

# Fuel Line

Defense Energy Support Center

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# DESC endangered program butterfly breeding takes flight

**By Susan Declercq Brown**  
**DESC Public Affairs**

On Feb. 27, a birth announcement of sorts went out from the area of the Palos Verdes peninsula near Los Angeles. The peninsula is home to Defense Fuel Support Point San Pedro, and the announcement heralded the emergence of the first Palos Verdes Blue butterfly to emerge this season in the newest captive breeding program to help repopulate the endangered butterfly's ranks.

By the beginning of April, more than 360 PVBs had emerged at two captive breeding locations, according to Jana Johnson, the Urban Wildlands Group biologist who oversees the breeding program for the Defense Energy Support Center.

The Palos Verdes Blue, thought to have been extinct since 1983, was discovered in March 1994 to be living in a small colony on the DFSP. Until this year when a second captive breeding program was begun north of Los Angeles, this was the only site where the PVB lived. It is still the only site where PVBs can be found in the wild.

A handful of scientists from the University of California at Los Angeles discovered the PVB during a routine exploration of the DFSP's native anthropods.

They determined the sole surviving DFSP colony was in danger of extinction within a decade if the natural habitat the butterflies relied on was not enriched and expanded. In addition, colonies had to be established in other areas of the peninsula to ensure the survival of the PVB sub-species. Thus began a partnership of government agencies, universities and conservation groups to save the postage stamp-sized butterfly.

The first step toward PVB recovery was to maximize the survival potential for the butterfly at the DFSP. Restoring the butterfly's natural habitat and protecting the two plants the butterfly relies on for food and reproduction – rattlepod and deerweed – was critical to that effort. The DFSP was unique in having both plants co-existing in the same location, said Army Maj. Jason Pike, Defense Logistics Agency command entomologist.

The Southwest Naval Facility and the service contractor for DFSP San Pedro immediately adjusted operations at the site, according to Steve Deatherage DESC environmental protection specialist for natural and cultural conservation. Pipeline construction which was underway was delayed until it was determined project completion was in the best interest of the butterfly.

Thirteen years later, service contractor United Paradyne Corporation's maintenance operations are still planned around the conservation efforts, Deatherage said. Grasses must be

mowed and vegetation cut back to meet fire safety and security standards. But, the contractor checks with conservationists before any mowing or pruning to ensure the rattlepod and deerweed, and other plants included in the natural habitat restoration plan are not disturbed. The same care is taken to ensure ingress and egress to fuel system points does not impact the conservation program.

"Plant surveys are conducted and approval granted prior to any new activities or operations," said Deatherage. "And, any use of pesticides is considered on a case-by-case basis. We always try cultural solutions first — like relocating bee colonies."

Recently, vegetation had grown up along the fences separating the DFSP area from public access areas of the naval base. Bushes had grown high enough that someone could have used them to climb over the fence, said Deatherage. "We worked with conservationists to gain approval to clear the vegetation and cover the ground on both sides of the fence with gravel to discourage future plant growth in that area."

Vegetation growth is encouraged in several areas of the DFSP's natural area. The site is described by Pike as "a biological island in L.A." Volunteers plant and cultivate the butterfly's host plants and others to restore the natural habitat so essential to the PVB's survival. As a result five separate butterfly areas have been established on the DFSP site, Pike said.

The number of volunteers coming through the gates creates a security challenge for the DFSP, said Deatherage, "but the conservation work is essential to saving the PVB," he explained.

Rehabilitation is also being conducted in other areas of the Palos Verdes peninsula in an attempt to reestablish successful habitats for the PVB. The butterflies once flourished in the cool, fog-shrouded seaward side of the Palos Verdes hills. But, in the 1970s and early 1980s, a complex mix of drought, human population growth and associated urban sprawl, and pesticide use led to the destruction of the PVB's natural environment and the ultimate apparent demise of the PVB.

Volunteers and conservationists also work to increase the PVB population through a captive breeding program. The breeding habitats and protocols have become more work-intensive, detailed – and successful – as the program developed.

Initially, butterfly pupae in the dormant stage of metamorphosis in which the caterpillar changes to a butterfly, emerged

in the lab and were then placed in large cages in the field where they were allowed to mate protected from predators. Smaller multi-plant boxes were soon added. These allowed scientists to contain ten males and ten females in a smaller space where they would mate and lay eggs. The larvae or caterpillars would live in the multi-plant boxes until mature when they would be transferred to the lab for safety.

Using these methods, conservationists were able to successfully increase the PVBs numbers, but they wanted to do more, explained Johnson. As a result, boxes were established for very carefully controlled breeding. And, new procedures were developed for very hands-on butterfly care.

As a result of the new procedures, initially used with just 23 females, Johnson quadrupled the number of PVBs in just one cycle, she said. As the lead biologist for the PVB breeding program, Johnson is certified to handle the butterflies and to strictly supervise the permitted-volunteers who also handle them.

That success enabled them to establish a second captive breeding site, another of the requirements for PVB recovery established by the scientist who first rediscovered the species. A second site helps ensure the survivability of the species by averting the possibility that an adverse situation at the DFSP – like fire or drought – could wipe out the entire PVB population, said Pike.

So, on Feb. 13, the captive breeding program began a new chapter when 360 pupae from the DFSP were delivered to a new captive breeding facility established in the teaching zoo of Moorpark College in Ventura, Calif., north of Los Angeles. This new program enables a more intricate hands-on procedure by establishing a program closer to the crew of 17 volunteers and conservationists on whom the program relies. And, it makes

the PVB story more accessible to the public, particularly children, who Johnson says must learn how to protect the flora and fauna which form the intricate web of life which makes up their natural environment.

“The volunteers have been essential to keeping up with the huge number of pupae, butterflies and larvae this season,” said Johnson. “There is no way



*An endangered Palos Verdes Blue butterfly feeds off of a cotton ball at the newest location for DESC's captive breeding program designed to increase the PVB population. (Photo by Fred Vachss.)*

I could have cared for the abundance we are experiencing without the team.

“If this year’s breeding program is as successful as last year’s, we may be ready in 2008 to release butterflies into the wild on the Palos Verdes peninsula [off of the military reservation.]”

*For a light-hearted look at the new procedures for the care and feeding of the butterflies in the captive breeding program, see page 20.*

# Endangered butterfly rearing taps

By Susan Declercq Brown  
DESC Public Affairs

Approximately nine months after the August 2003 power outage, called the largest ever to strike the East Coast, newspapers reported an unprecedented population surge. Sociologists say the same trends are reported on a smaller scale after most urban power outages. If only increasing an endangered butterfly population were so easy, DESC officials might say.

Instead, scientists and volunteers implementing DESC's captive breeding program have found that kind of success only through a carefully controlled environment and a work-intensive, hands-on rearing protocol.

How does successfully rearing the endangered Palos Verdes Blue butterfly differ from guiding our own little bundles of joy through life?

Well, after talking to Jana Johnson, the lead Urban Wildlands Group biologist running the captive breeding program for the Defense Energy Support Center, I learned the experience is more similar than one might think.

Until Feb. 13, when a new captive breeding program was begun at the Moorpark teaching zoo north of Los Angeles, the endangered PVB lived only on the grounds of the nearby Defense Fuel Support Point San Pedro. It was thought to be extinct until being discovered at the DFSP 11 years ago. Since that time, DESC-sponsored conservationists have been working to restore the PVB population which once flourished on the Palos Verdes peninsula where the DFSP is located. Intensive captive breeding procedures have been developed and are now being practiced at the DFSP and the zoo. The goal is to strengthen the existing populations and then introduce the PVB back into the wild areas of the peninsula beginning in 2008.

And, here's the beauty: the conservationist "parents" can birth, nurture, choose the mates for their "offspring," and have "grandchildren" in just one year. And they get to take a four-month hiatus of sorts when they refrigerate the "kids" for a long nap before months of

near non-stop activity begin. But, then the cycle begins all over again with the next generation.

For Johnson, that has meant nurturing six generations of butterflies in ever-increasing numbers over the past five years.

In the captive breeding program, success is measured in terms of successful mating and reproduction. Like the "power outage babies," the captive breeding program experiences a predictable surge of butterfly "births" – but the surge is not contingent on unpredictable external phenomena. Instead, the cycle proceeds each year with a precision that is almost like clockwork.

"The first eclosion [butterfly emergence] occurred at 8:30 this morning," Johnson said in a Feb. 13 e-mail to update the team of scientists, conservationists, and volunteers involved in the effort. "It appears that the heat lamps are triggering eclosion around 8 a.m. Yeah!"

Johnson can also predict with certainty that the 18th day after the first eclosion will be the busiest day for eclosions.

The use of refrigerators and heat lamps provides a degree of certainty not usually afforded human parents – unless, of course, you subscribe to the invitro fertilization and scheduled caesarian birth approach.

The newly emerged PVBs jump right into puberty. Like humans, the females tend to mature a little faster. "The females are ready to mate almost immediately," said Johnson. "But the males are



*A PVB larva poses for the "grandkids" album. (Photo by Daniel Stoyka Beran.)*

allowed to age for a couple of days before they are ready."

Human adolescents and teens are used to parents urging a slow maturation process. Early dating is often chaperoned and a "decent distance" between dancers is usually enforced at school dances. The prospective grandparents wait and watch patiently through years of courting while their offspring select life partners. Only near the end of the waiting period do some prospective grandparents become impatient and begin demanding to know when the grandchildren are coming.

But, the PVB "prospective grandparents" will have none of that. They want grandchildren, and they want them now. And the young butterflies are willing to comply.

Successful PVB "parents" are exponentially more controlling in their efforts to achieve grandchildren. They refrigerate the females to reduce their opposition to mating. Conversely, they heat the males in the sun to warm them to the idea of mating. Next they carefully select males and females from specific gene pools to ensure a strong population and then introduce them to each other in a controlled setting.

PVB "parents" rub the females against the males to ensure the males are aware

# into primal human parental instincts

of their presence. Once mating is established – it can last 30 minutes to 24 hours – the mating pair are moved to a private suite (empty plastic bottles donated by local elementary school children) to ensure success. The female will mate only once, but the male is returned to the breeding box and is allowed to breed as many times as he is able, said Johnson.

From the very beginning, successful PVB “parents” provide hand feeding for the new butterflies, but unlike human parents, the hand-feeding continues through adulthood right up until death. Twice a day, volunteers soak thumb-sized wads of toilet paper in either honey water or Fierce Melon Gatorade (a PVB favorite formula) and offer it to isolated butterflies. While human parents might touch some milk to the baby’s lips to entice it to eat, PVB “parents” touch the sopping toilet paper to the feet of the butterfly. Once enticed, the butterfly will extend its proboscis to the toilet paper and feed. Did I mention there are several hundred butterflies to feed?

In the wild, the butterflies live only a week, but the PVB “parents” have already stretched the life expectancy to 30 days through their special care protocols. “We hope to have

captive breeding boxes because they can kill the adult butterflies which become too geriatric at the end of their artificially extended lives to protect themselves from the ants, said Johnson.

PVB “parents” also take the kids out for daily walks. “This involves taking the cages, with the butterflies in them, outside in the fresh air and sunlight. This increases their longevity, breeding and oviposition (egg depositing) rate,” Johnson explained.

Successful PVB “parents” are very protective of the grandkids. Egg laying females are switched to new spots on the plant, and then the old spot is placed in a protective larval container to keep the caterpillars in and predators out. The females lay two dozen or more eggs per spot. Clippings from the multi-plant boxes are brought into the laboratory in larval rearing containers to preserve as many larvae as possible from the earwigs and other predators.

Human parents often struggle to deal with toddlers, infants and preschoolers at the same time. It can be challenging to change diapers, bottle feed and chase after the young ones. As the PVB’s lives are extended, our PVB “parents” face similar challenges as they care for butterflies, larvae and pupae at the same time. The work-intensive phase of PVB “parenting” may be short, but it is brutal.

PVB parents don’t change diapers, but they do go on daily “frass” patrol to prevent the younguns from eating it. And stressed caterpillars have been known to eat each other, so the “parents” have to separate adolescents to prevent cannibalism.

Many parents look forward to their children heading off to college. While it is an exciting milestone for the children, it is often also a time for parents to focus on their own needs and rejuvenate after years of putting the kids first. When the PVBs form pupae and enter a dormant phase during which they begin the transformation to butterflies, the PVB “parents” must heave a sigh of relief loud enough to be heard by the seals off the coast of Monterrey.

In June after the pupae are weighed, labeled and individually packaged in little plastic cups, they will be placed in the refrigerator for a four-month nap. You may remember they are anticipating upwards of 3,000 pupae this year. Did I just hear you sigh?

After a well deserved hiatus, the PVB “parents” will be back at it again next February. The pupae will be removed from refrigeration and weighed. (One of the two captive breeding sites will remove pupae three weeks later than the other. This will lengthen the child rearing phase for the PVB “parents,” but it will spread out the work load as well.) Then the pupae will be placed under the heat lamps to jump start the natural “Californian spring” cycle. Within a few days the first “grandchild” will eclose. And just like clockwork, 18 days later, the place will be “a zoo.”

*Learn more about DESC’s role in saving the Palos Verdes Blue, on page 12.*



*A male with outstretched wings and a female share a branch.  
(Photo by Daniel Stoyka Beran.)*

butterflies living up to 45 days now,” said Johnson. “The longer they live, the more they can reproduce.” Johnson hopes to have 3,000 “grandchildren” this year so more than 2,000 can be introduced to wild areas of the Palos Verdes peninsula which have been specially cultivated to support them.

In captivity, the butterflies are kept in plant boxes with the rattlepod and deerweed plants. The females will lay their eggs on this and the larvae/caterpillars will feed as they grow before entering the dormant pupae stage. Volunteers water the plants daily. And when eggs and larvae are on the plants, the volunteers wield tweezers to remove aphids, spiders, earwigs and other pests. In the wild, ants tend to the eggs and larvae, keeping them clean and safe in exchange for a sweet substance extruded from the larvae. But the ants are not allowed in the