3. Project Year 1997

The Mineral King Risk Reduction Project was initialized during March 1995 with inventory and monitoring field work and burn operations begun during the summer and fall (2,100 ac/850 ha in the Atwell Segment (segment #3), **Fig. 2.1-1**). No burns were conducted during 1996 due to the extent of resource demands during the summer of 1996 inside and outside the parks (more acres burned in the western USA than any year since 1920). Burning in the watershed during 1997 amounted to 375 ha (925 ac) in two segments.

Burn operations plans developed by the Fire Management Office during the spring of 1997 called for burning portions of the Tar Gap, Redwood, and Lookout Segments (segments #10, #4, and #2 respectively) during the summer/fall. Ignitions in the Tar Gap Segment were planned to begin as fuels at higher elevations in the unit dried during the summer. The primary goal of the plan was to burn areas above the Tar Gap Trail with this trail being the main holding line. Depending on circumstances burning might continue below the Tar Gap Trail with the Hockett Trail being the secondary and lower holding line. The burn was to extend from the Mosquito Creek/Mineral Creek area in the northeast portions of the segment to Horse Creek to the south. The key unit planned for ignition during 1996 was the Redwood Segment, located between the East Fork and the lower portion of the Atwell Segment along the Mineral King Road. The upper forested portions of this unit were to be burned in the fall after most visitor use and local residents in Silver City and Mineral King had left for the season. Additional burning in chaparral and oak woodland in this unit and in the Lookout Segment were planned to take place following significant rainfall. The plan was for rainfall to wet heavy forest fuels while brush fuels would dry rapidly following precipitation. Eventually, a burn buffer between the lower East Fork drainage and the Silver City/Mineral King developed areas would be created.

The critical Redwood Segment, below and west of Atwell Mill, was burned during November 1997 (184 ha/455 ac). This completed the basic buffer of burned areas across the East Fork drainage (Atwell and Redwood Segments, and the Deer Creek Burn) which will provide better fire protection for Atwell, Cabin Cove, Silver City, and Mineral King from wildfires burning up out of the chaparral. Considerable prefire prep work was carried out in this segment because of its location below Atwell and Silver City. An extensive sprinkler system was installed around the developed area of Atwell to wet fuels and minimize disturbance from line construction while defendable holding lines were built on the east and west flanks of the unit from the Mineral King Road down to the East Fork. An addition internal line was constructed through the central portion of the unit down to the river to allow burning to be carried in two phases to enabled better control.

Ignitions at higher elevations in the Tar Gap Segment were initiated in August/September but burning conditions were poor due to late summer rainfall and fire spread was minimal. Burn operations were then moved down to the Tar Gap Trail. Burning off the upper side of the trail was carried out from the Horse Creek area northward until the trail swung around onto the north aspect above the old Deer Creek Burn (1991). Most of the fire spread was above the trail although it backed downhill below the trail in a couple of locations. A total of 190 ha (470 ac) were burned in this segment.

Attempts at burning the Lookout Segment were again curtailed when heavy rains fell after the Atwell Segment was completed.

Monitoring, inventory, and research progressed and expanded into a large portion of the watershed during 1997 (**Fig. 3-1**). The projects included studies begun during 1995 and several new investigations. The former include: (1) fire effects plots; (2) sequoia fire scars; (3) natural resource inventory; (4) fuels; (5) wildlife-small mammal populations; (6) fire history; (7) watershed-chemistry and hydrology; (8) watershed-aquatic macroinvertabrates; (9) resampling of red-fir plots established by Donald Pitcher. The latter include: (1) fire and red fir regeneration; (2) landscape analysis of changes in forest structure over time; (3) population and niche requirements of bark-foraging birds; and (4) establishing permanent fuel plots (for C. Miller); (5) remote sensing of fuels and vegetation;. A significant amount of information was collected from throughout the East Fork during summer of 1997. While field work was rushed during the 1996 season to collect data and establish sampling plots, the lack of burning in the East Fork during that summer created breathing room for the investigators. The delay provided a one field season lead for planning and implementing projects.

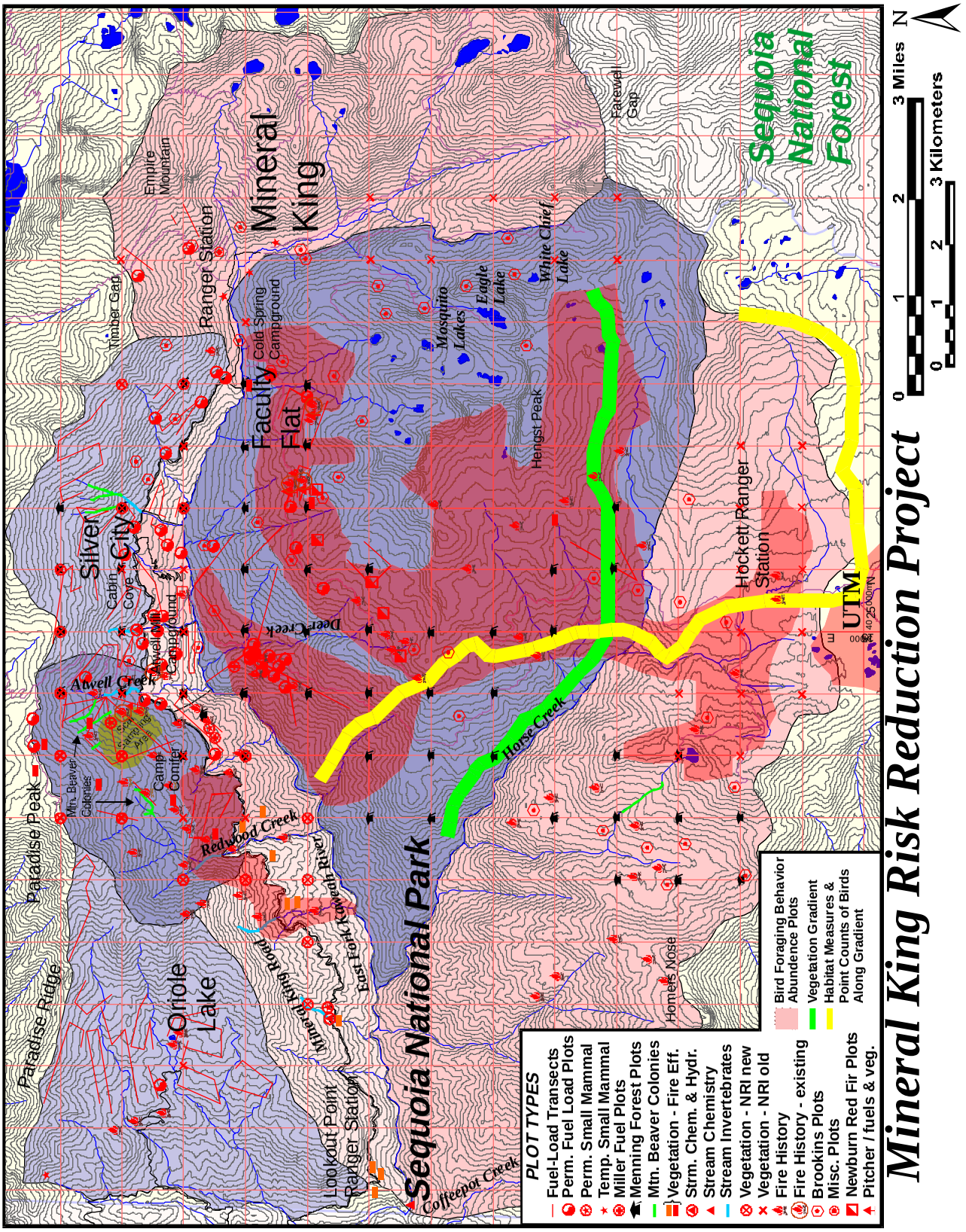

Figure 3-1. Location of all sample sites in the East Fork watershed that have been collected from 1995 to 1997.

3.1 - Vegetation Sampling

3.11) Landscape Assessment - Fire and Forest Structure

- Kurt Menning, University of California, Berkeley & Biological Resources Division, USGS, SEKI

Lead: Kurt Menning; Crew: H. Mikkelsen, C. Peterson, and B. Sullivan

PROJECT OBJECTIVES AND BACKGROUND

For much of the last century, fire has been kept out of the forests of Mineral King. This exclusion of fire from a forest in which it has been a dominant force for centuries has altered regeneration of many tree species, occurrences of habitat for birds and wildlife, susceptibility of the forest to insect attacks and disease, and biodiversity of small forest plants. For these reasons, many park managers and scientists believe we should restore forests to within some range of historic conditions at the same time we reduce risk.

Methods of forest restoration vary. *Structural restorationists* believe we should alter forest structure to historic conditions with silvicultural thinning followed by the reintroduction of fire. They argue that prescribed fire in unthinned stands could result in stand-replacing fires and that historic forest conditions could not be achieved since forests have changed so much during the period of suppression. *Process restorationists* would restore native processes—fire—directly, without first heavily modifying fuel loads, with the goal of recreating historic forest structures. Process restorationists maintain that one or two prescribed fires, carefully planned and managed, would begin to re-establish forest conditions with little risk of catastrophic loss to fire. The implications of this debate have profound significance to managers wishing to restore forest conditions and ecologists wishing to understand fire ecology, disturbance regimes and forest succession. In a national park, it is particularly important to know how effective a light-handed restoration approach--such as process restoration--can be.

Fortunately, the Mineral King Risk Reduction Project (MKRRP) offers an excellent opportunity to test this approach (**Fig. 3.11-1**). As fire is reintroduced to the forest a study is being conducted to determine both the current forest conditions and the effects of fire on this forest. The Mineral King Landscape Assessment (MKLA) completed its second summer of data collection in 1997. This research seeks to provide some answers to this forest restoration debate by examining landscape-level effects of fire. The project's

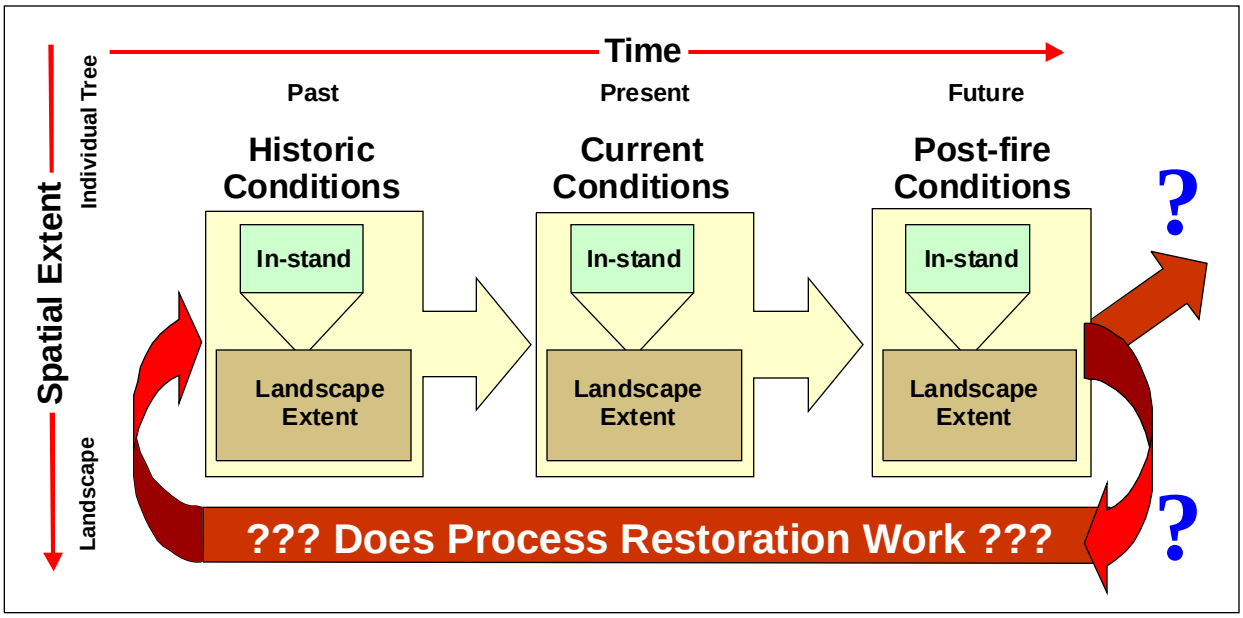

Figure 3.11-1.

Figure 3.11-2. Locating plot with GPS unit.

Figure 3.11-3. Equipment used in sampling plots.

scope of inquiry can be divided into several questions. First, what is the historic structure and pattern of the mixed conifer forest in this area? Second, in what ways does prescribed fire result in a more structurally diverse and complex forest? Third, can prescribed fire be used to restore forest conditions to the state or range of variability described in the answer to the first question? A central concept being tested is whether burning increases structural and pattern diversity and complexity by breaking a more homogeneous, ingrown forest into a patchier mosaic. This more complex mosaic theoretically should have hot spots burned out containing no remaining forest cover, areas with the understory consumed by fire but little damage to the overstory, and other locations in which all size classes and species of trees remain relatively undisturbed by fire.

The Mineral King Landscape Assessment represents a broad collaborative effort involving Sequoia and Kings Canyon National Park; U. S. Geological Survey, Biological Resources Division; University of California, Berkeley's Laboratories of Forest Community Ecology (Dr. John Battles) and Landscape Ecology (Dr. Tracy Benning); and Dr. Dean Urban of Duke University. Kurt Menning, Ph.D. student at the University of California, Berkeley, is the lead analyst in the project.

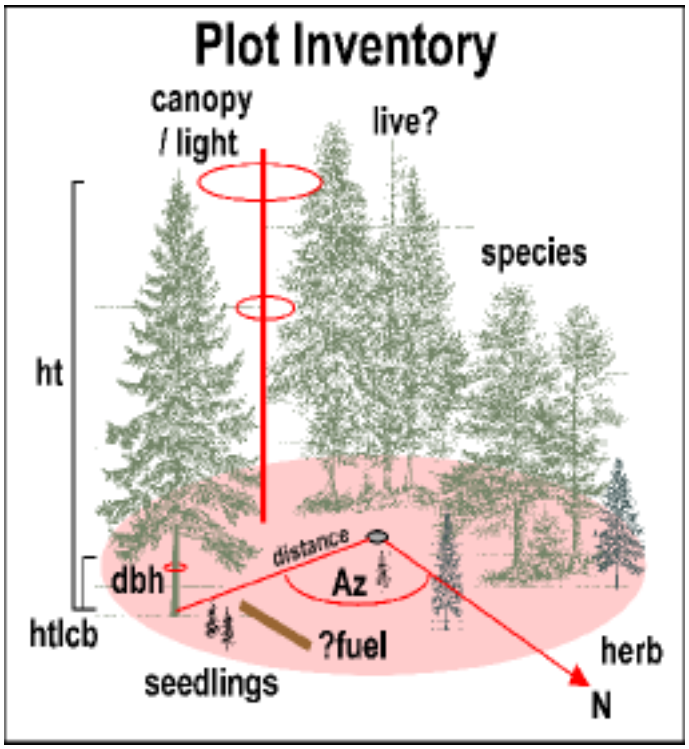

Figure 3.11-4.

METHODS

Data collected in support of these analyses come from three time periods—historic, pre-fire, and post-fire (**Fig. 3.11-1**). In addition, data are collected both within forests by use of an extensive but relatively traditional forest inventory approach, and from the air, using aerial photographs. Historic data have not yet been examined closely. To date, the focus has been on collecting data on the current condition of the

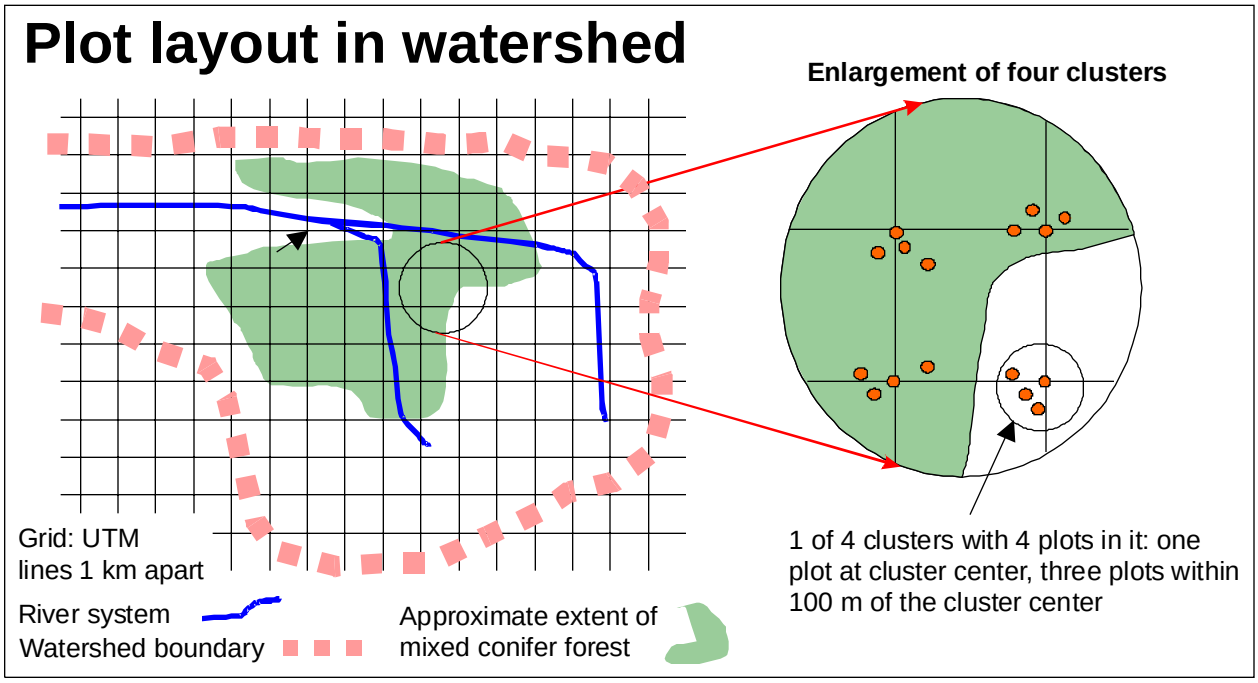

Figure 3.11-5.

forest before it burns and on re-inventorying the forest following the prescribed fires.

Field data for pre- and post-fire conditions are collected from forest plots ten meters in radius (**Fig. 3.11-4**). These are located precisely using a precision global positioning system (GPS) unit (**Fig. 3.11-2**). Within each plot, trees are identified, measured and mapped; fuel conditions are recorded; brush and plant cover are described; slope and aspect are recorded; and light penetrating through the forest canopy is measured (**Fig. 3.11-3** and **Fig. 3.11- 4**).

Collection and processing of the remote imagery data is a more elaborate process. High resolution, digital photographs were first taken during an overflight in September of 1996 but due to a flight planning error on the part of the flight contractor, the imagery had to be recollected in the summer of 1997. The digital photographs, with a resolution of about one meter, are actually four simultaneous pictures in different bands of light—blue, green, red, and near infrared. The instrument digitally records the time, flight conditions and position of each set of photographs. It is hoped that this special imagery will allow us to determine individual tree species and detect subtle changes in forest conditions due to stress or insect attack.

WORK COMPLETED IN 1997

In the second season of data collection, 157 plots were added to the 52 plots inventoried in 1996. This two-year total of 209 plots represents a broad coverage of the mixed conifer forest of Mineral King (**Fig. 3.11-6**). In total, over 2500 trees taller than breast height (1.37 m, or 4.5 feet) have been described and mapped covering a total area greater than six and a half hectares (16 acres). In addition, data from 1800 soil depths, litter and duff measurements, and seedling counts have been tallied. Collecting these data took four months of intensive fieldwork with a crew of two to four people (thanks to Dez Mikkelsen, Brian Sullivan, and Kris Peterson!). In the autumn of 1997 these data were compiled into a database for further analysis. test this contention prior to the reintroduction of fire, we examined the current structure and composition of the mixed conifer forest in Mineral King by comparing five elevational belts of plots. Seventy-nine of the 0.03 ha plots were selected for this analysis due to their locations. Tree density varied from 160 to 480 trees/ha per belt. Basal areas ranged from 47 m^2/ha to 72 m^2/ha. A variance-to-mean ratio between plots on

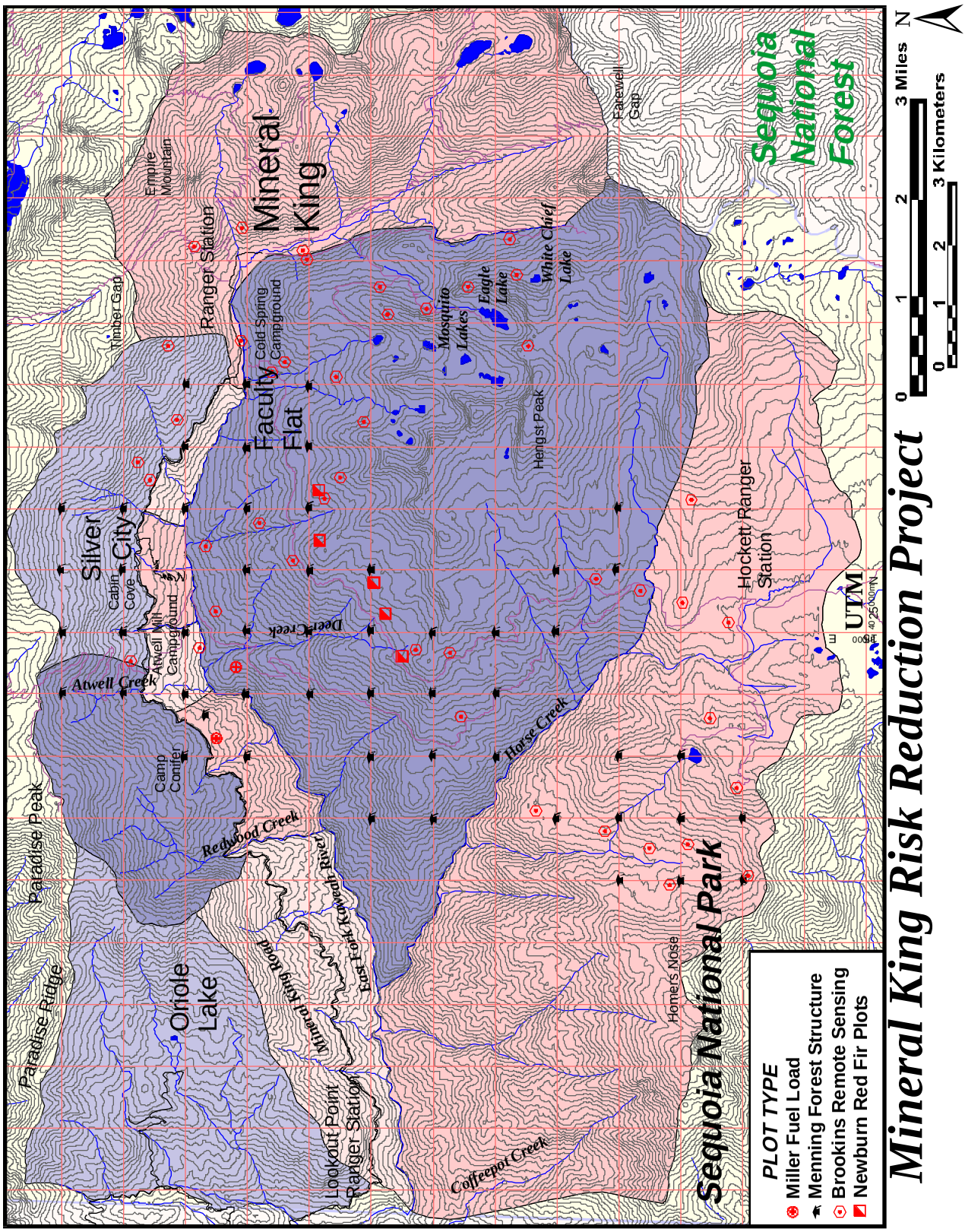

Figure 3.11-6. Plot locations for graduate students working on vegetation within the East Fork.

Evaluation of these field data is currently underway. Some fire scientists have contended, for example, that current forests are too evenly structured to experience highly variable mortality from fire. To

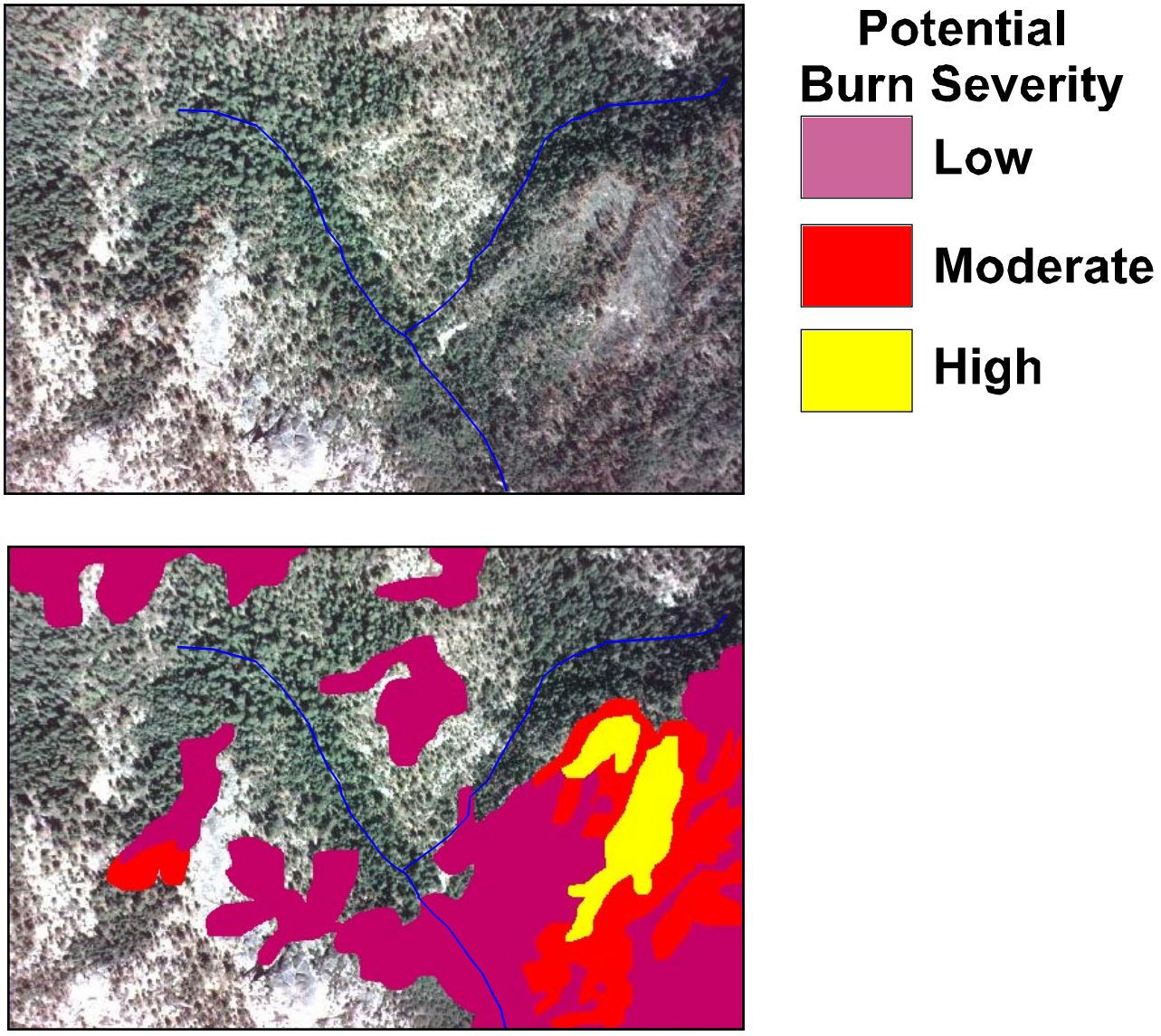

Figure 3.11-7. Preliminary classification of potential burn severity patches in the upper Redwood Creek area burned during October 1995. The high intensity patches (yellow) are visible from the Mineral King Road from below the Redwood Creek crossing.

each belt, used as a test of structural diversity, indicated the highest structural diversity was on the mid-elevational belt of the southern aspect (ratio 1.75, n=12). Structural diversity was lower on northern aspects (ratios 0.50, n = 20; 0.58, n = 23). High structural diversity on the southern aspect indicates post-fire structural diversity may be higher than comparable locations on the northern aspect, which have a more evenly distributed forest structure. Post-fire analysis will help us determine if this is true.

Over seven hundred digital aerial photographs were successfully taken in 1997. Processing and analyzing the images is not yet complete. A heavy workload with the field data and a lack of supporting terrain information from USGS has delayed the process. Exploratory analysis to obtain estimates of fire intensity from the digital air imagery has been carried out at a few burned locations (**Fig. 3.11-7**).

CURRENT STATUS

Currently, analysis of field data is a top priority. We are evaluating forest structure and pattern as these attributes vary across the watershed. Pattern analysis of the remote imagery will proceed in spring and summer of 1998.

SUMMER 1998

In summer 1998, the MKLA project will resume in the field. We expect six weeks of intensive fieldwork. During the six weeks, four field crew members will inventory the estimated 25-40 plots that burned in segments 4 and 10 during the prescribed fires of autumn, 1997. Second, a few previously inventoried plots will be revisited to assess the degree of change in plots from year to year. Third, quality assessments will be performed on current inventory efforts to determine our level of accuracy.

Fourth, fairly accurate soil depth measurements will be taken for an analysis of the moisture holding capacity of soils in the watershed. These data will support an effort to determine the variability in site-potential for tree growth across the landscape. During a long period of fire suppression, as much of Mineral King has experienced, site-potential differences may have resulted in uneven forest growth. This, in turn, may have resulted in highly variable fuel loads and could lead to a patchy fire pattern. By collecting these additional data we hope to be able to model these relationships.