

Manure Management Practices of 30 Horse Ranches in Marin County

By
Michael Murphy, Dave Nicholson, Marin Resource Conservation District
And Marin County Stormwater Pollution Prevention Program

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ABSTRACT

State Water Resources Control Board 319(h) Grant funds were allocated to the Marin Resource Conservation District (MRCDD) for a study on manure management practices at Marin County equine facilities. Consultants were hired to conduct the study. A sample of 30 facilities volunteered their facilities for data collection. The area of study was restricted to Marin County, California. Information gathered included horse populations, manure and bedding management practices, proximity to and potential effect of nearby watercourses, Best Management Practices (BMP) implementation, hauling techniques and costs, composting operations and cooperative compost site interest. The horse population observed was about 25% of the approximate horse population throughout Marin County. It was found that generally facility owners/operators held high interest in watershed health and attempted at least some BMPs to reduce or eliminate potential surface water contamination due to manure. Hauling costs for individual sites were as little as \$75 per year and as high as \$24,000 per year. About 23% of the 30 facilities composted on site. The others had manure hauled away or picked-up by local gardeners and farmers for fertilizer use. There was a sizable interest in cooperative hauling/composting especially those facilities with high hauling costs. One site with high hauling costs was linked up with a second site that wanted manure for composting. Hauling costs were reduced for the hauler. Generally, with the exception of a few, the sites visited made a moderate to adequate attempt at reducing and/or eliminating surface water pollution as a result of equine operations. All sites were interested in technical assistance with improvement projects and manure management advice. To accommodate this need, future grant funds will need to be procured.

Introduction

The State Water Resources Control Board (SWRCB) allocated 319(h) grant funds to the Alameda County Resources Conservation District, which were in turn distributed to the Marin County Resource Conservation District (MRCDD) for the purpose of conducting a study on manure management practices at equine keeping facilities. The MRCDD hired Michel Murphy, a professional equine facility consultant, to head the study, collect data and conduct the facility site visits. Also, Dave Nicholson, of Marin County Flood Control and Water Conservation District, accompanied Michael Murphy on almost half of the site visits. Dave Nicholson is an Engineering Technician specialized in surface water pollution prevention.

The primary interest in the study was to collect data on general manure management practices among facilities of varying horse populations. With the data, the MRCDD hopes to learn if a need for manure management practice alteration and/or improvement is in order to improve the quality of surface waters in Marin County.

Other goals in the study included cooperative manure collection/hauling interest to reduce hauling costs and future facility-improvement grant fund interest. If a need was found for hauling cost reduction, it was proposed that a centrally located compost facility within the west Marin County would help reduce these costs as well as offer a mulch/soil amendment product for local gardens, farms and landscaping.

Study Area

The area of study included the entire County of Marin. An approximate population of 4,000 horses residing in Marin County was determined in an equine economic study conducted by Dr. Carlos Benito of Sonoma State University Economics Department. His study was conducted for the Marin Horse Council (MHC) with a grant from Marin County Supervisors.

A sample from the total horse population was taken. Within the sample, ranch sizes varied from small family single horse operations, to large boarding facilities of over 100 horses. Demographically, the eastern border of Marin is predominately urban while rural areas comprise the western portion including, range land, open space, parks, and small unincorporated towns. Equine facilities are spread throughout the entire county with typically the smaller ranches within or near urban areas.

Methods

The site visits were based on anonymous, voluntary participation with ranch owners/operators. The MRCD and Michael Murphy determined that 30 ranches could be visited in order to attain sufficient data, but stay within the grant budget. Michael Murphy made initial contact and appointments with the ranch owner/operators for the site visits from a list supplied by the MHC. Also for each site visit, Michael Murphy allowed the owner/operator the option to have Dave Nicholson accompany the visit. This option was allowed because it was assumed that some owners/operators might not want government officials on the site visit.

A data collection checklist was constructed to insure that data was collected evenly for all 30 sites (Appendix A). Categories of information include size of facility, proximity to watercourse, manure collection frequency, storage, compost operations, pickup/hauling frequency, hauling/disposal costs, best management practices (BMPs) and vector control. A corresponding checklist was consistently filled out after each site visit (Appendix B). Following each site visit, a facility site assessment report was written depicting general site conditions, management techniques, and general comments, concerns and/or recommendations (Appendix C).

While conducting each site visit, the proximity of horses to a watercourse was observed. Also, it was noted if any potential adverse affect to surface waters was present.

Finally, each ranch was issued a free copy of *Horse Keeping: A Guide to Land Management for Clean Water* that was prepared by the Council of Bay Area Resource Conservation Districts in partnership with the USDA Natural Resources Conservation Service. The Marin County Stormwater Pollution Prevention Program supplied funding for the manuals.

Results

Horse Population and Land Area

After visiting 30 sites, sufficient data was collected for reporting. Dave Nicholson accompanied Michael Murphy on 14 of the 30 sites. A cumulative total land area of 3,873 acres was visited. The smallest facility was 1 acre and the largest facility was 2,500 acres with an average ranch size of 129 acres. With respect to horse population, there were a total of 391 owned horses, and 609 boarded horses for a total of 1,000 horses observed (25% of the approximate total Marin County horse population). The facility with fewest horses had 3 and the facility with the most horses had 125. Horse density ranged from 0.01 horses/acre to 22 horses/acre with an average of 3.68 horses/acre (Table 1).

The facility keeper to horse ratio was noted to depict manure management efficiency. The total keepers to horse ratio was 125 to 1,000. The most keepers to horse ratio was 2 to 1 while the least was 1 to 50. Throughout all 30 facilities, the average was 1 to 8 (Table 2). It is assumed that a higher ratio (more keepers per horse) would result in a more efficient manure management operation.

Table 1. Facility Horse Population and Land Area Tally.

Facility #	Owned Horses	Boarded Horses	Total Horses per Site	Site Area (acres)	Horses/Acre
1	6	0	6	2	3.00
2	25	0	25	800	0.03
3	20	6	26	10	2.60
4	1	24	25	44	0.57
5	0	2	2	1	2.00
6	1	3	4	2	2.00
7	3	0	3	1.3	2.31
8	0	30	30	1.4	21.9
9	7	20	27	9	3.00
10	18	25	43	10	4.30
11	0	14	14	35	0.40
12	4	8	12	35	0.34
13	27	0	27	2,500	0.01
14	30	5	35	143	0.24
15	0	62	62	67	0.93
16	11	15	26	12.5	2.08
17	10	50	60	17	3.53
18	100	0	100	24.5	4.08
19	14	36	50	50	1.00
20	20	50	70	25	2.80
21	8	14	22	3.4	6.47
22	12	24	36	5	7.20
23	25	100	125	15	8.33
24	2	0	2	1	2.00
25	3	11	14	6	2.33
26	11	10	21	1.5	14.0
27	17	55	72	7.5	9.60
28	3	0	3	2.5	1.20
29	10	45	55	30	1.83
30	3	0	3	11	0.27
Total	391	609	1,000	3,873	110
Average	13	20	33	129	3.68

Table 2. Ranch Keeper to Horse Ratio Statistics.

	Keepers	Horses
Total Keepers per Horse	125	1,000
Most Keepers per Horse	2	1
Least Keepers per Horse	1	50
Average Keeper per Horse	1	8

Proximity to a Watercourse

Nearly half of the ranches were within 50 feet from a watercourse (including perennial, intermittent and ephemeral), and just over half of the ranches that were within 50 feet were fenced. Few of the ranches allowed horses within the watercourse (Table 3).

Table 3. Proximity of Paddocks, Stalls and/or Horses to Creeks or Watercourses.

	Not Near Creek	>50 Ft from Creek	<50 Ft from Creek	Within Creek	Creek Fenced off	Creek not Fenced off
No. of Ranches	5	9	14	2	16	4

Collection

Onsite manure collection regiments ranged from twice-daily pickups to greater than once a month pickup. As expected, ranches with the highest density of horses required collection more often, but 80% of the ranches collected at least once a day (Figure 1).

There were 7 sites that kept 100% of the manure onsite by spreading it throughout the pasture and/or tilling it into the soil (Figure 1). As depicted later in this report the majority of the sites had their manure taken off-site in various ways to various destinations.

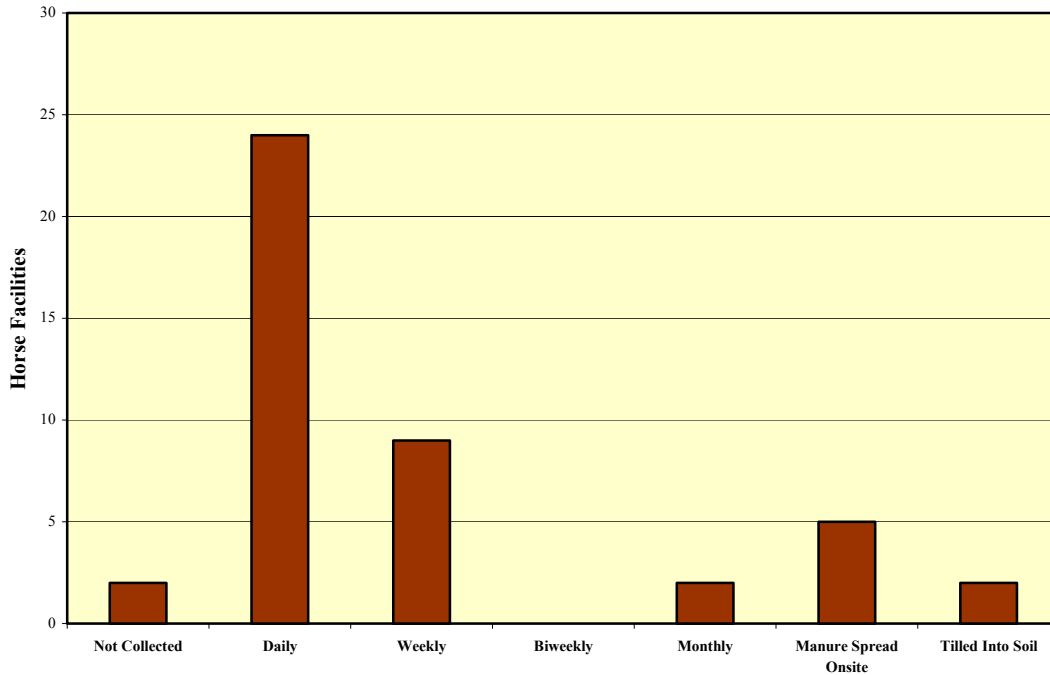


Figure 1. Frequency of Onsite Manure Collection in Paddocks and Stalls.

Temporary Storage and Composting

There was a definite distinction made between manure storage and manure composting. Those who stored their manure did so with the intention of having it hauled off site at some point in time. The sites that composted did so over an extended period of time with the intention of producing a soil amendment from the manure and bedding mix.

Manure was temporarily stored on 23 ranches and 7 of them composted. The majority of the sites had manure piles between 5 and 25 cubic yards (CY). The remainder of the sites had storage piles of either less than 5 CY or between 25 and 100 CY with one site having greater than 100 cubic yards of manure (Figure 2). Most of the larger piles were composting operations.

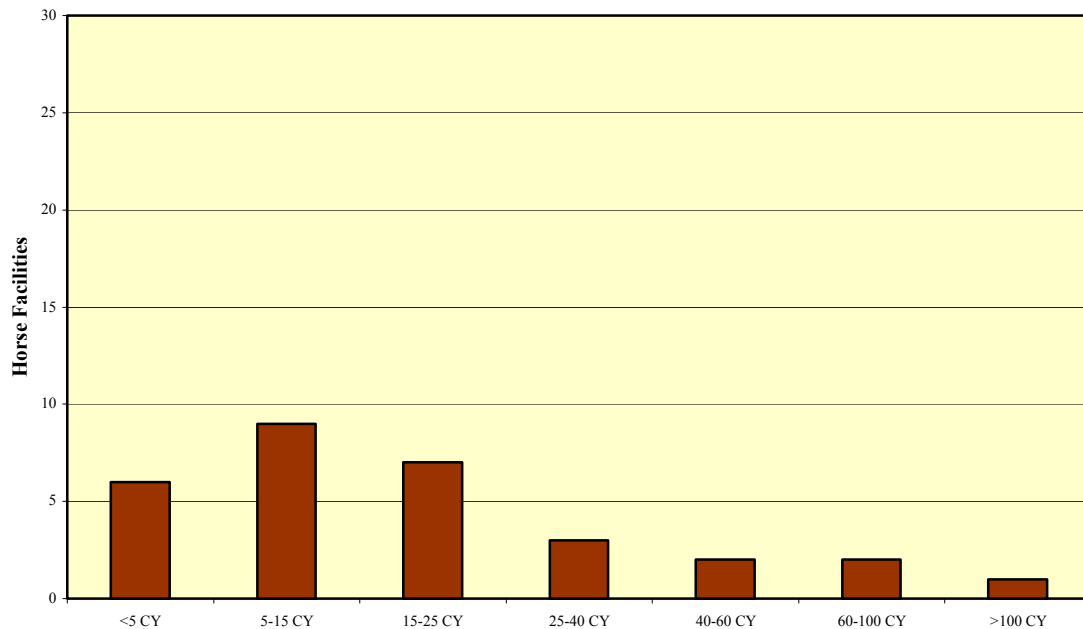


Figure 2. Manure Storage Pile Size.

Containment of the stored/composted manure was an important interest for facilities within close proximity to a watercourse. Some containment methods included metal dumpsters, 3-sided concrete boxes, concrete slabs and some had no containment at all. Others filled their hauling truck directly by parking it close to the collection area. The ratio of sites that had their manure well contained to the sites that had no containment was about 50/50 (Figure 3). There were only 2 of the 30 sites that covered their manure storage/compost.

For those not composting onsite, there seemed to be little interest in doing so (Figure 4). Reasons included the following: 1) having no room, 2) No interest and/or expertise, and 3) lack of proper equipment/resources. There was some interest in contributing to an off-site composting facility as long as hauling expenses were not increased and/or if there was a cost savings. And finally, among the ranches who were not composting at the time of the interview, there were 2 who were interested in composting onsite (Figure 4).

Of the 7 ranches that composted their manure, compost management was minimal. Very few ranches had adequate water available and those that did have water available did not use it during the dry summer months. None of the composters took temperatures and none turned the compost regularly. On the other hand, it appeared that all 7 ranches allowed for an adequate 90-day compost duration.

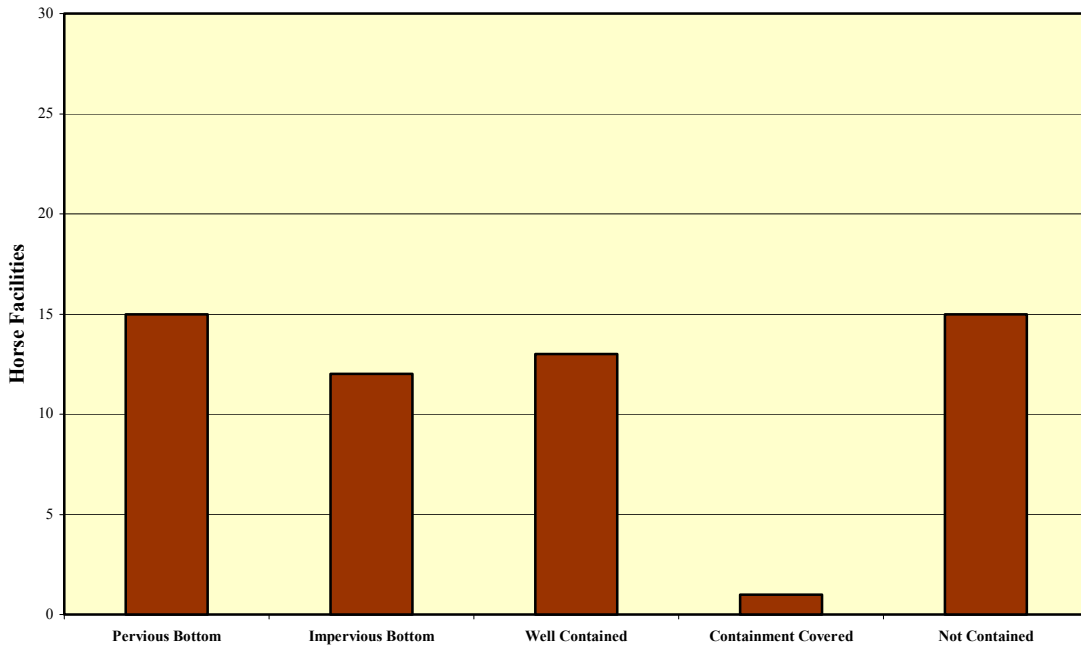


Figure 3. Manure Storage/Compost Containment.

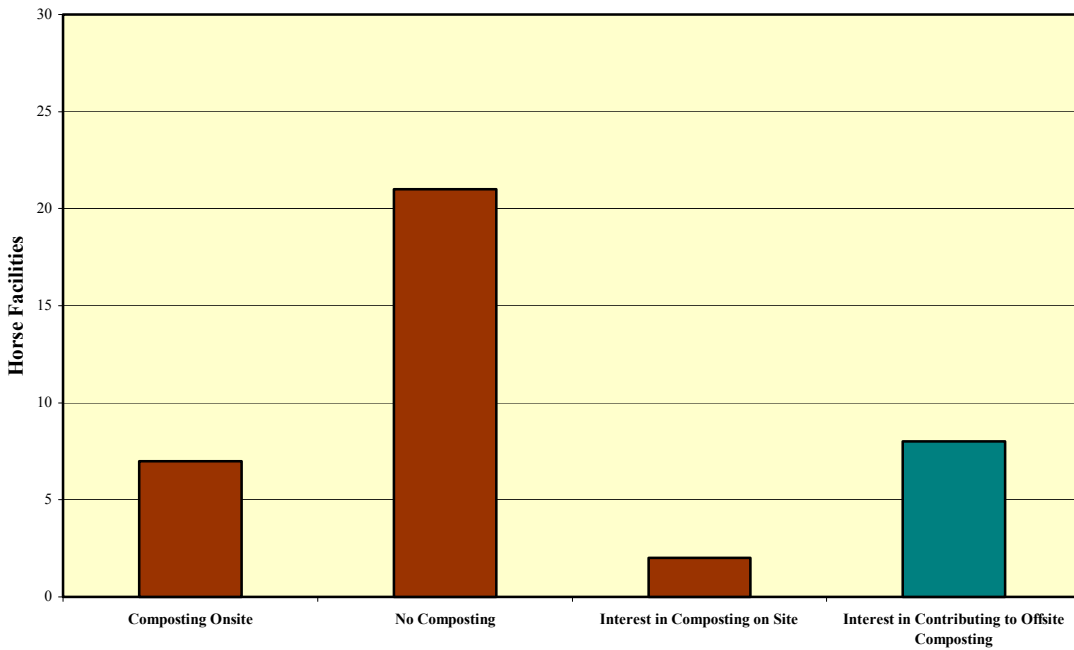


Figure 4. Interest in Composting.

Manure Hauling/Destination

Hauling manure off-site is an important and, for some, an expensive necessity. It is important so that an accumulation of manure does not cause any detrimental impact on a watershed. Most of the sites seemed to haul regularly enough to minimize any risk. It was found that a little over half of the ranches had their manure hauled away every 1 to 2 weeks. The remainder of them had manure hauled every month or more (Figure 5). The sites that had manure hauled less frequently were smaller and generated less manure than larger ranches. All of those who hauled their manure off-site

were asked if there was an interest in a collection cooperative that hauls to a local compost facility. Nearly half of those polled were interested (Figure 5). The majority of them seem to be paying more money toward hauling than most others interviewed.

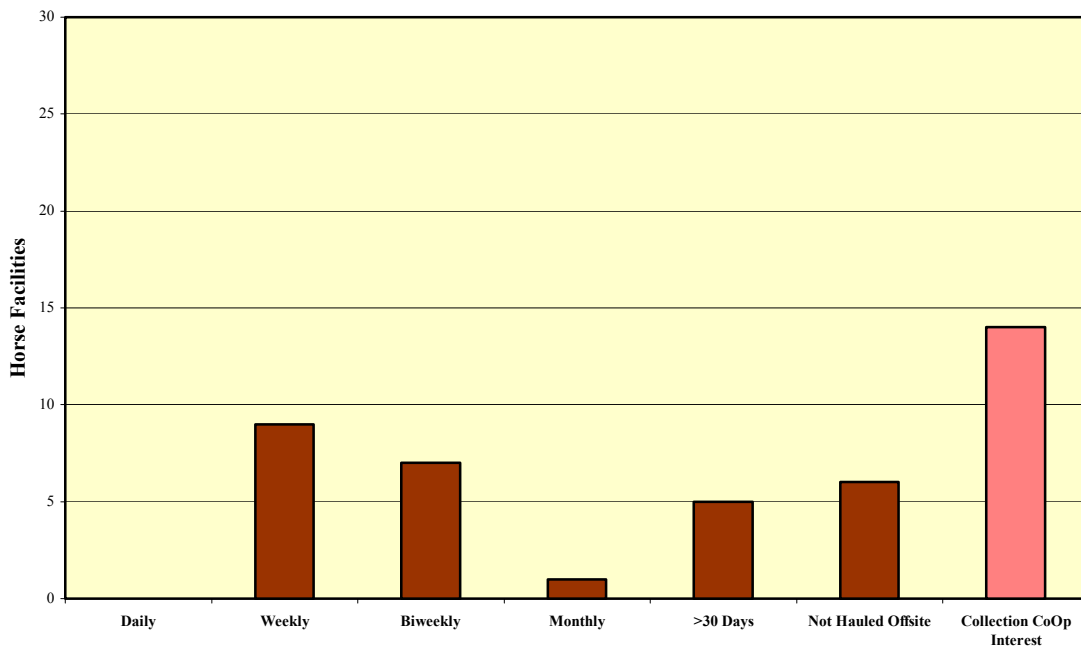


Figure 5. Manure Hauling Frequency and Collection Cooperative Interest.

The hauling costs that 15 of the 30 ranches pay was noteworthy. Among them, the cumulative total cost of hauling manure was nearly \$100,000 per year. While some spent as little as \$75 per year, others spent up to \$24,000 per year on hauling costs. The average money spent among the ranches surveyed was just over \$6,600 (Table 4). The ranches that were spending the most money on hauling costs were most interested in a cooperative hauling arrangement. The remainder of the ranches not composting onsite had little or no hauling costs. They allowed local gardeners, farmers and landscapers to pick-up manure as needed.

Table 4. Approximate Hauling Costs of Manure (of 15 Sites)

	\$/year
Ranch with Highest Cost	\$24,000
Ranch with Lowest Cost	\$75
Cumulative Total Cost (15 Ranches)	\$99,054
Average Cost per Ranch	\$6,603

With respect to the destination of the manure, it was found that the majority of the manure generated went to local gardens and farms. Some went to a local compost facility, a small amount to a landfill, and a few didn't know its destination (Figure 6).

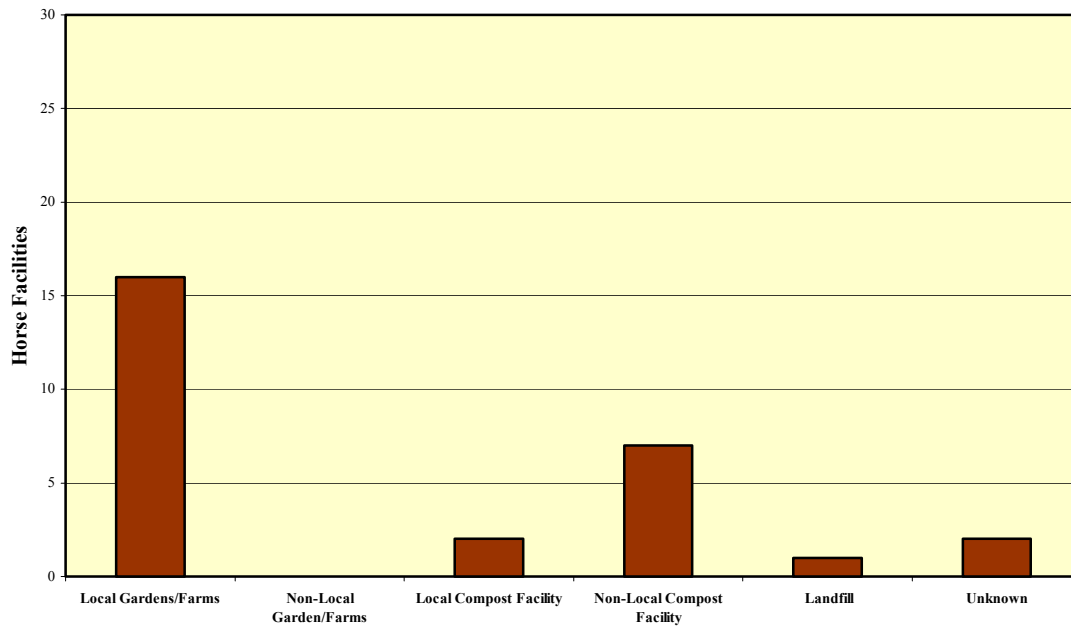


Figure 6. Uses/Destination of Manure/Compost

BMPs Used Onsite

There were a number of different types of BMPs used from ranch to ranch. BMPs were considered effective if they reduced or eliminated water runoff containing manure and sediment. Manure containment was the primary focus for the BMP evaluation.

More than half of the ranches appeared to have implemented moderately effective BMPs. This generally equates to some BMPs used, but there is room for improvement. A select few had highly effective BMPs while the same amount had no BMPs installed (Figure 7). Some of those who had no BMPs installed were not within close proximity to a watercourse.

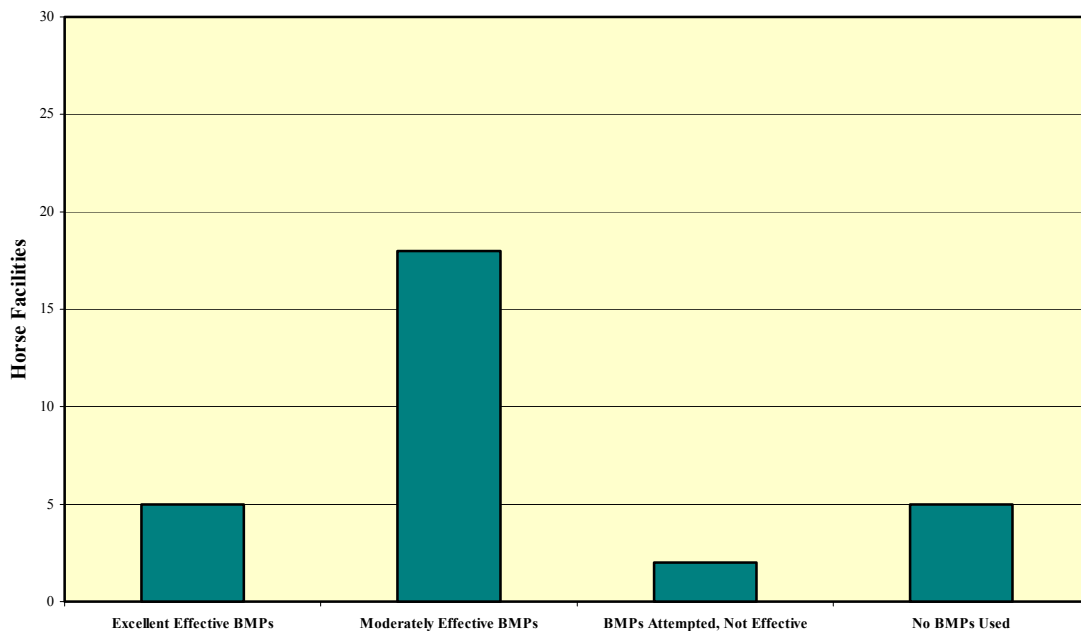


Figure 7. BMP Effectiveness for Reducing or Eliminating Pollution.

Pest/Vermin Control

Most ranches did not use any broadcast pest control method for the entire site. For fly control, most used sprays directly onto the horses, others used fly and wasp traps, and some attempted natural predation techniques such as parasitic wasps. The predominate type of pest observed was flies. On several sites, there seemed to be a healthy native bird population that may be attributed to fly reduction through predation. Over half of the ranches visited used some kind of pest control. At an equal number of sites, there were no vermin observed (Figure 8).

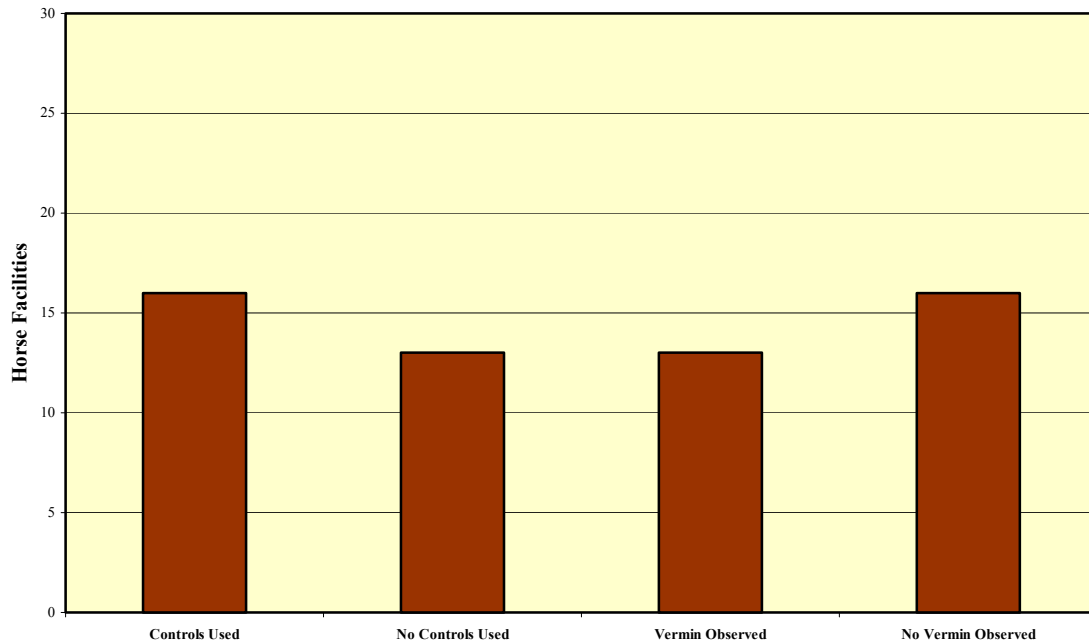


Figure 8. Overall Pest/Vermin Control at 30 Horse Facilities.

Discussion

It was consistently found that the majority of the owners/operators of the ranches visited were highly conscientious about watershed health and maintaining or improving a healthy ecosystem. Most of the ranches in close proximity of a watercourse had employed some kind of manure management practice and/or attempted to keep manure from accumulating. Each ranch was rated as excellent, adequate, marginal or poor in manure management practices as they pertain to the quality protection of nearby surface water (Figure 9). Most managers and/or owners stated an interest in facility improvement that time and available money would allow.

There was a definite interest in facility-improvement grant funds across the board. Main interests of funds were for facility improvement and technical advise. Some ranches were open to technical advise at the time of visit. Several suggestions were made about seeding, mulching, maintaining filter strips, fencing placement, and manure storage practices.

With respect to a cooperative hauling arrangement, there were 14 facilities that expressed interest. A future compost facility may be established to accept local manure and bedding as a result of a letter of support from the MRCD. The findings of this study further supported the need for a regional compost facility.

Also, in the process of conducting this survey, Michael Murphy was successful in linking two facilities with their manure management needs. One ranch that was hauling manure off-site was linked with a second site that needed manure for composting. As a result, hauling costs were reduced for one facility and a manure shortage was eliminated at the other.

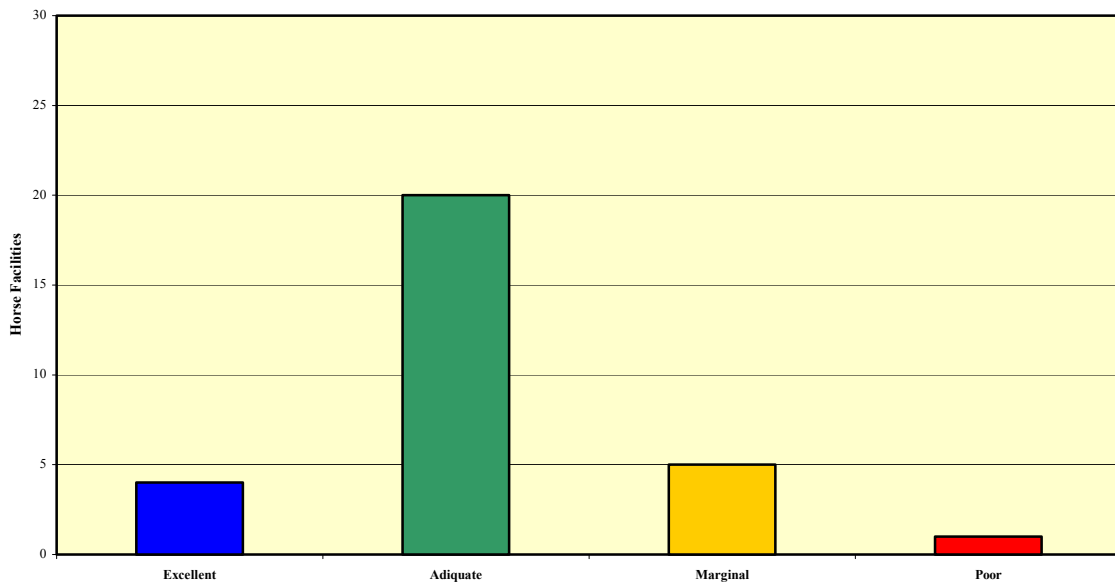


Figure 9. Overall Rating of Manure Management.

Recommendations

There are several recommendations suggested as a result of this study. They are as follows:

- 1) Establishment of a regional composting site that would enable stored material (manure and bedding) from participating ranches to be turned into a mulch/soil amendment product for local gardens, farms, landscaping.
- 2) Location of regional composting site should be within close proximity to participating ranches. A maximum hauling distance of 10-miles is suggested.
- 3) Procurement of grants for facility improvements, such as roof gutters, downspouts, horse creek crossings, exclusionary fencing, manure storage container improvements, low labor-cost composting methods for composting sites, seeding and/or re-vegetation and watercourse restoration.
- 4) Short-term rental equipment available to ranches. For example, manure spreaders, water trucks for composting operations, front loaders/scrapers, and dump trucks.
- 5) Education on composting and importance of conservation planning for horse facilities and how they fit into the entire ecosystem.
- 6) Government involvement by clearly defining and separating equine facilities from dairy facilities.
- 7) Educate government officials on equine facility management to improve communication and rapport with ranch owners/operators.
- 8) Hire a compost consultant who would be available for on-site composting consultation.
- 9) Recommend to ranch owners/operators the importance of separating manure and bedding. This would reduce manure/bedding volume as well as improve composting mixture.

Note: Appendixes were not included in this PDF file for brevity. A hard copy is available upon request from Marin County Stormwater Pollution Prevention Program. Call Dave Nicholson at (415) 499-6528. Thank you.