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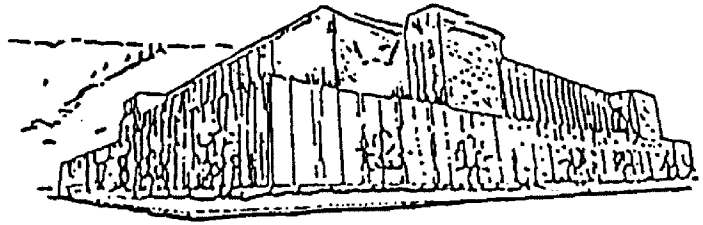
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THE STRANGER'S CRAFT

by Kim Todd

Yale University, B.A., 1992

Presented in partial fulfillment of the requirements

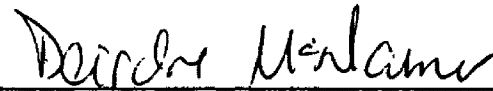
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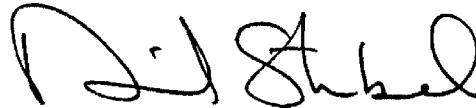
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Introduction

As a young Darwin wandered the Galapagos, picking his way over lava beds and clambering on the backs of tortoises, he noticed that the birds on the islands were completely unafraid of humans. Hawks, doves, and finches treated Darwin's shipmates as if they offered no more threat than boulders. This lack of bashfulness was taken advantage of by men who killed them for sport, but still the birds persisted on ignoring rocks chucked at them and continued to land on Darwin's water pitcher or on a nearby branch. In his journal he noted, "We may infer from these facts, what havoc the introductions of any new beast of prey must cause in a country, before the instincts of the aborigines become adapted to the stranger's craft or power."

Since Europeans began settling the area we now call America, Darwin's prediction has been rigorously tested as the pace of new animals introduced has escalated. Colonists brought over rock doves to keep as pets, little imagining the hordes of pigeons that would grow with the country's cities. They brought clothes moths in their coats and rats on their ships. More and more animals that evolved in other countries have taken up residence here, creating dramatic changes in landscapes and ecosystems. More than 2,000

exotic insects buzz and creep their way over American soil. In the San Francisco Bay, where trade ships from other countries have docked for centuries, 95 percent of the biomass is exotics.

"Nonnative." "Exotic." Invasive." "Introduced." "Alien." When juxtaposed against the term "native," all of these words take on a moral dimension. And one can see why. At stake is biodiversity, a word which conjures up visions of lush Amazon forest, fig trees visited by innumerable birds of different species, and trunks hosting countless numbers of plants -- all the endless permutations of evolution that only require a changing environment and a little isolation to do their magic. Innumerable. Countless. Endless. As anyone knows who has felt a rush of exhilaration looking up at the stars, nothing is more hopeful than infinity. But here, where isolation is increasingly hard to come by, people fear a world of rats and fire ants, the victors in the game of survival of the fittest. Exotics have contributed to the decline of 42 percent of threatened and endangered species, according to a recent Nature Conservancy report. The number of species is growing smaller and people feel all that potential slipping away.

On the other hand, exotics, both plant and animal, are so entrenched here that no mere extermination program will do. In many parts of the country, a person can't stroll through town, take a bike ride, or even go for a hike in the hills without passing through a landscape that is occasionally or primarily nonnative. And many of these same people smile at dandelions in spring, pause and listen to a starling buzz and chirp, and recognize these species as part of their environment, wherever they came from. And in the weaving together of these travelers with all kinds of biological histories, lies

the heart of this project.

This exploration started when I was taking a wildlife biology course, and my textbook announced that starlings had been introduced in 1890 by Eugene Schieffelin, who wanted to bring all of the birds mentioned in Shakespeare to Central Park. Other books repeated the same details, rarely giving them more than a sentence. Dates differed, the numbers of birds released shifted from account to account. It was one of those facts that gets tossed about, worn with time, becoming almost apocryphal, but it electrified me.

Not often, when surveying a disaster, do I think, "I could have done that." But here, the smallest of gestures had the most dire consequences. All it took was a passion for Shakespeare, a love of birds, a little drive, and a romantic streak a mile wide. Had I lived in a different time, with more disposable income and less knowledge of biology, I could have released those starlings. No question.

Investigating Schieffelin led me to newspaper editor E.B. Webster and astronomer Leopold Trouvelot, who wrote more publicly about their obsessions, though neither addressed directly their thoughts as they brought mountain goats to the Olympic Peninsula and gypsy moths to Massachusetts. These men were looking to recreate their world, tinker with the garden of Eden. They had a vision, and they wanted to build it out of cells rather than stone. While my driving question in my research was "why," the answer was always "who knows?" Even when people write their thoughts down, they may not finger every motivation. I could merely trace the effects back through time in hopes of finding the way to a blueprint.

The reasons for these introductions prove as varied and complex as our relationship with animals. People brought species here to eat, to keep them company, to remind them of home, to satisfy a poetic whim, to get rich, to draw tourists, and to hunt. Over the centuries perceptions of different animals have shifted, but the old views don't disappear; they linger, gathering strength, so that now all these reasons and more play into our relationship with the natural world.

Each person, town, or country has creation stories, whether a legend of gods born from chaos, a child's cherished tale of how her parents met, or the story every fourth grader in this part of Montana knows about how glacial Lake Missoula filled this valley before the ice dam broke for the last time and sent thousands of gallons of water rushing into the Columbia River and out to sea. I chose to focus on the continental United States, rather than the whole country, because Hawaii is so exotic-species plagued it is a story unto itself. This collection, however, does begin with a species introduced to Canada that probably quickly made its way into the United States, as birds are not great respecters of political boundaries.

So here is another creation story for our country, already burdened by so many. The plot centers on a ragged band of heroes, adventurers and villains who have reshaped the United States because somehow we, as a species, wanted it this way. We chose starlings and gypsy moths and knapweed, just as clearly as we chose the Grand Coulee Dam and the Sears Tower. This is what we picked for our country. What we have ended up with after centuries of experimentation is an ecosystem at risk, biodiversity in decline, and a scramble to eradicate exotics and reintroduce natives. But as

fields of knapweed rustle in the wind, flocks of starlings beat overhead and pigeons coo in the alleys, in a way we are witnessing the manifestations of all our desires.

A New Direction for New France

In a parking lot under a four-lane overpass, a flock of pigeons plucks bits of popcorn and hotdog bun from the cigarette butts and broken glass. Some are built along classic lines, close to the ancestral rock dove: a slate grey body, dark bands on the wings, a white patch above the tail, an iridescent green and purple sheen on the neck. Except for hot pink feet and orange eyes, they are the colors of asphalt, the colors of shadow-stripped cement. Others seem rusted, reddish brown in patches, or mud splattered, dripped with black or beige. Another is grey with wings half white, as if it had soared through a narrow corridor, slick with wet paint. One, all white with bright black eyes, looks as though it could have borne holy messages before it started slumming down here just off the curb.

In a way, these feathers act as a map back to each bird's origins, though we don't have a complete key. Scientists say the ones nearest to the wild form, called "blue bars," are exceptional fliers and use these skills to soar deep into the countryside in search of grain. Aggressive, they defend larger territories than their mottled cousins, but are more susceptible to toxic poisoning. The explosion at Chernobyl killed more blue bars than any other type. Spotted,

streaked and multicolored birds fare well over the winter and breed year round, signs of their links to a domesticated past. And white pigeons, rare and highly urban, lose aggressive contests, fail to defend wide areas, make easy targets for predators, but may be able to soak up toxins like no others.

The patchy tails and splotched wings also provide a different kind of history, the history of population that has been interbreeding, and living wild for hundreds of years, but that was once domestic. The wingtips, black, grey, brown and white, all point back to one day in the early 1600s on the Canadian coast as a ship headed east.

* * * *

They had failed again. New France, it seemed, would never take root on this sandy soil. Sieur de Monts and his navigator Samuel Champlain had set off with high hopes, a monopoly on the fur trade, and a boat full of colonists in 1604. All de Monts needed to do in exchange for his royally granted monopoly was establish a settlement and import 50 settlers a year. He had visions of heaps of thick beaver fur piled at the docks waiting for his ships, while Champlain thirsted after that long rugged Atlantic coastline, his to map, his to explore. Any one of those rushing river mouths might lead to China. As they followed their compass toward North America, they plotted how to sow and tend the seeds of a glorious New France.

But nothing worked out as they planned. The first colony at St. Croix was a disaster. Determined to wrest a society out of the rock, the settlers spent the summer mashing swarms of mosquitoes as they built their new houses. They planted and watered gardens, only to watch the sun dry the soil, wilting young shoots. Legendary rich copper mines remained legends. Over the

course of a long brutal winter, man after man came down with scurvy, limbs swollen like balloons, teeth so loose they could be pulled out by hand, and died. Others may have sat melting snow for water, heard the wind beating about their wood shelters, thought of a warm French afternoon and a mouthful of unfrozen wine, calculated the number of miles back to all that, and died. Before the next cold season, they abandoned St. Croix, and built homes and planted crops again at Port Royal, where the weather might prove more mild.

But low on morale, low on supplies, they deserted Port Royal, too, after a year. Though his matter-of-fact journals chart no regret, Champlain must have had bitterness on his tongue as he left the garden pools he'd filled with trout and watched those unknown, unnamed swells of land behind them disappear as the ship pulled away.

In a stormy sea, after breaking and patching their rudder, the colonists saw a small ship coursing toward them. When within earshot, a man on board said he came from de Monts and that another ship, the *Jonas*, was sailing even now to Port Royal, laden with new supplies. The settlers returned to their abandoned plots on the shore, where the larger ship had already landed. Cannons blasted in celebration, the colony was reclaimed, a recently arrived nobleman opened a cask of wine, and they drank.

As well as hope and alcohol, the boat carried pigeons. While North America was home to several species of pigeons, including wood pigeons, and more notably, passenger pigeons that nested in flocks miles wide, the domesticated rock dove was a stranger. This ancestor of the street birds who now dirty statues in New York City and roost on window ledges in

Minneapolis, originated in southern Asia, but had been bred for centuries in Europe for food and amusement.

Champlain didn't mention the pigeons in his extensive records, but then, he didn't mention his wife either. Focused on his task of mapping a New France, Champlain spent his ink and enthusiasm on details of rivers and soil. But Marc Lescarbot, a passenger on the *Jonas* and a favorite of the historians because he was witty and prolific, did notice the pigeons and penned them into history. In his *History of New France*, after describing the settlement's sole sheep, he writes, "We had no other domestic animals save hens and pigeons, which failed not to yield the accustomed tribute." He also mentions that the settlers had to watch out for eagles which feasted on the pigeons as an imported delicacy.

A lawyer and sometimes poet, Lescarbot was not so singleminded as many of his companions. At one point, he wrote a play to welcome Champlain home after a long scouting journey, picking up a trident and donning a seaweed beard to play the lead role of Neptune himself. Later he would be jailed for writing verses that mocked the Jesuits. While he cheerfully dug drains and built walls, he seemed to have come to New France mainly on vacation.

Lescarbot's observations didn't stop with pigeons. He chronicled a New France bursting with resources ignored by his gold- and fur-seeking peers: lobster, mussels, and cod, thick forests and raspberries, and eagles so plentiful as to become a nuisance. He also recorded the first of the flood of exotics colonists would bring to New France: wheat, rye, hemp, asparagus, French beans, turnips, peas, roses, hollyhocks, tulips, sheep, cattle, pigs, horses, geese,

ducks and donkeys. Another exotic species -- less desired -- snuck on board. Detailing the local tribes' encounters with European rats, Lescarbot comments, "The savages had no knowledge of these animals before our coming; but in our time they have been beset by them, since from our fort they went even to their lodges, a distance or over four hundred paces, to eat or suck their fish oils."

Though Lescarbot is considered very accurate, I wonder how long captive pigeons could have survived in a climate where scurvy ran rampant and Champlain believed one cure was fresh meat.

But the next year, the party left further evidence of pigeon dreams. After abandoning Port Royal a second time, Champlain stubbornly returned yet again and established Quebec. He sketched a drawing of the settlement, each area meticulously labeled. The picture showed a building half fanciful and half martial, part country village and part fortress. Three main sections housed workmen's and artisans' quarters, a storehouse for weapons, a forge, and a kitchen. Raised outdoor walkways and a lower promenade allowed residents to take a stroll without leaving the main structure, and a drawbridge permitted or forbade entrance. Beefy curves of smoke curled out of three chimneys, and similarly cheery swirls poured out of three cannons. A flag above a sundial snapped in the breeze. A plot decorated with intricate designs indicated Champlain's gardens on the banks of the St. Lawrence River. And towering three stories high, in the middle of it all, was the pigeon house.

Despite this persistent longing to keep pigeons as pets, it's once again hard to believe these tender and tasty morsels made it through the next winter when men died from eating badly cooked eels, and starving Indians

rode a block of ice across the river to ask the settlers for bread and beans and to devour a dead and rotten dog. Ten more died of scurvy before spring.

But if a pair of rock doves didn't escape, make a nest of sticks and feathers on a bare cliff and brave the snow rather than returning to the elaborate pigeon house, if they didn't spend the spring stealing hemp seeds out of Champlain's gardens, and raising chicks, if they didn't engender a flock which soared grey over the town of Quebec, grew with it, and then began to push west and south, plenty more arrived with settlers from England flooding into Virginia. Cage after cage came over. Some odd and overwhelming desire created ample opportunity.

During the years when Champlain was mapping North America's east coast, pigeons represented nobility in its most refined and oppressive form. One of the rights of nobles in sixteenth and seventeenth century France, along with building windmills, taxing peasants, and administering their own form of justice, was owning a dovecote, or pigeon house. Surrounding farmers could not kill the birds, no matter how much they gorged themselves on their grain. At times, more than a million of the birds flew over the fields. At the start of the French Revolution, one of the first things the peasants did was to release the noble's pigeons, sending this privilege fluttering to the winds.

Maybe by importing these pigeons, the settlers of New France were trying to carry the structures of class with them, to set up the old society on new land across the sea. Unlike some of the colonists from England, seeking to escape oppression in their home country, settlers from France wanted to spread their nation's glory, religious and otherwise. Though they were not

themselves missionaries, both Champlain and Lescarbot laud Catholicism and priests' efforts to enlighten the Indians. This blend of biology and symbolism is made overt in the symbol of France as three lilies and in patriotic metaphor which paints France as a fertile garden. Champlain followed in this vein when he wrote to the Queen of his love of navigation which "induced me to expose myself almost all my life to the impetuous waves of the ocean, and led me to explore the coasts of a part of America, especially of New France, where I have always desired to see the Lily flourish." Maybe the birds were a similar sign of national pride, a feathered badge of patriotism. As a noble, de Monts would have had the right to set up a dovecote wherever he claimed new land.

But even a carpenter, measuring posts for a cannon platform, or a thief plucked off the Paris streets, now listening to the churning of Canada's strange tide, must have been soothed by the familiar low coos. Amid all these new hawks and fish and seals and moose, the puff-breasted, soft grey bodies bobbing in that homely strut must have been something of a relief. Now resentful, now homesick, they must have sensed how these birds can prompt a tangle of emotions.

Columba livia is one of the only animals with two vernacular names, one bearing all the complaints, the other holding all the metaphorical richness. No one looks at the grimy feathered, orange eyed, randy bird defacing a statue in San Francisco's Union Square, and thinks, "These street doves are a menace," just as no one refers to "the white pigeon of peace." "Pigeon," which follows "pig" in the dictionary, originally referred to any young bird, and comes from the Latin "pipire," to chirp or cheep. The earliest

listings in the *Oxford English Dictionary* are for recipes ("Take peions and stop hem with garlec ypylled and with gode erbes ihewe," from a 1390s tome), but it's all downhill after that. A pigeon is someone who's easily duped or a coward; to pigeon someone is to take advantage of their gullible nature. A stool pigeon is nobody's friend.

The birds deemed "pigeons" also mirror us in ways we may not find flattering. They live in cities along cement ledges when they could fly anywhere. Once the pets of aristocrats, now they now share the habitat of skateboarders looking for smooth cement slopes far from the police. They achieve huge densities and cover their immediate surrounding with grime. They become greasy with dirt and filth. They think about sex all the time. They're mostly monogamous, but not strictly, and they prefer Twinkies and Wonderbread to more wholesome foods.

"Dove," of more doubtful origins, may spring from the Old English word for "dive," but it has come to represent our hopes for our best selves. A 1380s use of "dove" is not a recipe but a revelation. From the Wyclif Sermons: "The Spirit cam doun...and his Spirit was his dowfe." Doves decorate statues of early fertility goddesses, and a dove returned with an olive leaf indicating receding water to Noah and his seasick ark. In Christian tradition, a dove is the holy spirit made manifest. We use "dove" to describe the ones who make our hearts thrill ("She is coming, my dove, my dear," chirps Tennyson in his poem *Maud*.) and the peace lovers in Congress. Essentially, the colonists brought doves to the new world, and ended up surrounded by pigeons.

But even within the category of "pigeon" there's a further split. Sometimes they're well bred, and sometimes they're feathered trash. As

traditional dovecotes fell from favor during the nineteenth century, pigeon breeding flourished as a pastime for gentlemen. Birds were bred for size, feathers that curled out rather than in, short beaks, lavish tails, navigational ability and speed. The most famous of the pigeon fanciers was probably Darwin, who used his pigeon observations as one of the foundation blocks of his argument for natural selection in *On the Origin of Species*. He watched and took notes as offspring of white and black pigeons went on to produce slate blue chicks with black bands on their wings. He gently ridiculed his fellow pigeon fanciers who believed prehistoric England to be populated by tumblers and fantails and pouters and runts. He proposed instead that people selected for and enhanced these traits in the humble rock dove. And, if artificial selection worked, he reasoned, why not natural selection?

From the time of Caesar, pigeons were bred to carry vital messages, but training of racing homers picked up during the nineteenth century. During World War I and World War II, homing pigeons used in battle were lauded as heroes, awarded medals. Cher Ami, Lady Astor, Wisconsin Boy, and Jungle Joe were a few of the stellar performers. G.I. Joe, an American bred homer, flew to a British fighter plane squad in time to stop it from bombing an area containing its own soldiers. Crippled by shrapnel and lamed by bullets, such birds were honored then stuffed upon death. Their determination was credited to courage rather than instinct, as is evident from the praise offered by J.L. Carney: "Into the breach went the little racing pigeon -- the most gallant little bird the world knows. And they came through -- came through with the messages of weal and woe; came through when the shattered troops were crying for aid -- when every other line of

communication had failed."

Only in the 20th century did pigeons start amassing in United States cities in dense populations. Their sheer numbers may contribute to their unpopularity. Near the turn of the century, the birds became more and more frequent. Some dramatic increases are even more recent than that. From 1972 to 1992, feral pigeons in El Paso, Texas, increased from roughly 100 birds to more than 1,500. Abundance may yield disrespect.

Some of this distaste has a biological foundation. Pigeons can carry disease -- influenza, tuberculosis, and toxoplasmosis to name a few. These can be transmitted to humans. But in other ways, pigeons are physiologically remarkable. Large eyes give them a visual field of over 300 degrees, and they are able to detect near ultra violet light. Their sense of hearing is more acute than ours as well, allowing them to track low and distant noise. Unlike most other birds, pigeons feed their young on crop milk, a protein rich fluid secreted from sacks in their throat.

Badges of privilege are usually rare, but pigeons' most outstanding trait is their ability to breed and breed and breed. Though they only lay one or two eggs per clutch, feral pigeons mate and rear chicks all year round in cheap nests composed of a few gathered sticks. These escaped domestics are more fertile than wild rock doves, indicating that humans selected for good layers.

Back under the overpass, the multicolored pigeons feed, heads bobbing in that characteristic pigeon way. The males puff out their chests and fan their tails, trailing the females who peck in the dirt. Their cooing blends with the shush of tires above. If a female doesn't chase him off, the male will begin preening gestures around her head and neck. Then she will peck at his bill as

a nestling asks for food, testing his fatherhood instincts. If he feeds her, the mating and nest building begin. It's a lifelong pairbond that can produce chick after chick, but this particular romance is interrupted. A man who's been sleeping in a taxi emerges from deep in his beard and starts the engine. They're off, wings clapping.

Sadly, other members of the order of pigeons and doves have proved not so able to breed themselves into abundance when faced with buildings and bullets. The last dodo, a huge flightless pigeon, became extinct the same century that rock doves first soared above the New World. Just as urban rock dove populations began to explode, Martha, the last passenger pigeon died old and infertile in the Cincinnati Zoological Gardens.

For a variety of reasons, opinion about pigeons may be switching yet again. They've proved difficult to dislodge as a pigeon nesting amid spikes on a windowsill attests. They are willing to keep us company in these cities that might otherwise seem sterile. They lure in more valued birds of prey. Recently, San Francisco, which once ardently attempted pigeon eradication, just gave up. In place of poisons, glossy ads appeared on kiosks and in bus stations offering urbanites tips on pigeons habits and natural history, so they could better appreciate their feathered associates. Maybe we'll just accept these messy neighbors, yield up our statues and park benches as a tribute, and let them go.

* * * *

Champlain was a navigator and a geographer, adept at finding his way from place to place. Proud of his profession, he wrote to the queen, "Among all the most useful and admirable arts, that of navigation has always seemed

to me to hold the first place; for the more hazardous it is and the more attended by innumerable dangers and shipwrecks, so much the more is it esteemed and exalted above all others, being in no way suited to those who lack courage and resolution." His maps bear the marks of this ardent desire and seriousness of purpose. A sea beast as with the head of a lion spouts water and frolics off the coast of Greenland. A bear and moose big as mountains roam through valleys. Bushy trees speckle the interior. Out at sea, two compass roses offer directions, along with sketchy longitude and latitude lines. He wrote books for seamen, instructing them to remain sober and become intimate with their astrolabe. In a way, he was the pigeon of his day, sails like wings carrying him back and forth across the Atlantic, until he finally died in Quebec in the spot he'd identified as his home.

But while Champlain's primitive instruments guided him over the salt waves, the pigeons, who tell time by the sun with eyes that can watch it move, who feel the tug of the earth's magnetism and lay out a map, who may smell dust from their loft on wind currents or hear distant waves, didn't find their way back to France. They stayed and flourished in ways New France's original colonies never did. Maybe the Atlantic was too daunting an obstacle. Maybe they'd become attached to their cages rather than to a distantly remembered dovecote. They remained as the British took New France. They dispersed as the French staged a revolution. They flew from Atlantic to Pacific as the Americans took the aftermath of their own revolution and built a nation with liberty, justice, and pigeons for all.

War Stories

In 1776, General Howe arrived in America with the mission of subduing the colonists who were in open rebellion. With him, he brought mercenaries from the areas that would eventually be Germany, but were then called Hesse-Hannau, Hesse-Cassel, Anspach-Baireuth, Anhalt-Zerbst, and others. These professional soldiers brought with them bayonets, cannonballs, maps, tents, salted pork, dried peas, seeds in the dirt of their boots, microbes on their skin, bacteria in their stomachs, and a small fly, which may have traveled in the straw of the soldier's bedding. The Hessian fly, or *Mayetiola destructor*, would thrive in America long after the Hessians and British were evicted, eventually becoming the nation's worst wheat pest.

The facts of this introduction are small and pesky as flies themselves, which buzz in the ear, but remain out of sight. During a war, no one is paying much attention to bugs, particularly those who busy themselves with plants rather than people. Naturalism is a leisure activity, but once it crosses the line into agriculture, concern begins to flourish. The effects are visible everywhere, in weak wheat crops, in struggling farms, but the cause is hidden

in a blackness when the nation blinked.

It might have been like this. Dark night. One soldier. A wound tearing down his side. Shifting in his bed, he can't get comfortable, though he knows he should sleep. The straw rustles and smells like home. Some European air must be locked in the stalks, held in the leaves. Stray pieces poke at him, touching the tender edges of flesh and making him smother his groans.

Slap. Missed. These rebel mosquitoes are fierce, bloodthirsty, much bigger than the ones he's used to, which seem as mild as butterflies in comparison. His legs are swollen with itchy bumps, eased briefly by scratching against the wool blanket. The bites are bad, but the worst is the high-pitched whine, like a list of chores undone. Slap. He's got one, leaving a smear of blood on his forearm, mixed with legs and wings.

As his legs itch and his side burns, he keeps thinking of fire. Flames met them on the shore as they landed on Long Island. Haystacks, barns and lighthouses lit up the dawn. First just a shy wisp of smoke escaped through a door, or window, then the buildings exploded with a roar like cannon. The haystacks took no time at all. One moment his horse would be pulling toward the sweet smell; the next there was nothing but small snakes of flame darting through the surrounding grass. These explosions seemed personal. The rebels hid themselves well, so the landscape appeared to spontaneously throw up its hands in hysteria and voluntarily combust at the sight of the English and Hessian troops.

And the fires when he rode into Flatbush. The sight of all of those fine houses, then the smell of burning wood and brimstone. But this time, the men holding torches were visible, and he flushed one out from the back of a

house. As the rebel fled into the woods, the Hessian jaeger glanced in a window and paused, resting his palm against the shingled wall. Two chairs sat by the fire place, perched an arm's distance away from each other. On one, a heap of soft blue knitting draped over the arm. On the other, someone had laid down a book, as if he'd just stepped out for a moment. The room centered on a table which held a bowl stacked high with peaches, apples, pears and grapes. Over the mantle, a landscape painting displayed a part of this troubled island in soothing colors, fences dividing the fields, neat and orderly.

Then, with a sound like a furnace, flames consumed the table, the painting, the knitting. He thought a pang of distress seared through his side, but when he looked, his jacket was torn. The shot passed clean through, leaving only blood and heat. A heat which centered on his side originally, focusing all its anger on the lips of the wound, but then spread. He imagines its tendrils reaching down his thigh, across his stomach, up toward his heart. Now his whole body is flushed, burning like a haystack, like a house, and he shivers in the chill breeze.

A man, the chaplain, comes in and puts his hand against the soldier's cheek, clucks, pours him some water. In the candlelight he seems like nothing but planes of brown and black, planes that keep shifting, reconfiguring themselves. The soldier can't tell which is face or arm, and finds himself staring at an eye that is actually a button and tracking a hand that turns out to be an ear. Finally, he just closes his eyes, feels the hand on his cheek, hears the cluck, and then the water rushing from the pitcher like a flood. Another cluck as the soldier turns on his side and exposes the wound to the night air.

"Any worms?" He asks.

Maybe the bands radiating out from the patch were processions of insects. He'd seen worms under the bandage of a friend, squirming where his toe had been blown away by a musket ball. His friend asked him to pick them off, but he couldn't even look, afraid they might begin consuming him too. Now he was vulnerable to any maggot that could find him out.

"No. Nothing like that," the chaplain says, his face pulling into focus for a moment, wrinkled forehead, sad mouth, before he takes the candle with him into the dark.

With the straw poking him in the back and his rough blanket chafing him in the front, the soldier thinks again of that soft wool gathered on the chair. He's tired of this life of uniforms and salt pork. These colonists have so much. It looks so easy. Produce and livestock grow fat on this land with only the smallest coaxing from men. Even with no coaxing at all, as he'd seen fruit growing wild and untended and deer walking casually out of the trees. Those woods could hide a man for days, or weeks. When the army moved on, he could emerge like an insect out of a chrysalis, and begin again as an American. He might just do that. Just walk away, out into the fields where the wild grapes grow as big as his thumb tip, as big as a dead man's eyes, as big as those hot, ripe, stars.

The next morning the fever had broken. Blankets lie smooth against his cool skin. Through the tent flap, he sees light wash over the fields of wheat, then pick out individual plants, making each one distinct. As clanking pots echo from other tents, geese feeding early take off from the plots of Indian corn, honking and beating their wings. He stretches, feeling for his

wound. It seems only a small hole in the solid expanse of his flesh. The tiniest of blemishes.

The chaplain pokes his head through the tent flap.

"They're running," he says. "This war might be over in days."

The soldier gets out of bed and begins to pull on his uniform.

And beneath him, in the warm sunlight of late summer, the pupae nestled in a piece of straw opens, and a fly crawls out. Tiny, delicate, a small brown body perched on long zigzagged legs, it's like a mosquito that feeds on plant juices rather than blood. After summering in the stalk, now the fly's ready to mate and lay 100-300 eggs, cradling them in the veins of the wheat leaves. When these eggs hatch, the maggots will crawl down the leaves to the stem, where they will begin to feed. All the adult needs are a few winter wheat plants to start the cycle. It doesn't have to fly far.

Only when the tide of battle turned, when the rebellion, which appeared on the brink of failure, was pressing toward victory, and when General Howe was recalled to England in disgrace, would anyone start to pay attention to the scale of the invasion. In 1789, farmers on Long Island noticed that in the same spots where the Hessians camped, wheat was stunted. Stalks grew bumpy, thick, with dark green leaves. Many plants died over the winter. Others failed to put out the tillers that allow the plant to expand. The Americans in their new country took even more notice as their main concerns switched from fighting to writing letters to the newspapers about the wording of the Constitution and reclaiming their homes and fields.

Amid organizing their government and sifting through ads for worm powders, stage coach rides, opium, hemp cordage, new printings of *The*

Principles of Latin Grammar, and rewards for runaway slaves, the Americans glimpsed a new enemy on their shores. So small they were barely visible at times, the insects hovered over the wheat fields, or clung to the plants, waiting for a spell of warm, calm, egg-laying weather. The fly was troublesome and threatened their homes, and the Americans named it after their old enemy.

But maybe it wasn't the Hessians who introduced the Hessian fly. The colonists despised them as mercenaries interfering in a personal feud, and didn't soften any as the soldiers looted their homes, despite strict orders from General Howe. As Bernhard Uhlendorf points out in *Revolution in America*, the Declaration of Independence itself devotes space to condemning the transport of "large armies of foreign mercenaries to complete the works of death, desolation, and tyranny already begun with circumstances of cruelty and perfidy scarcely paralleled in the most barbarous ages, and totally unworthy the head of a civilized nation." In his recollections of his days as a soldier in the Revolutionary War, Private Joseph Plumb Martin writes of the Hessians, "they should have kept at home; we should...never have gone after to kill them in their own country." Maybe the pinpointing of the insects' origin in a spot where the Hessians camped had a political motivation. The flies originated in Russia, after all. No one with a German accent came forward to admit bringing over contaminated straw. No one saw the first newly hatched insect take flight near a Hessian bed. Pestilence makes good propaganda. Loyalists responded with the rumor that it had been somehow all George Washington's fault.

Ten years after General Howe and his troops landed on Long Island,

the name "Hessian fly" was firmly established, even if the origin wasn't. In 1787, a citizen penned a letter to the *Pennsylvania Gazette*, writing "I would beg leave to propose...that the Philadelphia Society appoint a committee to inspect a number of fields of grain, infested with the Hessian fly, to inform themselves of its history and progress....This insect did not advance to my neighborhood, to be observed, until May 1786. It is now increasing to an amazing degree."

And the fly remains. Pesticides never were that successful, and farmers have taken to planting around the breeding cycle of the fly and plowing infested fields under. The Hessian fly and wheat have been together long enough and have short enough life spans to engage in an intricate dance of evolution. In the 1780s, reports in America of wheat varieties resistant to the fly began to crop up. Larvae die on the resistant plants, unable to feed for one reason or another. China, Red May, Red Chaff and Mediterranean were some early resistant varieties. In the late 1800s, farmers recorded that Palestine, Polish, Common March, Diamond, and Egyptian Imported proved at least somewhat resistant. At the turn of the century, Prosperity, Democrat, and Red Russian joined the list. And Pawnee, Omaha, Redcoat, and Ben Hur were recognized as resistant in the late 1920s. But in time, the few Hessian flies that could thrive on these varieties predominated, and the breeders had to come up with something new. Currently there are 40 wheat varieties resistant to the Hessian fly.

Wheat itself is an exotic, that is, if a plant so cultivated can lay claim to one region or another. In his 1908 book, *The Book of Wheat*, Peter Tracy Dondlinger cites sources that say wheat originated in Mesopotamia, but notes

that tracing the plant is difficult as even wild patches are thought to have escaped from cultivation. Wheat arrived in America along with the Europeans in the 16th and 17th centuries. The Hessian fly has followed the wheat wherever it went and inhabits most if not all of the places worldwide where the grain grows. Maybe the question of native versus exotic becomes moot here as the "natural" home of wheat, and by extension the pests which have evolved to feed on it, can be defined as anywhere that humans are. Of course, these semantic games mean nothing to the ecosystems strained by these newcomers, but they do take the hypocrisy out of judging one a hostile invader, and the other a welcome guest.

Following Silk Threads

Events that summer unfolded with the grim predictability of a horror story. Though predating Hollywood B-movies such as *The Deadly Mantis*, *Arachnophobia*, or *The Fly*, the tale featured all the elements of a hack screenwriter's fantasy. The mad scientist. A repulsive creature invading a suburban neighborhood. Women shrieking when they opened their closets. One slip, one tipped vial, and cities throughout the east coast were plagued by swarming hoards of caterpillars, stripping apple and oak trees, worming their way into houses, then turning and rising in a mad flutter of wings. Despite pesticides and predators, they spread, outbreak by outbreak, leaving a trail of bare branches and disgust. Eventually, the storyline veered beyond anything a cinema screen could hold.

In a modest house at 27 Myrtle Street in Medford, Massachusetts. Leopold Trouvelot, an astronomer with a knack for naturalism, was trying to breed a better silk worm. He imported several European gypsy moth eggs, planning to cross them with a North American species. If his efforts

succeeded, he could jump start the silk industry in the United States and boost his own fortunes as well. When several of the gypsy moths escaped one warm day in 1868, the plot ground into motion.

In late July of 1997, hoping that stories stick to walls like paint or sink into the ground like motor oil, I go looking for 27 Myrtle Street, Trouvelot's old home. With me I have an 1895 street map, a photograph of the house, and a thick book called *The Gypsy Moth*. This 500-page tome was written in 1896 by two zealous scientists who gathered knowledge as ammunition against the persistent insect. The book, full of passion-driven detail, is equally full of bleak photographs of bare shrubs and leafless trees. It's no mystery why the authors were so compelled. After winding through the streets of Medford, following the command of one-way signs, I light on Myrtle. The quiet neighborhood near the Mystic River teeters on the edge of disrepair. A boy rollerblades down the sidewalk in too big overalls, his baseball cap on backwards. He zooms by a man in a wheelchair going the other way. Dogs behind chain link fences growl threats at passersby. Weeds push through cracks in the asphalt. A wind chime tinkles over distant traffic.

The houses on the left side tick off in numerical order. 35, 31, 29, 25. There is no 27. Possibilities leap to mind. Trouvelot's angered neighbors burned it down. The house, infested with moths from cellar to ceiling, was dismantled by the state. Or more recent owners simply changed the number. My photograph is no help. All the houses are identical, and the basic blueprint could have sprung from a child's pen: a boxy front, a peaked roof, a door to the left with several steps leading up to it, and four windows to the right, two on each floor. Within this outline, each has small adjustments,

shifts and ruffles in response to the owner's personality. One home is pale yellow. Another, pale green. Some have brown wood showing through chipped white paint; others display renovated windows, pulled to the center, and the sun shines on new glass. One yard is tightly cropped and fenced. In another, a knee-high virgin Mary, robed in blue, keeps watch over daisies and nasturtiums.

The house in the 1895 photograph has wooden cutouts, like waves, running along the front of the upside-down "V" of the roof. Surrounded by a picket fence, the yard contains an arbor with vines massed on top. In front of the house stands a hitching post and a thin tree, staked on both sides like a splinted arm. A tree in the yard looks even worse. Leaves fluff one or two branches, but the rest are bare sticks. Now, decades later, the trees have recovered, or been replanted, but they are not so noticeable beside the telephone poles marching down the street, lacing the sky with wires, or the Fords, Mazdas and Toyotas parked against the curb.

For my own satisfaction, I decide that Trouvelot's house is 29, and that the current occupants doctored the address. Slightly self-conscious about staring on this bright day, I lean against my car with the expression of someone attempting to locate the address of a good friend. With information gathered from side glances at number 29, I try to strip away this 20th-century veneer of cars and telephone wires, and see what might have gone on within those walls one afternoon in May of 1868.

Somewhere, maybe moving into the kitchen, a man searches for his pen. He has a crooked nose and his eyes are close set, dark with intelligence. Black hair sweeps up off a pale forehead and a beard buries the lower part of

his face, but under all that hair sits a rather delicate mouth. He is talking to himself as he peers at a cocoon, tilts it into the light. The transformation of a caterpillar into a fragile pair of wings never ceases to fascinate him. Earlier, he sliced the cocoon open and replaced one half with a small window so he could watch the moth take shape, and it does, right now, but he can't find a pen to record it.

The kitchen table is covered with his experiments: deformed moths, whose wings he pricked when they were newly hatched and fluid-filled, silk reservoirs which he cut from caterpillars to see how far they would stretch, pupae in a bottle. He has just come from his real laboratory, the five acres of shrubs and weeds behind his house, where, under nets, he keeps thousands of moths and caterpillars captive. Still warm after chasing the hungry robins off the bushes, he feels sweat beading on his face. Perhaps he wipes his forehead with a silk handkerchief.

Fashions of the time are swathed in silk, from bonnet to shoe. Black silks for mourning, silk velvets for opera mantles, intimate silks for the wedding trousseau, rose silks, pink silks, maize silks, silver, grey, and blue silks, light striped silks for spring, cheap checked silks for daily wear, grand silks with the new satin stripe, bonnet silks, sewing silks, walking, evening, and dinner silks, silk for sleeveless jackets (new for May!) in Duchess and Walter Scott styles. Hundreds of yards of the lustrous fabric pile in warehouses and shops waiting for consumers to come, to buy, with appetites almost as voracious as those of the caterpillars themselves.

With a new tax on imported silks, and disease running through French and Italian silk worm populations, the time seems right for an American silk

industry. Magazines like *Scientific American* urge readers to breed silk worms and feature frequent articles on the topic. Pasteur is intrigued; Stiles, the President of Yale College, spends 40 years studying the moths. In California, where hopefuls raise millions of trees and cocoons, one man envisions a silk community, and proposes carving up a ranch near Los Angeles and selling 10-acre lots to families who will plant mulberry trees and raise silk worms. The state fair displays California-grown silk fringe and demonstrations of silk reeling and cloth weaving. The new business is economical as well. In 1871, W.V. Andrews notes in *Scientific American* that "The labor of a few old men, or women, or even children, is sufficient for the purpose. The cost is therefore trifling."

In Massachusetts, a textile industry based on cotton and wool flourishes, with the mills in Lawrence and Lowell churning out yard after yard. Power looms and new machines that weave lush velvets and complex patterns revolutionize the industry, cracking open a market for silk. Mills and foundries churn and roar the country into a new shape. For manufacturers, this is a time when production is limited only by ingenuity, market smarts, the willingness to risk. Young farm women and immigrants are only beginning to organize, to object to being treated like machines.

But the American silk worms aren't cooperating, and imported raw silk from China still feeds the American industry. Most American species spin silk that proves dull and difficult to card, or create dense cocoons that are tightly stuck together and weak-fibered. Raising silkworms in the Northeast is particularly chancy because the insects often can't survive the cold, and one *Scientific American* author argues that introducing new species is of "so

much prospective importance, that I shall devote the remainder of this article to the consideration of whether *Yamamai* and *Pernyi* may not be naturalized here." He is not the only one dissatisfied with native species. The Council of Paris Acclimatization Society imports silkworms from North America, while Japanese silkworms munch on oaks in Austria.

Trouvelot's wide-ranging and restless mind seizes on this problem. Maybe he's drawn in by waving antennae and powder-dusted wings. Or maybe he imagines silk threads will carry him across the river to a nicer house in Cambridge, where the big scientists peer through big telescopes. Either way, he's experimented for years with *Telea polyphemus*, a North American species whose caterpillar spun a strong and glossy thread, but which was notoriously difficult to raise. But now he has new hopes. Amid the vials, cocoons, and moth parts, lie the eggs of the European gypsy moth. The moth is classified as *Bombyx dispar*, placing it in the same genus as silkworms. When crossed with the North American moths, the gypsy moths might produce a heartier breed, easy to raise and able to withstand the New England winters. Mind alive with possibilities, Trouvelot takes a last look at the emerging moth, and spots a pen wedged at the back of a shelf by the oven. And then...

Here my imagination yields to three different accounts of what actually happened. The eggs, resting on a table, blow out the window with a gust of wind, or the eggs, enclosed in a vial, are knocked from the windowsill and set free, or wind rips a hole in the netting covering Trouvelot's experimental plots. But somehow, the first small spheres drop to the grass.

The eggs nestle there for days or weeks, growing dark as the embryo

swells. Then one day, their first instinct pricks to life, and they start to chew, first gnawing a hole in the egg casing, then enlarging the circle, until only scraps of the top and bottom of the shells remain. Once free, they rest for a day, or two, or three, nibbling at leaf hairs. Eventually, the tiny caterpillars turn and move toward the light until they stumble across another leaf.

If it is a black currant bush, a turnip plant, a weeping willow, a red maple, a black oak, a white pine, or any other of more than 400 plants found in Massachusetts, they feed, starting a circle in the leaf and then chewing around it, bite by bite, until holes spread like acid on cotton. In Trouvelot's yard, they find a rosebush, or maybe an oak. When one tree is stripped, they drop down on a silk thread and let the wind launch them to another patch of green. When older, they will eat along the edge of a leaf, traveling around again and again, jaws working methodically, until all that's left is a spine.

As they eat, they strain their skins and molt, pulling their heads from the old casing, then pressing backward until the casing tears. Crawling out of this crevice, they resume the search for food. They molt and grow and molt again. Hairs sprout from the red and blue bumps that file down their backs. Grey bodies end in black heads marked with fingers of white, skunklike. Traveling on many legs over twigs and limbs, the caterpillars occasionally stop to rear back and test the air.

A few months after first hatching, the caterpillars seek a sheltered spot, like the eaves of the astronomer's shed or the corner of his fence. In three hours, they pupate, and over the course of ten to twelve more, they shift and change, growing new structures and losing the old. Finally they emerge, wet and exhausted. A male moth dries off nut-brown wings and feathery

antennae tuned to the female scent. A female, larger, with thin curved antennae, flaps light wings painted with black spots and gray scallops. Weighed down with eggs, she is too heavy to fly, but the males are already cruising in a zig-zag pattern trying to catch her smell. They are already gathering around her. All she has to do is wait.

After mating, the female rubs her abdomen against the tree trunk or fence post, leaving fine hairs in the bark, then deposits her eggs, layer upon layer, hour after hour, gumming the mass together with abdominal hairs and her own glue. Several days later, she completes her egg mass -- each yellow mound capable of hatching up to one thousand new caterpillars the next summer.

Back in the kitchen, Trouvelot must shiver when he hears the "clink" of broken glass or finds a tear in his backyard netting. He has witnessed the ravages of a native silk worm, and noted, "What a destruction of leaves this single species of insect could make if only a one-hundredth part of the eggs laid came to maturity." Panic knifes through him as he searches the grass, and he tells everyone he knows to be wary, but his mind can't possibly encompass the destruction that will follow, the acres defoliated and millions spent on pesticides, any more than he can picture a man on the moon.

Ten years later, Trouvelot was gone and his warnings forgotten. Mr. William Taylor moved to number 27. He said "I found the shed in the rear of the house swarming with caterpillars." He sold the shed, but that didn't solve the problem. "In their season I used to gather them literally by the quart before going to work in the morning," he wrote.

Devoted to tracking the invasion, the scientist/authors of *The Gypsy*

Moth interviewed Trouvelot's neighbors about the first years of the gypsy moths on United States soil. They told similar stories of discomfort verging on the unbearable. Mrs. William Belcher, who lived next door to Trouvelot, recalled: "They were all over the outside of the house, as well as the trees."

Mrs. J.W. Flinn, another neighbor, said, "The caterpillars would get into the house in spite of everything. We would even find them on the clothing hanging in the closets."

Mr. D.W. Daly, who lived at #5, remembered: "I spent much time in killing caterpillars. I used to sweep them off the side of the house and get dustpanfuls of them. At night time we could hear the caterpillars eating in the trees and their excrement dropping to the ground....I used to sweep them off in solid masses from the tree trunks."

And then, in 1889, things started to get really bad.

Having denuded Myrtle Street, the moths spread to the outlying neighborhoods and flourished with the new food supply. As the gypsy moth caterpillars fell from the trees, one man covered his head with his coat and ran to catch the train to work, but at the station he found his jacket lining squirming with worms. Another woman described the embarrassment of having to sweep off her front steps every time guests stopped by, so they wouldn't arrive with their shoes covered with insects. Masses of caterpillars blackened house fronts. Days were filled with raking and burning piles of leaves infested with caterpillars, pouring boiling water over caterpillars marching along fences, picking caterpillars off the wash and from underneath the pillows. Many stayed inside on hot summer days to avoid insects in their hair and skirts. The stench of dead bugs hung over Medford like smoke,

intensifying in the summer heat. The noise of the feeding insects sounded like "the clipping of scissors," "a breeze," or "the pattering of very fine rain drops," and whoever heard them knew she would wake up to a yard full of skeleton plants. Some tried to move out of the neighborhood, but were invariably met by questions about the trees, leafless and bare in June. One glance at a caterpillar crawling across a trouser cuff, and the prospective home-buyer was gone.

As the outbreak progressed, the state launched its own attack. Teams of men descended on egg clusters and burned them, sprayed them with acid, doused them with oil, and coated them with tar and varnish. Individual trees of sentimental or commercial interest were girdled with tar paper, in hopes that the caterpillars would stick, unable to cross. Others were wrapped with burlap, which lured caterpillars to its shelter so managers could remove and destroy them. They sprayed Paris green, London purple, and other arsenic-based poisons over acres of hatched caterpillars, in an attempt to kill them before they bred.

Meanwhile, in his new home in Cambridge, Trouvelot shifted his gaze upward and pursued his true passion: astronomy. At his own observatory and at Harvard's, he watched fiery arms fling themselves from the sun, reaching for a distance of 300,000 million miles, flaring and disappearing in seconds. Nights were spent gauging the transparency of the inner rings of Saturn. Before his eager eyes, mist-covered holes opened in the sun's chromosphere, red spots glowed on Jupiter, the tail of a comet pulsed with light.

The Harvard Observatory commissioned a series of astronomical

drawings by Trouvelot, which met favorable reviews in the *New York Times*. A critic wrote, "In one of these drawings there is a fork of flame very nearly 100,000 miles in height, and it is surrounded with cascades of fire resembling - - though on an immense scale -- the fantastic play of the flames which leap from the huge furnaces of the iron districts."

And one May day in 1883, while the gypsy moths in Medford consumed his neighbors' fruit trees, he perched on Caroline Island, an isolated reef in the middle of the South Pacific, waiting for a solar eclipse. In a break between two storms, Trouvelot watched with other scientists from the United States and France as the sun ducked out of sight. The ocean was lit by stars. For the five minutes and twenty-three seconds of darkness, he scanned for planets orbiting Mercury, but nothing was there.

At the moment when I get in the car and turn to go, releasing Myrtle Street to its history, European gypsy moths are spread throughout the eastern states. An Asian cousin arrived in California by boat in the early 1990s, and both species turned up in evergreen-spotted states, where trees are big business and don't recover from losing their needles. They have been named and renamed over the years -- no longer viewed in the same genus with *Bombyx mori*, the silkworm, they now are dubbed *Lymantria dispar* -- but the destructive effects are the same. In 1981, gypsy moths defoliated 12 million acres. Scientists have introduced more than 100 exotic gypsy moth predators, in hopes of controlling the outbreaks, and managers spray gallons of new insecticides including Dimilin and Gypchek. Their tricks also include luring males to their deaths with artificial sex pheromone. But other methods remain the same, and on hot summer evenings in the east, families still go

seeking gypsy moth egg clusters, torch in hand.

In the late 1950s film *The Deadly Mantis*, technology saves the world from an unwanted intruder. The military does in an outsize Arctic preying mantis by hurling “chemical mines” at the beast as it crouches in a Manhattan tunnel, trapped by civilization. As every insect worth its antennae knows, power comes from numbers, not size. But this is only one way these monster movies misinterpret the possibilities of invasion. Missing from the real life horror story scenario is the quick fix and the antidote. Instead there is human adaptability, the same quality which allows us to live in the desert and in the Arctic. The same quality which allows us to colonize almost any place we choose, including outer space. The same quality that allows us to turn cocoons into lingerie and to breed better cocoons if the original ones aren't satisfactory. And the insects adapt, as well. Instead of the good guy who will blast the pernicious invaders to Kingdom Come and return the neighborhood to static perfection, we have a neighborhood changing so fast that no savior can keep up. Stasis and control are myths of the machine age and motion pictures. One offers products that are mass produced, all the same. The other offers stories with neat endings, all the same. But the horror that comes from change doesn't hold its shape through the soothing span of time. During an outbreak in the 1970s, while caterpillars moved like a black carpet over six states, the plague became a game. Kids perfected the art of stomping on the caterpillars at just the right angle so the guts would spray all over their friends.

Pacing the streets of Medford, Trouvelot must have walked around in a daze half the time. With knowledge not only of the interstellar dramas

crashing overhead, but of the minute worlds writhing through the microscope, his mind must have been taxed trying to grasp the complexity visible at every scale. Strange though, that with the sun shrugging off million mile long licks of flame like so much comet dust, he counted on the microscopic world to follow a regular plan. While he watched an eclipse make day into night as helpless scientists jotted notes, he thought that an insect might easily be harnessed to industry, that the natural world would follow his dreamt-up rules. It's a common enough assumption and many stake their fortunes on it. But Trouvelot? With all that he knew, with all he'd seen, he surely might have suspected?

Words on the Wing

I imagine him a quiet man, an unassuming man. While his relatives were making headlines all through the 1800s -- stewing in jail on charges of bigamy, leading expeditions to the West, being captured by the Crow and released moments before death, amassing large fortunes in business and giving interviews in *The New York Times* about the servant problem -- Eugene Schieffelin was working for the family drug manufacturing company, attending meetings of the New York Zoological Society and reading Shakespeare.

But he would have a more lasting effect on this country than any of his sisters, brothers or nephews. They might have improved a neighborhood, or fashioned a law, but Eugene changed the American landscape from coast to coast.

What was he thinking that day as he went to Central Park with 80 newly imported European starlings in cages? He must have pulled his wool coat tighter around him to protect against the cold, and wrapped his scarf around his face an extra time. It was March 6, 1890, and the temperature

averaged 23 degrees. Snow had fallen all morning, occasionally turning to sleet, and then easing back to fluffy white flakes. It made icy statues of trees and bushes in the park, softening the accusing fingers of bare twigs into gestures of pale grace. Upstate, currant and strawberry farmers worried for their crops in the unseasonable weather; in the city, families hitched their horses to sleighs and prepared to go joy riding through the streets of New York.

It was a heady time, full of electricity and excitement. Side shows and fortune tellers lured crowds to Coney Island. Chicago scrambled to raise money to hold the World's Fair, and New York hoped it would fail. One business man was arrested when his product "hop soda" turned out to be beer. One business woman launched an international matchmaking service to link American desire for noble titles to the European desire for American money. As the world was growing faster and dirtier, hurtling with increasing speed toward a goal that was never quite clear, people wondered if art could save them. Poets were so revered that John Whittier instructed his barber to burn all his hair clippings to keep them from overeager fans. Robert Browning's death made front page headlines for nearly a week. There was a movement afoot to keep the Metropolitan Museum of Art open on Sundays to lure people out of the saloons. Schieffelin, in his own attempt to civilize the beast his country had become, wanted to introduce all the birds mentioned in the plays of Shakespeare, to offer scraps of poetry on the wing.

At 64, he must have had to watch his footing. Underneath the layer of snow, the cobblestones of the streets were buried under four inches of mud, frozen now and slick. The birds would have been unwieldy and loud,

screeching to each other in combat and fear as they pushed for space in the crowded cages. I imagine Eugene, carrying one cage in each hand, each bout of squawking threatening to knock him off balance. His servants followed with the rest. Finally, under a tree that looked like it might be hospitable when the ice melted off its branches and was replaced by leaves and buds, Eugene stopped and set the cages on the ground. He paused for a moment, breathing in the chill air. Then one by one, he opened the latches, and the birds stepped out into the snow-covered grass.

Dazed from months of traveling, first on rocking ships, then in bumping carriages, the starlings lingered near the cages at first. Some flexed their wings, still in winter plumage, flashing hundreds of white spots on black feathers. But they didn't go anywhere, just wandered a few feet in one direction, then another. At 4:30, the clouds pulled away, leaving a clear sky darkening into the deep blue of evening. Shouts and laughter filled the streets as the sleighs flew by, some carrying a couple, flushed and romantic, others whisking a whole family, squirming with glee. Hats and mittens littered the sidewalk. Eugene, growing cold and thinking about dinner, finally rushed at his birds, waving his arms and half yelling, half cheering them on, "Go, go, go." And first one, and then the whole group, took off, circling higher and higher into the black sky on blacker wings.

At 2 a.m., just as the last sleigh bells were falling silent, a pair of starlings found their way to the roof of the Museum of Natural History and ducked out of the cold. They fluffed their feathers, preened briefly and settled in for the night. Soon, if the hole was large enough, protected enough, they would begin to build a nest. It was almost spring, after all.

Schieffelin, back in his Madison Avenue home, was in bed. His wet coat and shoes crackled and hissed and sent up plumes of steam as they dried by the fire. The empty cages were stacked nearby, a few feathers still tangled in the wire mesh. Lost in a deep sleep, with the blanket pulled up to his chin, the drug manufacturer snored and mumbled and dreamt of waking to a world echoing with the same bird song that Shakespeare heard.

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Conservation biologists now view Schieffelin as an eccentric at best, a lunatic at worst. But he was not alone in his affection for the birds of the poets or his desire to see them in the New World. Throughout the United States "acclimatization" societies were releasing birds they thought would benefit or improve the landscape. Before Schieffelin, bird lovers freed starlings in New Jersey in 1844 and in Oregon in 1889, but the birds didn't thrive. House sparrows were introduced at least 20 times between 1850 and 1900, including a release of 1,000 in Philadelphia by city officials. In 1881, the popular turn-of-the-century naturalist John Burroughs received a shipment of skylarks from a friend in England and wrote back, "Only seven out of the 24 sent reached me, and two of those died on my hands. The rest I let out on a field back of the hill, and two of them, at least, are still there, and, I think, will breed. When you come over I think you can hear the original of Shelley's skylark."

In 1871, James Edmund Harting wrote *The Ornithology of Shakespeare*, which listed all the birds that appeared in the plays and sonnets, as well as the quotations that named them. While sparrows, larks and

nightingales twitter their way through play after play, the only time the starling appears is in *Henry IV, Part One*.

In the crucial scene, King Henry demands that Hotspur, a passionate and willful soldier, release his prisoners, but Hotspur refuses. The enemy has captured Hotspur's brother-in-law, Mortimer, and Hotspur is withholding his prisoners until the King agrees to pay the ransom. The King loses his temper, declares Mortimer a traitor, and instructs Hotspur never to speak of his captured brother-in-law again. After the King leaves, Hotspur fumes:

He said he would not ransom Mortimer,
 Forbade my tongue to speak of Mortimer,
 But I will find him when he is asleep,
 And in his ear I'll holler "Mortimer!"
 Nay,
 I'll have a starling shall be taught to speak
 Nothing but 'Mortimer,' and give it him
 To keep his anger still in motion.

Maybe Schieffelin should have read his beloved Bard more closely. In Shakespeare's imagination, the starling was not a gift to inspire romance or lyric poetry. It was a bird to prod anger, to pick at a scab, to serve as a reminder of trouble. It was a curse.

* * * *

Helium balloons, Roman candles, rockets, whirling shiny objects, noise makers shot from 15-mm flare pistols, firecrackers blasted from 12-gauge shotguns, explosions of propane gas, artificial owls, airplanes, distress calls broadcast on mobile sound equipment, chemicals derived from peppers,

chemicals that cause erratic behavior, chemicals that cause kidney failure, chemicals that wet feathers in the winter, and keep them wet until the birds freeze to death.

These are the ways farmers have sought to protect their crops from starlings. None has had lasting success.

The medium-sized black bird, with a glossy purple and green sheen and a talent for mimicry, can be a charmer when first introduced. Wolfgang Amadeus Mozart owned a pet starling, which he found in a shop whistling the theme from one of his concertos. He kept it for several years, and penned a poem in its honor when it died. Pliny wrote with admiration of a starling which could recite phrases in both Greek and Latin, and Samuel Pepys noted in his diary that he witnessed "a starling which do whistle and talk the most and best that I have ever seen anything in my life." The very name "starling" calls to mind a creature of the night sky, of the heavens, almost divine. But as their numbers increased, along with awareness of the dangers of introducing exotic species, starlings' popularity plummeted.

When Schieffelin died in 1906, the birds were nesting outside the Museum of Natural History, in a church on 122nd Street and Lennox Avenue, and in the Boy's High School building in Brooklyn, but they hadn't yet reached Kansas, California, or Alaska. From the 80 he released in 1890, and the 40 more he set free in April of 1891, the number of starlings in North America has now grown to 200 million. They decimate fruit crops and out compete other birds which nest in holes, including eastern bluebirds, northern flickers, great crested flycatchers, and red-bellied woodpeckers. A single flock of starlings, called a "murmuration," can reach up to a million or

more birds, blanketing the sky with darkness and the ground with excrement. They thrive in cities, along highways, at garbage dumps. Several years ago, an Ohio town hired an extermination company to poison the birds which were roosting nearby and rendering the sidewalks slick with droppings.

In 1906, when starlings had just reached New Haven, Connecticut, Frank M. Chapman wrote in the American Museum of Natural History's magazine, "From the bird-lover's point of view, the Starling is a decided acquisition to the bird-life of our cities, where its long-drawn, cheery whistle is in welcome contrast to the noisy chatter of House Sparrows." But even then, some segments of the population were beginning to realize the noisy house sparrows were also introduced from England by some well-meaning soul, and that exotic birds were more than an aesthetic pleasure. Seven years earlier, T.S. Palmer, Assistant Chief of the US Biological Survey, wrote a paper detailing the dangers of introducing animals wantonly, and suggested that species introductions should be restricted by law. Starlings introduced in Australia and New Zealand had already proved themselves voracious crop destroyers and persistent pests. By 1940, even Chapman was noting that the starling was shoving out some equally attractive native birds, and that its song, when sung by a thousand-bird chorus, no longer sounded so cheery.

If starlings have a noteworthy genetically programmed personality characteristic, it is aggression. They wait until other birds have created cavities for nests, then harass the architects until they abandon the site. Sometimes the starling enters a hole while the original owner is gone. When the bird returns, the starling leaps onto its back, clinging and pecking it all the way to the ground. Even when it has claimed a nesting cavity, a starling may

continue to abuse other birds breeding nearby, plucking their eggs out of the nest and dropping them on the ground. One ornithologist watched a starling dangle a piece of food in front of the nesting cavity of a downy woodpecker. When the young woodpecker reached out of the hole for the bait, the starling dispatched it with a quick jab of the beak.

This violence begets violence, and not just from farmers. Bird lovers watch in dismay and anger as the native species they cherish are chased off by the pesky intruders. In an article entitled "Nest-site competition between European starlings and native breeding birds in northwestern Nevada, " in the scientific journal *Condor*, author Norman Weitzel described a study conducted on his property just south of Reno. Two cottonwoods on his land hosted 14 pair of breeding native birds in 1978, but in early 1979, a pair of starlings moved in. Then a dozen more joined them. As Weitzel watched through binoculars from his kitchen window, the starlings scared off American kestrels, northern flickers, olive-sided flycatchers and house wrens in March. In April and May, mourning doves, tree swallows and house finches approached the cottonwoods, only to be rebuffed. By June, the trees offered refuge to nothing but starlings. After five years of starlings flocking to his land, Weitzel decided it was time for a little experimentation. His scientific method was simple: he took his 12-gauge shotgun, blasted all the birds in the trees, then counted the 47 starlings that tumbled down. As a result of his study, 17 pair of native species nested in the cottonwoods in 1987.

* * * *

At the point in history when Schieffelin hatched his plot, America's relationship with England was rife with ambiguity. America, like a younger sister, admired her older sibling's poise and experience, but chafed at her patronizing tone. Thoreau and Whitman were valorizing the species of plants and animals in the United States as more wild and hearty than their tame English counterparts, but American thoughts still dwelt on the glories of Britain. As such a young nation, with many people so new to the land, America had a shortage of stories that took place on its own soil. Without a literary tradition, the Americans didn't know what could happen in their landscape. Was there romance in America, or did lovers need to waken to the song of the lark to experience the joys of Romeo and Juliet? Could Hamlet have seen providence in the fall of a bluebird, or did it have to be a sparrow? The desire to see ourselves as heroes and heroines of stories that we know and love, easily translates to a desire for the literal artifacts of those tales. The architects of Yale University paint the stone walls with acid to give them the aged look of Cambridge. A traveler clips a sprig of heather from the moors where Heathcliff may have roamed and plants it in her garden in Arizona. Children at Disneyland hop on Mr. Toad's Wild Ride and watch the landscape of *Wind in the Willows* careen past.

The New York drug manufacturer's error was on such a grand scale because he underestimated the dark potential of both language and biology. Wanting to release all of Shakespeare's birds indiscriminately, because they were part of the landscape, because they were in poetry, he viewed them as pleasant, or, more importantly, benign. Birds and poetry were pretty. They

uplifted the spirit. They kept people out of saloons. Nature and art, particularly when they are beautiful, are often viewed as good, which is an underestimation of both. Left unrealized are the dangers of dreaminess, of looking at bright colors of plumage or blur of flight, rather than the ruthless engine of DNA.

In a mild Seattle June, starlings speckle the lawns, probing the grass with bright yellow beaks. One ducks into a hole in the roof of an apartment building. Such a raucous cheer rises from the young inside, it's easy to believe the ancestors of this family spent several generations in the Bronx before winging their way west. In November, in Missoula, Montana, the imported birds huddle in a parking lot, their speckled feathers fluffed out in ragged spikes. As they make their homes in cities, starlings are starting to mimic the noises of urban life. The rumble of cars and hum of other machinery may work its way into the clicks and whistles that make up their repertoire. They have been reported to imitate dogs barking, doors slamming, hammers hitting wood. Though maybe not in the way he intended, Eugene Schieffelin successfully incorporated the birds of Shakespeare into the story of America, just as surely as Shakespeare wrote the birds into the history of England when he penned *Henry IV*. Not much is known about why Schieffelin did what he did. No journal entries. No direct quotes. Just a few facts told and retold in scientific journals, in birding guides, and in biology textbooks with the same smug sense of horror. It's a story of hubris, of ecological disaster, of good intentions gone awry. And as they pick up the cadences of urban life, the jackhammers and the squeal of brakes, the starlings in Florida, Ohio, and New Mexico, are gathering the threads of the narrative. Starlings are

reporting what America has become since they flew free over 100 years ago in Central Park. They are telling it to us over and over.

Exotic Fauna in the Olympics

The mountain goat peered down at us from a patch of scree below Grand Pass in the Olympic Mountains. We hadn't been able to see it as we mounted the snowy ridge, but the goat scented our salt sweat as Jennie and I climbed, and was waiting. The animal was fat and sleek in its summer coat -- all white except for black nostrils, black mouth, dark eyes, and two horns, each curved like a sickle moon. A long fringe of hair lined its jaw and bunched into a tuft on its chin. It cautiously approached us, then skittered away, over and over again, as if it were gathering the courage to come up and take a lick.

I had seen mountain goats before, lingering along the main road through Glacier National Park and darting across trails in the Cascades, but this one had near celebrity status. The animal was one of the remaining mountain goats of the Olympics, a non-native population that trampled and grazed on threatened alpine plants. The fate of this goat and its comrades was debated weekly on the radio and in the newspapers in Seattle. Park Service personnel, animal rights activists, and native plant lovers could scarcely

speak in civil tones to one another. They were goats with a history and very little future.

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Seventy one years before, on the morning of New Year's Day, 1925, a boat laden with goats bumped against the shore of Port Angeles in Washington State. Plucked from the Selkirks in Canada, the four mountain goats had been trapped, packed and shipped across the Strait of Juan de Fuca into the small timber town. While revelers from the night before tried to beat the morning light to their houses, and shop keepers swept up confetti and bottles of prohibition ginger ale, a local ranger and the state game warden heaved the heavy crates on a truck and drove them to the shore of Lake Crescent, at the foot of the Olympic Mountains.

E.B. Webster, a local newspaper man and president of the mountaineering club that pushed for the introduction, followed along and jotted notes. As he waited, he tried to frame the historic release into a cheerful New Year's story for Port Angeles. Maybe it was a good omen.

At the start of the new year, Washington State was drunk on hope. In 1923, Washington led the United States in lumber production. In 1924, the state produced 5 billion cedar shingles. Commerce, building, and manufacturing for 1924 outstripped all expectations, and 1925 was going to shine even brighter. Essay contests offered prizes for the best reason to move to Seattle. The railroads declared January "Washington Month," and plotted an advertising campaign to lure immigrants to the natural beauty and easy farming of the Pacific Northwest.

But somehow, economic security kept eluding Port Angeles. As news

of the towering cedars and Douglas fir reached the ears of businessmen, three railroads competed to survey routes through the town of 8,000, but the plans fizzled as quickly as they had sparked. During World War I, government workers surged into the area to build a railroad that could transport the spruce needed to make planes. But the war ended before the railroad was done, and economic hopes dribbled away again. While they had their charms, the Olympics lacked some of the animals that lured tourists and their money to the neighboring Cascades. No grizzly bear. No big horn sheep. No red fox. No lynx. No mountain goat.

Ever the newspaperman with a healthy respect for advertising, Webster saw an opportunity to promote the beauty in his backyard. Though he grew up in Iowa, Webster soon felt he knew the Olympics as well as he knew the keyboard of his typewriter. He spent his free time exploring the mountains that towered in his backyard, and fishing their creeks and rivers, strolling through the hills and shivering at the bugles of the Roosevelt elk. In one of his books he describes the anticipation of a hiker like himself who sets out into familiar territory: "He wonders too if he will again find a band of elk in this or that old-time feeding ground; if there will be a deer in a certain draw; if he will again catch sight of a bear in a berry patch or on the river bar. Every bend in the trail brings pleasant memories, even if it is only of a brood of instantly vanishing valley quail."

He not only appreciated the scenery; he helped define it. On one of his jaunts on Mount Angeles, Webster glimpsed a clump of flowers with yellow petals and yellow centers pushing through an alpine rock garden. His was the first record of the plant, related to the sunflower but looking more like a

frazzled daisy. It grew only on the Olympic Peninsula and later was named after its discoverer: *Senecio neowebsteri* or Webster's Ragwort. He wrote and published three books detailing the glory of the landscape: *King of the Olympics: the Roosevelt Elk*, *Fishing in the Olympics*, and *The Friendly Mountain*.

Despite his confident and glowing tone, Webster was ambivalent about his publicity project, knowing that as he wrote of the quiet and solitude in the mountains, he was assuring that they would disappear. Thoughts of trees scarred by axe marks and campgrounds layered with litter made him wince, and he was glad he wouldn't live to see the effect of popularity on the area. But he had no doubts about the Klahhane Club's plan to introduce goats into the Olympics. The club lobbied to declare parts of Mount Angeles a game sanctuary to ensure that the goats would thrive. The plan had the blessing and assistance of the Forest Service and the Washington State Department of Fish, Game and Furs. The crags and alpine shrubs of Mount Angeles echoed those described as ideal mountain goat habitat. Cougars posed a threat, but the timber wolf was on the decline. With six years of planning, Webster had thought and rethought every possibility.

The ranger, the warden and the journalist pulled over next to the white railing separating the highway from the lake shore. The choppy water of Lake Crescent smacked against the rocks and Webster must have felt a flutter of anticipation as he heard shuffling and bumping in the crates. He stepped back as the ranger and game warden pulled the boxes to the ground. They opened the doors and waited. And waited. Then, in a blur of white, the animals came out charging: one headed for the ranger, who was trying to

snap a picture, and another aimed its horns at a nearby road crew. Eventually all four clambered up into Storm King Mountain, deft hooves finding footholds in the foreign cliffs. They paused for a moment, looking back over the road as Webster scribbled frantically to record every movement, then they turned away. Hop. Scramble. Leap. Gone.

* * * *

When glaciers muscled their way into the Puget Sound 10,000 years ago, they isolated the Olympic Peninsula from the mainland. The rocky crags at the top of the mountains poked above the ice, and provided a stage for evolution to create species of plants and animals unique to their pinnacles.

A nimble-footed botanist, if she didn't mind breaking park rules, could make a bouquet of flowers that only grow in the Olympics. Flett's violet, a woodland plant staking a claim in the crags, shoves its five magenta petals and heart-shaped leaves between the rocks. Piper's bellflower cups five petals around a cluster of yellow stamens, white in the center and tipped with violet. The closed buds, deeply grooved, look like five fingers on one hand, tips touching. Olympic rockmat takes root on steep slopes. Its leafy base sends out a frail pink stem heavy with white flowers. Olympic Mountain milkvetch, Olympic Mountain synthyris and Flett's fleabane are also peninsula exclusives, along with varieties of wandering fleabane, lance-leaf spring beauty, and -- my personal favorite -- sand-dwelling wall flower.

By craning my neck and squinting through the branches, I could see the Olympics through the window of my apartment in Seattle. On clear days the mountains across the sound beckoned, and I often yielded to their icy invitation. On cloudy days, when the city was drenched in mist and the

mountains were invisible, the peninsula was no less tempting. The mountains cast a rain shadow over patches of forest and shore, and I could put on my hiking boots, catch a ferry, and stand in the sun. It was the place I took people I loved. My father and I hiked up the Hoh River to a ridge near Mount Olympus to watch the buckled blue glacier inch downhill. At our campsite under a rotting hemlock, his engineer's mind constructed the most complicated bear bag rig I'd ever seen. I wanted to memorize it for future use, but after two hours I went to bed and let him finish up in the dark. My mother and I walked the spruce railroad route along Crescent Lake, eating avocado and cheese sandwiches in the rain. One birthday backpacking trip took me up the Duckabush River with friends from college. At the campsite I felt woozy and lay with my feverish head against a river-smoothed stone, listening to the water break against rocks and fallen trees. I dragged my boyfriend on a day hike along the Dosewallips, where green light pooled on the forest floor and trees muffled in moss lined the trail. Later, I took my first solo backpacking trip through the Seven Lakes Basin, where I peered through my binoculars at a bear and her cub badgering a log, ate tart blueberries, and watched the mist gather in the valleys. Over the course of three years, the spaces on my tattered map of the park slowly filled in with memory and sensation.

Jennie was an old friend, and for her first backpacking trip I wanted to take her through three creek drainages on the east side of the Olympics. Though we hadn't spent much time together since high school, Jennie and I still looked like variations on a theme. She was taller and sported dimples. I was more athletic and had a cleft chin. Her curls were tight while mine were

loose and wavy. But hair, skin and lips were painted from the same palette with the same tools, and strangers mistook us for sisters. In generations close enough to remember faces, our ancestors grew up and flirted and ate sardines and worshipped in nearby villages of Russian Jews. Her great grandparents fled from Minsk and Pinsk to escape pogroms, while my grandfather and his family ran from the mobs near Kiev that had burned their neighbors alive in the synagogue. In 1925, as the goats were first exploring the Olympics, my grandfather arrived in New York City. Both Jennie and my families gradually moved west, through Chicago and Indianapolis, traveling until they reached the Pacific, where Jennie and I met under the metal stairway of Martin Luther King Jr. Junior High School in Berkeley, California, and discussed soccer strategies and algebra.

We both continued the migration, pushing farther north. On a sunny July day we sat in Deer Park campground, plotting our mileage. Most of my previous ramblings had been off season, and I was surprised by the number of car campers, backpackers and rangers pacing the hillsides. While we were deciding what flavor of instant oatmeal to have on the first day, a white haired-ranger drove up and told us to stay on the trail if we hiked up Blue Mountain as hikers were trampling the endemic plants . Then she asked us our destination and called in a reservation on her cellular phone when she discovered we didn't have one. When we got to the site at Grand Lake, large areas were roped off and marked by stakes showing hiking boots with a slash through them. The park was undergoing revegetation to encourage greenery on the lake shore, trampled flat and bare.

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The mountain goat, *Oreamnos americanos*, is not really a goat. The species, related to the antelope, likely crossed the Bering Strait before dispersing into its natural range from Alaska through Canada, and parts of Washington, Montana and Idaho. Its hooves, designed for mountaineering, have rounded pads on the bottom that offer traction on the smallest crevice. Some of its behaviors are easily related to fighting or mating. Others, like the 360 degree aerial leaps, termed "whirling," remain more mysterious. After a breeding season in November and December, females give birth in May to one kid, or sometimes twins. Mountain goats live within rigid, aggressively-defended dominance hierarchies. And they eat everything.

In hunting and travel lore, animals gain personalities that appear over and over. The wolf is vicious and cunning, the bear fierce and noble. But mountain goats, though they lack the character of tooth and claw, personify bravery and individuality in their choice of habitat. The image of the mountain goat valorized on the Great Northern logo and repeatedly in literature is the solitary animal perched on the topmost crag.

In his 1893 essay "The White Goat and his Country," Owen Wister described a mountain goat in his sights. "He looked white and huge and strange; and somehow I had a sense of personality about him more vivid than any since I watched my first silvertip on a rotten log." In the 1925 book *Big Game Fields of America, North and South*, Daniel Singer reflected back on a goat that now graced his wall as a trophy: "I like to think of him, alone up there, with only the eagles and hawks and ptarmigan for company, and how he calmly surveyed the world below with that feeling of security and lordship." Dr. William T. Hornaday described the goat "as an animal to

whom fear is an almost unknown sensation. He is serenely indifferent to the dangers of crag-climbing and ledge-walking, and to him, a 500-foot precipice is no more than a sidewalk to a domestic goat." Webster included this quotation in his 1920 book *King of the Olympics*.

In their lonely gazing over rivers and valleys and distant peaks, with nothing but fresh air and falling rock to disturb their contemplation, mountain goats seem to remind mountaineers of themselves. What rock climber doesn't relish feeling at home part way up a cliff, as he or she leaves behind the more domestic humans? But the solitary mountain kings are only the billys. The females and young goats travel separately in large groups, foraging for food, finding safety in numbers, ensuring the growth of the population. And in these herds, unglamorous and unsung, lay the potential for trouble.

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From the small gathering on Storm King, Webster's goats spread south and east to Klahhane Ridge, Royal Basin, Lake Constance, Sawtooth Ridge, and Anderson Pass. In following years, officials released more mountain goats on the peninsula. One was lassoed near Mt. Baker in the Cascades. Seven others were delivered from Alaska, traded for a few of the Olympics' Roosevelt elk. The population grew, giving birth on stone ledges, growing thick winter coats and shedding them again, scrambling onto higher and higher mountains. On high ridges the goats wallowed in the earth, scratching off insects and creating bare troughs up to 30 feet wide and 3 feet deep. Hillsides that used to be anchored by plants were stomped into sun-baked soil. In the alpine and subalpine areas where they preferred to wander, the goats

found tasty flowers and grazed them down to the earth. Plant species that developed without the need to protect themselves from grazing provided meal after meal. Soon the Olympics' unique plants were disappearing, first a clump here, then a patch there. One of the goats' favorites was an all-yellow alpine flower. Webster's Ragwort.

By the 1970s, the goat population was increasing by 20 percent a year. By the mid-1980s, some estimates placed 1,200 goats in the park. Something had to be done.

The Park Service concocted plan after plan to slow the tide of kids and trampling, but each plan met cries of outrage. Some scientists advocated contraception. They tried tubal ligation, vasectomy, and skin implants that temporarily prevent pregnancy. But these methods involved trapping, treating and releasing each goat. Managers fantasized about a substance that could be administered by dart from a helicopter, saving the hassle and expense of capturing individual animals. Other plans noted that the simplest, most cost effective, and ecologically sound solution would be to shoot all the goats from a helicopter.

But even this wasn't an easy answer. While the Park's mandate was to eliminate exotic species, Olympic National Forest and the Washington Department of Fish and Wildlife had to provide hunting opportunities, and goats were a prize trophy. So, according to some plans, the peninsula would be purged of goats, right up to the boundary between park and national forest land.

Native plant societies shrank at the thought of unique plants being chewed into extinction. Animal rights groups stated that the goats had been

in the park almost a century and that they shouldn't pay the price of the human mistake of introducing them in the first place. One strand of argument wrapped around the notion that mountain goats may actually be native to the Olympics. A turn-of-the-century *National Geographic* article mentioned a mountain goat sighting, and native tribes in the area possessed items made of goat hair and horn. But others argued that the *National Geographic* writer made a mistake, and that the tribes acquired the items through trade.

During all these discussions in the 1980s, the Park Service removed more than 600 goats from the Olympics. Some were used for research; others were shot as specimens or died during capture; another group was relocated, in some cases, to states where mountain goats were not native. In some years, as many as 60 percent of the captured adult females were mothers with milk, indicating that they left young kids behind. Still others were shot by hunters on adjacent national forest land. These factors, combined with a series of harsh winters, culled the goats from the high of 1,200 to around 250 in the mid-1990s. But the Park Service still felt the pressure of an exotic population that could explode again.

In a shelter where Gray Wolf River, Cameron Creek and Grand Creek came together, Jennie and I met a tired trail crew setting up for the night. Winter storms scattered trees and branches on most trails, and the crew was clearing the path for hikers. One of the crew members, a soft-spoken man with a curly blonde beard, seemed eager to chat as he prepared dinner, and we were full of questions. Over a meal of potatoes, spam and an egg, he summed up the park service goat policy as he understood it.

"Shoot them and leave them lay," he said.

* * * *

If Webster could wander through his favorite valleys and along the ridges of Mount Angeles in 1997, what would he see? Would he despair over the bare patches where the goats take their dirt baths? The remnants of overgrazed Flett's violet? Or would he instead be distracted by the oil tankers gliding through the strait or the clearcuts that run straight up to the park boundary?

While humans have inhabited North America for thousands of years, some of our behavior fits the pattern of an exotic species, constantly spreading, shoving other creatures from their niches. In a way, we are the exotic that defines all others, as a plant or animal is classed as "exotic" if it was introduced by people, rather than clinging to the coat of a white-tailed deer or hitching a ride in the intestinal tract of a sparrow. While human introduction seems an arbitrary definition, so does the time span. For the United States, a species is considered native to an area if it was present before Europeans first started settling here. But is 400 years the right number to choose? Like Jennie and I, like Webster, the goats embraced the Olympics after only being there for a short time.

The rhetoric of the exotic species debate makes me uneasy. The discussion is framed so that nostalgia is legitimated by science, and the only other option is sentimentality. But how scientific is the desire to purge an environment of new-comers who have already started to breed or taken root? It's as if Pandora, after releasing all the sins and diseases into the world, imagined she could simply put them back in the box. At times, the efforts to

eradicate exotic species seem like humankind putting a shoulder against the wheel of time and straining. And it's never moved back. Not one inch.

Not that we shouldn't try to preserve species and lessen our ability to do harm. Not that agencies and individuals shouldn't make efforts to slow the spread of exotics and stop new introductions. I just wonder if returning portions of the United States to their condition prior to European settlement, while the Europeans' offspring continue to crawl all over those same areas, is an achievable or laudable goal.

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At Grand Pass, Jennie and I made our laborious progress up the trail, watching the next range appear over the crest. The mountain goat lingered by a pool near the peak. The water was icy blue, the color of the sky in a photograph my grandfather sent me from Alaska. The goat grazed and stopped, then circled around behind us, and grazed again. But as we topped the ridge, it grew bold and stepped right into our path. Then the animal turned to look at us again. For the first time my outfit of flowered boxer shorts, black jog bra, Idaho Shakespeare Festival baseball cap and red bandanna struck me as outlandish, out of place. The goat continued to stare with dark eyes that melted to brown toward the edge of the iris, and we stared back, strangers under the sun.

More Mercenaries

Gardening with my mother mystified me. I was seven and we were weeding. She pointed which plants to pick and which to save, according to no logic I could see. The ones we defended sometimes sprouted nothing but green leaves, while the ones we discarded sometimes offered sprigs of bright flowers.

"But look at it," I argued, gesturing at a condemned plant, fingering the tiny flat petals, delicate and purple, like violets for dolls.

"It's a weed," my mother replied, yanking it up by the roots. This word was enough to damn the prettiest blossom. Later, when I was not much older, but had gleaned a bit about Darwin, I mulled over the phrase "survival of the fittest." I thought of lions, bullies, and the purple flowers that sprang up again and again despite my mother's zeal. I thought of orchids, antelope, and my scrawny self. "If this is true," I wondered, always skeptical, "then why isn't the whole world weeds?"

In a small lab in the Bitterroot Valley of Western Montana, scientists

are fighting a world of weeds. Sulfur cinquefoil, Dalmatian toadflax, hound's tongue, beggar's ticks, leafy spurge, and spotted knapweed are a few. Over four million acres in Montana are pestered by spotted knapweed alone. Idaho, Washington, Oregon, North Dakota, South Dakota, and Canada also have knapweed, but the problem is most severe in Western Montana. The purple flower loves disturbed land, and the Bitterroot offers overgrazed fields, twisting mountain roads, and an increasing patchwork of subdivisions. The native grasses here are bunch grasses. Rather than growing in the smooth carpets of Kentucky bluegrass or other plants that root themselves with rhizomes, they spring up in clumps, like small bushes. Knapweed finds a toehold in the spaces between clumps, sweeping over rangeland once covered by native prairie and turning prime pasture into weedlots. Cows and sheep won't eat it. Neither will the white-tailed deer and elk that roam wild through this country.

The main reason that knapweed, or any other successful exotic species, does so well in a new locale is that there are no natural predators. When a species evolves in a certain environment, other species will evolve to eat it. Without those natural checks, a species can take off like wildfire, just as knapweed has here. In response, scientists are practicing biocontrol, that is, bringing the natural predators over to do their work on new soil. Since knapweed was introduced, twelve insect species have been set free in the hopes they will stop its broad sweep.

In the valley in late May, red-winged blackbirds perch on the barbed wire fences then fly off, flashing their epaulets in the sun. A kestrel glides over, red chest, black and white face. A great blue heron flaps toward a

rookery on the Bitterroot River, flooding with a rush of spring run off. Most of the fields are topped with balls of dandelion fluff and carpeted with yellow dandelion sunbursts. Dried knapweed -- last year's -- clings to the fence along the pasture. A sign announces the "Western Agricultural Research Center, MSU Agricultural Experiment Station."

The lab itself is a collection of yellow buildings with brown trim, surrounded by mounds of landscaped flowers. Inside, Bill Good and a lab assistant are picking apart knapweed roots, looking for moth larvae. These moths, *Agapeta zoegana*, were brought from Austria and Hungary and released in Montana in 1984 to feed on knapweed roots. As the lab assistant adjusts the microscope, the radio murmurs country music. I wonder how these Austro-Hungarian bugs perceive it all. How do their audio receptors translate the mournful rhymes and the twangy guitar? Do they think it sounds exotic?

As a result of biocontrol efforts, Montana is now host to four exotic seed head flies (*Urophora affinis*, *Urophora quadrifasciata*, *Chaetorellia acrolophi*, and *Terellia virens*), three seed head weevils (*Larinus obtusus*, *Larinus minutus*, and *Bangasternus fausti*), a seed head moth (*Metzneria paucipunctella*), three root moths (*Agapeta zoegana*, *Pelochrista medullana*, and *Pterolonche inspersa*) and a root weevil (*Cyphocleonus achates*). *Urophora affinis* and *Urophora quadrifasciata* have flown throughout the state and are well established. The lab raises *Agapeta zoegana* and *Cyphocleonus achates* to send to counties and weed districts that request them.

The insects attack the knapweed at one of two vulnerable spots: the

seed head or the root. In some root specialists, for instance, the adults lay eggs over the summer, then the larvae spend the winter in the knapweed root. Others overwinter in the seed head, poking above the snow, providing midwinter snacks for chickadees.

Good gives me a tour, telling me about the history of the insects on the way. In the back is the knapweed field, the center of the lab's distribution operations. Small barriers create a miniature pen for the weevils, who can't fly. Cloaks of netting secure the agapeta, who can. He introduces me to Linda White, a woman with a strawberry blonde ponytail standing next to a box of rocks wearing Tough Guys gloves.

"She's weeding her knapweed patch," Good says.

Though it's not her official title, White is a knapweed farmer. This, in an area where "knapweed" is a worse word even than "Californian," where residents swap pesticide tips over coffee, lowering their voices when they mention some particularly noxious chemical. One day White came home from work to find the census taker. Clipboard in hand, the woman asked White where she worked and what she did. White thought for a moment. "Well, I transplanted knapweed today," she offered. The woman just stared.

She raises the knapweed to raise the bugs that will hopefully destroy it. The adults lay eggs during the summer, the larvae spend the winter in the knapweed root. When they emerge in the spring, White sucks the agapeta up with a modified Dustbuster (she collects the weevils by hand), puts them in quart icecream containers, and sends them FedEx. Last year her efforts produced 50,000 agapeta and 12,000 cycleonus which she mailed around the state. Each starter kit contains about 150 agapeta and 50 weevils.

When I return a few months later to talk to head scientist Jim Story, the valley has shrugged off spring and embraced summer. The sky holds more than one kind of weather here. Over the Bitterroot Mountains, cut by canyons, dark storm clouds obscure the mountaintops and send an occasional gust to the country below. Up each canyon, the Selway-Bitterroot Wilderness is visible, peaks still snow-covered and forbidding. To the east, the Sapphire Mountains appear only as ripples in comparison. In the valley, sun presses down on thick air. Sprinklers swoosh over fields, much greener now in July. The river has retreated. The dandelions are gone, but tall purple thistles, relatives of the knapweed, tower over the land surrounding the lab.

In Jim Story's office, a large plastic grasshopper peeks down from one of his book shelves. A paper butterfly rests on the wall. A calendar demands "Know your category 1 noxious weeds," and offers color pictures of the enemy. Story himself is a gangly man with grey hair and a shirt with big checks. He likes the word "logical" and has spent more than twenty years experimenting with insects that might like knapweed.

"If we can tilt the scales a little bit and introduce a natural enemy and put things back in balance that would seem like nice, logical way to do things," he says.

Story's goal is to get enough species working in tandem to show a significant decrease in knapweed density. He would also like to see the insects in sufficient numbers around the state so that people could collect flies and beetles to bring to their own weed patches. Unlike many, who hope to see the last perky blossom disappear from the continent, he knows that the plant will never completely be gone.

"We're not going to eradicate knapweed....We're trying to reduce it to a level we can live with," Story says.

No one is sure how the first knapweed plant came to the Bitterroot. Immigrants from the Ukraine may have brought it in bags of alfalfa seed. Bees that feed on the flowers make notoriously good honey, and rumors have it that someone brought the plant deliberately to sweeten his or her arrival in a new place. Regardless, 1927 was the first report in Ravalli County, and the weed has steadily made its presence known ever since.

While the beginnings of knapweed are hard to document, the beginnings of the insects are easy. As a graduate student in the early 1970s, Jim Story stumbled onto the biocontrol project. As he says, "It was a study where I was going to be having to spend a lot of time basically eyeball to eyeball with some insects, which is the kind of stuff I love to do." He introduced *Urophora affinis*, a seed head fly, right here at the experimental station. Soon *Urophora affinis* and *Urophora quadrifasciata*, another seed head fly, had flown throughout the state. The other ten species were released by Story, Good, or both either here at the experimental station, or at the Teller Wildlife Refuge down the road.

Biocontrol is not new. As early as 300 B.C., Chinese collected parasitic ants and built bamboo bridges from citrus tree to citrus tree, so the ants could travel eating harmful insects. In 1762, Count de Maudare brought the mynah to Mauritius to eat red locusts. In 1875, Captain Nathaniel Vesey brought a toad from British Guyana to Bermuda, so it could gulp down cockroaches. In 1889, as the cottony cushion scale ate its way through the nascent citrus business in California, Albert Koebele traveled to Australia and brought

home a lady bug and a fly that liked nothing better than munching on the puffy white bodies of the scales. People have kept cats to eat rats forever.

Disaster stories too appear in the biocontrol history books. The mongoose, brought to Hawaii to eat snakes, preferred the island's native birds instead. In his essay, "Unenchanted Evening," Stephen Jay Gould describes the ravages of *Euglandina*, a snail introduced to eat an undesirable species, that often displays a preference for a desirable species. As Gould points out, the metaphor of the old woman who swallowed a fly does come to mind.

But Story and the ranchers, farmers, and wildlife managers wrestling with knapweed feel that the risk is worth it. In order to get a visa to the U.S., insects have to pass a series of strict exams. In one test, the insects are starved, then offered plant after plant to see if even under extreme conditions they will hold out for knapweed. Any bug that takes the bait is left behind.

But it was only recently that scientists began testing plants of ecological as well as environmental importance. Before this switch, the United States Department of Agriculture brought over the flowerhead weevil to devour the European nodding thistle. While it stays away from wheat and barley, the weevil also has a taste for native thistles, like the Platte thistle, and is severely reducing its numbers. Many don't like thistles, those bristling plants that score the hiker's leg with red lines, so no one is hollering yet to end biocontrol efforts. But such tales give Story pause.

"If we ever have a big mistake, it'd shut the whole thing down," he says.

Patience. Story, Good, and White have it, and they are hoping others have some too. They have been waiting 20 years for some insect populations

to grow large enough to be released, and they are planning to wait 20 more before the knapweed shows signs of reduced density. Ten years ago, Story thought he would be able to see knapweed density decreasing at test sites by the year 2000. Now he's readjusting those figures. They count larvae in roots. They vacuum moths with Dustbusters. If one insect isn't doing the job, they add another, and hope the combination will prove too much for the plant. Some people's patience is running thin.

The slow pace of biocontrol and the rapid spread of the exotic weeds have created a battle between environmentalists. Richard Manning, a passionate environmentalist, is equally passionate about wresting the remnants of native prairie out of the grip of introduced species, no matter what he has to spray to do it. In an article for *Audubon* magazine, Ted Williams observes Hells Canyon blooming with exotics, and writes that weeds' "second-best friend is a chemophobic environmentalist." Meanwhile in Missoula, local environmentalists organize protests against spraying for noxious weeds in the Rattlesnake Wilderness Area. One woman in the Bitterroot claims to be tracking mutant deer, damaged by all the chemicals raining down on the Bitterroot Valley.

Story thinks eventually biocontrol will win out, despite the desires to spray and be done with it.

"People are starting to realize that the days of a quick cure are probably gone. That was the nice thing about herbicide. You go out and spray your weed and the next day the weed's all curved over and dying. It's just not that easy," he says.

When looking at the soft purple glow of the Bitterroot Valley, it's hard

to believe that knapweed is disappearing in some places. In Eastern Europe it is growing more and more scarce. Patches frequented by insect collectors in the past have been swallowed by vineyards and subdivisions. Other collection sites have been turned into parking lots. About the only thing knapweed can't compete with is pavement.

Where the knapweed has disappeared, so have the insects. After one trip, Story returned with a handful of agapeta, just 25. Another insect, *Pelochrista medullana*, was approved in 1985. White calls it "the bug of the future," but scientists couldn't find enough of the root moth to ship to the United States. Finally, the lab got some eggs three years ago.

Now pelochrista live in a green house in a cage with potted knapweed. When I visited earlier, Good gave me the tour. He stepped on a stool and took out a fluttering moth in a petri dish. He could tell from the swelling of abdomen that it was a female. They are trying to get a greenhouse colony started, but it is slow going. The insects hatch at the wrong time of year because of the greenhouse conditions, and the scientists may see a yield of only three adults from fifty larvae. But these few pots of knapweed may be more food than pelocrista can find in Europe.

"It's probably the biggest population of the insects in the world," Story says.

Just as abundance makes knapweed a nuisance, scarcity increases its charm. In Candida Lycett-Green's book *England: Travels Through an Unwrecked Landscape*, she describes glorious banks in Gloucestershire which "brim with meadow crane's bill, hogweed, yarrow, lady's bedstraw, scabious, knapweed, and sudden patches of rosebay willowherb." Admittedly, there are

many kinds of knapweed, and I don't know which the author is describing. But it's hard to imagine Bitterroot Valley residents tempted to visit England by this description, nonetheless.

An hour north of Corvallis, along the banks of the Clark Fork River as it cuts through Missoula, the knapweed is blooming. It has claimed this north side of the river, creating a hedge only interrupted by rocks and cottonwoods. The weed lines travel ways, like this popular river-front trail, tracing the path of people, cattle, and cars. During the spring the white dry husks emerged from under the snow and lay crouched, bleached and frail as old mouse bones. Then the new green shoots pushed up through the ground and, only recently, burst into lilac. Bees land and fumble for nectar. Pale green stalks and leaves with grey/brown seed heads look fuzzy, feel prickly. Knapweed is related to bachelor's buttons, though it has the scraggly, tough look of an uncultured plant. Here, in the early summer, some of the swollen heads are tipped with purple. Others, open further, offer a brush dipped in lavender. It's a composite flower, like a daisy, made of tiny flowers clustered in the center with white tongues, and outside petals that start as a spike and burst into five parts, a small, fragile, claw. The base is filled with seeds. The leaves are small, and the stem is tough enough to cause a bystander to break a sweat trying to uproot one, or merely to pick one blossom. And despite it all, the air smells sweet.

Across the river, the bank displays a different character. In this spot, the Clark Fork is paralleled by a slower side stream, home to muskrats and claims of sightings of 100-pound beaver. In between the mowed lawns and landscaped mounds of the *Missoulian* newspaper offices and the restrooms

adjoining a football field, a patch of native prairie has been restored. *Clarkia*, grows here. So do shooting star, bitterroot, and blue bunch wheatgrass. This is a mixed polyculture rather than a monoculture along the river, a variety of plants, the most noticeable of which is the wheatgrass. Here bees are also busy and grasshoppers spring through the stalks, but it's only a small patch. One bison would make short work of it.

Even further north, in Glacier National Park, knapweed is dropping seeds. At the bases of jagged peaks and in the glacier scooped valleys, hotels and campgrounds establish a human stronghold in the land of grizzlies, wolves, and mountain goats. Each rest area has a parking lot, and in the spots of grass near these parking lots, knapweed waves a few purple pom poms of victory. Most of Glacier's backcountry is still dominated by the vivid red, blue, and yellow of paintbrush, lupine, and glacial lilies, but a few bursts of lavender have made it beyond the pavement edge.

" We're finding more evidence of noxious weeds along streams and lakeshores," says Chief Ranger Steve Fry.

The seeds hitch rides on tourists' cars and in shipments from contractors. In an effort to retain the traditional ecology of the park, purification becomes an obsession. Officials inspect all gravel and dirt brought into the park and contractors must wash their vehicles before entering. No hay is allowed in the backcountry and hay that is brought in must be certified as "weed seed free." Despite these efforts, some weeds have taken root. While the parks have a mandate to keep exotic species at a minimum, Glacier uses introduced insects for both spurge and knapweed. With over a million visitors to the park each year, each with the potential of carrying seeds on

wheels or boots, the choice becomes not whether exotics but which.

"You evaluate the full suite of options available to you," Fry says.

On the other side of the Rocky Mountain Front, where the mountains give way to the plains, lies a rare water-rich area called the Pine Butte Swamp. The preserve, managed by the Nature Conservancy, contains the largest fen in the Rocky Mountains. In spring, when 100 mile an hour winds race through the grasses, grizzly bears stumble out of mountain hibernation down to the plains, lured by the lush stream-side habitat. Today, the winds are only blustering, and the grizzlies are out of sight, but a white pelican flaps over the fens, sharp-edged against the dark water. About thirty miles away, three flat-topped buttes heave off the level ground, but flatness wins out in the far distance, as blue sky bleaches out to white.

Here too, knapweed and leafy spurge poke through the soil. Managers, worried that the more than 700 species of plants at Pine Butte will turn to a knapweed monoculture, spray with tordon and 2D. They walk the preserve, scanning for new starts. The Nature Conservancy, like the National Park Service, is hesitant to introduce more exotics, but the ranchers on all sides use the insects, so infestation just seems like a matter of time. Pine Butte is the first Nature Conservancy property to try biocontrol. Somewhere, down where the shadows of clouds slip over the prairie, the flea beetle is gnawing at leafy spurge.

Dave Carr, Pine Butte's manager, surveys the scene and explains the contradiction. "There's a risk if I do it, but if I don't do it, we're going to lose the whole shebang," he says.

Further east, rancher Robert E. Lee speaks of grass with a religious

fervor. Self-described "caretakers of the Western tradition," the Lees raise cattle, wheat, and barley on a 880-acre ranch near Judith Gap, in the plains of central Montana. Grass, how it fares through the winter, how early it shoots up in spring, how much meat it adds to his cows, all this is Lee's passion. Noticing a patch of grasses by the road, he can't resist crouching down to examine it, running his fingers over the stalks, pulling up a shoot and chewing on it himself.

His biggest fear is exotic weeds. The Lees spend a lot of money on weed control, and Kathy, Robert's wife, spends a lot of time walking the roads along their property, checking for starts. A few leafy spurge plants have taken root, and he's introduced the flea beetle to go after them. He shivers when he thinks of the Bitterroot Valley and all its knapweed.

"The rest of us in Montana had better take charge and wake up because it will move east," he says.

But like Jim Story, Lee isn't opposed to exotics, per se, just the ones he thinks are damaging. His cows are exotics, after all. Each year he plants a pasture of crested wheat grass which pokes above the snow before the native grasses, providing his cattle with early spring forage. Despite the benefits for ranchers, studies have suggested that crested wheatgrass might cause more soil erosion and provide fewer soil nutrients than native grasses.

Watching after the Western tradition is challenging in a place where celebrities are buying trophy ranches on one side, and subdividers are carving up and fencing in wide tracks of land on the other. But even the movie stars are easier to take than the knapweed, and the thought of those purple shoots pushing up through his grass preys on Lee's mind.

"That just scares me, I can't tell you how bad that scares me," he says.

In their battle against knapweed, landowners who don't want to spray or introduce more exotic species, have a few choices. They can bring in goats, which find the weed palatable. They can burn it, douse it with vinegar or hot water, or mow it at strategic times of year. None of these is the cure-all that's going to put knapweed back in the alfalfa sack.

"There's no perfect answer," Story says, "but we're trying to do the most logical thing we can."

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