# CA_WILDFIRE_PLOTS

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*January 31, 2018*

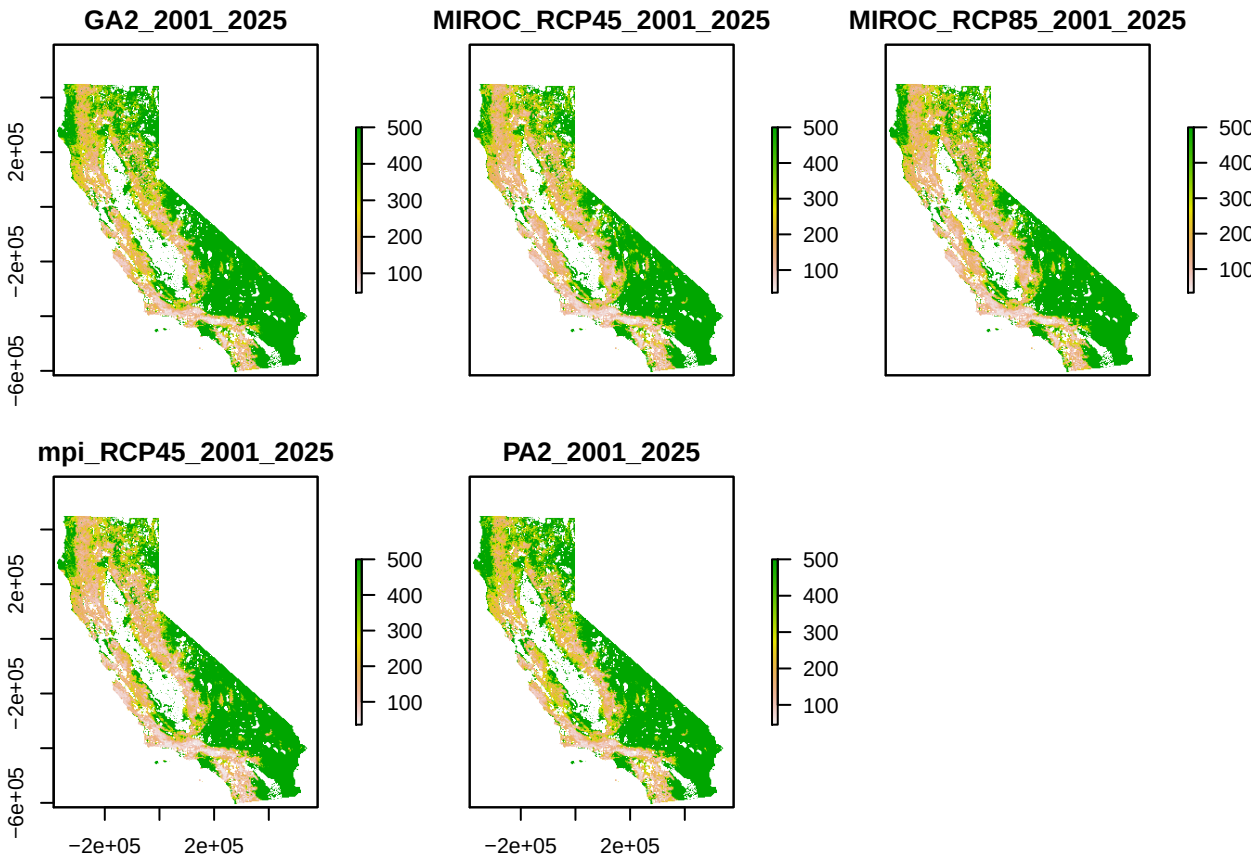
# Read in Data

```
all_mfri = list.files('./Wildfire_MFRI/',pattern = '.tif',full.names = T)
for(file in all_mfri){
  object_name = file_path_sans_ext(basename(file))
  assign(object_name, raster(file))
}

CC4a_reg = read_sf('./Boundries/CC4a_RegionsSub.shp')
CC4a_reg  = st_transform(CC4a_reg, "+proj=aea +lat_1=34 +lat_2=40.5 +lat_0=0 +lon_0=-120 +x_0=0 +y_0=-4
# dissolve multipart Sierra Mountain feature
CC4a_reg = ms_dissolve(CC4a_reg,field = 'Region')
```

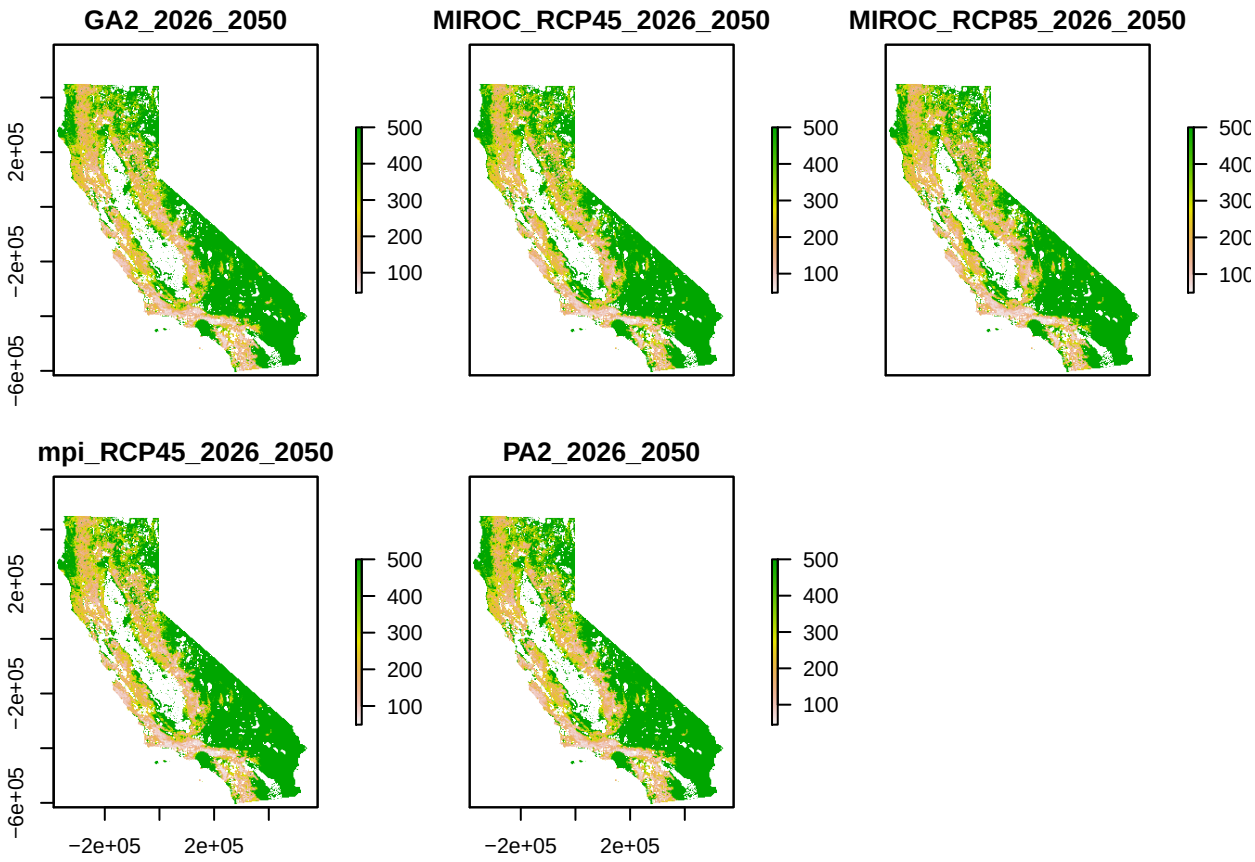
# Get stats for 01-25 & 26-50 MFRIs cap at 500 years

```
all_2001_2025 = stack(all_mfri[grepl('2001_2025',all_mfri)])
all_2026_2050 = stack(all_mfri[grepl('2026_2050',all_mfri)])

# years for maximum plotted MFRI
capat=500

# calculate stats for stacks and cap MFRI
# writes out files with 3 different postfix _stat for statisic (mean etc), _df for dataframe for ggplo
summary_functions = c('min','max','mean' )
for(summary in summary_functions){
  for(stac in c('all_2001_2025','all_2026_2050')){
     assign(paste(summary,stac,sep='_'),do.call(summary,list(x=get(stac),na.rm=T)))
     capper = get(paste(summary,stac,sep='_'))
     # write out df for ggplot
     capper.df = data.frame(rasterToPoints(capper))
     names(capper.df)  =c("lon", "lat","MFRI")
     assign(paste(summary,stac,'df',sep='_') ,capper.df)
     # cap at catat yrs
     capper[capper>capat]=capat
     assign(paste(summary,stac,'capped',sep='_'),capper)
  }}

 # write out df for ggplot
 MFRI_76_00.df = data.frame(rasterToPoints(MFRI_76_00))
 names(MFRI_76_00.df)  =c("lon", "lat","MFRI")
```

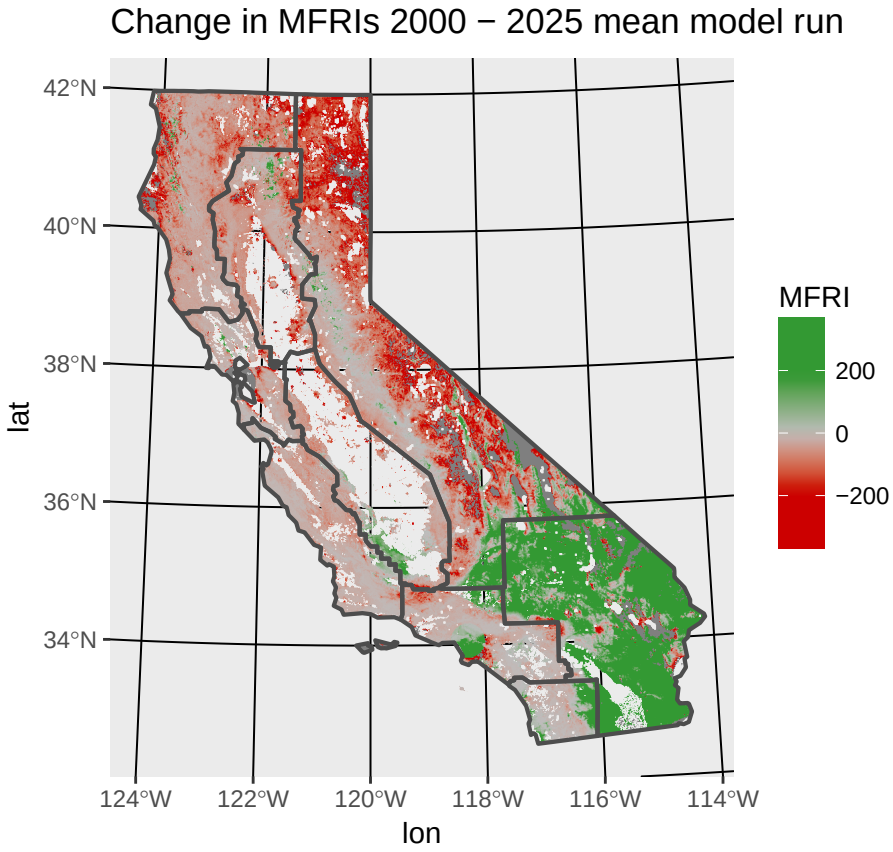
```
all_2001_2025[all_2001_2025>500]=500
all_2026_2050[all_2026_2050>500]=500
plot(all_2001_2025)
```



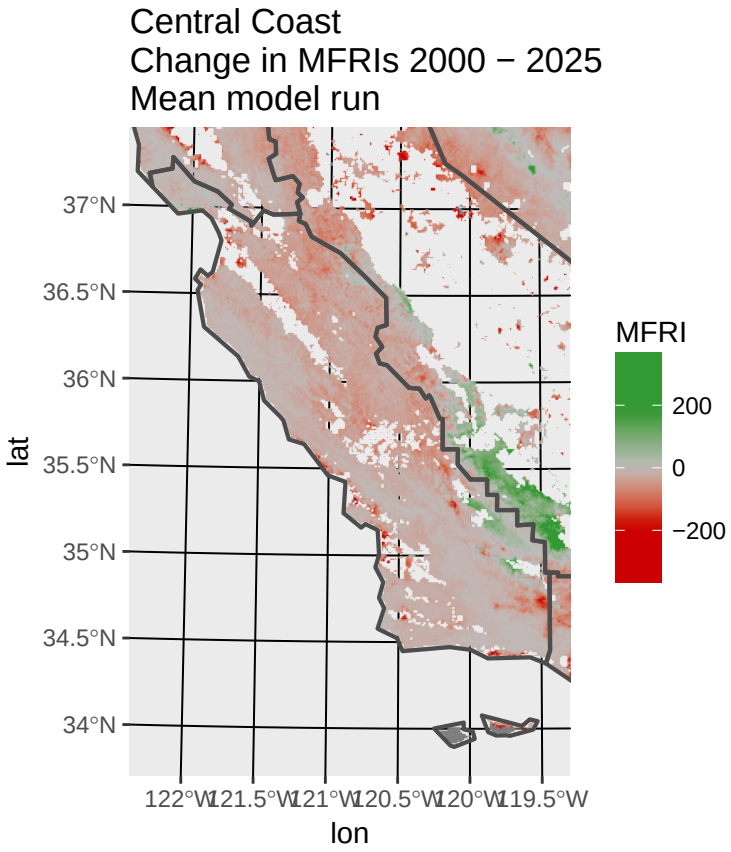

```
plot(all_2026_2050)
```

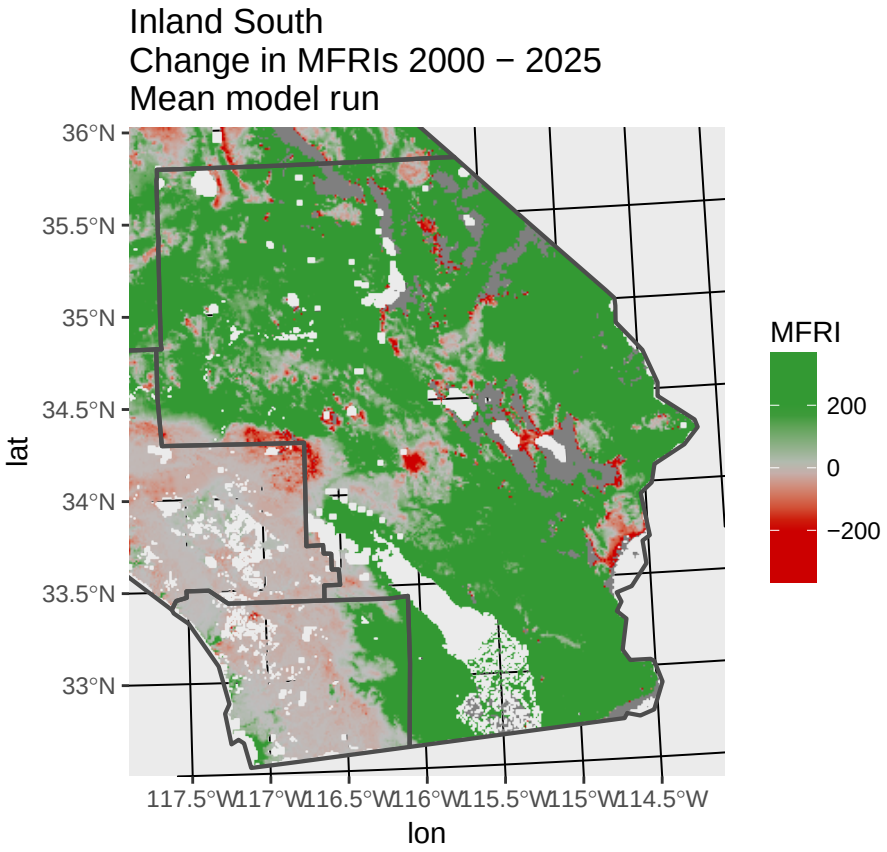


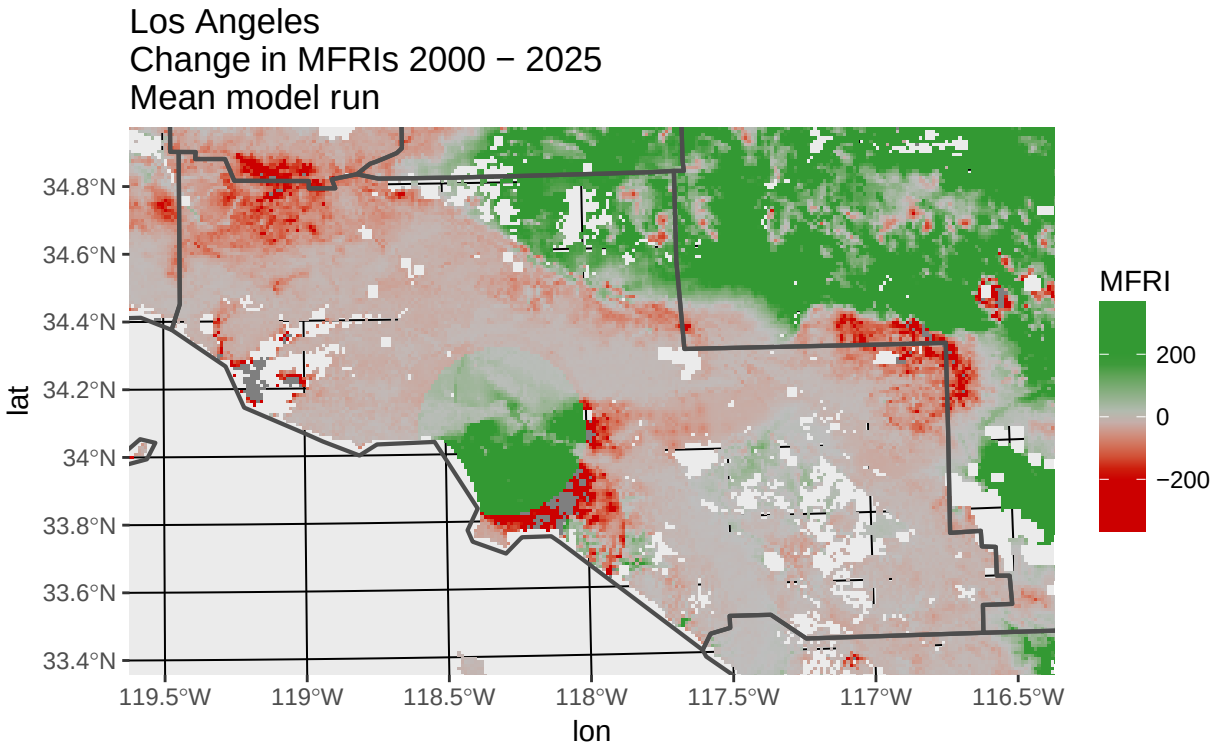

```
mean_chg_76_25 = MFRI_76_00.df
mean_chg_76_25$MFRI =  mean_all_2001_2025_df$MFRI-mean_chg_76_25$MFRI
mean_chg_76_25$MFRI[ mean_chg_76_25$MFRI >350]=350
rng= range(mean_chg_76_25$MFRI)

ggplot()+geom_raster(data=mean_chg_76_25,aes(x=lon,y=lat,fill=MFRI))+
  scale_fill_gradientn(colours= c("#cc0000", "#cc0000"  , 'grey', "#339933","#339933" ), #colors in
     limits=c(-350, 350))+ geom_sf(data=CC4a_reg,colour = "grey30", fill = NA,size=.75) + #same limits
  ggtitle('Change in MFRIs 2000 - 2025 mean model run')+coord_sf()
```

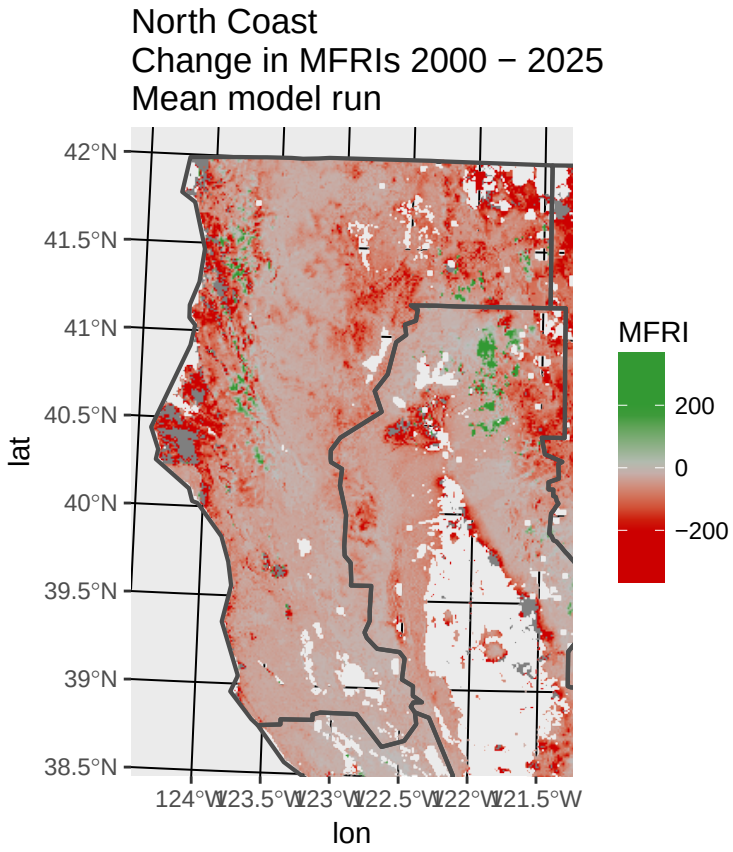


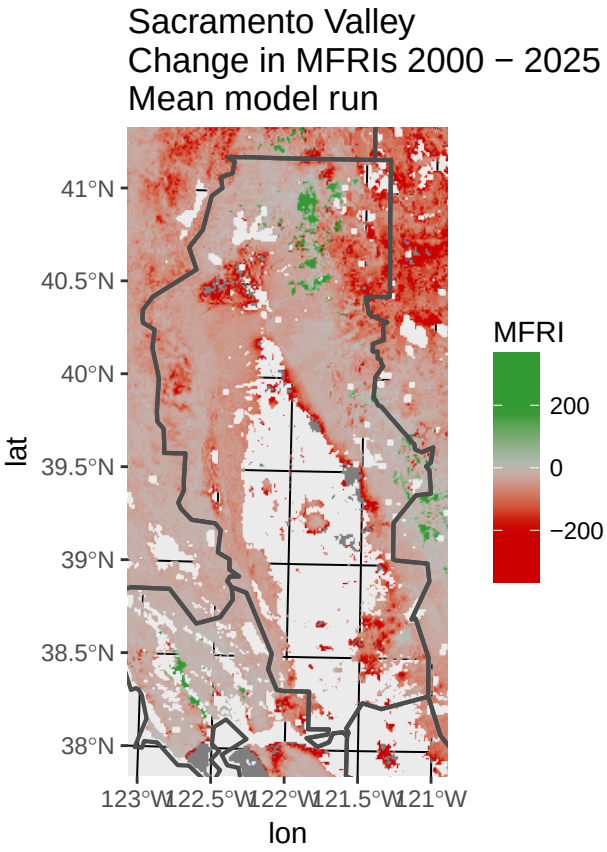

```
for(region_aoi in CC4a_reg$Region){
    aoi = st_bbox(CC4a_reg[CC4a_reg$Region==region_aoi,])
    aplot = ggplot()+  geom_raster(data=mean_chg_76_25,aes(x=lon,y=lat,fill=MFRI))+
     scale_fill_gradientn(colours= c("#cc0000", "#cc0000"  , 'grey', "#339933","#339933" ),
        limits=c(-350, 350))+ geom_sf(data=CC4a_reg,colour = "grey30", fill = NA,size=.75) +
     ggtitle(paste(region_aoi,'\nChange in MFRIs 2000 - 2025 \nMean model run'))+
      coord_sf( xlim=c(aoi[1],aoi[3]),ylim=c(aoi[2],aoi[4]) )
    plot(aplot)
    }
```

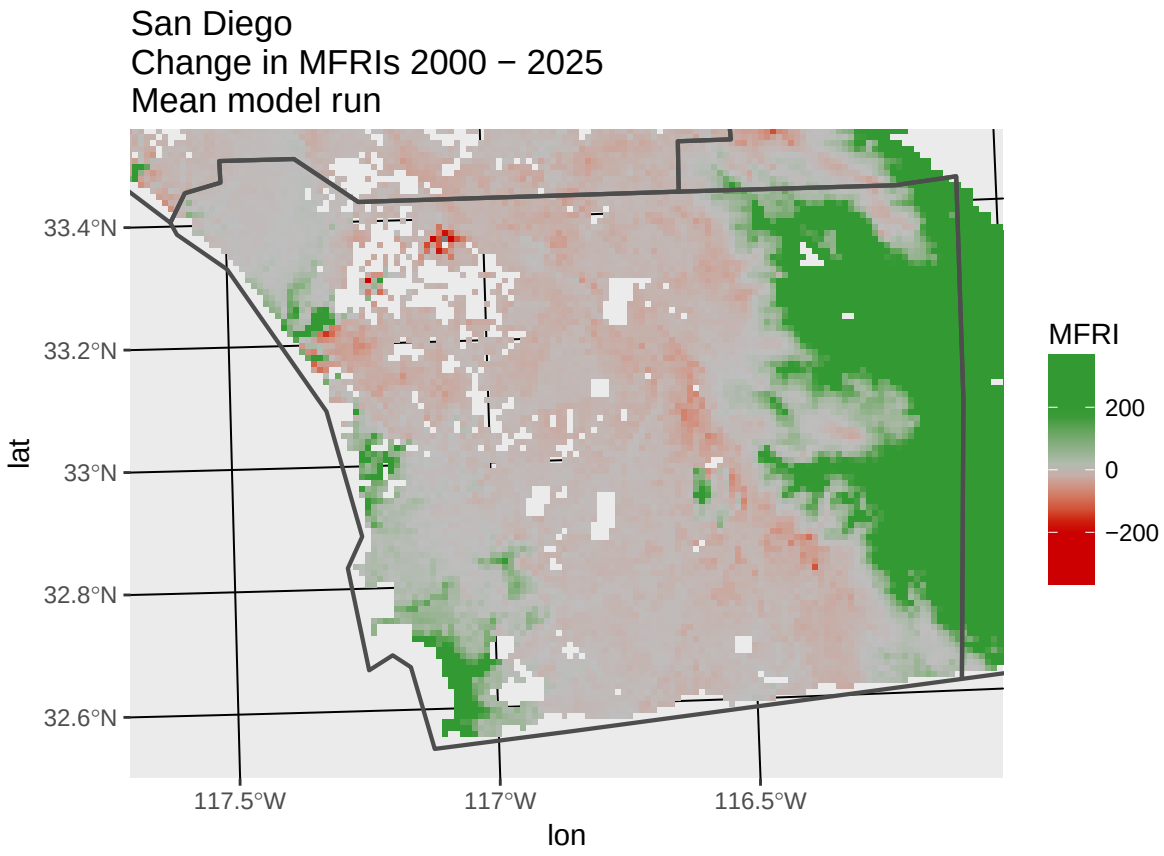

Central Coast
Change in MFRIs 2000 − 2025
Mean model run
37°N
36.5°N
36°N
35.5°N
35°N
34.5°N
34°N
lat
122°W
121.5°W
121°W
120.5°W
120°W
119.5°W
lon
MFRI
200
0
−200

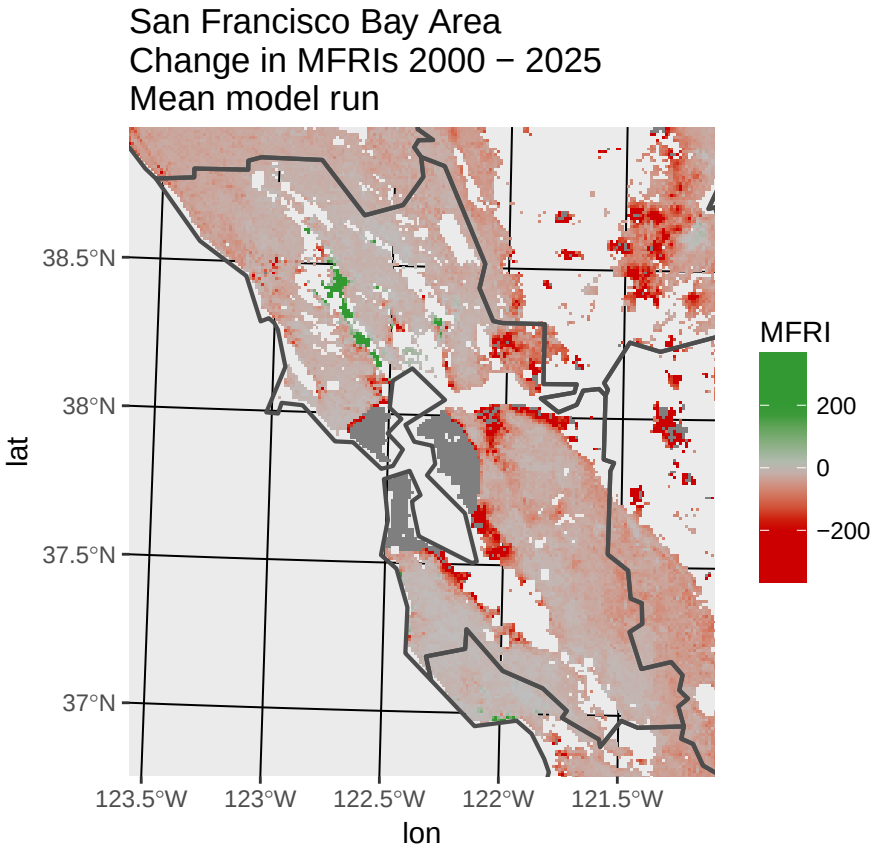

Inland South
Change in MFRIs 2000 − 2025
Mean model run
36°N
35.5°N
35°N
34.5°N
34°N
33.5°N
33°N
lat
117.5°W
117°W
116.5°W
116°W
115.5°W
115°W
114.5°W
lon
MFRI
200
0
−200

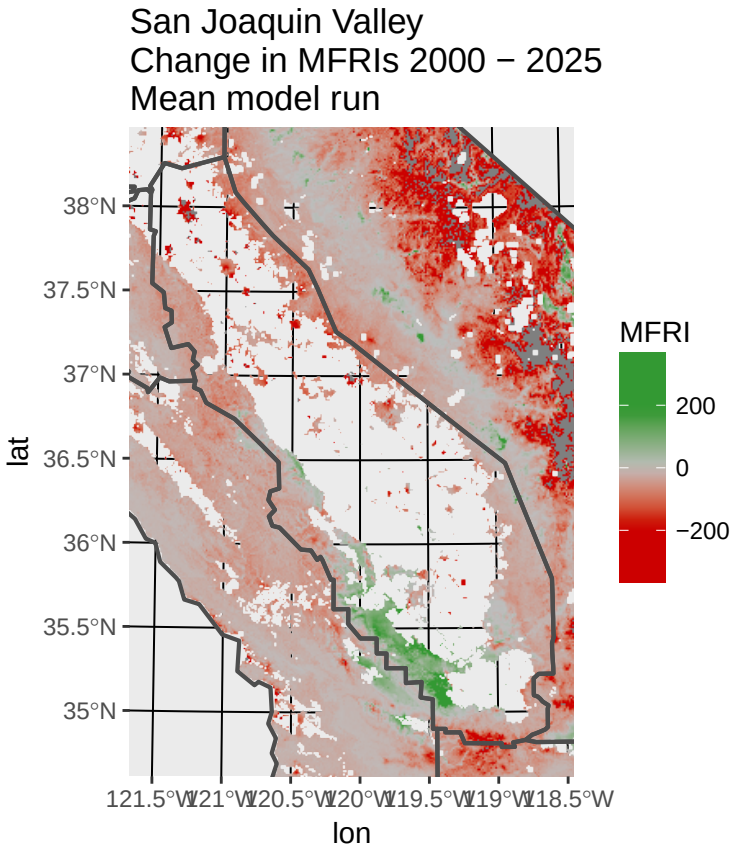

Los Angeles
Change in MFRIs 2000 − 2025
Mean model run
34.8°N
34.6°N
34.4°N
34.2°N
34°N
33.8°N
33.6°N
33.4°N
lat
119.5°W
119°W
118.5°W
118°W
117.5°W
117°W
116.5°W
lon
MFRI
200
0
−200

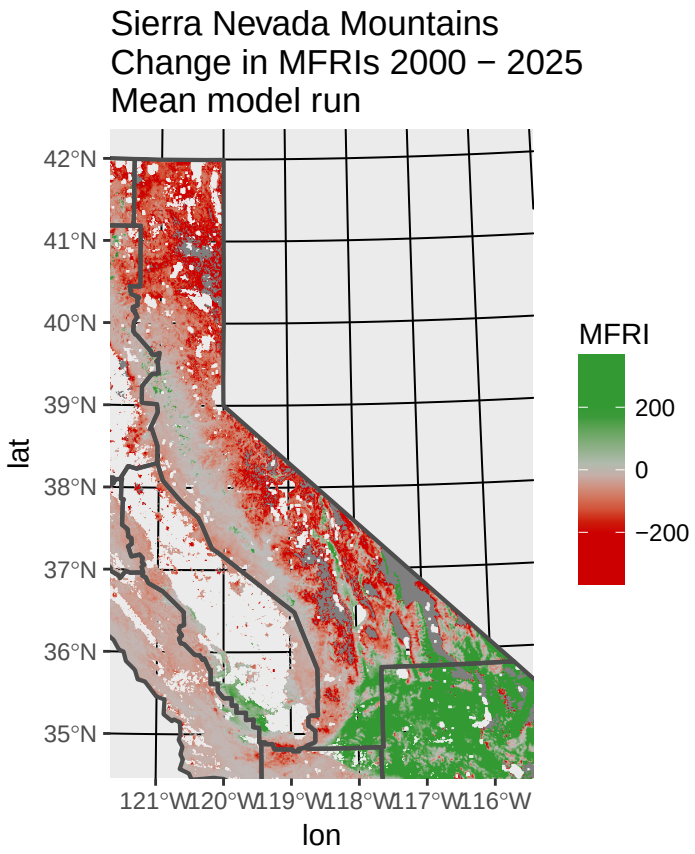

North Coast
Change in MFRIs 2000 − 2025
Mean model run
42°N
41.5°N
41°N
40.5°N
40°N
39.5°N
39°N
38.5°N
lat
124°W
123.5°W
123°W
122.5°W
122°W
121.5°W
lon
MFRI
200
0
−200


Sacramento Valley
Change in MFRIs 2000 − 2025
Mean model run
41°N
40.5°N
40°N
39.5°N
39°N
38.5°N
38°N
lat
123°W
122.5°W
122°W
121.5°W
121°W
lon
MFRI
200
0
−200

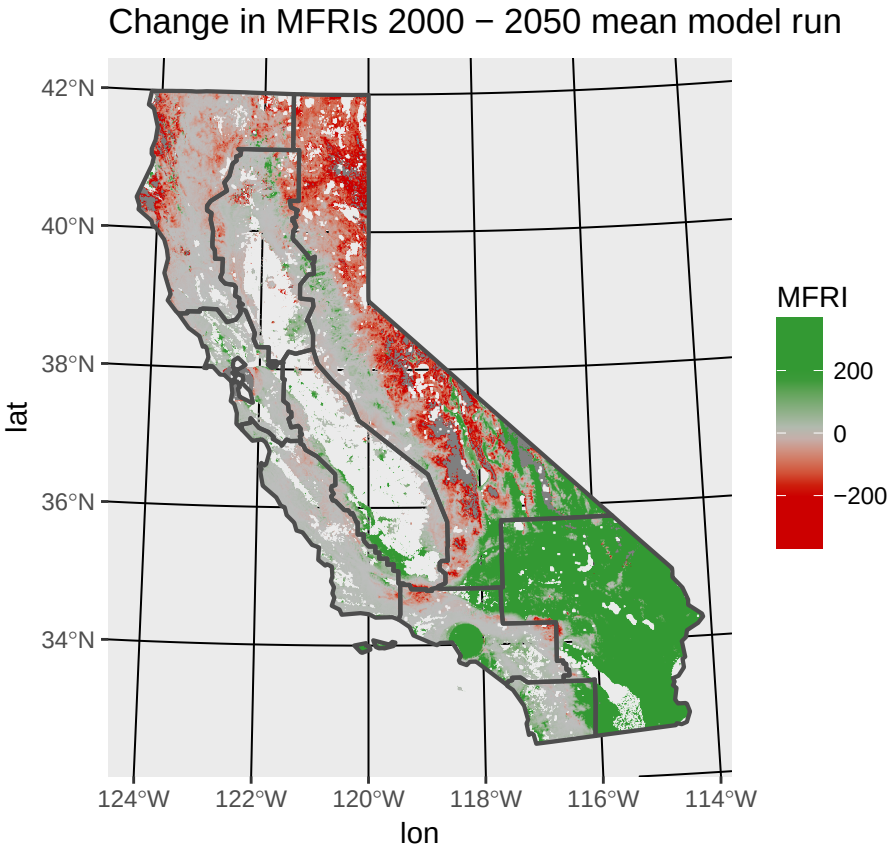

San Diego
Change in MFRIs 2000 − 2025
Mean model run
33.4°N
33.2°N
33°N
32.8°N
32.6°N
lat
117.5°W
117°W
116.5°W
lon
MFRI
200
0
−200


San Francisco Bay Area
Change in MFRIs 2000 − 2025
Mean model run
38.5°N
38°N
37.5°N
37°N
lat
123.5°W
123°W
122.5°W
122°W
121.5°W
lon
MFRI
200
0
−200

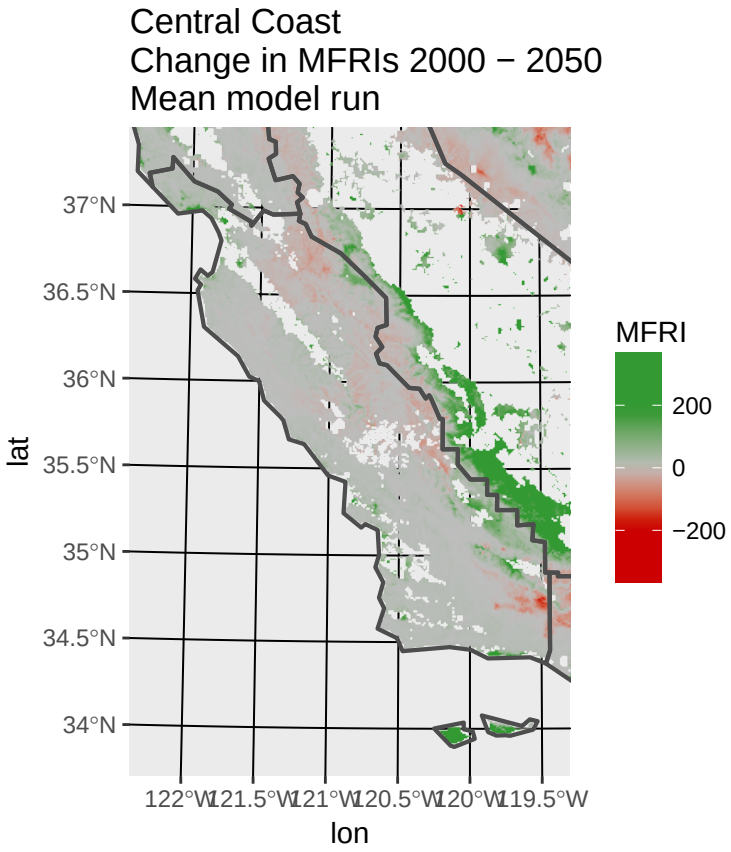

San Joaquin Valley
Change in MFRIs 2000 − 2025
Mean model run
38°N
37.5°N
37°N
36.5°N
36°N
35.5°N
35°N
lat
121.5°W
121°W
120.5°W
120°W
119.5°W
119°W
118.5°W
lon
MFRI
200
0
−200

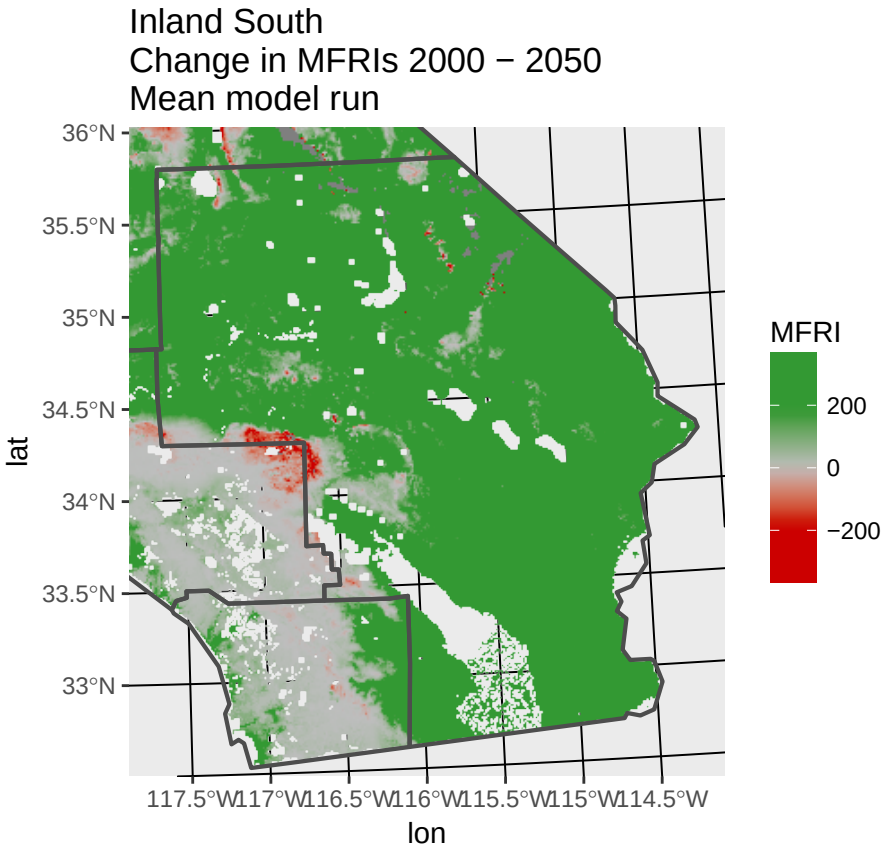


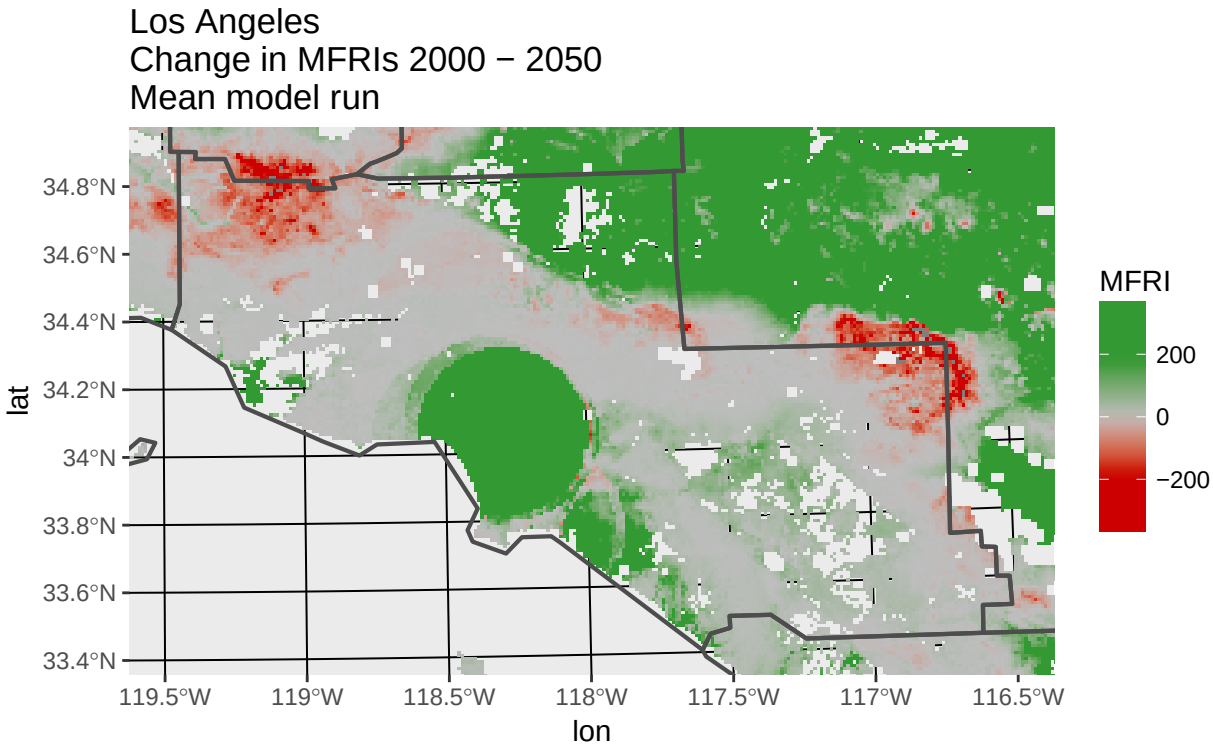

```
mean_chg_76_50 = MFRI_76_00.df
mean_chg_76_50$MFRI =  mean_all_2026_2050_df$MFRI-mean_chg_76_50$MFRI
mean_chg_76_50$MFRI[ mean_chg_76_50$MFRI >350]=350
rng= range(mean_chg_76_50$MFRI)

ggplot()+geom_raster(data=mean_chg_76_50,aes(x=lon,y=lat,fill=MFRI))+
  scale_fill_gradientn(colours= c("#cc0000", "#cc0000"  , 'grey', "#339933","#339933" ),
                limits=c(-350, 350))+ geom_sf(data=CC4a_reg,colour = "grey30", fill = NA,size=.75)+
   ggtitle('Change in MFRIs 2000 - 2050 mean model run')+coord_sf()
```

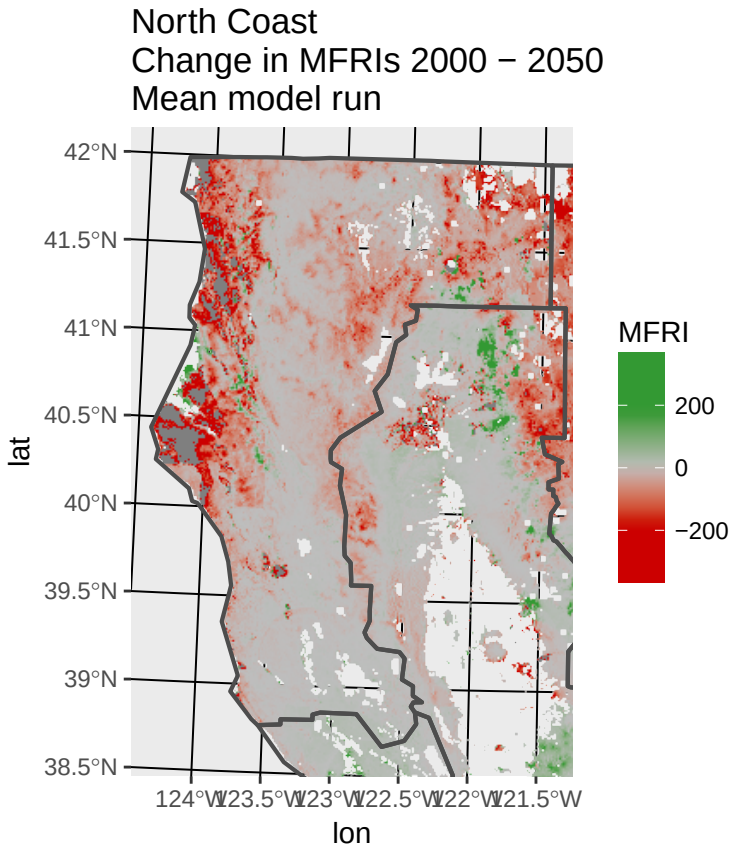


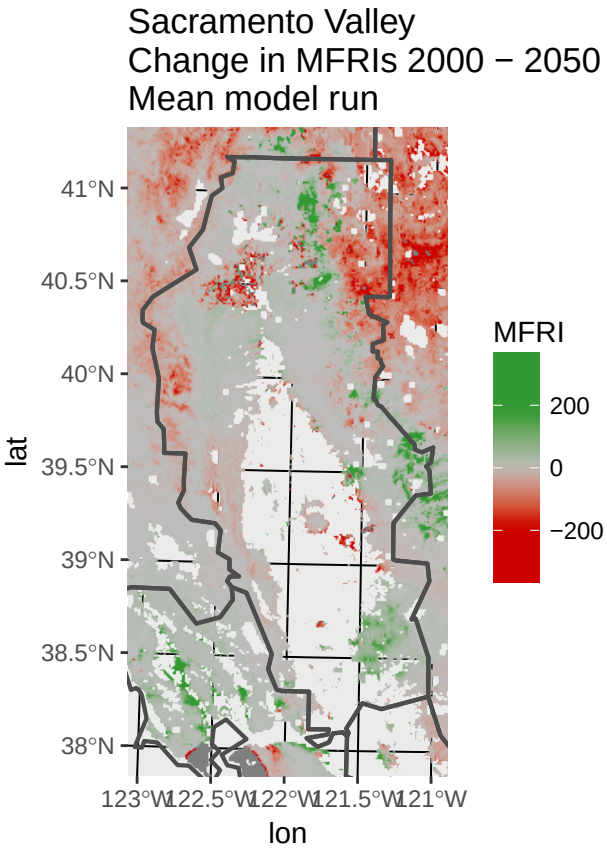

```
for(region_aoi in CC4a_reg$Region){
    aoi = st_bbox(CC4a_reg[CC4a_reg$Region==region_aoi,])
    aplot = ggplot()+  geom_raster(data=mean_chg_76_50,aes(x=lon,y=lat,fill=MFRI))+
     scale_fill_gradientn(colours= c("#cc0000", "#cc0000"  , 'grey', "#339933","#339933" ),
        limits=c(-350, 350))+ geom_sf(data=CC4a_reg,colour = "grey30", fill = NA,size=.75) +
     ggtitle(paste(region_aoi,'\nChange in MFRIs 2000 - 2050 \nMean model run'))+
      coord_sf( xlim=c(aoi[1],aoi[3]),ylim=c(aoi[2],aoi[4]) )
    plot(aplot)
    }
```

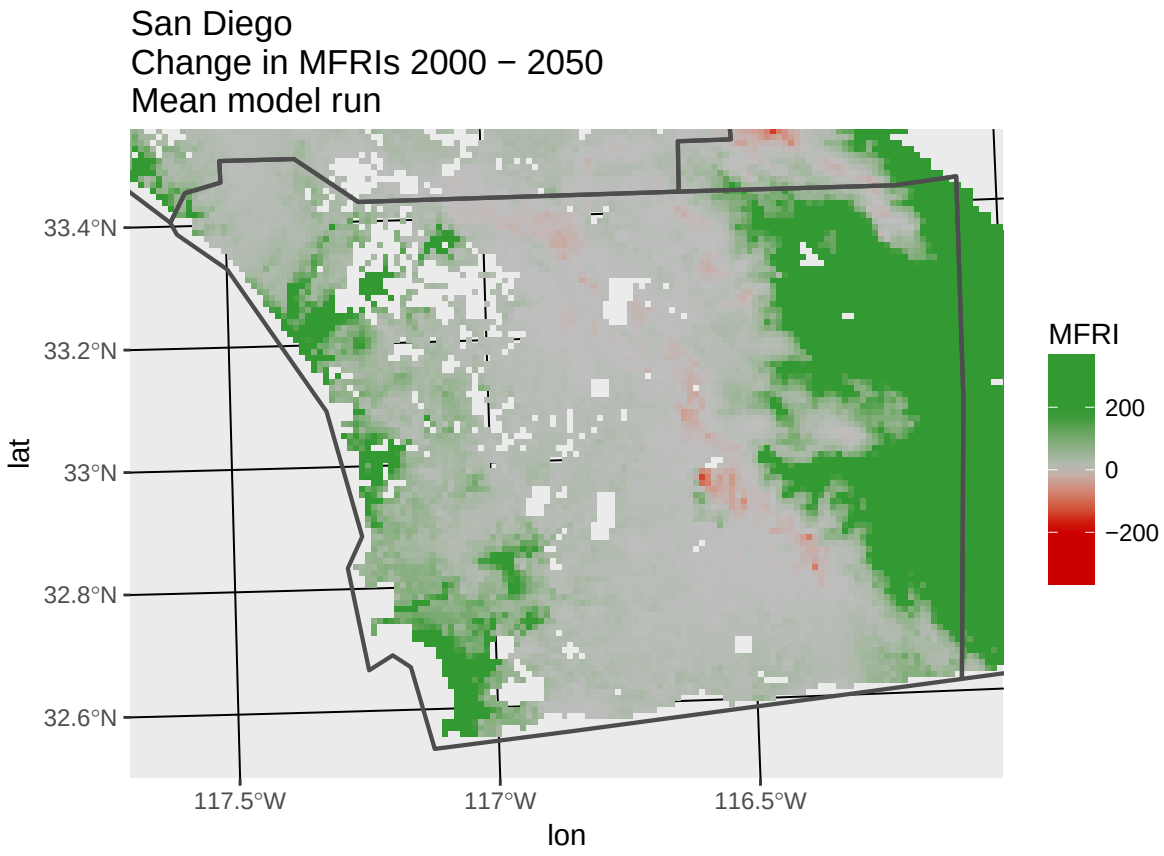

Central Coast
Change in MFRIs 2000 − 2050
Mean model run
37°N
36.5°N
36°N
35.5°N
35°N
34.5°N
34°N
lat
122°W
121.5°W
121°W
120.5°W
120°W
119.5°W
lon
MFRI
200
0
−200

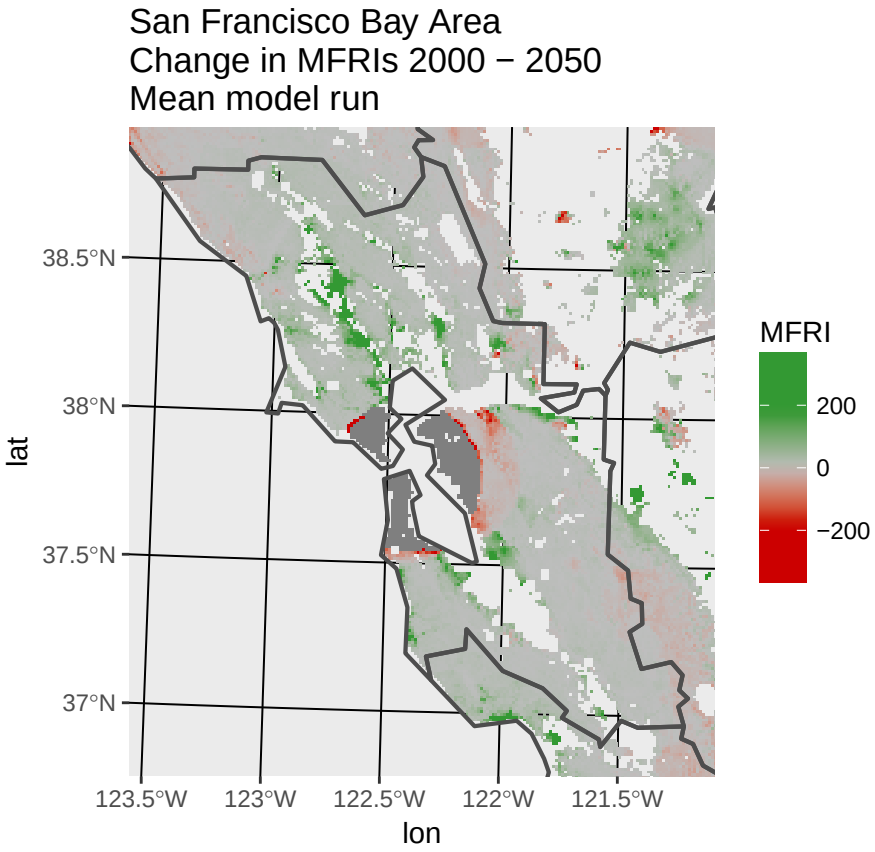

Inland South
Change in MFRIs 2000 − 2050
Mean model run
36°N
35.5°N
35°N
34.5°N
34°N
33.5°N
33°N
lat
117.5°W
117°W
116.5°W
116°W
115.5°W
115°W
114.5°W
lon
MFRI
200
0
−200

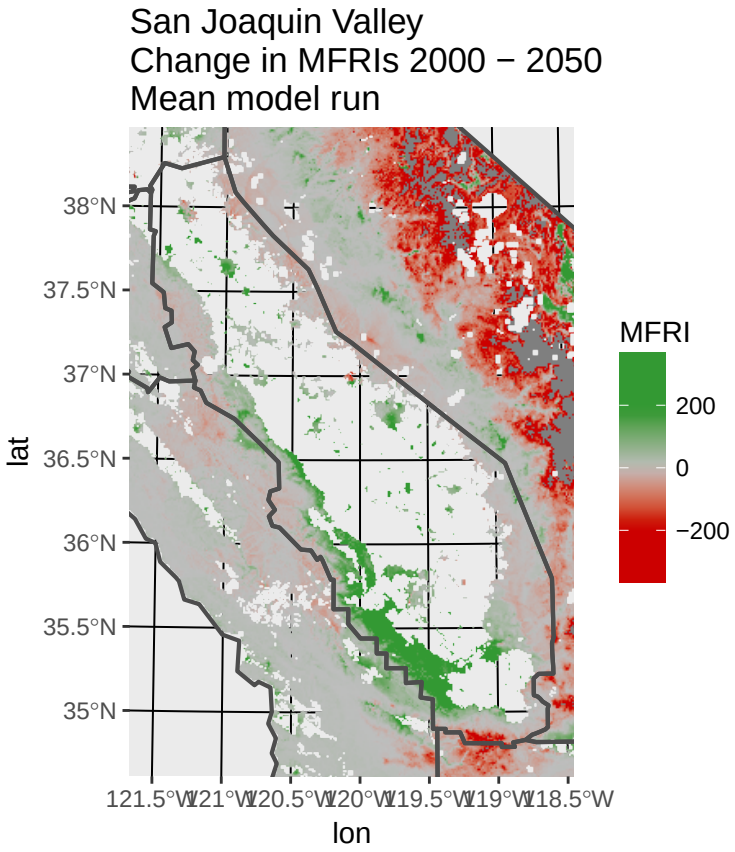

Los Angeles
Change in MFRIs 2000 − 2050
Mean model run
34.8°N
34.6°N
34.4°N
34.2°N
34°N
33.8°N
33.6°N
33.4°N
lat
119.5°W
119°W
118.5°W
118°W
117.5°W
117°W
116.5°W
lon
MFRI
200
0
−200

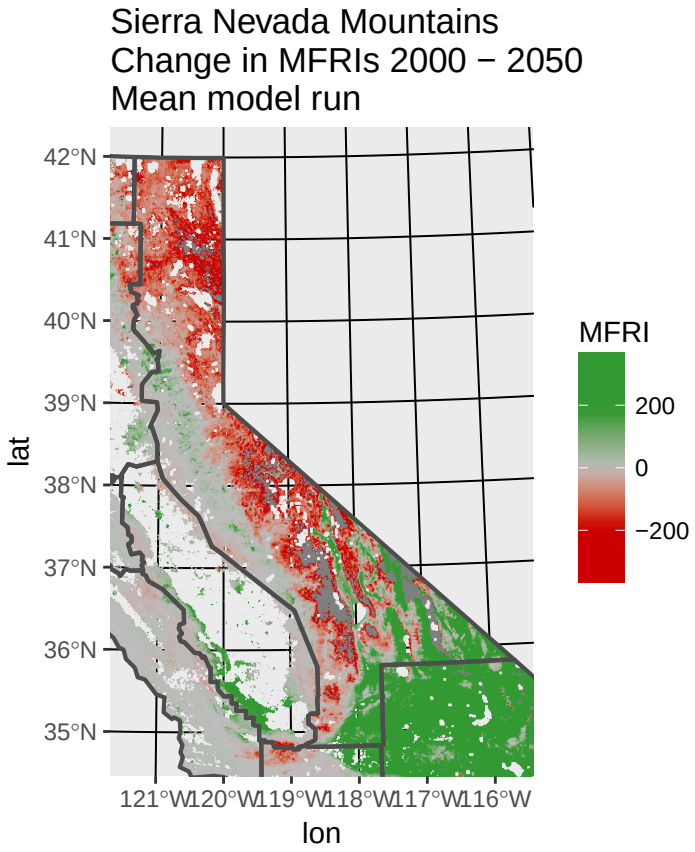

North Coast
Change in MFRIs 2000 − 2050
Mean model run
42°N
41.5°N
41°N
40.5°N
40°N
39.5°N
39°N
38.5°N
lat
124°W
123.5°W
123°W
122.5°W
122°W
121.5°W
lon
MFRI
200
0
−200


Sacramento Valley
Change in MFRIs 2000 − 2050
Mean model run
41°N
40.5°N
40°N
39.5°N
39°N
38.5°N
38°N
lat
123°W
122.5°W
122°W
121.5°W
121°W
lon
MFRI
200
0
−200


San Diego
Change in MFRIs 2000 − 2050
Mean model run
33.4°N
33.2°N
33°N
32.8°N
32.6°N
lat
117.5°W
117°W
116.5°W
lon
MFRI
200
0
−200

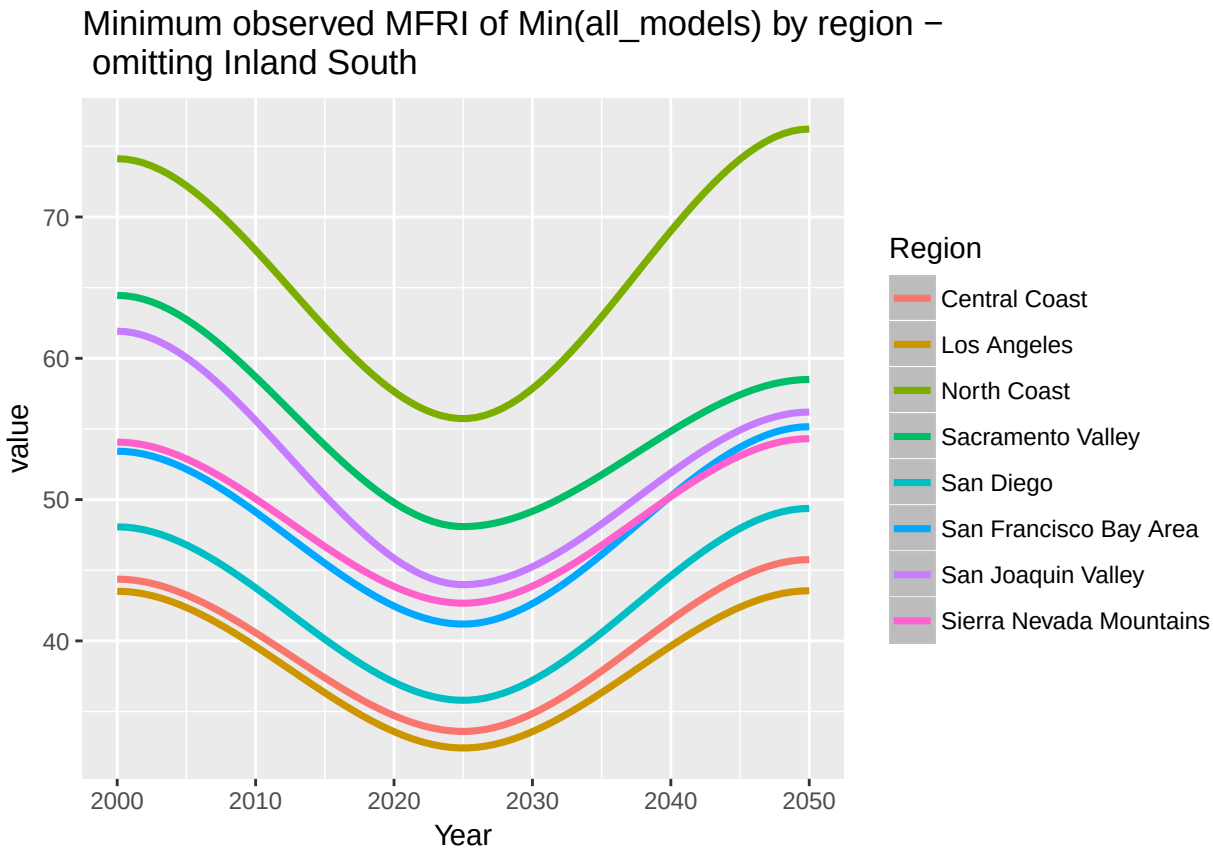

San Francisco Bay Area
Change in MFRIs 2000 − 2050
Mean model run
38.5°N
38°N
37.5°N
37°N
lat
123.5°W
123°W
122.5°W
122°W
121.5°W
lon
MFRI
200
0
−200


San Joaquin Valley
Change in MFRIs 2000 − 2050
Mean model run
38°N
37.5°N
37°N
36.5°N
36°N
35.5°N
35°N
lat
121.5°W
121°W
120.5°W
120°W
119.5°W
119°W
118.5°W
lon
MFRI
200
0
−200

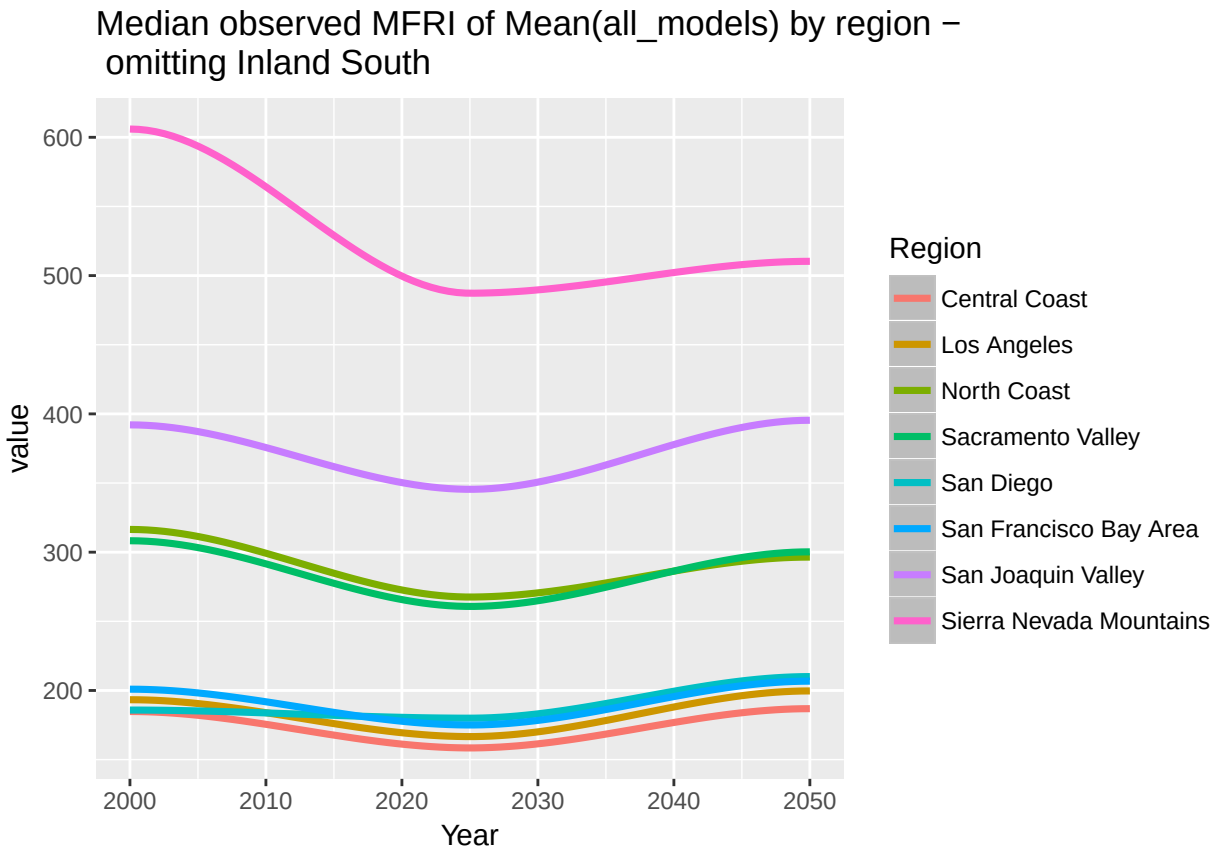



```
the_fun = median  # function used to summarize raster values by polygons
region_code = data.frame(ID=seq(1,9),as(CC4a_reg,'Spatial')@data$Region)
full_mean_stack = stack(MFRI_76_00,mean_all_2001_2025,mean_all_2026_2050)
names(full_mean_stack) =c('2000','2025','2050')
extract_full_mean_df = extract(full_mean_stack, as(CC4a_reg,'Spatial'), fun=the_fun, na.rm=T, df=T)
extract_full_mean_df = left_join(region_code,extract_full_mean_df,by='ID') %>% select(-ID)%>%melt()
extract_full_mean_df$Year = as.numeric(substr(as.character(extract_full_mean_df$variable),2,5))
names(extract_full_mean_df)=c('Region','variable','value','Year')

the_fun = min  # function used to summarize raster values by polygons
full_min_stack = stack(MFRI_76_00,min_all_2001_2025,min_all_2026_2050)
names(full_min_stack) =c('2000','2025','2050')
extract_full_min_df = extract(full_min_stack, as(CC4a_reg,'Spatial'), fun=the_fun, na.rm=T, df=T)
extract_full_min_df = left_join(region_code,extract_full_min_df,by='ID') %>% select(-ID)%>%melt()
extract_full_min_df$Year = as.numeric(substr(as.character(extract_full_min_df$variable),2,5))
names(extract_full_min_df)=c('Region','variable','value','Year')
```

```
ggplot()+geom_smooth(data=subset(extract_full_min_df, Region != 'Inland South' ),aes(x=Year,y=value,c
```




```
ggplot()+geom_smooth(data=subset(extract_full_mean_df, Region != 'Inland South' ),aes(x=Year,y=value,
```


Median observed MFRI of Mean(all_models) by region − omitting Inland South
600
500
400
300
200
value
2000
2010
2020
2030
2040
2050
Year
Region
Central Coast
Los Angeles
North Coast
Sacramento Valley
San Diego
San Francisco Bay Area
San Joaquin Valley
Sierra Nevada Mountains