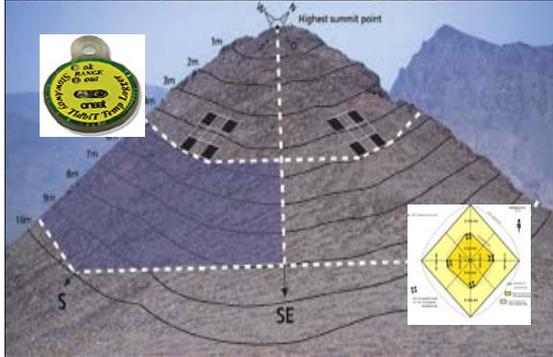


# A New GLORIA (Global Research Initiative in Alpine Environments) Site in Southwestern Montana

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Global climate change is predicted to have a major impact on the alpine environments and plants of western North America. Alpine plant species and treelines may migrate upwards due to warmer temperatures. Species composition, vegetation cover, and the phenology of photosynthesis, flowering, pollination, and seed dispersal may change. The Global Research Initiative in Alpine Environments (GLORIA) is a network of alpine sites established with the goal of understanding the interactions between climate change and alpine plants. The Continental Divide traverses Southwestern Montana, where the flora contains representative species from both sides of the divide. In the summer of 2008, we established a GLORIA site east of the Continental Divide in Southwestern Montana with the objective of determining whether the temperature changes at the site, and if so, how temperature changes influence alpine plants. We are monitoring soil temperature along with species composition and percent cover of alpine plants at four sub-summits along an ascending altitudinal gradient. We placed the treeline, lower alpine, and upper alpine sites on Mt. Fleecer ( $45^{\circ}49'36.06''$  N,  $112^{\circ}48'08.18''$  W, 2886.2 m (9469 ft)) and the highest sub-summit on Keokirk Mountain, ( $45^{\circ}35'37.94''$  N,  $112^{\circ}57'03.89''$  W, 2987.3 m (9801 ft)) in the Pioneer Range. The current treeline on Mt. Fleecer is  $\pm$  8943 ft., 2726 m, northern aspect, and on Keokirk Mt. it is 9100 ft., 2774 m, eastern aspect. Interesting species on these mountains include *Lewisia pygmaea*, the Pygmy Bitterroot, *Silene acaulis*, the Moss Campion, *Eritrichium nanum*, the Alpine Forget-Me-Not, *Lloydia serotina*, the Alpine Lily, and *Pinus albicaulis*, the Whitebark Pine. This new site will remain in place indefinitely. Baseline and subsequent data from this site will be linked with the database of the global network of GLORIA sites with which we will assess changes in alpine flora.



The GLORIA site consists of four sub-summits along an ascending altitudinal gradient beginning at treeline (Pauli et al. 2004). Each sub-summit has an Onset 32K Stowaway Tidbit waterproof temperature sensor at each cardinal direction. These sensors have a range of  $-20^{\circ}\text{C}$  to  $+50^{\circ}\text{C}$  (although winter temperatures  $< -20^{\circ}\text{C}$  occur frequently in Montana). We recorded the frequency and percent cover of alpine plant and lichen species upon installation of the site in summer 2008 and will monitor plants and lichens in future summers. We have constructed a list of the plants and lichens by genus, species, and family. Please take a species list.



**References.** Mark, A. F., Dickinson, K. J. M., Maegli, T., and Halloy, S. R. P. 2006. Two GLORIA long-term alpine monitoring sites established in New Zealand as part of a global network. *Journal of the Royal Society of New Zealand*. 36 (3):111-128/Pauli, H., Gottfried, M., Hohenwallner, D., Reiter, K., Casale, R., and Grabherr, G. 2004. The GLORIA field manual-multi-summit approach. Luxembourg//.