

Environmental Impacts of Equine Operations

NE-1041 (2009-2014)

Impacts of Equine Operations Spread beyond the Farm

The Northeast and Mid-Atlantic states are home to more than 428,000 horses, ponies, and mules living on about 65,000 farms. These farms can have far-reaching environmental effects. Poor horse pasture and trail management combined with heavy horse hoof traffic can lead to problematic soil erosion. Runoff can carry eroded sediment and pollutants (like nitrogen, phosphorous, and bacteria from horse feed, manure, and bedding) off the farm and deposit them in nearby soils and bodies of water. Each horse produces approximately 50 pounds of manure per day, for a total of over 3.9 million tons of manure in the region each year. To avoid the cost of disposing of waste off the farm, many horse owners apply manure to pasture and hay fields. Because horse stall manure often contains bedding material and parasites, over-applying manure can limit the growth of pasture grasses and hay. Horse owners need affordable, environmentally friendly alternatives for waste disposal. With nutrient analyses of different kinds of forage, farmers would know how to better meet horses' dietary needs and minimize excretions of excess nutrients.



The impacts of horse farms can spread far beyond the individual farm, affecting the surrounding area's soil, water, and air quality. Photo courtesy of Carey Williams, Rutgers University.

Multistate Project Develops Strategies for Environmentally Friendly Horse Farms

In 2009, experts on horses, farm management, and soil, water, and air quality formed Multistate Research Project NE-1041 "Environmental Impacts of Equine Operations." These scientists developed reliable methods for measuring nutrient and pathogen levels on farms. They also created models to understand the origins and destinations of pollutants. Using these models, the group identified feeding and pasture and stall management strategies to minimize the environmental impacts of horse farms.

Many NE-1041 studies focused on ensuring horse nutrition by improving feeding strategies and pasture management. These strategies have reduced feed waste and associated costs.

- Rutgers University researchers compared effects of rotational and continuous grazing on pasture health, soil quality, horse health, and production costs.
- North Carolina State University scientists refined methods for predicting and regulating pasture dry matter intake.
- Studies at the University of Minnesota investigated horse preference for and nutrient value of different forages. For example, a University of Minnesota study showed that spring wheat is a high-yielding forage that is palatable to grazing horses and may be a viable option for horse owners in need of emergency pasture forage when grasses and legumes are injured or killed during cold winter weather. Researchers also showed that mixing certain legumes with grasses can increase pasture forage yield as well as the amount of crude protein and digestible energy horses consume. In field trials, researchers determined that a grazing muzzle reduced a horse's pasture intake by 30%.
- NE-1041 research findings have given horse farmers better choices for hay feeding, including new hay feeder designs that can reduce feed waste. Researchers also illuminated ways to efficiently feed small-square hay bales in outdoor paddocks, which has helped reduce hay waste and associated costs.
- University of Massachusetts researchers tested a paddock system that delivers feed and water at different points along a track. Owners who adopted the system said their horses get more exercise and are healthier than on typical dry lots.
- To predict whether weeds commonly found on dry lots can trigger laminitis episodes, University of Minnesota researchers analyzed the weeds to determine if they are palatable to horses and high in carbohydrates. Laminitis is a painful condition for horses that leads to decreased performance, increased veterinary costs, and even horse death.
- Rutgers University studied the influence of diet on nitrogen and phosphorous excretion in manure. Studies showed that overfeeding of phosphorus supplements may result in more water soluble phosphorus present in manure. Based on NE-1041 findings, some horse owners have adopted feeding strategies that reduce nitrogen and phosphorus in horse diets; however, NE-1041 continues to explore ways, including cost-sharing programs and compliance, to encourage horse farmers to adopt recommendations.

NE-1041's work has increased implementation of sustainable stall and waste management practices that improve air, water, and soil quality in and around horse paddocks. For example, horse owners have adopted and promoted heavy use area pads because

of demonstrations by NE-1041. These pads have reduced mud in high traffic areas on farms. Less mud lowers the risk of slips and injury, limits bugs and pathogens harbored in muddy areas, and reduces runoff. To optimize practices for adding horse manure to soils to improve quality, researchers developed a training course for horse owners and managers with composters. Composting reduces the volume of waste material, eliminates some pathogens and parasites, and improves manure's utility as a soil amendment. In these ways, composting can reduce the cost of waste disposal and reduce potential pollution. Rutgers University research teams assessed how runoff from horse manure compost piles varied with covering, turning frequency, and use of grass buffer systems. They also assessed the influence of bedding types on stall air quality and their suitability for composting.

After developing a Near Infrared Spectroscopy method, Rutgers University researchers partnered with a local bioenergy company to measure the carbon dioxide and methane in manure from a modular anaerobic digester. The study found that adding high levels of bedding increased the carbon content of manure, creating potential for horse manure to be used in gasification or combustion energy technologies. Tests also showed that wood pellet bedding was easier for the digester to chop than straw bedding.

Extension Increases Horse Owner Awareness of Issues & Adoption of Solutions

To extend their findings, NE-1041 researchers published articles in technical journals, trade magazines, and local newspapers. Project members also developed print and online materials, including fact sheets and videos, making information easily accessible to farmers.

To discuss current issues and share new technology and best practices, NE-1041 members held informational meetings with county personnel, municipal officials, environmental organizations, and local residents. In Vermont, meetings led to updated waste management regulations. The group also hosted seminars for the American Horse Council and individual state horse councils, state farm bureaus, and state departments of agriculture and environmental protection. Project members also participated in conferences, including the Livestock and Poultry Environmental Learning Center's Waste to Worth Conference and University of Florida's Manurepalooza.

NE-1041 members also installed educational exhibits with models and posters and created demonstration fields at their institutions to illustrate best management practices. South Dakota State University students in equine and waste management classes collaborated with agricultural engineering students and designed manure composting demonstration plots. The University of Massachusetts secured grants for two pilot farms to test different footing materials and evaluate a new composter. Tours of farms and demonstration fields for horse owners, farm managers, trail riders, and other stakeholders provided important hands-on learning. To date, 20 farms have participated in the University of Minnesota's Pasture Evaluation Program, which includes two visits from a specialist, a facilities assessment, and pasture, forage, and soil samples, as well as optional yearly maintenance visits.

Want to know more?

This project was supported, in part, through USDA's National Institute of Food and Agriculture by the Multistate Research Fund established in 1998 by the Agricultural Research, Extension, and Education Reform Act to encourage and enhance multistate, multidisciplinary research on critical issues that have a national or regional priority. Additional funds were provided by contracts and grants to participating scientists. For more information: <http://nera.umd.edu>.

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NE-1041's research on hay feeders has reduced feed waste. Photo courtesy of Krishona Martinson, University of Minnesota. New composter designs and practices have provided more affordable, environmentally friendly manure disposal for horse farmers. Photo courtesy of Michael Westendorf, Rutgers University.

At their respective institutions, many NE-1041 members designed education programs related to horse and environmental stewardship. Programs through Rutgers University and Pennsylvania State University helped over 1,000 horse owners develop plans for proper manure management and nutrient management. NE-1041 is involved in over 12 different educational programs, including:

Pennsylvania State University

- Equine Environmental Stewardship Short Course, completed by 1,086 farm managers in Pennsylvania and New York
- Environmentally Friendly Farm Program
- Implementing and Marketing Environmental Stewardship on Small Farms program (a partner program with NRCS)
- Equine demonstrations and talks at the 2012 and 2015 North American Manure Expos

Rutgers University

- Gold Medal Horse Farm, Environmental Stewardship Program
- Compost Certification Online Course
- Diet management program for 20 horse farms in New Jersey focused on the environmental benefits of optimal feeding techniques on horse farms

South Dakota State University

- Healthy Lands, Healthy Horses
- Stable Management and Animal Waste Management classes
- Specially-designed outreach for small acreage farmers
- 4-H Horse Committee, 4-H Youth HORSE Training, Western National Roundup, the American Youth Horse Council, and other youth programs

University of Vermont

- Across the Fence television episodes about best management practices

Participating Institutions:

Auburn University, University of Connecticut, Louisiana State University, University of Maryland, University of Massachusetts, Michigan State University, University of Minnesota, North Carolina State University, Pennsylvania State University, Rutgers University, South Dakota State University, University of Vermont, Virginia Polytechnic Institute and State University