

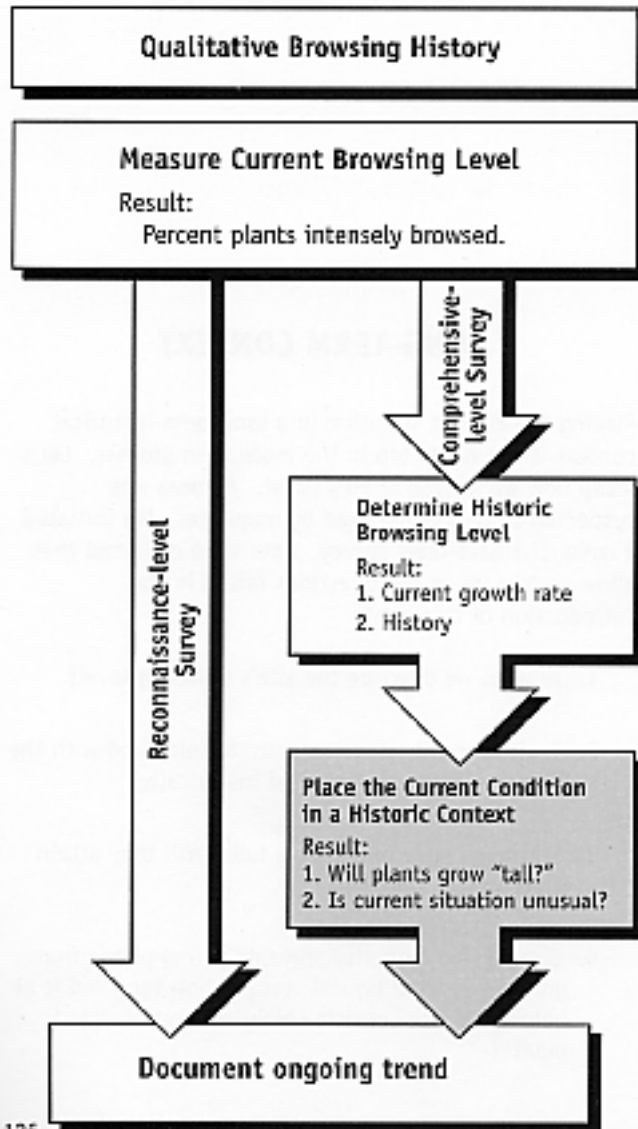


LONG-TERM CONTEXT

Placing the current situation in a long-term historical context is the final step in the evaluation process. Let's recap how we arrived at this point. An area was suspected to be heavily used by ungulates. We initiated a comprehensive-level survey. Data were collected that allow us to address the questions raised in the Introduction of this book:

1. How do we describe the site's browsing level?
2. Is the current situation unusual compared with the situation that has prevailed historically?
3. Will trees and shrubs grow tall? Will they attain their typical stature?
4. If browsing currently prevents young plants from growing to their typical stature, how long will it be before the site consists solely of short-statured plants?

BROWSE SURVEY SEQUENCE



Is The Current Situation Unusual?

To answer this question, we examine the site's long-term history of browsing. To reconstruct that history, we selected the species that best portrayed the changes that occurred over the past century or so. A change in the level of use for any species has implications for all other browse species at the site.

In the Wisdom District case study, the long-term history was based on aspen. Aspen were intensely browsed for about the past 10 years, and light-to-moderately browsed for about the preceding century. The current level of aspen use is decidedly unusual compared with the level that prevailed historically.

A deviation from the historic browsing norm implies that other ecological processes are changing as well.

Will Trees And Shrubs Grow Tall?

In the previous chapter we calculated the net annual growth rate ($NAGR_t$) that has existed since intense browsing began. We also measured the height of previous-year-growth above ground level (H_{pyg}).

We use growth to 2.5 m as a criterion for release, because a retrogressed-type individual continues to be classified as retrogressed until it grows taller than 2.5 m. We calculate the height to release (H_R) by subtracting H_{pyg} from 2.5 m.

The number of years that would be required to grow to release height (y_r) is calculated by:

$$y_r = H_r / \text{NAGR}_r$$

Having calculated y_r , the question is: will the shoot survive long enough to grow that tall? This question can be answered in two ways. First, one could determine the maximum lifespan of other shoots growing in the area. If y_r is unreasonably large compared with that lifespan, it is doubtful that the heavily browsed stem will live long enough to grow to 2.5 m.

There is a simpler approach. Dead, intensely browsed primary stems indicate that the heavily-browsed stems do not survive long enough to grow to release height.

Case study

At Site 1 of the sample area, the average height of previous-year-growth was 115 cm. We calculate the height required to grow taller than 2.5 m (H_r) by:

$$\begin{aligned} H_r &= 250 \text{ cm} - H_{\text{avg}} \\ H_r &= 250 \text{ cm} - 115 \text{ cm} \\ H_r &= 135 \text{ cm} \end{aligned}$$

We calculate the number of years required to grow to 2.5 m by:

$$\begin{aligned} y_r &= H_r / \text{NAGR}_r \\ y_r &= 135 \text{ cm} / 4.9 \text{ cm} / \text{y} \\ y_r &= 28 \text{ y} \end{aligned}$$

y_r for sites 2 and 3 were calculated to be 43 and 35 years respectively.

Many shrubs in the 0.5 - 1.5 m size class contained dead, intensely browsed primary stems. At the present growth rate, it does not seem likely that a primary stem could survive long enough to grow to 2.5 m tall.

Unless browsing level changes, the willow community will eventually consist of short heavily-browsed shrubs. The question is how much time will elapse before that occurs?

Estimating The Rate Of Decline In Structural Diversity

Consider the situation on the Wisdom District. At some time about 1991-1992, browsing intensity increased from light-to-moderate to intense. Some Geyer willow had grown taller than 2.5 m. But with a net annual growth rate ranging from 4-to-5 cm/y, it seems unlikely that willows in the 0.5 - 1.5 m size class will reach 2.5 m tall.

As the taller willows die, the structural diversity of the site will diminish. The willow component will then be limited to diminutive hedges. The rate at which structural diversity declines is determined by the longevity of tall willows present at the site. How long will the tall plants survive?

Tall coarse-barked trees may be relatively insensitive to the direct impact of browsing. Certain willows, such as Bebb willow, also develop a coarse bark. Individuals that are old enough to have coarse bark when intense browsing begins may survive for many decades. In these

cases, maturity confers a degree of protection from browsing.

But in the case of the typical willow growth habit where the shrub consists of many stems, maturity of the shrub may hasten the decline of structural diversity in the presence of intense browsing.

The rationale for the above interpretation is as follows. The stems of most willows are relatively short-lived. A shrub persists as an entity because older shoots are replaced by younger ones as they die. Tall shrubs can withstand intense browsing for several years. While ungulates may kill young shoots that emerge at the periphery of the shrub, young shoots in the middle are mechanically protected from browsing.

Young shoots may readily develop within the interior of a young, sparsely-stemmed shrub. But with age, the interior may become crowded and young stems may not be able to grow within the protective confines of the older stems. Shoots that develop along the less-crowded periphery are killed by browsing.

We are not aware of research that documents the lifespan of heavily-browsed willows and so we cannot estimate longevity in years. But if most of the tall willows on heavily browsed site are old and decadent, the conversion to a short-statured willow community may occur in the near future.

Summary Of Sample Area Condition

The condition of Sample Area 1 can be briefly summarized.

1. Douglas fir has been light-to-moderate browsed for several decades.
2. The record of aspen browsing extends from about 1865 to the present . Aspen was light-to-moderately browsed until the mid-1980s, after which, browsing increased to intense.
3. Geyer willow is currently intensely browsed. The intense browsing began about 1991.
4. The average net annual growth rate during the present period of intense browsing has been 4.0 cm / year. At that growth rate, the Geyer stems sampled in this survey will require an average of 35 years to grow to the release height of 2.5 m. Geyer stems do not live that long.
5. Unless conditions change, tall willows will be replaced by short hedges. Ultimately the willow component may be eliminated.