
>90%

"Has deforestation continually increased or stabilized in the areas of deforestation concentration?"

1. Results suggest that the probability of deforestation occurring in the same areas is larger than its diffusion to new ones

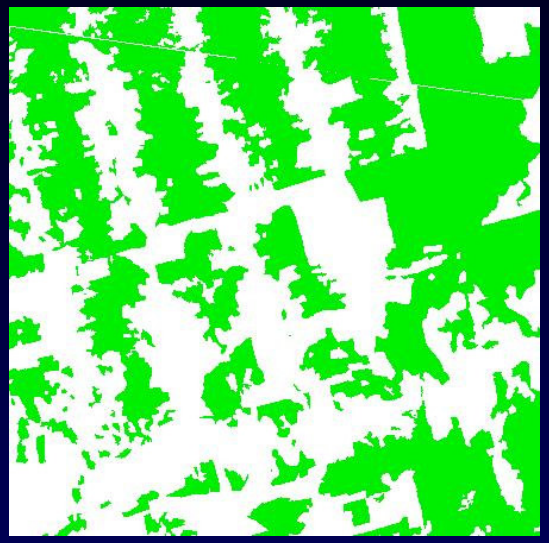
2. Forest clearing has not halted at the 50% limit prescribed by the Forest Code, neither has it stopped after the new 20%-limits was put into place

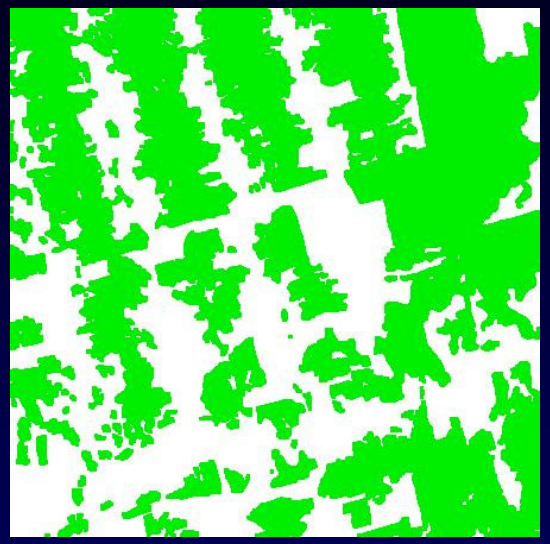
3. Landscape fragmentation faster and wider in West (BR363). Second place – BR230 and then East (PA150, S Pará only). Recently accelerated around BR163.

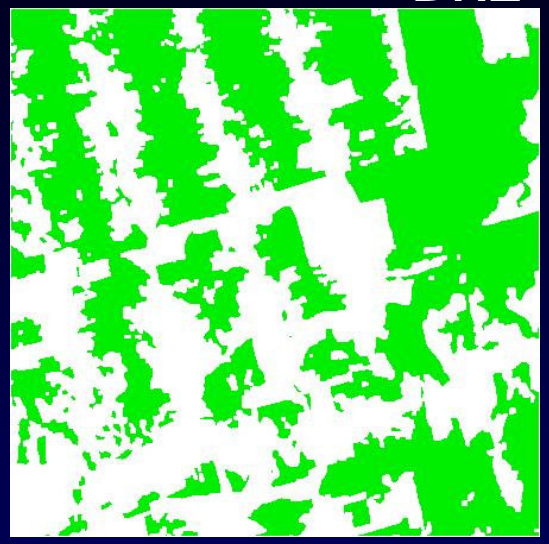
"What kind of landscape connectivity do areas of deforestation concentration show?"

A percolation experiment based on repeating a pair of one dilation and one erosion by a determined number of cycles until it becomes possible to "percolate" the cell

"What kind of landscape connectivity do areas of deforestation concentration show?"

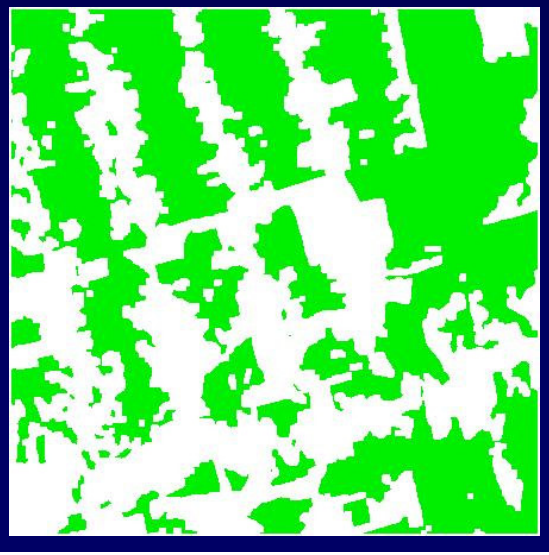




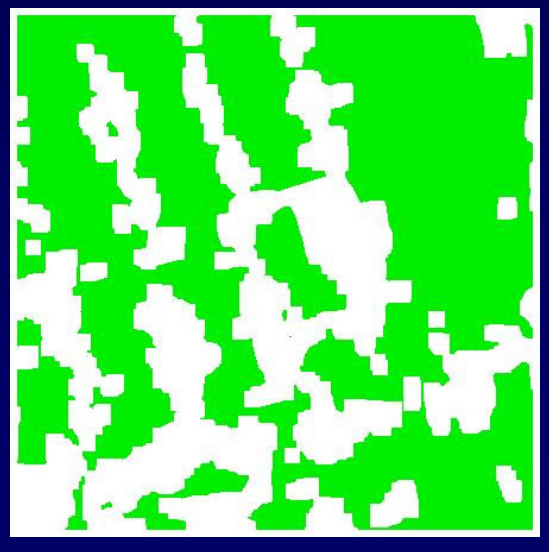


D

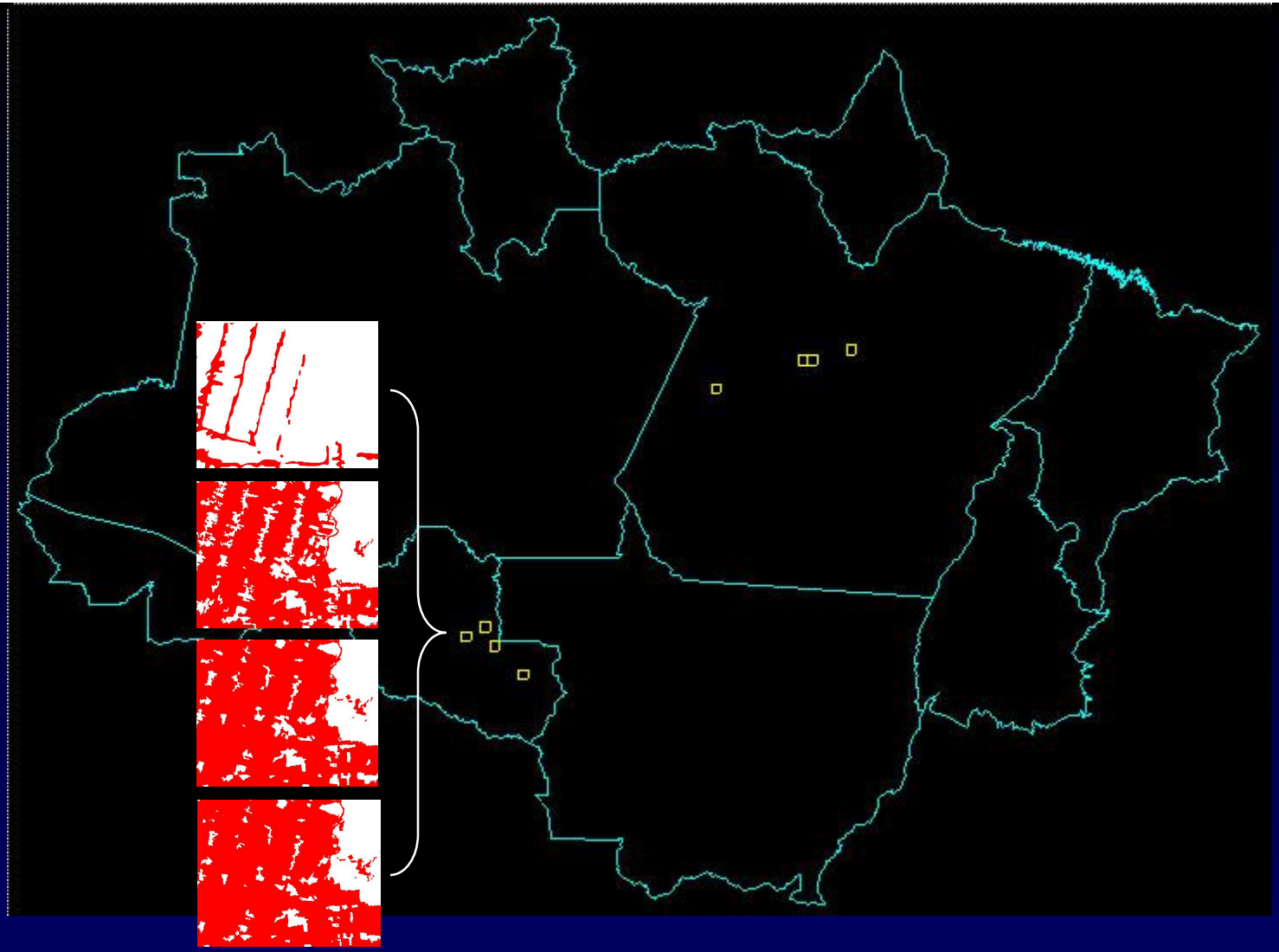
DxE



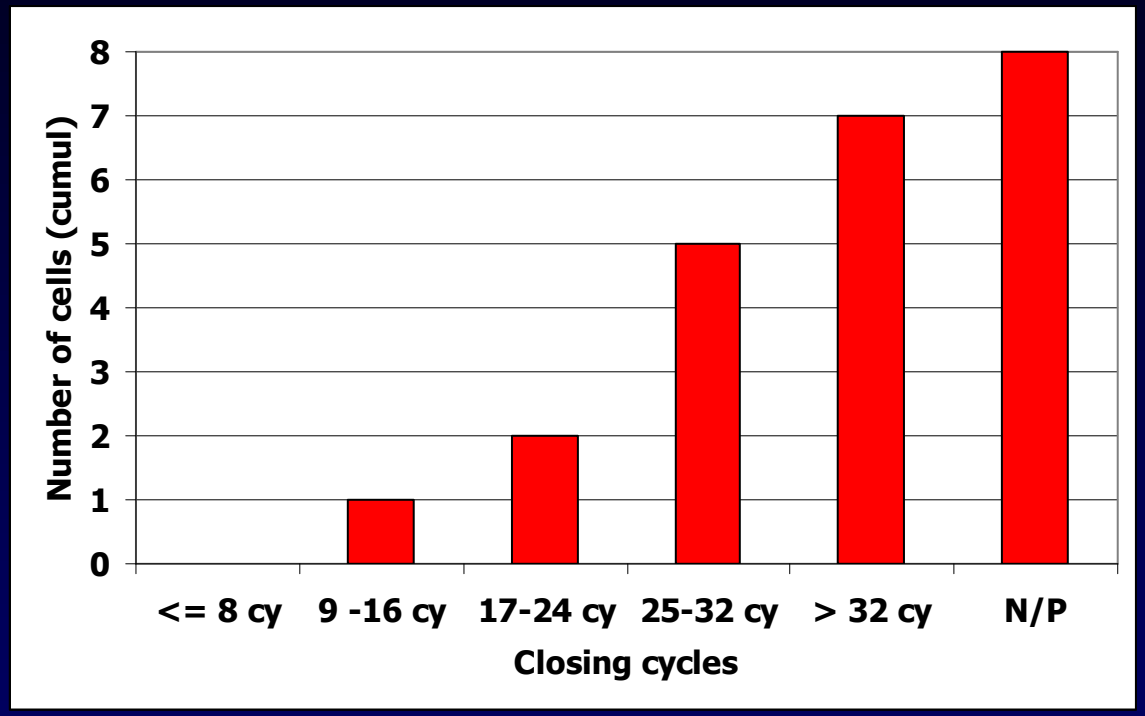
(DxE)x2



(DxE)x9



"What kind of landscape connectivity do areas of deforestation concentration show?"



""What kind of landscape connectivity do areas of deforestation concentration show?"

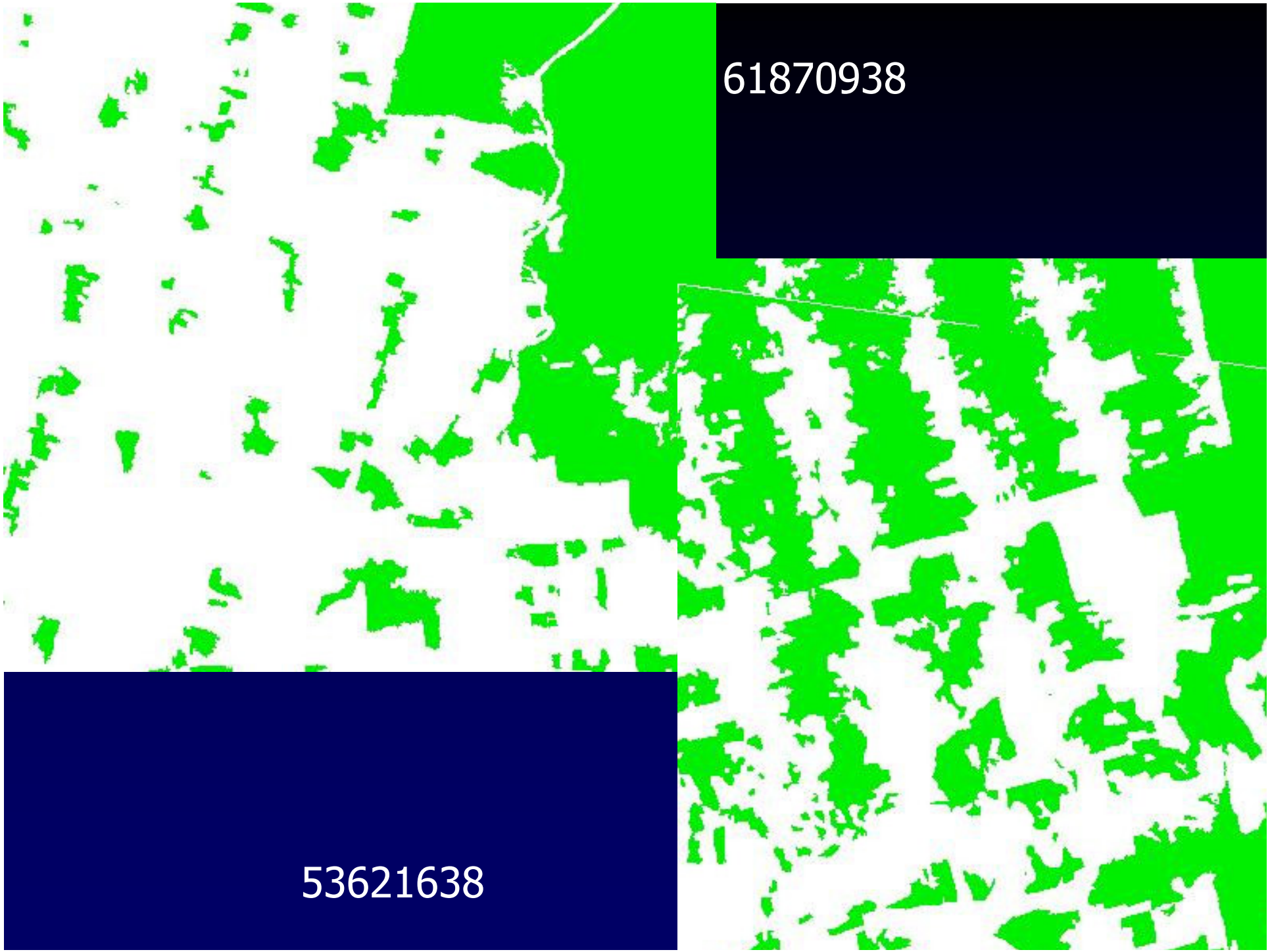
1. A large majority of ¼-degree cells percolated only after 25 cycles *(1500 m)* or more

2. Resulting forest fragmentation seems to be very high, with few, scattered fragments of forest remaining in the areas of clearing concentration and old settlement

NEXT QUESTIONS FOR LBA:

"What kind of landscape patterns is frontier expansion generating in the Amazon?"

"How is land cover dynamics evolving in these landscapes and how the succession of different land covers interact with the functioning of the Amazon"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