AMERICAN ANGUS ASSOCIATION®

Sire Evaluation Report

FALL 2017

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Angus Sire Evaluation

From a total of **257,684** sires with progeny records in the American Angus Association database June 30, 2017, the *Fall 2017 Sire Evaluation Report* released July 7, 2017, lists **2,603** sires with the following qualifications.

1. The sire must have at least 35 yearling progeny weights in proper contemporary groups on Angus Herd Improvement Records (AHIR®).
2. The sire must have a yearling accuracy value of at least 0.40.
3. The sire must have had at least 5 calves recorded in the American Angus Association Herd Book since **June 1, 2015.**

The Young Sire Supplement lists **3,624** bulls born after **Jan. 1, 2013,** that have at least 10 progeny weaning weights on AHIR and have a weaning accuracy of at least 0.30.

The American Angus Association takes reasonable research and editing measures to ensure the quality of the genetic prediction analysis and other information made available in this report. However, the American Angus Association does not guarantee or assume responsibility for the accuracy, timeliness, correctness, or completeness of information available in this report. The information presented here should not be considered or represented to be a measure of the actual value of the animal or its progeny or a guarantee of performance. Any conclusions that users draw from the information presented here are their own and are not to be attributed to the American Angus Association.

The American Angus Association has available upon request additional booklets explaining expected progeny differences (EPD) and national cattle evaluation (NCE) procedures.

To view the latest *Sire Evaluation Report* online, visit *www.angussireresearch.com.*

Trait Descriptions

Calving Ease

Calving ease. Heifer calving ease expected progeny differences (EPDs) were calculated using a multi-trait animal model including birth weight and calving score data. The result is a heifer calving ease direct and a heifer calving ease maternal EPD, as defined below.

Calving ease direct (CED): Calving ease direct EPD is expressed as a difference in percentage of unassisted births, with a higher value indicating greater calving ease in first-calf heifers. It predicts the average difference in ease with which a sire's calves will be born when the sire is bred to first-calf heifers.

Calving ease maternal (CEM): Calving ease maternal EPD is expressed as a difference in percentage unassisted births with a higher value indicating greater calving ease in first-calf daughters. It predicts the average ease with which a sire's daughters will calve as first-calf heifers when compared to daughters of other sires.

How to Read the Report

Each bull listed in this report is comparable to every other bull in the database. The analysis takes into account only the differences expressed in each herd in which the bulls were used. For example, bull A has a weaning EPD of +60 lb. and bull B has a weaning EPD of +50 lb. If you randomly mate these bulls in your herd, you could expect bull A's calves to weigh, on average, 10 lb. more at weaning than bull B's progeny (60 – 50 = 10).

EXPECTED PROGENY DIFFERENCES AND $VALUES

SIRE STATISTICS	PRODUCTION									MATERNAL						
	CED ACC	BW ACC	WW ACC	YW ACC	RADG ACC	DMI ACC	YH ACC	SC ACC	Doc ACC	HP ACC	CEM ACC	Milk ACC	MkH MkD	MW ACC	MH ACC	$EN
A & B FINAL ANSWER 9022 16489947 [AMF-CAF-XF] 02-05-09	+6 .62	-.5 .81	+61 .78	+119 .74	+.34 .46	+.06 .46	+.3 .73	+.50 .70	+18 .47	+11.8 .49	+5 .52	+12 .51	5 37	+46 .35	+.1 .40	+.75

SIRE STATISTICS	CARCASS						$VALUES			
	CW ACC	Marb ACC	RE ACC	Fat ACC	CGrp CProg	UGrp UProg	$W	$F $G	$QG $YG	$B
A & B FINAL ANSWER 9022 16489947 [AMF-CAF-XF] 02-05-09	+27 .66	+.62 .64	+.56 .60	-.028 .60	8 33	18 54	+44.45	+95.37 +44.42	+34.10 +10.32	+122.91

Accuracy (ACC) is the reliability that can be placed on an expected progeny difference (EPD). An accuracy of close to 1.0 indicates higher reliability. Accuracy is affected by the number of progeny, pedigree and genomic information included in the analysis.

$Values are multi-trait selection indexes, expressed in dollars per head, created to assist beef producers by adding simplicity to genetic selection decisions. The $Value is an estimate of how future progeny of each sire are expected to perform, on average, compared to progeny of other sires in the database if the sires were randomly mated to cows and if calves were exposed to the same environment.

Expected progeny difference (EPD) is the prediction of how future progeny of each animal are expected to perform relative to the progeny of other animals listed in the database. EPDs are expressed in units of measure for the trait, plus or minus. Interim EPDs may appear for young animals when their performance is yet to be incorporated into the American Angus Association National Cattle Evaluation (NCE) procedures. This EPD will be preceded by an "I," and may or may not include the animal's own performance record for a particular trait, depending on its availability, appropriate contemporary grouping, or data edits needed for NCE.

PRODUCTION TRAITS

Calving ease direct (CED) is expressed as a difference in percentage of unassisted births, with a higher value indicating greater calving ease in first-calf heifers. It predicts the average difference in ease with which a sire's calves will be born when he is bred to first-calf heifers.

Birth weight EPD (BW), expressed in pounds, is a predictor of a sire's ability to transmit birth weight to his progeny compared to that of other sires.

Weaning weight EPD (WW), expressed in pounds, is a predictor of a sire's ability to transmit weaning growth to his progeny compared to that of other sires.

Yearling weight EPD (YW), expressed in pounds, is a predictor of a sire's ability to transmit yearling growth to his progeny compared to that of other sires.

Residual Average Daily Gain (RADG), expressed in pounds per day, is a predictor of a sire's genetic ability for postweaning gain in future progeny compared to that of other sires, given a constant amount of feed consumed.

Dry Matter Intake (DMI), expressed in pounds per day, is a predictor of a sire's ability to transmit feed intake during the postweaning phase to his progeny compared to that of other sires.

Yearling height EPD (YH), expressed in inches, is a predictor of a sire's ability to transmit yearling height compared to that of other sires.

Scrotal circumference EPD (SC), expressed in centimeters, is a predictor of a sire's ability to transmit scrotal size compared to that of other sires.

Docility (DOC) is expressed as a difference in yearling cattle temperament, with a higher value indicating more favorable docility. It predicts the average difference of progeny from a sire in comparison with another sire's calves. In herds where temperament problems are not an issue, this expected difference would not be realized.

Growth

Birth weight/weaning weight/yearling weight/maternal milk. Growth traits were evaluated together in a multi-trait model. As it is recommended for the evaluation of maternally influenced traits, a direct genetic effect, a maternal genetic effect and a maternal permanent environmental effect were fitted for birth and weaning weights. Postweaning gain was not considered to be maternally influenced; therefore, the direct genetic effect was the only random effect fitted. Yearling weight EPDs were calculated from the EPDs for weaning weight direct and postweaning gain. The evaluation includes individual weights on embryo transfer calves out of registered Angus recipient females, provided any other National Cattle Evaluation (NCE) requirements for edited data are met.

Residual average daily gain and dry-matter intake. The steps to generate the components needed to calculate the residual average daily gain (RADG) EPD include a comprehensive genetic evaluation of multiple phenotypic traits, including the phenotypic feed intake data collected on individual animals through research and tests. Also, the dry-matter intake (DMI) genomic predictions are used as an indicator trait in the intake evaluation process. The resulting feed intake genetic component from the multi-trait animal model analysis is used to calculate RADG. The genetic RADG EPD reflects composition-constant genetic potential for growth given a constant amount of feed. It characterizes postweaning gain among animals given the same amount of feed consumed. RADG is presented in pounds per day, with a higher value being more favorable. DMI, expressed in pounds per day, is a predictor of difference in transmitting ability for feed intake during the postweaning phase, compared to that of other sires.

Yearling height and scrotal evaluations. Yearling height and scrotal circumference traits are analyzed separately using a multi-trait animal model in the genetic evaluation. Both the height and scrotal evaluations include genetically correlated measures for yearling weight and any available genomic results. Yearling height EPDs are reported in inches and are reported on bulls and heifers at or near a year of age. Scrotal circumference EPDs, generated from scrotal data collected on yearling Angus bulls, are presented in centimeters.

Docility

Yearling temperament scores were used to calculate an EPD for docility. Four categories were used, for scores 1, 2, 3 and the combined category of scores 4, 5 and 6. The docility EPD is presented as a percentage, where a higher value is considered more favorable in terms of docile temperament. Since this is a threshold trait, herds that exhibit no problems in temperament will realize no improvement in selecting for favorable docility EPDs.

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MATERNAL TRAITS

Heifer pregnancy (HP) is a selection tool to increase the probability or chance of a sire's daughters becoming pregnant as first-calf heifers during a normal breeding season. A higher EPD value is more favorable, and the EPD is reported in percentage units.

Calving ease maternal (CEM) is expressed as a difference in percentage of unassisted births with a higher value indicating greater calving ease in first-calf daughters. It predicts the average ease with which a sire's daughters will calve as first-calf heifers when compared to daughters of other sires.

Maternal milk EPD (Milk), expressed in pounds of calf weaned, is a predictor of a sire's genetic merit for milk and mothering ability as expressed in his daughters compared to daughters of other sires. In other words, it is that part of a calf's weaning weight attributed to milk and mothering ability.

MkH indicates the number of herds from which daughters are reported as having progeny weaning weight records included in the analysis.

MkD indicates the number of daughters that have progeny weaning weight records included in the analysis.

Mature weight EPD (MW), expressed in pounds, is a predictor of the difference in mature weight of daughters of a sire compared to the daughters of other sires.

Mature height EPD (MH), expressed in inches, is a predictor of the difference in mature height of a sire's daughters compared to daughters of other sires.

Cow energy value ($EN), expressed in dollar savings per cow per year, assesses differences in cow energy requirements as an expected dollar savings difference in daughters of sires. A larger value is more favorable when comparing two animals (more dollars saved on feed energy expenses). Components for computing the cow $EN savings difference include lactation energy requirements and energy costs associated with differences in mature cow size.

CARCASS TRAITS

Carcass weight EPD (CW), expressed in pounds, is a predictor of the differences in hot carcass weight of a sire's progeny compared to progeny of other sires.

Marbling EPD (Marb), expressed as a fraction of USDA marbling score, is a predictor of the difference in marbling of a sire's progeny compared to progeny of other sires.

Ribeye area EPD (RE), expressed in square inches, is a predictor of the difference in ribeye area of a sire's progeny compared to progeny of other sires.

Fat thickness EPD (Fat), expressed in inches, is a predictor of the differences in external fat thickness at the 12th rib (as measured between the 12th and 13th ribs) of a sire's progeny compared to progeny of other sires.

Group/progeny (CGrp/CProg and UGrp/UProg) reflects the number of contemporary groups and the number of carcass and ultrasound progeny included in the analysis.

$VALUE INDEXES

Weaned calf value ($W), an index value expressed in dollars per head, is the expected average difference in future progeny performance for preweaning merit. $W includes both revenue and cost adjustments associated with differences in birth weight, weaning direct growth, maternal milk and mature cow size.

Feedlot value ($F), an index value expressed in dollars per head, is the expected average difference in future progeny performance for postweaning merit compared to progeny of other sires.

Grid value ($G), an index value expressed in dollars per head, is the expected average difference in future progeny performance for carcass grid merit compared to progeny of other sires.

Quality grade ($QG) represents the quality grade segment of the economic advantage found in $G. $QG is intended for the specialized user wanting to place more emphasis on improving quality grade. The carcass marbling (Marb) EPD contributes to $QG.

Yield grade ($YG) represents the yield grade segment of the economic advantage found in $G. $YG is intended for the specialized user wanting to place more emphasis on red meat yield. It provides a multi-trait approach to encompass ribeye, fat thickness and weight into an economic value for red meat yield.

Beef value ($B), an index value expressed in dollars per head, is the expected average difference in future progeny performance for postweaning and carcass value compared to progeny of other sires.

Trait Descriptions CONTINUED FROM PAGE 335

Heifer pregnancy

The heifer pregnancy (HP) EPDs are designed to characterize differences among sires in the Angus breed for daughters' heifer pregnancy. When comparing two sires based on their heifer pregnancy EPDs (reported in units of percentage), a higher-EPD sire would be expected to have daughters with a greater probability or chance of becoming pregnant than a sire with the lower EPD.

A performance database is assembled using available breeding information on first-calf heifers. A heifer's breeding record is coded as a success or failure of being pregnant based on any pregnancy check data or calving information recorded and submitted by the breeder. The heifer contemporary group is defined as breeding herd, breeding year, season and synchronization code. Edited data on heifers are analyzed in a threshold analysis.

Mature cow size

Mature weight (MW) and height (MH) are highly heritable traits, indicating selection for these traits can be effective. The mature size genetic evaluation is a multi-trait animal model using repeated measures on cows from yearling age throughout their lifetime.

A body condition score must be included with the cow weight in order for data to be utilized to calculate mature size EPDs in the NCE. Any cow weights submitted without a body condition score are not used. For more information on body condition score, go to *www.cowbcs.info.*

As a reminder for weaning time, cow weights with a body condition score need to be taken ±45 days of the calf's weaning measure date. Cow hip heights may be captured at this time, also. It is important to collect this information after the cow has weaned her first calf, and then again in subsequent years.

EPDs are generated for mature weight and mature height based on these varying amounts of performance information and pedigree relationships. The resulting EPDs are representative of the genetics for Angus cow size at a projected 6 years of age.

Carcass

Carcass EPDs are calculated from an integrated analysis of the Beef Improvement Records carcass, ultrasound, growth (weaning weight) and genomic profile databases. The weekly genetic evaluations result in a single EPD, respectively, for carcass weight, marbling score, ribeye area and fat thickness. The units of measure for EPDs are in carcass trait format — marbling score, carcass weight in pounds, carcass ribeye in square inches, and carcass fat thickness in inches. Growth (weaning weight), carcass, genomic and pedigree databases are simultaneously combined into one set of genomic-enhanced carcass EPDs for Angus breeding programs.

The carcass and ultrasound data contributing to the evaluation are described in Table 1 and Table 2 with average adjusted measurements.

Ultrasound images incorporated into the carcass EPDs were collected by field technicians certified by the Ultrasound Guidelines Council (UGC). The images were interpreted through one of the American Angus Association's authorized ultrasound processing labs by UGC-certified lab technicians.

Table 1: Angus phenotypic averages of steer and heifer carcasses

	Age at harvest, days			
	330 < Age < 480		481 < Age < 799	
Heifers:	**Avg.**	**SD[1]**	**Avg.**	**SD**
Avg. age at harvest, days	436	30	553	58
Adj.[2] carcass wt., lb.	706	84	713	101
Adj. fat thickness, in.	0.59	0.18	0.54	0.19
Adj. ribeye area, sq. in.	12.03	1.35	12.12	1.54
Adj. marbling score	6.73	1.30	6.33	1.38
No. of heifers	5,502		6,627	
Steers:				
Avg. age at harvest, days	437	26	525	45
Adj. carcass wt., lb.	797	84	778	100
Adj. fat thickness, in.	0.57	0.17	0.54	0.19
Adj. ribeye area, sq. in.	12.61	1.33	12.62	1.44
Adj. marbling score	6.22	1.08	5.85	1.25
No. of steers	75,197		27,425	

[1]SD = standard deviation.
[2]Carcasses adjusted to 480 days of age at harvest.

Table 2: Yearling Angus live-animal and ultrasound measures

	Bulls		Heifers		Steers	
Trait	**Avg.**	**SD[1]**	**Avg.**	**SD**	**Avg.**	**SD**
Age, days	370	26	389	30	404	38
Gain, lb./day	2.92	0.69	1.51	0.52	2.84	0.74
Adj. scan wt., lb.	1,118	139	866	112	1,101	168
Adj. %IMF, %	3.82	1.07	4.78	1.36	4.92	1.43
Adj. ribeye area, sq. in.	12.57	1.88	9.75	1.73	12.26	2.24
Adj. 12th-rib fat thickness, in.	0.28	0.10	0.26	0.11	0.40	0.15
Adj. rump fat thickness, in.	0.30	0.11	0.30	0.12	0.40	0.15
Total animals	1,084,336		739,779		12,904	

[1]SD = standard deviation.

As a review, the scoring system for marbling and its relationship to the USDA Quality Grading System is defined in Table 3. For a carcass to meet *Certified Angus Beef*® (CAB®) standards, it must have a Modest (average Choice) or higher marbling degree, be of "A" maturity (the most youthful classification for beef), have a 10- to 16-square-inch ribeye, less than 1 inch fat thickness, less than 1,050-pound hot carcass weight and a fine to medium marbling texture. For more details, go to *www.cabpartners.com.*

Table 3: USDA quality grading system and marbling score

Quality Grade	Amount of Marbling	Numerical Score
$Prime^+$	Abundant	10.0-10.9
Prime	Moderately abundant	9.0-9.9
$Prime^-$	Slightly abundant	8.0-8.9
$Choice^+$	Moderate	7.0-7.9
Choice	Modest	6.0-6.9
$Choice^-$	Small	5.0-5.9
Select	Slight	4.0-4.9
Standard	Traces	3.0-3.9
Standard	Practically devoid	2.0-2.9
Utility	Devoid	1.0-1.9

A New Model for National Cattle Evaluation

The Angus National Cattle Evaluation (NCE) combines information from multiple sources of information to create the best estimate of the animal's genetic value as a breeding candidate and is presented as an Expected Progeny Difference (EPD). All sources of information used, including genomic information, are described in Fig. 1.

The genotypes used in the NCE include a common set of about 40,000 single-nucleotide polymorphisms (SNPs). The EPDs are calculated using a single-step genomic BLUP (Best Linear Unbiased Predictor) model (SSGBLUP, or single step). The single-step model and underlying software were developed by Drs. Misztal, Legarra, Lourenco and colleagues at the University of Georgia and is peer-reviewed[1].

Due to the large number of genotyped individuals in the Angus dataset, the APY (Algorithm for Proven and Young) is implemented in the single-step approach. The Angus NCE includes a number of trait complexes that are combined into individual multiple-trait genetic evaluations that are used to calculate the reported EPD. The single-step approach allows for genotyped and non-genotyped animals to be combined into the same genetic evaluation analysis.

The traditional genetic analysis (animal model) to calculate EPDs is reliant on a pedigree relationship between all animals. Examples of these relationships include the parent offspring (0.5+), full siblings (0.5) and half siblings (0.25). Such expected relationships are based on pedigree. The analysis considers the interrelationships between all animals in the pedigree.

The high-density genotypes used in the Angus single-step approach allows a more accurate relationship to be determined between individuals than is possible with pedigree alone. When genetic relationships are based on pedigree, the average relationship is modeled. A progeny always inherits half its genetics from each parent, but the sample that parent passes from each of its parents (progeny grandparents) is different. The relationships determined from the genotypes (genomic relationships) reflects the "true" relationship between individuals and represents the different sampling from grandparents passed to grandprogeny.

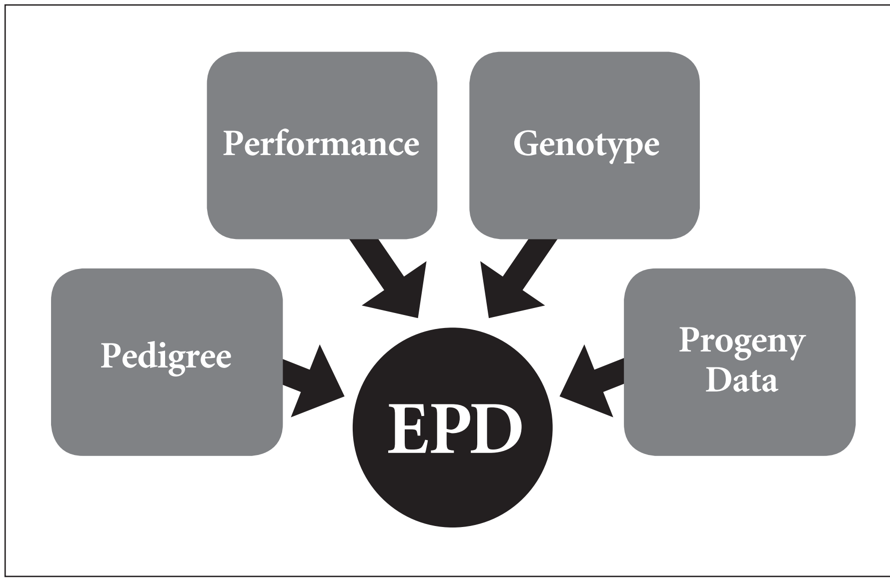
The single-step model uses these true genetic relationships based on genomics to calculate more accurate EPD values. With genomics included, different, individual EPD, can be provided to full-sib flushmates, for example, instead of the expected average EPD possible with pedigree alone.

The genetic relationship matrix used includes both genotyped and non-genotyped animals in the same analysis, making all animals in the Angus genetic evaluation influenced by genomics. Even if they are not genotyped, with other animals in the analyses genotyped, and all animals related, all EPD from the Angus genetic evaluation should be considered influenced by genomic information.

The degree that an individual's EPD is influenced by genomic information will depend on the relationship of that animal's inherited DNA to similar segments of DNA tied to phenotypes elsewhere in the pedigree. The individuals more influenced by genomics will be those that are genotyped. Among genotyped individuals, those most closely connected to genotyped individuals tied to phenotypes will have the highest EPD accuracy.

The EPDs presented are dependent on the phenotypic recording by Angus breeders. The Angus genetic evaluation offers the opportunity to more accurately evaluate young animals with genotypes for all traits. The genomic-enhanced predictions are only possible due to the phenotypic recording tied to genotypes in the database. Through recording (phenotyping) and genotyping, breeders provide the information contributing to the most accurate genomic predictions on their young animals.

Fig. 1: EPDs combine multiple sources of information simultaneously



Source: Angus Genetics Inc.

[1]Legarra, A., I. Aguilar and I. Misztal. 2009. A relationship matrix including full pedigree and genomic information. *J. Dairy. Sci.* 92:4656-4663.

Misztal, I., A. Legarra and I. Aguilar. 2014. Using recursion to compute the inverse of the genomic relationship matrix. *J. Dairy. Sci.* 97:3943-3952.

Lourenco, D.A., S. Tsuruta, B.O. Fragomeni, Y. Masuda, I. Aguilar, A. Legarra, J.K. Bertrand, T.S. Amen, L. Wang, D.W. Moser and I. Misztal. 2015. Genetic evaluation using single-step genomic best linear unbiased predictor in American Angus. *J. Anim. Sci.* 93:2653-2662.

+ These relationships will be slightly higher in the Angus pedigree due to common ancestors (inbreeding).

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The use of multi-trait economic selection indexes as tools for commercial cow-calf operators and seedstock breeders is rapidly evolving in the beef industry. Selection indexes are tools to select for several traits at once. An index approach takes into account genetic and economic values to select for economic merit. An index is challenging to develop, but the end result is easy to use, adding the simplicity and convenience of a multi-trait approach.

The expected progeny differences (EPDs) currently available through the American Angus Association, along with numerous individual performance measures, can become overwhelming. Weaned Calf Value ($W), Cow Energy Value ($EN), Feedlot Value ($F), Grid Value ($G) and Beef Value ($B) are bioeconomic values, expressed in dollars per head, to assist commercial beef producers by adding simplicity to genetic selection decisions.

$Values encompass the revenue generated from genetically derived outputs and associated costs (expenses) from required inputs. $Values only have meaning when used in comparing the relative merit or ranking of two individuals. Each sire listed in this report is comparable to every other sire. The $Values are sensitive to the assumptions for the industry-relevant components used in calculating the indexes.

As with EPDs, variation in $Values between animals indicates expected differences in the relative value of progeny if random mating is assumed. Thus, a $Value has meaning only when used in comparison to the $Value of another animal. Also, averages and percentile breakdowns are provided for $Values as reference points for the Angus database. A $Value of 0 does not correlate to the lowest ranking or to an average animal.

Weaned Calf Value ($W)

Weaned Calf Value ($W) quantifies four primary economic impact areas:

- Birth weight — birth weight influences on calf death losses related to dystocia, weaned calf crop percentage and resulting revenue per cow.
- Weaning weight — direct growth impact on weaning weight revenue (preweaning growth and pounds of calf sold) and energy requirements and related costs necessary to support preweaning calf growth.
- Maternal milk — revenue from calf preweaning growth and pounds of calf sold as influenced by varying cow milk levels, and costs related to lactation energy requirements.
- Mature cow size — expense adjustments are made for maintenance energy as related to differing mature cow size, including mathematical linkages between mature weight and yearling weight.

The impact areas are combined into a bioeconomic value expressed in dollars per head assigned to Angus genetics from birth through weaning. Resources used to form the $W include the National Research Council (NRC), Roman L. Hruska U.S. Meat Animal Research Center (USMARC), CattleFax, Standardized Performance Analysis (SPA) and university cow-calf budgets, and the American Angus Association performance database.

$W provides the expected dollar-per-head difference in future progeny preweaning performance in a multi-trait fashion, within a typical U.S. beef cow herd. Assume, for example, Bull A has a $W of +50.00 and Bull B has a $W of +35.00. If these sires were randomly mated to a comparable set of females, the calves were exposed to the same environment, and a normal number of replacement females were saved from both sires, on average you could expect Bull A's progeny to have a +15.00-per-head advantage in preweaning value over Bull B's progeny (50.00 - 35.00 = +15.00 per head). As with any $Value, $W has meaning when used in comparing the relative merit or ranking of two individuals.

The $W includes the following assumptions:

Base calf price	$185 per cwt.
Cow/heifer mix	80%/20%
Cow weight	1,300 lb.
Feed energy cost	$0.090 per Mcal NE_m

Cow Energy Value ($EN)

A Cow Energy Value ($EN) is available to assess differences in cow energy requirements, expressed in dollars per cow per year, as an expected dollar savings difference in future daughters of sires. A larger value is more favorable when comparing two animals (more dollars saved on feed energy expenses). Components for computing the cow $EN savings difference include maintenance requirements for lactation and energy costs, as well as those associated with differences in mature cow size.

Cow Energy ($EN) Savings, $/cow/year	+15.75	Cow Energy ($EN) Savings, $/cow/year	+4.68

In the above example, the expected difference in cow energy savings per cow per year for future daughters of the two animals is +11.07 (15.75 - 4.68 = +11.07).

Feedlot Value, Grid Value and Beef Value

Feedlot Value ($F), Grid Value ($G) and Beef Value ($B) are provided as postweaning bioeconomic $Values, expressed in dollars per head, to assist commercial beef producers by adding simplicity to genetic selection decisions. The $Values were developed primarily to serve as selection tools for commercial bull buyers.

$Values are reported in dollars per head, as illustrated below:

	$F	$G	$B
Example	+46.67	+35.60	+122.60

Although feedlot and carcass merit are important components of the beef production chain, it should be stressed to producers that the $Values ($F, $G, $B) are not to be used as a single selection criterion, since the indexes only encompass postweaning and carcass performance.

$Values have meaning when used in comparing the relative merit or ranking of two individuals. Each sire listed in this report is comparable to every other sire. For example, Bull 1 has a $B value of +126.00, and Bull 2 has a $B value of +116.00. If these bulls were randomly mated to a comparable set of females and the calves were exposed to the same environment, on average you would expect Bull 1's progeny to have a $10-per-head advantage in postweaning performance and carcass merit over Bull 2's progeny (126.00 - 116.00 = +10.00 per head).

$Feedlot, $Grid, and $Beef values incorporate available EPDs, converted into economic terms, using industry-relevant components for feedlot performance and carcass merit. The base components used to calculate $Values for any registered animal are:

Feedlot assumptions:

Time on feed	170 days
Ration cost	$250 per dry ton
Fed market	$130 per cwt. live

Grid assumptions:

Quality components:	
Prime premium (above Choice)	$14.00
CAB premium (above Choice)	$4.00
Choice-Select spread	$10.00
Standard discount	-$25.00
Yield components:	
YG 1 premium	$4.50
YG 2 premium	$2.25
YG 3 base	$0.00
YG 4 & 5 discount	-$18.00
Avg. carcass wt., lb.	861
Heavyweight discount	-$23.00

Feedlot Value ($F), an index value expressed in dollars per head, is the expected average difference in future progeny performance for postweaning merit compared to progeny of other sires. $F incorporates weaning weight (WW) and yearling weight (YW) EPD along with feed intake data, genomic information and trait interrelationships. Typical feedlot gain value and cost differences are accounted for in the final calculations, along with a standard set of industry values for days on feed, ration costs and cash cattle price.

Grid Value ($G), an index value expressed in dollars per head, is the expected average difference in future progeny performance for carcass grid merit compared to progeny of other sires. The $G combines quality grade and yield grade attributes, and is calculated for animals with carcass EPDs. A three-year rolling average is used to establish typical industry economic values for quality grade and yield grade schedules. Quality grade premiums are specified for Prime, *Certified Angus Beef*® (CAB®) and Choice carcasses, as well as discounts for Select and Standard. Yield grade premiums are incorporated for YG 1 and YG 2 (high-yielding carcasses), with discounts for YG 4 and YG 5 (low red meat yields). Grid impact in dollars per hundredweight (cwt.) and dollars per head is calculated from the yield and quality grade components, and then combined to arrive at the $G.

Quality Grade ($QG) represents the quality grade segment of the economic advantage found in $G. $QG is intended for the specialized user wanting to place more emphasis on improving quality grade. The carcass marbling (Marb) EPD contributes to $QG.

Yield Grade ($YG) represents the yield grade segment of the economic advantage found in $G. $YG is intended for the specialized user wanting to place more emphasis on red meat yield. It provides a multi-trait approach to encompass ribeye, fat thickness and weight into an economic value for red meat yield.

Beef Value ($B) facilitates the simultaneous multi-trait genetic selection for feedlot and carcass merit, based on dollars and cents. $B represents the expected average dollar-per-head difference in the progeny postweaning performance and carcass value compared to progeny of other sires. The $B value encompasses $F and $G. To align $B with marketplace realities and appropriately value carcass weight in Angus cattle, the following factors are incorporated into the final calculations for $B.

- $B is not simply the sum of $F and $G.
- Projected carcass weight and its value are calculated, along with production cost differences.
- $B takes into consideration any discount for heavyweight carcasses.
- Final adjustments are made to prevent double-counting weight between feedlot and carcass segments.

The resulting $B value is not designed to be driven by one factor, such as quality, red meat yield or weight. Instead, it is a dynamic result of the application of commercial market values to Angus genetics for both feedlot and carcass merit.

Availability of EPDs and $Values

Weekly EPDs and $Values on individual animals may be viewed on the Association website, *www.angus.org*. Members and affiliates can also access EPDs and $Values through AAA Login.

An interactive application for Custom $Values ($W, $F, $G, $B) is available for members and affiliates through AAA Login. Users can customize economic components to create tailored within-herd $Values for their given scenarios. The Custom $Values are designed for within-herd use in assisting commercial bull buyers producing to a specified market.

Direct questions about American Angus Association performance programs to ahir@angus.org or 816-383-5100.

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Genomic-enhanced expected progeny differences (GE-EPDs) contained in this report are calculated using the American Angus Association database along with results from the Zoetis HD 50K and i50K for Angus and the GeneSeek GGP-HD and GGP-LD for Angus. Published EPDs include genomic results.

EPDs and associated $Values in this report were as of **July 7, 2017.** For the most up-to-date information on an individual animal, go to *www.angus.org* and input the animal's registration number in the search function.

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Fall 2017 EPD and $Value Percentile Breakdowns

CURRENT SIRES

	Production									Maternal						Carcass				$Values					
TOP PCT	CED	BW	WW	YW	RADG	DMI	YH	SC	Doc	HP	CEM	Milk	MW	MH	$EN	CW	Marb	RE	Fat	$W	$F	$G	$QG	$YG	$B
1%	+17	-3.2	+78	+136	+.36	-.83	+1.2	+2.13	+32	+16.0	+15	+37	+85	+1.1	+36.63	+66	+1.29	+.99	-.049	+79.20	+110.45	+56.04	+49.85	+12.80	+178.56
2%	+16	-2.6	+74	+131	+.34	-.68	+1.1	+1.92	+30	+15.2	+15	+36	+78	+1.0	+29.14	+63	+1.17	+.92	-.041	+75.43	+101.75	+53.54	+47.43	+11.86	+171.30
3%	+15	-2.2	+72	+127	+.33	-.61	+1.0	+1.81	+29	+14.8	+14	+34	+73	+1.0	+25.26	+60	+1.09	+.88	-.037	+73.15	+96.57	+51.81	+46.03	+11.22	+166.10
4%	+14	-2.0	+71	+124	+.32	-.55	+1.0	+1.72	+28	+14.6	+14	+34	+70	+.9	+22.43	+58	+1.04	+.85	-.033	+71.40	+92.54	+50.62	+44.73	+10.75	+162.16
5%	+14	-1.8	+69	+122	+.31	-.49	+1.0	+1.66	+27	+14.3	+14	+33	+67	+.9	+20.33	+57	+.99	+.82	-.030	+69.88	+89.35	+49.44	+43.90	+10.28	+159.41
10%	+12	-1.0	+65	+114	+.29	-.34	+.8	+1.43	+24	+13.3	+13	+31	+57	+.8	+13.62	+51	+.86	+.73	-.020	+64.77	+78.68	+45.37	+40.71	+8.97	+149.08
15%	+11	-.5	+62	+109	+.27	-.24	+.8	+1.29	+22	+12.8	+12	+29	+52	+.7	+9.57	+48	+.77	+.67	-.014	+61.28	+71.86	+42.66	+38.34	+7.98	+141.87
20%	+10	-.2	+60	+105	+.26	-.16	+.7	+1.18	+21	+12.2	+11	+28	+47	+.6	+6.74	+45	+.70	+.62	-.009	+58.47	+66.20	+40.44	+36.38	+7.27	+135.90
25%	+10	+.2	+58	+102	+.24	-.10	+.7	+1.09	+19	+11.8	+11	+27	+43	+.5	+4.54	+43	+.65	+.58	-.005	+56.01	+61.51	+38.36	+34.74	+6.59	+130.40
30%	+9	+.4	+56	+99	+.23	-.04	+.6	+1.00	+18	+11.4	+10	+26	+39	+.5	+2.61	+41	+.60	+.55	-.001	+53.89	+57.22	+36.63	+33.05	+6.02	+125.49
35%	+8	+.7	+55	+96	+.22	+.02	+.6	+.93	+17	+11.0	+10	+26	+36	+.5	+.90	+39	+.56	+.51	+.002	+51.86	+53.20	+34.95	+31.64	+5.46	+120.90
40%	+8	+.9	+53	+93	+.22	+.07	+.5	+.85	+15	+10.7	+9	+25	+33	+.4	-.54	+37	+.52	+.48	+.006	+49.96	+49.58	+33.40	+30.18	+4.89	+116.61
45%	+7	+1.1	+51	+91	+.21	+.12	+.5	+.78	+14	+10.3	+9	+24	+30	+.4	-2.03	+35	+.48	+.45	+.009	+47.99	+46.09	+31.90	+29.02	+4.40	+112.19
50%	+7	+1.4	+50	+88	+.20	+.17	+.4	+.71	+13	+10.0	+9	+24	+27	+.3	-3.44	+33	+.45	+.42	+.012	+46.22	+42.70	+30.47	+27.38	+3.83	+108.03
55%	+6	+1.6	+48	+85	+.19	+.22	+.4	+.64	+12	+9.7	+8	+23	+24	+.3	-4.82	+32	+.42	+.39	+.015	+44.37	+39.20	+29.10	+26.13	+3.31	+103.66
60%	+5	+1.8	+47	+82	+.18	+.28	+.4	+.57	+11	+9.4	+8	+22	+21	+.2	-6.28	+30	+.39	+.36	+.018	+42.66	+35.67	+27.70	+24.76	+2.74	+99.29
65%	+5	+2.0	+45	+80	+.17	+.34	+.3	+.49	+10	+9.0	+7	+21	+18	+.2	-7.72	+28	+.35	+.33	+.022	+40.71	+32.05	+26.16	+23.51	+2.07	+94.55
70%	+4	+2.3	+44	+77	+.16	+.40	+.3	+.42	+8	+8.6	+7	+21	+14	+.1	-9.28	+26	+.32	+.30	+.025	+38.53	+28.19	+24.54	+21.59	+1.49	+89.63
75%	+3	+2.5	+42	+73	+.15	+.46	+.2	+.33	+7	+8.2	+6	+20	+11	+.1	-10.99	+24	+.28	+.26	+.029	+35.97	+23.78	+22.82	+20.29	+.72	+84.41
80%	+2	+2.8	+39	+69	+.14	+.53	+.2	+.24	+5	+7.8	+6	+19	+6	+.0	-12.80	+21	+.24	+.22	+.033	+33.23	+18.80	+21.02	+18.24	-.16	+78.04
85%	+1	+3.2	+36	+64	+.13	+.62	+.1	+.13	+3	+7.2	+5	+17	+0	-.1	-14.90	+18	+.20	+.18	+.038	+29.85	+12.55	+19.01	+16.14	-1.14	+70.42
90%	+0	+3.6	+33	+57	+.11	+.73	+.0	+.00	+1	+6.5	+4	+16	-7	-.2	-17.55	+14	+.15	+.12	+.044	+25.49	+4.33	+16.26	+13.49	-2.52	+60.23
95%	-2	+4.3	+26	+46	+.09	+.90	-.2	-.22	-3	+5.3	+2	+13	-18	-.4	-21.45	+7	+.07	+.03	+.054	+18.26	-10.18	+11.96	+9.14	-4.81	+42.19
Total Animals	**24,828**		**--------- 24,936 --------**		**---- 15,027 ----**		**16,961**	**18,546**	**16,535**	**14,623**	**24,828**	**24,936**	**15,030**	**15,030**	**24,937**	**20,057**	**20,057**	**20,057**	**20,057**	**24,937**	**24,937**	**22,197**	**22,197**	**22,197**	**22,197**
Avg. EPD	**+6**	**+1.3**	**+49**	**+86**	**+.20**	**+.18**	**+.4**	**+.71**	**+13**	**+10.0**	**+8**	**+23**	**+26**	**+.3**	**-2.47**	**+33**	**+.48**	**+.42**	**+.012**	**+45.37**	**+41.74**	**+30.58**	**+27.14**	**+3.44**	**+105.64**

CURRENT DAMS

	Production									Maternal						Carcass				$Values					
TOP PCT	CED	BW	WW	YW	RADG	DMI	YH	SC	Doc	HP	CEM	Milk	MW	MH	$EN	CW	Marb	RE	Fat	$W	$F	$G	$QG	$YG	$B
1%	+15	-2.4	+70	+122	+.33	-.70	+1.2	+1.85	+29	+15.3	+15	+36	+81	+1.1	+30.50	+58	+1.19	+.90	-.042	+72.01	+89.05	+54.03	+47.85	+12.40	+163.53
2%	+14	-1.9	+67	+117	+.31	-.61	+1.1	+1.69	+27	+14.7	+14	+35	+73	+1.0	+25.78	+54	+1.08	+.83	-.036	+68.16	+81.70	+51.58	+45.64	+11.44	+155.94
3%	+13	-1.6	+65	+113	+.30	-.56	+1.0	+1.59	+26	+14.3	+14	+34	+68	+.9	+23.05	+52	+1.02	+.78	-.032	+65.80	+77.32	+49.95	+44.35	+10.83	+150.98
4%	+13	-1.3	+63	+111	+.29	-.51	+1.0	+1.52	+25	+14.0	+14	+33	+65	+.9	+21.02	+50	+.97	+.75	-.028	+64.00	+73.88	+48.70	+43.28	+10.33	+147.19
5%	+12	-1.1	+62	+109	+.28	-.48	+1.0	+1.47	+24	+13.7	+13	+32	+62	+.8	+19.44	+49	+.93	+.72	-.026	+62.54	+71.17	+47.62	+42.35	+9.97	+144.16
10%	+11	-.5	+58	+102	+.26	-.36	+.8	+1.27	+21	+12.9	+12	+30	+53	+.7	+14.45	+44	+.81	+.63	-.018	+57.63	+62.14	+43.94	+38.84	+8.76	+133.57
15%	+10	-.1	+56	+98	+.25	-.28	+.8	+1.15	+19	+12.3	+12	+29	+47	+.6	+11.34	+41	+.73	+.58	-.012	+54.35	+56.19	+41.40	+36.96	+7.84	+126.48
20%	+9	+.3	+54	+94	+.24	-.21	+.7	+1.05	+18	+11.9	+11	+28	+43	+.6	+9.01	+38	+.67	+.53	-.008	+51.76	+51.48	+39.32	+35.05	+7.21	+120.81
25%	+8	+.6	+52	+91	+.23	-.16	+.7	+.97	+17	+11.5	+10	+27	+39	+.5	+7.08	+36	+.62	+.50	-.004	+49.53	+47.40	+37.51	+33.39	+6.54	+115.90
30%	+8	+.8	+51	+88	+.22	-.11	+.6	+.90	+15	+11.2	+10	+26	+36	+.5	+5.37	+34	+.58	+.46	-.001	+47.55	+43.78	+35.92	+32.01	+6.04	+111.47
35%	+7	+1.0	+49	+86	+.21	-.06	+.6	+.83	+14	+10.9	+10	+25	+33	+.4	+3.80	+32	+.54	+.43	+.002	+45.70	+40.47	+34.45	+30.53	+5.51	+107.31
40%	+6	+1.2	+48	+83	+.20	-.01	+.6	+.77	+13	+10.6	+9	+25	+30	+.4	+2.35	+31	+.50	+.41	+.005	+43.94	+37.38	+33.05	+29.41	+4.95	+103.42
45%	+6	+1.4	+46	+81	+.20	+.03	+.5	+.70	+12	+10.3	+9	+24	+27	+.3	+.93	+29	+.47	+.38	+.008	+42.24	+34.32	+31.73	+28.21	+4.52	+99.65
50%	+5	+1.6	+45	+79	+.19	+.08	+.5	+.64	+11	+10.0	+8	+23	+24	+.3	-.39	+28	+.44	+.35	+.011	+40.52	+31.33	+30.45	+26.97	+4.08	+95.97
55%	+5	+1.8	+44	+77	+.18	+.12	+.4	+.58	+10	+9.7	+8	+23	+22	+.3	-1.72	+26	+.41	+.33	+.013	+38.80	+28.32	+29.20	+25.58	+3.52	+92.24
60%	+4	+2.0	+42	+74	+.17	+.17	+.4	+.52	+9	+9.4	+8	+22	+19	+.2	-3.08	+25	+.39	+.30	+.016	+37.03	+25.17	+27.96	+24.76	+3.03	+88.56
65%	+4	+2.2	+41	+72	+.17	+.22	+.4	+.46	+8	+9.1	+7	+21	+16	+.2	-4.54	+23	+.36	+.27	+.019	+35.20	+21.98	+26.68	+23.51	+2.48	+84.63
70%	+3	+2.4	+39	+69	+.16	+.28	+.3	+.39	+7	+8.8	+7	+21	+13	+.1	-5.97	+21	+.33	+.24	+.022	+33.23	+18.48	+25.36	+22.05	+1.91	+80.51
75%	+2	+2.7	+38	+66	+.15	+.34	+.3	+.32	+6	+8.5	+6	+20	+10	+.1	-7.57	+20	+.30	+.21	+.025	+31.06	+14.68	+23.94	+20.69	+1.27	+76.11
80%	+2	+2.9	+36	+63	+.14	+.41	+.2	+.24	+4	+8.0	+5	+19	+6	+.0	-9.35	+18	+.26	+.18	+.029	+28.61	+10.38	+22.35	+19.18	+.51	+71.14
85%	+1	+3.2	+33	+58	+.13	+.49	+.2	+.14	+3	+7.6	+5	+18	+1	+.0	-11.45	+15	+.23	+.14	+.034	+25.70	+5.08	+20.49	+17.10	-.37	+65.22
90%	-1	+3.6	+31	+53	+.12	+.59	+.1	+.02	+0	+6.9	+4	+16	-5	-.1	-14.04	+12	+.18	+.10	+.039	+21.97	-1.74	+18.18	+15.02	-1.62	+57.61
95%	-2	+4.2	+26	+45	+.09	+.75	+.0	-.17	-3	+6.0	+2	+14	-13	-.2	-17.96	+7	+.11	+.03	+.048	+16.15	-12.50	+14.56	+11.37	-3.51	+45.78
Total Animals	**343,313**	**---------**	**344,974**	**---------**	**---- 151,025**	**----**	**183,715**	**193,623**	**177,591**	**152,624**	**343,313**	**344,974**	**165,442**	**165,442**	**345,033**	**245,025**	**245,025**	**245,025**	**245,025**	**345,033**	**345,033**	**289,832**	**289,832**	**289,832**	**289,832**
Avg. EPD	**+5**	**+1.6**	**+45**	**+78**	**+.19**	**+.10**	**+.5**	**+.65**	**+11**	**+10.0**	**+8**	**+23**	**+24**	**+.3**	**+.03**	**+28**	**+.47**	**+.36**	**+.011**	**+40.06**	**+30.58**	**+30.74**	**+27.00**	**+3.74**	**+95.61**

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Fall 2017 EPD and $Value Percentile Breakdowns

NON-PARENT BULLS

	Production								Maternal						Carcass				$Values					
TOP PCT	CED	BW	WW	YW	RADG	DMI	YH	SC	Doc	HP	CEM	Milk	MW	MH	$EN	CW	Marb	RE	Fat	$W	$F	$G	$QG	$YG	$B
1%	+16	-2.8	+77	+135	+.36	-.70	+1.2	+2.13	+32	+16.1	+15	+37	+87	+1.1	+26.66	+66	+1.36	+1.02	-.049	+79.02	+106.15	+56.92	+50.96	+12.76	+176.44
2%	+15	-2.2	+74	+129	+.34	-.58	+1.1	+1.95	+30	+15.5	+15	+35	+80	+1.0	+21.27	+63	+1.24	+.96	-.041	+75.25	+98.28	+54.21	+48.23	+11.77	+169.62
3%	+14	-1.9	+72	+126	+.33	-.51	+1.0	+1.84	+29	+15.1	+14	+34	+76	+1.0	+18.24	+60	+1.16	+.91	-.037	+72.70	+93.18	+52.52	+46.61	+11.11	+165.32
4%	+14	-1.6	+70	+123	+.32	-.45	+1.0	+1.76	+28	+14.8	+14	+33	+73	+.9	+16.04	+59	+1.11	+.88	-.033	+70.74	+89.36	+51.24	+45.64	+10.64	+161.85
5%	+13	-1.4	+69	+121	+.31	-.41	+1.0	+1.69	+27	+14.5	+13	+32	+70	+.9	+14.44	+57	+1.06	+.85	-.031	+69.14	+86.39	+50.24	+44.58	+10.23	+158.93
10%	+12	-.8	+65	+113	+.29	-.26	+.8	+1.47	+25	+13.7	+12	+30	+61	+.8	+9.57	+52	+.92	+.76	-.021	+63.53	+76.41	+46.50	+41.26	+8.91	+148.70
15%	+11	-.3	+62	+108	+.27	-.16	+.8	+1.33	+23	+13.1	+12	+29	+55	+.7	+6.63	+49	+.83	+.70	-.015	+59.77	+69.73	+43.95	+39.17	+7.95	+141.81
20%	+10	+.0	+60	+105	+.26	-.08	+.7	+1.21	+22	+12.6	+11	+28	+50	+.6	+4.37	+46	+.76	+.66	-.010	+56.96	+64.45	+41.76	+37.21	+7.27	+136.20
25%	+9	+.3	+58	+101	+.25	-.01	+.6	+1.11	+20	+12.1	+11	+27	+46	+.6	+2.55	+44	+.70	+.62	-.006	+54.58	+59.97	+39.92	+35.77	+6.59	+131.27
30%	+9	+.5	+56	+98	+.24	+.05	+.6	+1.03	+19	+11.8	+10	+26	+42	+.5	+.94	+42	+.65	+.58	-.002	+52.54	+56.04	+38.25	+34.10	+6.06	+126.80
35%	+8	+.8	+55	+96	+.23	+.11	+.6	+.95	+18	+11.4	+10	+25	+39	+.5	-.43	+40	+.61	+.55	+.002	+50.67	+52.55	+36.67	+32.65	+5.52	+122.68
40%	+8	+1.0	+53	+93	+.22	+.16	+.5	+.87	+17	+11.1	+9	+25	+36	+.4	-1.79	+39	+.57	+.52	+.005	+48.93	+49.10	+35.21	+31.64	+4.95	+118.76
45%	+7	+1.2	+52	+91	+.21	+.22	+.5	+.80	+16	+10.7	+9	+24	+32	+.4	-3.08	+37	+.53	+.49	+.008	+47.27	+45.87	+33.81	+30.18	+4.51	+114.85
50%	+6	+1.4	+50	+89	+.20	+.27	+.4	+.74	+15	+10.4	+9	+24	+29	+.3	-4.39	+35	+.50	+.46	+.011	+45.67	+42.70	+32.41	+29.02	+4.07	+111.09
55%	+6	+1.6	+49	+86	+.19	+.32	+.4	+.66	+14	+10.1	+8	+23	+26	+.3	-5.66	+34	+.46	+.43	+.014	+44.08	+39.54	+31.07	+27.77	+3.49	+107.35
60%	+5	+1.8	+48	+84	+.18	+.37	+.4	+.59	+13	+9.7	+8	+22	+23	+.3	-6.93	+32	+.43	+.41	+.017	+42.44	+36.32	+29.68	+26.55	+2.99	+103.48
65%	+5	+2.0	+46	+81	+.18	+.43	+.3	+.52	+11	+9.4	+7	+22	+20	+.2	-8.29	+30	+.40	+.38	+.020	+40.76	+32.91	+28.29	+25.18	+2.41	+99.41
70%	+4	+2.3	+45	+78	+.17	+.49	+.3	+.44	+10	+9.0	+7	+21	+16	+.2	-9.71	+28	+.36	+.35	+.024	+38.98	+29.39	+26.86	+23.87	+1.83	+95.12
75%	+3	+2.5	+43	+75	+.16	+.55	+.2	+.35	+9	+8.5	+6	+20	+12	+.1	-11.24	+26	+.33	+.31	+.027	+37.04	+25.38	+25.34	+22.51	+1.14	+90.48
80%	+2	+2.8	+41	+72	+.14	+.63	+.2	+.26	+7	+8.1	+6	+20	+8	+.1	-12.92	+24	+.29	+.27	+.032	+34.83	+21.00	+23.59	+20.69	+.40	+85.30
85%	+2	+3.1	+39	+68	+.13	+.71	+.1	+.14	+5	+7.5	+5	+19	+3	+.0	-14.93	+21	+.24	+.23	+.037	+32.11	+15.62	+21.55	+18.71	-.59	+79.20
90%	+0	+3.6	+35	+62	+.11	+.83	+.0	+.00	+2	+6.9	+4	+17	-3	-.1	-17.46	+18	+.19	+.18	+.043	+28.55	+8.36	+18.98	+16.14	-1.88	+71.62
95%	-2	+4.2	+30	+53	+.09	+.99	-.1	-.21	-1	+5.8	+2	+15	-13	-.2	-21.12	+13	+.11	+.10	+.052	+22.91	-3.25	+15.00	+11.99	-3.85	+59.56
Total Animals	**151,637**	**---------**	**155,185**	**--------**	**----- 54,367 -----**		**63,929**	**75,018**	**60,852**	**53,448**	**151,637**	**155,185**	**53,448**	**53,448**	**157,489**	**86,235**	**86,235**	**86,235**	**86,235**	**157,489**	**157,489**	**118,367**	**118,367**	**118,367**	**118,367**
Avg. EPD	**+6**	**+1.4**	**+50**	**+88**	**+.20**	**+.28**	**+.4**	**+.74**	**+14**	**+10.3**	**+8**	**+24**	**+29**	**+.3**	**-4.01**	**+35**	**+.53**	**+.47**	**+.011**	**+45.75**	**+42.30**	**+32.53**	**+28.83**	**+3.70**	**+110.33**

NON-PARENT COWS

	Production									Maternal						Carcass				$Values					
TOP PCT	CED	BW	WW	YW	RADG	DMI	YH	SC	Doc	HP	CEM	Milk	MW	MH	$EN	CW	Marb	RE	Fat	$W	$F	$G	$QG	$YG	$B
1%	+16	-2.7	+75	+132	+.35	-.69	+1.2	+2.12	+32	+16.1	+15	+36	+89	+1.1	+27.12	+66	+1.38	+1.05	-.049	+77.19	+101.81	+56.84	+50.49	+12.62	+175.02
2%	+15	-2.1	+72	+126	+.34	-.57	+1.1	+1.94	+30	+15.5	+14	+34	+82	+1.0	+21.56	+62	+1.27	+.98	-.042	+72.96	+93.93	+54.17	+48.05	+11.62	+168.13
3%	+14	-1.8	+70	+123	+.33	-.50	+1.0	+1.84	+29	+15.1	+14	+33	+77	+1.0	+18.17	+60	+1.20	+.93	-.037	+70.22	+89.12	+52.51	+46.61	+10.99	+163.44
4%	+14	-1.6	+69	+120	+.32	-.45	+1.0	+1.76	+28	+14.8	+14	+32	+74	+.9	+16.01	+58	+1.15	+.90	-.034	+68.22	+85.57	+51.30	+45.64	+10.50	+159.68
5%	+13	-1.4	+67	+118	+.31	-.40	+1.0	+1.70	+27	+14.5	+13	+32	+71	+.9	+14.16	+57	+1.10	+.87	-.031	+66.61	+82.66	+50.27	+44.58	+10.07	+156.67
10%	+12	-.7	+63	+111	+.29	-.25	+.8	+1.48	+25	+13.6	+12	+30	+62	+.8	+9.13	+52	+.96	+.78	-.021	+61.14	+73.36	+46.64	+41.26	+8.79	+146.49
15%	+11	-.3	+61	+107	+.27	-.15	+.8	+1.33	+23	+13.0	+12	+28	+56	+.7	+6.14	+49	+.87	+.72	-.015	+57.66	+67.38	+44.05	+39.17	+7.83	+139.74
20%	+10	+.1	+59	+103	+.26	-.07	+.7	+1.21	+22	+12.5	+11	+27	+51	+.6	+3.86	+46	+.80	+.67	-.010	+55.04	+62.61	+41.93	+37.21	+7.19	+134.30
25%	+9	+.3	+57	+100	+.25	+.00	+.7	+1.12	+20	+12.1	+11	+27	+47	+.6	+2.15	+44	+.75	+.63	-.006	+52.93	+58.46	+40.10	+35.77	+6.51	+129.72
30%	+8	+.6	+55	+98	+.24	+.06	+.6	+1.03	+19	+11.7	+10	+26	+43	+.5	+.58	+42	+.70	+.60	-.002	+51.08	+54.89	+38.43	+34.10	+6.01	+125.60
35%	+8	+.8	+54	+95	+.23	+.12	+.6	+.94	+18	+11.4	+10	+25	+40	+.5	-.78	+40	+.65	+.56	+.001	+49.42	+51.49	+36.87	+33.05	+5.50	+121.73
40%	+7	+1.0	+53	+93	+.22	+.18	+.5	+.87	+17	+11.0	+9	+25	+36	+.4	-2.08	+39	+.61	+.53	+.004	+47.86	+48.29	+35.41	+31.64	+4.95	+117.95
45%	+7	+1.2	+51	+90	+.21	+.23	+.5	+.79	+16	+10.7	+9	+24	+33	+.4	-3.35	+37	+.57	+.50	+.007	+46.35	+45.30	+34.01	+30.53	+4.53	+114.37
50%	+6	+1.4	+50	+88	+.20	+.28	+.4	+.72	+15	+10.3	+9	+23	+30	+.4	-4.60	+35	+.54	+.48	+.010	+44.86	+42.24	+32.60	+29.41	+4.09	+110.82
55%	+6	+1.6	+49	+86	+.19	+.33	+.4	+.65	+14	+10.0	+8	+23	+27	+.3	-5.85	+34	+.50	+.45	+.013	+43.39	+39.18	+31.27	+27.77	+3.54	+107.25
60%	+5	+1.8	+47	+84	+.19	+.39	+.4	+.57	+12	+9.6	+8	+22	+24	+.3	-7.13	+32	+.47	+.42	+.017	+41.88	+36.02	+29.91	+26.97	+3.06	+103.53
65%	+5	+2.0	+46	+81	+.18	+.44	+.3	+.49	+11	+9.3	+7	+22	+21	+.2	-8.41	+31	+.43	+.39	+.020	+40.30	+32.80	+28.59	+25.58	+2.54	+99.82
70%	+4	+2.3	+45	+79	+.17	+.50	+.3	+.41	+10	+8.9	+7	+21	+17	+.2	-9.72	+29	+.40	+.36	+.023	+38.60	+29.31	+27.23	+24.29	+1.97	+95.89
75%	+3	+2.5	+43	+76	+.16	+.57	+.2	+.32	+8	+8.4	+6	+20	+14	+.1	-11.16	+27	+.36	+.32	+.027	+36.79	+25.56	+25.75	+22.51	+1.36	+91.48
80%	+3	+2.8	+41	+72	+.15	+.64	+.2	+.22	+7	+8.0	+6	+20	+9	+.1	-12.80	+25	+.32	+.29	+.031	+34.66	+21.31	+24.14	+21.14	+.61	+86.61
85%	+2	+3.1	+39	+68	+.13	+.72	+.1	+.10	+5	+7.4	+5	+19	+4	+.0	-14.73	+22	+.27	+.24	+.035	+32.12	+15.94	+22.26	+19.18	-.24	+80.80
90%	+0	+3.5	+36	+63	+.12	+.84	+.0	-.04	+2	+6.7	+4	+17	-2	-.1	-17.09	+19	+.22	+.19	+.041	+28.64	+9.06	+19.92	+17.10	-1.48	+73.48
95%	-1	+4.1	+31	+54	+.09	+1.01	-.1	-.26	-2	+5.6	+3	+15	-11	-.2	-20.75	+14	+.13	+.10	+.051	+22.95	-2.84	+16.29	+13.49	-3.36	+61.74
Total Animals	**126,653**	**--------**	**130,362**	**---------**	**----- 30,909 -----**		**39,527**	**30,424**	**37,102**	**31,964**	**126,653**	**130,362**	**30,446**	**30,446**	**132,056**	**51,922**	**51,922**	**51,922**	**51,922**	**132,056**	**132,056**	**91,355**	**91,355**	**91,355**	**91,355**
Avg. EPD	**+6**	**+1.4**	**+50**	**+87**	**+.20**	**+.29**	**+.4**	**+.72**	**+14**	**+10.2**	**+8**	**+23**	**+30**	**+.4**	**-4.10**	**+35**	**+.57**	**+.48**	**+.010**	**+44.76**	**+41.37**	**+32.91**	**+29.12**	**+3.79**	**+110.13**

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Angus Trait Heritabilities (on diagonal) and Genetic Correlations (on upper off diagonal)

Trait	CED	BW	WW	PG	DMI	YH	SC	Doc	HP	CEM	Milk	MW	MH	YW	UFAT	UIMF	UREA	FAT	MARB	REA	CW
Calving ease direct (CED)	0.19[1]	-0.65[2]								-0.06											
Birth weight direct (BW)		0.46	0.29	0.29																	
Weaning direct (WW)			0.28	0.48	0.48									0.87	0.12		0.34	0.09		0.27	0.65
Postweaning gain (PG)				0.27	0.57	0.50	0.28														
Dry-matter intake (DMI)					0.33																
Yearling height (YH)						0.51															
Scrotal circumference (SC)							0.48														
Docility (Doc)								0.44													
Heifer pregnancy (HP)									0.15												
Calving ease maternal (CEM)										0.20											
Maternal milk (Milk)											0.12										
Mature weight (MW)												0.37	0.76								
Mature height (MH)													0.62								
Yearling weight (YW)														0.42	0.07		0.33	-0.07		0.35	0.75
Ultrasound fat (UFAT)															0.46		0.00	0.65		-0.35	-0.10
Ultrasound % intramuscular fat (UIMF)																0.41			0.71		
Ultrasound ribeye area (UREA)																	0.39	-0.10		0.65	0.28
Fat thickness (FAT)																		0.33		-0.34	0.10
Marbling (MARB)																			0.48		
Ribeye area (REA)																				0.32	0.46
Carcass weight (CW)																					0.44

[1]Heritability estimates are on the diagonal.
[2]Upper off-diagonals are genetic correlations among traits.

Accuracy and Associated Possible Change

The following table lists the possible change values associated with each EPD trait at the various accuracy levels. Possible change is expressed as "+" or "-" units of EPD and can be described as a measure of expected change or potential deviation between the EPD and the "true" progeny difference. This confidence range depends on the standard error of prediction for an EPD. For a given accuracy, about two-thirds of the time an animal should have a "true" progeny difference within the range of the EPD plus or minus the possible change value.

For example, a sire with an accuracy of 0.60 for a marbling EPD of +0.50 is expected to have his "true" progeny value falling within ±0.12 marbling score EPD (ranging between +0.48 and +0.72) about two-thirds of the time.

With the conservative approach taken with respect to heritabilities in the Angus evaluation, actual EPD changes of animals within the population are much less than statistics would indicate.

ACCURACY AND ASSOCIATED POSSIBLE CHANGE

	Production									Maternal					Carcass			
Accuracy	CED	BW	WW	YW	RADG	DMI	YH	SC	Doc	HP	CEM	Milk	MW	MH	CW	Marb	RE	Fat
.05	9.7	2.55	14.9	24.3	.092	.730	.42	.76	16.7	7.7	10.4	9.5	38	.54	20	.29	.30	.041
.10	9.2	2.42	14.1	23.0	.087	.691	.40	.72	15.8	7.3	9.9	9.0	36	.51	19	.28	.28	.039
.15	8.7	2.28	13.3	21.7	.082	.653	.38	.68	14.9	6.9	9.3	8.5	34	.49	18	.26	.27	.037
.20	8.2	2.15	12.6	20.5	.077	.614	.35	.64	14.0	6.5	8.8	8.0	32	.46	17	.25	.25	.034
.25	7.7	2.02	11.8	19.2	.073	.577	.33	.60	13.2	6.1	8.2	7.5	30	.43	16	.23	.23	.032
.30	7.2	1.88	11.0	17.9	.068	.538	.31	.56	12.3	5.7	7.7	7.0	28	.40	15	.22	.22	.030
.35	6.7	1.75	10.2	16.6	.063	.500	.29	.52	11.4	5.3	7.1	6.5	26	.37	14	.20	.20	.028
.40	6.2	1.61	9.4	15.4	.058	.462	.26	.48	10.5	4.9	6.6	6.0	24	.34	13	.18	.19	.026
.45	5.6	1.48	8.6	14.1	.053	.423	.24	.44	9.7	4.5	6.0	5.5	22	.31	12	.17	.17	.024
.50	5.1	1.34	7.9	12.8	.048	.385	.22	.40	8.8	4.1	5.5	5.0	20	.29	11	.15	.16	.022
.55	4.6	1.21	7.1	11.5	.044	.346	.20	.36	7.9	3.7	4.9	4.5	18	.26	10	.14	.14	.019
.60	4.1	1.08	6.3	10.2	.039	.308	.18	.32	7.0	3.3	4.4	4.0	16	.23	9	.12	.12	.017
.65	3.6	.94	5.5	9.0	.034	.269	.15	.28	6.1	2.9	3.8	3.5	14	.20	7	.11	.11	.015
.70	3.1	.81	4.7	7.7	.029	.231	.13	.24	5.3	2.4	3.3	3.0	12	.17	6	.09	.09	.013
.75	2.6	.67	3.9	6.4	.024	.192	.11	.20	4.4	2.0	2.7	2.5	10	.14	5	.08	.08	.011
.80	2.1	.54	3.1	5.1	.019	.154	.09	.16	3.5	1.6	2.2	2.0	8	.11	4	.06	.06	.009
.85	1.5	.40	2.4	3.8	.015	.115	.07	.12	2.6	1.2	1.6	1.5	6	.09	3	.05	.05	.006
.90	1.0	.27	1.6	2.6	.010	.077	.04	.08	1.8	.8	1.1	1.0	4	.06	2	.03	.03	.004
.95	.5	.13	.8	1.3	.005	.038	.02	.04	.9	.4	.5	.5	2	.03	1	.02	.02	.002

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Fall 2017 Breed Average EPD and $Values

	Production									Maternal						Carcass				$Values			
	CED	BW	WW	YW	RADG	DMI	YH	SC	Doc	HP	CEM	Milk	MW	MH	$EN	CW	Marb	RE	Fat	$W	$F	$G	$B
Current Sires[1]	+6	+1.3	+49	+86	+.20	+.18	+.4	+.71	+13	+10.0	+8	+23	+26	+.3	-2.47	+33	+.48	+.42	+.012	+45.37	+41.74	+30.58	+105.64
Main Sires[2]	+7	+1.1	+52	+91	+.20	+.20	+.4	+.74	+14	+10.0	+8	+23	+25	+.3	-3.06	+33	+.48	+.42	+.013	+48.76	+48.27	+29.95	+107.78
Supplemental Sires[3]	+7	+1.2	+54	+94	+.21	+.27	+.4	+.81	+15	+10.3	+8	+24	+29	+.3	-6.11	+37	+.50	+.47	+.013	+50.87	+51.30	+30.86	+115.22
Current Dams[1]	+5	+1.6	+45	+78	+.19	+.10	+.5	+.65	+11	+10.0	+8	+23	+24	+.3	+.03	+28	+.47	+.36	+.011	+40.06	+30.58	+30.74	+95.61
Non-Parent Bulls[4]	+6	+1.4	+50	+88	+.20	+.28	+.4	+.74	+14	+10.3	+8	+24	+29	+.3	-4.01	+35	+.53	+.47	+.011	+45.75	+42.30	+32.53	+110.33
Non-Parent Cows[4]	+6	+1.4	+50	+87	+.20	+.29	+.4	+.72	+14	+10.2	+8	+23	+30	+.4	-4.10	+35	+.57	+.48	+.010	+44.76	+41.37	+32.91	+110.13

[1]Current Sires — At least one calf record in herd book within the past two years

[2]Main Sires — Sires that met the requirements of the most recent *American Angus Association Sire Evaluation Report*.

[3]Supplemental Sires — Young sires meeting the requirements for the *American Angus Association Sire Evaluation Report*.

[4]Non-Parents — Registered animals born in the last 3 years with no current progeny in the Angus National Cattle Evaluation.

Note: Symbols are used with a registration number to denote important information about an animal. An "F" following the symbol for a genetic condition means the animal has tested free of the condition. A "C" following represents a carrier of the condition, an "A" represents an animal that is affected, and a "P" represents an animal that is a potential carrier by pedigree. The status for a bull listed in this *Fall 2017 Sire Evaluation Report* represents the status of that animal as of **July 7, 2017.**

Symbol	Meaning
#	Pathfinder cow or Pathfinder sire
+	Embryo transfer calf
^	Cell clone
%	Split-ET
@	Clone-ET
AM	Arthrogryposis multiplex
CA	Contractural arachnodactyly
D2	PRKG2 gene mutation for dwarfism
DD	Developmental duplication

Symbol	Meaning
DM	Double muscling
DW	Dwarfism
HG	Horn gene
HI	Heterochromia irides
M1	nt821 mutation for double muscling
NG	Not genomic tested
NH	Neuropathic hydrocephalus
OH	Oculocutaneous hypopigmentation
OS	Osteopetrosis
RD	Red gene

Symbol	Meaning
RTF	Produced 35 or more calves from daughters without a simple recessive genetic defect or genetic factor
SN	Syndactyly
WT	Wild type color gene
XA	Affected of more than one genetic condition
XC	Carrier of more than 1 genetic condition
XF	Free of more than 1 genetic condition

Across-breed EPD Adjustment Factors

Researchers at the Roman L. Hruska U.S. Meat Animal Research Center (MARC) in Clay Center, Neb., develop breed adjustment factors annually so that expected progeny difference (EPD) values can be compared across breeds. This process allows the estimation of across-breed EPDs, sometimes referred to as AB-EPDs. The across-breed EPD concept was introduced in the late 1980s and continues to spark interest with commercial bull buyers using more than one breed of bull. This is mostly due to the fact that without adjustments, the within-breed EPDs cannot be used to directly compare animals of different breeds, since the values are typically computed separately for each breed.

MARC adjustment factors can be added to the EPDs of animals of different breeds, adjusting their EPD values to an Angus equivalent. The adjustment factors, given relative to an Angus equivalent of zero for each trait, take into account breed differences measured in the Germplasm Evaluation Project at MARC, as well as differences in breed average EPDs and base year. Animals of various breeds can be compared on the same EPD scale, after adding the specific adjustment factor to EPDs produced in the most recent genetic evaluations of the representative breeds. Use of these factors does not change differences in EPDs among bulls within a breed. However, it does affect differences among bulls of different breeds.

It is important to remember that EPDs are not perfect when comparing bulls even within a breed; therefore, AB-EPDs are somewhat less accurate when comparing animals of different breeds. AB-EPDs are most effective for selecting bulls of two or more breeds for use in systematic crossbreeding. When evaluating the potential application of AB-EPDs as a tool for a particular breeding program, commercial cow-calf producers must first examine the needs of their individual operations. Producers must diligently review their breed choices and crossbreeding systems in order to provide the best sire selection match to cow genetic type, environment, feed resources and market targets.

With the release of the new Angus NCE, the across-breed adjustment tables from 2016 no longer apply. The USDA will be re-estimating the across-breed adjustment factors based on the new evaluation. When these new adjustments are available, they will be updated at http://bitly/AAA-AB-EPD.