

Rabbit Hawking with Harris' Hawks

by Toby Bradshaw

NB: Throughout this chapter the term “rabbit” often is used loosely to refer to any of the Leporid group of Lagomorphs known colloquially as rabbits (*Oryctolagus* and allied genera), cottontails (*Sylvilagus*), pygmy rabbits (*Brachylagus idahoensis*), or hares and jackrabbits (*Lepus*).

Harris' Hawks and rabbits – a classic contest

The essence of exciting falconry is the close contest between predator and prey. Some of these contests have become classics – Merlins and skylarks, goshawks and pheasants, peregrines and grouse, Cooper’s Hawks and quail. Can there be a “classic” quarry for a raptor as versatile as the Harris' Hawk? Many Harris' hawkers would say that rabbits fill the bill.

The Harris' Hawk is known around the world for bringing an astonishing variety of quarry to bag, catching feather from sparrows to swans, and fur from voles to deer. Some Harris' hawkers specialize on quarry such as squirrels, quail, small birds, crows, or ducks. However, it is safe to say that the bread and butter of North American Harris' hawking are rabbits. There are good reasons for this.

First and foremost is that Harris' Hawks and rabbits are well-matched adversaries in the classic tradition. This should come as no surprise, because every North American Harris' Hawk is the descendant of a long line of successful rabbit hunters, just as every cottontail and jackrabbit in the Sonoran and Chihuahuan deserts has ancestors that used their speed, stealth, strength, and wits to make a family of Harris' Hawks go hungry. Darwinian coevolution has kept things interesting for both sides in every generation.

Nearly any Harris' Hawk is faster than any rabbit, at least in the absence of wind, but the difference in speed is not overwhelmingly in favor of the hawk. And while speed is important to both hawk and rabbit, most rabbits aren't caught in a drag race. More often, the rabbit uses its intimate knowledge of its habitat along with its phenomenal ability to make sharp turns to evade pursuers, while the experienced Harris' Hawk continually positions itself to take advantage of the beaters, dogs, and cast-mates to get a shot at the rabbit when it is forced to cross a gap in the cover or has slowed while making a turn. The combination of speed and strategy on both sides means that the thrill of the chase never fades for hawk nor hawker (nor, presumably, for the rabbit)!

Second, most North American hawkers have ready access to at least one species of rabbit. There are eleven species of cottontail (*Sylvilagus* spp.), nine species of hare (*Lepus* spp.), and the pygmy rabbit (*Brachylagus idahoensis*) native to North America, plus the introduced brown hare and European rabbit

(*Oryctolagus cuniculus*). The Harris' hawk's favorite quarry thus thrives in practically every biome from tundra to forest, from the driest deserts to the steamiest swamps, and from urban industrial areas to pristine wilderness. A Harris' hawk with a taste for adventure can go coast to coast and border to border to sample North America's unparalleled variety of rabbits and their habitats.

Rabbits are considered legitimate quarry, or even pests, by hunters and non-hunters alike. Jackrabbits, in particular, are classified as vermin in most of North America, and frequently may be hunted with no closed seasons or bag limits. Many farmers and ranchers are protective of their pheasants, quail, and grouse, but a rabbit hawk is almost never refused permission to hunt. In urban and suburban settings, where gun hunting is forbidden, a Harris' hawk is usually a welcome guest of the landowner anxious to keep a lid on the local rabbit population.

Since rabbits breed like ... well, like rabbits, their populations can sustain high hunting pressure. The cyclical peaks of rabbit numbers are one of nature's greatest spectacles, and no rabbit hawk should forego the opportunity to travel with a cast of Harris' Hawks to exploit these decadal "plagues."

Third, from the falconer's point of view, one of the most endearing traits of rabbits is the squealing sound that they make when captured by a hawk. What falconer has not cocked an ear toward the conclusion of a rabbit flight in heavy cover, hoping to hear the "sweet sound of success" as the hawk crashes in? A squealing rabbit is the acoustic version of telemetry for the hawk lost on a kill. An accomplished rabbit hawk can tell from the sound of the squeal not only whether the quarry is a cottontail or a jack, but even whether the hawk has secured the head or is locked on to the rabbit's hindquarters.

Fourth, rabbits and hares have been considered choice table fare for millennia. Neither rabbits nor hares have much fat in the muscle tissue, and thus are cooked in ways that keep the meat moist. The tenderloins and hind legs of cottontails are a delicate white meat, and can be prepared in many ways, from pan fried to stewed. The flesh of hares is much different – a deep red color, almost purple. The classic dish prepared with hare is hasenpfeffer, or "jugged hare." The meat is marinated in an oil mixture to keep it moist when cooked.

And, finally, rabbits (especially cottontails) inspire Harris' Hawks to exert their best efforts in the field. It is heart-stopping to watch Harris' Hawks pour their full measure of energy into the chase, throwing caution aside to stoop and rebound frantically until the catch is made or the rabbit finds an impenetrable refuge. Jackrabbit hawking has, in addition, a real element of danger for the Harris' Hawk, testing the hawk's courage as well as strength, speed, persistence, and footing.

Choosing and training the Harris' Hawk for rabbit hawking

North American falconers live at the northern limit of the Harris' Hawk's range. Both northern subspecies (*Parabuteo unicinctus harrisi* and *P. u. superior*) feed extensively on rabbits in the wild and are better suited to hawking rabbits and especially jackrabbits than the considerably smaller nominate subspecies (*P. u. unicinctus* of South America). By comparison with other North American raptors commonly flown at rabbits and hares, the Harris' Hawk is neither as athletically gifted as the goshawk nor as powerful as the Red-tailed Hawk, but the Harris' Hawk is uniquely suited to the sport of falconry because, unlike nearly all other birds of prey, it is a social animal whose natural history includes cooperative hunting. Harris' Hawks understand instinctively, perhaps better than any other species of raptor, how to work with partners – human, canine, and avian – in the field. Sociality is essentially a preadaptation for falconry. In the wild, Harris' Hawks normally hunt in family groups consisting of the breeding pair (or trio, since polyandry is common) and their offspring from the previous year. By hunting cooperatively, Harris' Hawks are willing and able to tackle much larger prey than a single hawk could, providing a wider prey base with which to provision the nestlings. Perhaps social behavior and pack hunting have arisen in the Harris' Hawk as adaptations to their desert environment, where prey may be scarce or may experience large year-to-year fluctuations in population.

Permits to trap passage Harris' Hawks may be obtained in a few southwestern U.S. states, and captive Harris' Hawks have been bred since the 1970s in the U.S. and Canada. Intensive, large-scale selective breeding for desirable falconry traits (*e.g.*, tameness, eagerness for quarry, sociability), has been practiced by some Harris' hawkers since the 1980s, with a few well-known pedigrees now in at least their sixth generation. In particular, Tom and Jennifer Coulson (Louisiana, USA) have been extraordinarily successful in the genetic improvement of Harris' Hawks for falconry. They have trained and flown more than 100 eyasses, selected from among the more than 700 offspring they have produced from three dozen breeding pairs, and retained only the top few percent of offspring to serve as parents for each successive generation. Such selectively-bred Harris' Hawks are the first choice of many rabbit hawkers in North America.

There is a widespread misconception that eyas Harris' Hawks invariably are screaming, mantling, and otherwise ill-behaved nuisances in comparison with passage birds. Instead, the selectively-bred eyas Harris' Hawk is more properly viewed as *tabula rasa* – a blank slate. This is simultaneously a blessing and a curse. The newly-minted, well-bred, properly-reared eyas has no bad habits, and can be made perfect (or so one hopes!) in the hands of a skillful falconer. On the other hand, the captive-bred eyas is completely clueless when it comes to flying and hunting. It is the falconer's task to

channel the hawk's natural desires to form social groups, and to hunt, in ways that produce a well-adjusted, effective hawking companion in the field. The training process begins with choosing a Harris' Hawk having a desirable pedigree, progresses through entering and hunting, and continues for the life of the hawk and falconer as they pursue increasingly complex and beautiful flights.

Many of the methods that have been developed for training imprint accipiters and falcons are equally appropriate for the selectively-bred Harris' Hawk, primarily because of the emphasis placed on directing the hawk's or falcon's search for food away from the falconer. Human-imprinted accipiters and falcons have become a fixture in modern falconry, often preferred to chamber-reared or passage birds of the same species. Through dedication, thought, and experimentation over the past 30 years, pioneering falconers have learned to train imprint accipiters and falcons without causing the problems historically associated with eyasses. While imprinting Harris' Hawks to humans must be strongly discouraged, because of the danger a territorial Harris' Hawk can pose in the field when it becomes sexually mature, there are striking similarities in behavior between human-imprinted accipiters and falcons, and the very tame (but parent-imprinted) selectively-bred Harris' Hawks. In all these cases, the falconer is treated as a member of the social group. The depth of the bond between falconer and hawk grows with time spent afield. It is a satisfying and unique partnership between predators. In many ways, a falconer having successful experience with human-imprinted accipiters or falcons is better able to understand the selectively-bred Harris' Hawk than is the falconer familiar only with passage birds.

With any falconry bird other than a Harris' Hawk the first decision to be made might be passenger *vs.* captive-bred, or male *vs.* female. With Harris' Hawks there is a far more consequential decision: Will the hawk be flown solo, with a cast partner, or even with a group? The uniquely social nature of Harris' Hawks is acknowledged by all falconers, but is truly understood by only a very few. The falconers and breeders who know Harris' Hawks best have come to the conclusion that keeping and flying Harris' Hawks with others of their own species is absolutely essential for the long-term mental health of the hawks. As a bonus, cast (or group) flying is fascinating to watch, is highly productive, and gives the falconer a window into the natural behavior of Harris' Hawks. If the falconer cannot arrange to meet frequently with other Harris' hawkers to provide the proper socialization for the hawks, then the falconer should fly a cast (or group) to fulfill the Harris' Hawk's deep-rooted need for the companionship of conspecifics. Certainly all Harris' Hawks should be molted with "friends."

Even when flying a cast, there are choices to be made. For quarry up to the size of cottontails and pheasant, many falconers prefer the male Harris' Hawk. Males are quicker, much more agile, and more aerial than females. They

have a flashy flight style, and rarely present a problem with aggression toward people, dogs, or other Harris' Hawks in the field. The typical male follows well, staying on top of the action, able to take advantage of the smallest mistake by a sneaking rabbit. Hard-turning males often put a foot on quarry that the more ponderous females can't hope to touch. It is easier to practice "catch-and-release" falconry with males, which don't do as much damage to rabbit-sized quarry as most females will.

But if the primary quarry is large rabbits (*e.g.*, swamp rabbit, European rabbit) or jackrabbits, most falconers prefer to have at least one female Harris' Hawk in the cast. Females have the size and strength necessary to subdue large and powerful quarry, and ~~the durability to withstand a season's worth of~~ the punishment that jackrabbits mete out. Female Harris' Hawks are faster than males over the long haul, and better able to fly into a strong wind. Every jackrabbit hawker has marveled at the sight of a female Harris' Hawk hanging onto a flailing jack with a crushing one-footed grip, a feat no male can consistently match. Female Harris' Hawks can eat a larger amount of food without gaining weight, and usually fly well at a wider range of weights, than a male. Many falconers fly female Harris' Hawks simply because females tend to have a more equable disposition.

Deleted: are

A female-male cast of Harris' Hawks plays to the strong points of both sexes. It is a pleasure to watch the two hawks simultaneously compete to get to the quarry first, and then cooperate in catching it. Their flying skills are complementary – the aerobatic male frequently forces the quarry to leave cover just as the female closes in at maximum speed to deliver the final powerful stroke. More than once, such a cast has filled a freezer with rabbits during the hunting season, then spent the spring and summer producing enough young Harris' Hawks to empty that freezer – a very gratifying annual cycle for all concerned (excepting perhaps the rabbits).

The initial training of the selectively-bred Harris' Hawk should be a very short and simple affair. The goal of "basic training" is simply to get the hawk into the field – catching quarry, becoming food-independent, and working in harmony with the other members of the hawking party – as quickly as possible. A selectively-bred eyas should be reared by the parents for at least 12-16 weeks in an open-sided breeding chamber, becoming accustomed to the constant activity of people and dogs while being taught essential social skills (usually including some stern discipline during adolescence) by the adults. For a female eyas it is particularly important that she learn to be subordinate to her elders, so that she is willing to let the falconer assume the dominant status in the hawking party. Since females mature more slowly than males, and are by nature inclined to assume dominance at some point in their lives, taking a female eyas from the parents before 15-16 weeks of age is asking for trouble down the road.

Once taken from the breeding chamber, the hawk is outfitted with jesses, a single leg or tail bell, and a tail-mounted or backpack-mounted telemetry transmitter. Hoods may be used but are rarely necessary. A good selectively-bred eyas is often flying free within a week and usually makes its first rabbit kill a few days later. The best of these eyasses practically train themselves. Because they have seen people up close every day of their lives, they react with curiosity rather than fear to their new circumstances. They will learn to jump to the glove the first or second day out of the chamber, and from that point forward are never shown a tid-bit on the glove. Instead, for the next few days the hawk flies to the ungarnished glove from which it can “hunt” tid-bits surreptitiously placed about the training yard. This teaches the hawk that the glove is not a vending machine for tid-bits, but a mobile hunting perch. The hawk should perceive the falconer not as a surrogate parent and food source, but as a pack-mate certain to provide the hawk with what it most desires – the opportunity to chase and kill. Overdependence on the falconer, reinforced by the misguided falconer who feeds the young hawk overtly – as one might train a passage Red-tailed Hawk – has ruined countless eyas Harris' Hawks and given captive-bred eyasses an undeserved reputation for having poor manners. Once in the field, the hawk will return hundreds of yards to the fist, not because food is expected, but because a pack bond with the falconer has been formed, and the hawk is anxious to continue the hunt.

As soon as the hawk will come quickly and reliably a distance of about 10 yards on the creance to the ungarnished glove, a whole dead rabbit (preferably in a simulated hawking situation, such as pulled from under a patch of cover) can be shown to gauge the hawk's reaction. The hawk's response is usually instantaneous, having fed on rabbits many times while growing up in the breeding chamber. With some assurance that a whole rabbit can be used as a lure to retrieve the hawk in an emergency, hunting can begin immediately. No other form of lure training is necessary. Any selectively-bred Harris' Hawk that needs to be recalled with a lure either has not formed a proper pack bond with the falconer or, more likely, is being flown much too heavy.

Harris' Hawks instinctively chase rabbits; all that is required to enter and make the hawk is a few close, quality rabbit slips. For at least the next month, the hawk should never eat anywhere but on a kill in the field. The hawk need not make its own kill every day – sharing a cast-mate's kill at the end of the hunt serves the same purpose, as long as the young hawk has put forth an honest effort as part of the team rather than simply parasitizing a more experienced cast partner. In an emergency, the “kill” may be a dead rabbit on a string pulled in such a way that the hawk does not realize that the falconer is controlling it. As long as the hawk believes that it is feeding itself by participating in the daily hunt, the crucial lesson is being driven home. By the end of the first month in the field, the hawk will not be completely polished, but at this young stage of life, will know the essentials: 1) The hawk is a Harris'

Hawk. 2) The falconer is the dominant member of a hunting pack that includes the hawk, other Harris' Hawks, and dogs. 3) To eat, active participation in the kill is required. A Harris' Hawk that has learned these lessons correctly at the beginning of life will be a joy in the field for a decade or more, continually acquiring new skills and repaying the breeder's and falconer's up-front efforts many times over.

Basic rabbit flights

An eyas Harris' Hawk's first few hunts should be as uncomplicated as possible. The young hawk has never flown more than a dozen or two yards, knows nothing about taking (or coming down from) a good perch, has never chased a rabbit, and has no concept of the many clever ways in which a rabbit can escape. It is the falconer's responsibility to put the hawk in situations that lead to early success. Success is crucial to the hawk's self-confidence, and growing confidence breeds further success. Every effort should be expended in providing the young hawk with the easy slips needed to make the first solo kill.

The ideal location for the first few hunts is crawling with rabbits but has light cover and lacks any high perches from which the minimally-trained hawk may be reluctant to return to the falconer. It is well worth a long day's drive and a week's vacation dedicated to exploiting a honey hole like this. The hawk may be flown singly to eliminate the chaos of other Harris' Hawks and dogs, allowing the new recruit to focus on the task at hand. Suitable "first hunt" sites run the gamut from prairie grasslands to abandoned farmsteads to urban junkyards.

The hawk is carried on the fist (or on a T-perch if one was introduced in training) while the falconer walks slowly through the cover, finding and flushing rabbits. If the time interval between flushes is more than five or ten minutes, the hawk is likely to become bored or distracted, since it has no idea what is going on. To maintain interest, the falconer should kick bushes, probe packrat nests with the beating stick, or rustle junk piles from which a rabbit might emerge. If this activity flushes the occasional woodrat, deer mouse, or fence lizard instead of a rabbit, that is all to the good. The hawk's reaction to close slips on prey of any size tells the falconer whether the hawk's flying weight is on target. If the hawk chases hard and tries to foot the quarry, its weight is fine. The hawk should return promptly to the fist once satisfied that the prey has escaped, since all prior experience indicates that the glove is the best place from which to initiate a new pursuit.

If instead the quarry has gone to ground, with the hawk peering excitedly at the place where the quarry disappeared, the falconer should move heaven and earth to reflush the quarry. Nothing builds a strong pack bond more quickly than this kind of "flush-pursuit-reflush-pursuit" cooperation. This

ought to come as no surprise, since it is exactly this sort of cooperation that bonds Harris' Hawk families hunting in the wild. If the young hawk's first kill is a chipmunk instead of a cottontail, there is no harm in that. The fact that the hawk is becoming independent by chasing and killing its own prey is worthy of celebration, as is the fact that the hawk is learning to appreciate the falconer's role in serving.

24 September 1999 Killer 893g

I flew Killer at the equipment yard, looking for her first good cottontail slip. Since Tom and Jenn sent her to me a couple of weeks ago, she has lived up to the high standards set by her mother, Lola. Without a doubt, Killer has more promise than any Harris' Hawk I've flown in 15 years.

As usual, the equipment yard seemingly had a bunny under every piece of scrap metal and truck body. For a solid hour, Killer chased everything in sight, getting a decent crack at a dozen or more cottontails. The bunnies know their turf, and were never quite far enough from impenetrable cover to give Killer a clean shot. Killer's fist response was OK – not great, but better than yesterday. She preferred to take perches on the equipment rather than sitting on the glove, in part because the late afternoon wind was strong. She quickly learned that rabbits like to hide under things, and after putting a rabbit into cover she would take stand while I rummaged through pallets, etc. to reflush for her.

Just before sunset she chased a rabbit into a coil of Caterpillar track at the edge of the yard, pulling out of her pursuit at the last second as the bunny rocketed into cover. From the roof of a truck cab, Killer was weathervaning into the wind, staring intently straight down into the center of the coil. I looked down into the coil to see the bunny crouched, motionless. I was certain that the rabbit was planning an upwind escape toward the safety of the equipment yard – no one can rightfully claim that a rabbit doesn't know which way the wind blows!

Unaccountably, when I jammed my beating stick into the coil of track, the cottontail squirted out downwind and streaked away from the safety of the yard into a field of green tumbleweed, white tail bobbing furiously, headed for a pallet pile 200 yards distant. With the wind behind her, Killer pumped her wings as hard as she could. The bunny was running flat out, but with the tailwind, Killer was gaining ground at an incredible pace. I was sure that the rabbit would take some evasive action, but Killer piled into it about 50 yards out, burying both feet in the rabbit's back and cartwheeling to a stop in the tumbleweed.

The rabbit tried to drag Killer through the tumbleweed, but when it started squealing, she shifted a foot to the bunny's head. A young female Harris' Hawk on her first kill seems to focus all her strength into her feet, convulsively squeezing the quarry, driving her talons deep. When I arrived at the scene, Killer was panting, wings spread, feet locked. Her first kill, and in a classic tail-chase!

After she caught her breath, folded her wings, and relaxed her grip, I pulled a front leg off the rabbit and tossed it on the ground. Killer stepped off the dead cottontail and ate her rabbit leg, not even hungry enough to swallow the bones or fur. She followed me back to the truck, alternating between the glove and higher perches on the equipment. She hopped into her transport box, roused, and pulled up one foot. We're both looking forward to tomorrow's hunt!

For the rest of the hawk's life, many more rabbits will be caught in simple flights – the solo hawk flying from the falconer's fist (or other low perch) in pursuit of a close-flushed rabbit. Every die-hard rabbit hawker's heart skips a beat (with the voice rising a substantial number of decibels) when a rabbit bolts underfoot. The ensuing straightaway sprint, with the rabbit's feet a blur and the hawk's wingtips sweeping along the ground as the distance between hawk and rabbit rapidly disappears, is always exhilarating. The flight can end with a cheer for the hawk or for the rabbit.

Deleted: she eats up

But the Harris' Hawk is not limited to simple rabbit flights – this remarkable raptor is capable of much more.

Intermediate rabbit flights

Once the young hawk has caught five or ten rabbits on solo hunts, it is time to join the pack in the field. The hawk has learned its purpose in life – to hunt. The daily hunting routine is familiar. The hawk will chase rabbits at any distance, and is wed to them as quarry. Now it is time to learn its place in the social order of the hunting party. The full potential of a Harris' Hawk cannot be realized without flying it in a cast or group.

A young Harris' Hawk is high-spirited and impetuous. This has its virtues – the first-year eyas shows no restraint or caution in pursuit of quarry, making up for a lack of hunting experience with sheer exuberance and intensity. But there is a downside to youth. A female eyas, in particular, will test the limits of her authority within her social group. She feels hunger keenly, and can become possessive around kills, even those made by cast-mates. She is impatient, and may thump one of the dogs if the action slows down or the dogs are goldbricking outside cover. Just because a hawk has caught a few rabbits does not mean it is a finished hawk. While the education process continues, the falconer must anticipate problems and be quick to correct any misbehavior before it becomes a bad habit.

There is no better mentor for a young Harris' Hawk than an experienced, steady, adult female Harris' Hawk flown as a cast partner. A good cast-mate will teach the young hawk many valuable hunting lessons and even more valuable social skills. If properly bred and reared, the trainee will recognize the

adult as dominant. The younger hawk should always defer to the adult – taking a lower perch, approaching another hawk’s kill with care and discretion, and following the older hawk’s lead in pursuit of quarry. A sidelong glance or a neck arch from the adult should result in immediate submission from the youngster. Should a young hawk forget its good manners, especially with the dogs, or around a kill where the adult cast-mate may be holding on to a jackrabbit for dear life, it is perfectly acceptable for the falconer to provide a reminder of social standing by gripping the youngster's feet and pinning the hawk gently but firmly on its back until the peeping and struggling stop, and the hawk submits and recovers its composure. For the falconer whose experience does not include Harris' Hawks, or who has never observed the dominance interactions among a family group of Harris' Hawks, the notion of the falconer administering physical discipline to a hawk may seem completely inappropriate (as indeed it would be for other species of hawks or falcons). But this sort of discipline, carefully applied with a full understanding of Harris' Hawk behavior, is effective with Harris' Hawks for the same reason it is effective with dogs – both are social animals with an instinctive grasp of a dominance hierarchy within the group. The eyas Harris' Hawk perceives the falconer’s discipline not as an attack, but as an assertion of social dominance.

13 August 2003 Killer 997g Q 815g

Both hawks were up in weight. Jacks were pouring across the water tank road on Monument Hill just before dawn. Killer had to administer a little ass-whipping to Q, and I was happy to help. Q has got to learn to be submissive. She isn't food-begging; she's actually neck-arching and giving crescendo screams to challenge Killer's dominance. But this struggle for dominance between a 4-year-old female and her first-season sister can only end one way: with Killer on top. The sooner the better.

Killer was flying "loose" at this weight – wanting to hunt but not following especially well. She made several long sorties but often didn't commit at the end. Q went after a mother nighthawk who lured Q with a "feigned injury" flight. Killer followed Q's pursuit, and when Killer crested the hill 200 yards from me, she must have surprised a sitting jack, which she caught. Q didn't come in on the kill – maybe she's finally learning some manners.

27 August 2003 Killer 952g Q 817g

Today youth and enthusiasm triumphed over age and experience. Q made an awesome jack hawking debut, catching three jacks at Monument Hill before Killer could catch one! At first, Q was a bit hesitant on jacks, but she followed Killer's lead and eventually took an open shot between the sagebrush to make her maiden jack catch. Shortly thereafter, a downhill jack ran right past Q while

evading a stoop from Killer. Q launched an attack from her perch on the sagebrush and beat Killer to the jack. Jack #3 was just pure effort on Q's part – she flew it down in a full power tail chase and held it by one back leg until the cavalry arrived. The family resemblance between Q and Killer is unmistakable.

Q behaves perfectly around Killer now. Apparently Q is satisfied with (or at least resigned to) her place at the bottom of the totem pole. This cast of sisters is going to look like the apocalypse to jackrabbits!

An experienced cast of Harris' Hawks is much more than the sum of its parts. It is not just two (or more) hawks chasing the same rabbit, but a coordinated effort to thwart the rabbit's many escape tactics. A veteran cast uses teamwork to set up the rabbit for the catch. The set-up can take several forms. One cast partner may tail-chase the rabbit at ground level, while the other hawk maintains a high trailing position. As the first hawk closes on the rabbit, the rabbit will usually make a hard turn to force the hawk to stall. The first hawk may overshoot or stall out trying to turn with the rabbit, but in turning the rabbit has lost much of its speed, leaving it vulnerable to a stoop from the trailing cast-mate. In a group of three Harris' Hawks, the pursuing hawk often is flanked by the others, flying outboard to keep the rabbit running in a straight line, making it easier to catch from behind. In brushy terrain, a rabbit putting in to heavy cover is flushed by one cast-mate crashing in to the brush, only to be caught by the other a heartbeat later when the rabbit bolts.

Cast flying in flat, relatively open terrain frequently leads to hunts analogous to coursing rabbits or hares with a brace of sight-hounds. The wide open spaces of western North America are ideal for this type of coursing flight. Every autumn, Harris' hawkers and their squadrons converge on the jackrabbit fields from Kansas to California and Texas to Saskatchewan to participate in the spectacle. If the hawks are allowed to take long slips, the flights may go for many hundreds of yards, with the hawks (and perhaps dogs) doing their own reflushing if the quarry puts in. Falconers must be prepared to run to keep up with the action!

7 September 2005 Q 972g Shadow 982g Delta 985g

Q's first catch was the day's headliner – an intricate multiple reflush pursuit. After sneaking and dodging for a hundred yards, the jack finally decided to shift into high gear for departure. Q put on her best speed and T-boned the running jack, raking it down the side and slitting it open behind the rib cage. When I arrived on the scene there were jackrabbit intestines draped in the sagebrush like tinsel on a Christmas tree. Q had the jack by the head. The jack's liver was hanging completely out of its body. I gave Q a few bites of the bloody liver, but we were short on fava beans and a nice Chianti.

Q caught two more jacks, one in good style and one in its form. Shadow tackled her first jack in her typical reckless, headlong way. Shortly thereafter, Jim Walker and his son Pete drove out to meet us. Shadow was returning from a flight behind us, cruising toward us about 10 feet off the ground. Q chased a jack back in Shadow's direction. Shadow saw the jack coming, folded her wings, and smashed the jack in a difficult head-on catch. Newton's Third Law illustrated.

We flew Delta solo just north of Jim's. After six weeks of hard flying, and many warm crops of jackrabbit, Delta is now an accomplished and enthusiastic jack hawk. She is very entertaining to watch. The first jack she saw today was about 75 yards out. She started her usual climbing attack, then leveled out at max speed when the jack started running. The jack stopped, Delta snapped into a hard banking stoop, and snagged the jack in a crunching hit. On the way back to the truck, Jim and Pete pushed a jack across an open alkali flat. Delta launched off the T-perch, smoking along right on the deck, and pulled the jack down from behind in a high-speed curving pursuit. We got a great view of the whole flight. It doesn't get any better!

5 September 2006 Shadow 996g Itsy 609g

What a difference a day makes! Trouble-free, top-shelf hawking today. Shadow and Itsy have become like a matched set of pistols. The first jack was the most spectacular. Itsy spotted it, and the chase was on. Both hawks took turns reflushing the jack as it bobbed and weaved through the sagebrush. Finally the jack abandoned its furtive strategy and lit the afterburners.

Itsy's wings were a blur as he angled down to take his shot. Itsy flew down the jack so quickly that the jack was forced to use its best move – it leaped vertically about three feet in the air, overtopping the sagebrush. Itsy raised a dust cloud when he struck the ground where the jack had been a moment before. The jack's desperate tactic would have worked if Shadow had not been Itsy's wingman. She ripped the jack out of the air at the apex of its jump. Phenomenal!

Shadow's third jack was almost as impressive. It flushed from a triangle between the center pivot irrigators and ran into the freshly mown alfalfa. Even though it had at least a 50-yard head start, Shadow's deep wing beats left no doubt about her intentions. She overhauled it at full speed, but missed when it made a hard turn. It's a lot of work for a female Harris' Hawk to rebound flat-footed, but Shadow didn't hesitate. The jack was running as fast as it could go, sending up puffs of dust from its feet as it headed back for the safety of the rabbit-brush, but within another 100 yards Shadow had it trussed like a Thanksgiving turkey. It was a big jack, and there were feathers and fur in equal proportions on the ground, evidence that the combatants were fairly matched.

Jackrabbits are built for speed and endurance, with long legs, a dog-sized heart, and deep red flesh rich with myoglobin to carry extra oxygen. The jackrabbit's large size and great strength make it a challenging quarry for Harris' Hawks, because the flight does not end with the catch – it just starts the fight. Most long-time jack hawks have been rolled over, dragged through a barbed-wire fence, or kicked senseless by a jackrabbit weighing three or more times as much as the hawk. The hawk risks permanent injury and even death when jackrabbits are the quarry. But the top-performing Harris' Hawks are undeterred by the rough-and-tumble of jack hawking. In fact, it brings out the best in them.

5 September 2001 Killer 970g Neon 680g

A breezy, pleasant morning (60°F). I flew Neon solo at the clinic. We started upwind at the top of the hill with Neon on a street light pole. Before I could work the sagebrush and tumbleweed at the base of the pole, Neon spotted a jack down in the flats almost a quarter-mile away. Rather than glide down the long slope, he stroked all the way, picking up so much speed that his wings folded closer and closer to his body with every beat. From my vantage point I had a panoramic view of the whole flight. I sort of hoped that Neon wouldn't connect, since it would take me forever to run down there and help him with the jack.

The jack saw Neon coming and loped along perpendicular to Neon's trajectory, no doubt planning to put a move on Neon at the last instant and escape uphill and upwind. But even at maximum speed a male Harris' Hawk can turn. I wasn't even halfway down the hill when Neon broadsided the jack. I was too far away to hear the impact, but I could see the dust cloud as they tumbled, and after a short delay because of the distance, I heard the distinctive squalling of a jackrabbit that has not been caught by the head.

By the time I arrived on the scene, a much-too-long couple of minutes later, Neon was choking on dust, legs fully extended with all eight talons sunk into the jack's rib cage, wings and tail spread to anchor the bucking jackrabbit. I dove to secure the jack's head, but missed. Neon relaxed his ferocious grip in anticipation of my help, but the jack pulled free, staggering away with a great swath of blood-stained fur on its left side.

Disgusted with myself for not holding up my end of the bargain after a Herculean effort by Neon, I offered him my glove. Neon was too exhausted to jump up. I put my glove on the ground so he could step onto it. Neon was still breathing hard as I looked him over for serious damage. His wings were hanging, but as he recovered from the exertion he pulled them back to their normal position. Finally he roused, dumping a pile of twigs, gravel, and dust onto my glove.

By any reasonable standard Neon should have been finished for the day, but this hawk doesn't know how to quit. Within ten minutes, he was standing on a cottontail kill made in great style. I traded him to a front leg, and when he cleaned that up, we started back for the truck. I figured that after being thrashed by a jack and being fed on a cottontail, Neon wouldn't be tangling with any more jacks today.

We hadn't gone more than a few steps when Neon's head shot straight up. I held him as high as I could to improve his view. When he launched from the fist, his whipping wing beat told me that he had spotted another cottontail. But as Neon skimmed over the sagebrush, I looked farther ahead of him and saw the blood-soaked jackrabbit running uphill and upwind. Neon had a score to settle with this jack and wouldn't be denied. Just as Neon overtook the jack from behind, the jack spun around under Neon and headed back downhill. Neon pitched up into the wind, executed a perfect hammerhead turn, reversing direction in the blink of an eye as only a male can do, and hit the jack squarely in the head in a short but hard stoop. There is no putting a value on a hawk with that kind of hunting drive.

In addition to learning to hunt with other Harris' Hawks and dogs, intermediate-level rabbit hawking includes using height and position to command larger fields. Most Harris' Hawks are less inclined than Red-tailed Hawks to work their way to the highest perch, but Harris' Hawks make up for this by being very good at moving from perch to perch as the earthbound falconer and dogs work the cover below. The best Harris' Hawks do not simply follow the hunting party, they lead it. Dogs attuned to the hawk's movements will follow the lead hawk, working the cover below the hawk's high perch and keeping the rabbit moving at a fast pace that makes for memorable flights.

The advantages of a high perch are obvious. The sight of a hawk high on a cliff or in a tall tree freezes rabbits in their forms. The hawk can spot rabbits sneaking far ahead of the hunting party, effectively covering more search area. Good eyes at the start of a flight are at least as important as good footing at the end. But from the falconer's point of view, the most rewarding aspect of having the hawk take a towering perch is that the hawk can use gravity to convert height into speed.

27 August 2000 Killer 906g Neon 676g

Had a spectacular flight on the road between Wyoming highways 530 and 414. The sage and rabbit-brush were very sparse, with no bunchgrass in between. A fresh westerly breeze carried Neon away from us and toward a green-rock haystack-shaped butte. As he approached the wall of the butte, he banked into the updraft and caught the rising wind, shooting up to and beyond

the top of the butte without so much as a single wing beat. Neon trimmed his sails and drifted down to land on the very edge of the rocks, at least 100 feet above Moira, Bridget, the dogs (Tip and Gator), and me. He followed us just by opening his wings and sliding along the cliff face to the next perch.

Within a few minutes of taking this impressive pitch, I looked up to see Neon starting to glide back down in our direction. I was disappointed that he was returning to ride on my glove instead of maintaining his excellent position on the butte, until I heard Tip give a yelp and saw the desert cottontail frozen practically at our feet. I quickly realized that Neon had this bunny in his sights. The rabbit had nerves of steel, but with three people and two dogs about to step on it the rabbit scorched out of its form. Neon altered his course to intercept the rabbit, steepening his glide enough to make the wind whistle through the slit in his bell. Even with death closing in at warp speed, the rabbit kept its head – it let Neon get within a few feet before making an incredible high-g turn that sent Neon well wide of the mark. But rather than losing his momentum, Neon converted his tremendous speed into height by pitching up sharply. At the apex of his climb, he winged over, started pumping his wings, and rolled the desert cottontail going away. Incredible!

Advanced rabbit flights

The selectively-bred Harris' Hawk in its second season is an altogether different beast than the first-year eyas. Whereas the first-year eyas hunts to feed itself, the older Harris' Hawk hunts to provision the whole pack and strengthen the pack bond. An adult Harris' Hawk often seems much more interested in hunting than in eating (a characteristic shared with most falconers!). A first-year Harris' Hawk comes in on almost every kill, hoping for a share. But in the second season, the cast-mate that did not make the catch will usually leave the site of the other hawk's kill to continue hunting with the falconer, even while the cast partner remains behind finishing a tasty morsel of jackrabbit shoulder blade.

If hawked every day the adult Harris' Hawk becomes phenomenally fit, capable of covering many miles in a day's outing, willing to take over-the-horizon slips, and able to bring remarkably long flights to a successful conclusion. Once in the groove, ~~the hawk will hunt very well at flying weights somewhat higher than those typical of the first season, especially as muscles build up from hard flying.~~ Shorter, stiffer adult plumage gives the hawk more speed, particularly in windy conditions. Multiple kills are routinely made, with the hawk coming off the kill ~~easily for a modest reward; the motivation is not so much hunger as cooperation with the pack.~~ Having accumulated a wealth of knowledge about rabbits and their tactics, the adult Harris' Hawk can fill the bag in circumstances where a first-year eyas might never put a foot on a rabbit. Every hawker enjoys the unbridled (if naïve) enthusiasm of a first-season

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Harris' Hawk, but these youngsters cannot hope to approach the effectiveness and sharply-focused cunning of a veteran rabbit hawk. A cast of old pros can make rabbits appear in the bag as if by magic, no matter how difficult the conditions.

Even for expert hawks and hawkers, among the most demanding rabbit flights are those in heavy cover. Cottontails across the continent are drawn to thick, usually thorny cover – catclaw briars, multiflora rose, saw palmetto, mesquite scrub, cholla and prickly pear, Himalayan blackberry, and any number of other such flesh-ripping habitats. Getting a cottontail out of the thorns and into the bag is never easy. For the duration of the hawking season, a rabbit hawker's legs can look like they've been used as scratching posts for a tiger. Every cottontail hawker knows what it means to give blood in pursuit of sport.

The Harris' Hawk is as much at home in thick brush as a cottontail. In heavy cover, the Harris' Hawk has no peer among rabbit hawks. The goshawk is quicker, the ~~Red-tail~~ can crash through more brush, but the Harris' Hawk is the master of position, timing, strategy, and teamwork – and these are what count most in the thick stuff. The camaraderie among a good cast of Harris' Hawks, a good brace of rabbit dogs, and the falconer who works with them is immensely rewarding.

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6 December 2003 Q 862g Milo 649g

Despite a forecast of rain and wind, the day dawned beautifully – sunny with a fresh breeze out of the north. We went to the field behind Precision Mold. The reed canary grass and thistle are all the way down now, and the middle of the field is flooded from the rains, concentrating the cottontails in the huge Himalayan blackberry bushes along the edges.

Q and Milo took stand on top of the buildings above the narrow gaps in the blackberries. They know the ropes here, having hawked this field many times. On several occasions, I have let the hawks out of their boxes, dropped the tailgate for Tip and Bart, then heard the dogs jump a bunny and the hawks catch it before I could put on my boots and walk into the field!

Within a couple of minutes of our arrival, Tip was on trail. Her frenzied yipping told all of us that she was close behind the rabbit. This rabbit was a runner rather than a circler – probably a buck who had wandered into an adjacent territory in search of does, and now was hot-footing it back to familiar ground. The hawks keyed in on Tip's yipping, staying ahead of her where they knew the rabbit must be. Milo is light enough to land on the very tops of the cottonwoods in the middle of the field, and is always in position.

The rabbit was a clever one, never giving the hawks a clean shot despite having two dogs burning up its trail. Q and Milo took turns making feinting stoops, hoping to panic the rabbit and give the follow-up hawk a crack at it. Tip and Bart worked the rabbit to the edge of a blackberry bush. The rabbit tried to double back, but the dogs cut off its escape route. Even Bart was yipping, so I knew the dogs must be able to see the rabbit. The cottontail didn't have many options left. It made a dash for the next blackberry bush more than a hundred yards away. Q took out her frustration on this one, hammering it from a tall cottonwood.

Milo didn't bother to join her on the kill. He kept a good lookout from the cottonwood while Tip and Bart sniffed the dead rabbit. Tip's ear was dripping blood from the blackberry thorns, and both dogs' bellies were raw with scratches. But once the kill was cleaned up, they headed back into the bushes, while Q remounted to join Milo.

Bart jumped the next rabbit, pushing it relentlessly for a couple of hundred yards until it broke cover. It hadn't cleared the blackberries by more than a couple of feet when Q stapled its head to the ground. While she worked on her rabbit foreleg reward, Milo took off to follow Tip, who was yipping on another rabbit in the distance. Bart and I left Q to finish her rabbit leg. Bart followed the sound of Tip's barking, cutting the corner on the rabbit's escape route and helping Tip put extra pressure on the bunny. Milo shadowed the rabbit from perch to perch before threading his stoop through an impossibly small hole in the head-high blackberries to snag the rabbit. By the time I hacked my way into the bush, he had eaten half the rabbit's head.

About the time we got Milo's kill put away, Q showed up on top of the wall of the building behind us. We started back for the truck, with the dogs and I walking through the flattened reed canary grass while Q and Milo flew top cover. Tip's nose went down, and her stub tail started buggy-whipping. She stuck her nose under some laid-over grass, and a rabbit shot out. The hawks were on their way, but Tip was quicker and pinned the rabbit with her front feet. She wisely gave it up to Q a second later!

I was beginning to wonder if we would be able to get back to the truck at all, with the dogs running rabbits everywhere, but luck was with us when Tip got the next cottontail going in the right direction. The rabbit ran along the base of the building, protected (or so it thought) by a wall of blackberry bushes. Q was having none of that, though. She executed her strategy perfectly, waiting 50 yards ahead of the sneaking rabbit at the corner of the building where there was a tiny gap in the cover. The rabbit was looking at Tip in its rearview mirror when Q dropped straight down, never opening her wings, to deliver the maximum impact. Great hawks and great dogs can make this look easy!

It is common for the second-season Harris' Hawk to make greater use of the vertical dimension in its flying, understanding that it has more control of the flight from above the rabbit than from behind it. The experienced hawk takes higher perches, climbs quickly to regain a commanding position after a miss, and uses its momentum to pitch up and wing over when rabbits put into cover. Perhaps the ultimate expression of this vertical flying is slope soaring. For purely aesthetic appeal and drama, it is difficult to match slope soaring flights. Harris' Hawks are less adept than Red-tails at soaring, but when conditions are right, a cast of Harris' Hawks can put on quite a show. The canyon country, chaparral, basalt cliffs, and sagebrush hills of western North America are perfect for slope soaring flights in pursuit of cottontails and jackrabbits.

29 September 2002 Killer 998g Milo 654g

It's hard to believe that things could be better than yesterday, but we woke to a 20+ mph upslope wind. Both hawks went straight to the top of the hill, and within a minute, Milo was slope soaring a hundred feet or more above the hilltop. Killer soon joined him. Lee Mann and I walked the hillside to flush jackrabbits.

Killer took the first shot, a slanting downhill stoop to the flats. The jackrabbit put in to a sagebrush. Killer pitched up, winged over, and tried to catch the jack in a vertical smash. But this jack was a cool customer, and waited for Killer to get hung up in the sagebrush before making its escape upwind.

Killer and Milo headed back up the hill and soared over the top again, following us like kites on a string for many minutes. Lee and I finally pushed a jack uphill. It made the crest just as the stooping hawks did, and the whole works disappeared over the hilltop. We waited for the hawks to return. When they didn't show up, I climbed the hill but couldn't find them nor hear their bells in the wind. I had to walk the half mile back to the truck for the telemetry receiver. I found Killer and Milo gorging on a very dead jackrabbit, a couple of hundred yards from where we had last seen them.

With their huge crops, I figured we were done, but Killer had other ideas. She and Milo went soaring again. Lee and I jumped a jack halfway down the hill. It had two choices – run upwind/downhill or run uphill/downwind. That's not an enviable choice with two Harris' Hawks waiting on above. The jack split the difference, side-hilling while waiting for the hawks to tip their hand. Killer folded up to stoop, but the jack knew what to do and put in to a sagebrush in the nick of time. Killer pulled out of her stoop, the wind in her face carrying her straight up over the jack to a fantastic height. I still have no idea why the jack would choose this instant to bolt, but it did. Killer rolled over and hurtled back down, leveling out behind the jack and walking up its back until she reached the head. Lee and

I arrived to find the classic jack catch – Killer with both feet planted on the jack's head, and the jack doubled up underneath Killer with its hind feet against her breast, kicking to free itself. Bring on the wind tomorrow!

Toby: How about a recipe for Jugged Hare here at the end?