

Post-fire Climate Effects on Montane Forest Tree Species in Glacier National Park
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Glacier National Park has an incredible amount of both plant and animal species diversity. The forests of Glacier include several species of trees, some of which reproduce by seed (reseeders) and some of which are capable of reproducing by resprouting from an existing root (resprouters). For example, lodgepole pine and Engelmann spruce, two species seen throughout the park, are only able to create new trees by seeds. Rocky Mountain maple and paper birch are species that can resprout from a stump if the top portion of the tree is killed by fire for instance. Each species has its own specific habitat requirements as well. To use our previous examples, lodgepole pine and Engelmann spruce do well in areas that are rather dry (xerophytic) while maple and birch prefer a moister habitat (mesophytic).



Several studies demonstrate that climate change is occurring across the globe, including the northern Rocky Mountains. Further, it has been reported that climate change is influencing the frequency of forest fires throughout the western United States. One of the consequences of climate change will likely be more extreme weather such as extremes in temperature or precipitation. These extremes, coupled with increased fire frequency mean that there will likely be more disturbance in the forests of Glacier National Park in the form of forest fires. Fires such as those that occurred in 2003 on the northern side of Lake McDonald can be rather severe and can kill the entire forest canopy. However, if you look closely at the forest floor, you will see an abundance of regrowth of many species. An example can be seen on the east side of the park in the area of the Red Eagle fire which occurred in 2006. One of the goals of our research was to identify how individual species respond following fire to drier than usual post-fire conditions.

In our research, we identified the tree species abundance and composition before several forest fires in Glacier, as well as the abundance and composition following fire. Most of the fires we studied were followed by drier than usual post-

TABLE 1. This table shows the fires in which we conducted the study as well as whether the group of species increased in proportion in the community after fire. All fires were followed by drier than usual conditions except the Red Bench fire. A '-' indicates a significant decrease in fires followed by dry conditions, while a '+' indicates a significant increase and a '0' indicates no change.

	Red Bench 1988	Moose 2001 Site 1	Moose 2001 Site 2	Robert 2003 Site 1	Robert 2003 Site 2	Trapper 2003	Red Eagle 2006
Resprouters	-	+	0	0	+	+	+
Reseeders	+	-	0	0	-	-	-
Mesophytic	+	+	0	-	+	+	+
Xerophytic	+	-	0	+	-	-	-

fire conditions. In so doing, we were able to identify which species increased in proportion in the community and which species decreased (Table 1). In general, we found that resprouter species increased in proportion following fire. This is likely because they have an existing root stock that gives them an advantage over species that must sprout from seeds. It is also likely that these

species increased because they can also reproduce by seed, which can add more individuals to the post-fire species pool. Reseeders generally decreased following fire. If conditions were too dry, seedlings of some species might struggle to survive. Interestingly we found results opposite of what we would expect for mesophytic vs. xerophytic response to fire. Species that prefer moist



environments increased in proportion in fires followed by dry conditions and xerophytes decreased. This is likely to the fact that most of the resprouters we found were also mesophytic and they increased.

As with most scientific endeavors, this project generated several new questions. Future work that uses this project as a baseline will tell us more about how individual species in Glacier respond to a changing climate in a landscape that is prone to fire. It will also provide further

insight to the effects of climate variability and change on individual species in Glacier National Park.

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