VM0048: Expanded Deforestation

Baseline Deforestation in Surrounding Community Forests 2013-2023

Winrock International[[1]](#footnote-20)

2025-05-13

set.seed(77777)  
# Import project aoi  
aoi = sf::read\_sf("/Users/seamus/Library/CloudStorage/OneDrive-WinrockInternationalInstituteforAgriculturalDevelopment/20087 - RSPB Gola Feasibility/Deliverables/Spatial Data/AOI/Archive/ProjectArea\_CF-Expansion\_051525/updated\_areas.shp") |>  
 sf::st\_make\_valid() |> # Fix geometry  
 sf::st\_transform("EPSG:32629") |> # Match the raster CRS   
 sf::st\_cast("POLYGON") |> sf::st\_cast("MULTIPOLYGON") |>   
 dplyr::select(Name)  
  
aoi$total\_ha = round(as.numeric(sf::st\_area(aoi) \* 0.0001, 4))  
voi = terra::vect(aoi)  
  
FOREST\_COUNTY\_2013 = terra::rast("./data/LULC/FOREST\_COUNTY\_2013.tif") |> terra::project("EPSG:32629")

|---------|---------|---------|---------|=========================================

FOREST\_COUNTY\_2023 = terra::rast("./data/LULC/FOREST\_COUNTY\_2023.tif") |> terra::project("EPSG:32629")

|---------|---------|---------|---------|=========================================

FOREST\_PROJECT\_2013 = terra::crop(FOREST\_COUNTY\_2013, voi, mask=T)

|---------|---------|---------|---------|========================================= |---------|---------|---------|---------|=========================================

FOREST\_PROJECT\_2023 = terra::crop(FOREST\_COUNTY\_2023, voi, mask=T)

|---------|---------|---------|---------|========================================= |---------|---------|---------|---------|=========================================

FOREST\_BINARY\_2013 = terra::classify(FOREST\_PROJECT\_2013,   
 rcl=matrix(c(-Inf, 0.5, 0,0.5, Inf, 1),ncol=3,byrow=TRUE))

|---------|---------|---------|---------|=========================================

FOREST\_BINARY\_2023 = terra::classify(FOREST\_PROJECT\_2023,   
 rcl = matrix(c(-Inf, 0.5, 0,0.5, Inf, 1),ncol=3,byrow=TRUE))

|---------|---------|---------|---------|=========================================

CHANGE\_RASTER <- (FOREST\_BINARY\_2013 \* 10) + FOREST\_BINARY\_2023

|---------|---------|---------|---------|========================================= |---------|---------|---------|---------|=========================================

CHANGE\_RASTER\_RECLASS <- terra::classify(CHANGE\_RASTER,   
 rcl = matrix(c(0, 0, # Stable non-forest stays 0  
 10,1, # Forest loss becomes 1  
 11,2), # Stable forest becomes 2  
 ncol=2, byrow=TRUE)) |> as.factor()

|---------|---------|---------|---------|========================================= |---------|---------|---------|---------|=========================================

terra::freq(CHANGE\_RASTER\_RECLASS)

layer value count  
1 1 0 1399286  
2 1 1 4835433  
3 1 2 67984085

# Then extract  
sum2013 = terra::extract(FOREST\_PROJECT\_2013, voi, fun = sum, na.rm = TRUE)  
  
# Set labels clearly:  
levels(CHANGE\_RASTER\_RECLASS) <- data.frame(  
 value = c(0, 1, 2),  
 label = c("Stable Non-forest", "Forest Loss", "Stable Forest")  
)  
terra::freq(CHANGE\_RASTER\_RECLASS)

layer value count  
1 1 Stable Non-forest 1399286  
2 1 Forest Loss 4835433  
3 1 Stable Forest 67984085

tmap::tmap\_mode("plot")  
tmap::tm\_shape(CHANGE\_RASTER\_RECLASS) +  
 tm\_raster(  
 palette = c("yellow", "red", "forestgreen"),  
 style = "cat",  
 title = "Forest Change (2013–2023)",  
 labels = c("Stable Non-forest", "Forest Loss", "Stable Forest")  
 ) +  
 tm\_shape(aoi) + tm\_borders(col="black", lwd=1) +  
 tm\_text("Name", col = "Name", size = 0.5) +  
 tm\_graticules(lines = TRUE, labels.rot = c(0,90), lwd = 0.2) +  
 tm\_scalebar(position = c("RIGHT", "BOTTOM"), text.size = 0.5) +  
 tm\_compass(color.dark = "gray60", position = c("left", "top")) +  
 tm\_layout(legend.outside = FALSE) -> tm1  
tm1

cell\_area\_ha = prod(terra::res(FOREST\_COUNTY\_2013)) / 10000  
getForestArea = function(forest\_raster, voi, cell\_area) {  
 forest\_ex = terra::extract(forest\_raster, voi, fun = sum, na.rm=T)  
 forest\_sum = forest\_ex[[2]]  
 forest\_area = forest\_sum \* cell\_area  
 return(forest\_area)  
}  
  
sum2013 = terra::extract(FOREST\_PROJECT\_2013, voi, fun=sum, na.rm=T)  
sum2023 = terra::extract(FOREST\_PROJECT\_2023, voi, fun=sum, na.rm=T)  
sum2013 = terra::extract(FOREST\_PROJECT\_2013, voi, fun = sum, na.rm = TRUE)  
  
aoi$ForestArea2013 = sum2013[,2] \* cell\_area\_ha  
aoi$ForestArea2023 = sum2023[,2] \* cell\_area\_ha  
aoi$AnnualDeforestation\_ha = round((aoi$ForestArea2013 - aoi$ForestArea2023) / 10, 2)  
  
add\_total <- \(x) {x |>   
 summarise(Name = "Total", across(where(is.numeric), sum)) |>  
 bind\_rows(x)  
 }  
  
summary\_table = aoi |>  
 sf::st\_drop\_geometry() |>  
 dplyr::mutate(  
 Forest\_2013\_pct = round((ForestArea2013 / total\_ha) \* 100, 2),  
 Forest\_2023\_pct = round((ForestArea2023 / total\_ha) \* 100, 2)) |>  
 dplyr::select(Name,   
 total\_ha,   
 ForestArea2013,   
 Forest\_2013\_pct,   
 ForestArea2023,   
 Forest\_2023\_pct,   
 AnnualDeforestation\_ha) |> add\_total()  
  
flextable(summary\_table[,1:7]) |>   
 fontsize(size=8,part="all") |>  
 set\_table\_properties(layout = "autofit")

| Name | total\_ha | ForestArea2013 | Forest\_2013\_pct | ForestArea2023 | Forest\_2023\_pct | AnnualDeforestation\_ha |
| --- | --- | --- | --- | --- | --- | --- |
| Total | 730,474 | 716,699.043 | 2,620.61 | 669,154.234 | 2,356.38 | 4,754.49 |
| Lukasu | 46,997 | 45,619.244 | 97.07 | 37,606.599 | 80.02 | 801.26 |
| Mbarma CF | 44,323 | 43,856.790 | 98.95 | 42,865.911 | 96.71 | 99.09 |
| Lower Sokpo CF | 14,069 | 13,414.162 | 95.35 | 11,635.964 | 82.71 | 177.82 |
| Upper Sokpo CF | 10,923 | 10,730.745 | 98.24 | 10,081.465 | 92.30 | 64.93 |
| Zuie CF | 36,236 | 35,779.533 | 98.74 | 33,493.157 | 92.43 | 228.64 |
| Gola Forest National Park | 89,042 | 88,117.930 | 98.96 | 87,480.344 | 98.25 | 63.76 |
| Tonglay CF | 19,595 | 19,246.972 | 98.22 | 18,666.632 | 95.26 | 58.03 |
| Norman CF | 12,349 | 12,050.846 | 97.59 | 11,174.953 | 90.49 | 87.59 |
| Foya | 104,885 | 103,751.592 | 98.92 | 102,872.331 | 98.08 | 87.93 |
| Kposo | 30,763 | 29,403.608 | 95.58 | 23,404.137 | 76.08 | 599.95 |
| Gola Konneh CF | 53,102 | 52,037.406 | 98.00 | 48,169.805 | 90.71 | 386.76 |
| Gola Konneh CF (ext. S) | 10,897 | 10,357.667 | 95.05 | 8,150.867 | 74.80 | 220.68 |
| Gola Konneh CF (ext. N) | 28,590 | 28,382.017 | 99.27 | 28,176.085 | 98.55 | 20.59 |
| Lower Sokpo CF (ext.) | 4,771 | 4,134.737 | 86.66 | 3,557.447 | 74.56 | 57.73 |
| Maima CF (ext.) | 13,916 | 13,747.247 | 98.79 | 13,308.006 | 95.63 | 43.92 |
| Zuie CF (ext.) | 1,495 | 1,443.866 | 96.58 | 1,227.579 | 82.11 | 21.63 |
| Yangaya | 5,834 | 5,571.289 | 95.50 | 5,232.538 | 89.69 | 33.88 |
| Koninga | 31,741 | 31,616.403 | 99.61 | 31,286.858 | 98.57 | 32.95 |
| Lobarsu | 16,548 | 16,144.180 | 97.56 | 14,463.931 | 87.41 | 168.02 |
| Bade | 51,367 | 50,370.395 | 98.06 | 47,312.825 | 92.11 | 305.76 |
| No-mans land | 39,447 | 39,155.353 | 99.26 | 37,814.859 | 95.86 | 134.05 |
| Lower Guma | 14,219 | 13,581.513 | 95.52 | 10,490.952 | 73.78 | 309.06 |
| Central Guma | 3,850 | 3,518.634 | 91.39 | 2,324.053 | 60.37 | 119.46 |
| Upper Guma | 13,771 | 13,535.371 | 98.29 | 10,961.805 | 79.60 | 257.36 |
| Hassala | 14,570 | 14,392.981 | 98.79 | 12,139.135 | 83.32 | 225.38 |
| Buluyeama | 10,021 | 9,835.550 | 98.15 | 9,072.979 | 90.54 | 76.26 |
| Hembeh | 7,153 | 6,903.012 | 96.51 | 6,183.017 | 86.44 | 72.00 |

#print(summary\_table)  
write.csv(summary\_table, "/Users/seamus/Library/CloudStorage/OneDrive-WinrockInternationalInstituteforAgriculturalDevelopment/20087 - RSPB Gola Feasibility/Deliverables/Surrounding Deforestation/Winrock\_RSPB\_Table\_SurroundingDeforestation\_051525.csv")

devtools::session\_info()

─ Session info ───────────────────────────────────────────────────────────────  
 setting value  
 version R version 4.3.0 (2023-04-21)  
 os macOS 15.4.1  
 system aarch64, darwin20  
 ui X11  
 language (EN)  
 collate en\_US.UTF-8  
 ctype en\_US.UTF-8  
 tz America/Vancouver  
 date 2025-05-15  
 pandoc 3.6.1 @ /usr/local/bin/ (via rmarkdown)  
  
─ Packages ───────────────────────────────────────────────────────────────────  
 package \* version date (UTC) lib source  
 abind 1.4-8 2024-09-12 [1] CRAN (R 4.3.3)  
 askpass 1.2.1 2024-10-04 [1] CRAN (R 4.3.3)  
 base64enc 0.1-3 2015-07-28 [1] CRAN (R 4.3.0)  
 cachem 1.1.0 2024-05-16 [1] CRAN (R 4.3.3)  
 caret \* 7.0-1 2024-12-10 [1] CRAN (R 4.3.3)  
 class 7.3-23 2025-01-01 [1] CRAN (R 4.3.3)  
 classInt 0.4-11 2025-01-08 [1] CRAN (R 4.3.3)  
 cli 3.6.3 2024-06-21 [1] CRAN (R 4.3.3)  
 codetools 0.2-20 2024-03-31 [1] CRAN (R 4.3.1)  
 colorspace 2.1-1 2024-07-26 [1] CRAN (R 4.3.3)  
 cols4all \* 0.8 2024-10-16 [1] CRAN (R 4.3.3)  
 crosstalk 1.2.1 2023-11-23 [1] CRAN (R 4.3.1)  
 data.table 1.16.4 2024-12-06 [1] CRAN (R 4.3.3)  
 DBI 1.2.3 2024-06-02 [1] CRAN (R 4.3.3)  
 deldir 2.0-4 2024-02-28 [1] CRAN (R 4.3.1)  
 devtools 2.4.5 2022-10-11 [1] CRAN (R 4.3.0)  
 dichromat 2.0-0.1 2022-05-02 [1] CRAN (R 4.3.0)  
 digest 0.6.37 2024-08-19 [1] CRAN (R 4.3.3)  
 dplyr \* 1.1.4 2023-11-17 [1] CRAN (R 4.3.1)  
 e1071 \* 1.7-16 2024-09-16 [1] CRAN (R 4.3.3)  
 ellipsis 0.3.2 2021-04-29 [1] CRAN (R 4.3.0)  
 evaluate 1.0.3 2025-01-10 [1] CRAN (R 4.3.3)  
 fastmap 1.2.0 2024-05-15 [1] CRAN (R 4.3.3)  
 flextable \* 0.9.7 2024-10-27 [1] CRAN (R 4.3.3)  
 fontBitstreamVera 0.1.1 2017-02-01 [1] CRAN (R 4.3.3)  
 fontLiberation 0.1.0 2016-10-15 [1] CRAN (R 4.3.3)  
 fontquiver 0.2.1 2017-02-01 [1] CRAN (R 4.3.3)  
 foreach 1.5.2 2022-02-02 [1] CRAN (R 4.3.0)  
 fs 1.6.5 2024-10-30 [1] CRAN (R 4.3.3)  
 future 1.34.0 2024-07-29 [1] CRAN (R 4.3.3)  
 future.apply 1.11.3 2024-10-27 [1] CRAN (R 4.3.3)  
 gdtools 0.4.1 2024-11-04 [1] CRAN (R 4.3.3)  
 generics 0.1.3 2022-07-05 [1] CRAN (R 4.3.0)  
 ggplot2 \* 3.5.1 2024-04-23 [1] CRAN (R 4.3.1)  
 ggplotify \* 0.1.2 2023-08-09 [1] CRAN (R 4.3.0)  
 globals 0.16.3 2024-03-08 [1] CRAN (R 4.3.1)  
 glue 1.8.0 2024-09-30 [1] CRAN (R 4.3.3)  
 gower 1.0.2 2024-12-17 [1] CRAN (R 4.3.3)  
 gridGraphics 0.5-1 2020-12-13 [1] CRAN (R 4.3.0)  
 gtable 0.3.6 2024-10-25 [1] CRAN (R 4.3.3)  
 hardhat 1.4.0 2024-06-02 [1] CRAN (R 4.3.3)  
 htmltools 0.5.8.1 2024-04-04 [1] CRAN (R 4.3.1)  
 htmlwidgets 1.6.4 2023-12-06 [1] CRAN (R 4.3.1)  
 httpuv 1.6.15 2024-03-26 [1] CRAN (R 4.3.1)  
 interp 1.1-6 2024-01-26 [1] CRAN (R 4.3.1)  
 ipred 0.9-15 2024-07-18 [1] CRAN (R 4.3.3)  
 iterators 1.0.14 2022-02-05 [1] CRAN (R 4.3.0)  
 janitor \* 2.2.1 2024-12-22 [1] CRAN (R 4.3.3)  
 jpeg 0.1-10 2022-11-29 [1] CRAN (R 4.3.0)  
 KernSmooth 2.23-26 2025-01-01 [1] CRAN (R 4.3.3)  
 knitr \* 1.49 2024-11-08 [1] CRAN (R 4.3.3)  
 later 1.4.1 2024-11-27 [1] CRAN (R 4.3.3)  
 latex2exp \* 0.9.6 2022-11-28 [1] CRAN (R 4.3.0)  
 lattice \* 0.22-6 2024-03-20 [1] CRAN (R 4.3.1)  
 latticeExtra \* 0.6-30 2022-07-04 [1] CRAN (R 4.3.0)  
 lava 1.8.1 2025-01-12 [1] CRAN (R 4.3.3)  
 leafem \* 0.2.3 2023-09-17 [1] CRAN (R 4.3.1)  
 leafgl \* 0.2.2 2024-11-13 [1] CRAN (R 4.3.3)  
 leaflegend 1.2.1 2024-05-09 [1] CRAN (R 4.3.3)  
 leaflet \* 2.2.2 2024-03-26 [1] CRAN (R 4.3.1)  
 leaflet.extras \* 2.0.1 2024-08-19 [1] CRAN (R 4.3.3)  
 leaflet.providers \* 2.0.0 2023-10-17 [1] CRAN (R 4.3.1)  
 leafsync 0.1.0 2019-03-05 [1] CRAN (R 4.3.0)  
 lifecycle 1.0.4 2023-11-07 [1] CRAN (R 4.3.1)  
 listenv 0.9.1 2024-01-29 [1] CRAN (R 4.3.1)  
 lubridate 1.9.4 2024-12-08 [1] CRAN (R 4.3.3)  
 lwgeom 0.2-14 2024-02-21 [1] CRAN (R 4.3.1)  
 magrittr 2.0.3 2022-03-30 [1] CRAN (R 4.3.0)  
 maptiles \* 0.8.0 2025-01-21 [1] Github (riatelab/maptiles@513b7d4)  
 MASS \* 7.3-58.4 2023-03-07 [2] CRAN (R 4.3.0)  
 Matrix 1.6-5 2024-01-11 [1] CRAN (R 4.3.1)  
 memoise 2.0.1 2021-11-26 [1] CRAN (R 4.3.0)  
 microbenchmark 1.5.0 2024-09-04 [1] CRAN (R 4.3.3)  
 mime 0.12 2021-09-28 [1] CRAN (R 4.3.0)  
 miniUI 0.1.1.1 2018-05-18 [1] CRAN (R 4.3.0)  
 ModelMetrics \* 1.2.2.2 2020-03-17 [1] CRAN (R 4.3.0)  
 munsell 0.5.1 2024-04-01 [1] CRAN (R 4.3.1)  
 nlme 3.1-166 2024-08-14 [1] CRAN (R 4.3.3)  
 nnet 7.3-20 2025-01-01 [1] CRAN (R 4.3.3)  
 officer 0.6.7 2024-10-09 [1] CRAN (R 4.3.3)  
 openssl 2.3.1 2025-01-09 [1] CRAN (R 4.3.3)  
 parallelly 1.41.0 2024-12-18 [1] CRAN (R 4.3.3)  
 performanceEstimation \* 1.1.0 2016-10-13 [1] CRAN (R 4.3.0)  
 pillar 1.10.1 2025-01-07 [1] CRAN (R 4.3.3)  
 pkgbuild 1.4.6 2025-01-16 [1] CRAN (R 4.3.3)  
 pkgconfig \* 2.0.3 2019-09-22 [1] CRAN (R 4.3.0)  
 pkgload 1.4.0 2024-06-28 [1] CRAN (R 4.3.3)  
 plyr 1.8.9 2023-10-02 [1] CRAN (R 4.3.1)  
 png 0.1-8 2022-11-29 [1] CRAN (R 4.3.0)  
 pROC 1.18.5 2023-11-01 [1] CRAN (R 4.3.1)  
 prodlim 2024.06.25 2024-06-24 [1] CRAN (R 4.3.3)  
 profvis 0.4.0 2024-09-20 [1] CRAN (R 4.3.3)  
 promises 1.3.2 2024-11-28 [1] CRAN (R 4.3.3)  
 proxy 0.4-27 2022-06-09 [1] CRAN (R 4.3.0)  
 purrr 1.0.2 2023-08-10 [1] CRAN (R 4.3.0)  
 R6 2.5.1 2021-08-19 [1] CRAN (R 4.3.0)  
 ragg 1.3.3 2024-09-11 [1] CRAN (R 4.3.3)  
 randomForest \* 4.7-1.2 2024-09-22 [1] CRAN (R 4.3.3)  
 raster \* 3.6-31 2025-01-16 [1] CRAN (R 4.3.3)  
 RColorBrewer 1.1-3 2022-04-03 [1] CRAN (R 4.3.0)  
 Rcpp \* 1.0.14 2025-01-12 [1] CRAN (R 4.3.3)  
 RcppThread \* 2.2.0 2025-01-07 [1] CRAN (R 4.3.3)  
 recipes 1.1.0 2024-07-04 [1] CRAN (R 4.3.3)  
 remotes 2.5.0 2024-03-17 [1] CRAN (R 4.3.1)  
 reshape2 1.4.4 2020-04-09 [1] CRAN (R 4.3.0)  
 rlang 1.1.4 2024-06-04 [1] CRAN (R 4.3.3)  
 rmarkdown \* 2.29 2024-11-04 [1] CRAN (R 4.3.3)  
 rpart 4.1.24 2025-01-07 [1] CRAN (R 4.3.3)  
 rstudioapi 0.17.1 2024-10-22 [1] CRAN (R 4.3.3)  
 s2 1.1.7 2024-07-17 [1] CRAN (R 4.3.3)  
 scales 1.3.0 2023-11-28 [1] CRAN (R 4.3.1)  
 sessioninfo 1.2.2 2021-12-06 [1] CRAN (R 4.3.0)  
 sf \* 1.0-21 2025-04-09 [1] Github (r-spatial/sf@ac49ec2)  
 shiny 1.10.0 2024-12-14 [1] CRAN (R 4.3.3)  
 snakecase 0.11.1 2023-08-27 [1] CRAN (R 4.3.0)  
 sp \* 2.1-4 2024-04-30 [1] CRAN (R 4.3.1)  
 spacesXYZ 1.3-0 2024-01-23 [1] CRAN (R 4.3.1)  
 stars 0.6-7 2024-11-07 [1] CRAN (R 4.3.3)  
 stringi 1.8.4 2024-05-06 [1] CRAN (R 4.3.1)  
 stringr 1.5.1 2023-11-14 [1] CRAN (R 4.3.1)  
 survival 3.8-3 2024-12-17 [1] CRAN (R 4.3.3)  
 systemfonts 1.1.0 2024-05-15 [1] CRAN (R 4.3.3)  
 terra \* 1.8-42 2025-04-02 [1] CRAN (R 4.3.0)  
 textshaping 0.4.1 2024-12-06 [1] CRAN (R 4.3.3)  
 tibble 3.2.1 2023-03-20 [1] CRAN (R 4.3.0)  
 tidyr 1.3.1 2024-01-24 [1] CRAN (R 4.3.1)  
 tidyselect 1.2.1 2024-03-11 [1] CRAN (R 4.3.1)  
 tidyterra \* 0.7.0 2025-02-03 [1] CRAN (R 4.3.3)  
 timechange 0.3.0 2024-01-18 [1] CRAN (R 4.3.1)  
 timeDate 4041.110 2024-09-22 [1] CRAN (R 4.3.3)  
 tinytex \* 0.54 2024-11-01 [1] CRAN (R 4.3.3)  
 tmap \* 4.0 2025-01-27 [1] CRAN (R 4.3.3)  
 tmaptools \* 3.2 2025-01-13 [1] CRAN (R 4.3.3)  
 units 0.8-7 2025-03-11 [1] CRAN (R 4.3.3)  
 urlchecker 1.0.1 2021-11-30 [1] CRAN (R 4.3.0)  
 usethis 3.1.0 2024-11-26 [1] CRAN (R 4.3.3)  
 uuid 1.2-1 2024-07-29 [1] CRAN (R 4.3.3)  
 vctrs 0.6.5 2023-12-01 [1] CRAN (R 4.3.1)  
 viridisLite 0.4.2 2023-05-02 [1] CRAN (R 4.3.0)  
 withr 3.0.2 2024-10-28 [1] CRAN (R 4.3.3)  
 wk 0.9.4 2024-10-11 [1] CRAN (R 4.3.3)  
 xfun 0.50 2025-01-07 [1] CRAN (R 4.3.3)  
 XML 3.99-0.18 2025-01-01 [1] CRAN (R 4.3.3)  
 xml2 1.3.6 2023-12-04 [1] CRAN (R 4.3.1)  
 xtable 1.8-4 2019-04-21 [1] CRAN (R 4.3.0)  
 yaml 2.3.10 2024-07-26 [1] CRAN (R 4.3.3)  
 yulab.utils 0.1.9 2025-01-07 [1] CRAN (R 4.3.3)  
 zip 2.3.1 2024-01-27 [1] CRAN (R 4.3.1)  
  
 [1] /Library/Frameworks/R.framework/Versions/4.1-arm64/Resources/library  
 [2] /Library/Frameworks/R.framework/Versions/4.3-arm64/Resources/library  
  
──────────────────────────────────────────────────────────────────────────────

Sys.getenv()

\_\_CF\_USER\_TEXT\_ENCODING  
 0x1F5:0:0  
\_\_CFBundleIdentifier com.rstudio.desktop  
CLICOLOR\_FORCE 1  
COMMAND\_MODE unix2003  
DISPLAY /private/tmp/com.apple.launchd.xbG4pFohwF/org.xquartz:0  
DYLD\_FALLBACK\_LIBRARY\_PATH  
 /Library/Frameworks/R.framework/Resources/lib:/Library/Java/JavaVirtualMachines/jdk-11.0.18+10/Contents/Home/lib/server  
EDITOR vi  
GIT\_ASKPASS rpostback-askpass  
HOME /Users/seamus  
LANG en\_US.UTF-8  
LC\_CTYPE en\_US.UTF-8  
LN\_S ln -s  
LOGNAME seamus  
MAKE make  
MallocNanoZone 0  
MPLENGINE tkAgg  
NOT\_CRAN true  
OGR\_ENABLE\_PARTIAL\_REPROJECTION  
 TRUE  
ORIGINAL\_XDG\_CURRENT\_DESKTOP  
 undefined  
PAGER /usr/bin/less  
PATH /Users/seamus/Library/Python/3.12/bin:/Users/seamus/Library/Python/3.9/bin:/usr/local/bin:/System/Cryptexes/App/usr/bin:/usr/bin:/bin:/usr/sbin:/sbin:/var/run/com.apple.security.cryptexd/codex.system/bootstrap/usr/local/bin:/var/run/com.apple.security.cryptexd/codex.system/bootstrap/usr/bin:/var/run/com.apple.security.cryptexd/codex.system/bootstrap/usr/appleinternal/bin:/opt/X11/bin:/Library/Apple/usr/bin:/Library/TeX/texbin:/Applications/quarto/bin:/usr/texbin:/Applications/RStudio.app/Contents/Resources/app/bin/postback  
PKGLOAD\_PARENT\_TEMPDIR  
 /var/folders/\_t/0yt99n3d0s1c1hnx40n3g9gw0000gn/T//Rtmpgb38vS  
PWD /Users/seamus/repos/rspb-redd-risk-new  
PYTHONIOENCODING utf-8  
R\_ARCH   
R\_BROWSER /usr/bin/open  
R\_BZIPCMD /usr/bin/bzip2  
R\_CLI\_HAS\_HYPERLINK\_IDE\_HELP  
 true  
R\_CLI\_HAS\_HYPERLINK\_IDE\_RUN  
 true  
R\_CLI\_HAS\_HYPERLINK\_IDE\_VIGNETTE  
 true  
R\_DOC\_DIR /Library/Frameworks/R.framework/Resources/doc  
R\_GZIPCMD /usr/bin/gzip  
R\_HOME /Library/Frameworks/R.framework/Resources  
R\_INCLUDE\_DIR /Library/Frameworks/R.framework/Resources/include  
R\_LIBS /Library/Frameworks/R.framework/Versions/4.1-arm64/Resources/library:/Library/Frameworks/R.framework/Versions/4.3-arm64/Resources/library  
R\_LIBS\_SITE /Library/Frameworks/R.framework/Resources/site-library  
R\_LIBS\_USER /Users/seamus/Library/R/arm64/4.3/library  
R\_MAX\_MEM\_SIZE “16Gb”  
R\_MAX\_VSIZE “1000000”  
R\_PAPERSIZE a4  
R\_PAPERSIZE\_USER a4  
R\_PDFVIEWER /usr/bin/open  
R\_PLATFORM aarch64-apple-darwin20  
R\_PRINTCMD lpr  
R\_QPDF /Library/Frameworks/R.framework/Resources/bin/qpdf  
R\_RD4PDF times,inconsolata,hyper  
R\_RUNTIME   
R\_SESSION\_TMPDIR /var/folders/\_t/0yt99n3d0s1c1hnx40n3g9gw0000gn/T//Rtmpgb38vS  
R\_SHARE\_DIR /Library/Frameworks/R.framework/Resources/share  
R\_STRIP\_SHARED\_LIB strip -x  
R\_STRIP\_STATIC\_LIB strip -S  
R\_SYSTEM\_ABI macos,gcc,gxx,gfortran,gfortran  
R\_TEXI2DVICMD /opt/R/arm64/bin/texi2dvi  
R\_UNZIPCMD /usr/bin/unzip  
R\_ZIPCMD /usr/bin/zip  
RMARKDOWN\_MATHJAX\_PATH  
 /Applications/RStudio.app/Contents/Resources/app/resources/mathjax-27  
RMARKDOWN\_PREVIEW\_DIR /var/folders/\_t/0yt99n3d0s1c1hnx40n3g9gw0000gn/T//Rtmp9tJqv7  
RS\_LOG\_LEVEL WARN  
RS\_RPOSTBACK\_PATH /Applications/RStudio.app/Contents/Resources/app/bin/rpostback  
RS\_SHARED\_SECRET 636da564-2ffd-459c-a5a9-5c72e54f834c  
RSTUDIO 1  
RSTUDIO\_CHILD\_PROCESS\_PANE  
 render  
RSTUDIO\_CLI\_HYPERLINKS  
 true  
RSTUDIO\_CONSOLE\_COLOR 256  
RSTUDIO\_CONSOLE\_WIDTH 113  
RSTUDIO\_DESKTOP\_EXE /Applications/RStudio.app/Contents/MacOS/RStudio  
RSTUDIO\_FALLBACK\_LIBRARY\_PATH  
 /var/folders/\_t/0yt99n3d0s1c1hnx40n3g9gw0000gn/T/rstudio-fallback-library-path-1955428559  
RSTUDIO\_LONG\_VERSION 2024.12.1+563  
RSTUDIO\_PANDOC /Applications/RStudio.app/Contents/Resources/app/quarto/bin/tools/aarch64  
RSTUDIO\_PROGRAM\_MODE desktop  
RSTUDIO\_SESSION\_PID 20618  
RSTUDIO\_SESSION\_PORT 13561  
RSTUDIO\_USER\_IDENTITY seamus  
RSTUDIO\_VERSION 2024.12.1.563  
RSTUDIOAPI\_IPC\_REQUESTS\_FILE  
 /var/folders/\_t/0yt99n3d0s1c1hnx40n3g9gw0000gn/T/Rtmp9tJqv7/rstudio-ipc-requests-508a66652cc4.rds  
RSTUDIOAPI\_IPC\_RESPONSE\_FILE  
 /var/folders/\_t/0yt99n3d0s1c1hnx40n3g9gw0000gn/T/Rtmp9tJqv7/rstudio-ipc-response-508a7c5e2c60.rds  
RSTUDIOAPI\_IPC\_SHARED\_SECRET  
 4c614ca1-8b7b-45f3-b59c-78671c7d9902  
SED /usr/bin/sed  
SHELL /bin/zsh  
SHLVL 0  
SSH\_ASKPASS rpostback-askpass  
SSH\_AUTH\_SOCK /private/tmp/com.apple.launchd.HjDLSNhGlG/Listeners  
TAR /usr/bin/tar  
TERM xterm-256color  
TMPDIR /var/folders/\_t/0yt99n3d0s1c1hnx40n3g9gw0000gn/T/  
TZDIR /var/db/timezone/zoneinfo  
USER seamus  
XPC\_FLAGS 0x0  
XPC\_SERVICE\_NAME application.com.rstudio.desktop.33619577.33619582

1. [krysla.lima@winrock.org](mailto:krysla.lima@winrock.org), [seamus.murphy@winrock.org](mailto:seamus.murphy@winrock.org) [↑](#footnote-ref-20)