

Supplementary Data

**One tree at a time: Restoring Landscape
Connectivity through Silvopastoral Systems in the
transformed amazon landscapes**

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Table S1. Landscapes unit's composition in the 2,214Km² analysis window

| Landscapes Units | Description |
|------------------------------------|--|
| Mountain Landscape | Conservation priority. High levels of diversity of fauna and flora species. This landscape is dominated by dense highland rainforest Landscape: it corresponds to the highest and most mountainous parts of the Amazon at the foot of the Andean region with slopes of 25-50%. Its forests have ecological and ecosystem characteristics of, fragmented woods, secondary vegetation and small agricultural areas. |
| Mountain foot Landscape | Transition between the Andes and the Amazon plain. Slightly wavy relief, with slopes >25%. Loamy-sandy and loamy-clay soils with good drainage and low fertility. Entisols, Inceptisols and Ultisols dominate. This landscape is dominated by clean pastures and recent oil palm monocultures. |
| Lowland Landscape (Lomerio) | Plain to wavy relief with slopes of 3-7% and 12-25%, drainage from imperfect to excessive. Soils formed by sedimentary rocks of the tertiary, moderately deep, well drained, clayey texture, low fertility, very acidic, low saturation base, low content of organic matter. Dominance of oxisols and ultisols. This landscape is dominated by pastures, mosaics of pastures with agriculture and secondary vegetation. The main economic activity is extensive livestock. |
| Floodplain Landscape | They are part of the floodplain of rivers that are born in the Andes mountain range. Flat relief, with slopes of 0-3%; they suffer occasional floods every 3 or 7 years. Clay soils with dominance of entisols and inceptisols with poor drainage; superficial and limited by the water-table; fertility is average. This landscape is dominated by agriculture and pastures. |

Table S2. Landcover areas by landscape unit in the 2214Km² analysis window.

| | | Lomerio Landscape | | | | Flood Plain Landscape | | | | Mountain foot Landscape | | | | Mountain Landscape | | | |
|-------|--|-------------------|--------|------------|--------|-----------------------|--------|-----------|--------|-------------------------|--------|-----------|--------|--------------------|--------|-----------|--------|
| ID | Landcover/landuse | 2002 | | 2018 | | 2002 | | 2018 | | 2002 | | 2018 | | 2002 | | 2018 | |
| | | Area (ha) | % | Area (ha) | % | Area (ha) | % | Area (ha) | % | Area (ha) | % | Area (ha) | % | Area (ha) | % | Area (ha) | % |
| 100 | Riparian Forest | 1373.25 | 1.13% | 1208.13 | 0.99% | 159.47 | 0.46% | 184.09 | 0.53% | 558.77 | 1.71% | 388.35 | 1.19% | 4.20 | 0.01% | 4.20 | 0.01% |
| 101 | Dense Highland Forest | 5962.46 | 4.90% | 2137.17 | 1.76% | 1260.39 | 3.61% | 307.37 | 0.88% | 1161.10 | 3.55% | 149.14 | 0.46% | 9363.92 | 31.24% | 7592.14 | 25.33% |
| 102 | Heterogeneous Dense Flooded Forest | 244.20 | 0.20% | 173.69 | 0.14% | 212.44 | 0.61% | 251.71 | 0.72% | | 0.00% | | 0.00% | 4396.79 | 14.67% | 371.51 | 1.24% |
| 103 | Fragmented Forest with pastures and crops | 328.12 | 0.27% | 569.99 | 0.47% | 140.06 | 0.40% | 171.65 | 0.49% | 0.00 | 0.00% | 43.26 | 0.13% | 2316.95 | 7.73% | 3487.70 | 11.63% |
| 104 | Fragmented Forest with secondary vegetation | 889.54 | 0.73% | 673.93 | 0.55% | 406.67 | 1.16% | 377.68 | 1.08% | 139.19 | 0.43% | 74.35 | 0.23% | | 0.00% | | 0.00% |
| 105 | Hydrocarbon exploitation | | 0.00% | | 0.00% | | 0.00% | 3.80 | 0.01% | | 0.00% | 5.09 | 0.02% | | 0.00% | | 0.00% |
| 106 | Mosaic of crops, pastures and natural spaces | 446.88 | 0.37% | 442.66 | 0.36% | 182.74 | 0.52% | 200.15 | 0.57% | 20.76 | 0.06% | 103.80 | 0.32% | 2241.09 | 7.48% | 1454.98 | 4.85% |
| 107 | Mosaic of pastures with natural spaces | 16996.89 | 13.97% | 12941.21 | 10.63% | 2979.84 | 8.53% | 3365.39 | 9.64% | 2832.51 | 8.65% | 2276.45 | 6.95% | 2318.11 | 7.73% | 4172.69 | 13.92% |
| 108 | Mosaico de pastos y cultivos | | 0.00% | 925.13 | 0.76% | | 0.00% | 526.85 | 1.51% | | 0.00% | 602.07 | 1.84% | | 0.00% | | 0.00% |
| 109 | Oil Palm | | 0.00% | | 0.00% | | 0.00% | | 0.00% | | 0.00% | 551.96 | 1.69% | | 0.00% | | 0.00% |
| 110 | Weedy grasses | 2979.92 | 2.45% | 6517.14 | 5.36% | 2119.28 | 6.07% | 3804.58 | 10.90% | 1281.02 | 3.91% | 789.70 | 2.41% | 1408.52 | 4.70% | 476.32 | 1.59% |
| 111 | Clean Pastures | 83125.80 | 68.31% | 85282.56 | 70.08% | 16736.83 | 47.93% | 19882.05 | 56.94% | 24490.63 | 74.80% | 26092.65 | 79.69% | 3602.66 | 12.02% | 2892.96 | 9.65% |
| 112 | Rivers(50m) | 6.52 | 0.01% | 6.45 | 0.01% | 3179.75 | 9.11% | 2967.60 | 8.50% | 97.52 | 0.30% | 99.33 | 0.30% | 297.83 | 0.99% | 322.03 | 1.07% |
| 113 | Continuous urban | 41.25 | 0.03% | 41.26 | 0.03% | 2.56 | 0.01% | 3.01 | 0.01% | 59.08 | 0.18% | 102.60 | 0.31% | 62.09 | 0.21% | 74.58 | 0.25% |
| 114 | Bare and degraded land | | 0.00% | | 0.00% | 34.73 | 0.10% | | 0.00% | | 0.00% | | 0.00% | | 0.00% | | 0.00% |
| 115 | Secondary or transition vegetation | 8556.17 | 7.03% | 10470.95 | 8.60% | 3926.93 | 11.25% | 2729.13 | 7.82% | 2101.20 | 6.42% | 1463.02 | 4.47% | 3965.22 | 13.23% | 9128.28 | 30.45% |
| 116 | Natural Sandy Areas | | 0.00% | | 0.00% | 40.84 | 0.12% | 94.47 | 0.27% | | 0.00% | | 0.00% | | 0.00% | | 0.00% |
| 117 | Natural Wetlands | 734.21 | 0.60% | 188.00 | 0.15% | 3536.98 | 10.13% | 49.97 | 0.14% | 1.08 | 0.00% | 1.08 | 0.00% | | 0.00% | | 0.00% |
| 118 | Burned Areas | | 0.00% | 106.94 | 0.09% | | 0.00% | | 0.00% | | 0.00% | | 0.00% | | 0.00% | | 0.00% |
| Total | | 121,685.21 | 1.00 | 121,685.21 | 1.00 | 34,919.51 | 1.00 | 34,919.51 | 1.00 | 32,742.85 | 1.00 | 32,742.85 | 1.00 | 29,977.39 | 1.00 | 29,977.39 | 1.00 |

Table S3. Area-shape, Subdivision and Aggregation metrics results of Fragstat by landscape for 2002.

| LU | LANDCOVER/LANDUSE | AREA-SHAPE | | | | SUBDIVISION | | | AGGREGATION |
|-------------------------|---|------------|------------|---------------------|-----------------------|-------------------|---------------|---------------------|-------------------------------------|
| | | Total Area | Proportion | Largest Patch Index | Landscape Shape Index | Number of Patches | Patch Density | Effective Mesh Size | Euclidean Nearest Neighbor Distance |
| | | TA | % | LPI | LSI | NP | PD | MESH | ENN_MN |
| FLOODPLAIN LANDSCAPE | Riparian Forest | 161 | 0.50% | 0.03 | 9.20 | 23 | 0.011 | 0.02 | 1.952 |
| | Dense Highland Forest | 1263 | 3.6% | 0.08 | 9.84 | 33 | 0.015 | 0.49 | 998 |
| | Dense Floodplain Forest | 212 | 0.6% | 0.08 | 2.32 | 4 | 0.002 | 0.16 | 1.571 |
| | Fragmented Forest with Pastures and Crops | 139 | 0.4% | 0.04 | 3.48 | 2 | 0.001 | 0.05 | 11.736 |
| | Fragmented Forest with Secondary Vegetation | 408 | 1.2% | 0.09 | 4.81 | 9 | 0.004 | 0.27 | 3.698 |
| | Secondary Vegetation | 3929 | 11.2% | 0.22 | 13.89 | 52 | 0.024 | 3.95 | 706 |
| LOWLAND LANDSCAPE | Riparian Forest | 1371 | 1.1% | 0.09 | 23.40 | 38 | 0.017 | 0.62 | 979 |
| | Dense Highland Forest | 5954 | 4.9% | 0.10 | 24.71 | 117 | 0.053 | 2.27 | 868 |
| | Dense Floodplain Forest | 246 | 0.2% | 0.10 | 3.32 | 4 | 0.002 | 0.24 | 2.865 |
| | Fragmented Forest with Pastures and Crops | 330 | 0.3% | 0.08 | 5.25 | 8 | 0.004 | 0.20 | 5.697 |
| | Fragmented Forest with Secondary Vegetation | 888 | 0.7% | 0.10 | 8.83 | 26 | 0.012 | 0.41 | 2.101 |
| | Secondary Vegetation | 8555 | 7.0% | 0.33 | 29.94 | 154 | 0.070 | 8.12 | 648 |
| | Natural Marshy Areas | 733 | 0.6% | 0.04 | 12.19 | 45 | 0.021 | 0.15 | 1.163 |
| MOUNTAIN LANDSCAPE | Riparian Forest | 4 | 0.0% | 0.00 | 1.36 | 1 | 0.001 | 0.00 | N/A |
| | Dense Highland Forest | 9373 | 31.2% | 1.74 | 7.30 | 11 | 0.005 | 133.88 | 205 |
| | Fragmented Forest with Pastures and Crops | 4401 | 14.7% | 01.03 | 10.41 | 6 | 0.003 | 32.50 | 1.191 |
| | Fragmented Forest with Secondary Vegetation | 2316 | 7.7% | 0.32 | 9.25 | 13 | 0.006 | 4.18 | 1.037 |
| | Secondary Vegetation | 3963 | 13.2% | 0.46 | 11.61 | 17 | 0.008 | 10.08 | 662 |
| MOUNTAIN FOOT LANDSCAPE | Riparian Forest | 556 | 1.7% | 0.07 | 13.09 | 16 | 0.007 | 0.23 | 757 |
| | Dense Highland Forest | 1159 | 3.5% | 0.19 | 09.09 | 28 | 0.013 | 1.11 | 813 |
| | Fragmented Forest with Pastures and Crops | | 0.0% | | | | | | |
| | Fragmented Forest with Secondary Vegetation | 140 | 0.4% | 0.06 | 02.04 | 4 | 0.002 | 0.08 | 1.688 |
| | Secondary Vegetation | 2099 | 6.4% | 0.16 | 12.14 | 44 | 0.020 | 1.40 | 787 |
| | Natural Marshy Areas | 1 | 0.0% | 0.00 | 2.00 | 2 | 0.001 | 0.00 | 60 |

Table S4. Area-shape, Subdivision and Aggregation metrics results of Fragstat by landscape for 2018

| LU | LANDCOVER/LANDUSE | AREA-SHAPE | | | | SUBDIVISION | | | AGGREGATION |
|-------------------------|---|------------|------------|---------------------|-----------------------|-------------------|---------------|---------------------|-------------------------------------|
| | | Total Area | Proportion | Largest Patch Index | Landscape Shape Index | Number of Patches | Patch Density | Effective Mesh Size | Euclidean Nearest Neighbor Distance |
| | | TA | % | LPI | LSI | NP | PD | MESH | ENN_MN |
| FLOODPLAIN LANDSCAPE | Riparian Forest | 182.9 | 0.5% | 0.03 | 10.11 | 15 | 0 | 0.04 | 3.227 |
| | Dense Highland Forest | 307.4 | 0.9% | 0.07 | 4.21 | 5 | 0 | 0.17 | 3.742 |
| | Dense Floodplain Forest | 252.8 | 0.7% | 0.06 | 3.73 | 6 | 0 | 0.09 | 1.411 |
| | Fragmented Forest with Pastures And Crops | 172.3 | 0.5% | 0.03 | 5.66 | 5 | 0 | 0.04 | 12.668 |
| | Fragmented Forest with Secondary Vegetation | 378.9 | 1.1% | 0.05 | 6.14 | 8 | 0 | 0.12 | 6.507 |
| | Secondary Vegetation | 2728.4 | 7.8% | 0.11 | 18.82 | 90 | 0 | 01.07 | 541 |
| LOWLAND LANDSCAPE | Riparian Forest | 1207.2 | 1.0% | 0.09 | 21.92 | 42 | 0 | 0.56 | 779 |
| | Dense Highland Forest | 2135.5 | 1.8% | 0.05 | 14.10 | 49 | 0.022 | 0.56 | 1.579 |
| | Dense Floodplain Forest | 174.3 | 0.1% | 0.06 | 2.26 | 3 | 0.001 | 0.09 | 4.323 |
| | Fragmented Forest with Pastures and Crops | 570.3 | 0.5% | 0.03 | 10.33 | 21 | 0.01 | 0.10 | 2.425 |
| | Fragmented Forest with Secondary Vegetation | 672.0 | 0.6% | 0.06 | 10.09 | 31 | 0.014 | 0.17 | 2.293 |
| | Secondary Vegetation | 10473.7 | 8.6% | 0.38 | 39.64 | 223 | 0.102 | 7.99 | 461 |
| | Natural Marshy Areas | 188.0 | 0.2% | 0.03 | 5.26 | 4 | 0.002 | 0.05 | 1.886 |
| MOUNTAIN LANDSCAPE | Riparian Forest | 4.3 | 0.0% | 0.00 | 1.36 | 1 | 5.00E-04 | 0.00 | N/A |
| | Dense Highland Forest | 7590.3 | 25.3% | 1.29 | 11.34 | 33 | 0.015 | 64.78 | 380 |
| | Fragmented Forest with Pastures and Crops | 371.0 | 1.2% | 0.02 | 8.56 | 9 | 0.004 | 0.07 | 1.791 |
| | Fragmented Forest with Secondary Vegetation | 3492.1 | 11.6% | 0.36 | 16.12 | 31 | 0.014 | 4.74 | 437 |
| | Secondary Vegetation | 9125.8 | 30.5% | 01.01 | 31.58 | 81 | 0.037 | 45.31 | 121 |
| MOUNTAIN FOOT LANDSCAPE | Riparian Forest | 387.2 | 1.2% | 0.06 | 11.34 | 7 | 0.003 | 0.13 | 1.581 |
| | Dense Highland Forest | 148.5 | 0.5% | 0.04 | 5.26 | 11 | 0.005 | 0.04 | 968 |
| | Fragmented Forest with Pastures and Crops | 43.2 | 0.1% | 0.01 | 3.14 | 5 | 0.002 | 0.00 | 2.195 |
| | Fragmented Forest with Secondary Vegetation | 74.8 | 0.2% | 0.02 | 4.14 | 4 | 0.002 | 0.01 | 9.184 |
| | Secondary Vegetation | 1465.4 | 4.5% | 0.05 | 16.14 | 63 | 0.029 | 0.36 | 542 |
| | Natural Marshy Areas | 1.1 | 0.0% | 0.00 | 2.14 | 2 | 9.00E-04 | 0.00 | 60 |

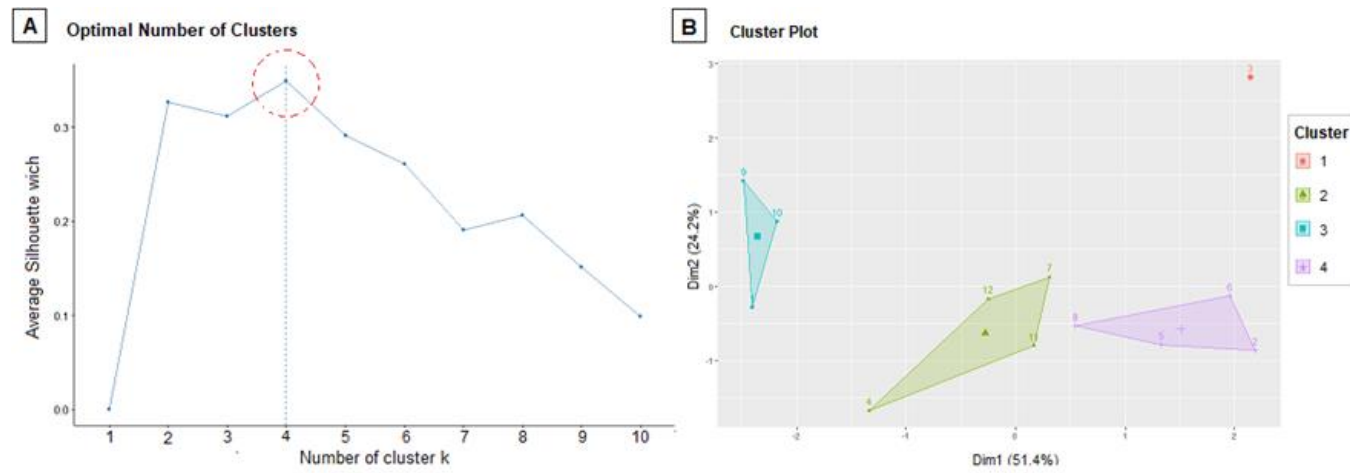


Figure S1. (A) Optimal number of clusters. Average of Silhouette value vs. Number of cluster (k). (B) K-Means clustering algorithm and Silhouette score.