

Behind the Scenes of the Inland PNW Pasture Calendar
What were we thinking? Why?
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Grasslands are a biome of grasses and forbs adapted to conditions between wet forests and dry deserts, found on all continents except Antarctica, and represent about 40 % of Earth's land surface. In North America, our grasslands are referred to as "prairies", which are temperate, typically drier than surrounding areas with cold winters and hot summers. Tropical grasslands have distinct wet and dry seasons while being warm year-round. Each of the 50 states has some type of prairie composition, ranging from the short-grass prairie to the tall grass prairie to the dry grassland steppe in Alaska and northern Canada to the subtropical dry prairie in Florida. One common characteristic of all grasslands is their creation and maintenance with natural wildfires or domestic, prescribed fires. Depending on location, environmental factors and adapted species, fires may naturally or prescribed burned every few years, to five – 10 years, or up to 40 years in North America. Wildland fires have a rejuvenating effect because most species are perennial with deep root systems and higher in sugar concentration than many other plants. Thus, they have reserves of energy stored in crown (stubble) and roots for rejuvenation. Fire, overgrazing, tillage, replanting introduced species, are some of the disturbance factors imposed naturally or by design on North American grasslands.

The Inland Pacific Northwest Pasture Calendar (PNW Bulletin 708), the 'Calendar', is designed for the Inland region of Idaho, Oregon and Washington, to recognize the importance of native rangelands and introduced tamegrass pastures for "... environmental sustainability while providing animal products and higher quality of life for those who live there", page 4. The Calendar is a joint Extension and USDA-NRCS effort from all three states. A USDA-WSARE grant supported this endeavor throughout, even though COVID-19 changed timelines and educational outreach plans. The intended audience for the Calendar includes, but not limited to: regional livestock producers and ranchers, hay producers, animal nutritionists, crop consultants, wildlife conservationists, NRCS agents, Extension faculty and anyone else interested in range and pastures. The basis of this Calendar is its predecessor PNW Bulletin 699, The Western Oregon and Washington Pasture Calendar (2017). The scientific foundation principles do not change but changing environmental conditions and stress factors, altered and expanded some component constituents and timing when growth or other events would occur.

The Calendar is composed of eight Introduction Chapters and 18 Appendix Chapters. The eight introduction chapters provide the scientific foundation of perennial cool-season grass growth and development we found and confirmed from research conducted by Irene Stuckey "Seasonal Growth of Grass Roots" in American Journal of Botany, 1941. She compared grass root growth and shedding of 11 perennial cool-season grass species and varieties during spring, summer and autumn growth periods. She did not investigate what these grasses did during winter dormancy. We confirmed her results for about half of her test species, plus other perennial cool-season grasses adapted and grown in PNW pastures, that she had not evaluated. That was our contribution to better understanding the below ground cycle of these plants, setting up the full development of the Calendar. To complement the below ground root growth – shedding cycle, as shown as Figure 1, page 10 We also overlayed typical above ground growth from well managed pastures in the PNW. We recognize that overgrazing reduces stand

vigor, plant and soil health, productivity, weed invasion, nutrient imbalances and quality losses. The overarching goal is to minimize overgrazing, promoting productive and sustainable range, dryland tame, irrigated and sub irrigated pastures in the Inland region.

The principles supporting the Calendar involve recognizing how and when pasture grasses grow within the different NRCS Major Land Resource Areas (MLRA's) in USDA Agriculture Handbook 296. Within the Handbook, each MLRA contains the following information: Area Identified, Physiography, Geology, Climate, Water, Soils, Biological Resources and Land Use. The Calendar MLRA discussion was adapted and expanded to: Natural Features, Environmental Factors, and Challenges (Introduction Chapter 4). The Calendar recognizes the challenges the target audience faces and provides some management insights to address those in relationship to environments, pastures and grazing. The Inland region encompasses 13 MLRA's with two (MLRA 9 and 43-44) shared among the three states. Idaho and Oregon share MLRA's 10, 11 and 25. Oregon and Washington share MLRA's 6, 7 and 8. Washington has five MLRA's (6, 7, 8, 9, and 43-44) while Idaho has seven MLRA's 9, 10, 11, 12, 13, 25 and 43-44) and Oregon has all 13 MLRA's (6, 7, 8, 9, 10, 11, 12, 13, 21, 23, 24, 25 and 43-44) (Introduction Chapter 7). We combined MLRA 43 and 44 because these represent the mountainous regions and valleys, which provide special characteristics and challenges. State maps highlighting MLRA's are depicted in Introduction Chapter 5.

Introduction Chapter 6 presents ten Growth Periods of grass root and above ground growth, starting with semi-dormancy, which occurs during the summer heat when roots are shedding, and above ground growth is nil. From mid-August through September, new apical meristem growth and first generation of roots are initiated and steady regrowth occurs with shortening daylengths and cooling autumn temperatures. Following the fall flush growth, growth declines as soil temperatures decrease to 41° F the transition into winter dormancy, Growth Period 4 when all active plant growth stops and root shedding occurs. Only spring or fall seeded perennial grasses, during the first winter dormancy period, do not shed roots, as roots will retain white coloration then. In future Growth Period 4 cycles, root shedding will occur. Post winter dormancy soil temperatures warm to 41° F when Growth Periods 5a and 5b initiate new spring root and above ground growth. This is when the second generation of root growth occurs. Rapid pasture growth follows as 6a and 6b, when cool soils transition into warmer soils with maximum daily growth and spring flush occurs. It should be noted that few to no new apical meristem development occurs during 5 and 6 Growth Periods but builds pasture stands and yields based on tiller development in the fall and how these were managed from Growth Period 2 through 4. As the flush ends, pasture grasses transition again into a slowing growth period because roots are about to transition into shedding rather than growth. Once roots transition into shedding, which occurs during Growth Periods 8, 9 and 10, above ground growth greatly reduces but under irrigation will likely not reach full summer dormancy. Lower than recommended grass stubble heights will increase soil temperatures from 10 to 20° F higher than when a canopy of leaves covers and protects the soil surface. Through managing pastures, based on the principles presented in the 18 Appendix Chapters, pasture will easily transition in Growth Period 1 and 2, will rejuvenate for another productive cycle again.

Chapter 7 presents the Growth Period responses for each MLRA within each state. Each bi-weekly period provides the growth and development of 'average or dryland' and 'optimal or irrigated'. These values should be considered an average within an MLRA and microclimates within maybe different by plus or minus one Growth Period on any calendar date period.

Finally, Chapter 8 presents the ‘essentials’, specific topics included are: What is the grass doing? Environmental effects. Management needed, and Things to avoid. This section provides an overall summary of the Calendar basics and recommendations that should be useful to anyone in the target audience and others.

The 18 Appendix Chapters are designed to provide greater details regarding pasture integration (chapters 1 and 2), agronomy focused (chapters 3 – 6), animal science focused (chapters 7 – 11) and systems focused (12 – 18). There were 20 co-authors, collaborators, colleagues, who spent countless hours, days, weeks, months and years developing the Calendar. We are all helpful this publication will support sustainable pastures, for many decades, in the Inland PNW region. Good Luck.