Fickle Hill/Maple Creek Valley Snowfall Micro Climate of northern California

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Introduction: The Cities of Eureka and Arcata, CA are coastal communities that border Humboldt Bay in northern California. Their low elevation (around 50-150 feet) and proximity to the Pacific Ocean (less than 10 miles) in the middle latitudes dictates that their wintertime climates are relatively mild compared to other locations at higher elevations inland. As with many locations along the Pacific coastline, these communities are surrounded by substantial hills and mountains where significant variations in the potential for snow can occur in small horizontal distances. However, some residents have decided to settle among the surrounding foothills and valleys, making snow forecasts in these areas quite important. Fickle Hill is one of these locations where many residents of the Humboldt Bay region choose to live for its rural appeal and breathtaking views of the bay and Pacific Ocean (figure 1). This report discusses some of the issues related to forecasting snow in the Fickle Hill and vicinity.

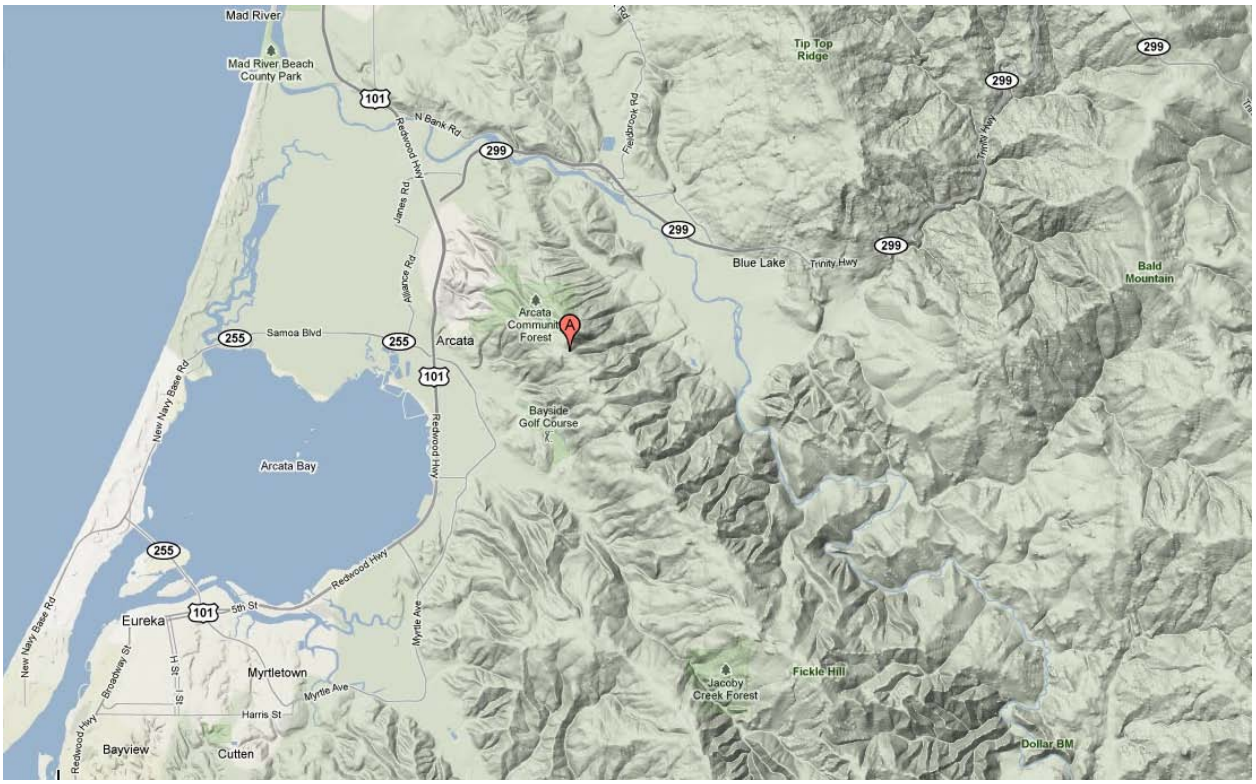

Figure 1 A topographic map of the area surrounding Fickle Hill (point A).

Geography: Figure 2 further annotates the previous image and it depicts the specific orographic features of the area… including the coastal plain, the Fickle Hill area and lee side inland elevated

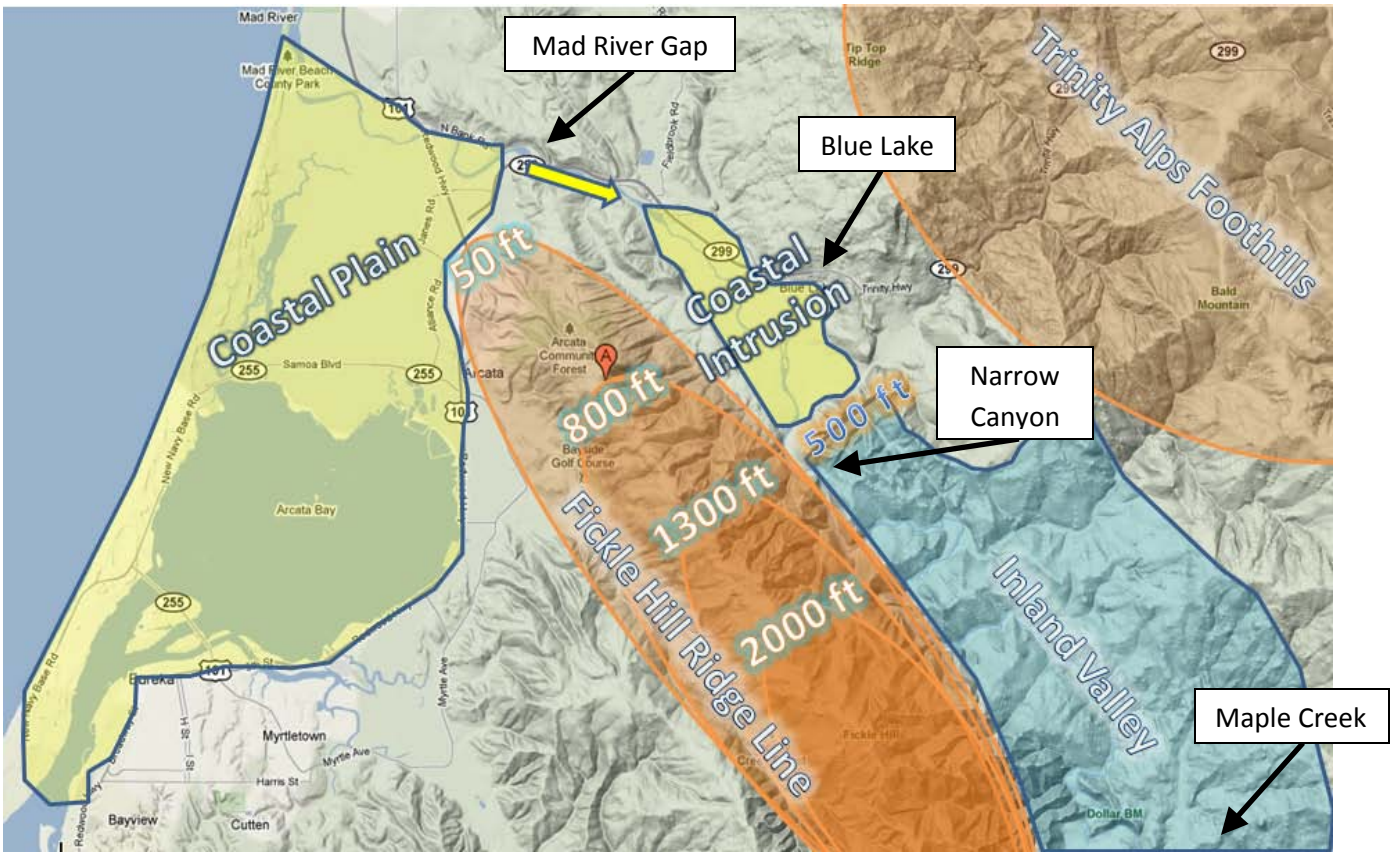

Figure 2 Annotation of significant geographic features in the Fickle Hill area.

valley. Fickle Hill is fundamentally a sloping ridgeline that rises from sea level to around 2200 feet over the span of about 10 miles. On the north end of this ridgeline is the Mad River, and its corresponding gap in the ridgeline allows maritime air to intrude inland under almost any climatic regime. California highway 299 cuts through this gap in the ridgeline and leads to the interior community of Blue Lake, California (elevation ~150 feet). While Blue Lake is not purely a maritime regime (especially during the warm season), its climate more closely resembles that of its coastal neighbors, rather than that of locations found further inland. South of blue lake, the Mad River turns in towards a narrow slot canyon and past set of barrier hills that rise to approximately 500 feet. Past these barrier hills, the Mad River weaves through a broader, slightly elevated inland valley ranging between 500 and 1000 feet. Located inside this valley is the community of Maple Creek. During certain synoptic patterns, Maple Creek's forecast will resemble more that of an inland community - like Willow Creek - and under other regimes, its forecast will resemble more of Blue Lake's.

One road travels up the spine of the Fickle Hill ridge, and serves approximately 1000 residents along its path. Automobile ice chain signs are posted at the entrance the roadway in the vicinity of Arcata, as there is very little attention paid by the local highway department to the road during

wintry conditions. Snows in this entire regime are uncommon, but not unusual. And only a very special set of circumstances will allow snows to form in the area.

Snow forecasting in Fickle Hill: Being the first coastal ridge of any consequence along the Humboldt Bay coastline, Fickle Hill is exposed to moist onshore flow when most storm systems pass by. During the wintertime, ceilings with the initial approach of frontal systems are typically based around the 1000 foot level. This means that the upper reaches of this ridgeline are routinely in fog conditions. The upslope flow on the west side of this ridge encourages condensation and relative warming of the air mass and the windward slopes. This combined with the heavily forested nature of the windward side with redwood rain forests, creates an environment where it is quite difficult to align precipitation with sufficiently cold temperatures to produce snow. This does not however mean that winter precipitation is impossible to form in this regime, but that the atmosphere must be preconditioned prior to the onset of frozen precipitation to form. Snow is not frequent in this zone; it occurs once or twice yearly, and ranges anywhere from a dusting to 3 inches of wet slushy snow, most often above 1500 feet. At the 2000 foot level, 6 inches to a foot of drier snow is possible in historic events, but is far less common here than at similar elevations just a few miles inland, such as the Kneeland, and Lord Ellis Summit locations.

The synoptic setup that can bring wintery precipitation to this area would include a sharp cold front that does not have a significant warm sector of rain ahead of it, or an occluded frontal system in which the warm front of the triple point system stays far south of the area. To give snow the best chance of sticking on hard surfaces, it is preferable for a prolonged period (preferably 2 days) of well below temperatures to precede the system. This would include 850mb temperatures below -8 degrees Celsius, and 925mb temperatures not exceeding freezing during the day times. When forecasting terrain, snow levels very seldom have a significant diurnal signature. However, in this near coastal zone in particular, it is much more likely for snows to accumulate in the overnight hours. This is especially true if there are a number of hours of clear skies ahead of the onset of precipitation. This will allow radiative cooling to drop the surface temperature very rapidly. The most significant snow accumulations will often occur in the showery zone behind a cold front where open cell convective cells, amplified by orographic lifting can produce intense rounds of short lived wet snowfall and mixed hail showers. The clear skies in between these cells overnight will again allow surface temperatures to remain depressed, and hence allowing for the greater possibility for snows.

Snow forecasting east of Fickle Hill: Any snows that form on over top of the ridgeline will continue in the regime to the lee side, and one can expect that snow levels will be 500-700 feet lower in the lee side valley during these cold events than they will be on the windward side. So if snow is not observed along the Fickle Hill ascent until 1000 feet, it is not unreasonable that at least some snow will make its way to the surface in the area around Maple Creek.