



P.O. Box 10786
Gaithersburg, MD 20898-0786
www.WisdomPanel.com

Dog Name: **Buddy**
Sample ID: **1234567890**
Owner: **Pete Smith**

Registration #: **AKC A123456789**
Breed: **Nova Scotia Duck Tolling Retriever**
Sex: **Male**

March 23, 2011

Dear Pete,

The **Optimal Selection™** computer programs have performed a variety of analyses comparing the DNA sample provided for Buddy with all the Nova Scotia Duck Tolling Retrievers in the Mars Veterinary breed database. The purpose of the attached report is to provide you with a better understanding of your dog's genetics so that you may make more informed breeding decisions. In this report you will find visual comparisons of your dog's DNA to other members of the breed. Upon reviewing the report you will learn about which haplotypes (distinct patterns of markers across specific chromosomes) lay on each chromosome examined. You may find that your dog has some particularly rare or common haplotypes within the breed. It is important to know this information when selecting potential breedings.

Once you have decided the pool of potential matches, have them analyzed with **Optimal Selection™**. You can then request match reports to learn which breeding pairs are the most compatible in order to maximize diversity at the chromosomal level.

Optimal Selection™ is a tool to provide you with a state-of-the-art genetic evaluation for each potential breeding and should be a component of your breeding assessment. Only you have all the information on each dog including temperament, conformation, working ability, and health history. Thus, the final breeding decisions are yours to make.

Thank you for using **Optimal Selection™**. We hope that you find this information useful and it helps you succeed in your breeding program. For additional information and examples, please visit www.OptimalSelectionDNA.com. If you have any questions, please contact our breeder services team at breederservices@marsveterinary.com.

Best regards,

A handwritten signature in blue ink that reads "A. Hughes DVM". The signature is fluid and cursive.

Angela Hughes DVM PhD

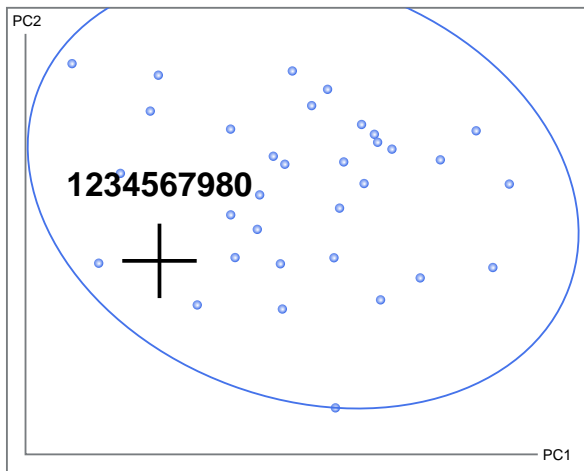
Veterinary Genetics Research Manager



Principle Component Analysis:

Principle component analysis (PCA) allows us to look at the genetic relatedness between dogs or how similar they are. Closely related samples would be expected to cluster closer together than more distantly related samples. Therefore, dogs from the same breed tend to create a cluster of points. However, you may notice some separation between sub-clusters indicating different family lines due to geography (e.g. US vs. UK), variety (e.g. size or coat type), or use (e.g. working vs. show lines).

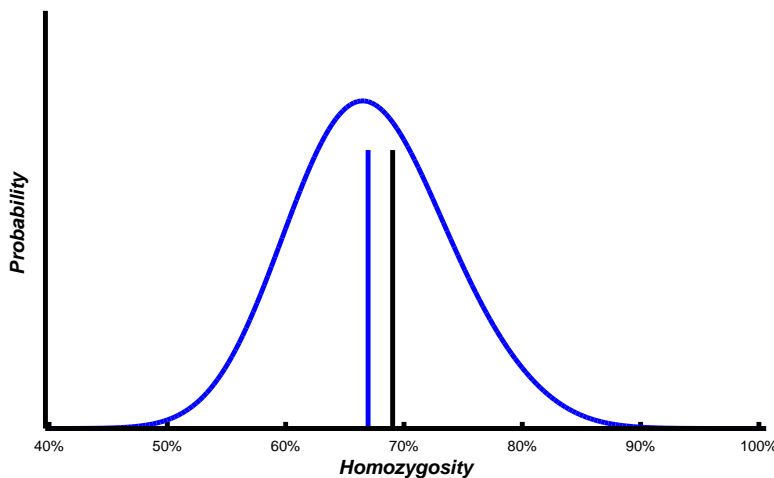
The PCA below shows your dog against the Nova Scotia Duck Tolling Retrievers currently in the breed database.



● Nova Scotia Duck Tolling Retriever

Homozygosity:

Homozygosity is a measure of the percentage of markers examined that are identical because the same marker variant was inherited from both parents. This graph shows the level of homozygosity found in your dog compared to the average homozygosity and range of homozygosity scores that is seen in representative samples of the Nova Scotia Duck Tolling Retriever breed.



● Breed Homozygosity Range

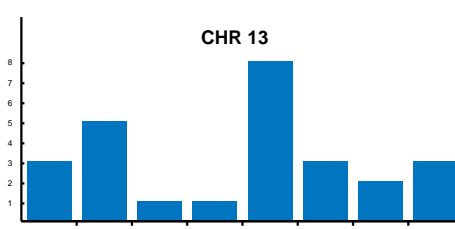
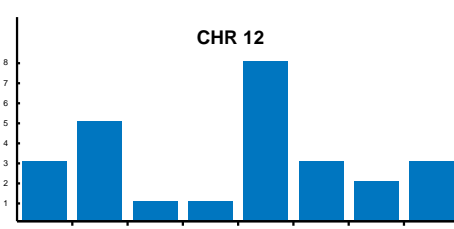
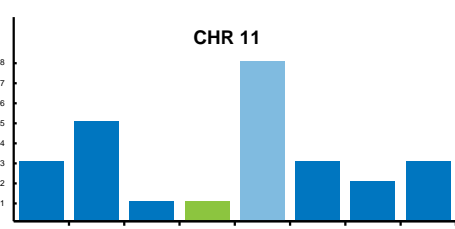
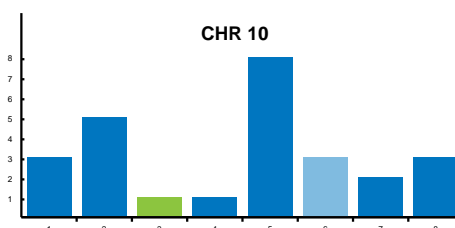
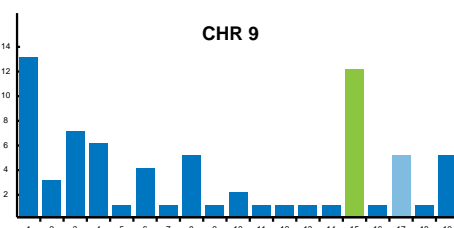
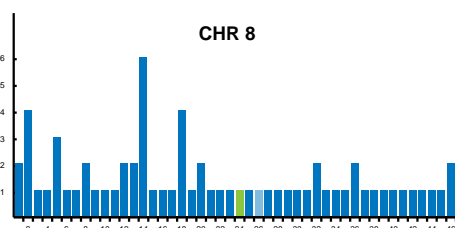
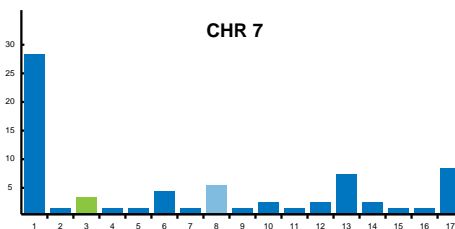
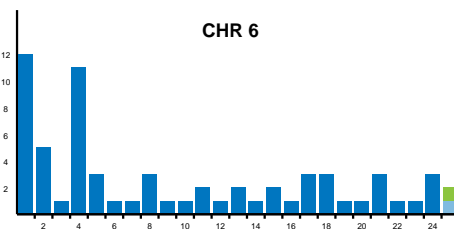
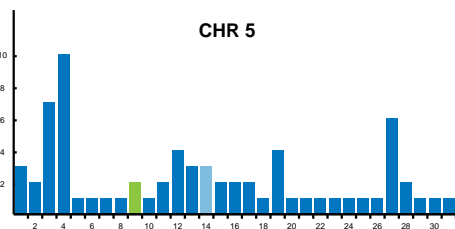
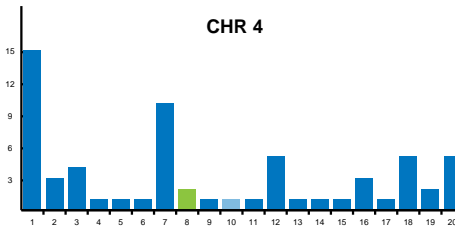
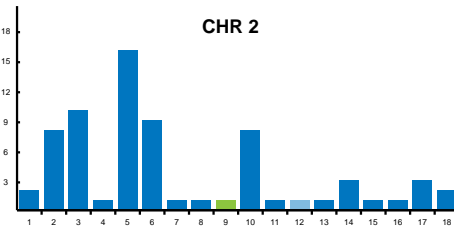
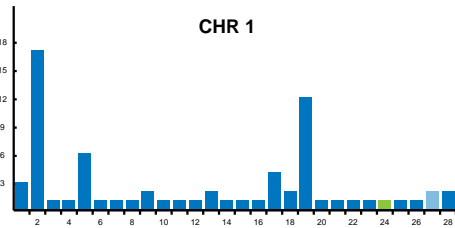
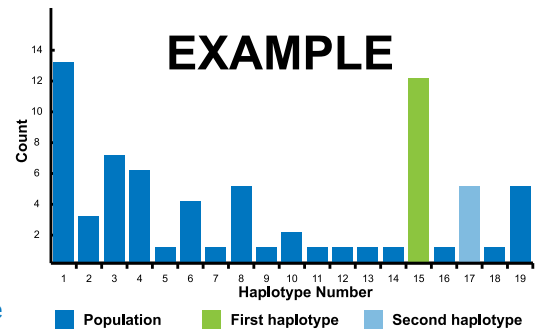
Average Homozygosity: 67%

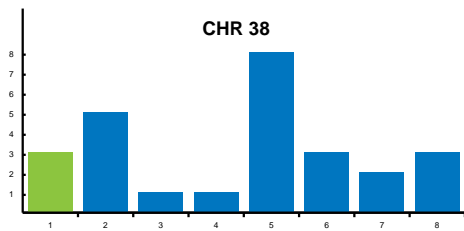
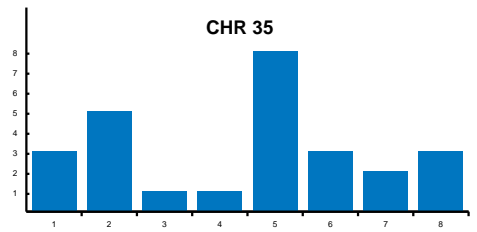
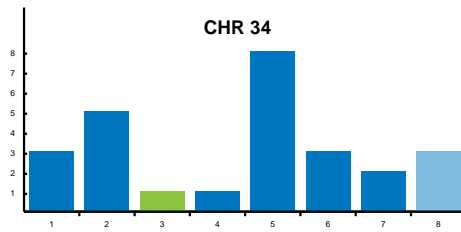
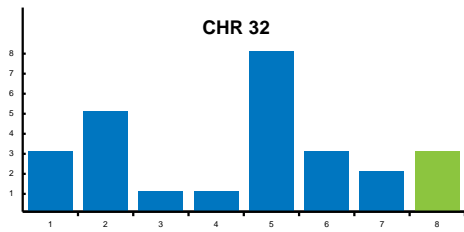
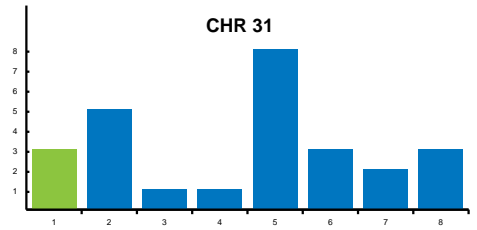
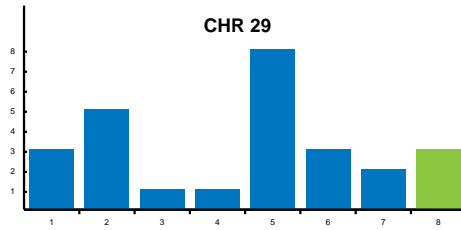
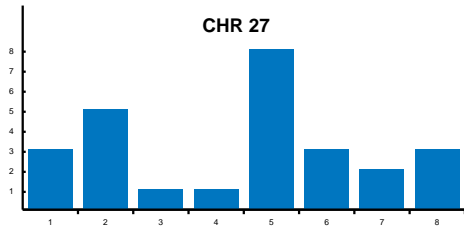
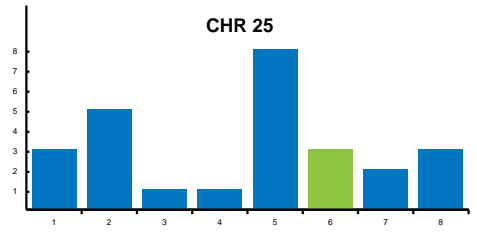
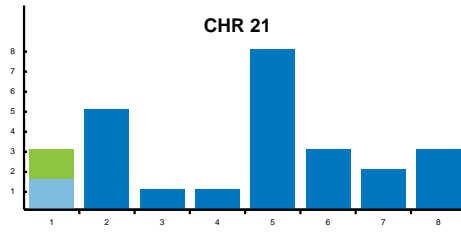
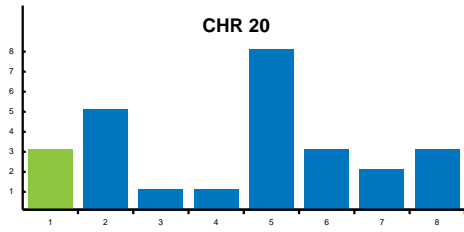
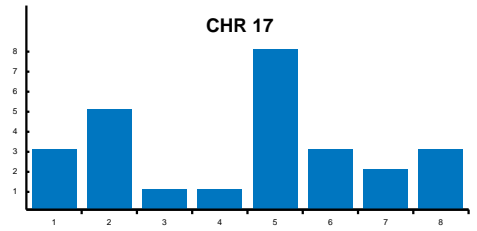
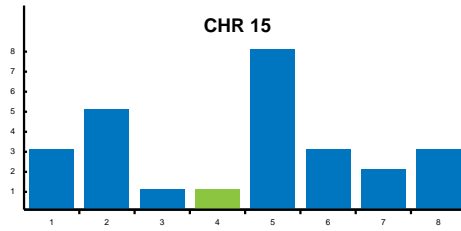
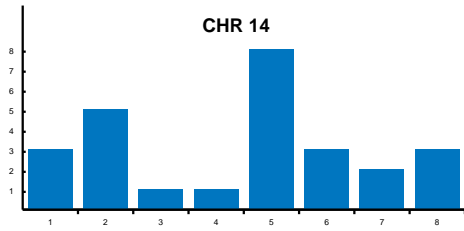
● Dog Homozygosity: 69%

Chromosomal haplotypes:

Every dog inherits two copies of each of their 38 autosomal, or non-sex, chromosomes from their parents. Between those two copies, the majority of the DNA will be exactly the same, however, some small differences can occur. When a specific change occurs in the DNA, it creates an 'allele'. When this DNA change, or allele, is in a gene it may result in an altered phenotype, for example a change in a coat color or risk for a particular disease. To model the underlying genetic information on each chromosome, a number of genetic markers can be examined and a computer program is used to construct the haplotypes in your dog in comparison to the breed. A haplotype is a distinct pattern of markers on a specific chromosome. These marker haplotypes can be used to model the underlying genes and alleles in that region, therefore, two different haplotype patterns likely represent some differences in the underlying genes on that chromosome. The markers used in *Optimal Selection™* currently cover 25 of the 38 autosomes. For a chromosomal list of identified diseases and traits, please visit www.OptimalSelectionDNA.com.

Each graph below represents a different chromosome and the individual bars indicate the different haplotypes available in the breed. The height of those bars shows how common (tall bar) or rare (short bar) each haplotype is for the breed. The two haplotypes identified in your dog are indicated by the green and light blue bars. In the example at the right, haplotype 1 is the most common haplotype in the breed and 12 is an example of a rare haplotype. This example dog carries one copy each of haplotypes 15 and 17. If a single bar is both green and light blue then your dog has two copies of that same haplotype, and is 'homozygous' on that chromosome. An identical haplotype may indicate that the two chromosomes were inherited from a common ancestor or it may be a popular haplotype in the population. A summary table of the haplotypes identified in your dog can also be found below the graphs.





Haplotype Summary Table:

Chromosome	Haplotype 1	Haplotype 2	Chromosome	Haplotype 1	Haplotype 2
1	24	27	15	4	12
2	9	12	17	14	15
4	8	10	20	1	22
5	9	14	21	1	1
6	25	25	25	6	11
7	3	8	27	11	25
8	24	26	29	8	22
9	15	17	31	1	14
10	3	6	32	8	12
11	4	5	34	3	8
12	17	19	35	14	28
13	11	18	38	1	21
14	11	12			

THANK YOU FOR CHOOSING OPTIMAL SELECTION FOR YOUR DOG'S GENETIC BREEDING ASSESSMENT

To best optimize your breeding selection, the information provided in this report should be considered as a tool to assess the genetic material and diversity that your dog carries. The next step is to identify the dogs that you are considering breeding to, have them tested with **Optimal Selection™**, and submit a match request. The match information can then be used to examine multiple potential breeding partners in terms of their genetic compatibility. This will likely reveal that while certain dogs may make less compatible genetic mates, other members of the breed will create better combinations.

Strong consideration should be made to breedings that will reduce the homozygosity of the population over time. This will increase genetic diversity within the individual dogs, with the aim of improving both individual and breed health.

Optimal Selection™ should not be the only means of determining a desirable breeding. However, the diversity of the dogs should be included as a factor in order to maintain the genetic health of your breed. This tool is intended to be used in conjunction with your other means of assessing potential mates based on desired behavioral and physical traits.

NOW FIND YOUR DOG'S MATE...

To request a match report for Buddy, request the Sample ID Code from the owner of each dog you are considering, then visit www.OptimalSelectionDNA.com and enter the dogs' Sample ID Codes in the appropriate spaces. A report will be produced for each match and **both owners will be notified by e-mail** when it is completed. Please allow up to 5 business days for completion of match reports.

Upon receipt of the match reports you can compare the overall genetic compatibility of the potential mates, assess specific chromosomes for overlap, and evaluate the predicted homozygosity of the puppies produced.

SHARE YOUR STORY!

Join our online community of breeders and share your breeding and **Optimal Selection™** experiences with others.

- Register your kennel and upload photos into our **Optimal Selection™** photo gallery.
- Show off your dogs and their puppies on your blog, Facebook, and MySpace profiles.

TERMS AND CONDITIONS:

Optimal Selection™ Genetic Breeding Analysis' proprietary analysis provides guidance in decision making when choosing prospective canine breeding pairs. **Optimal Selection™** is designed and intended to be used on purebred dogs solely to help identify the genetic compatibility of potential breeding pairs and no other purpose is authorized or permitted. It is not intended to diagnose diseases or predict behavior in any particular dog.

Upon receipt of your dog's blood sample, Mars Veterinary will analyze your dog's DNA to determine chromosomal similarities and differences of a potential sire and dam with a reasonable degree of certainty. Mars Veterinary's testing procedures are designed to provide reliable and accurate results. By submitting samples for **Optimal Selection™** it is understood that you agree they may be used confidentially by Mars in conjunction with all other samples from the breed to increase the understanding of the breed's genetic structure. It is understood that future releases of the **Optimal Selection™** test may refine results as more information is obtained regarding the breed structure and/or if new genetic markers are included.

Optimal Selection™ genetic assessment reports for individual dogs will only be available to the person(s) who submitted and registered the sample. Match reports may be requested using the Sample ID Codes for the dogs and will be provided only to the owners of the dogs matched.

In the unlikely event that it is not possible to provide breeding scores, for example due to an insufficient DNA sample, or that an error in the analysis occurs, liability by Mars Veterinary or related companies and individuals is disclaimed and damages in any event are limited to the payment actually received by Mars Veterinary for the specified analysis at issue. Mars Veterinary continues to study the complexities of the canine genome with the goal of continuing to provide the most advanced analysis possible.