

# Sustainable Canadian Agricultural Partnership

Competitive. Innovative. Resilient.

## Silvopasture In British Columbia Information Series

# Unit 2.s.1. Light and Microclimate in Silvopastures



## **Acknowledgment**

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# Silvopasture in BC Information Series Content Guide



## Core Units

0. Series Overview

1. Introduction

2. Science Behind SP

3.1. SP BMPs - part 1

3.2. SP BMPs - part 2

4. SP Planning

## Case Studies

2.c.1 Production Synergies:  
Kootenay Tree Farms

2.c.2 Riparian Silvopasture:  
Silver Hills Ranch

3.c.1 Small-lot SP: Just Another  
Weed Patch Farm

3.c.2 Mature Forest to SP:  
Indian Gardens Ranch

4.c.1 Planning on Crown Land:  
SP Pilot Project

4.c.2 Adaptive Management at  
Aveley Ranch

## Supplemental Units

1.s. History of SP in BC

**2.s.1. Light & Microclimate**

2.s.2. Hydrology

3.s. Managing Damage

# Unit 2.s.1. Light and Microclimate in Silvopastures

## Goal

Provide a deeper understanding of the science behind silvopasture design and management, specific to light, microclimate and photosynthesis.

## Prerequisites

Unit 2: Science Behind Silvopasture.

## Content

1. Plant physiology and photosynthesis: Cool vs Warm Season Plants
2. The Physics of Light
3. Microclimate and Photosynthesis



# Silvopasture Resource Sharing and Interactions

## Photosynthesis



Carbon dioxide (CO<sub>2</sub>) turned into carbohydrates (food) and oxygen, powered by sunlight.

Different processes for:  
cool-season vs. warm-season forages.

# Silvopasture Resource Sharing and Interactions



## Cool- and Warm-Season Plant Differences

### Cool Season Plants

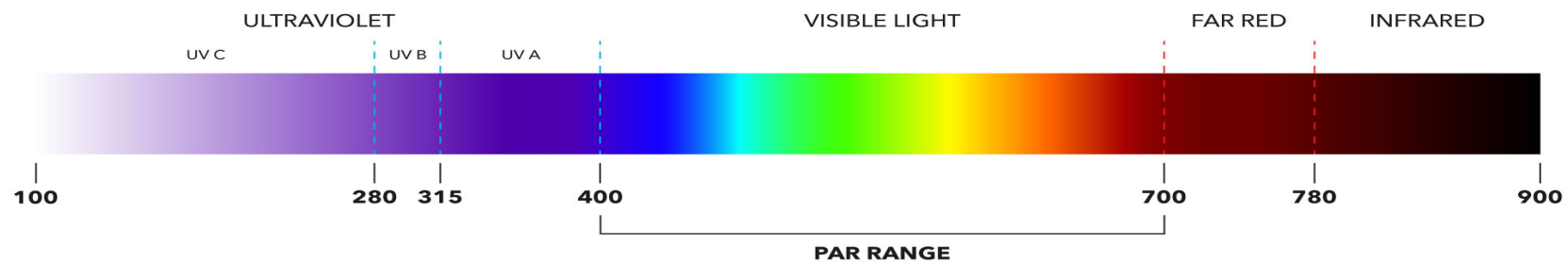
- a.k.a. C3 plants: produce an acid with 3 carbon atoms as first product of photosynthesis.
- Lose water during photosynthesis.
- Includes most common forages grown in BC pasture and range land.

### Warm Season Plants

- a.k.a. C4 plants: produce an acid with 4 carbon atoms as first product of photosynthesis.
- Efficient CO<sub>2</sub> and water use but need high temperatures (30-35° C).
- Only a few C4 crops are grown in warmer areas of BC.

# Silvopasture Resource Sharing and Interactions

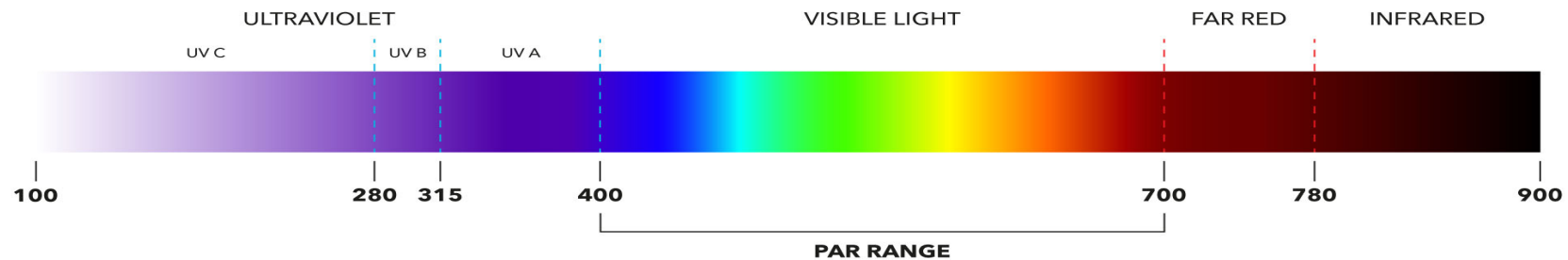
## Light Availability and Photosynthesis



- Only a portion of solar input used = Photosynthetically Active Radiation (PAR).
- Light compensation point = minimum PAR needed to survive (~10% full sun).
- Light saturation point = maximum PAR that can be used:
  - Cool-season plants ~ 50% of full sun
  - Warm-season plants ~ 85% of full sun

# Silvopasture Resource Sharing and Interactions

## Light Quality and Forage Growth



- As light passes through the uppermost canopy layer, the spectral quality changes.
- Important ratio: Red to Far-Red wavelengths (R:FR).
- Low R:FR ratio triggers growth change: elongated stems, less tissue density, less roots.

# Silvopasture Resource Sharing and Interactions

## Light and Delayed Development

- Small reductions in PAR and a shift in light quality with other understory effects can be beneficial.
- Delays the maturation of forage crop to later in the season.
- Supports lush forage, at peak quality, later in the growing season.



# Silvopasture Resource Sharing and Interactions

## Temperature and Relative Humidity



# Silvopasture Resource Sharing and Interactions

## Temperature Effects on Plant Physiology

### Positive

Moderate extreme temperatures that can impact cool-season crop production.

### Negative

Cooler temperatures in understory work against the base requirements of warm-season crops.



# Silvopasture Resource Sharing and Interactions



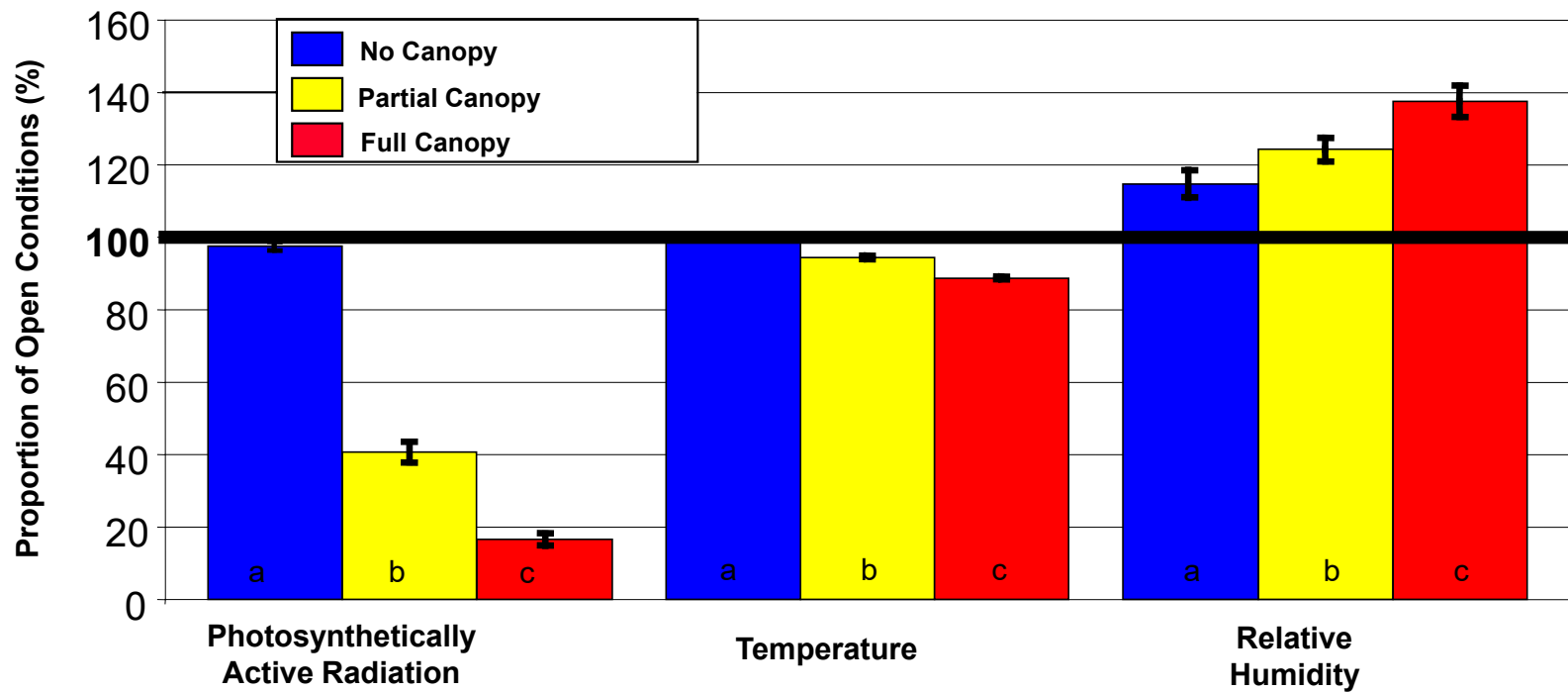
## Relative Humidity

- Cool-season forages need stomates open for photosynthesis.
- When the air is too dry, these plants close leaf openings to conserve moisture.
- Mature trees and shrubs elevate humidity allowing crops to continue to grow.



# Silvopasture Resource Sharing and Interactions

Average climatic conditions in a silvopasture in the Lower Boreal ecoregion of central Alberta



# Questions and Discussion

