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Discussions
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Discussions

The 21st Century Silviculturist

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Introduction

As a discipline, silviculture has a long legacy of practitioners who mentored the next generation, passing their knowledge—and vision for the future—onward. For example, silviculturists in the northern Rocky Mountains such as Julies Larson, Irvine Haig, Chuck Wellner, and Russ Graham (Graham 2009) followed this mentoring process, leaving a legacy of knowledge and irreplaceable experiences that many others have been privileged to incorporate into their own careers. Along these lines, we offer this discussion. The unique opinions and perspectives of this group of silviculturists from across the United States are intended to contribute to the mentoring process by offering our thoughts on the promises and challenges facing 21st century silviculturists, beginning with my own insights concerning the future of our profession.

Ecosystem Management and Collaboration

Theresa Beneavidez Jain

In the early 1980s, silviculture was defined as the art and science of controlling the establishment, growth, competition, health, and quality of forest vegetation and could only be applied in a given forest cover and locality if there was a clearly defined management objective (Helms 1998). In a recent silviculture textbook by Nyland et al. (2016, p. 16), the authors expanded the definition. "Silviculturists apply different treatments to make forests more productive and more useful to a landowner and society on a sustainable basis," and the discipline requires "integrating biologic and economic concepts to devise and carry out treatments most appropriate in satisfying the objectives of a landowner."

Nyland et al. (2016) continue by also stating "the philosophies of ecosystem management, sustainable forest management, or ecological forestry refine the definition of silviculture as a process for creating, maintaining, or restoring an appropriate balance of essential components, structures, and functions that ensure long-term vitality, stability, and resiliency." A silviculturist designs and implements silvicultural methods to develop stand composition and structures that may be reflected in natural disturbed ecosystems and thereby fulfill objectives that produce tangible (harvestable commodities) and intangible (ecosystem structure and function) benefits. Given this definition, a successful silviculturist in the 21st century will need broad skills to ensure that a high level of innovation is used to develop and implement silvicultural systems that meet resource-management demands today and into the future. A major component of this skillset is effective communication skills (oral and written).

Evolution of Silvicultural Systems and Methods

The practice of silviculture, particularly in the 1930s through 1970s within the northwestern United States, was often single objective focused, and consisted of even-aged silvicultural systems and the assumption that forest growth and development were predictable and relatively stable. However, for the 21st century, this historical paradigm is shifting to include multiresource management objectives that integrate, for example, wildlife, fuels, recreation, and forest products. Rather than viewing ecosystems as static, we now view ecosystems as dynamic and less predictable because of invasive species, wildfires, and large-scale insect infestations. Increased public and stakeholder engagement in forest management requires continuous engagement with the public. Last but not least, not knowing how

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the future climate will influence forest development introduces an element of uncertainty. These shifts in how we manage forests require increased innovation in the silviculture profession.

Silvicultural terms now include "legacy trees," "green tree retention areas," "required opening sizes for regeneration establishment, competitive advantage, and free-to-grow," "individuals, clumps, and openings (known as ICO) (Churchill et al. 2013)," "clearcuts with reserves," "commercial thinning," "variable density thinning," and "precommercial thinning." This terminology is associated with silvicultural systems and methods that focus on leaving residual overstory trees designed to create essential components, structures, and functions that, for example, enhance wildlife habitat or restore the historical pattern of trees to increase disturbance resilience. For example, free selection (an uneven-aged silvicultural system) is designed to add diversity in forest structure, yet create large enough opening sizes to encourage successful regeneration of shade-intolerant species (Graham and Jain 2005). The ICO silvicultural method attempts to maintain groups and clumps of trees separated by small openings and gaps to reflect historical ponderosa pine characteristics. As forestry progresses over time, most likely new methods and silvicultural systems, and terminology, will evolve.

The Silviculturist Skillset

To meet these forest-management challenges, a strong partnership between science and management will become the norm. A 21st century silviculturist will need general knowledge on several subjects, particularly if ecological forestry is the foundation of the management objectives. I often state that silviculturists know something about many subjects, but rarely are experts in any one subject. Subsequently, they will need to depend on a strong science background to synthesize different sources of information (e.g., basic and applied sciences, technical knowledge, economics, and policy), combined with the management objectives and their knowledge of forest dynamics and silvics to create a vegetative management scenario. Only through a strong partnership between science and management will the silviculture profession be able to implement these complex treatments. It will become common practice for scientists and managers to work closely together to develop, implement, and evaluate silvicultural methods and systems to ensure outcomes meet multiresource objectives in the short- (post-treatment) and long-term (decades to centuries).

People inside and outside the profession view silviculturists as leaders in forest management. With more public and stakeholder engagement, particularly on federally administered lands, a silviculturist needs to be an effective communicator in both the oral and written arenas. Today, silviculturists communicate with an assortment of forest resource specialists on interdisciplinary teams, as well as with forest management stakeholders and the public. As an effective communicator, a silviculturist spends time and energy on listening, internal and external emotional awareness, speaking clearly, and using simple language (avoiding jargon). Silviculturists must be confident, but not defensive, when speaking, be open to feedback, and take time to learn another person's perspective. As with oral communication, writing becomes paramount.

For example, a silviculture prescription is a written document that describes the series of planned treatments that are applicable throughout the life of a stand to meet a management objective. However, there are times when writing becomes particularly challenging. For example, designation-by-prescription or designation-by-description are clearly written criteria that describe which trees should be cut or left, and then it is the contractor's responsibility to implement these criteria based on the descriptions provided. This requires silviculturists to write a clear "vision" of what post-treatment outcomes they want to achieve so a contractor, contracting officer, or sale administrator who may or may not have a forestry degree can implement the treatment. This can become challenging when a management objective requires forest structures and species compositions that enhance vegetative biodiversity, produce snags, create nest sites for particular species, and perpetuate processes that lead to disturbance resilience. A silviculturist uses a variety of tools, including GIS, remote sensing, modeling, and other forms of technology to understand and write their desired treatment outcomes that address these complex and multiresource objectives.

Fortunately, the silviculture discipline is well suited to meet these challenges; the foundation of the profession has always included knowledge integration and a close relation between science and management. Multidisciplinary thinking will continue to be a part of silviculture, and excellent communication skills are always a component of this portfolio. Current

objectives, communication skills, and meeting the desires of the landowner today just requires a bit more art and a broad ecological, economic, and social science background. Innovation is a part of this profession; it is just what silviculturists do. It is truly a fun time to be a silviculturist.

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The 21st Century Silviculturist: Climate Change and Technology

Constance Harrington

How does the skill set of the successful silviculturist in the past differ from that of the present or in the future? Jain tackles this question in her Discussion piece and concludes that success currently and in the future requires broad skills, a high level of innovation and effective communication skills. I agree with her conclusions; however, I smiled when thinking about the topic of communication as I recall discussions going way back to the 20th century (!) when both university faculty and employers lamented that many people went into forestry to work in the woods and communication skills were not high on their priority list. And I've heard that lament repeated many times in my career. But getting work accomplished both in the past and in the future always has and always will require dealing with people, and that requires communication skills. These days many of us work on projects that require buy-in from a diverse set of clients and stakeholders and people from other disciplines. As a researcher I can attest that I don't have to just persuade a supervisor that a line of research is promising to be able to implement a project, I often need to also persuade multiple landowners, clients, and funding sources. My research projects are on a wide array of land owning and land management organizations including family-owned companies (large and small), traditional and nontraditional industrial owners (TIMOS, REITS, and the like), and numerous state, federal and tribal organizations and NGOs. I would expect that diversity of clients to continue and expand in the future and communicating with all of them will be critical.

Jain mentions several changes in silviculture, such as using more complex and variable prescriptions to achieve a broader array of management objectives, especially on public lands. I agree with her observation, and in spite of greater complication of designing and implementing the treatments, I think many silviculturists appreciate the opportunity to implement more complex prescriptions to take advantage of the variation in stand characteristics and management objectives. Implementing and monitoring those more variable prescriptions have become and are likely to continue to become easier to do with our current and future tech tools and toys. Who would have dreamed in the last century of what we can now view on a Google map on a phone, or how we can monitor a treatment with a drone?

The biggest challenge for the 21st century silviculturist in my mind is climate change. It is likely to add greater variation in plant responses as well as increasing the frequency of extreme events. Foresters often pride themselves on developing local rules of thumb such as "I get good survival if I plant in this time window" or "Vegetation control treatments are effective if applied in this time window." But those rules of thumb are based on plant phenology—especially the timing of plant growth. If the climate changes (and it already has changed to some degree) then those rules increasingly break down. Silviculturists will need to think more in the future about which biological factors are important in response to treatments and how stand responses will vary with predicted changes in temperature and precipitation.

The lowlands of the Pacific Northwest typically have wet, relatively mild winters and dry, but still fairly mild summers. In the last few years in the Pacific Northwest we have had several record setting