

Mount Rainier Glacier Monitoring 2009

The National Park Service began to monitor annual mass balance on Nisqually and Emmons glaciers in 2003, while tracking area and volume changes of all Mount Rainier glaciers on a 20-year cycle. The annual program includes spring, summer and fall field measurements of snow depth, density, snow and ice melt, and annual terrestrial photography on the Nisqually and



Figure 1. Emmons and surrounding glaciers with stake measurement sites.

Emmons glaciers. This program is a cooperative venture between Mount Rainier National Park and North Cascades National Park.

Between April 15th and May 23 of this year we measured snow density and depth and placed ablation stakes between ~11,000 and 5,000 feet on the Nisqually and Emmons glaciers (Figures 1 and 2).

We placed a total of six stakes per glacier with the lowest two stakes in debris covered ice. Data collected thus far indicate 2009 snow water accumulation was 83 percent of average on the

glaciers. On Mount Rainier, snow accumulation generally increases with altitude but has high spatial variability due to wind effects. The accumulation trend on the south side of the mountain increases with elevation up to ~7100 feet and then decreases above (Table 1). Accumulation on the Emmons Glacier generally peaks at ~10,000', our highest placed stake.

We normally take spring measurements in early April at the lower elevations and in May at higher elevations. The

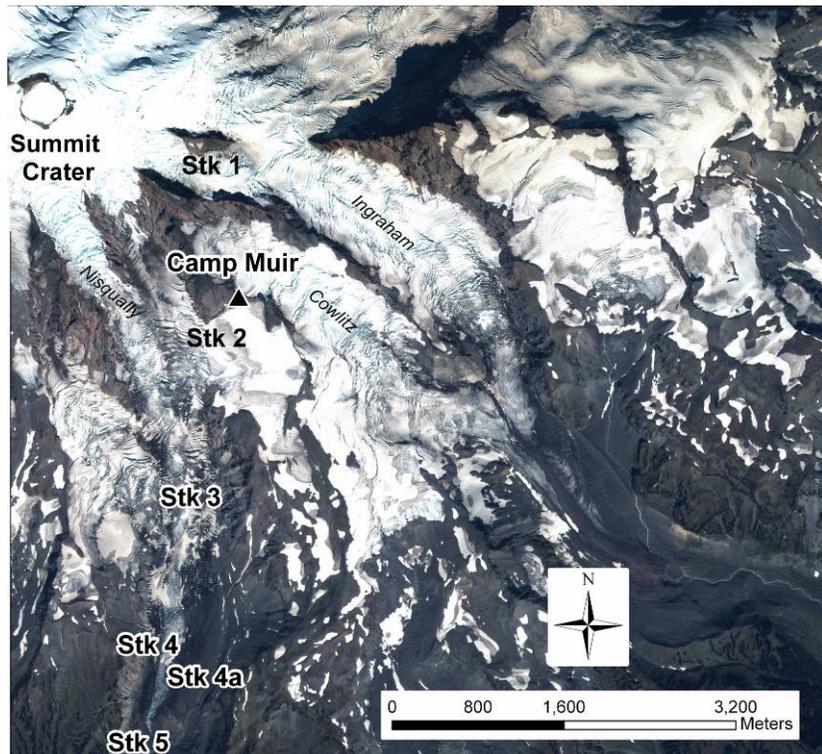


Figure 2. Nisqually and surrounding glaciers with measurement sites.

glaciers at Mount Rainier are unique for the Pacific Northwest in that they span up to a ~10,000' elevation range. In the spring when melt begins on the lower glacier, the upper mountain is still accumulating snow. Likewise in the fall, when snow begins to collect on the upper mountain, snow and ice melt is still occurring on the lower glacier. This program is unique in that we time our visits to capture these seasonal differences and make multiple trips per year. For the second year in a row our spring collection dates have been delayed due to persistent cool temperatures and continual snow accumulation.

Table 1		Altitude	Accumulation (inches w.e.)						Average
		(feet)	2004	2005	2006	2007	2008	2009	
Muir Snowfield & Nisqually Glacier	11,096	NA	NA	94	NA	NA	78	86	
	9,711	89	59	105	92	90	84	87	
	7,136	151	78	144	165	149	103	132	
	6,201	98	55	118	91	145	84	99	
	6,135	83	39	146	88	124	58	90	
	5,833	67	20	118	75	NA	59	73	
Paradise	5,121	72	35	84	70	106	82	75	
Emmons Glacier	10,205	NA	NA	117	153	NA	71	114	
	9,218	74	104	94	153	122	68	102	
	6,462	65	27	85	57	83	61	63	
	5,577	48	25	66	48	51	33	45	
	5,593	36	32	48	51	52	30	41	
	5,183	32	9	30	31	67	31	33	

Table 1. Maximum accumulation (inches water equivalent) on Mount Rainier glaciers, for the years 2004 through 2009. *Provisional Data.*

We will return to the glaciers in early July to confirm our spring snow depths, take additional density measurements, and record snow melt. On a fall visit (late September/early October) we will record final ablation measurements from the stakes. The end result of these seasonal measurements is the net balance, which is the sum of winter accumulation (always positive) and summer melt (always negative). The cumulative net balance allows us to see the overall trend in glacier health (Figure 3).

If you see our melt stakes sticking out of the glacier, please do not approach or remove them. Several stakes are near climbing routes and should not be confused as route wand markers. For more information contact Jon_Riedel @nps.gov or Jeanna_Wenger@nps.gov.

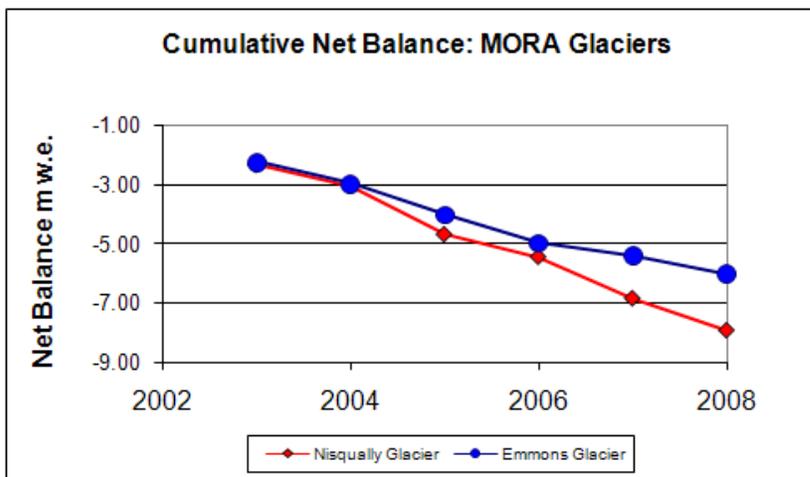


Figure 3. Cumulative net balance for the Nisqually and Emmons glaciers. Units are in meters water equivalent.