

Watershed Agricultural Program SOP

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PLANNING GUIDES FOR BARNYARD SIZING & MANURE ESTIMATION

Purpose: Sizing of manure storages and stacking pads, as well as, sizing barnyards, feeding pads, and confinement buildings are a major component of the planning process. To ensure all situations are planned in a uniform manner, planners should utilize a “standardized” guide to determine the sizing for these BMPs.

These guides have been generated by planners using numerous sources and references, vetted through their peers and approved by WAP Management for use during the planning process. They should also be referenced during the design of the BMPs to ensure BMPs are adequately sized. If the plan deviates from the approved numbers, justification must be provided during the approval at peer, coaches, and ag committee meetings.

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Barnyard Sizing Planning Guide

Livestock Type	Class/Type/Age	Weight	Confinement ¹		On/Off Pad ^{2/3}		Exercise ⁴	Notes	
BEEF	cow (larger frame)	>1200#	75		70		400-800	for alternate management systems (self-cleaning/sloped floor, slotted floor, wood chips*, mounded turnout, etc.) refer to MWPS or other land grant university references; be prepared to support/justify any "new" system calves must be born and spend significant time on BMP	
	cow (smaller frame)	<1200#	65		60		400-800		
	growing	400-800#	50		44		300-600		
	finishing	800-1200#	60		55		400-800		
	calf	<400#	40		35				
	* Wood Chip Pads	use 150 sf/adult and 100 sf/youngstock for sizing the wood chip area							
DAIRY	frame:	small #	large #	small	large	small	large	reduce barnyard size (confinement number) by ~ 1/2 if constructed mounds will be used in conjunction with feed pad; refer to MWPS for mound details ³	
	0-3 month	50-160#	90-250#	28	32	group pens = 40			200
	3-6 month	160-300#	250-325#	30	40	25	35		300
	6-12 month	300-500#	325-700#	40	50	33	40		400
	12-18 month	500-750#	700-950#	50	60	40	45		500
	18 mo.-pre-fresh	750-900#	950-1250#	60	70	45	60		550
	adult	1100#	1400#	70	80	55	70		500-600
	barn clean only			30	40				
	holding area only			15					
				85	100				
Bedded Pack	composting		up to 125					use "regular" numbers for barnyards used for heat detection	
	traditional								
SHEEP/GOAT	ram	180-300#	25		16		50		
	smaller ewe	<130#	14		8		35		
	larger ewe	>130#	16		12				
	ewe/lamb (small)	<130#	18		12		40	add 5 sq. ft./ewe if over 170% lambing rate	
	ewe/lamb (large)	>130#	22		16		50		
	lamb/kid	< 30#	4		2		8	raised separate from mother	
	feeder	30-60#	6		5				
	feeder	60-100#	8		6				
<i>Manure Storage/ Stacking Area</i>	Use best estimation of amount of time spent on pad to determine how much manure will be collected. Generally, on/off pads will see animals on the pads/in buildings 60-75% of the time. Likely less if just a feed pad. Adjust manure collection accordingly.								

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Livestock Type	Class/Type	Weight	Confinement	On/Off Pad	Exercise	Sources & Ranges
			“stalls”			use numbers as a guide
HORSE	mini/pony		100	30?		for horse feeding pads, size for only the room
	“normal”		144	50?	200-500	needed for feeder and horses eating, add
	draft or mare/foal		200	80?	750-1000	additional sq. ft. for manure stacking, etc.
						example: 4 horses (8’ long) with 5’ wide round bale feeder - pad would be ~21’ square
SWINE	boar	600+#	60		200+	variations based on current industry standards
	sow w/ piglets		60			may be applicable
		30-60#	6			
		60-120#	10	8		
		120-250#	20	14		
		250-450#	40	20		
450-600#	50	30				
POULTRY	Chickens		4		10	
	Turkey		6		20	

¹ Add square footages for all feed alleys, lanes, feeders/waterers w/ animals around.

² Assumes “loafing” area is inside building. Only add the sq. ft. for the actual feeder & waterer; attention needs to be taken to site turnout areas appropriately to minimize any potential water quality issues. If access to a barn, account for that square footage in sizing calculations.

³ If feeding pad only, account for only the area needed to feed on (feed ally, feeders with animals around them, etc.); size “off” area appropriately (wood chips, mounds, etc.); amount of manure storage may need to be reduced as well (less time on the pad)

⁴ The numbers for “Exercise” are provided for a reference/guide when determining if enough area is available for livestock when given access off a pad or barnyard. Site feed pads in areas as to minimize potential water quality issues (away from water courses, buffer, mounds, etc.

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Additional Items/Considerations

Item	Class/Type	Weight		Feeding System			Sources, Notes, Considerations	
		small #	large #	1x feed*	2x feed	free choice forage grain		
Feed Rail	frame			small	large			
Dairy	3-6 mo.	160-300#	250-325#	12"	15"		4" 12"	* 1 bale per 24 hr. period and/or pushed up multiple
	6-12 mo.	300-500#	325-700#	15"	18"		5" 15"	times per day = 1x
	12-18 mo.	500-750#	700-950#	18"	20"		6" 18"	bales enough for 2 days+ = free choice
	18 mo.-spring	750-900#	950-1250#	20"	24"		6" 18"	if participant supplying headlocks, adjust sizing accordingly
	adult	1100#	1400#	26"	30"		6" 18"	if using slant bars, size accordingly based on mfg. recommendations
Beef	cow	>1200#		28"	14"		6" 14"	
	cow	<1200#		26"	13"-14"		5" 13"	
	growing	400-800#		16"-19"	10"		4" 9-10"	adjust based on actual size
	finishing	800-1200#		19"-25"	12"		5" 10-12"	adjust based on actual size
	bulls			30"-36"				smaller bulls = 30"; larger bulls = 36"
Scrape Alley								width (& height) of scrape machinery; 12' if cow (large frame) & 10' (small frame) standing w/ walking behind ("standard" feed rail & true bedded packs); 8' w/ free pass behind cows
Sheep	180-300# ram			12"			6"	
	150-200# ewe			18"			5"	
	30-110# feeder			9-12"			2-4"	
	ewe/lamb			20"			8"	
Scrape Alley								width (height) of scrape machinery; 6' if sheep/goat standing w/ walking behind ("standard" feed rail & true bedded packs); 4' w/ free pass behind animals
Round Bale Feeder	"standard"	25 sq. ft.		or actual size				add measurement(s) to pad size need 25 linear feet for 1 round bale and cows eating on all sides
Feeder		measure actual unit						add measurement(s) to pad size

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Wagon					
Waterer		actual size if on pad			add measurement(s) to pad size
Manure Storage					calculate amount produced and to be stored for given length of time; account for “slump”, etc.
Sheep/Goat		6 sq. ft./animal	based on 5 ft. high pile w/ average bedding;		
Swine		12 sq. ft. /animal	will vary depending on animal size;		
Horse		72 sq. ft. /animal	will vary depending on bedding type/amount		
Cattle	adult	72 sq. ft. /animal			
		1.2 & 1.0 cu. ft.		w/ & w/o bedding	Sas.
	to 500#	.6 & .5 cu. ft.		w/ & w/o bedding	Sas.
	to 750#	.8 & .7 cu. ft./		w/ & w/o bedding	Sas.
Tonka Blocks				account for actual foot print of blocks	
Minimum Practical Size				30'x50' isn't very big; cleaning logistics; access to feed; etc. 20'x20' is a typical waterer pad, adjust actual dimensions based on location (middle of field vs on fence line)	

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WAP Manure Production Guide

Livestock Type	Size	#/day	cu. ft./day	gal/day	Sources
DAIRY	150	13	.21	1.6	ASAE; UMD
	250	22	.35	2.6	ASAE; UMD; AWM
	500	43	.69	5.2	ASAE; UMD; AWM
	1000	85	1.3	11.6	ASAE; UMD; ? (unlabeled source)
	1400	143	2.4	14.5	ASAE; UMD; PSU
high milk	1000	120	2.0	13	UMD; PSU; AWM
low milk	1000	90	1.5		UMD
dry cow	1000	82	1.3		UMD; PSU; OSU; AWM
BEEF ¹	500	30	.48	3.6	ASAE; UMD; AWM
	750	42	.7	5.3	ASAE; UMD; AWM
	1000	60	.95	7.5	ASAE; UMD; OSU; ?; AWM
	1250	75	1.19	8.9	ASAE; UMD
SWINE					
piglet	35	2.3	.04	.3	ASAE
grower	65	4.2	.07	.5	ASAE; UMD; PSU; OSU
finishing	150/200	9.8/13	.16/.21	1.2/1.6	ASAE; UMD; PSU
gestating sow	275	8.7	.15	1.4	ASAE; UMD; PSU; ?
sow w/ litter	375	24	.36	2.7	ASAE; UMD; OSU; ?; AWM
boar	350	10.5	.15	1.4	ASAE; UMD; ?
SHEEP	100	4	.06	.46	ASAE; UMD; PSU; OSU; AWM
GOAT	100	4		.49	ASAE; UMD; OSU; AWM
POULTRY					
layer	4/8	.24/.46	.0035	.026	OSU
broiler	5	.35	.0022	.016	OSU
HORSE	1000	48	.81	5.8	ASAE; UMD; PSU; OSU; AWM
Horse Bedding		8-15			PSU*
BEDDING		use actual poundage if known	cu. ft./day	#/cu. ft.	AWM program; NRCS AWFH # bedding used/1000# dairy cow
straw (chopped)			.07	7	5.7 (stanchion); 11 (dairy housing)
straw (loose)			.2	2.5	5.4 (stanchion); 9.3 (dairy housing); 2.7 (freestall)
hay (chopped)			.08	6-6.5	5.7 (stanchion); 11 (dairy housing)
hay (loose)			.13	4-4.25	5.4 (stanchion); 9.3 (dairy housing); 2.7 (freestall)
sand			.01	105	20-35 (freestall)
sawdust/shavings/chips			.06	12/9	3.1 (freestall)

**Note: animals will spend ~60-75% of their time on the pads, adjust sizing accordingly
If higher or lower numbers are used, provide justification at Peer/Coach reviews.**

¹ Higher numbers possible if beef fed a high energy or high fiber diet; provide documentation/justification if higher numbers used.

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