Table 8. Indicators to monitor Vegetation conditions in wilderness

Indicator	Human activities indicator responds to	Indicator response to human activities	Comments and additional variable that help confirm cause of change	Legislative Mandate	References
VEGETATION COVER LOSS	Trampling	Decrease ground cover	Must be compared with control. Vegetation cover is lost rapidly with visitor use.	No	Frissell and Duncan 1965 Cole 1983b Cole 1982 Marion and Merriam 1985 Treshow and Allan 1985 Bayfield 1985 Willard and Marr 1970
SPECIES COMPOSITION -floristic dissimilarity index	Trampling Selective grazing	Shift in composition towards unpalatable, trample-resistant species (especially native and exotic invaders)	Must be compared with control. Must separate composition changes caused by human activities from composition changes caused by natural plan succession. Species that increase significantly with low levels of visitor use are valuable early indicators of campsite condition.	No	Kellogg 1985 Kuss et.al. 1986 Cole 1979 Leonard et.al. 1983 Dale and Weaver 1974 Cole 1982 Marion and Merriam 1985 Price 1985 Weaver et.al. 1978 Cole 1981 DeBenedettie and Parsons 1979
PRESENCE OF EXOTIC PLANT SPECIES	Livestock and packstock Recreationists Managers (seeding projects) Historic human uses (e.g. homesteading)	Presence Increased frequency of occurrences	Exotic plant spp. are especially prevalent on sites used by horse parties.	No	Marion et.al. 1986 Cole 1985 Crowder 1983 Ahlgren and Ahlgren 1984 Pestena 1986 Weaver et.al. 1978 Price 1985
CAMPSITE AREA	Trampling	Increased campsite area	Campsite area is often defined by the area of trampled vegetation. Campsite area appears to increase with increasing visitor use, especially use by larger groups	No	Marion and Merriam 1985 Merriam and Smith 1974 Cole and Marion 1986 Cole 1982 Cole 1983b Frissell 1978
TREE DAMAGE	Recreation use (hacking, nail, nails, firewood gathering, tying stock	Increased number or percent of damaged trees per campsite	Must separate scars caused by human activities from scars caused by natural agents (e.g. frost, animal). Sites used by horse groups tend to have more damaged trees. Tree damage is caused by a few destructive parties by damage is cumulative thus increases with campsite age.	No	Cole 1983b Cole 1985 Bratton et.al. 1982 Brown et.al. 1977 Marion and Merriam 1985 Cole 1982 Frissell and Duncan 1965
SEEDLING LOSS	Trampling	Decrease in the number of seedlings on campsites	Must be compared with control. Seedlings are lost rapidly with visitor use.	No	Cole and Fichtler 1983 Settergren 1977 Brown et.al. 1977 Frissell and Duncan 1965 Marion and Merriam 1985 Cole 1982

Source: Merigliano, L. 1987. Identifying and Evaluating Indicators to Monitor Wilderness Conditions. MS Thesis, University of Idaho. Moscow, ID.

Table 8. (continued) Indicators to monitor Vegetation conditions in wilderness

NUMBER OF CAMPSITES ABOVE SOME IMPACT INDEX	Recreation use on campsites	Increase in impact rating for site	The most useful assessment method is a multiple-parameter system which combines a number of indicators into an overall impact rating but records each of the indicator measurements separately	No	Cole 1983b Marion and Lime 1986 Marion 1984 Frissell 1978 Parsons and MacLeod 1980 Schreiner and Moorhead 1979 Kitchell 1985
NUMBER AND SIZE OF FIRESITES	Firewood use by recreationists	Increased number of firesites in area. Increased size of individual firesites	The number of firesites is related to the amount of visitor use the area has received. The size of firesites is related to the amount of firewood consumed	No	Bratton et.al. 1978 Bratton et.al. 1982 Carothers et.al. 1984 Davilla 1979 Cole and Dalle-Molle 1982
FIREWOOD PRODUCTION AND UTILIZATION	Firewood use by recreationists	Firewood consumption exceeding production indicates that the forest type cannot support the current rate of consumption	Firewood consumption can be estimated by a decrease in firewood distribution and density around campsites. Firewood production can be estimated by parabolic tree volume.	No	Davilla 1979
FORAGE PRODUCTION AND UTILIZATION	Livestock and packstock grazing	Forage utilization exceeding production indicates that the range cannot support the current number of grazers	Seasonal precipitation amounts influence forage production		DeBenedettie and Parsons 1983 USDA 1981 Reid and Pickford 1946 Mosley 1983 Strand 1979
RANGE CONDITION AND TREND	Livestock and packstock trampling and grazing	Condition and trend heading away from the natural vegetation potential for the site	Seasonal precipitation amounts influence range condition and trend		Reid and Pickford 1946 Francis 1978 USDA 1976 USDA 1981 Avery 1975 Hughes 1981 Hayes 1976
LIVESTOCK OF PACKSTOCK NUMBERS	Livestock and packstock trampling and grazing	Increased number of grazers	Seasonal precipitation amount influence the number of animals a range can support without deterioration in any given year. There must by a clear understanding of the impact of different animal numbers on range conditions	No	DeBenedettie and Parsons 1983 USDA 1981
TREE AND SHRUB ENCROACHMENT ON MEADOWS		Decreased meadow size	Very little information is currently available to evaluate these indicators.		
FIRE SEVERITY RATING INDEX	Fire suppression	Increased fire severity rating	The historic role and frequency of natural fires must be known. Observed changes must be compared with changes excepted with succession under a natural fire regime.	No	USDA 1985 Fischer and Clayton 1983 Fischer 1985 Noste 1985 Cole 1981 Garton 1984 vanWagtendonk 1986
RATIO OF UNDER-BURNING FIRES TO CROWN/STAND REPLACING FIRES	Insect and disease control	More crown fires compared with underburning fires			
STAND COMPOSITION		Increased dominance of shade tolerant tree species	Air photos can be useful for mapping changes in vegetation communities over time.		