Carbon

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#I. set up

Used pakages :

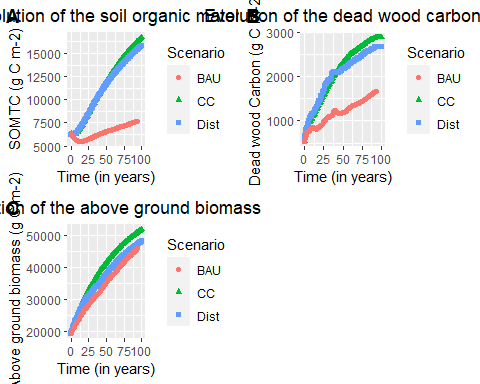
setwd(  
 "D:/Users/181248/Documents/R")  
library(magrittr)  
library(cowplot)  
library(ggplot2)  
library(raster)

CC\_input =   
 "D:/Users/181248/Documents/Klamath\_(CA\_only)\_2021 - CC only/"  
Dist\_input =   
 "D:/Users/181248/Documents/Klamath\_(CA\_only)\_2021 - CC & disturbances/"  
  
BAU\_input =  
 "D:/Users/181248/Documents/Klamath\_(CA\_only)\_2021 - Harvest BAU1/"

#II.

CC\_NECN\_long = paste(CC\_input,"NECN-succession-log.csv",sep="") %>% read.csv()  
  
CC\_NECN = aggregate(data=CC\_NECN\_long, cbind(NEEC, SOMTC, AGB, AG\_NPPC, BG\_NPPC, Litterfall, AgeMortality, MineralN, TotalN, GrossMineralization, C\_LiveLeaf, C\_LiveFRoot, C\_LiveWood, C\_DeadWood, C\_DeadCRoot, C\_DeadLeaf\_Struc, C\_DeadLeaf\_Meta, C\_DeadFRoot\_Struc, C\_DeadFRoot\_Meta, C\_SOM1surf, C\_SOM1soil, C\_SOM2, C\_SOM3, N\_Leaf, N\_FRoot, N\_Wood, N\_CRoot, N\_DeadWood, N\_DeadCRoot, N\_DeadLeaf\_Struc, N\_DeadLeaf\_Meta, N\_DeadFRoot\_Struc, N\_DeadFRoot\_Meta, N\_SOM1surf, N\_SOM1soil, N\_SOM2, N\_SOM3, SurfStrucNetMin, SurfMetaNetMin, SoilStrucNetMin, SoilMetaNetMin, SOM1surfNetMin, SOM1soilNetMin, SOM2NetMin, SOM3NetMin, TotalNdep, LeachedC, LeachedN, FireCEfflux, FireNEfflux, Nuptake, Nresorbed, TotalSoilN, Nvol, FrassC) ~ Time, mean)  
  
CC\_NECN$Scenario = "CC"  
  
  
Dist\_NECN\_long = paste(Dist\_input,"NECN-succession-log.csv",sep="") %>% read.csv()  
  
Dist\_NECN = aggregate(data=Dist\_NECN\_long, cbind(NEEC, SOMTC, AGB, AG\_NPPC, BG\_NPPC, Litterfall, AgeMortality, MineralN, TotalN, GrossMineralization, C\_LiveLeaf, C\_LiveFRoot, C\_LiveWood, C\_DeadWood, C\_DeadCRoot, C\_DeadLeaf\_Struc, C\_DeadLeaf\_Meta, C\_DeadFRoot\_Struc, C\_DeadFRoot\_Meta, C\_SOM1surf, C\_SOM1soil, C\_SOM2, C\_SOM3, N\_Leaf, N\_FRoot, N\_Wood, N\_CRoot, N\_DeadWood, N\_DeadCRoot, N\_DeadLeaf\_Struc, N\_DeadLeaf\_Meta, N\_DeadFRoot\_Struc, N\_DeadFRoot\_Meta, N\_SOM1surf, N\_SOM1soil, N\_SOM2, N\_SOM3, SurfStrucNetMin, SurfMetaNetMin, SoilStrucNetMin, SoilMetaNetMin, SOM1surfNetMin, SOM1soilNetMin, SOM2NetMin, SOM3NetMin, TotalNdep, LeachedC, LeachedN, FireCEfflux, FireNEfflux, Nuptake, Nresorbed, TotalSoilN, Nvol, FrassC) ~ Time, mean)  
  
Dist\_NECN$Scenario = "Dist"  
  
  
BAU\_NECN\_long = paste(BAU\_input,"NECN-succession-log.csv",sep="") %>% read.csv()  
  
BAU\_NECN = aggregate(data=BAU\_NECN\_long, cbind(NEEC, SOMTC, AGB, AG\_NPPC, BG\_NPPC, Litterfall, AgeMortality, MineralN, TotalN, GrossMineralization, C\_LiveLeaf, C\_LiveFRoot, C\_LiveWood, C\_DeadWood, C\_DeadCRoot, C\_DeadLeaf\_Struc, C\_DeadLeaf\_Meta, C\_DeadFRoot\_Struc, C\_DeadFRoot\_Meta, C\_SOM1surf, C\_SOM1soil, C\_SOM2, C\_SOM3, N\_Leaf, N\_FRoot, N\_Wood, N\_CRoot, N\_DeadWood, N\_DeadCRoot, N\_DeadLeaf\_Struc, N\_DeadLeaf\_Meta, N\_DeadFRoot\_Struc, N\_DeadFRoot\_Meta, N\_SOM1surf, N\_SOM1soil, N\_SOM2, N\_SOM3, SurfStrucNetMin, SurfMetaNetMin, SoilStrucNetMin, SoilMetaNetMin, SOM1surfNetMin, SOM1soilNetMin, SOM2NetMin, SOM3NetMin, TotalNdep, LeachedC, LeachedN, FireCEfflux, FireNEfflux, Nuptake, Nresorbed, TotalSoilN, Nvol, FrassC) ~ Time, mean)  
  
BAU\_NECN$Scenario = "BAU"  
  
NECN = rbind(CC\_NECN, Dist\_NECN, BAU\_NECN)

SOMTp = ggplot(NECN, aes(x=Time, y=SOMTC, col=Scenario, shape = Scenario)) +  
 geom\_point() +  
 scale\_x\_continuous(name= "Time (in years)") +  
 scale\_y\_continuous(name = "SOMTC (g C m-2)") +  
 ggtitle("Evolution of the soil organic mater") +  
 theme(plot.title = element\_text(hjust = 0.5))  
  
CDWp = ggplot(NECN, aes(x=Time, y=C\_DeadWood, col=Scenario, shape = Scenario)) +  
 geom\_point() +  
 scale\_x\_continuous(name= "Time (in years)") +  
 scale\_y\_continuous(name = "Dead wood Carbon (g C m-2)") +  
 ggtitle("Evolution of the dead wood carbon") +  
 theme(plot.title = element\_text(hjust = 0.5))  
  
AGBp = ggplot(NECN, aes(x=Time, y=AGB, col=Scenario, shape = Scenario)) +  
 geom\_point() +  
 scale\_x\_continuous(name= "Time (in years)") +  
 scale\_y\_continuous(name = "Above ground biomass (g C m-2)") +  
 ggtitle("Evolution of the above ground biomass") +  
 theme(plot.title = element\_text(hjust = 0.5))  
  
plot\_grid(SOMTp, CDWp, AGBp, labels="AUTO", ncol = 2, nrow = 2)

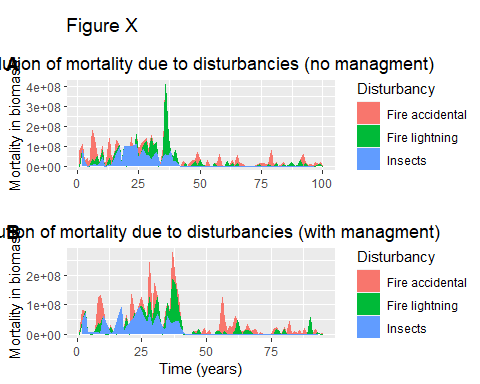


# III. Perturbations analysis

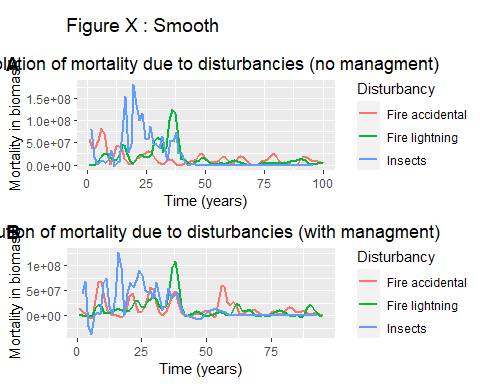
Dist\_BDA\_Tot = read.csv("D:/Users/181248/Documents/Klamath\_(CA\_only)\_2021 - CC & disturbances/bda\_log.csv")  
Dist\_BDA = cbind(Dist\_BDA\_Tot$Time, Dist\_BDA\_Tot$TotalBiomassMortality) %>% as.data.frame()  
colnames(Dist\_BDA) = c("Time", "Mortality")  
  
Dist\_BDA = aggregate(Dist\_BDA$Mortality, by=list(Time=Dist\_BDA$Time), FUN=sum)  
  
colnames(Dist\_BDA) = c("Time", "Mortality")  
Dist\_BDA$Disturbancy = "Insects"  
  
  
Dist\_scrapple\_Tot = read.csv("D:/Users/181248/Documents/Klamath\_(CA\_only)\_2021 - CC & disturbances/scrapple-summary-log.csv")  
Dist\_scrapple\_Acc = cbind(Dist\_scrapple\_Tot$SimulationYear,  
 Dist\_scrapple\_Tot$TotalBiomassMortalityAccidental) %>% as.data.frame()  
colnames(Dist\_scrapple\_Acc) = c("Time", "Mortality")  
Dist\_scrapple\_Acc$Disturbancy = "Fire accidental"  
  
  
Dist\_scrapple\_Nat = cbind(Dist\_scrapple\_Tot$SimulationYear,  
 Dist\_scrapple\_Tot$TotalBiomassMortalityLightning) %>% as.data.frame()  
colnames(Dist\_scrapple\_Nat) = c("Time", "Mortality")  
Dist\_scrapple\_Nat$Disturbancy = "Fire lightning"  
  
Dist\_Mortality = rbind(Dist\_BDA, Dist\_scrapple\_Acc, Dist\_scrapple\_Nat)

BAU\_BDA\_Tot = read.csv("D:/Users/181248/Documents/Klamath\_(CA\_only)\_2021 - Harvest BAU1/bda\_log.csv")  
BAU\_BDA = cbind(BAU\_BDA\_Tot$Time, BAU\_BDA\_Tot$TotalBiomassMortality) %>% as.data.frame()  
colnames(BAU\_BDA) = c("Time", "Mortality")  
  
BAU\_BDA = aggregate(BAU\_BDA$Mortality, by=list(Time=BAU\_BDA$Time), FUN=sum)  
  
colnames(BAU\_BDA) = c("Time", "Mortality")  
BAU\_BDA$Disturbancy = "Insects"  
  
  
BAU\_scrapple\_Tot = read.csv("D:/Users/181248/Documents/Klamath\_(CA\_only)\_2021 - Harvest BAU1/scrapple-summary-log.csv")  
BAU\_scrapple\_Acc = cbind(BAU\_scrapple\_Tot$SimulationYear,  
 BAU\_scrapple\_Tot$TotalBiomassMortalityAccidental) %>% as.data.frame()  
colnames(BAU\_scrapple\_Acc) = c("Time", "Mortality")  
BAU\_scrapple\_Acc$Disturbancy = "Fire accidental"  
  
  
BAU\_scrapple\_Nat = cbind(BAU\_scrapple\_Tot$SimulationYear,  
 BAU\_scrapple\_Tot$TotalBiomassMortalityLightning) %>% as.data.frame()  
colnames(BAU\_scrapple\_Nat) = c("Time", "Mortality")  
BAU\_scrapple\_Nat$Disturbancy = "Fire lightning"  
  
  
BAU\_Mortality = rbind(BAU\_BDA, BAU\_scrapple\_Acc, BAU\_scrapple\_Nat)

title = ggdraw() +   
 draw\_label(  
 "Figure X",  
 fontface = 'plain', x = 0, hjust = 0, size = 14) +  
 theme(plot.margin = margin(0, 0, 0, 50))  
  
Mort1 = ggplot(Dist\_Mortality, aes(x=Time, y=Mortality, color=Disturbancy, group=Disturbancy)) +  
 geom\_area(aes(fill=Disturbancy)) +  
 xlab("") +  
 ylab("Mortality in biomass") +  
 ggtitle("Evolution of mortality due to disturbancies (no managment)") +  
 theme(plot.title = element\_text(hjust = 0.5))  
  
Mort2 = ggplot(BAU\_Mortality, aes(x=Time, y=Mortality, color=Disturbancy, group=Disturbancy)) +  
 geom\_area(aes(fill=Disturbancy)) +  
 xlab("Time (years)") +  
 ylab("Mortality in biomass") +  
 ggtitle("Evolution of mortality due to disturbancies (with managment)") +  
 theme(plot.title = element\_text(hjust = 0.5))  
  
plot\_row = plot\_grid(Mort1, Mort2, ncol=1, labels="AUTO")  
  
plot\_grid(title, plot\_row, ncol=1, rel\_heights = c(0.1, 0.7))



title = ggdraw() +   
 draw\_label(  
 "Figure X : Smooth",  
 fontface = 'plain', x = 0, hjust = 0, size = 14) +  
 theme(plot.margin = margin(0, 0, 0, 50))  
  
Mort1 = ggplot(Dist\_Mortality, aes(x=Time, y=Mortality, color=Disturbancy, group=Disturbancy)) +  
 geom\_smooth(span = 0.1, se=FALSE) +  
 xlab("Time (years)") +  
 ylab("Mortality in biomass") +  
 ggtitle("Evolution of mortality due to disturbancies (no managment)") +  
 theme(plot.title = element\_text(hjust = 0.5))  
  
Mort2 = ggplot(BAU\_Mortality, aes(x=Time, y=Mortality, color=Disturbancy, group=Disturbancy)) +  
 geom\_smooth(span = 0.1, se=FALSE) +  
 xlab("Time (years)") +  
 ylab("Mortality in biomass") +  
 ggtitle("Evolution of mortality due to disturbancies (with managment)") +  
 theme(plot.title = element\_text(hjust = 0.5))  
  
plot\_row = plot\_grid(Mort1, Mort2, ncol=1, labels="AUTO")  
  
plot\_grid(title, plot\_row, ncol=1, rel\_heights = c(0.1, 0.7))



Mean mortality, max, f pics

biomass recover after disturbancy (slope).