# How to use estimated breeding values (EBVs) successfully

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#### Must Have



- Data on all or most dogs bred
- Consistency and accurately measured

## 3 Principles of Genetic Selection:

- Selecting replacement breeders
- Who mates with whom
- How long they remain an active breeder

# Selecting replacemen t breeders



A now-retired stud and two of his puppies screened as potential replacement breeders.

### Select genetically superior candidates for breeders.

Screen 3x as many as you need, best indexes available from a variety of pedigrees.





#### Need 2 breeders, screen 6...

#### **Candidates:** IWDR > Estrus, Puppies, Breeding Colony > Candidates

Dog	Sex	Breed	<u>Sire</u>	Dam	Health Score	IWDR Index Rank $\psi$	BodySensitivity Rank	Chase Rank	Dog Distract Rank	Elbow Rank	Excitable Rank	<u>Hip Rank</u>	HarnessSens Rank	Inhibited Rank	Noise Rank	Object Rank	Skin Rank	Resilence Rank
Yella GEB 2YY15	Female	Labrador Retriever	Gallagher GEB 2G12 GEB Gallagher 2G12	Maura GEB 4M411 GEB Maura 4M411	3	100.00%	96.22%	77.62%	70.54%	80.99%	95.61%	98.09%	68.76%	77.47%	98.55%	93.96%	50.81%	98.07%
Izzie GEB 3II15	Female	Labrador Retriever	Darwin (Durango) GEB 5D413 GEB Darwin 5D413	Haiku GEB 5HH13 GEB Haiku 5HH13	3	99.00%	95.06%	82.38%	70.59%	87.77%	64.16%	84.09%	77.73%	96.19%	98.10%	98.53%	84.49%	97.68%
Yeti GEB 11YY15	Male	Labrador Retriever	Gallagher GEB 2G12 GEB Gallagher 2G12	Maura GEB 4M411 GEB Maura 4M411	5	99.00%	70.39%	89.09%	75.24%	84.94%	95.39%	97.92%	65.24%	76.51%	96.25%	84.78%	84.83%	97.78%
Fitz GEB 2F16	Male	Labrador Retriever	Able GEB 3A311 GEB Able 3A311	Orly GEB 7014 GEB Orly 7014	4	99.00%	86.87%	76.21%	49.53%	97.39%	85.80%	89.17%	63.71%	91.06%	95.80%	96.61%	85.23%	98.41%
Kimberly GEB 7KK15	Female	Labrador Retriever	Garth GEB 6G512 GEB Garth 6G512	Halsa GEB 7HH10 GEB Halsa 7HH10		98.00% Oor Health	79.61%	58.35%	53.51%	87.36%	93.50%	95.37%	11.18%	82.11%	91.14%	89.07%	42.96%	99.47%
Kagan GEB 4K16	Male	Labrador Retriever	Vito GEB 7VV14 GEB Vito 7VV14	Rita GEB 8RR12 GEB Rita 8RR12	3	98.00%	91.23%	97.48%	61.70%	98.58%	91.72%	79.01%	64.80%	55.13%	99.95%	88.17%	42.67%	95.57%
Vic GEB 5VV15	Male	Labrador Retriever	Sierra 154/13/LR KNGF Sierra	Magnolia GEB 4M12 GEB Magnolia 4M12	3	97.00%	96.59%	81.73%	94.68%	86.29%	99.44%	62.96%	78.30%	45.65%	65.35%	56.92%	68.94%	96.68%
Rais GEB 7RR15	Ale	Labrador Retriever	Dax GEB 4D14	Delphi GEB 7D413 GEB Delphi 7D413	3	94.00%	80.08%	72.00%	61.44%	96.45%	78.86%	47.86%	66.44%	72.10%	96.37%	91.21%	71.54% 5	98.35%



# Choosing mates



A German Shepherd brood sits in front of a tank of frozen semen.



#### Mating Decisions (Test Matings): IWDR > Breed Stock Data & Test Matings

VDR DogID		Search Name 个		Sex Birth Year		Breed		Status Details			Dam			Total Litters Total Progeny			
33	38	Violet GEB 3VV19		F 2019	L	abrador Retriever	Breedin	g Active	Zinc	GEB 8ZZ17	Courtney GEB	8C414 GEB Courtne	ey 8C414		2	10	
s	Birtus Date	s Genotypes By Do	og - All	Genotypes By Dog - No Ris		Genotypes By Dog	- Risk Genotypes	Genotypes By Dog - Active		th Diagnoses - All (	data 🕜 🛛 Health I	Diagnoses - All with	gnoses - All without normals 🕑		g Relationships	s Private Notes 🖸	Sire Litters 🕑
					11								<i>u</i>		<i>n</i>		
	COI (Inbreeding)	of Proposed Litter 个	Parent 2	2 P2 IWDR Index Ra	nk <u>Note</u>	s Parent 2 Breed	P2 Activated Stre	ss P2 Body Sen	<u>isitivity</u>	P2 Chase Rank	P2 Dog Distractio	n P2 Elbow Rank	P2 Excitable	P2 Harness	P2 Hip Rank	P2 PennHIP Rank	P2 Inhibited Stre
	<sup>0.10</sup> Medic	cal concern	Baron GEB 4B20	53.00%		Labrador Retriever	70.62%	95.38%		83.82%	81.49%	92.29%	62.37%	74.06%	49.36%	91.89%	46.77%
	0.11 Used r	recently	Carbon (Maui) GEB 4C413	99.00%		Labrador Retriever	71.87%	97.99%		83.06%	30.41%	93.59%	81.70%	73.79%	92.93%	59.47%	92.87%
	0.12 Ma	ixed out	Kisco GEB 6KK18	87.00%		Labrador Retriever	90.30%	73.49%		10.35%	39.79%	94.83%	65.85%	99.61%	52.49%	95.52%	71.24%
	0.12 Ch	iosen stud	Denny GEB 8D21	64.00%		Labrador Retriever	73.66%	59.04%		88.08%	87.69%	73.52%	42.66%	98.22%	80.82%	98.09%	63.11%
	0.12		Darren GEB 4D20	52.00%		Labrador Retriever	57.58%	95.26%		72.74%	84.36%	97.25%	69.57%	88.21%	63.76%	88.03%	14.88%
	0.14		Edison GEB 1E416	94.00%		Labrador Retriever	88.69%	96.60%		91.43%	56.44%	91.83%	60.51%	74.59%	54.75%		84.79%
	0.14		Midnigh GEB 4M19	t 86.00%		Labrador Retriever	52.89%	75.41%		91.11%	92.77%	97.94%	63.59%	86.36%	59.75%	91.62%	98.15%



Lowest inbreeding





Stud genetically strong where brood is not so genetically strong



Avoid producing carriers where genetic tests are available



**Monitoring Inbreeding:** IWDR > Estrus, Puppies, Breeding Colony > Colony Reports-COI Inventory > Colony Size Age Inbreeding





Limit each stud's number of matings – within own colony AND among population where he is shared.

#### Limit depends on effective population size.

- Ideally want ≥20
- Considers how many breeders contribute to the last year of production, or several years if small colony
- Bolstered by saving semen on studs not actively saved and/or collaborating with organizations of similar quality & goals

#### Downloadable chart can help you calculate effective population size.



Effective population size ( $N_e$ ) = Genetically effective number of breeding animals Effective population size should be as large as possible.

#### Effective Population Size Spreadsheet / Calculator

Click here to download the .xlsx file – Effective Population Size Calculator.

https://www.iwdr.org/master-knowledge-base/effective-population-size/

# Who to retire and when?



A retired stud and his great-granddaughter, now also retired.





- Limit progeny from each stud.
  - Know how many you need to replace in next quarter.
  - Screen 3x as many, look for males with index higher than these.
- Some males are problematic due to own health, very low index, or other factors not in index: then replace with genetically better dog before reaching limit UNLESS offering something like diversity.
- Better to use strong, single-use or FS mating with stud going to/in Training than continue using very poorly ranked active stud.
- Also consider fertility: semen quality, conception rate. (IWDR provides via Breed Stock records)
- Same concepts apply to broods. <sup>12</sup>

## Summary

- 1. Identify genetically best candidates
- Select highest index dogs representing a variety of families.
- Screen 3x as many as needed for replacement breeders.
- Team of experts performs screening, informs one decision maker.
- No dog is perfect. Keep the best of what is available in the needed quantity & continue using genetic principles to guide future improvement.

## 2. Select genetically strong mates

- Minimize inbreeding in each mating. Overall, keep inbreeding increase ≤2% per generation.
- Don't mate two carriers where genetic tests are available.
- Don't repeat same stud x brood combination.
- Use studs equally.
- Stud good where brood is not so good. (Make sure not all pairs are low x high EBV!)

## 3. Determine how long they will be active breeders

- Limit progeny from any one breeder, within own colony and elsewhere. (Consider effective population size.)
- Replace problematic/weak dogs with genetically stronger dogs before limit is reached unless they offer something else significant like diversity.
- Consider fertility (e.g. semen quality, conception rate).
- Use frozen semen and/or collaboration to bolster population size/genetic merit.

# Questions?

