Exotic Plant Species Assessment – Yosemite

U.S. Geological Survey, Yosemite Field Station, Western Ecological Research Center
1998 and 1999

The goals of the alien plant species assessment project were to document the distribution of nonnative species in Yosemite National Park and correlate the distribution with environmental and landscape variables. Generalized surveys and more detailed quantitative sampling were used to accomplish these objectives. During surveys, field workers cruised the target area and listed all non-native plant species, estimating the abundance (both years) and distribution (in 1998 only) of each species.

The goal of the quadrat sampling within surveyed areas was to measure the cover of introduced and native species so that the measures could be correlated with environmental variables and patch types. The distribution of species varied within target areas, however, so random quadrat placement within each sampling area was used to minimize sampling bias.

Area Features

Campgrounds were landscape patches (versus linear features) defined by the area that was disturbed during normal campground use and campground construction and maintenance. Properties of disturbance that were used to delineate campgrounds were compacted soil, cut trees or stumps, and vegetation that was damaged from trampling. Field crews did not use an appearance of "weediness" to designate campground boundaries. When definite boundaries were difficult to distinguish, the campground boundary was considered to be 10 m outside of the outer-most structure in the campground (picnic table, tent platform, restroom, parking lot, road, etc.).

Developments were landscape patches where buildings, infrastructure maintenance, and recreational activities occurred within the park. Sampling only took place along the perimeter of developments because they were too disturbed to sample effectively. Perimeters are areas of disturbance such as compacted soil, cut trees or stumps, and vegetation that were damaged from foot traffic and other means development access.

Corrals were landscape patches that include open fenced areas and stables where horses and mules are kept. Sampling was placed in the areas outside corrals that were disturbed by animal traffic and activities around the stable. Signs of grazing, compacted soil, and soil disturbance from horse hooves were used to designate the area around the corral that was appropriate for sampling.

Linear Features

Trails are built landscape corridors that receive heavy foot or horse traffic. The width of the trail extended to the vegetation not affected by frequent disturbance from the trail traffic. Trees and shrubs were designated boundaries in forests and shrublands. In grassland or similar areas, the trail corridor was considered to extend 1 m beyond the defined edge of the trail.

Roads are built landscape corridors where the vegetation is influenced by the continual disturbance from the road. In forests and shrub lands, trees and shrubs, respectively, will designate the width of the road corridor. When differences in vegetation were not clear, the corridor extended 5 m from the actively disturbed area (edge of road or road cut).

Field Methods in 1998

Field crews laid transects along the width of sampling areas. They then used a random number table to place five transects perpendicular to the baseline width and numbered the transects consecutively. In the field, transects were sampled in random order until an adequate numbers of quadrats was sampled. Quadrats (1 m x1 m) were placed at random distances along each transect, and the transects sampled in random order until an adequate sample number was reached. Crews estimated native and exotic species cover in each quadrat.

Linear features, i.e., roads and trails, required a different approach because greater distances had to be surveyed, the distribution of non-native species was very patchy, and randomly placed quadrats would miss the intermittent patches of exotics. The length of each corridor selected for survey were sectioned into 1-km segments, and the presence of exotic species noted in each section. Abundance estimates and distribution categories were recorded for each species in each 1 km section.

Some portions of developments were not sampled because they did not meet the criteria for vulnerable natural area or would not support plant life. Lawns and ornamental plantings, for example, may be potential sources of exotic species but are not negatively impacted by them in the same way as places managed as natural areas. The following rejection criteria were applied to avoid placing quadrats in such areas.

Quadrats will be rejected if more than 50% of the cover is not capable of supporting plant life (pavement, large boulders, and trampled areas within 1 m of a structure). Areas where exotics are cultivated (lawns, flower pots, and gardens) will also be rejected for sampling.

When a quadrat is rejected, field crews will place the next quadrat at a random distance along the transect from the beginning of the appropriate sampling environment.

Target areas are defined below; and surveys or sampling were confined to these areas.

Field Methods in 1999

During the 1999 field season, we measured the distribution of exotic species in three types of disturbance areas (campgrounds, developments, and corrals) and two types of disturbance corridors or linear features (roads and trails).

We placed ten 50-m x 2-m transects randomly in the patches by establishing a baseline along one border of the patch and recording its direction in degrees and length in meters. The width of the patch was measured as a line perpendicular to the baseline, and the transects were placed randomly along the two axes (Figure 1).

When a transect reached the boundary of the disturbed area opposite the baseline, the remainder of its length was continued from the same baseline position starting at the baseline. At 10-m intervals beginning at meter 0, 2-m x 1-m quadrats were placed with the 2 m axis perpendicular to the transect and parallel to the baseline (Figure 2). The cover of individual exotic species and total cover of all native species as a group was estimated to the closest percent in each quadrat. Canopy cover was recorded as presence/absence every 5 m along the transect using the point-intercept method with a hand-held periscope. After ten transects were completed in a disturbance patch, we had sampled 50 quadrats and 100 canopy points. Some exotic species did not fall within the ten transects, so we also surveyed the sampling area and noted the presence of additional species to compile a list of all exotics. Areas with high densities of buildings or few plants were not suitable for transect and quadrat sampling, so we only surveyed in those areas. After completing a survey, we recorded species abundance in the patch on a log scale (1 = 1-10 individual plants, 2 = 11-100 individuals, 3 = 101-1000 individuals, 4 = 1000-10,000, 5=>10,000). We did not categorize species distribution within the site as we had in 1998.

Trails in Yosemite were sampled based on levels of use by hikers and stock trains. The Wilderness Office of Yosemite National Park supplied data on the number of backpacking wilderness permits issued on each trail, and trails clustered into three groups: low use (0-50 people/year), medium use (51-1100 people/year), and high use (1101-6900 people/year). Seven trails were randomly selected for sampling from each use level. The Wilderness Office also supplied data on the number of stock using the trails in categories of low (3-10/day) medium (11-25/day) and high (26+/day), and the concessions stables provided route information for their daily rides in Yosemite Valley. Stock are only allowed on certain trails, so all trails ranked for stock use were also sampled. The high-permit-use category had the fewest number of trails, and most of these popular trails also received medium-high stock use. By comparison, low permit use trails had no stock use. The Wilderness Office does not record day users, so some trails had higher use levels than indicated by the wilderness office data; those trails were placed in the next higher category.

At each trailhead, we placed the first of ten 50-m x 2-m transects on the right side of the trail, one meter out from the tread of the trail. Subsequent transects began at the end of the previous transect but on the alternate side of the trail. Transects were sampled using the same methods as in patches. After sampling within the transects, field crews walked three km from the trailhead, recording the exotic species that occurred within 2m of the trail in each kilometer.

We selected roads for sampling based on an elevation gradient. All roads in the park were categorized in 1000-ft intervals between 3000 and 8000 feet, and 1 km segments of road were mapped within the intervals. Five segments within each interval were randomly selected for sampling. Field crews walked both sides of the road within the selected kilometer segments and recorded the exotic species within 3 m of the shoulder of the

road. Because more intensive sampling would have posed a safety threat to the field crews, transects were not placed along roads.

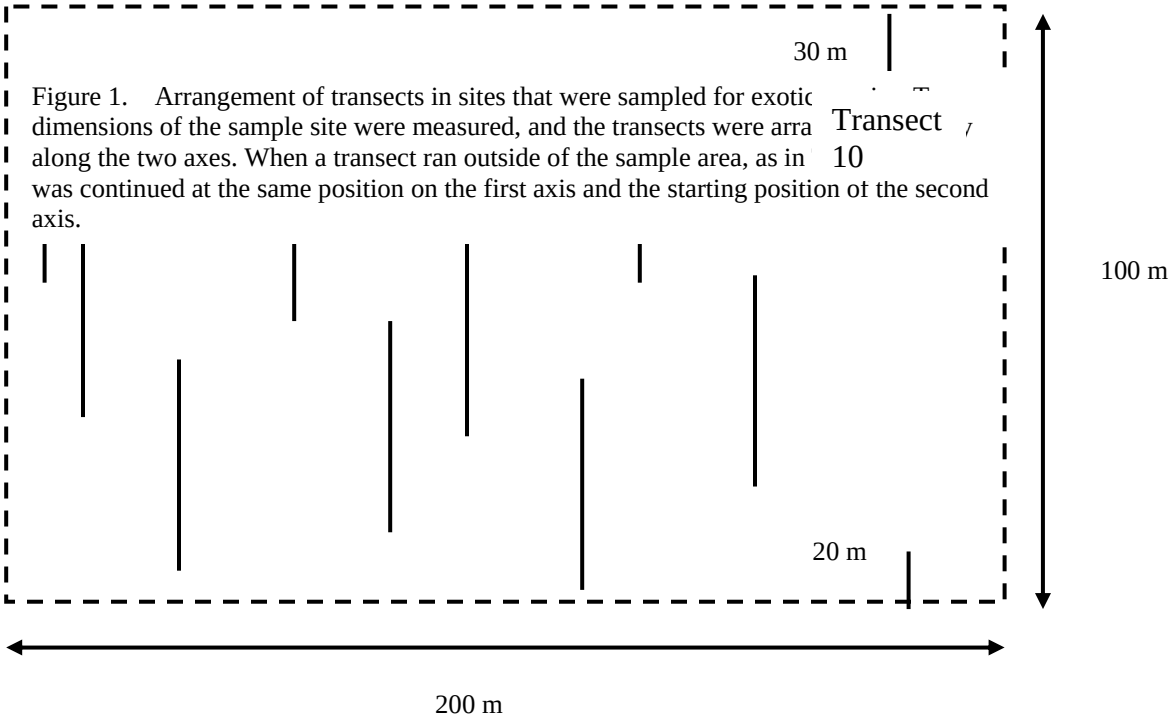

Figure 1. Arrangement of transects in sites that were sampled for exotic dimensions of the sample site were measured, and the transects were arra along the two axes. When a transect ran outside of the sample area, as in was continued at the same position on the first axis and the starting position of the second axis.

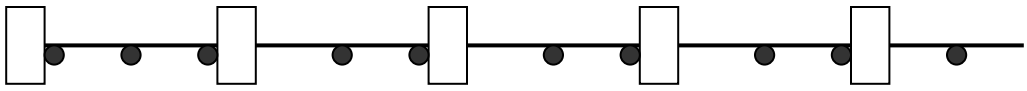

Figure 2. Sampling along transects. 1-m x 2-m quadrats (rectangles) were placed every 10 m, and canopy cover was sampled every 5 m (black points).