

# CA\_WILDFIRE\_PLOTS

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```
# Read in Data
all_mfri = list.files('./Wildfire_MFRI2/', 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=-40")
# dissolve multipart Sierra Mountain feature
CC4a_reg = ms_dissolve(CC4a_reg, field = 'Region')

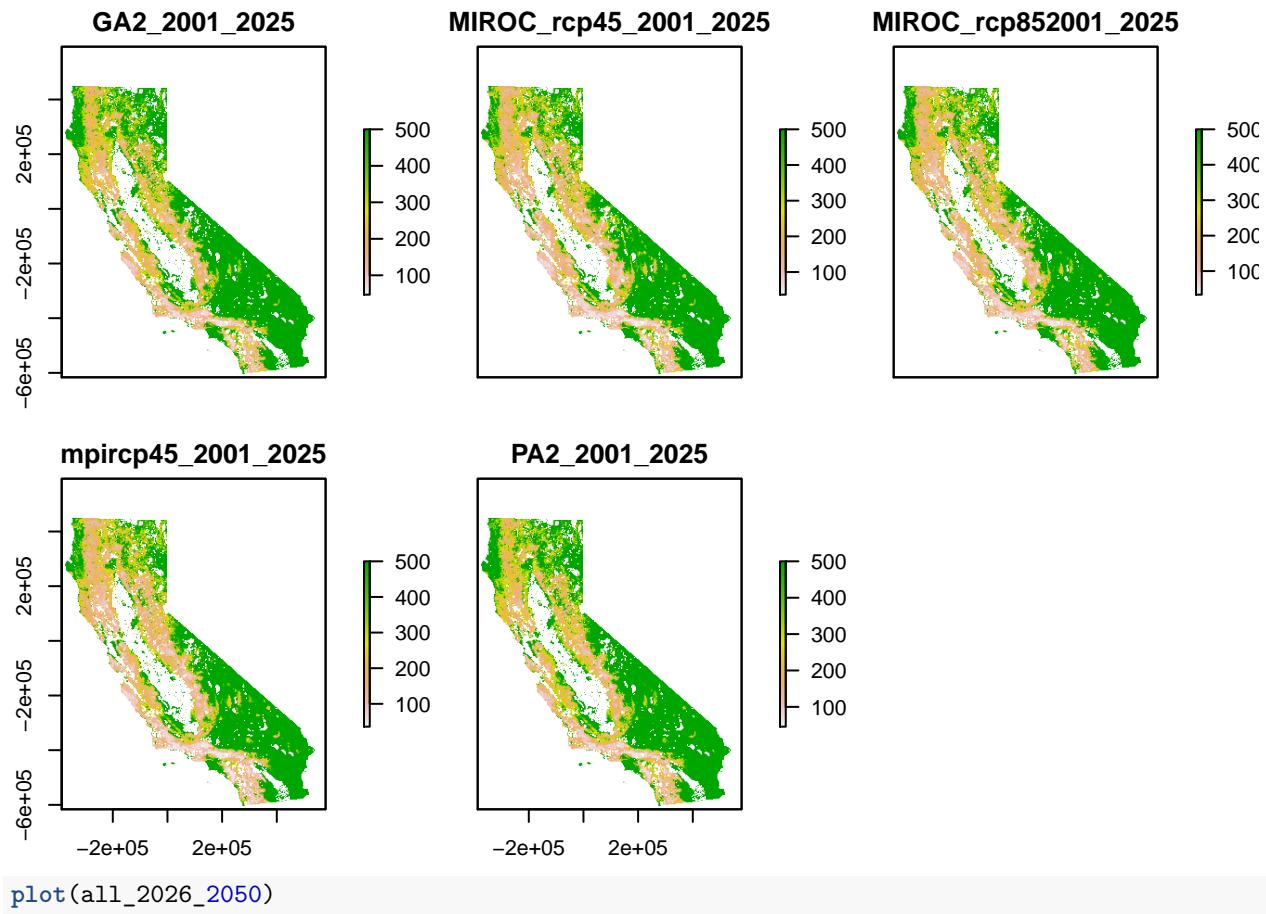
# Get stats for 01-25 & 26-50 MFRIIs cap at 500 years
all_2001_2025 = stack(all_mfri[grep('2001_2025', all_mfri)])
all_2026_2050 = stack(all_mfri[grep('2026_2050', all_mfri)])

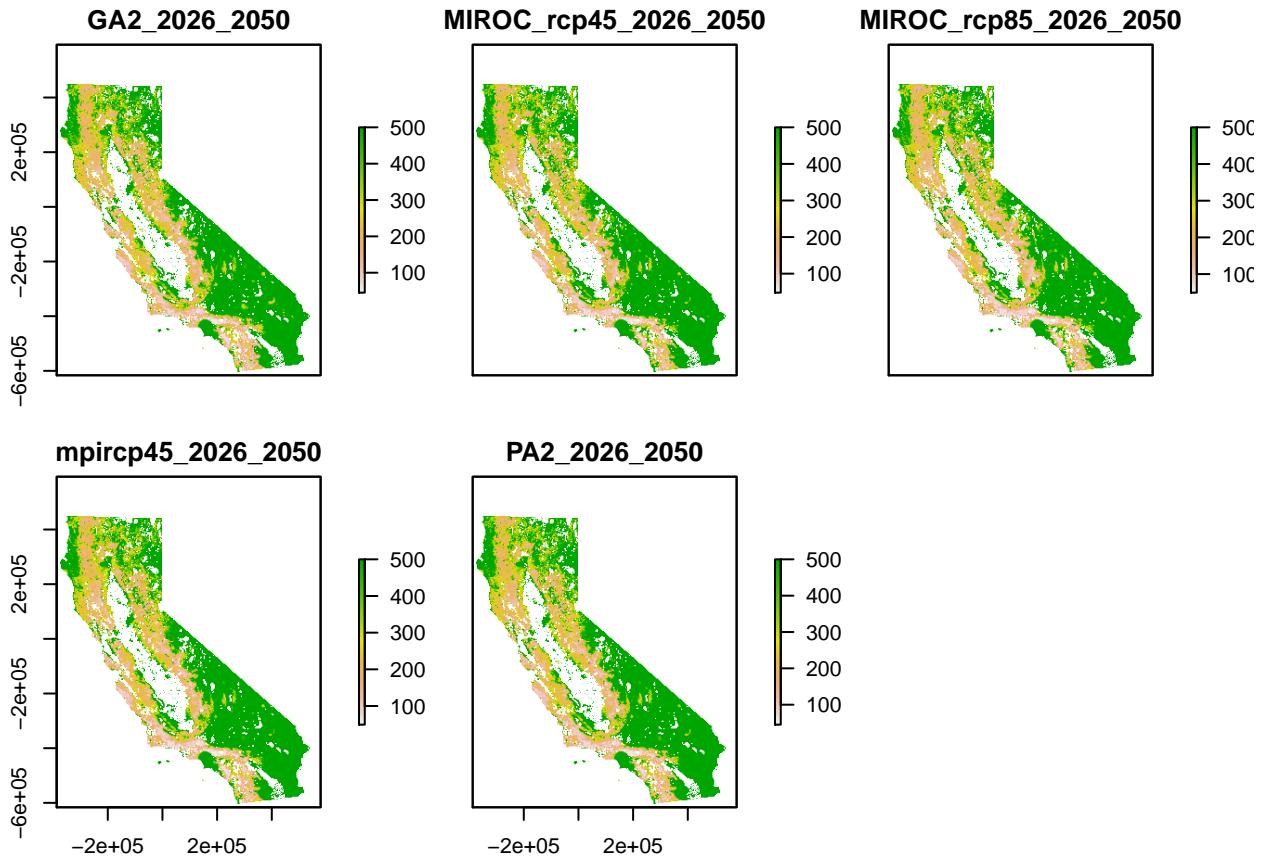
# years for maximum plotted MFRI
capat=500

# calculate stats for stacks and cap MFRI
# writes out files with 3 different postfix _stat for statistic (mean etc), _df for dataframe for ggplot
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)
```





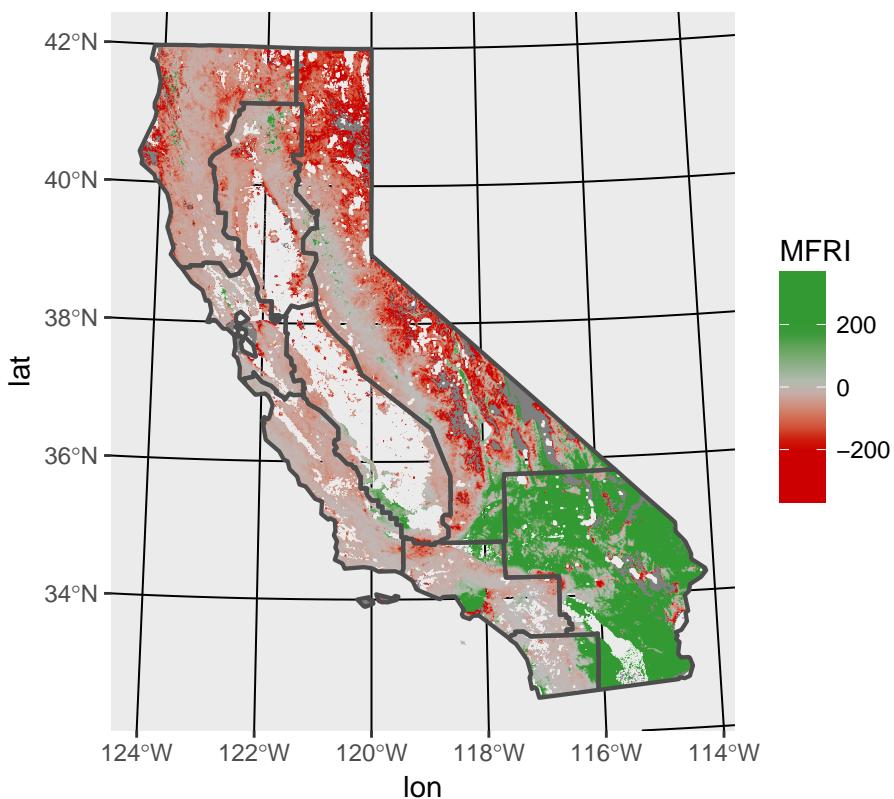
```

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
  ggttitle('Change in MFRI's 2000 - 2025 mean model run')+coord_sf()

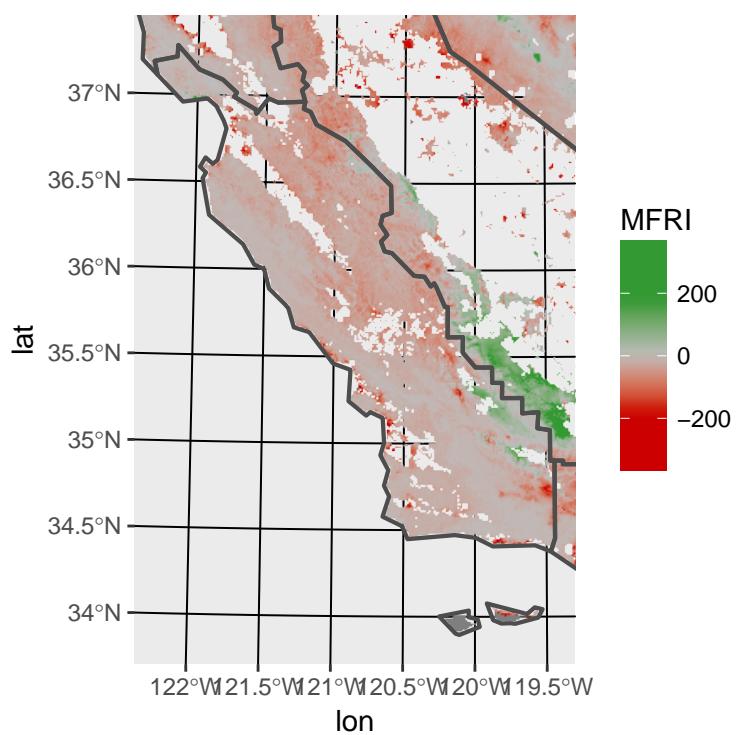
```

## Change in MFRI 2000 – 2025 mean model run

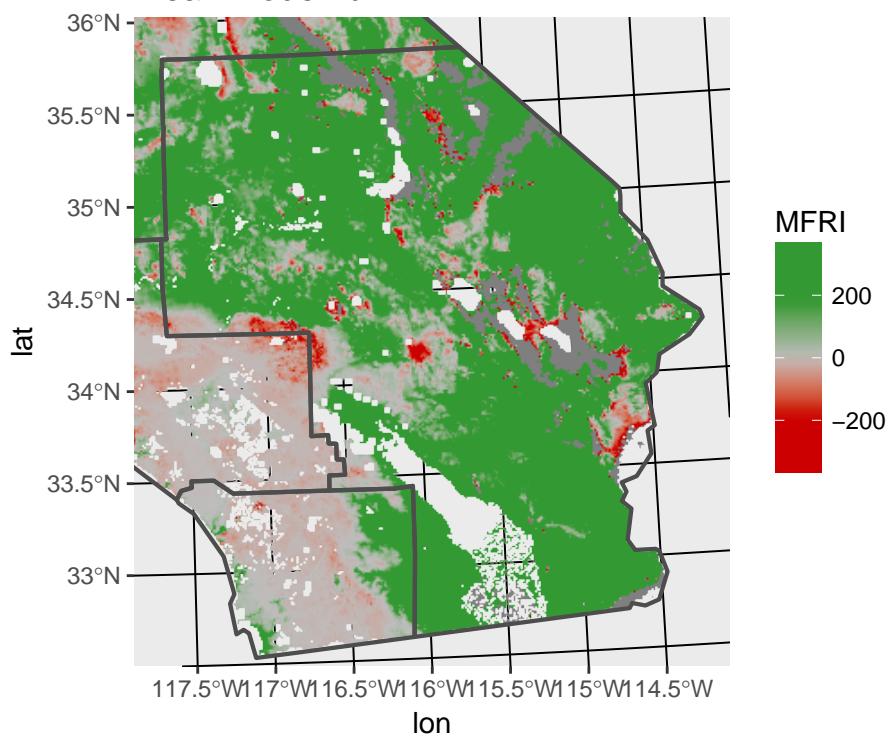


```
for(region_aoi in CC4a_reg$Region){  
  aoi = st_bbox(CC4a_reg[CC4a_reg$Region==region_aoi,])  
  aplot = ggplot() + geom_raster(data=mean_chg_76_25,aes(x=lon,y=lat,fill=MFRI)) +  
    scale_fill_gradientn(colours= c("#cc0000", "#cc0000" , 'grey', "#339933", "#339933" ),  
    limits=c(-350, 350))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

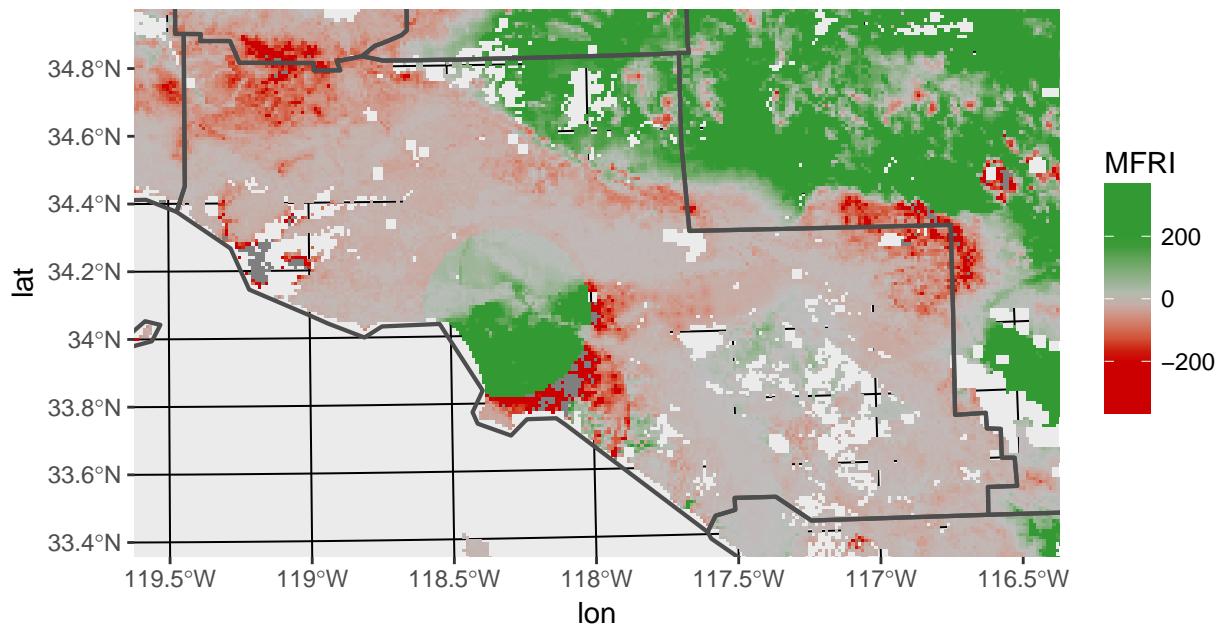
Central Coast  
Change in MFRI 2000 – 2025  
Mean model run



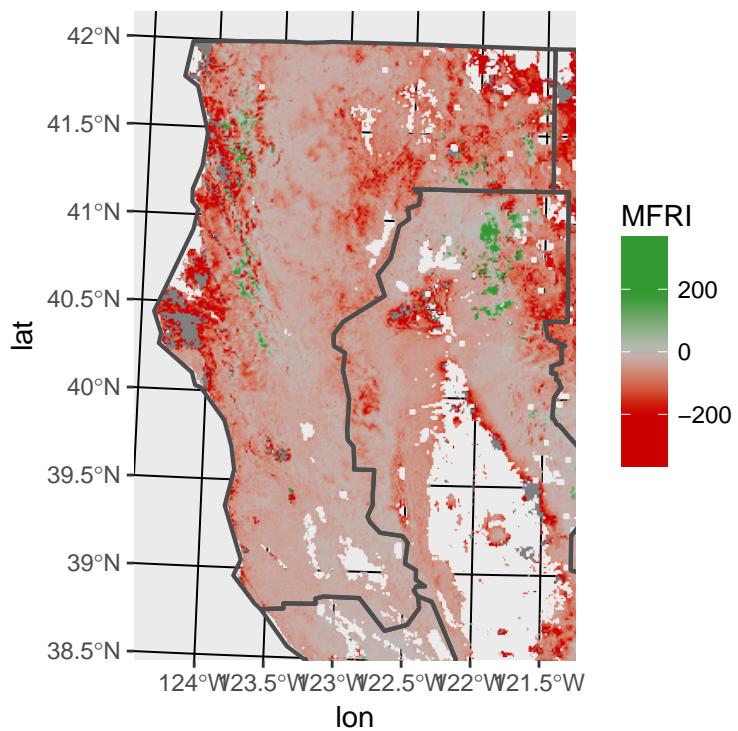
Inland South  
Change in MFRI 2000 – 2025  
Mean model run



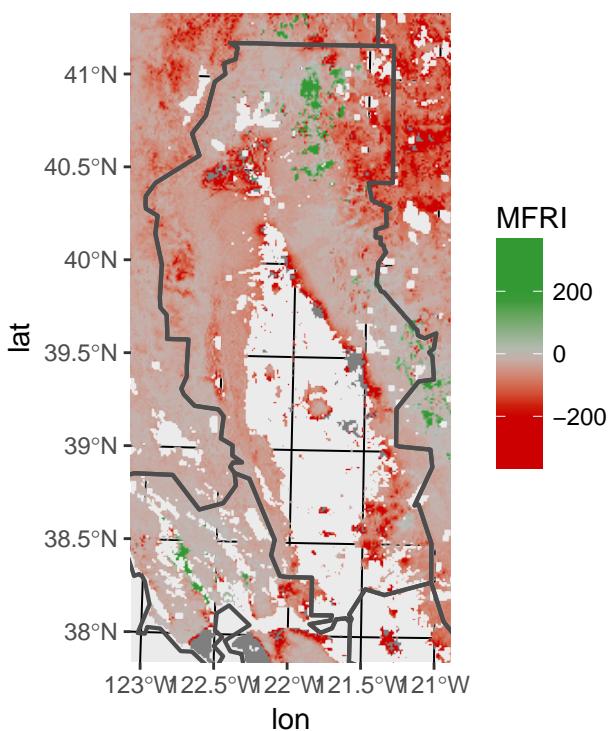
Los Angeles  
Change in MFRIs 2000 – 2025  
Mean model run



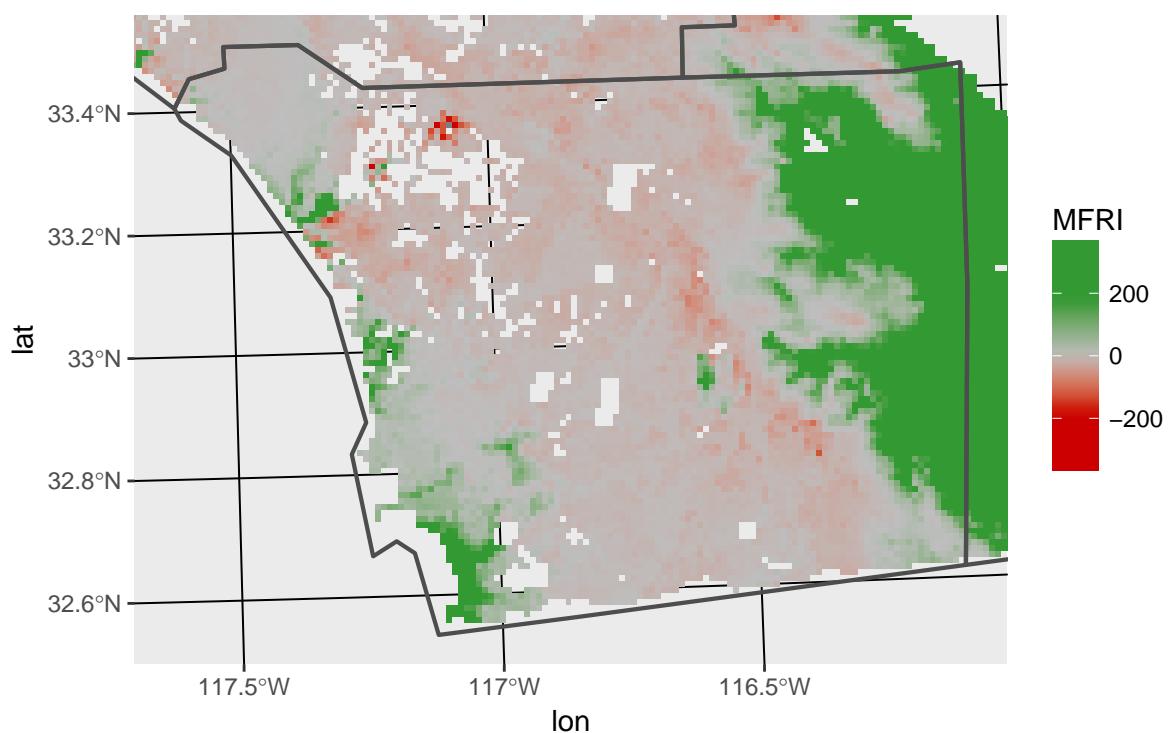
North Coast  
Change in MFRI 2000 – 2025  
Mean model run



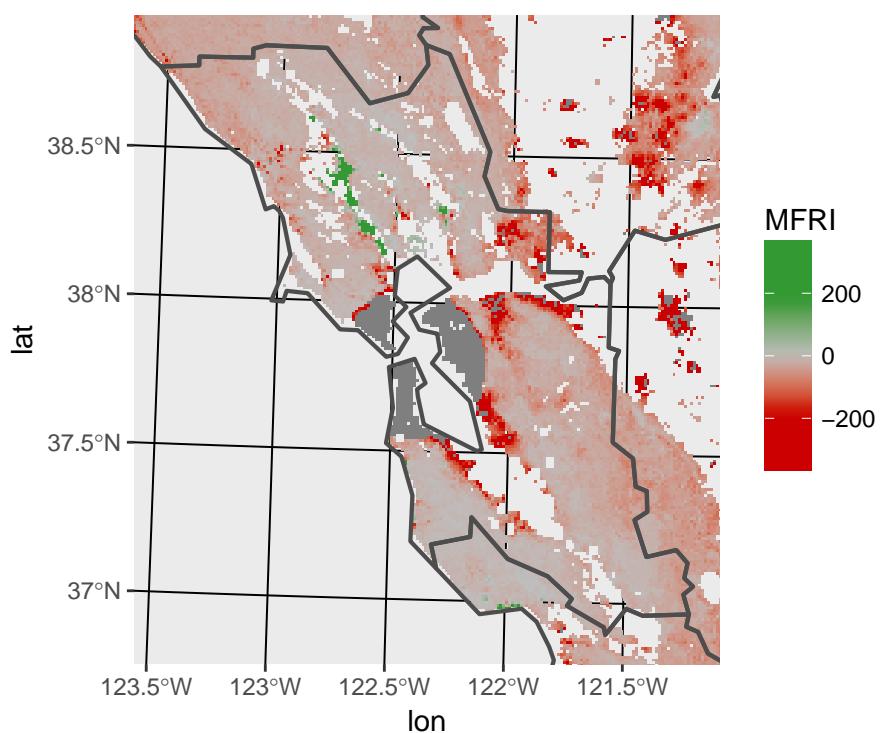
Sacramento Valley  
Change in MFRI 2000 – 2025  
Mean model run



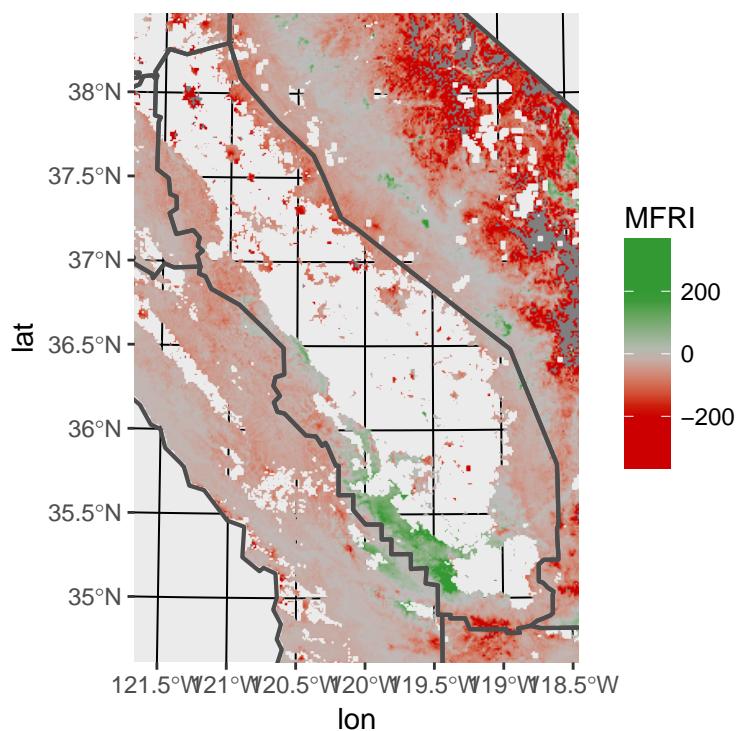
San Diego  
Change in MFRI 2000 – 2025  
Mean model run



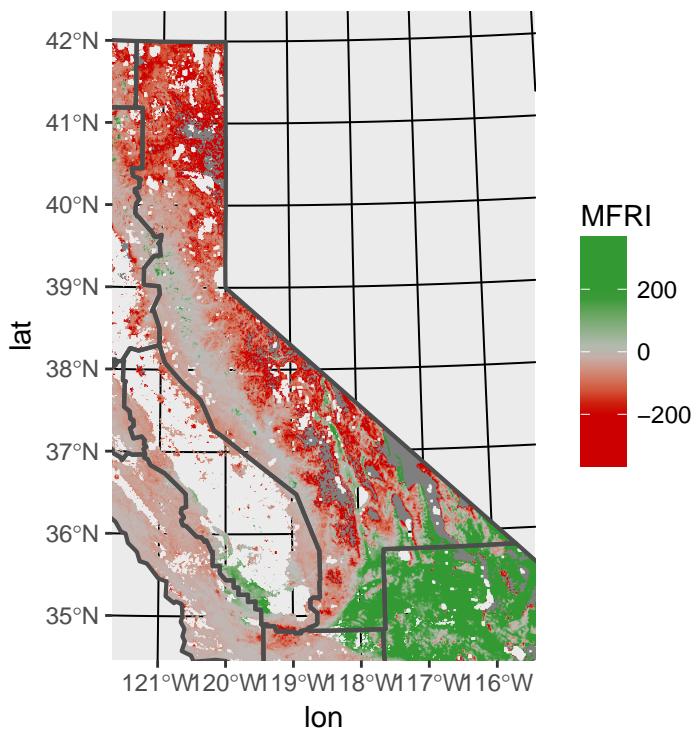
San Francisco Bay Area  
Change in MFRIs 2000 – 2025  
Mean model run



San Joaquin Valley  
Change in MFRIs 2000 – 2025  
Mean model run



**Sierra Nevada Mountains**  
**Change in MFRI 2000 – 2025**  
**Mean model run**



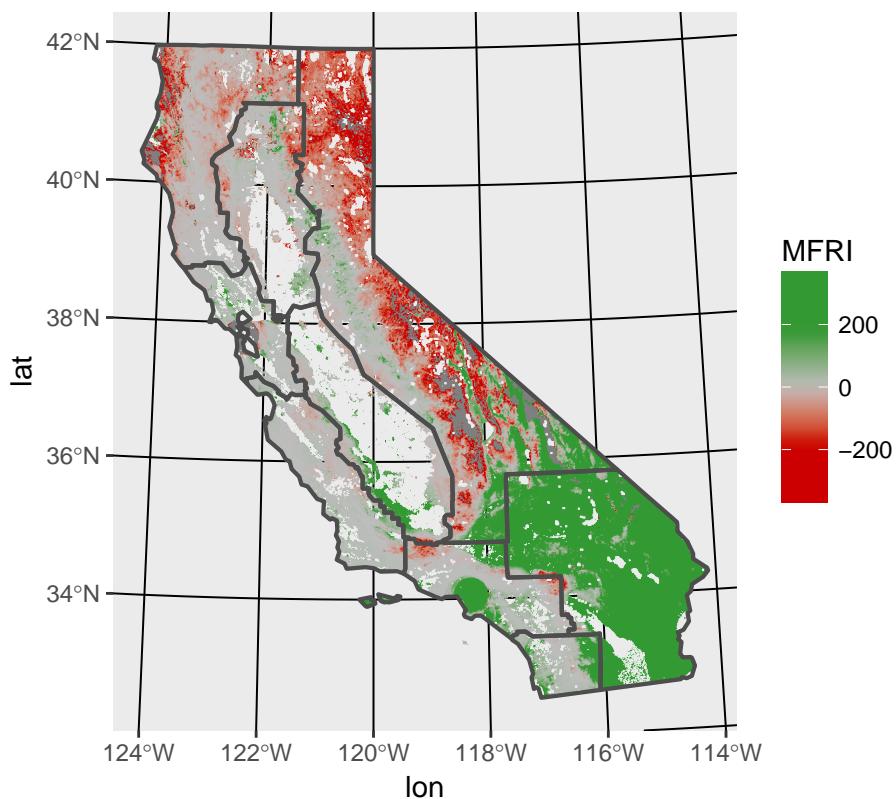
```

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 MFRI 2000 – 2050 mean model run')+coord_sf()

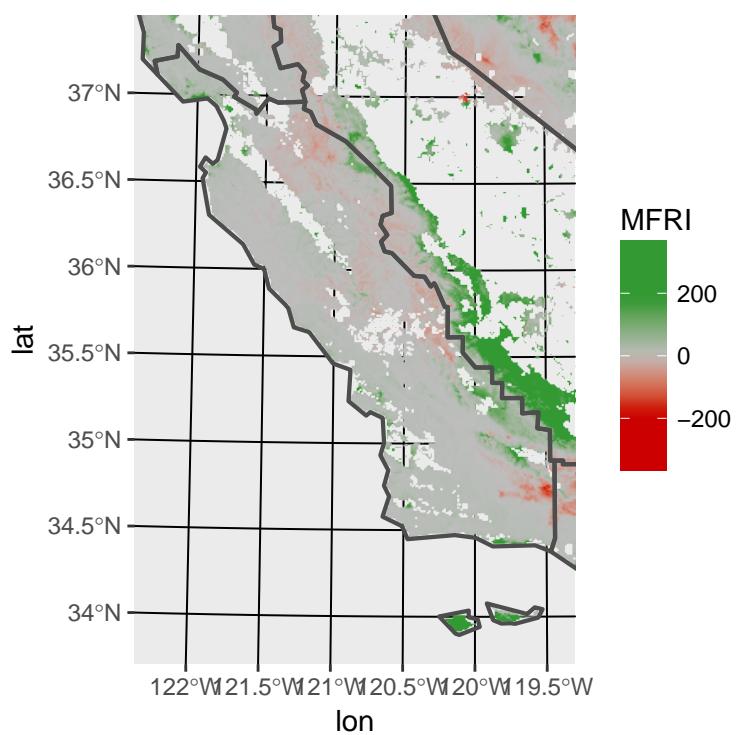
```

### Change in MFRI 2000 – 2050 mean model run

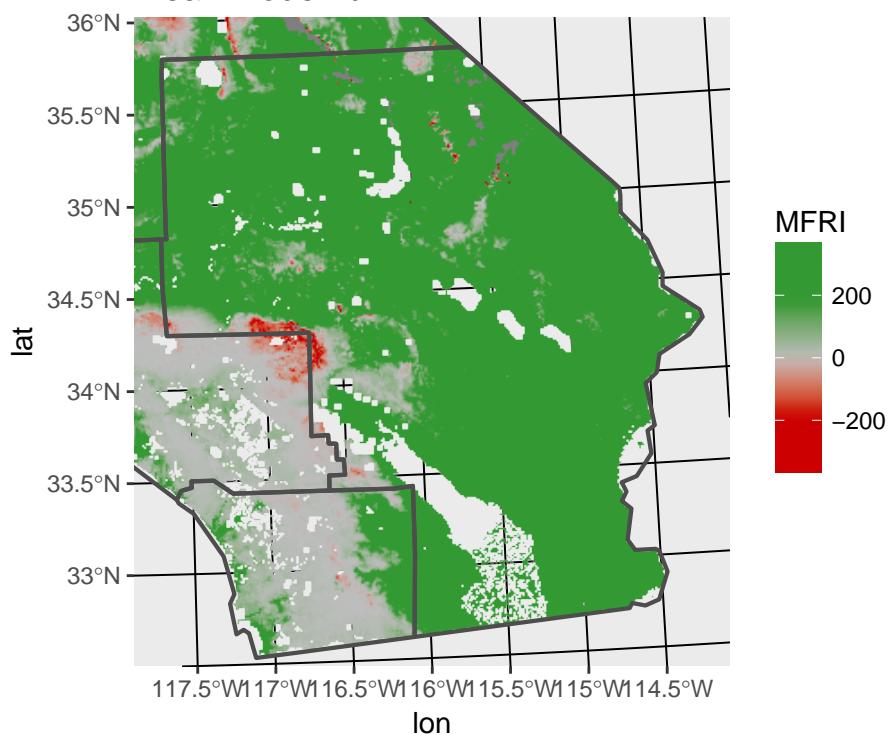


```
for(region_aoi in CC4a_reg$Region){  
  aoi = st_bbox(CC4a_reg[CC4a_reg$Region==region_aoi,])  
  aplot = ggplot() + geom_raster(data=mean_chg_76_50,aes(x=lon,y=lat,fill=MFRI)) +  
    scale_fill_gradientn(colours= c("#cc0000", "#cc0000" , 'grey', "#339933", "#339933" ),  
    limits=c(-350, 350))+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

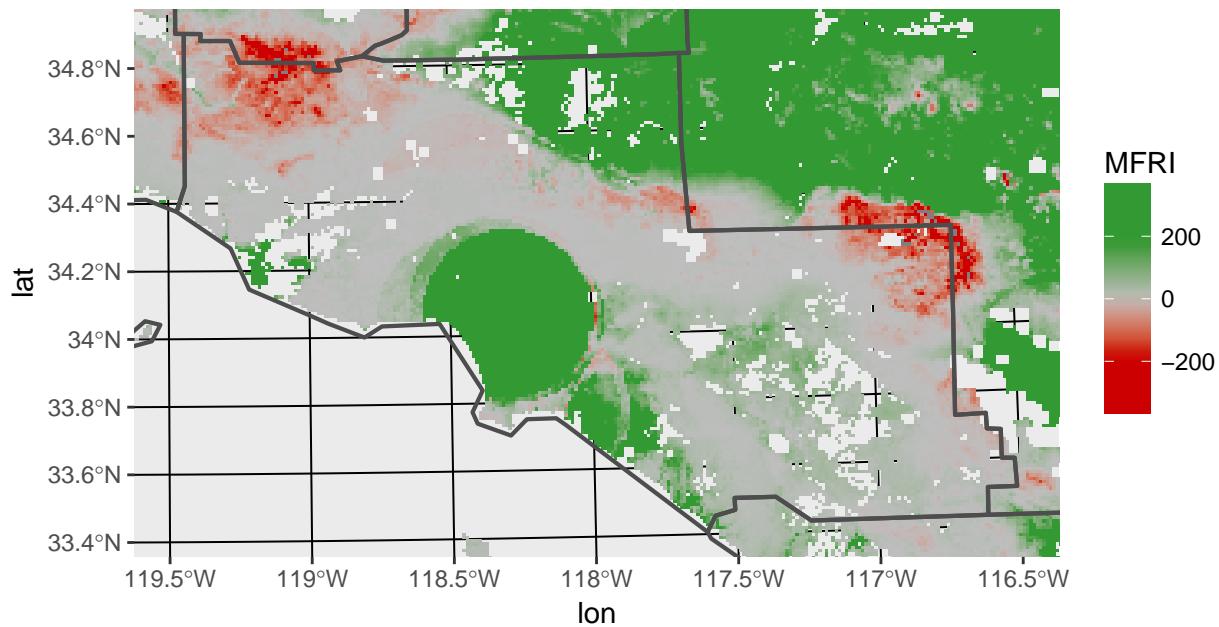
Central Coast  
Change in MFRI 2000 – 2050  
Mean model run



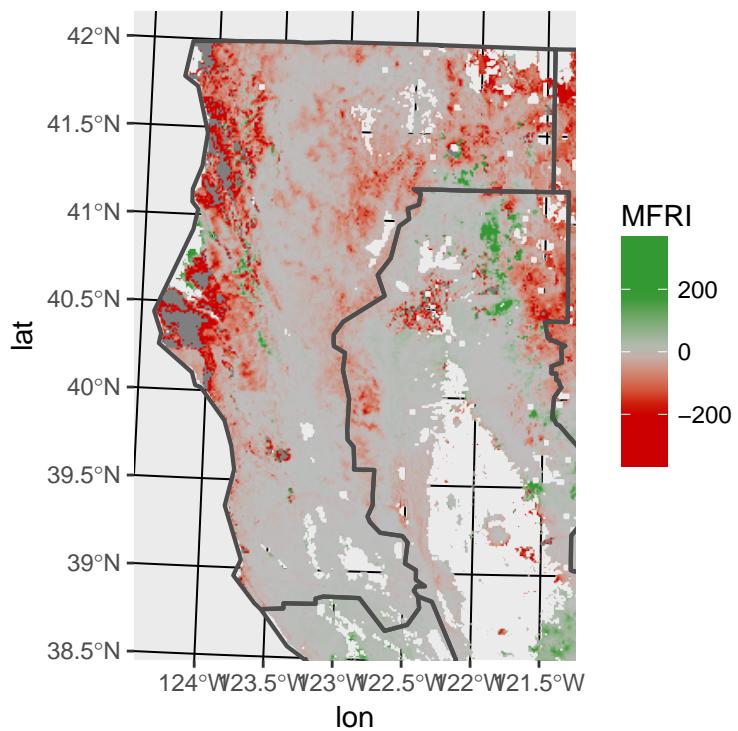
Inland South  
Change in MFRI 2000 – 2050  
Mean model run



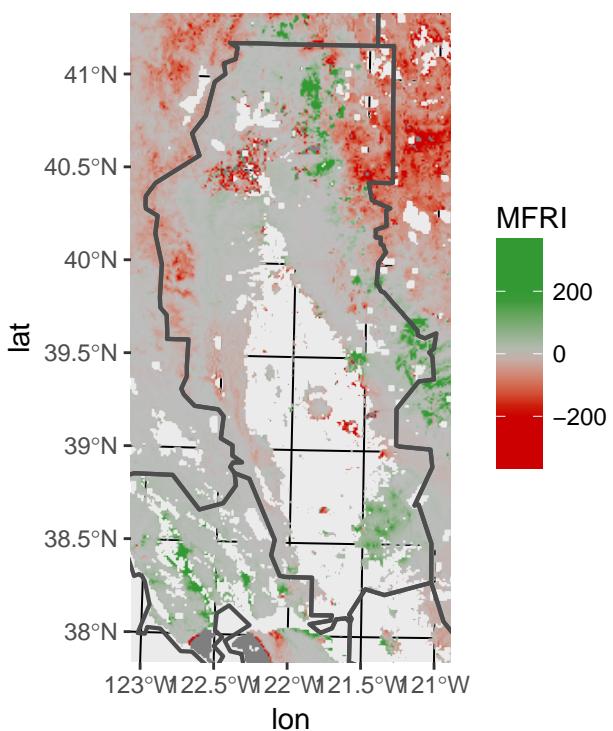
Los Angeles  
Change in MFRIs 2000 – 2050  
Mean model run



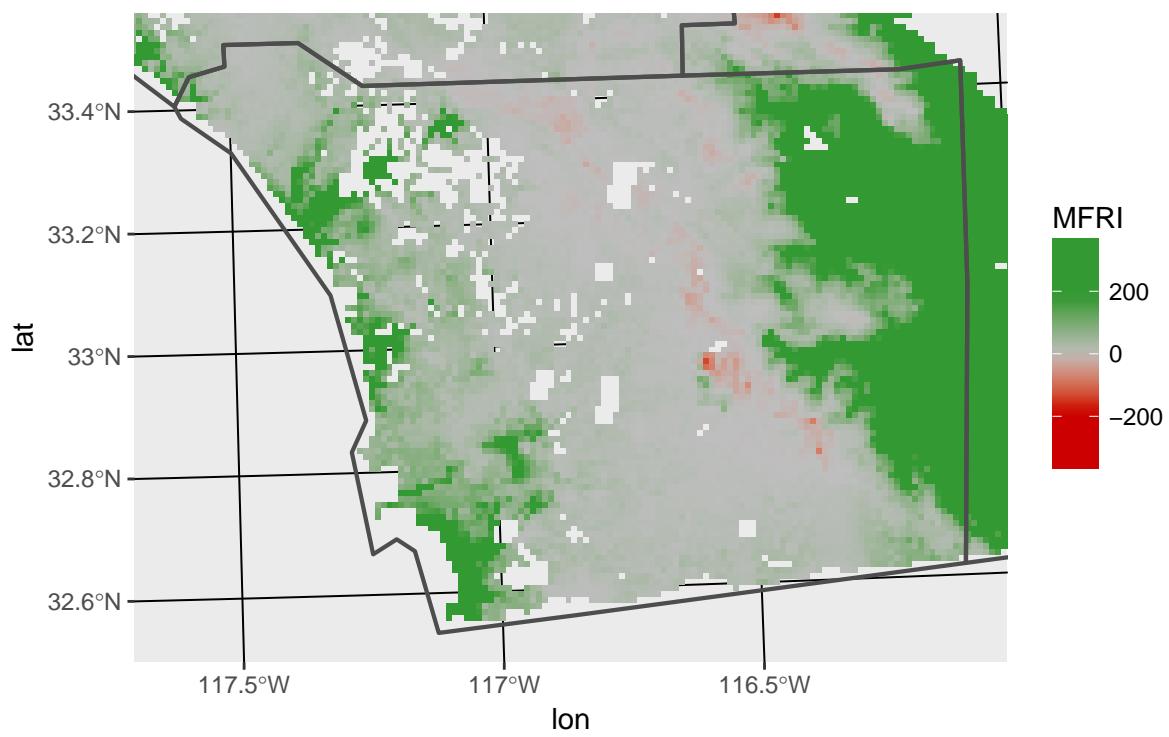
North Coast  
Change in MFRI 2000 – 2050  
Mean model run



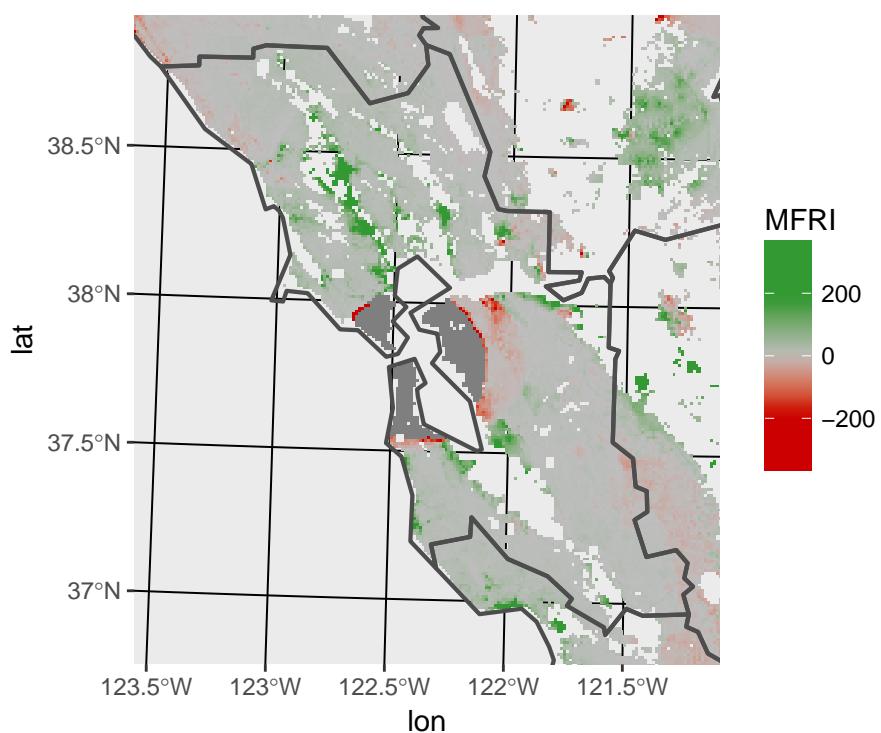
Sacramento Valley  
Change in MFRI 2000 – 2050  
Mean model run



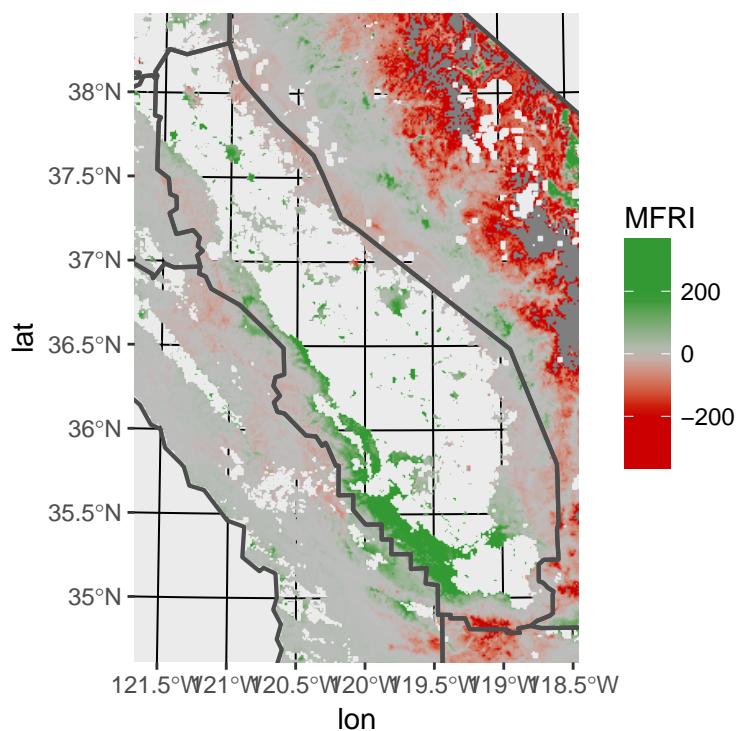
San Diego  
Change in MFRI 2000 – 2050  
Mean model run



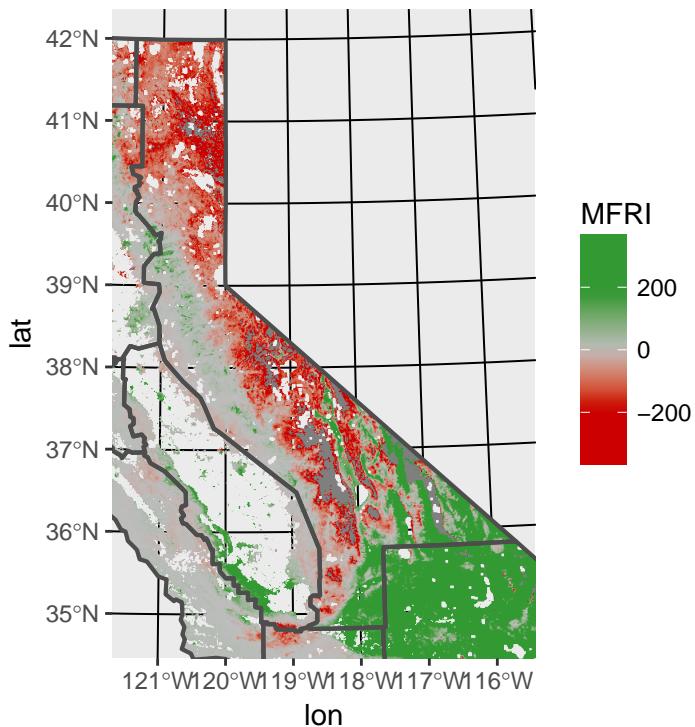
San Francisco Bay Area  
Change in MFRIs 2000 – 2050  
Mean model run



San Joaquin Valley  
Change in MFRI 2000 – 2050  
Mean model run



Sierra Nevada Mountains  
 Change in MFRI 2000 – 2050  
 Mean model run



```

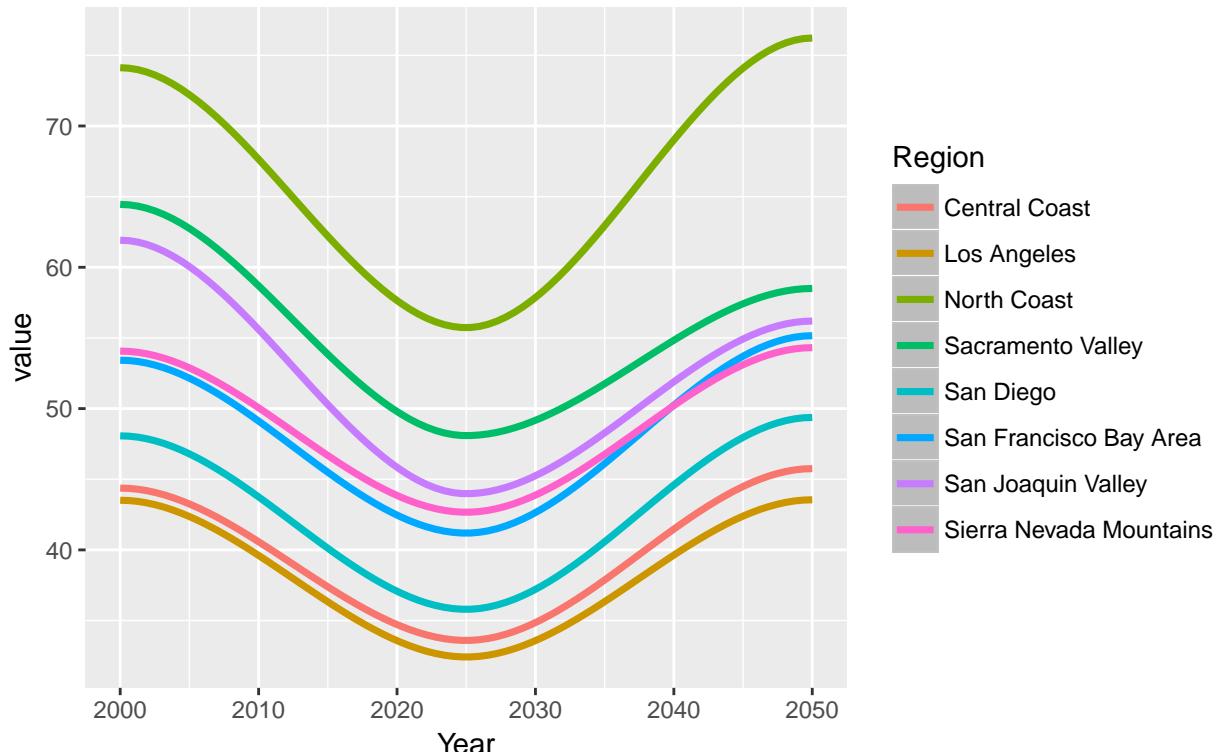
the_fun = median # function used to summarize raster values by polygons
region_code = data.frame(ID=seq(1,9),as(CC4a_reg,'Spatial')@data$Region)
full_mean_stack = stack(MFRI_76_00,mean_all_2001_2025,mean_all_2026_2050)
names(full_mean_stack) =c('2000','2025','2050')
extract_full_mean_df = extract(full_mean_stack,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

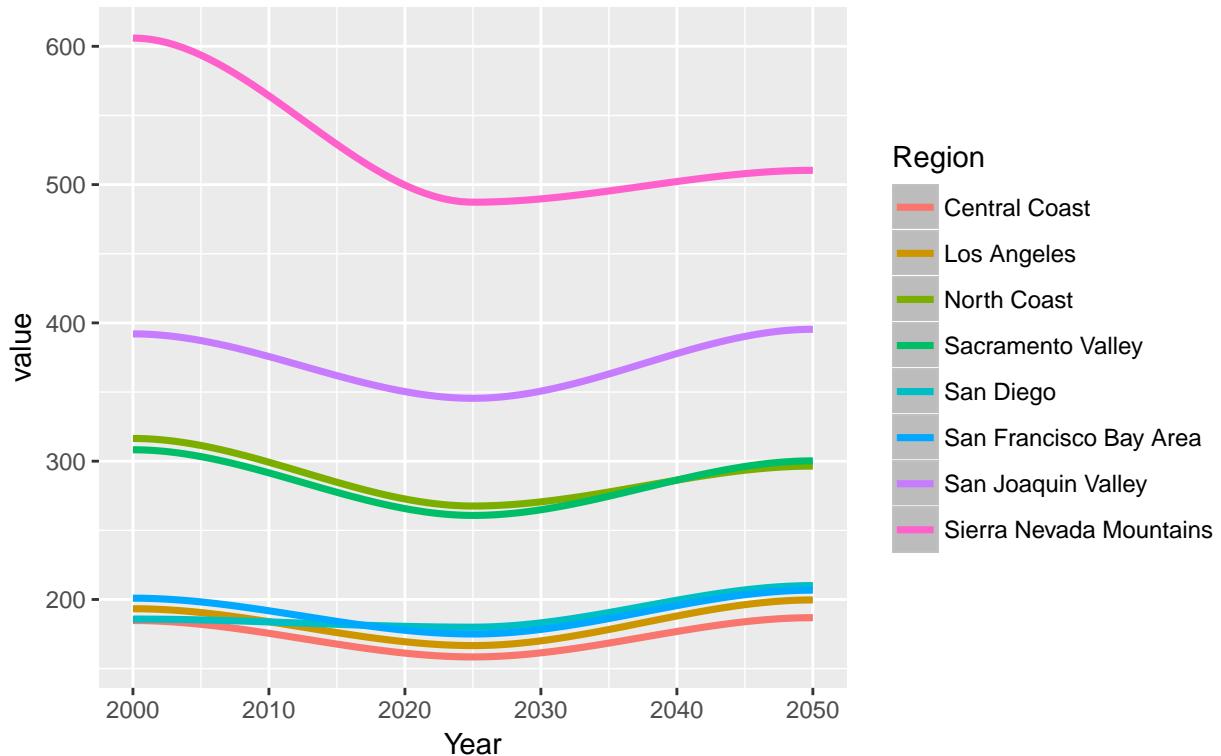
```

## Minimum observed MFRI of Min(all\_models) by region – omitting Inland South



```
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



## Median MFRI by individual model run

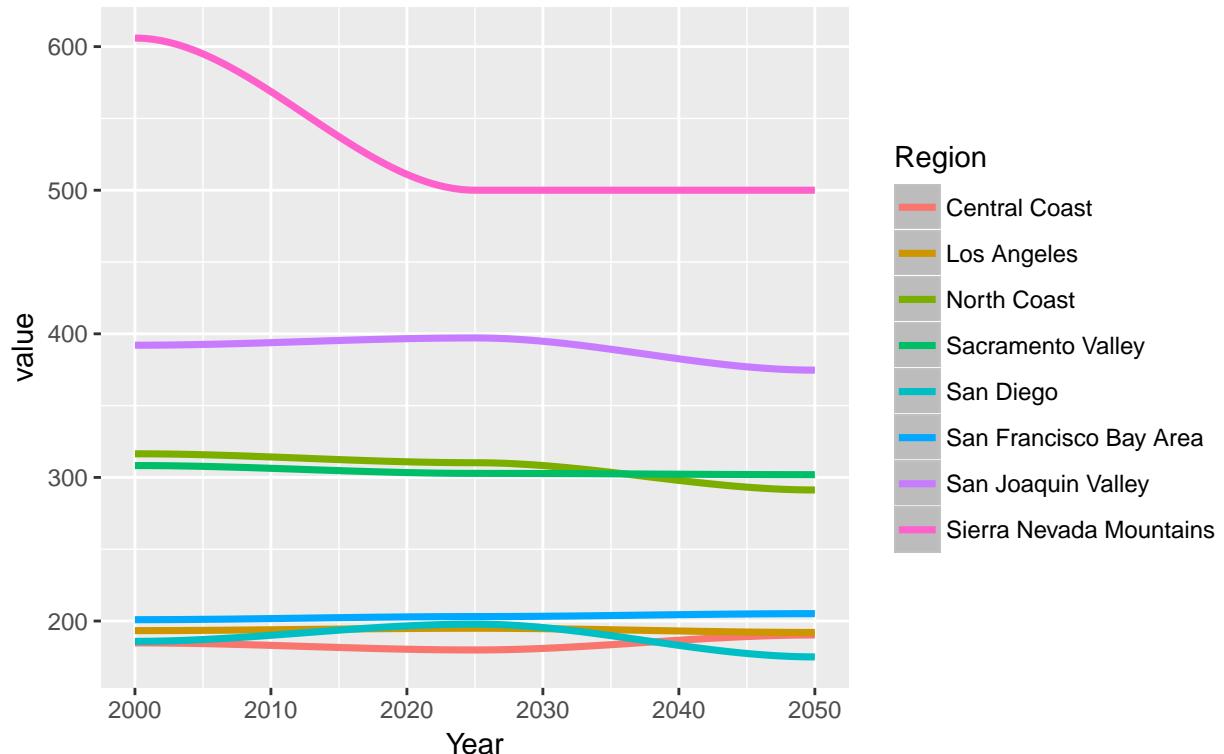
```

the_fun = median
for(model in c('GA2','MIROC_rcp45','MIROC_rcp85','mpircp','PA2')){
  region_code = data.frame(ID=seq(1,9),as(CC4a_reg,'Spatial')@data$Region)

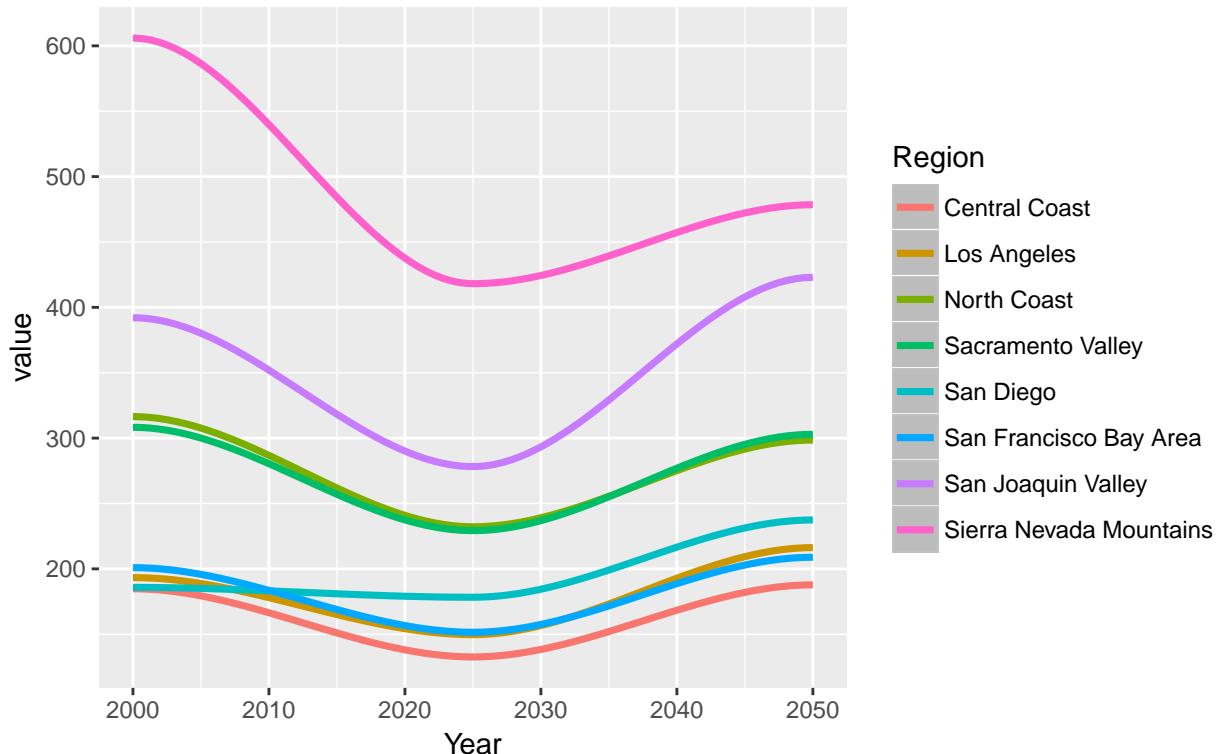
  model_stack = stack(MFRI_76_00,all_2001_2025[[grep(model,names(all_2001_2025))]],
                       all_2026_2050[[grep(model,names(all_2001_2025))]])
  names(model_stack) =c('2000','2025','2050')
  extract_model_stack_df = extract(model_stack, as(CC4a_reg,'Spatial'), fun=the_fun, na.rm=T, df=T)
  extract_model_stack_df = left_join(region_code,extract_model_stack_df,by='ID') %>% select(-ID)%>%me
  extract_model_stack_df$Year = as.numeric(substr(as.character(extract_model_stack_df$variable),2,5))
  names(extract_model_stack_df)=c('Region','variable','value','Year')

  aplot = ggplot() +geom_smooth(data=subset(extract_model_stack_df, Region != 'Inland South' ), aea
}
  
```

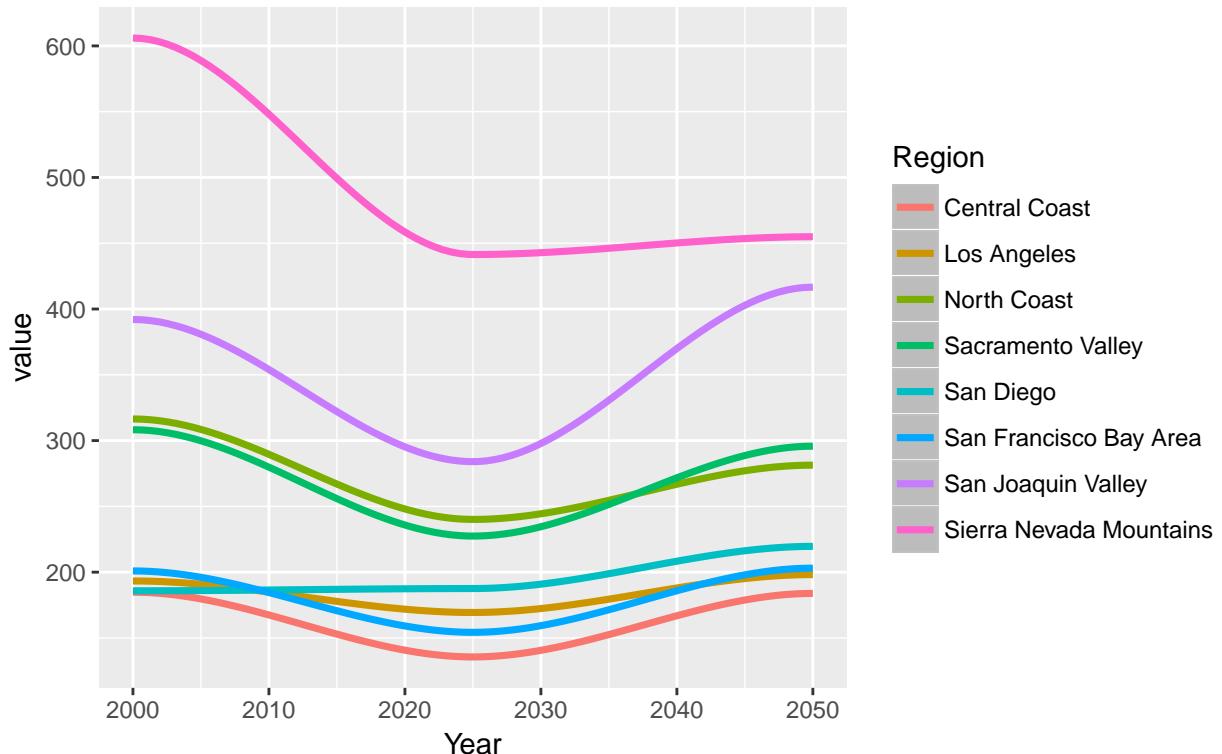
GA2 – Median observed MFRI by region –  
omitting Inland South



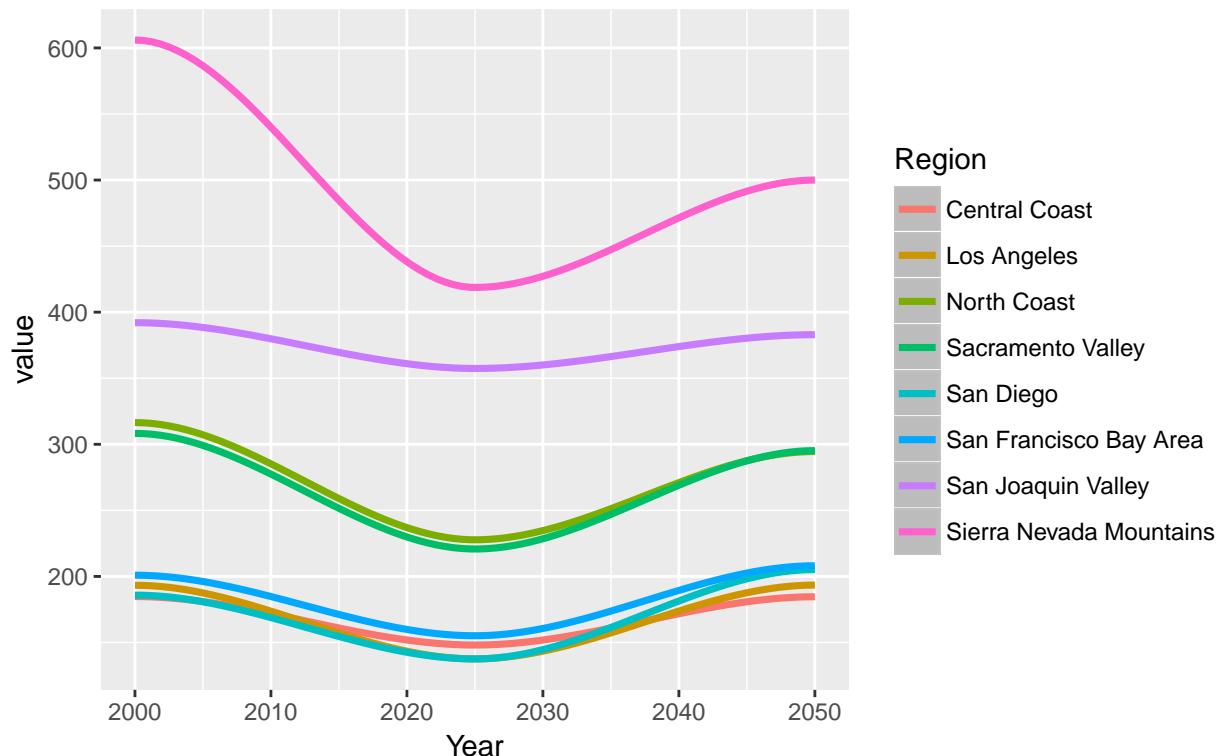
MIROC\_rcp45 – Median observed MFRI by region –  
omitting Inland South



MIROC\_rcp85 – Median observed MFRI by region –  
omitting Inland South



mpircp – Median observed MFRI by region –  
omitting Inland South



PA2 – Median observed MFRI by region –  
omitting Inland South

