

Introduction

This manual has been developed as a study guide for the Florida State Fair Skillathon which is part of the Champion Youth Program. The topic for this year's Skillathon is **reproductive management**. Animal reproduction has become a complex science that involves a series of physiological and psychological events that must be properly timed and managed. Reproduction has at least three purposes within the animal industry: 1) perpetuation of the species; 2) genetic improvement; and 3) to provide food.

The Florida State Fair recognizes that agricultural education instructors, 4H agents, parents, and leaders provide the traditional and logical instructional link between youth, their livestock projects and current trends in the animal agriculture industry. **PLEASE NOTE:** This manual is provided as a **study guide** for the skillathon competition and should be used as an additional aid to ongoing educational programs.

Sections are labeled **Junior, Intermediate & Senior, Intermediate & Senior, or Senior** to help exhibitors and educators identify which materials are required for each age level.

****Denotes additional information in the study manual for preparing for the Champion of Champions competition but not required as part of the skillathon.**

The knowledge and skills vary by age group and may include:

Juniors (age 8-10 as of September 1, 2011)

Breed Identification
Selection: Visual Evaluation

Intermediates (age 11-13 as of September 1, 2011)

all of the above plus...
Male and Female Reproductive Anatomy
Reproductive Functions
General Management Practices

Seniors (age 14 and over as of September 1, 2011)

all of the above plus...
Breeding Management Practices
Selection: Pedigree/Performance Evaluation

GOOD LUCK!



Rabbit Breed Identification

Rabbits are selected for traits that are considered economically important. A purebred rabbit is one that has the characteristics defined by a breed registry and purebreds are expected to pass those traits on to their offspring with a high degree of predictability. Crossbreeding has been used to develop new lines of rabbits that are now considered purebreds because they have a set of traits that are consistently passed on and a breed registry has been established. Some breeds of rabbits and their descriptions are listed below. The American Rabbit Breeder's Association (ARBA) recognizes 47 different breeds of rabbits. Visit the official website of the ARBA to learn more about the breeds of rabbits listed here as well as others not listed. <http://arba.net/breeds.htm> Clicking on a breed picture will link you to that breed's website.



Californian:

This commercial breed is best known for its meat-producing qualities. The body is medium in length with a depth equal to its width. The profile is to rise gradually from the front of the neck to the highest point over the hips. This breed was developed in 1928 and is white with a black nose, ears, feet and tail. At maturity, bucks ideally are 9 pounds and does are 9 ½ pounds.



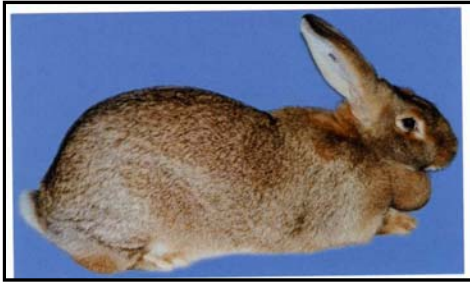
Dutch:

This breed is one of the oldest breeds and is said to have originated in Holland. There are six varieties of this breed: black, blue, chocolate, tortoise, steel and gray. Although small in size, 3 ½ - 5 ½ pounds at maturity, this breed carries a lot of meat on its compact body type. These rabbits have a unique distribution of points in the Standard of Perfection, with 50 points out of 100 devoted to markings.



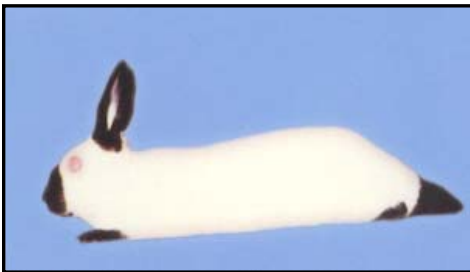
Florida White:

Developed in Florida, this breed has a close coupled, meaty body type with well-developed shoulders, hips and hindquarters. This breed comes only in red-eyed white and is characterized by fly-back, normal fur. A small rabbit, this breed is ideally 5 pounds at maturity.



Flemish Giant:

Possibly dating back to the 1500's the Flemish Giant is one of the original rabbit breeds. The Standard requires a 14 pound minimum for adult rabbits; it is one of the largest rabbit breeds today. Accepted colors include: Black, Blue, Fawn, Light Gray, Sandy, Steel Gray and White. The Flemish Giant should be a well-balanced animal with a gradual arch starting from behind the shoulder blades. This breed is used in many commercial meat rabbit crosses, but has limited use as a meat rabbit itself.



Himalayan:

This is the only breed that has cylindrical type, characterized by a long, narrow body. They are white with color on their ears, nose, feet and tail. Accepted colors are Black, Blue, Chocolate and Lilac They reach 2 ½ - 4 ½ pounds at maturity. The Standard specifically states this breed must be posed stretched out on the show table.



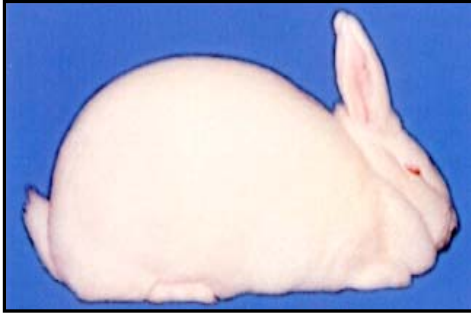
Holland Lop:

Developed in the Netherlands, this breed is shown in two varieties, solid and broken. This fancy breed is known for its good-natured personality and lovable face. The smallest member of the lop family; this breed only reaches 4 pounds at maturity.



Jersey Wooly:

This short, compact breed is one of the newest to the Standard. The body type resembles that of a Netherland Dwarf, but it is covered in wool instead of fur. Although the wool can be spun, the Standard recommends it should not be used for commercial purposes. This breed is shown in five groups: Agouti, AOV, Self, Shaded, Tan and Broken. A small, fancy breed, these rabbits are only 3 ½ pounds at maturity.



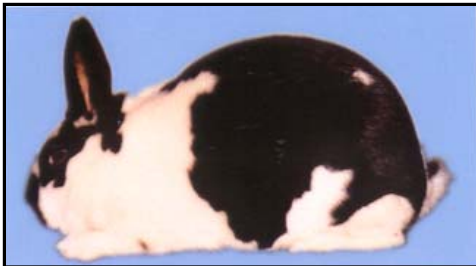
New Zealand:

Accepted by the A.R.B.A. in the mid 1920's, this commercial breed comes in three different varieties: Black, Red and White with white being the most popular for laboratory use. At maturity, this breed's bucks weigh at least 9 pounds and the does, 10 pounds. They are known for their excellent meat producing qualities.



Rex:

Though its fur is the standout characteristic of this breed, a commercial meat body is found under the velvety pelt. An extremely dense, plush coat with guard hairs almost as short as the undercoat gives the Rex its name. The colors appear deeper in hue compared to a normal rabbit coat due to the unique texture. This breed has fifteen different varieties: Black, Black Otter, Blue, Broken, Californian, Castor, Chinchilla, Chocolate, Lilac, Lynx, Opal, Red, Sable, Seal and White. These make wonderful meat rabbits reaching up to 10 ½ pounds when mature.

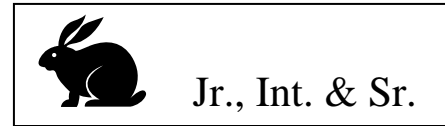


Satin:

This unique commercial breed gets its name from the satin sheen the fur gives off. This quality is a mutation of the normal hair shaft that turned it translucent. This breed has eleven different varieties: Black, Blue, Broken, Chocolate, Chinchilla, Californian, Copper, Otter, Red, Siamese and White. They have a medium-length body with depth that equals its length. These too are excellent meat rabbits, reaching up to 10 ½ pounds at maturity.

Adapted from the A.R.B.A. Standard of Perfection, 2011-2015, and Official Guide to Raising Better Rabbits and Cavie.

Selection: Visual Evaluation



Many traits of economic importance can be evaluated by simply looking at the animal. In purebreds or registered animals, the “ideal” is usually described or illustrated by the breed registries like the ARBA Standard of Perfection. Most rabbit show judges are trained to evaluate the way the animal looks, moves, and feels to make their decisions on class placings. Learn to evaluate rabbits by type, structure and color patterns and be familiar with faults and disqualifications.

Feet and Leg Structure

How well an animal can stand and move around will have a major impact on its ability to find food, mate and care for its young. Often, an animal that stands correctly will move freely while a crooked legged animal may have trouble getting around and may become sore or lame. Feet and leg structure as well as movement are important evaluation criteria for breeding animals. Rabbits should be straight legged, free from sore hocks, with clean, well furred feet.

Criteria for Selection

The criteria listed below are commonly considered most important in evaluation of rabbits. The priority or emphasis placed on each may change with market demand, breed, age, management scenario and performance data.

General type - varies greatly and depends on intended use.

Includes evaluation of:

Body	Fur	Pedigree
Head	Color	Breeding Record
Ears	Condition	Overall Health

Some criteria considered faults for show rabbits of all breeds include hutch stains, stray white hairs in colored fur, poor tail carriage, poor ear carriage, poor eye color, flabby or overly fat, thin or extremely poor flesh condition, and specimen in molt. Disqualification can arise from ailments like ear canker, abnormal nasal or eye discharge, tumors, hernia, and infestation with mites, fleas or lice. Other factors related to structure (eyes, legs, ears, teeth, toenails, etc), color or color pattern, or altering appearance that can lead to disqualification are outlined in the Standard of Perfection. Learn more about judging rabbits visually by visiting:

<http://cru.cahe.wsu.edu/CEPublications/em4502e/em4502e.pdf>.

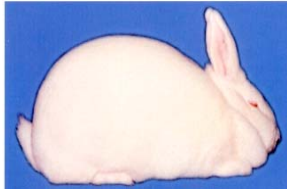
Rabbit terms are listed at: <http://www.angelfire.com/tx3/rabbitpad/terms.html>

When selecting breeding stock, it is important to choose a breed with a body type that will help you meet your production goals. There are five different body types found in rabbits: Commercial, Compact, Cylindrical, Full-Arch and Semi-Arch. Those body types are described and illustrated below.



Jr., Int. & Sr.

Commercial:



Rabbits with commercial type are considered to be the ideal meat type. They are medium in length, with depth equaling width and showing roundness of body. This group is posed down on the table. Included in this group are: New Zealand, Californian, Crème d'Argent, Champagne d'Argent, Hotot, French Angora, Giant Angora, Satin Angora, Cinnamon, American Chinchilla, French Lop, Harlequin, Palomino, Rex, American Sable, Satin, Silver Fox and Silver Marten.

Compact:



Most rabbits with compact body type possess commercial type characteristics, but are smaller. Most of this group is posed down on the table, but a few are posed standing up. Included in this group are: American Fuzzy Lop, English Angora, Standard Chinchilla, Dwarf Hotot, Dutch, Florida White, Havana, Holland Lop, Jersey Wooly, Lilac, Mini Lop, Mini Rex, Netherland Dwarf, Polish, Mini Satin, Thrianta, and Silver.

Cylindrical:



This group has a type that is long, slim, and cylindrical with fine bone and a long slender body. They are posed stretched out on the table. This group includes one breed, the Himalayan.

Full-Arch:



Rabbits with the full arch type show an arch (rise) starting from the back of the neck over the body. Most rabbits in this group show more depth than width, and pose standing up. Most are allowed to move naturally on the show table. Included in this group are: Belgian Hare, Britannia Petite, Checkered Giant, English Spot, Rhinelander and Tan.

Semi-Arch:



Rabbits with semi-arch (mandolin) type show an arch (rise) starting from **behind** the shoulders and over the body. This group is posed down on the table, but may be allowed to move about for further evaluation. Included in this group are: American, Beveren, English Lop, Flemish Giant and Giant Chinchilla.



Int. & Sr.

Reproduction Overview

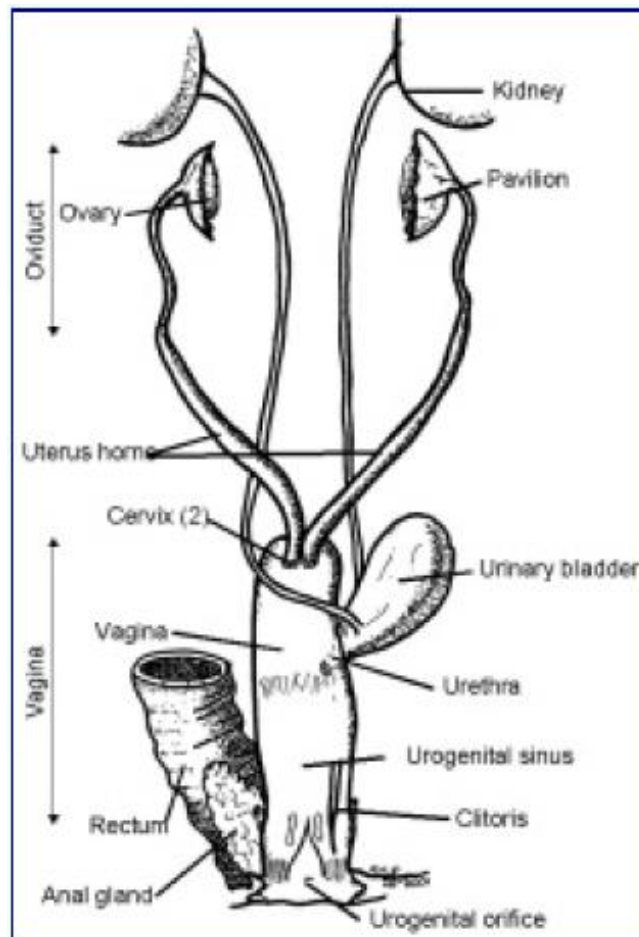
Puberty is reached when a rabbit is able to reproduce (4-8 months of age or 75-80% of mature body weight). Sexual reproduction begins with the buck and doe mating, called *copulation*. Rabbits do not have heat cycles so mating occurs throughout the year when the doe will accept the buck. During mating, the buck deposits *sperm* in the reproductive tract of the doe. Rabbits are *reflex ovulators* meaning the act of mating causes release of eggs from follicles on the ovary of the doe. *Fertilization* is the union of sperm and egg cells. The number of young or *kits* a rabbit gives birth to at one time is an indication of the number of egg cells released and fertilized. The normal *gestation* period or pregnancy in the doe lasts 30-33 days followed by *parturition* or *kindling* which is the process of giving birth.

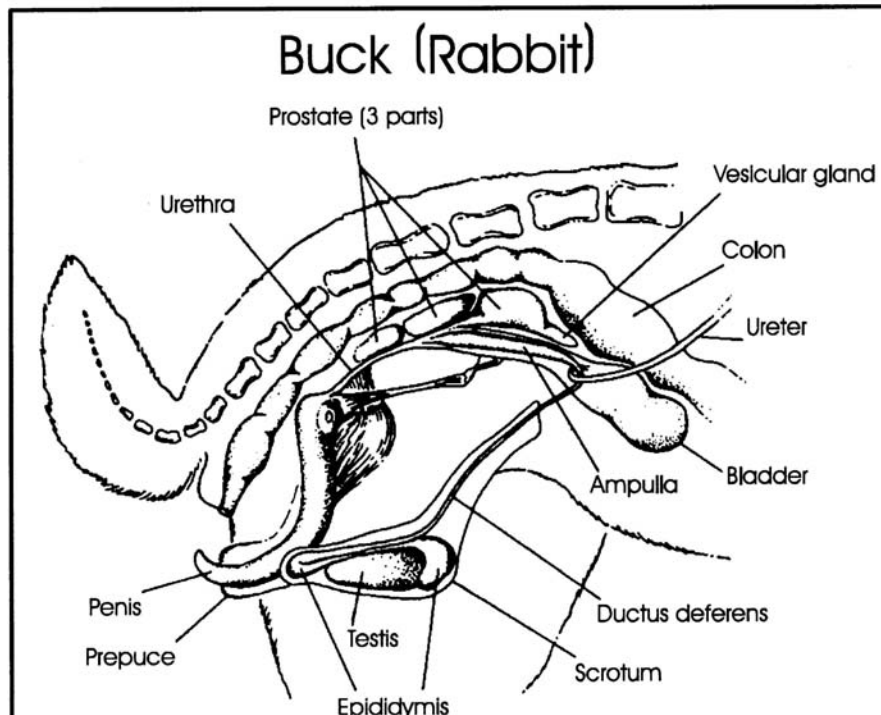
Reproductive Anatomy

Rabbits are able to give birth to multiple kits at each kindling and may have multiple litters per year. Understanding reproductive anatomy is basic to managing reproduction.

http://www.medirabbit.com/EN/Uro_gen_diseases/generalities/female_organ.PDF

Doe (Rabbit)





Reproductive Functions

Once you know the names of all of the reproductive structures, the next step is to understand the role of each part. Understanding normal functional anatomy allows the manager to apply reproductive management tools.

Female Functional Anatomy

Ovaries Paired female gonads that produce eggs and hormones. Follicles are blister-like structures that grow on the ovary which produce estrogen (causes doe to allow mating) and release the eggs at ovulation (rupture of the follicle). Following ovulation, the remaining cells change and form the corpora lutea which produce progesterone (maintains pregnancy).

Oviducts Two tubes that connect the ovaries to the uterine horns. The oviducts transport eggs and sperm cells, are the site of fertilization and move the fertilized ova (eggs) into the uterus.

Uterus Supports, nourishes, and protects the embryos as they develop and expels the fetuses at parturition. Walls are soft and spongy in non pregnant animals. Unlike other farm animal species, the rabbit has no uterine body; rather it is made up of two distinct, separate uterine horns.

Cervix Rabbits have two cervixes, each made of a thick-walled tube connecting directly to the uterine horns. The cervixes prevent microbial contamination of the uterine horns and serve as a reservoir for and transport of sperm. The cervixes are also part of the passageway for delivery at kindling.

Vagina The passageway from the vulva to the cervix that serves as the organ of copulation and birth canal during parturition. This is the site of semen deposit. The urethra enters the floor of the vagina.

Urethra Tube connecting the bladder to the vagina that serves as a passageway for urine excretion.

Vulva External opening of the female reproductive tract.

Male Functional Anatomy

Scrotum

External sac; contains, supports, protects and provides temperature control for the testes. Bucks have the unique ability to retract the testicles into the abdominal cavity when threatened.

Testicles or Testes

Paired male gonads that produce the sperm cells and the male sex hormone, testosterone.

Epididymis

Long coiled tube that sperm enter upon leaving the testicles. It is the site of sperm storage, concentration, maturation and transport.

Vas deferens

Long tube that connects the epididymis to the urethra near the bladder and transports sperm. The ampulla is the section that dumps into the urethra.

Seminal Vesicles

Paired glands that secrete seminal fluid into the urethra which serves as a transportation medium and provides protection for sperm.

Prostate

Found near the urethra and the bladder. It adds fluid to the semen.

Bulbourethral Gland

(Also referred to as the Cowper's gland.) Secretes a fluid similar to that of the seminal fluid that flushes urine residue from the urethra.

Urethra

The tube that passes through the penis and is the common passageway for semen and urine.

Penis

Organ used for copulation that deposits sperm into the female reproductive tract. Rabbits do not have an S-shaped bend called the sigmoid flexure, found in other species, which allows the penis to be retracted into the body by the retractor penis muscles.

Prepuce

Fold of skin serving to protect the penis by enclosing the free end when retracted.



General Management Practices

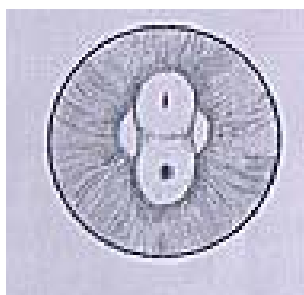
Handling and Restraint

Rabbits are generally timid and excitable. They may resist handling and can cause harm to themselves as well as the handler. Due to this you must practice proper restraint. When carrying a rabbit, its head should be tucked into the crook of the arm that is supporting the hind quarters. This allows the handler to control the animal with one hand leaving the other hand free to open doors and cages. Never pick a rabbit up by the ears as it can cause pain and damage to the cartilage in the ears. In a cage or resting on a table, a rabbit should be grasped by the scruff of the neck with one hand and supported in the rear quarters and back with the other. If the rear quarters are not properly supported, expect a powerful kick. For sexing, rabbits can be grasped by the scruff of the neck and turned over using the hand that is supporting the rump. The rabbit is tucked under the arm that is holding the scruff of the neck and sexing can be done with the free hand. To check for pregnancy, restrain the rabbit belly down on a non-slippery surface with one hand holding the ears or a fold of skin over the shoulders and place the free hand under the body slightly in front of the pelvis.

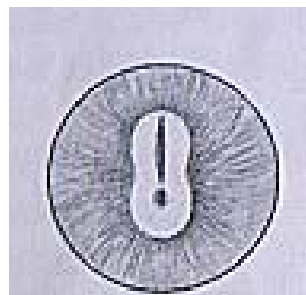
Gender Determination

Knowing if your rabbit is a male or a female is useful in making management decisions and to prevent unwanted pregnancies. Older animals give you clues by the way they look. Bucks usually have a blockier head and body than does. Does usually have much larger dewlaps than bucks (the dewlap is the large fold of skin under the chin). On a hot day, the older buck's testicles may protrude from the body as a means of keeping them cool.

Sexing younger rabbits from 3 weeks of age is tricky but not impossible with a bit of training and practice. This is done at close range by laying the bunny on its back, upside down in your lap, placing the palm of one hand behind the ears and the thumb in front of the ears, placing the thumb and index finger of your free hand on opposite sides of the sex organ and applying gentle pressure. At around 6 weeks of age, the organ of the buck will appear rounded with a small hole, while the doe will appear slit-like or V-shaped. With increasing age, the differences will become more obvious.



Young male with testes partially descended.



Female with slit-like genital opening.

<http://www.pet-informed-veterinary-advice-online.com/sexing-rabbits.html#rabbitsex>



Breeding Management Practices

Mating

Unlike most mammals, rabbits do not have regular estrous cycles. Instead, they are ready to breed about 12 out of every 15 days. Does that are receptive to the buck will often lift their hind end upwards if touched on their hindquarters, even if a buck is not nearby. Often the vulva will appear bright pink to purple in color rather than being pale. Some does show no signs while others may show signs and yet not accept the buck. If the doe does not get pregnant after mating, she may go through false pregnancy “pseudo pregnancy” for 17 days. Most does will not breed during this time, but will make a nest. See the Rabbit Breeding Schedule on Pg 13.

When breeding rabbits by natural mating, it is important to NOT bring the buck into the doe’s cage but to take the doe to the buck. Many does object to having another rabbit placed into their territory and will often attack or injure the intruder. Another problem is that the buck will investigate the new surroundings, mark his territory, and not be interested in the doe. If everything is done correctly and the doe is receptive to the buck, mating will occur immediately. After the mating is complete the buck will usually fall over on his side and the doe should be returned to her cage immediately. Sometimes the doe will squat in a corner and will not accept the service. If the doe will not accept the buck she can be placed with another buck to see if she is receptive to him. If she still does not accept the buck, she should be returned to her cage and rescheduled for the next day. A doe may be non-receptive for several days. A buck and doe should NOT be left together unattended for more than a few minutes because the buck may become injured. It is thought that allowing the rabbits to breed again 1 to 12 hours after the initial mating may increase litter size. <http://www.fao.org/docrep/t1690E/t1690e05.htm>

Palpating

A doe may be checked for pregnancy 12 to 14 days after mating. Restrain the doe in your lap, or on a flat surface, and reach one hand under to the area between the hind legs. With the thumb on one side and the fore finger on the other, press slightly and move the hand gently back and forth. The fetuses will feel like small marbles slipping between the thumb and fore finger. Use caution to avoid bruising or abortion.

Kindling

About 3 weeks after the doe has been bred it is time to prepare for kindling. At 29 days post breeding, a nest box should be placed into the cage to allow her to start a nest. If the nesting box is placed in the cage too soon, the doe may use it as a litter box and it will be unsanitary when the kits arrive. The size of the nest box will vary depending upon the size of the doe. (Dwarfs: 12" long x 8" wide x 8" tall - Medium: 15" long x 10" wide x 10" tall - Large: 18" long x 12" wide x 12" tall)

Materials such as straw or shavings should be placed in the pen to be used by the doe in building her nest. After building the nest, the doe will pull fur from her hips, dewlap, and mammary glands to complete the nest. A doe’s appetite will usually decrease 2 to 3 days before kindling. She should be left alone at kindling as there are no real problems that should

occur if the kits are of normal size. In some cases there are only a few kits, and in these cases one or two may be abnormally large and they are usually a day or two late. As each kit is delivered, the doe licks it and may nurse it immediately. When the entire litter is kindled, the doe will pull out more fur and cover the litter. Kindling the entire litter often takes less than 15 minutes. The doe will eat the placentas, probably an instinct that developed to prevent attracting predators.

Care of kits

Kits are born with little fur and their eyes closed. They need to be in the nest in order to survive. A doe must be checked after she kindles to make sure she cares for all of her young. If she happens to kindle on the hutch floor rather than in the nest box, the young must be warmed and placed in the nest box so that they will not die from exposure. The doe will not move a kit that falls out of the nest.

If a doe becomes frightened at kindling time or just after, she may jump into the nest box and injure or kill the kits by stamping her back feet. Another cause of loss at kindling time is cannibalism. It is not common, but can happen if the doe does not have an adequate diet or becomes disturbed, nervous, or frightened after kindling. These problems can be prevented with proper supervision, by providing a good diet and by using care around the doe. If kits have chewed toes or go missing, do not assume the doe is eating them. Sometimes rats, snakes or opossum will eat the kits or chew their toes so the nest boxes should be well protected.

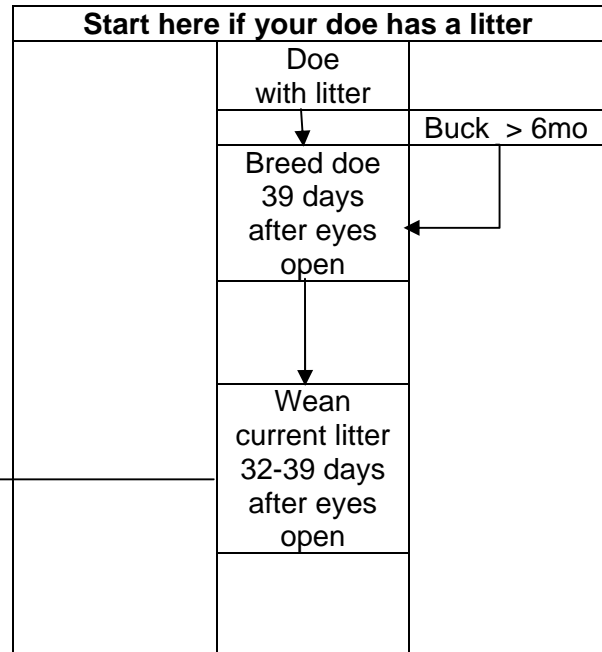
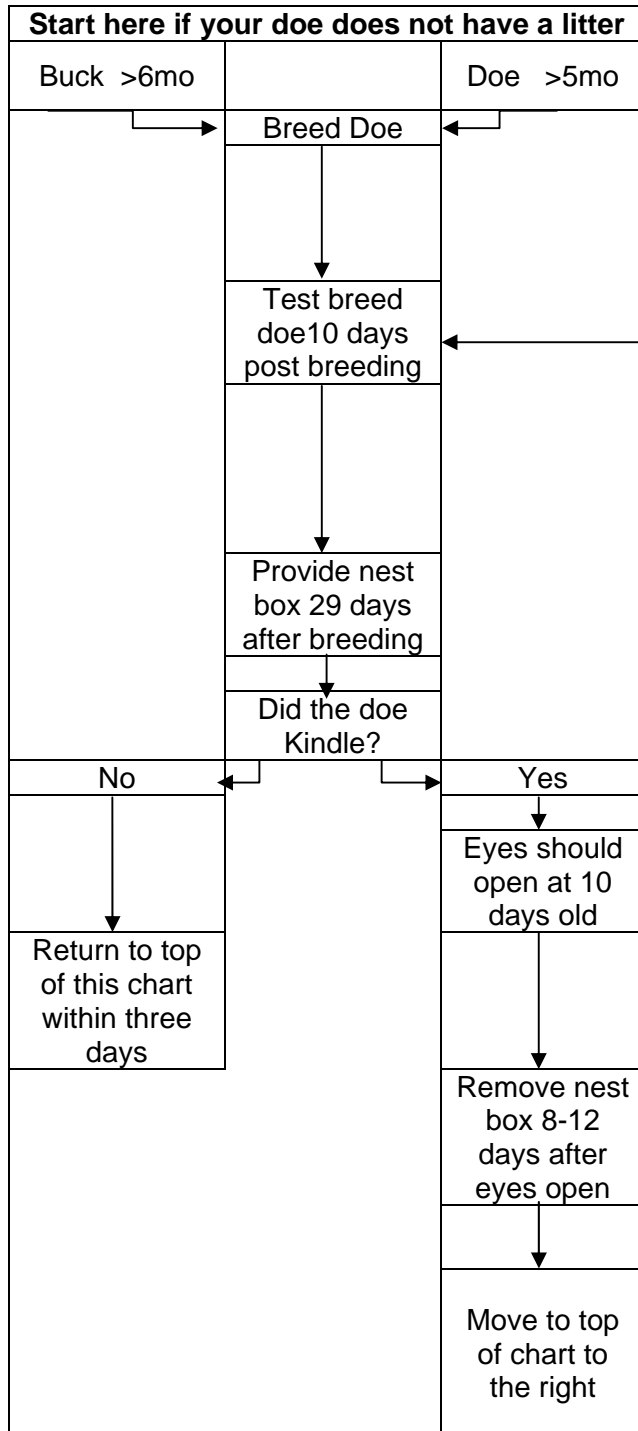
At day 10, the bunnies will be covered with fur and their eyes will open. They may start to climb out of the nest box at that time. They start to eat solid food between 11 and 14 days old. If it is necessary to foster babies to another litter, it is important to do it before day 12 so the doe will be less likely to reject them. The nest box should be removed between day 14 and 20, depending on the weather.

Weaning should occur between 6 to 8 weeks after birth. To enhance record keeping, tattoo the kits after weaning. The individual number, given by the breeder, is tattooed in the left ear.

Keep Accurate Records

Good management requires accurate record keeping. Many commercial record systems are available at very little cost. Choose one and stick with it. Planning and preparation prevent poor performance. Using the schedule below, you can plan calendar dates on which to perform various breeding management practices.

Rabbit Breeding Schedule



- Notes:
- When weaning, remove a few kits at a time over a period of 7 days
 - If the litter dies, rebreed the doe one week after the birth.
 - Upon weaning, sort litter based on sex, evaluate quality, tattoo ears, and schedule first breeding when 6-8 months old.
 - Never keep mature rabbits together past the age of 4 months.
 - Several times a year, evaluate the productiveness of each mature rabbit and consider removing non-producers.

Adapted from: <http://www.debmark.com/rabbits/breeding.htm>



Selection: Pedigree/Performance Evaluation

Proper selection is a critical factor in establishing a good breeding program. The goal of animal selection is to produce an animal that will yield/produce high quality products at a low cost to the farmer and the consumer. This goal is the foundation of the standard “ideal animal” in the various species. That is, the animal that expresses, to the highest degree, traits that are of economic importance like milking ability, litter size, body weight, carcass merit or even coat color is the type selected.

The expression of observable or measurable traits is called the animal’s *phenotype*. Phenotype is affected by both heredity and environment. The inherited portion of a trait is referred to as *genotype*. How well an animal expresses the genotype is affected by the environment in which it is raised. Therefore, when making selected matings, use and management of the offspring should be considered.

We use both visual appraisal and performance records when selecting breeding stock. The following section outlines various traits and methods used to evaluate breeding animals. Use and management are expressed as *scenarios*.

Performance Evaluation

How an animal looks may be important on the show table but how that animal performs is more important to the farmer. With advancements in the understanding of heredity and the increased use of computers for keeping records, the use of genetic information in selected matings has become easier. By keeping records on desirable traits and then carefully selecting males and females to be mated using the available data, producers can improve the genetics, and thus the performance of their offspring.

Performance Data

There are several types of performance data that, when used properly, are important tools in the selection and genetic improvement of animals. Many breed associations and commodity groups provide information, assistance and technical support to producers wishing to collect and use performance data.

Conception rate
Litter size born
Litter size weaned
21 day total litter weight
56 day total litter weight
Dressing percentage
Type

RABBIT SHOWMANSHIP

Rabbit showmanship is quite different from that of other animal species. Rabbit showmanship involves thoroughly examining an animal as a judge would do in competition. Each step that a youth forgets to complete is counted against their overall score. Appearance of the exhibitor and their knowledge are two other areas important in this competition.

ATTIRE:

Required Dress Code: All exhibitors will be required to be clean and neat and dressed in white, green, dark blue or dark black jeans or slacks with a solid white shirt with a white collar. FFA and 4-H accessories are strongly recommended. No caps or hats. Closed-toed shoes or boots are required.

The following is a list of actions exhibitors must perform in the showmanship class:

- Appearance and Actions of Showman 10 points
 - a. Clean and neatly dressed
 - b. Natural, graceful actions
 - c. Good eye contact
 - d. Confidence
- Appearance of Animal 5 points
 - a. Clean condition and healthy
 - b. Free from major defects and deformities
- Examination of Rabbit
 - a. With the rabbit in sitting position 10 points
 - 1. Check ears for mites, tattoo, and tears
 - 2. Examine fur for furmites
 - 3. Run hands over body & check for blemishes
 - 4. Examine the fur quality and color
 - b. With the rabbit on its back..... 35 points
 - 1. Properly and safely flip the rabbit over
 - 2. Check the eyes for blindness, white spots, proper color and diseases
 - 3. Check the nose for snuffles
 - 4. Check teeth for broken, missing, malocclusion or simple malocclusion
 - 5. Check the front 5 toes and toenails for broken, missing or mis-colored
 - 6. Check the front legs for straightness and signs of broken bones
 - 7. Check the back 4 toes and toenails for broken, missing or mis-colored
 - 8. Check back legs for signs of broken bones
 - 9. Check the vent area for disease & sex (examine bucks for missing testicles)
 - 10. Check tail for straightness and signs of broken bone
 - 11. Run hand down entire abdomen looking for blemishes
 - c. Completing the examination..... 10 points
 - 1. Properly post the rabbit for its specific breed
 - 2. Smooth down the fur
 - 3. Make sure the tail is carried properly
- Knowledge of Animal/Project..... 30 points
 - a. Answer general knowledge questions
 - b. Answer breed specific questions
- TOTAL POINTS.....100 POINTS

Preparation for this contest is like any other. Practicing with your rabbit ahead of time will earn you more points on the day of the contest. Use an animal that is familiar with the procedures described, not an unruly one. Also, read up on rabbit information in the American Rabbit Breeders Association's Book of Standards.

<http://arba.net/PDFs/Showmanship.pdf>