MAN OF SCIENCE, MAN OF FAITH *By Ann Posegate* PAGE 9 | THE SCIENCE BEHIND THE GRAPES *By Sydnie Lemieux* PAGE 44

TUCSON WEEKLY

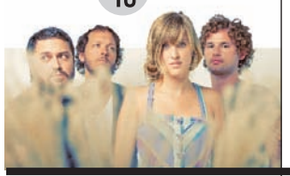
JANUARY 9–15, 2014 • WWW.TUCSONWEEKLY.COM • FREE

REBALANCING NATURE

Why hasn't the reintroduction of bighorn sheep to the Catalina Mountains worked?

By Cathy Rosenberg PAGE 12

Learn about the Gungors behind Gungor. 46



TUCSON WEEKLY

JANUARY 9-15, 2014 | VOL. 30, NO. 47

Sorry, Seagal, we're still endorsing Cap'n Al.

Odds and Ends Again

• It just worked out this way, but this is more or less a science themed issue, as we have three excellent stories that emerged from the UA Journalism School: Cathy Rosenberg's cover story on bighorn sheep, Ann Posegate's profile of theologian/astronomer Christopher Corbally and Sydnie Lemieux on the science behind Arizona wine. Thanks to the enigmatic John de Dios for his help getting all of this together and to Noelle Haro-Gomez for her photos, who is sadly no longer going to be available at the last minute to shoot things for us as she's heading to Pennsylvania for a few months. I'm generally confused by anything science-related, but the writing on these pieces is so good that I enjoyed each word. Hopefully you do as well.

• This week in unsolicited endorsements: the Gungor show at Club Congress on Thursday the 16th should be a magnificent evening of music. You can read more about the husband and wife that make up the core of the group in this week's music feature on page 46, but if you feel like you might enjoy a slightly less weird version of Sufjan Stevens, they should be up your alley. I can't imagine they'll be playing places the size of Congress for long, at very least. Plus, the scheduled opener, Kye Kye, who I believe are from Estonia via Portland, could be something special as well, if only based on the first single from their forthcoming second album, "Honest Affection."

• You'll start seeing his posts on The Range, but I managed to convince David Safier, who writes a monthly-ish column for us, to bring his blogging over to Tucsonweekly.com, which should class up the joint a bit. He knows more about the state of education in the state and nationally than anyone I know, so I'm glad to have him on board.

• On an entirely different note, our new contributor on the pizza beat, James Krepps, should be entering the fray at some point soon as well. He loves pizza and he's a good writer, so it seems like a natural fit. Sure, the daily paper had an endless bracket voting thing, but we have someone assigned to just write about pizza. Take that, traditional media!

Thanks for reading.

DAN GIBSON, Editor
dgibson@tucsonweekly.com

Dan Gibson can be heard on Fook Music Mornings on 92.1 FM KFMA most Fridays around 8 a.m., and on DeSimone's Daily Double on 1030 AM KVOI Thursday, January 9 from 8 a.m. to 9 a.m.

COVER DESIGN BY ANDREW ARTHUR

Trained in the Jesuit order, Christopher Corbally balances two worlds in his work at the Vatican Observatory

Man of Science, Man of Faith

BY ANN POSEGATE, mailbag@tucsonweekly.com

To Christopher Corbally, science and religion do not conflict. Period.

He holds degrees in physics and astronomy. He has studied the structure of galaxies, classified stars, worked as a vice director at a famous observatory and been an active member of international astronomy associations. And he is a Roman Catholic priest.

"If through scientific method we find out about the truth in the universe, then that truth, the source of that truth, is the creator," the Rev. Christopher Corbally says in his UA office.

Two colorful images of stars decorate an office wall. A book titled *Evolution* sits next to his computer.

"You might find apparent conflict, in which case the questions get interesting," he says comfortably. "But fundamentally, there's not going to be."

Evolution. The Big Bang theory. Big questions demand big answers. Modern society often divides science and religion in two, but for Corbally and the priest-astronomers who work for the Vatican Observatory, science and religion are more than compatible. They are unique to humans—and a necessary part of culture.

Corbally trained for 21 years to become a Jesuit. He earned several degrees along the way, including an undergraduate degree in physics from Bristol University, a master's degree in astronomy from the University of Sussex, a bachelor of divinity degree in theology and a pastoral diploma from Heythrop College at the University of London and a doctorate in astronomy from the University of Toronto.

Since earning his final degree, Corbally has devoted much of his time to the Vatican Observatory. He credits his desire to work at the observatory to a summer he spent at its headquarters in Castel Gandolfo, Italy, as an undergraduate.

The Vatican Observatory, re-established in 1891 in Vatican City, stemmed from early observatories and more than three centuries of astronomical research by the Roman Catholic Church. The headquarters were moved to Castel Gandolfo in the 1930s because of light pollution in Rome. In 1981, when the new location became too bright as well, the observatory opened a research arm based at the UA and hosted by the Steward Observatory.

Today, a mix of Jesuits, a priest from the Diocese of Padua, brothers and lay astronomers still work at the observatory. Corbally and five others are based in Tucson. "In our outreach, we are really trying to implement and argue that science and religion are complementary if they're understood," says the Rev. William Stoeger, a Jesuit priest who works with Corbally. "What science is studying are the details of creation."

Ask Corbally about the sunglasses he wears while performing an astronomy skit in lieu of a lecture at science conferences, and his face lights up. "You mean the space goggles?" he asks.

The skit is part of a new research venture called the Human Sentience Project, in which he and colleague Margaret Boone Rappaport, an anthropologist and writer, use performance, research, dialogue and publications to encourage people to think outside the box about science, religion and art. The scenes in the skit compare supernovae, or exploding stars, in the context of past, present and future culture.

It's the year 3054, Corbally explains. He and Rappaport stand onstage. Corbally, wearing black from neck to toe and matching wrap-around sunglasses—er, space goggles—represents his future priest-astronomer cousin.

Rappaport, representing her future relative, wears the same outfit but in white. From her position on Jupiter's moon Europa, Rappaport's character spots a supernova. She relays the news to the priest-astronomer, who is 40 light-minutes away on Earth's moon. He sets up his telescope in time to watch the explosion. The two characters can easily observe the event and explain it through science.

Corbally and Rappaport now flash back to 1054, when a bright star appears in the sky and fades more than a year later. The chief astronomer in China waits weeks to present an explanation to the emperor that fits in with Chinese culture. He finally calls the celestial event a "guest star." Unbeknown to him, scientists will later identify it as a supernova, and its remnant will become the Crab Nebula.

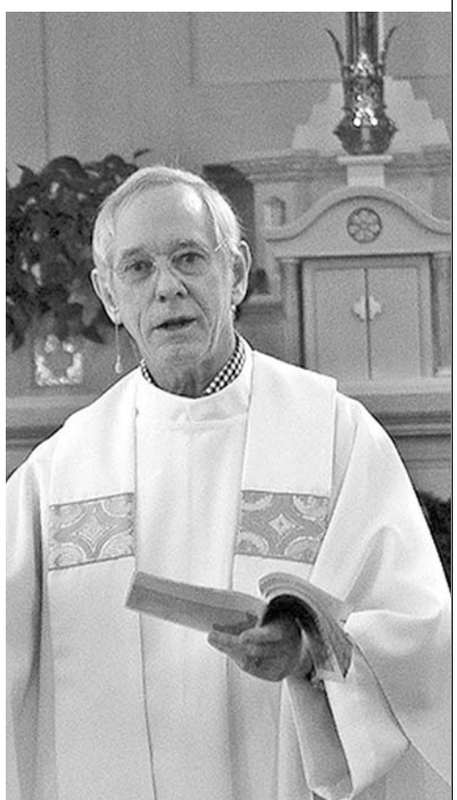
Now in the present, Corbally and Rappaport lead a discussion with an audience of astronomy enthusiasts: How will human thought have changed over these 2,000 years? What might these supernovae have meant to each culture?

The skits are basically a dialogue between a priest and an anthropologist about the evolution of human thought, Rappaport says. "The ability to think scientifically only arose in one animal: us."

She and Corbally refer to the highest level of human thought as "matrix thinking." It is "what makes humans human," Corbally says.

The two scientists met in 2006 and discovered a common interest in the way humans think. They are currently writing a book about matrix thinking and plan to present the skit in high schools and universities, starting with a Tucson high school this spring.

"We must tell young people about (these ideas) so that they can be comfortable," Corbally says. "It's natural to be religious, to be scientific and to be artistic."



NOELLE HARO-GOMEZ

Christopher Corbally

Ask Corbally about evolution and the Big Bang theory, and he directs you to the Bible.

"Genesis is not trying to teach us about science, but about our relationship with the created world and obviously with the creator," he says. "So once you realize that, then there's no conflict."

He picks up the book *Evolution* from beside his computer and dons a pair of thin, wire-framed glasses. A small-framed man of average height, with a British accent and silver hair parted on the side, he seems ready to introduce a story for *Masterpiece Theatre*.

"Evolution is our best science story at the moment," Corbally says. He does not go into detail about the creation of the universe or the evolution of living things. He speaks of "big history"— the evolution of planets, rocks, life, humans, society, culture and religion. "Big history includes everything." And there, his explanation ends. TW

Ann Posegate is a graduate student in journalism and environmental science at the UA. As a freelancer, she has written for The Washington Post, Weatherwise *magazine and numerous websites and blogs.*

THE SKINNY

Continued from page 8

will push for more disclosure laws of so-called political "dark money" that's being spent by non-profits, but the legislation is unlikely to go very far.

• **Tax reform:** There's a new push to create a flat tax in Arizona, or at least a flatter one that would move from Arizona's current five tax brackets to just three. The fundamental political problem: Going to a flat tax means that the top earners in Arizona would get a big break, while the bottom 90 percent would see a tax increase if the state keeps the tax collection revenue-neutral. Supporters of the flat tax are trying to avoid that result with a new package of tax credits that would ensure that a flat tax wouldn't cut taxes for Arizona's richest at the expense of everyone else, but that raises a question: If you're going to introduce a new, complicated credit and deduction program, what's the point of simplifying rates with a flat tax?

SECRETARY POOL

Democrat **Terry Goddard**, who has lost three statewide races for governor (1990, 1994 and 2010) and won two statewide races for attorney general (2002 and 2006), is taking aim at the Secretary of State's office.

TERRY

Goddard announced on Facebook last week that "after many discussions and much serious thought, I have decided to run for Arizona Secretary of State. I love our State and can't stay on the sidelines when fair elections are at risk and dark money is polluting campaign financing."

Goddard's entrance into the race sets up a Democratic primary against state Sen. **Leah Landrum Taylor**.

Landrum Taylor, who was first elected to the Legislature in 1998, has reached her term limit in the Senate. She told The Skinny last month that she was tempted to "ride off into the sunset" but she decided "a lot more needs to be done, there's a lot more to give back … and the office that came to mind was Secretary of State."

A three-way Republican primary is shaping up between extremely wealthy **Wil Cardon** (last seen losing big to Sen. Jeff Flake in 2012), state Sen. **Michelle Reagan** and state Rep. **Justin Pearce**.

COLLEGE EXPULSION

A recall effort is in the works to unseat three members of the Pima Community College governing board.

Former state lawmaker **Phil Lopes** told The Skinny that paperwork was filed on Monday, Jan. 6, to begin the process of gathering signatures to knock **Scott Stewart** and **Marty Cortez** off the board. A recall effort against a third board member, **David A. Longoria**, is likely to start next month, according to Lopes.

PCC Board member **Brenda Even** isn't going to be targeted because she's up for reelection in November, so her political opponents will just try to defeat here then, Lopes said.

The effort won't be easy: Organizers will have 120 days to collect about 10,000 valid signatures to recall Cortez and

CONTINUED ON NEXT PAGE

Rebalancing Nature

Why hasn't the reintroduction of bighorn sheep to the Catalina Mountains worked?

STORY AND PHOTOS BY CATHY ROSENBERG, mailbag@tucsonweekly.com

A desert bighorn sheep, a ewe, dashes toward the mountains in Catalina State Park, near Tucson. After two full days in a containment trailer the mountains are a sight for sore eyes.

>> PAGE 14

NATURE continued from page 12

The helicopter lands easily on the concrete slab. Quickly, the team onboard carries the desert bighorn sheep to a stretcher. Blindfolded and entangled in a capture net, the sheep is moved to a nearby staging area.

Many hands restrain the animal as the twisted net is removed. The ram struggles, and then relents as he is poked, prodded and processed in preparation for transport to his new home in the Santa Catalina Mountains near Tucson.

"Overheating is the greatest concern during the capture," says Anne Justice-Allen, a wildlife health specialist for the Arizona Game and Fish Department. Overheating can cause capture myopathy, a stress-related complication from problems such as overexertion that sometimes occur during capture. The condition damages muscles and can lead to heart failure.

After a temperature reading, cool water is poured over the animal. The sheep is given oxygen and an intravenous drip to help keep him from overheating during his evaluation.

Along with a team of assistants, Justice-Allen draws blood, takes nasal and oral swabs to check for respiratory diseases such as pneumonia, and snips a small piece of skin from the sheep's ear for DNA testing. Then a biologist attaches a satellite GPS radio collar to the ram's neck.

The GPS system will show Arizona Game and Fish where the sheep is located after his release. If satellite reception is good, the system will upload at 7 a.m. each day and indicate four of the ram's locations from the past 24 hours.

Twenty-one adult ewes, three yearling ewes,

For more info about the desert bighorn relocation, including a Q & A on the process, visit tucsonweekly.com

five adult rams and two yearling rams were captured in the Trigo Mountains, near Yuma, and the Plomosa Mountains, near Quartzite. Shortly after sunrise on the two days of capture, helicopters headed out into the mountains in search of sheep.

Arizona Game and Fish contracts the copters. Their pilots come from Grand Canyon Papillon Helicopters, which also does helicopter tours of the Grand Canyon.

A nonlethal net gun is shot from one copter as it hovers over the sheep. The net entangles the animals, which are then scooped up by the crew and brought back to the staging area.

The operation took place on a weekend in November 2013. The following Monday morning the sheep were released in Catalina State Park as the first phase of the Santa Catalina Bighorn Restoration Project.

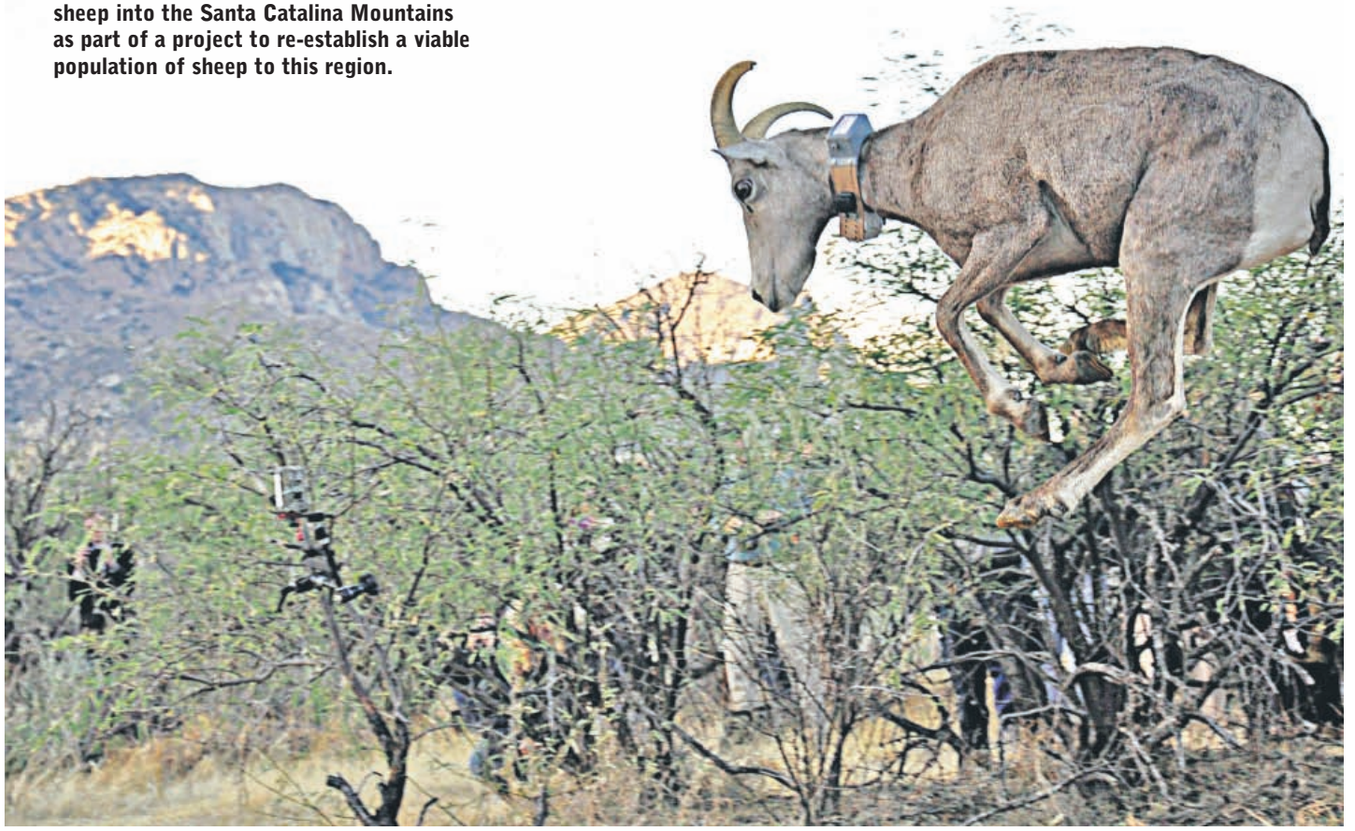
The reintroduction leaves many questions unanswered. No one knows if the sheep will become a self-sustaining population. The bighorns might fall victim to the same fate that caused their disappearance from the Pusch Ridge Wilderness Area of the Catalinas in the late 1990s. Sheep had thrived in that range through most of the 20th century.

"No one is really certain why the original herd disappeared," said Mike Quigley, the Arizona representative for the Wilderness Society. "It was likely due to a combination of factors."

The sheep declined as the number of people living in the region grew. That correlation suggests that human encroachment might have contributed to the sheep's demise.

continued on next page

A desert bighorn sheep jumps from the trailer that brought it to Catalina State Park near Tucson. The Arizona Game and Fish Department released 31 bighorn sheep into the Santa Catalina Mountains as part of a project to re-establish a viable population of sheep to this region.



A desert bighorn sheep passes a hidden photographer as it bounds away from the spectators in Catalina State Park near Tucson.

NATURE continued from page 15

Other theories include the effects of fire suppression on bighorn habitat, predation by mountain lions and disease passed to the native sheep by their domestic cousins. In the last two decades, much speculation has occurred about why the sheep disappeared, but no definitive answer has been confirmed.

Historical presence

Desert bighorn sheep have roamed the American Southwest for tens of thousands of years—from what is now Mexico into Arizona and Nevada, through southern New Mexico and western Texas.

In the 1800s, large populations lived in nearly all the mountainous regions of Arizona. As settlers moved in, the number of bighorns declined. Diseases transmitted by domestic sheep brought from Europe infected and killed the native sheep. The bighorns didn't have enough time to adapt to these new diseases.

Unregulated hunting and loss of traditional water sources might also have contributed to the bighorns' decline. Bighorn meat was commonly sold in Arizona markets in the late 1800s.

As early as 1887, bighorns gained protection in the Arizona Territory. This protected status, however, did not result in an increased abundance of sheep. The factors contributing to their decline continued to affect their overall numbers.

Two national wildlife refuges—Kofa and Cabeza Prieta—were established in 1939, providing 1.5 million acres in southwestern Arizona for the bighorn sheep as well as other wildlife. About 900 bighorns still live in these two refuges. By the early 1990s, however, their range elsewhere in the state had been reduced to the Grand Canyon and a few other remote areas.

Today, the desert bighorn sheep again occupy many of their historical sites in Arizona because of relocation projects implemented by Arizona Game and Fish. More than 5,000 sheep now live throughout the state.

The bighorn sheep disappeared from the Catalinas in the late 1990s, when construction and development brought in large numbers of new residents. The roadways expanded, with some 55,500 cars now passing along Oracle Road daily at the Ina Road intersection, according to the Arizona Department of Transportation.

One theory is that the mere presence of people precipitated the bighorns' decline. "The sheep are notoriously sensitive to humans, especially during lambing season," said Randy Serraglio, the Southwest conservation advocate for the Center for Biological Diversity (and *Tucson Weekly* columnist). "Hikers can cause sheep to scatter and get separated from their young."

Humans can also prevent sheep from moving freely from one part of their habitat to another in search of food and water. Ewes can miscarry when frightened by humans, Serraglio said.

In response to the declining population, the U.S. Forest Service instituted hiking and trail restrictions in the historical lambing areas in 1996. Those restrictions are still in place.

Hikers are instructed to stay on hiking trails. No off-trail hiking or bushwhacking is allowed from January through April, when the ewes give birth and nurture their newborn lambs. Dogs are also banned from lambing sites because they traumatize sheep. Research has shown that bighorns have higher heart rates when dogs accompany hikers than when hikers are alone.

"Encroachment of the urban area may have also cut off connectivity corridors that the sheep used to get from the Catalinas to other mountain ranges around the Tucson basin," Serraglio said.

Playing with fire

Along with human encroachment, fire suppression and predation are thought to be responsible for the disappearance of the sheep. Historically, the mountain ranges in Arizona burned on a regular basis. Natural fires, usually set by lightning strikes, "maintain the forests by keeping the undergrowth in balance with the rest of the ecosystem," Serraglio said. "There was no one around to put the fires out."

In recent decades, however, the Forest Service has routinely extinguished forest fires. Because of fire suppression, the undergrowth grew thicker. "The change in forest structure may have crowded out the sheep's preferred forage," the Wilderness Society's Quigley said.

The dense vegetation also created hiding places for mountain lions, Quigley said. The sheep could not see the lions and were more likely to fall victim to attacks.

Conditions needed to change if the species was going to be restored to the region. "There has always been a desire to put sheep back into the Catalinas," said Joe Sacco, a field supervisor for Arizona Game and Fish.

After two large fires in the Pusch Ridge Wilderness Area—the Bullock Fire in 2002 and the Aspen Fire in 2003—the habitat again became suitable for bighorn sheep. The fires reduced the opportunity for mountain lions to prey on sheep and also increased the grasses, forbs and shrubs such as jojoba and fairy duster that sheep eat, Serraglio said.

The Forest Service is exploring a new policy to allow some of the natural fires in sheep country to burn—as long as they do not threaten human life or property. Prescribed burns will not only help maintain better conditions for sheep but will also re-establish a healthy ecosystem naturally driven by fire.

Forming a coalition

Typically, Arizona Game and Fish uses an accumulation of biological data to manage wildlife. The agency sometimes consults with conservation organizations and holds public hearings to solicit community input.

With the bighorn relocation, however, the agency wanted to implement creative solutions to some of the existing issues, particularly management of fire and predation by mountain lions. "We knew this project was going to be controversial and wanted broad support from the community," Sacco said.

The Catalina Bighorn Advisory Committee was formed to bring to the table many diverse voices interested in public lands and a healthy wildlife population. Representatives from the

Wilderness Society, the Arizona Wilderness Coalition, the Center for Biological Diversity, the Sky Island Alliance and the Arizona Bighorn Sheep Society joined the committee. The members work closely with Game and Fish and the Forest Service in making decisions about relocating the bighorns to the Catalinas.

Participating on the advisory committee created an opportunity for the conservation community to work hand in hand with Game and Fish. In the past, Sacco said, the agency did not always have a good working relationship with some environmental groups.

The Wilderness Society was interested in restoring a population of desert bighorn sheep "to where they rightfully belonged, within the context of a larger restoration project for the mountain range as a whole," Quigley said.

The formation of the committee could be a good model not only for the success of the bighorn project but also for wildlife restoration in the rest of the state. The high level at which the coalition influences decision-making in the restoration project is unprecedented in wildlife management undertakings in Arizona, Quigley said.

If the advisory committee could agree on the bighorn relocation, then maybe this type of committee could again be used in other environmental restoration initiatives. "At the Center for Biological Diversity we believe every species is important," Serraglio said, "especially in a time when species are winking out faster than they have in millions and millions of years."

A big part of the discussion focused on pro-

continued on next page

A desert bighorn sheep is given oxygen on a stretcher while being examined at a staging area in the Imperial National Wildlife Refuge near Yuma. The sheep, captured as part of a relocation project, can suffer from overheating and are given oxygen to help offset the effects of stress.

NATURE continued from page 17

tecting the sheep by managing the mountain lions. Since the initial population of reintroduced sheep was small—just 31 animals—lions hunting bighorns could disrupt the success of the project, Sacco said.

To build a viable population of sheep, mountain lions that preyed on the reintroduced bighorns would have to be removed. Some mountain lions even specialize in preying solely on sheep.

Biologists and wildlife managers at Game and Fish believe that a healthy, robust population of mountain lions lives in the Catalina Mountains. Track counts and scat analysis, plus the large number of lions taken by hunters in recent years, support this theory. Whitetailed deer and javelina, the lions' primary prey, also thrive in the range, indicating that the predator population is probably large, too.

"The best way to determine if a healthy number of lions exists in a region is through hunt harvest information," said Ben Brochu, a wildlife manager for Arizona Game and Fish. Hunting mountain lions is legal in the state, and Game and Fish issues yearly tags to interested hunters.

Every hunter who kills a mountain lion is required to present that animal to Game and Fish within 10 days. A DNA sample is taken and a premolar extracted to provide an index to the population structure of lions within a given area.

The premolars collected in recent years indicate that both young and older lions have been harvested. If the population was overexploited or in trouble, the teeth would represent mostly young animals, Brochu said.

A research study conducted in the Catalinas from 2005 to 2008 collected genetic samples from mountain lions to analyze their viability. The results showed a low probability of inbreeding, Brochu said.

Mountain lions are difficult to survey because they are secretive. Lions avoid human contact and are rarely seen. This behavior

leads people to a false assumption that mountain lions are rare or even endangered.

In addition, the lions have large home ranges. Those found in the Catalinas are part of a metapopulation that roams the Catalina, Rincon, Tortolita and Galiuro ranges. Because of this enormous area, "There is no such thing as a limited or fixed mountain lion population in the Catalinas," Brochu said.

Mountain lions reproduce more quickly than their prey. The females have litters of one to six kittens every year and a half. About 66 percent survive.

Bighorn sheep, however, are more susceptible to drops in population because of their low reproduction rate. "Ewes usually only have one lamb a year, with about a 20 to 25 percent success rate," Sacco said. Lambs fall off cliffs, die from disease and are lost to mountain lions and other predators such as golden eagles.

The ultimate goal is for sheep and lions to coexist in a natural balance. But until the sheep population is stable, the advisory committee supports a short-term predator management protocol for mountain lions. If a mountain lion preys on bighorn sheep, a hunter will be sent in to attempt to kill the lion. Usually a mountain lion will remain in the vicinity of its kill for several days. If five days go by and the lion is not found, it won't be removed. A mountain lion with kittens will be spared.

Arizona Game and Fish has placed a moratorium on sport harvest of mountain lions using dogs in the Bighorn Sheep Management Area within the Pusch Ridge wilderness. With information collected from the bighorns' GPS collars, Game and Fish will conduct a long-term research study comparing where the sheep settle with the effect those site selections have on predation.

In order to include the opinions of the Tucson community, three public hearings were held before the sheep were released. Some of the most frequent questions were about hiking restrictions and killing mountain lions.

Other initiatives

Relocating bighorn sheep is not a new practice. Arizona Game and Fish has been reestablishing new populations since 1957. "We've taken small subgroups from established populations and moved them to locations where sheep have lived historically and the habitat is sufficient to maintain them," Sacco said.

Sometimes these projects are not successful at first. "It takes time for the sheep to find water and get used to new habitat," Sacco said. The first historical population of bighorn sheep re-established in Arizona was in Aravaipa Canyon, where the sheep took 18 years to re-establish.

In most relocation projects, the sheep initially respond with similar behavior. The newly introduced sheep in the Catalinas were no different. "At first, the sheep scattered and then hunkered down, which is what we have seen with other restoration efforts," Brochu said.

The animals remained in one area for several days. "It took time for the sheep to relax and begin to explore their new surroundings," Brochu said.

After the sheep calmed down, they started moving around more and found suitable terrain higher up on peaks and cliffs with an open field of view.

The Arizona Desert Bighorn Sheep Society has been working with Arizona Game and Fish to reestablish desert bighorns for more than 40 years, said Brian Dolan, past president of the society and a member of the Catalina Bighorn Advisory Committee.

One of the first relocation projects the organizations worked on together was in Aravaipa Canyon. "The new, reintroduced population is doing quite well," Dolan said.

Overall, the relocation projects in Arizona have been about 70 percent successful.

The release

The trailer loaded with desert bighorn sheep sat at a distance from the group of spectators at Catalina State Park. Before the release, a representative from the Tohono O'odham Nation spoke privately to the sheep. He said they were ready to go into their new home.

When the gates opened, there were a few moments of silence, followed by banging as most of the sheep bolted. Some, probably unsure of what was happening, had to be pulled out by their horns. One sheep jumped out of the trailer, stopped, looked around at the crowd of people and then skedaddled, following the other sheep into the mountains.

The GPS monitoring collars help Game and Fish keep track of the sheep. A few days after the release, many of the sheep had shifted to two canyons farther east, an area used in the past for lambing. One ram had roamed higher into the mountains.

Another ram had not moved much since the release. A few days later that ram died, most likely from capture myopathy, which can persist for two to four weeks after release.

By the second weekend, two ewes had been killed by mountain lions. As established by the management plan set up for the project, a houndsman and a wildlife manager were sent into the area where the sheep were killed. Separately, the men found and shot the two mountain lions responsible for killing the two sheep, whose remains were found in both of the lions' stomachs.

A third ewe was killed by a mountain lion and found on Dec. 9, bringing the total mortalities to four. The mountain lion responsible for the recent death was not removed because snow and ice prevented the hunter's dogs from picking up a scent.

The rest of the sheep have begun moving into habitat where mountain lions are less likely to prey on them.

The plans for re-establishing a viable herd remain in place. Arizona Game and Fish intends to capture about 30 sheep in 2014 and another 30 in 2015 for release into the Catalinas. Tw

For information on the current status of the Santa Catalina Bighorn Restoration Project, go to catalinabighornrestoration.org.

Cathy Rosenberg is a graduate student in the School of Journalism at the University of Arizona.

What about the climate of Southeastern Arizona makes it a new hotbed for wine?

The Science Behind the Grapes

BY SYDNIE LEMIEUX, mailbag@tucsonweekly.com

If making wine is a science, then Southern Arizona is a superior laboratory. But ditch the lab coats and goggles because the most important components for growing grapes are elevation, climate and soil.

Arizona has more than 80 licensed and bonded wineries, according to the Arizona Wine Growers Association. In Southern Arizona the vineyards are clustered around Sonoita and Willcox. These vineyards don't thrive among saguaros and cholla but in well-watered grasslands above 4,000 feet, where the days are warm and the nights cool.

In 2007, Peggy Fiandaca and Curt Dunham established Lawrence Dunham Vineyards, 36 miles southeast of Willcox. The name honors Dunham's parents—Betty Jane Lawrence and Robert Ervin Dunham.

The winery sits on the western slopes of the Chiricahua Mountains. "This area has incredible soil and water qualities, and the weather, on the edge of briskness, provides a wonderful place to grow mountain fruit," Dunham said.

"Great wine starts in the vineyard," Fiandaca added.

Grapes are traditionally grown along coasts or in valleys below 1,000 feet. Compared with most vineyards, Lawrence Dunham Vineyards sits at a high elevation—4,896 feet. The temperature dips into the 50s at night and rises into the 90s during the day in the growing season. "Plants would rather have it 72 and sunny every day," Dunham said, but that wouldn't make tasty grapes.

These temperature swings stress the grapes, which is a good thing. A stressed grape means a thick skin, which results in better-tasting wine.

But here's where it gets tricky. Like humans, grapes can be too stressed.

"Grapes are an arid plant, meaning they don't want wet feet," Dunham said. When it rains hard during the summer monsoons, the grapes need good drainage.

The grassland soils provide an ideal rain-filtering system. The soils are made of rhyolite, ash and granite. The rhyolite and ash formed from a massive volcanic eruption about 27 million years ago that cooled atop older granite and formed the Chiricahuas. This porous mixture allows rainwater to drip through so the grapes are not sitting in an underground bathtub.

At the same time, this particular mixture of rock helps hold onto a bit of the moisture so the plants don't dry up.

Soils play an important role in determining a wine's taste. They add distinctive flavors to the grapes because the roots pick up minerals and other nutrients that filter downward from the surface. "Grasslands are amazing at storing and accumulating nutrient-rich organic matter in the surface soils," said Rebecca Lybrand, a doctoral student studying soils in the UA's Department of Soil, Water and Environmental Science.

Fiandaca and Dunham modeled their wine varieties after those in the Rhône Valley of southern France, where rocky soils also predominate.

Each year Lawrence Dunham Vineyards produces about 2,000 cases of four varietals: grenache, syrah, petite sirah and viognier. Varietals are wines made from the same type of grape. The opposite of varietals are blends, which are mixtures of varietals.

Petite sirah grapes produce red wine with a spicy, plummy flavor. Syrah, not to be confused with petite sirah, is also a red. It contains flavors of blackberry, mint and black pepper. The third red, grenache, is spicy, with red fruit flavors. It is the dominant variety produced in the Rhône Valley. Grenache grapes thrive in warm, dry conditions. So do viognier grapes, which produce a white varietal with floral aromas and hints of peach, pear and violet.

NOELLE HARO-GOMEZ

Peggy Fiandaca, left, and Curt Dunham, right, owners of Lawrence Dunham Vinyards inside their wine cellar.

Elevation, climate and soil all affect the quality of the grapes. So which one matters most?

Stephan Hlohowskyj, a soil scientist and lab manager in UA's Department of Geosciences, offered an interesting analogy. "Let's say you're having a baby and you ask your doctor, 'What is the most dominant factor in the way my baby will look?' There is no one dominant thing because there are 23 chromosomes from each parent that go into making your baby. And that's kind of the same thing when you're growing plants. That's why it's so hard to grow good wine grapes."

Keep in mind that we haven't even gotten to talking about fermenting the grapes and bottling the wine.

After the grape vines are planted, there is a lot of plant-sitting to do. One of the most important tools that Fiandaca and Dunham rely on is a weather station, which tracks the wind flow, humidity, temperature and soil moisture.

Dunham listed the weather variables encountered during one growing season, which is equivalent to one calendar year.

- Ninety-degree heat waves start in May. Hopefully, the plants won't dry out or die of thirst.
- During the summer, thunderstorms and hail can obliterate the plants by ripping their roots out of the ground and damaging leaves and fruit. Also, if the field stays wet for a long time, the grapes can rot.
- Early freezes begin in fall, followed by hard freezes in winter. If frost occurs in spring after the plants have budded, fruit won't form.
- Pests and diseases can also interfere with plant growth.

With 40 acres to tend, Fiandaca and Durham can't just wrap a blanket around their vines to protect them. "There really is not much you can do to prevent the acreage from damage," Fiandaca said, "so we just drink." Tw

Sydnie LeMieux recently graduated from the UA with a bachelor's degree in geosciences.