Supplementary Table 1: Selected South African protected areas, size, ecological characteristics (rainfall and biome), number of years that game census were conducted and managing authority. South African National Parks (SANParks; National conservation authority), North West Parksboard and Eastern Cape Parks and Tourism Agency (provincial conservation authorities) and Private (privately owned protected areas).

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Nature Reserve | Latitude | Longitude | Protected area size (km2) | Province | Managing authority | Biome | Annual rainfall | Percentage winter rainfall | No. of count years | Data source |
| Addo Darlington | -33.21981 | 25.147215 | 985 | Eastern Cape | SANParks | Thicket | 344 | 37.7 | 2 |  |
| Addo Kuzuko | -33.194947 | 25.455517 | 149 | Eastern Cape | SANParks | Thicket | 419 | 40.4 | 2 |  |
| Addo Main | -33.485119 | 25.753492 | 222 | Eastern Cape | SANParks | Thicket | 483 | 41.1 | 2 |  |
| Agulhas National Park | -34.743056 | 19.865665 | 209.6 | Western Cape | SANParks | Fynbos | 482 | 65.6 | 1 |  |
| Baviaanskloof World Heritage Site | -33.663154 | 24.54112 | 5000 | Eastern Cape | Eastern Cape Parks and Tourism Agency | Fynbos | 631 | 37.8 | 3 |  |
| Bloemhofdam Nature Reserve | -27.695922 | 25.676175 | 120 | North West | North West Parksboard | Savanna | 457 | 33.9 | 19 |  |
| Bontebok National Park | -34.06614 | 20.468718 | 27.86 | Western Cape | SANParks | Fynbos | 644 | 59.6 | 2 |  |
| Borakalalo Nature Reserve | -25.160796 | 27.818514 | 130 | North West | North West Parksboard | Savanna | 550 | 26.9 | 19 |  |
| Boskopdam Nature Reserve | -26.538448 | 27.091239 | 30 | North West | North West Parksboard | Grassland | 472 | 34.3 | 19 |  |
| Botsalano Nature Reserve | -25.561387 | 27.712234 | 58 | North West | North West Parksboard | Savanna | 519 | 28.9 | 19 |  |
| Camdeboo National Park | -32.220267 | 24.540074 | 194 | Eastern Cape | SANParks | Thicket | 290 | 39.2 | 3 |  |
| Elandsberg Private Nature Reserve | -33.468952 | 19.059085 | 30 | Western Cape | Private | Fynbos | 762 | 74.7 | 1 | Makady 2009 thesis |
| Golden Gate National Park | -28.516809 | 28.616513 | 340 | Freestate | SANParks | Grassland | 1030 | 32.8 | 1 |  |
| Great Fish River Nature Reserve | -33.065714 | 26.82055 | 450 | Eastern Cape | Eastern Cape Parks and Tourism Agency | Thicket | 627 | 36.5 | 5 |  |
| Greater Makalali Private Game Reserve | -24.150416 | 30.642915 | 220 | Limpopo | Private | Savanna | 589 | 30.0 | 5 | Kettles and Slotow 2009 |
| Kgalagadi National Park | -26.482922 | 20.630491 | 10000 | Northern Cape | SANParks | Savanna | 173 | 33.3 | 2 |  |
| Kgaswane Mountain Reserve | -25.717905 | 27.327413 | 53 | North West | North West Parksboard | Savanna | 596 | 27.6 | 19 |  |
| Krantzkop ammunition factory | -33.508233 | 19.04438 | 20 | Western Cape | Private | Fynbos | 1003 | 71.4 | 1 | Makady 2009 thesis |
| Kruger National Park | -23.863691 | 31.57184 | 19485 | Limpopo | SANParks | Savanna | 431 | 29.3 | 3 |  |
| Kwandwe Private Game Reserve | -33.130464 | 26.537344 | 185 | Eastern Cape | Private | Thicket | 523 | 35.7 | 2 | Welch 2014 thesis |
| Madikwe Nature Reserve | -24.760569 | 26.277546 | 750 | North West | North West Parksboard | Savanna | 490 | 26.7 | 19 |  |
| Mafikeng Nature Reserve | -25.866018 | 25.722252 | 48 | North West | North West Parksboard | Grassland | 570 | 32.6 | 19 |  |
| Mapungubwe National Park | -22.202866 | 29.36368 | 280 | Limpopo | SANParks | Savanna | 264 | 25.9 | 3 |  |
| Marakele National Park | -24.415006 | 27.610003 | 670 | Limpopo | SANParks | Savanna | 576 | 29.1 | 3 |  |
| Mkambati Nature Reserve | -31.265218 | 29.984123 | 92 | Eastern Cape | Eastern Cape Parks and Tourism Agency | Grassland | 1323 | 33.6 | 4 |  |
| Mokala National Park | -29.16629 | 24.319596 | 264.8 | Northern Cape | SANParks | Savanna | 369 | 38.2 | 3 |  |
| Molopo Nature Reserve | -25.71993 | 22.89366 | 240 | North West | North West Parksboard | Savanna | 274 | 32.5 | 19 |  |
| Mpofu Nature Reserve | -32.630303 | 26.5728 | 75 | Eastern Cape | Eastern Cape Parks and Tourism Agency | Grassland | 780 | 31.5 | 5 |  |
| Pilanesberg Nature Reserve | -25.246676 | 27.094206 | 572 | North West | North West Parksboard | Savanna | 560 | 26.6 | 18 |  |
| SA lombard Nature Reserve | -27.589833 | 25.477273 | 46 | North West | North West Parksboard | Savanna | 509 | 31.3 | 20 |  |
| Samara Private Game reserve | -32.452652 | 24.733626 | 541 | Eastern Cape | Private | Thicket | 308 | 40.6 | 1 | Clements 2012 thesis |
| Shamwari Private Game Reserve | -33.433459 | 26.0767 | 187 | Eastern Cape | Private | Thicket | 532 | 48.4 | 8 | O'Brien 2012 thesis |
| Suikerbosrand Nature Reserve | -26.483855 | 28.22922 | 116 | Gauteng | Private | Grassland | 855 | 29.1 | 1 | Reilly and Haskins 1999 |
| Table Mountain National Park (south) | -34.227328 | 18.420519 | 148 | Western Cape | SANParks | Fynbos | 732 | 72.2 | 1 |  |
| Thomas Baines Nature Reserve | -33.387859 | 26.4843 | 10.5 | Eastern Cape | Eastern Cape Parks and Tourism Agency | Thicket | 637 | 37.5 | 4 |  |
| Tsolwana Nature Reserve | -32.185973 | 26.502594 | 85 | Eastern Cape | Eastern Cape Parks and Tourism Agency | Grassland | 639 | 43.6 | 4 |  |
| Tswalu | -27.245706 | 22.405422 | 1440 | Northern Cape | Private | Savanna | 285 | 32.0 | 6 |  |
| West Coast National Park | -33.172175 | 18.148719 | 362 | Western Cape | SANParks | Fynbos | 399 | 74.9 | 1 |  |
| Wolwespruit Nature Reserve | -27.416759 | 26.315921 | 23 | North West | North West Parksboard | Grassland | 612 | 33.4 | 19 |  |

Supplementary Table 2: Metabolic biomass for five different functional groups in selected South African Protected areas.

|  |  |  |
| --- | --- | --- |
| Protected area | Functional Group | Metabolic biomass (kg/km2) |
| Addo Darlington | Small non-social browser | 0.119413 |
|  | medium-sized social mixed diet | 23.53387 |
|  | Large browser | 18.67938 |
|  | Water-dependent grazer | 10.05749 |
|  | Non-ruminant | 4.01613 |
| Addo Kuzuko | Small non-social browser | 0.634372 |
|  | medium-sized social mixed diet | 70.82159 |
|  | Large browser | 202.8139 |
|  | Water-dependent grazer | 76.50152 |
|  | Non-ruminant | 150.3287 |
| Addo Main | Small non-social browser | 0.216216 |
|  | medium-sized social mixed diet | 30.9686 |
|  | Large browser | 202.7971 |
|  | Water-dependent grazer | 268.0057 |
|  | Non-ruminant | 1057.161 |
| Agulhas National Park | Small non-social browser |  |
|  | medium-sized social mixed diet | 14.98636 |
|  | Large browser |  |
|  | Water-dependent grazer |  |
|  | Non-ruminant |  |
| Baviaanskloof World Heritage Site | Small non-social browser | 0.939491 |
|  | medium-sized social mixed diet | 1.112137 |
|  | Large browser | 4.605372 |
|  | Water-dependent grazer | 6.299611 |
|  | Non-ruminant | 0.666932 |
| Bloemhofdam Nature Reserve | Small non-social browser | 0.509593 |
|  | medium-sized social mixed diet | 515.1043 |
|  | Large browser |  |
|  | Water-dependent grazer | 417.5871 |
|  | Non-ruminant | 276.4565 |
| Bontebok National Park | Small non-social browser | 27.72013 |
|  | medium-sized social mixed diet | 148.1839 |
|  | Large browser |  |
|  | Water-dependent grazer | 44.53055 |
|  | Non-ruminant | 19.86844 |
| Borakalalo Nature Reserve | Small non-social browser |  |
|  | medium-sized social mixed diet | 96.53974 |
|  | Large browser | 170.8783 |
|  | Water-dependent grazer | 518.6137 |
|  | Non-ruminant | 296.3746 |
| Boskopdam Nature Reserve | Small non-social browser |  |
|  | medium-sized social mixed diet | 326.0045 |
|  | Large browser |  |
|  | Water-dependent grazer | 488.2419 |
|  | Non-ruminant | 292.4645 |
| Botsalano Nature Reserve | Small non-social browser | 1.281394 |
|  | medium-sized social mixed diet | 555.9239 |
|  | Large browser | 154.9436 |
|  | Water-dependent grazer | 561.7926 |
|  | Non-ruminant | 357.6341 |
| Camdeboo National Park | Small non-social browser | 0.238147 |
|  | medium-sized social mixed diet | 113.051 |
|  | Large browser | 72.42417 |
|  | Water-dependent grazer | 75.89082 |
|  | Non-ruminant | 41.40042 |
| Elandsberg Private Nature Reserve | Small non-social browser |  |
|  | medium-sized social mixed diet | 652.754 |
|  | Large browser |  |
|  | Water-dependent grazer | 139.2651 |
|  | Non-ruminant | 76.54424 |
| Golden Gate National Park | Small non-social browser | 4.7411 |
|  | medium-sized social mixed diet | 379.0225 |
|  | Large browser |  |
|  | Water-dependent grazer | 281.3906 |
|  | Non-ruminant | 227.3814 |
| Great Fish River Nature Reserve | Small non-social browser | 10.79334 |
|  | medium-sized social mixed diet | 113.8274 |
|  | Large browser | 243.6547 |
|  | Water-dependent grazer | 117.8672 |
|  | Non-ruminant | 114.175 |
| Greater Makalali Private Game Reserve | Small non-social browser | 0.999778 |
|  | medium-sized social mixed diet | 5.698554 |
|  | Large browser | 202.0881 |
|  | Water-dependent grazer | 224.9125 |
|  | Non-ruminant | 176.7447 |
| Kgalagadi National Park | Small non-social browser | 1.783643 |
|  | medium-sized social mixed diet | 66.94561 |
|  | Large browser |  |
|  | Water-dependent grazer | 19.01264 |
|  | Non-ruminant |  |
| Kgaswane Mountain Reserve | Small non-social browser | 0.754226 |
|  | medium-sized social mixed diet | 136.9111 |
|  | Large browser | 26.90862 |
|  | Water-dependent grazer | 259.2415 |
|  | Non-ruminant | 122.7235 |
| Krantzkop ammunition factory | Small non-social browser | 11.5141 |
|  | medium-sized social mixed diet | 802.5775 |
|  | Large browser | 13.93878 |
|  | Water-dependent grazer | 172.233 |
|  | Non-ruminant | 81.00171 |
| Kruger National Park | Small non-social browser |  |
|  | medium-sized social mixed diet | 2.149549 |
|  | Large browser | 116.8422 |
|  | Water-dependent grazer | 449.723 |
|  | Non-ruminant | 676.1434 |
| Kwandwe Private Game Reserve | Small non-social browser | 1.951582 |
|  | medium-sized social mixed diet | 80.50334 |
|  | Large browser | 254.9143 |
|  | Water-dependent grazer | 213.9037 |
|  | Non-ruminant | 335.2603 |
| Madikwe Nature Reserve | Small non-social browser |  |
|  | medium-sized social mixed diet | 21.37935 |
|  | Large browser | 83.91629 |
|  | Water-dependent grazer | 315.988 |
|  | Non-ruminant | 667.899 |
| Mafikeng Nature Reserve | Small non-social browser | 1.254595 |
|  | medium-sized social mixed diet | 323.4722 |
|  | Large browser | 134.7839 |
|  | Water-dependent grazer | 634.7637 |
|  | Non-ruminant | 503.4915 |
| Mapungubwe National Park | Small non-social browser | 0.323577 |
|  | medium-sized social mixed diet | 112.4017 |
|  | Large browser | 55.55195 |
|  | Water-dependent grazer | 195.9382 |
|  | Non-ruminant | 492.4602 |
| Marakele National Park | Small non-social browser |  |
|  | medium-sized social mixed diet | 32.97707 |
|  | Large browser | 29.46319 |
|  | Water-dependent grazer | 129.53 |
|  | Non-ruminant | 218.9382 |
| Mkambati Nature Reserve | Small non-social browser | 0.998692 |
|  | medium-sized social mixed diet | 180.5655 |
|  | Large browser | 5.302796 |
|  | Water-dependent grazer | 127.3556 |
|  | Non-ruminant | 198.4326 |
| Mokala National Park | Small non-social browser | 1.326592 |
|  | medium-sized social mixed diet | 314.1697 |
|  | Large browser | 105.8473 |
|  | Water-dependent grazer | 425.0398 |
|  | Non-ruminant | 103.0099 |
| Molopo Nature Reserve | Small non-social browser | 4.876038 |
|  | medium-sized social mixed diet | 505.5886 |
|  | Large browser | 60.84992 |
|  | Water-dependent grazer | 251.1188 |
|  | Non-ruminant | 68.27567 |
| Mpofu Nature Reserve | Small non-social browser | 8.110907 |
|  | medium-sized social mixed diet | 348.8714 |
|  | Large browser | 78.78668 |
|  | Water-dependent grazer | 520.0063 |
|  | Non-ruminant | 325.5905 |
| Pilanesberg Nature Reserve | Small non-social browser |  |
|  | medium-sized social mixed diet | 24.96021 |
|  | Large browser | 79.30874 |
|  | Water-dependent grazer | 237.75 |
|  | Non-ruminant | 464.7515 |
| SA lombard Nature Reserve | Small non-social browser | 0.840627 |
|  | medium-sized social mixed diet | 280.0606 |
|  | Large browser |  |
|  | Water-dependent grazer | 442.0538 |
|  | Non-ruminant | 134.0714 |
| Samara Private Game reserve | Small non-social browser | 0.25709 |
|  | medium-sized social mixed diet | 103.3898 |
|  | Large browser | 65.53049 |
|  | Water-dependent grazer | 41.07247 |
|  | Non-ruminant | 27.63643 |
| Shamwari Private Game Reserve | Small non-social browser | 23.95187 |
|  | medium-sized social mixed diet | 97.88266 |
|  | Large browser | 259.8435 |
|  | Water-dependent grazer | 160.4165 |
|  | Non-ruminant | 299.0851 |
| Suikerbosrand Nature Reserve | Small non-social browser | 2.580747 |
|  | medium-sized social mixed diet | 317.071 |
|  | Large browser | 14.65975 |
|  | Water-dependent grazer | 240.3034 |
|  | Non-ruminant | 328.2824 |
| Table Mountain National Park (south) | Small non-social browser | 0.174255 |
|  | medium-sized social mixed diet | 44.8049 |
|  | Large browser |  |
|  | Water-dependent grazer | 10.64454 |
|  | Non-ruminant | 1.320035 |
| Thomas Baines Nature Reserve | Small non-social browser | 94.5361 |
|  | medium-sized social mixed diet | 64.99503 |
|  | Large browser | 19.25743 |
|  | Water-dependent grazer | 305.1369 |
|  | Non-ruminant | 208.4654 |
| Tsolwana Nature Reserve | Small non-social browser | 9.188677 |
|  | medium-sized social mixed diet | 416.767 |
|  | Large browser | 81.33687 |
|  | Water-dependent grazer | 644.5737 |
|  | Non-ruminant | 119.6559 |
| Tswalu | Small non-social browser | 3.807776 |
|  | medium-sized social mixed diet | 225.8794 |
|  | Large browser | 50.52962 |
|  | Water-dependent grazer | 101.3573 |
|  | Non-ruminant | 45.86028 |
| West Coast National Park | Small non-social browser | 0.383202 |
|  | medium-sized social mixed diet | 8.299944 |
|  | Large browser | 4.620589 |
|  | Water-dependent grazer | 12.44637 |
|  | Non-ruminant | 1.25926 |
| Wolwespruit Nature Reserve | Small non-social browser | 1.665842 |
|  | medium-sized social mixed diet | 213.4556 |
|  | Large browser | 18.58504 |
|  | Water-dependent grazer | 267.3406 |
|   | Non-ruminant | 339.1012 |

Supplementary Table 3: The metabolic biomass of large herbivores on the Palaeo-Agulhas Plain (PAP) for large mammal functional groups (Hempson et al. 2015). Herbivore biomass has been classified into biome and PAP section. Annual and winter rainfall have been calculated from the centroids of each of the PAP sections.

|  |  |  |
| --- | --- | --- |
| Palaeo-Agulhas Plain characteristics |   | Large herbivore biomass (including min and max) |
| Section | Annual rainfall | Functional group | Fynbos | Thicket | Savanna | Grassland |
| North-west | 655 | Small non-social browsers | 7.79(0-94.05) | 51.69(0-187.35) | 0.53(0-125.56) | 5.88(0-141.92) |
|  |  | Medium-sized social mixed diets | 264.81(178.55-351.07) | 75.88(0-211.54) | 163.23(38.2-288.76) | 288.93(152.89-424.97) |
|  |  | Large browsers | 8.8(0-95.06) | 211.76(86.1-357.41) | 125.11(0.08-250.14) | 30.63(0-166.67) |
|  |  | Water-dependent grazers | 52.63(0-138.89) | 287.32(151.66-422.98) | 459.81(334.78-584.84) | 451.45(315.41-587.48) |
|  |  | Nonruminants | 24.21(0-110.46) | 453.64(317.99-589.3) | 354.44(229.42-479.47) | 273.4(137.36-409.44) |
| South-west | 766 | Small non-social browsers | 9.26(0-102.23) | 71.83(0-266.89) | 0.02(0-177.01) | 5.2(0-116.68) |
|  |  | Medium-sized social mixed diets | 416.65(323.69-509.63) | 65.31(0-260.37) | 120.8(0-297.8) | 262.11(150.62-373.59) |
|  |  | Large browsers | 10.49(0-103.46) | 248.56(53.51-443.62) | 142.49(0-319.48) | 20.87(0-132.35) |
|  |  | Water-dependent grazers | 84.7(0-177.67) | 367.12(172.06-562.17) | 528.77(351.78-705.76) | 398.22(286.74-509.7) |
|  |  | Nonruminants | 40.52(0-133.49) | 565.45(370.39-760.5) | 383.37(206.38-560.37) | 264.75(153.27-376.23) |
| North-central | 421 | Small non-social browsers | 4.7(0-148.69) | 9.22(0-76.79) | 1.6(0-70.54) | 7.31(0-220.33) |
|  |  | Medium-sized social mixed diets | 0(0-88.69) | 98.51(30.58-165.73) | 252.68(183.75-321.62) | 345.47(132.45-558.49) |
|  |  | Large browsers | 5.23(0-149.22) | 165.25(97.67-232.28) | 88.46(19.53-157.4) | 51.21(0-264.23) |
|  |  | Water-dependent grazers | 0(0-129.01) | 119.1(51.52-186.67) | 314.43(245.49-383.36) | 563.66(350.64-776.68) |
|  |  | Nonruminants | 0(0-133.8) | 217.95(150.37-285.53) | 293.46(224.52-362.39) | 291.62(78.6-504.64) |
| South-central | 513 | Small non-social browsers | 5.92(0-119.69) | 25.92(0-100.38) | 1.18(0-74.91) | 6.75(0-187.13) |
|  |  | Medium-sized social mixed diets | 70.56(0-184.33) | 89.4(14.94-163.85) | 217.52(143.78-291.25) | 323.24(142.86-503.62) |
|  |  | Large browsers | 6.64(0-120.41) | 187.46(113-261.92) | 102.87(29.14-176.6) | 43.12(0-223.5) |
|  |  | Water-dependent grazers | 11.6(0-125.38) | 185.24(110.78-259.7) | 371.58(297.85-445.32) | 519.54(339.16-699.92) |
|  |  | Nonruminants | 3.33(0-117.11) | 310.62(236.16-385.07) | 317.43(243.7-391.17) | 284.46(104.07-464.84) |
| North-east | 648 | Small non-social browsers | 7.7(0-94.45) | 50.42(0-182.5) | 0.56(0-122.5) | 5.93(0-143.89) |
|  |  | Medium-sized social mixed diets | 255.23(168.48-341.99) | 76.55(0-208.63) | 165.91(43.97-287.85) | 290.62(152.66-428.58) |
|  |  | Large browsers | 8.69(0-95.45) | 220.07(87.98-352.15) | 124.01(2.07-245.95) | 31.25(0-269.21) |
|  |  | Water-dependent grazers | 50.61(0-137.36) | 282.29(150.2-414.37) | 455.46(333.52-577.4) | 454.8(316.84-592.76) |
|  |  | Nonruminants | 23.18(0-109.93) | 446.59(314.51-578.68) | 352.62(230.68-474.56) | 273.94(135.98-411.9) |
| South-east | 713 | Small non-social browsers | 8.56(0-94.97) | 62.22(0-228.4) | 0.26(0-151.88) | 5.53(0-127.16) |
|  |  | Medium-sized social mixed diets | 344.15(257.75-430.56) | 70.36(0-236.54) | 141.06(0-292.67) | 274.91(153.28-396.55) |
|  |  | Large browsers | 9.69(0-96.09) | 235.76(69.58-401.95) | 134.19(0-185.8) | 25.53(0-147.16) |
|  |  | Water-dependent grazers | 69.39(0-155.8) | 329.02(162.83-495.2) | 495.84(344.23-647.46) | 423.63(302-545.27) |
|   |   | Nonruminants | 32.73(0-119.14) | 512.06(345.88-678.25) | 369.56(217.94-521.18) | 268.88(147.25-390.51) |

Hempson, G. P., S. Archibald, and W. J. Bond. 2015: A continent-wide assessment of the form and intensity of large mammal herbivory in Africa. Science 350:1056–1061.