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DEFINING ELK SECURITY: THE HILLIS PARADIGM

ABSTRACT

Elk vulnerability may be reduced, and hunter opportunity may be increased, by providing security areas for elk during the hunting season. We define security area requirements for land managers so that timber harvest decisions can reflect elk security needs.

To provide a reasonable level of bull survival, each security area must be a nonlinear block of hiding cover ≥ 250 acres in size and ≥ one-half mile from any open road. Collectively, these blocks must equal at least 30% of the analysis unit. Vegetation density, topography, road access, hunter-use patterns and elk movements are variables that must be considered when applying these guidelines. Examples are provided that illustrate how the security guidelines are applied in the field.

INTRODUCTION

Timber harvest affects elk vulnerability by changing the structure, size, juxtaposition and accessibility of security areas. Biologists have recently provided working definitions of "security," "security area," and "elk vulnerability" (Lyon and Christensen 1990). However, elk and timber managers still await research answers to current questions such as: "How large must a cover block be to provide effective security, how far must a security area be from a road, and how much of the area should provide security to meet elk vulnerability objectives?"

We developed guidelines for retaining elk security areas west of the Continental Divide in Montana. We suggest that the concepts presented here could assist managers in providing security areas elsewhere. We also hope this stimulates constructive criticism and research that improve the guidelines.

Special thanks go to S. D. Rose for helpful editorial comments. J. E. Firebaugh and R. E. Henderson provided technical reviews of the manuscript. We thank O. L. Daniels and C. W. Spoon for supporting development and application of these guidelines.

STUDY AREA

We devised guidelines applicable to the situations we know in the Clark Fork River drainage (excluding the Flathead River drainage). The area is characterized by steep slopes extensively forested by ponderosa pine, Douglas-fir, lodgepole pine, western larch and subalpine fir. Average elk populations and hunter numbers are at 30-year highs in the area, while the average bull/cow ratio observed by Montana Department of Fish, Wildlife and Parks (MDFWP) biologists in early spring has declined during the same period (MDFWP, Missoula, unpubl. data). The majority of elk habitat in the area is managed by the Lolo, Bitterroot and Deerlodge National Forests; although substantial portions are owned by Plum Creek Timber Company, Champion International Corporation, other private landowners, Montana Department of State Lands and USDI Bureau of Land Management.

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MANAGEMENT OBJECTIVES

Lonner and Cada (1982) proposed that, "hunting recreational opportunities are good when hunting season lengths are relatively long, harvest rates are uniform, and rules and regulations few. The present 35-day general elk-hunting season in Montana permits a diversity of choice [for hunters] with regard to time, weather conditions, hunter density and area. A lengthy hunting season has little meaning if the majority of the harvest occurs in the first few days."

Nine years since Lonner and Cada's (1982) contribution, MDFWP and the three national forests within the study area formally share the following objectives: 1) maintain the current, relatively unregulated, 5-week hunting season; 2) distribute the bull harvest evenly over the entire hunting season; and 3) maintain a desired level of mature bulls in the post-hunting season population (For. Plan, Lolo Natl. For., 1986; For. Plan, Bitterroot Natl. For., 1987; For. Plan, Deerlodge Natl. For., 1987; Draft Elk Manage. Plan, MDFWP, Helena, 1991). We developed guidelines to meet these objectives.

The agencies have decided to maintain habitat security levels that allow desired numbers of bull elk to escape harvest, rather than impose more restrictions on hunters (e.g., shorter hunting seasons, antler-point restrictions, limited licenses). The recreational opportunities resulting from this type of management are becoming increasingly rare nationwide (Anon. 1988).

DOCUMENTATION

We developed guidelines from the following background of knowledge:

1. Elk behavior changes in response to the hunting season (Marcum 1975; Morgantini and Hudson 1979, 1985; Canfield 1988; Lyon and Canfield 1991).

2. Elk avoid areas adjacent to roads with vehicular traffic, especially during the hunting season (Marcum 1975, Perry and Overly 1976, Lyon 1979, Irwin and Peek 1983, Lyon 1983, Lyon et al. 1985, Lyon and Canfield 1991).

3. Elk spend more time in dense cover during hunting season than they do before the hunting season (Marcum 1975, Irwin and Peek 1983, Canfield 1988). Large cover-blocks contribute to security more than small blocks (Canfield 1988, Lyon and Canfield 1991).

4. Elk movements generally are confined to habitats within a traditionally used home range (Edge et al. 1985, Lyon et al. 1985, Edge et al. 1986).

5. Road closures may either increase or decrease elk vulnerability depending upon the influences of cover, topography and hunting pressure, both within and adjacent to a security area (Basile and Lonner 1979, Lyon et al. 1985).

SECURITY-AREA GUIDELINES

How Large Must a Cover Block Be?

Larger is better—To meet the hunting opportunity objectives outlined here, managers should strive to retain, perpetuate, or replace the largest security areas possible. We assume that as security areas increase in size, elk become harder for hunters to find, and liberal hunting opportunities become less costly in terms of elk vulnerability.

Minimum size—In the lower Clark Fork drainage, conditions are favorable for elk to elude hunters: cover is dense, terrain is steep, and forest communities are largely unfragmented. Lyon and Canfield (1991) found that elk in this area selected for large, connected, vegetation communities (i.e., forest blocks of similar canopy structure). All other factors held constant, 236-acre unfragmented communities met minimum security requirements for 60% of the radioed elk. For the purposes of these guidelines, 250 acres appears to be the minimum-sized area for providing security under favorable conditions; under less favorable conditions, the minimum must be >250 acres.

Variables to consider—Effective security areas may consist of several different cover-types if the block is relatively unfragmented. For example, regenerated cutting units that provide reasonable cover might be found within an effective security area (Canfield et al. 1986). Among security areas of the same size, one with the least amount of edge and the greatest width generally will be the most effective. Rugged topography may increase security if it substantially decreases the accessibility of the area to hunters. Wallows, springs and saddles may require more cover than other habitats because both hunters and elk recognize and target these destinations.

How Far Must a Security Area Be from a Road?

Minimum distance—Generally, security areas become more effective the farther they are from an open road. Considering documented road-avoidance by elk (Lyon 1983, Lyon et al. 1985), the minimum distance between a security area and an open road should be one half mile. The function of this ≥ one half mile "buffer" is to reduce and disperse hunting pressure and harvest that is concentrated along open roads (Daneke 1980). Failure to accomplish this function will reduce the effective size of the security area and may render it ineffective.

Road design considerations—Road-design features may inadvertently turn designated security areas into hunter destinations. For example, trailheads, turnouts and/or parking areas in close proximity to security areas will concentrate hunting pressure in the vicinity and increase elk vulnerability. Similarly, open roads located both above and below a security area on a slope will encourage hunters to walk through the security area.

Cover and terrain—When cover is poor and terrain is gentle, it may require a distance >one half mile from open roads before security is effective. In such situations, hunters may identify the security area from the road, and the gentle terrain will deter few hunters from hiking. Conversely, if the security area is hidden or difficult to reach from a road, elk may find security in situations < one half mile from an open road.

Closed roads—Roads may be closed (to motorized travel) to provide security and a buffer between security areas and open roads. However, the minimum distance between open roads and security areas increases as closed-road densities increase within both the security area and buffer. Closed roads located within security areas may increase elk vulnerability by providing hunters with walking and shooting lanes. Use of horses and increasing use of mountain bikes by hunters on closed roads allows them better access and increases elk vulnerability, compared to unroaded habitats. Therefore, roads within security areas should be kept to an absolute minimum.

How Much of the Area Should Provide Security?

Analysis unit—First, a standardized "habitat analysis unit" (Lyon and Christensen 1990) must be described. To be biologically meaningful, analysis unit boundaries should be defined by the elk herd home-range (Edge et al. 1986), and more specifically by the local herd home-range during hunting season. Typically, the hunting season home-range includes the local herd transitional-range and at least the upper edge of winter range. These boundaries should be verified in advance by radio telemetry, particularly where elk vulnerability is at issue. Without telemetry data, biologists should test their home-range predictions against the experience of reliable local hunters and outfitters. Analysis units should not be adjusted for land ownership; instead, they should reflect the cumulative habitat conditions perceived by elk.

Minimum amount of security—Our collective experience suggests elk vulnerability increases when less

than 30% of an analysis unit is comprised of security areas (Canfield 1991). Where bull survival objectives are high, it may be necessary to retain greater than 30% of the analysis unit in security.

Spatial arrangement—In conjunction with considering "how much security," it is critical to consider spatial arrangement of security areas across the landscape. The arrangement should provide for the habitat needs of elk through the 5-week hunting season (e.g., forage and water). Providing security only on dry, harsh, steep slopes may allow elk to avoid hunters early in hunting season; however, it is unlikely that elk will stay in harsh sites for extended periods (Marcum 1975). Further, security areas should cover a wide elevational range so they are available to elk under various weather conditions (e.g., security areas at high elevations may be unusable by elk during periods of deep snow).

A few large, or several minimum-sized, security areas may comprise the same combined proportion of an analysis unit. The best balance between security-area sizes and numbers for an analysis unit will result from creative thinking firmly based on knowledge of local elk-movement and hunting patterns.

APPLICATION OF THE MANAGEMENT GUIDELINES

We suggest that security areas should be ≥ 250 acres in size, ≥ one half mile from an open road, and should comprise ≥ 30% of a valid analysis unit. Unquestioning adherence to these guidelines may lead to serious misapplications and should be avoided. We believe the guidelines are properly applied when used to compare relative security levels in an analysis unit over time or to compare and evaluate the cumulative impacts of various timber-harvest alternatives on security. These guidelines represent minimums and do not necessarily justify reducing security to meet these levels (i.e., if 50% of an analysis unit is security, do not assume that 20% of the unit is excess security).

Inferences from detailed knowledge of a local elk herd—such as that typically obtained by radio telemetry—should override these management guidelines whenever discrepancies occur. For example, radioed elk have shown us site-specific exceptions where security is provided along highways or in small cover-blocks that hunters do not find. Similarly, traditional migration corridors and other elk concentration areas, if known, may deserve special considerations that are not covered by these guidelines (USDA 1991).

A comprehensive, sustained timber-management planning effort is required to obtain the greatest benefits from these guidelines. Radio-telemetry data should be collected ≥ 1 before year preparing alternative management strategies, and it may take ≥ 1 year to budget and prepare for a projected telemetry effort. Future timber harvest rotations, and recruitment of new security areas, should be projected to evaluate the best options for any proposed timber sale. Proposed timber harvests in remote and heavily forested analysis units should be carefully approached because the rare opportunity exists to retain elk security by design in these units, rather than by default as dictated by past logging practices.

In analyzing security requirements for a specific area, interpretation of the guidelines is needed to ensure that the result makes biological sense for local conditions. The point of designating elk security areas is not to meet some generalized guidelines, but to provide functional habitat.

We present examples of actual management problems we have addressed, to illustrate: 1) guideline adjustments that made designated security areas reflect reality, and (2) provisions for meeting present and future security needs.

Example 1

The Sequoia-Brewster area lies about 20 miles from Missoula. The area's entrance road ends at a gate on level terrain (Fig. 1). The ease of walking in the area and the concentration of hunters at the end of the road suggested to us that an area only one half mile from the parking area would not provide adequate security. Therefore, the buffer between the parking and security areas was increased to 1 mile.

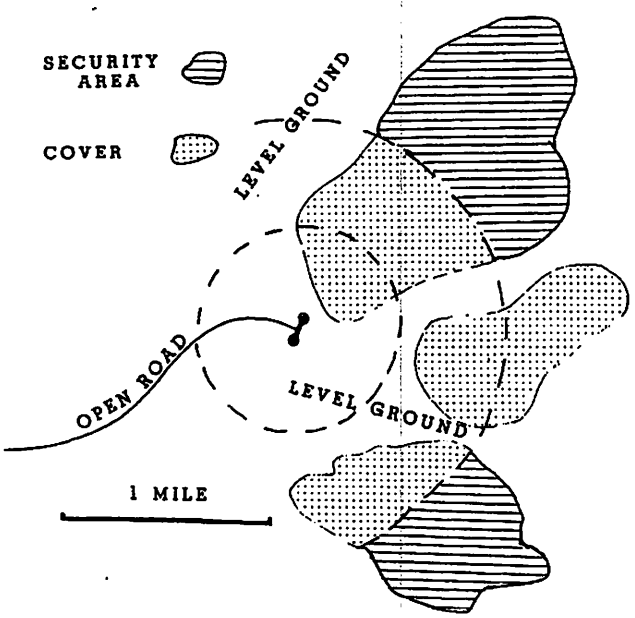

Figure 1. *Sequoia-Brewster area, showing the relationship of security to an open road, recognizing the trailhead, level ground, and concentrated use. The one half mile zone was increased to 1 mile.*

Example 2

The Tujo area includes a ridge between two parallel, creek-bottom roads; the two roads are connected by a road that switchbacks over the steep ridge (Fig. 2). This connecting road affects security in two ways: 1) its zigzag path accesses a large area and reduces the size of security areas A, B, and C (Fig. 2); and 2) it provides easy access to the ridgetop. Hunters can drive to the top and walk on a level, closed road into security area A. Likely hunting routes from the ridgetop to the creekside roads (and often to a second vehicle) are all downhill.

Keeping the connecting road open during the hunting season seriously compromises the protection we would expect from a large (2,400-acre) block such as security area A. To increase the area and quality of security, we proposed closing the connecting road during the hunting season. Since much of the area's popularity is due to the easy access provided by the open connecting road, public involvement on the issue is planned.

Example 3

The Sapphire Divide area (23,000 acres) lies 25 miles southeast of Missoula. The area is unusual because past logging was concentrated in the high-elevation basins along a major ridgetop-road. This fragmented the productive habitats that would have made good security areas. The 13% of the area that now provides security is all located in low- to mid-elevation sites that are low in productivity and characterized by steep, rocky ground.

Radio-tracking studies (Marcum 1975) in the 1970s showed that Sapphire Divide elk used the heavily logged, high elevations until hunting season. When hunters entered the area along the ridgetop road, elk immediately dropped down to the steep, dry slopes below. The elk adopted a weekly pattern of movement, returning to the productive, higher areas at mid-week and fleeing to the unproductive secure areas on weekends (when hunting pressure was highest). Thus the security areas were not only inadequate in acreage, they also were located in the

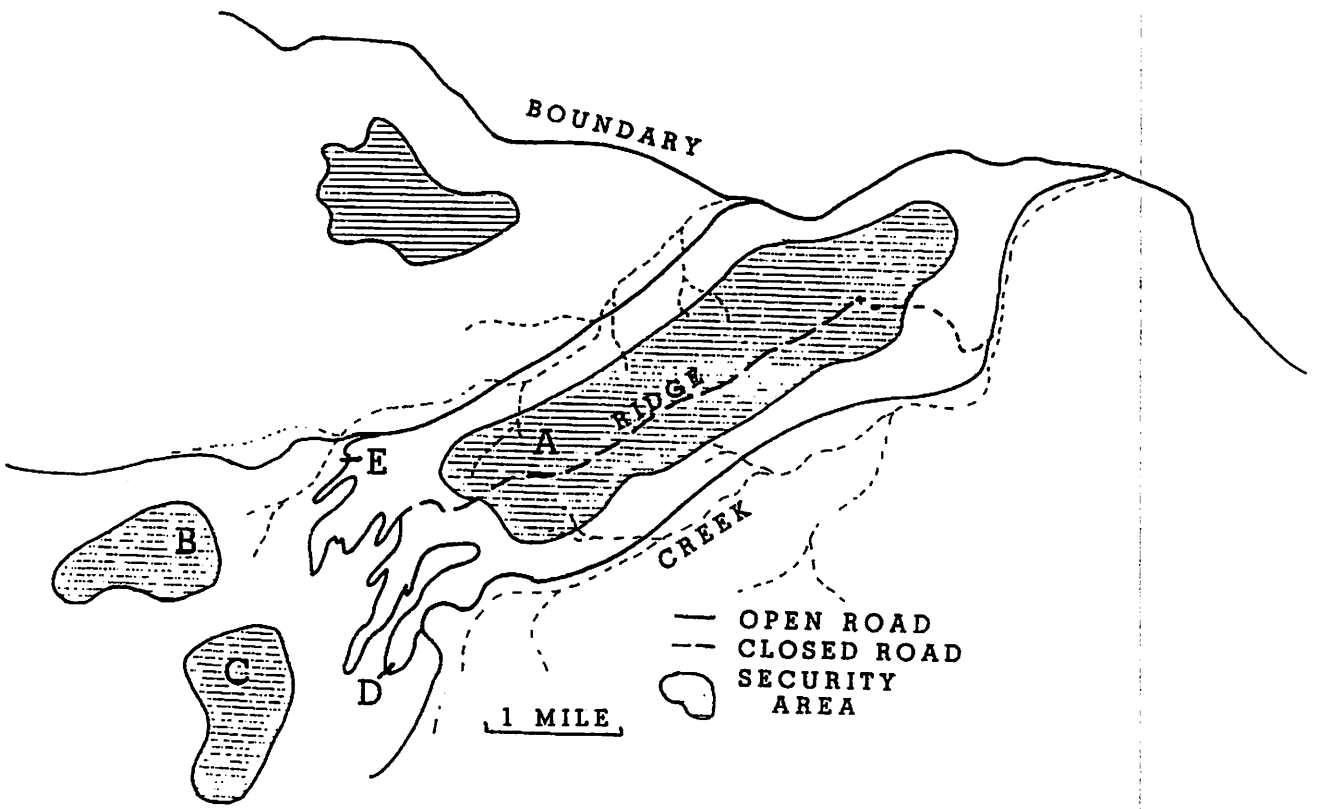

Figure 2. *Tujo area, showing how security area A is affected by the ridgetop closed road. The proposed solution is to close the connecting road at points D and E.*

wrong place. This made bulls especially vulnerable.

Predictably, the bull/cow ratio of this elk population is extremely low. After the 1989 hunting season, this ratio had declined to 3:100 (J.E. Firebaugh, MDFWP, Missoula, pers. commun.), suggesting that bull mortality due to hunting is very high.

To recover security in this analysis area, we first proposed to decrease hunter access to the high-elevation basins by closing entry roads near the points where they cross the divide from the west (Fig. 3). Second, to allow recovery of large cover-blocks in the productive, high-elevation basins, we developed a long-term strategy for the spatial arrangement of timber harvest: deferring timber harvest in designated large blocks (Fig. 3) to allow contiguous areas to regain cover at the same time, and reduce the area's fragmentation. Third, future timber harvests will be designed to minimize fragmentation by concentrating logging in small areas not currently providing security. The initial logging entries will revisit previously logged land, joining (in effect) the scattered, recovering units (Fig. 4). This will create a block of recovered cutting-units that will provide the next generation of security, totalling about 25% of the analysis unit by the year 2000.

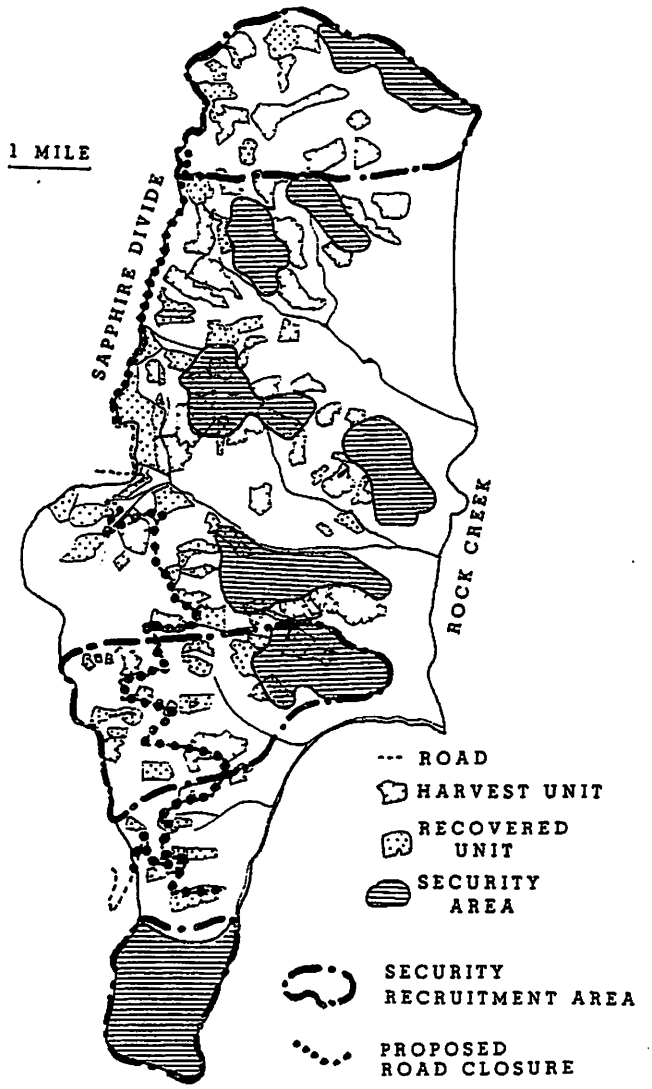

Figure 3. *Sapphire Divide area, showing designated security recruitment areas and roads proposed for closure. Note how the past harvest pattern has fragmented cover.*

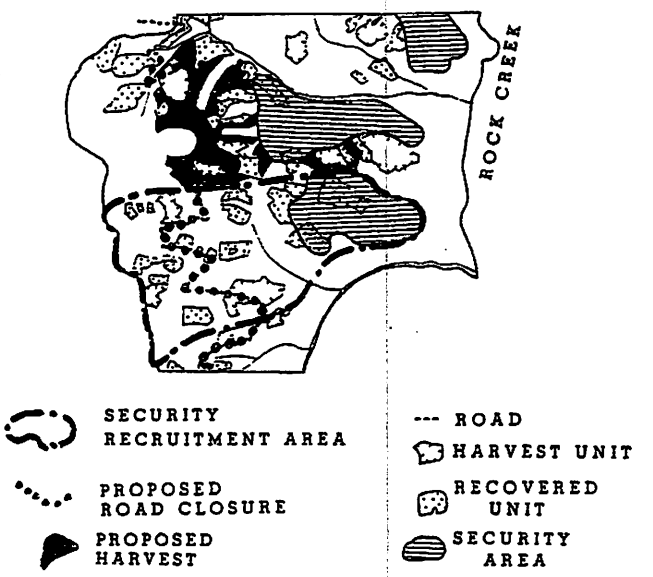

Figure 4. *South Sapphire Divide area, showing a clustered timber harvest strategy designed to create a large block of future security. Note how proposed cutting units are adjacent to recovered harvest units.*

CONCLUSIONS

During the last year, these guidelines were applied to nine elk herd-units involving 14 timber sales. Two disturbing trends were discovered. First, most herd units already had less than the minimum 30% security due to past timber harvest; in many of these cases, there were strong indications that bull survival was declining or at risk. Second, even in situations where security was substantially less than 30%, all remaining security stands were targeted for timber harvest. This indicates that timber harvest decisions made over the next few years will potentially severely impact remaining security and, ultimately, hunter opportunity.

Additional research is needed to test and refine these guidelines. However, based on the rapid, apparent decline of security, it is critical that we begin applying these guidelines immediately. Planning must not only address the quality and spatial arrangement of existing security areas, but also must provide for the regeneration of replacement security areas where a sustained timber harvest is desired.

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