

## Cost Comparison for Weed Control Goat Grazing vs Chemical Herbicides

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### What is landscape restoration?

Restoring landscapes doesn't just mean getting rid of noxious weeds and invasive species. The presence of unwanted vegetation is actually the symptom of broader problems with soil health. In order to restore the land, it is critical to focus on repairing the biological life of the soil. In this context, herbicide use is simply a way to treat symptoms, while the use of goats will address the factors that cause weeds and other invasive species to appear in the first place.

Effective landscape restoration heals the soil through aeration, added nutrients, and balancing active beneficial fungi and bacteria. This, in turn, makes the landscape more resilient to weed infestation. Goats grazing provides all of these benefits. Goat hooves churn and aerate the soil, and add slow-release nutrients and beneficial microbes through their urine and waste. While herbicides suppress problem vegetation, they fail to remediate the soil, therefore perpetuating conditions that lead to weed intrusion.

### Not Just a One for One Comparison

The difference between these approaches has important financial implications. A pilot study conducted by the Washington State Department of Transportation (WSDOT) determined that goats were cost-effective when compared against the use of herbicides in certain conditions, but not in others. At one site in Vancouver, WSDOT found goats controlled problem vegetation as well as traditional maintenance crews for roughly \$300 less per acre.<sup>1</sup> It's important to note that for each cost comparison, WSDOT looked at one for one cost savings, and did not consider the add-on benefits of goat grazing or the negative financial externalities associated with herbicide use.

### Costs of Herbicide Use

Use of herbicides creates external costs that are borne by the public at large. Herbicides, such as glyphosate, triclopyr, and imazapyr have been linked to a range of costly health and environmental impacts.<sup>2</sup> Both triclopyr and imazapyr have been detected in groundwater and are considered toxic to aquatic organisms.<sup>3</sup> In 2015, the World Health Organization determined glyphosate to be a probable carcinogen.<sup>4</sup> A study by Cornell University Entomologist Dr. David Pimentel determined that pesticide use contributes to \$1.1 billion in public health care costs, and \$2 billion in groundwater contamination each year in the United States.<sup>5</sup>

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<sup>1</sup> Washington State Department of Transportation. 2016. WSDOT Blog: Weed Warrior Update. <http://wsdotblog.blogspot.com/2016/05/weed-warrior-update.html>

<sup>2</sup> Beyond Pesticides. 2016. Gateway on Pesticide Hazards and Safe Pest Management. <http://www.beyondpesticides.org/resources/pesticide-gateway?>

<sup>3</sup> Ibid

<sup>4</sup> World Health Organization. 2015. IARC Monographs Volume 112: evaluation of five organophosphate insecticides and herbicides. <http://www.iarc.fr/en/media-centre/iarcnews/pdf/MonographVolume112.pdf>

<sup>5</sup> Pimentel, David. 2005. Environmental and Economic Costs of the Application of Pesticides Primarily in the United States. *Environmental Development and Sustainability*. 7:229-252. [http://link.springer.com/chapter/10.1007%2F978-1-4020-8992-3\\_4#page-1](http://link.springer.com/chapter/10.1007%2F978-1-4020-8992-3_4#page-1)

Continuous herbicide use also inevitably leads to resistance in target species. Dr. Pimentel determined that \$1.5 billion in costs are created as a result of pesticide resistance. Weed resistance to glyphosate, the world's most commonly used herbicide, has occurred in over 35 different plant species, including the *Kochia scoparia* which is invasive in Colorado.<sup>6</sup> Herbicide use also harms beneficial soil organisms like earthworms.<sup>7</sup> Studies find that soil microbial diversity is the basis for the proper functioning of valuable ecosystem services, including nutrient cycling, carbon fixation, soil aeration and stabilization.<sup>8</sup>

### **Benefits of Goat Grazing**

Where herbicide applications fail in promoting functioning ecosystem services, preserving clean ground and surface water, protecting human health, and stopping pest resistance, goats grazing succeeds. Goats not only increase the amount of nutrient, micronutrient and microbial diversity of the soil, but also add to its capacity to hold and filter water and nutrients. By restoring and stabilizing the soil, goats can help decrease excess nutrient flow into local streams, and potentially cut costs associated with trail clean-up or wash-outs after flooding.

There is no mechanism for weeds to become resistant to goats, and the grinding action of their chewing, and stomach acids ensure that weed seeds are not viable when excreted. Goats do not put public health at risk – in fact the opposite is true. Goat grazing is a social good; a draw for the community, particular young children, and promotion of a grazing site can lead to increased visitation.

### **Conclusion**

When taking the long view and considering impacts beyond simply eradicating weeds, the social, economic, and environmental benefits goat grazing provides far outweigh those associated with the use of chemical herbicides. This has been the experience of communities and public land managers across the country including those in Anaheim, CA;<sup>9</sup> Cheyenne, WY; <sup>10</sup>Mesa, AZ; Hempstead, NY; and Chicago O'Hare International Airport.<sup>11</sup> Goats should be considered a safer, economically viable alternative to herbicide use.

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<sup>6</sup> Weed Science <http://www.weedscience.org/Summary/MOA.aspx?MOAID=12>

<sup>7</sup> Gaupp-Berghausen, Malin et al. 2015. Glyphosate-based herbicides reduce the activity and reproduction of earthworms and lead to increased soil nutrient concentrations.

<sup>8</sup> Delgadi-Baquerizo, Manuel. 2016. Microbial diversity drives multifunctionality in terrestrial ecosystems. *Nature Communications*. 10.1038/ncomms10541

<http://www.nature.com/ncomms/2016/160128/ncomms10541/full/ncomms10541.html>

<sup>9</sup> Covelman, Steven. 2014. SoCal City Enlists Goats to Combat Fire Danger. NBC4.

<http://www.nbclosangeles.com/news/local/Red-Flag-Warnings-Fire-Danger-SoCal-Weather-Goats-Anaheim-Fields-Clear-239984761.html>

<sup>10</sup> Beyond Pesticides. 2009. Goats Replace Toxic Pesticides and Mowing Nationwide. Daily News Blog.

<http://beyondpesticides.org/dailynewsblog/2009/06/goats-replace-toxic-pesticides-and-mowing-nationwide/>

<sup>11</sup> Doyle, Bridget. 2012. City extends bidding deadline for O'Hare goat herd. Chicago Tribune.

[http://articles.chicagotribune.com/2012-09-26/news/ct-met-ohare-goats-deadline-extended-20120927\\_1\\_goat-animals-airport-property](http://articles.chicagotribune.com/2012-09-26/news/ct-met-ohare-goats-deadline-extended-20120927_1_goat-animals-airport-property)