Herbicide Use on Forestlands

A Position of the Society of American Foresters

Originally adopted on November 29, 1978, and subsequently revised and renewed in 1996, 2001, 2008, 2014, and December 2019. This position statement will expire in 2024, unless, after subsequent review, it is further extended by the SAF Board of Directors.

Purpose: Clarify the science and rationale for the responsible use of herbicides in forest management.

Scope: Herbicides applied on US forestlands in accordance with all federal, state, and local regulations, manufacturer labels, and forestry best management practices (BMP).

Position

The Society of American Foresters (SAF) supports the judicious use of herbicides as a safe and effective tool for controlling undesired vegetation as a component of an integrated management strategy for forestlands. SAF recommends the use of herbicides, when applied in accordance with federal, state, and local regulations, manufacturer labels, and forestry BMPs, as an approach to achieve a desired site condition or management objective. Herbicide use on forestland is a critical management option for facilitating forest regeneration, restoring ecological function, improving forest productivity, promoting forest health and resiliency, and controlling invasive plant species.

Issue

Forests often face significant competition from undesired vegetation for available space, sunlight, water, and nutrients. This effect is magnified in many locations where invasive plant species easily outcompete native vegetation. This intense competition can prevent the successful establishment and growth of desired species, alter and negatively impact ecological function, degrade forest health, and increase fuel loading, potentially resulting in catastrophic losses from wildfire.

Depending on the particular circumstances, forest managers may have several options to control undesirable vegetation, including the use of prescribed fire, mechanical site preparation, mowing, hand removal, grazing, and/or herbicides. The use of herbicides has raised questions about the impacts these chemicals pose to human health and safety, biodiversity, and non-target species. Research, legislation, and litigation have all attempted to address these concerns, with some countries and local governments in the United States restricting or prohibiting certain herbicide use due to a 2015 “probably carcinogenic” classification by the International Agency for Research on Cancer (IARC 2017).

Background

Role of Herbicides in Forestry

Trees and other vegetation on forestlands are in constant competition for the available space, light, water and nutrients. This competition is intensified following a timber harvest or natural disturbance that opens the forest canopy and increases light availability to the understory vegetation. Undesired and invasive plants quickly dominate forest ecosystems, significantly impede the establishment and productivity of desired forest species, negatively impact ecological function, and degrade forest health. Research, monitoring, and operational experience have shown that the proper use of herbicides, prescribed burning, or mechanical devices, utilized as a part of an integrated pest management (IPM) system, can significantly improve the establishment and growth of desired species by selectively limiting competition (Campbell et al. 2013, Mendell et al. 2015). Importantly, IPM systems by design do not eliminate competing plants altogether (Lautenschlager and Sullivan 2002), and total species diversity can actually increase when the most aggressive plants are controlled (Subedi et al. 2017).

Herbicides are an important tool for competition control in responsible forest management. When compared to other control methods, herbicides may provide greater certainty of results, less soil disturbance and erosion, increase water availability, and often require less cost and energy to implement. For example, in areas where concerns about air quality and wildfire risk are high, herbicides provide a valuable alternative to prescribed burning for vegetation control and fuels treatment projects. Similarly, in areas that are inaccessible to mechanical control options, herbicides can be used effectively.

The amount, frequency, and area treated with herbicides in forestry is relatively small compared to other users. In many cases, landowners elect to use application rates lower than the authorized label rates (NCASI 2015, Scarborough et al. 2015, Tatum et al. 2017). Herbicide applications are typically only prescribed one to three times over management periods that extend as long as a century, depending on the region and tree species. According to the Environmental Protection Agency (EPA), industrial, commercial, and government use combined (which includes forestry) accounts for only 4% of the total annual conventional herbicide active ingredient usage (Atwood and Paisley-Jones 2017). Forest Inventory and Analysis statistics from the USDA Forest Service indicate that less than 1% of the Nation's forest area is treated annually with herbicides (USDAFS 2019).

Environmental Effects and Research

The *Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA)* requires all pesticides sold in the United States to be registered by the EPA. EPA registration requires extensive research and testing on a wide variety of human health and environmental effects associated with using the product (EPA 2019a). Risk assessments are also conducted to evaluate the potential for harm to humans, wildlife, fish, plants (including endangered species and non-target organisms) as well as contamination of surface or ground water. EPA also reviews and approves the manufacturer's product label to ensure that the directions for use, safety measures, and warnings are appropriate to mitigate any potential risk. Federal law requires applicators to strictly adhere to manufacturer labels.

States also have jurisdiction over pesticide application within their boundaries. States work cooperatively with EPA to enforce federal regulations, register pesticides for use, certify and license applicators, operators, and dealers, and respond to complaints. Additionally, most states have been delegated authority by EPA to administer the Pesticide General Permit program, ensuring that water quality is protected during applications (EPA 2019b). States also lead continuing education programs for pesticide licenses, ensuring that operators are skilled and informed on new developments within this industry.

Universities, research cooperatives, government, and other private organizations regularly conduct studies

on the uses and effects of herbicides (McBroom et al. 2013). Research findings have consistently indicated that herbicides currently approved for use on forestlands are unlikely to negatively affect associated fauna (Tatum 2004). These studies have also been used to validate and strengthen state forestry BMPs (Griffiths et al. 2019). For example, BMP guidelines regard Streamside Management Zones (SMZs) as no-spray zones. Although herbicides can be applied with other methods (e.g., injection, basal bark), research has shown that limiting broadcast spray applications in SMZs significantly protects water quality and associated aquatic fauna (McBroom et al, 2013, Griffiths et al. 2017, Louch et al. 2017).

When following label instructions and forestry BMPs, forest herbicides are generally low in toxicity, applied infrequently and in low doses, and decompose rapidly in the environment. Additionally, these chemicals have a mode of action that is unique to plant systems, further decreasing exposure at levels of concerns to people, animals, and pollinator species (Neary et al. 1993, Giesy et al. 2000, Durkin 2011, Thompson et al. 2012, Boily et al. 2013). Manufacturers have also developed and registered various herbicides that are selective to specific species, providing greater flexibility to forest managers for controlling undesirable vegetation.

Role of Forestry Professionals and Planning

Forestry professionals have knowledge and experience to guide the proper and effective use of herbicides. Landowners can utilize this expertise to develop comprehensive, integrated vegetation management strategies that directly address and mitigate the ecological factors that promote weed establishment and spread. These plans can also evaluate alternative combination of treatments that provide an environmentally sound and cost-effective solution. Herbicides may be only one part of an integrated approach that may include prescribed burning, mechanical control, or hand clearing.

In addition to herbicide chemical and application rates, professionals also specify the seasonal, temporal, and weather conditions recommended for each herbicide prescription. The proper prescription will facilitate effective weed control and minimize adverse ecological effects. For example, on the scheduled day of treatment, suitable weather conditions are confirmed prior to application. Lastly, forestry professionals can provide a valuable role in communications with local residents, landowners, recreational users, and other parties who may have questions or concerns about planned herbicide applications.

Technology and Innovation

Advancements in technology have led to significant innovation in herbicide products and application methods (Thompson et al. 2010). Web-based, decision-support systems are now readily available to assist foresters in determining appropriate herbicide prescriptions depending upon any number of constraints and preferences. Computer models can be used to evaluate the likely effectiveness of herbicide treatments and predict their environmental fate prior to treatment. Applicators are now equipped with computer mapping systems that allow treatment boundaries to be uploaded and spray areas mapped, enabling precision application. Specialized nozzles are manufactured with immediate shut-off valves. This not only reduces the potential of treating non-target areas, but in the unlikely event of an overspray, accurate maps are produced so remediation can occur immediately.

Where environmental concerns are significant, alternative chemicals or application methods are available to increase treatment effectiveness and reduce environmental risks. For example, banded or spot treatments may replace broadcast applications. Additionally, increasing the droplet size of liquid herbicides will help minimize drift. Researchers continue to develop and evaluate new products, methods, and equipment for more effective and safer integrated vegetation management (Callaghan et al 2019).

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