A Secret Too Well Kept: The NRS at 50

By Elizabeth Devitt

From our coastal waters to the Sierra Nevada, more than half a million acres of land are protected by the University of California for scientific research, education, and public service. This Natural Reserve System is patchworked across 39 properties and provides undisturbed study sites for research that may have worldwide impact. Since these lands aren’t routinely open to the public, many people don’t realize these areas even exist. However, a lot of these reserves are accessible in ways that aren’t well known; they may be entry points for public hiking trails, locations for tours of unique Bay Area habitats, or places where citizen scientists are invited to help collect study data. On this fiftieth anniversary year of the NRS, perhaps an introduction to these sequestered spots is overdue.

Eight NRS parcels are scattered around the Bay Area. Some better known locations may be the wildflower displays at the Jepson Prairie Reserve in northeastern Solano County; Año Nuevo Island Reserve, a key breeding ground for northern elephant seals; or Stebbins Cold Canyon Reserve, which backs up to public trails on the Putah Creek Wildlife Area next to Lake Berryessa. Other local NRS sites include Bodega Marine Reserve, McLaughlin Natural Reserve, Quail Ridge Reserve, Younger Lagoon Reserve, and the Blue Oak Ranch Reserve in the foothills below the Lick Observatory on Mount Hamilton.

The reserve system was established in 1965 with seven university-owned properties to preserve “living laboratories,” said Peggy Fiedler, director of the NRS. The need for pristine field sites was championed decades ago by Kenneth Norris, a UC professor of natural history who once lost his Palm Springs desert study site to bulldozers and building development. Norris cofounded the NRS (first named the Natural Land and Water Resources System) with acclaimed UCLA botanist Mildred Mathias and Wilbur Mayhew, a UC Riverside professor of zoology. Since then, the system has grown to encompass 759,000 acres through land donations and partnerships with land trusts or federal and state parks.

“Each reserve has a different ecosystem and a different ‘flavor’ based upon the interests and strengths of reserve manager or research scientists,” Fiedler said.

At the Blue Oak Ranch Reserve in San Jose, director Mike Hamilton is a self-professed technology geek with a doctorate in natural resources, policy, and planning. Since the property was donated to the NRS eight years ago, he’s been “instrumenting
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up” the 3,259-acre site with sensors, cameras, drones — and, someday, maybe robots — to help scientists monitor everything from soil moisture to mountain lion movements.

“Our mission is to extend our classrooms and laboratories on campus to the natural environment,” Hamilton said.

So far, Hamilton counts more than 150 research projects conducted across the undisturbed terrain at the base of Mount Hamilton. His public outreach efforts include streaming images from real-time cameras mounted around the reserve — at nesting boxes, ponds, and other ranch locations — to a baggage terminal at Mineta San José International Airport. Last year, more than nine million passengers went through that airport. “Maybe one-quarter of them picked up bags at that terminal,” said Hamilton. “Even if 10 percent of those people took a look, we’ve exposed thousands of people to science who would never have set foot on our reserve.”

The camera project officially ended in 2012, but Hamilton is planning to meld all the live feeds into a time-lapse display and return it to the Terminal B baggage claim area.

On a wider property scale, the NRS recently received $1.9 million — its largest single grant ever — to study climate change across 24 of the reserves. A UC Santa Cruz professor of ecology and evolutionary biology, Barry Sinervo, is leading the Institute for the Study of Ecological and Evolutionary Climate Impacts, which includes a network of more than 100 other scientists.

Sinervo called the diverse landscapes and historical records of the California reserves “a treasure” that will enable scientists to collect and analyze long-term data from an entire gradient of ecosystems. With this breadth and depth of information, researchers plan to capture patterns that can help create better models to understand and predict the effects of climate change.

“Climate change is happening now, and it’s happening fast,” Sinervo said. “If we can get people the most scientifically up-to-date perspectives about what’s happening — on our reserves and across California — then they can make better decisions about many of the issues that will come up, be they bills the legislature is trying to pass, or taking other actions.”

Although an application is required to pursue research, or any other activity, on the reserves, that doesn’t mean the land is completely off limits to the general public. Since 2010, the California Phenology Project, in partnership with the National Park Service, regularly brings volunteers out to NRS sites where they measure the status and stages of flowering and fruiting in more than 60 species of plants. This work helps researchers track the effects of climate change. In the aftermath of the recent wildfires, data collected from the Stebbins Cold Canyon Reserve, burned by the Wragg Fire in July, may also help scientists learn how plants recover from catastrophic events.

But scientific research isn’t the only thing that brings people onto the reserves. Many locations host education programs, ranging from wildflower tours for schoolchildren to art classes for adults. At the Blue Oak Ranch Reserve, Hamilton is eager to start the Adventure Risk Challenge, a program that blends outdoor adventures with academics to boost leadership and literacy for at-risk high-schoolers. Opportunities to visit other reserves vary by location.

“So much goes on at the reserves and they’ve been a secret too well kept. We’re trying to change that,” said Fiedler. “It’s a rare collection of unique ecosystems and people devoted to them.”

Negotiations are underway to add a fortieth property to the NRS network — perhaps the deal will be closed in time to become a gift that ushers out the fiftieth anniversary year.

Elizabeth Devitt covers open space for the Monitor.
Bay Area Transportation Needs Grow as Funding Remains Uncertain

By Cecily O'Connor

A BART extension, commuter connector project, and Caltrain electrification are among a list of projects contributing to holes in Bay Area transportation budgets as lawmakers seek a sustainable state funding solution.

The California legislature assembled a transportation infrastructure conference committee in late September to approve a funding plan after failing to do so during a special summer session. The committee is slated to begin initial hearings in October, and proceed through the end of the year with hearings across the state.

It needs to address the state's $59 billion backlog of deferred maintenance to roads and bridges. Transportation advocates and lawmakers have devised a slew of potential financial fixes. Yet there's gridlock about the payment approach, even though most agree revenue will be essential to restoring streets to good condition.

"Funding demand is outpacing the existing resources," said Chris McKenzie, executive director of the League of California Cities. The nonprofit association of California city officials is a member of the Fix Our Roads Coalition, which supported Governor Jerry Brown's recent $3.6 billion transportation funding proposal (although the coalition previously advocated for $6 billion in funding).

Overall, the Bay Area's average pavement condition index score is 66, nearing the point at which pavement starts to decline and repair costs grow, according to a Metropolitan Transportation Commission report. This comes as more drivers, pedestrians, bike riders, and others are using local streets and highways — the Bay Area population has jumped 270,000 since 2010, reaching 7.4 million in 2014, according to the California Department of Finance.

But road upgrades are only one part of what's necessary to accommodate the growing region, based on interviews with county officials and priority lists released by some agencies in September. The combined input reveals how extensive — and expensive — infrastructure, maintenance, and expansion is becoming.

For example, the Alameda County Transportation Commission (ACTC) received more than 300 applications during a recent call for projects. Over the next 25 years, plans aimed at transit, roads, bicyclists, pedestrians, transit-oriented development, and goods movement projects comprise nearly $25 billion in total costs (exclusive of some major transit capital replacement and maintenance needs) and represent almost $20 billion in funding requests, said Tess Lengyel, ACTC deputy director of planning and policy.

The Santa Clara Valley Transportation Authority (VTA) recently received 630 proposals (some of which were in duplication) from South Bay agencies totaling $50 billion, also on a 25-year horizon. Many of the requests called for transit upgrades.

VTA will pare down its list to a "number we can manage," said Brandi Childress, a public information officer with the agency. It collects an average $400 million annually from various local sales taxes and vehicle registration fees that are largely dedicated to current operations and construction projects.

VTA's focus is on several big priorities, including a planned four-station, six-mile BART extension through downtown San Jose at an estimated $4.7 billion. The agency also wants to make bus rapid transit service improvements on busy roadways such as El Camino Real, an endeavor that could run as much as $223 million if a dedicated bus lane is added.

Both projects could be aided, in part, by federal funding through matched grants. It also might be necessary to seek local support through a ballot measure in 2016 for these and other next-generation needs.

"We're still working that out," Childress said. "At this point, a half-cent sales tax is most likely the target because of the need over an extended period of time."

Funding uncertainty also presents unique challenges in San Mateo County, where Caltrain is preparing for a $1.5 billion electrification program. However, the agency does not have a permanent, dedicated funding source for rail operations.

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Electrification is a capital program and nearly completely funded, but Caltrain still lacks $430 million from the $1.5 billion total. It did get a recent $20 million grant from the Bay Area Air Quality Management District, and continues to seek financing. The reason? Electrified rail car costs have risen past previous estimates, due in part to expenses for customized features like bike boarding. The previous estimate also was done in 2009, so inflation is a factor.

“We are in talks about the remaining shortfall,” said Jayme Ackemann, communications manager for the San Mateo County Transit District, which operates bus service along the Peninsula and serves as the administrative body for both Caltrain and the San Mateo County Transportation Authority. “We’re hoping to have this all nailed down by next month,” she told the Monitor in mid-September.

Potential funding sources include a Federal Core Capacity Grant, high-speed rail funding through the state’s cap-and-trade program, and increased contributions from agency partners on Caltrain’s own Peninsula Corridor Joint Powers Board, she said.

Even when the electrification program is running by 2020, there are other needs in the neighborhood of $1 billion to consider. Caltrain wants to increase service capacity, add more grade separations along the corridor, purchase additional electrified cars, raise platform height for level boarding, and add more wayside bike facility storage.

Marin County is another area seeking rail funding. It needs $65 million to extend Sonoma-Marin Area Rail Transit to Larkspur from San Rafael, but suffered a recent setback because of federal “Small Starts” grant program cuts.

“We are chagrined the federal and state government can’t give us a continual, reliable source of funds,” said Dianne Steinhauser, executive director of the Transportation Authority of Marin. “We have to rely on ourselves.”

The county receives an average $33.5 million in funding annually — $25 million from a local half-cent sales tax, $2 million from car registration fees, $4 million from the state, and $2.5 million from federal sources. However, the latter two are subject to availability of funds.

The total amount collected annually is a fifth of what’s needed for a $150 million Highway 101/580 connector project. It’s a third of what’s needed to finish the Highway 101 “Marin-Sonoma Narrows” widening project between northern Novato and Petaluma, estimated at $90 million.

“We have to build these projects with dribbles and drabbles and sniff out the funding opportunities,” Steinhauser said.

The needs are just as critical in Alameda County. For example, the combined goods movement projects total $1.2 billion, with a funding request of $997 million for a series of improvements at the Port of Oakland that support both international and domestic plans. Many of these projects could take trucks off Highway 580 and put more goods on rails, as well as create jobs and advance technology at the port, ACTC’s Lengyel said.

“We need to make sure we continue to invest here to remain competitive, support local jobs and innovation, and support the local community,” Lengyel said.

In the meantime, some new transportation approaches are giving county officials something to think about. Anecdotally, several sources interviewed noted how private business is contributing to creative solutions like employee shuttles. Even car-ride services are helping take care of that “last mile” struggle between a public transit station and home.

Cecily O’Connor covers transportation for the Monitor.

Backup Power for Backup Data: Computing Yields More BUGs

By Leslie Stewart

The Bay Area is known worldwide for its technological accomplishments. One side effect of Silicon Valley’s success has been a proliferation of data centers, massive buildings containing computer servers that store, process, and distribute dizzying amounts of data. “Green computing” advocates have raised awareness about the significant energy requirements of these centers, which have been popping up all over the world, including within this region. Along with their daily energy usage comes an additional environmental concern — the huge diesel backup generators needed in case of a power outage.

While the surge in data centers has drawn fresh attention to these generators, they’ve already been relied upon for a long time to deliver substitute electricity in many other capacities. For health and safety, hospitals and critical care facilities are required to have backup power systems that start automatically and can operate at full capacity within 10 seconds after a power failure. Water and wastewater facilities also need uninterrupted power to maintain pumping and treatment operations. Large event centers and other gathering places employ backup generators out of concern about safely
handling crowds of people during an outage. Whether they serve data centers, arenas, college campuses, business parks, hospitals, or supermarkets, as the region grows, so does the number of generators. In 2001, the Bay Area Air Quality Management District estimated that there were 3,000 to 5,000 backup generators, or BUGs, in the region. Now that estimate is 7,500 BUGs, most of them diesel-powered.

Diesel particulate matter, the fine sooty particles in diesel exhaust, was a growing issue of concern for regulators in 2001. At the same time, the state was in an energy crunch, prompting a proposal to link large emergency diesel generators into the grid to form a distributed energy network. The Air District pushed back against this idea — the agency’s executive officer at the time, Ellen Garvey, warned, “During a rolling blackout situation, firing up those dirty diesels can add up to 10 tons of pollutants in a day.” The Air District took action that summer, eliminating permit exemptions for emergency standby engines while also setting new operating rules.

Currently, stationary generators over 50 horsepower are regulated by the Air District, the California Air Resources Board, and the U.S. Environmental Protection Agency. Generator operators receive Air District permits after an engineer determines compliance with restrictions set by all of these agencies on nitrogen oxides, sulfur compounds, ozone precursors, carbon monoxide, toxic organic compounds, and diesel particulate matter. The permits allow limited hours of use for maintenance and reliability-related activities. Otherwise, the generators may be operated only during emissions tests and for emergencies; all operations must be logged and reported.

To reduce emissions, all generators must use “best available control technology” requirements mandated by the federal Clean Air Act. Diesel particulate matter is considered a toxic air contaminant, so diesel generators are also subject to additional restrictions, and if the levels of emissions run high enough, the Air District conducts a health risk assessment. Permit conditions such as specific hours for maintenance testing may be set based on closeness to hospitals, schools, daycare facilities, or senior housing — those places that serve people more vulnerable to toxic air contaminants. If a proposed generator is unable to meet the restrictions, the permit applicant may need to accept reduced hours of operation for maintenance and reliability-related activities. The addition of abatement devices may also be necessary.

Although data centers use multiple generators, for permitting purposes they are considered as part of a single project. Sanjeev Kamboj, engineering manager for the Air District, explained, “We look at risk levels for the whole project. There is no ‘piecemealing.’ In order to discourage circumvention that might be achieved by breaking a project into smaller pieces and submitting more than one permit application over a period of time, we look back two years to be sure we include any previous permits at the same location.” This lookback period applies to all permits. For example, a recent application for a new BUG at Broadway Plaza Shopping Center in Walnut Creek included data for an existing generator as well.

In addition to the project level risk, the Air District on an annual basis reviews the BUG emissions data for each facility to ensure that the facility-wide risk stays below regulatory thresholds.

Federal regulations for generators have become increasingly stringent. The EPA started by setting Tier 1 standards in 1994, and now applies Tier 3 standards to stationary diesel BUGs and Tier 4 standards to prime ones. Tier 3 controls reduce nitrogen oxides and particulate matter by about 62 percent over Tier 1 levels, while Tier 4 brings reductions to 90 percent. Kamboj expects that Tier 4 could soon start to apply to diesel BUGs.

The remaining older generators are more than offset by restrictions on the others. Despite the increased number of BUGs, the amount of total particulate matter they add to the Bay Area’s air is still only 16 tons per year, a relatively slight increase over the 2001 estimate. Today, they contribute only .09 percent of the region’s total particulate matter. As Kamboj summed it up, “Overall, the tech has improved, regulatory continued on page 6
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programs have become more stringent, and the risk has decreased.” Per the Air District’s data, the estimated lifetime cancer risk in the Bay Area from all toxic air contaminants combined declined by 80 percent between 1990 and 2014.

If air pollution is less of a concern now for diesel backup generators on the output end, what about making them “greener” at the input end? A relatively small generator, such as the one at Walnut Creek’s Broadway Plaza that produces about 200 kilowatts of power, uses about 14 gallons of diesel an hour at maximum power. It’s comparable to the engine in a diesel-powered transit bus, while a typical diesel BUG at a data center is like the engine in a switching yard locomotive — it’s 10 times as powerful (2,000 kilowatts) and uses 10 times as much diesel (140 gallons).

Here the potential for improvement may not be as great. Generators fueled by natural gas and propane are used in the Bay Area; both are cleaner than diesel engines, at least before pollution control technology is applied. Unfortunately, natural gas has a downside: automatic cutoffs for gas lines in the case of an earthquake make it useful only for other types of power disruptions. Another option is an alternative fuel such as biodiesel, which has some of the same emissions concerns but is not a fossil fuel. However, a white paper on biodiesel by Erich Plebuch, a consultant with Peterson Power Systems in San Leandro, has cautioned that “its innate properties, as well as inadequate regulations pertaining to its usage, renders its use in standby applications problematic.”

Could renewable sources and new forms of energy storage replace diesel BUGs? “Fueled systems are difficult to replace in this instance,” Haresh Kamath from the Electric Power Research Institute in Palo Alto e-mailed in answer to this question. “It’s unlikely that batteries will ever entirely replace diesel generators for backup, for the simple reason that battery storage is a limited duration technology and most backup systems require a continuous reliable source of power.”

Kamath noted that most backup systems today use a combination of short-duration batteries for 5 to 15 minutes, giving the system enough time to turn on a diesel generator. “In the near future, however,” he added, “we can expect backup batteries to be longer duration, so the backup system will perhaps run on batteries for an hour or longer before turning on the generator. Local renewable energy such as solar can be implemented through a microgrid. Together, these advances can substantially reduce the amount of diesel fuel used, even if it does not entirely eliminate it.”

Leslie Stewart covers air quality and energy for the Monitor.

Tackling the Twin Tunnels, Again

By Robin Meadows

Here we go again. Just last year, we were invited to have our say on the Bay Delta Conservation Plan (BDCP), the state’s failed proposal to pipe water under the Sacramento-San Joaquin Delta. Now the twin tunnels are back with a new name — California WaterFix — and the key difference of no longer being linked to extensive habitat restoration. Permits are up to federal and state wildlife agencies, and funding is up to the water users, who are mostly Central Valley farmers and Southern California water agencies. We have until October 30 to get our comments in.

About half of California’s freshwater flows through the Delta, which has been heading for trouble since people diked its many islands for agriculture about 150 years ago. Today those levees are crumbling and, according to the Legislative Analyst’s Office, breaks big enough to threaten water supplies are likely. The Delta supplies about 13 percent of the state’s water and 43 percent of the Bay Area’s water.

The Delta is also a major thoroughfare for California’s salmon. Two-thirds of them migrate through the Delta, and several salmon runs are threatened or endangered. Other at-risk fish include the famous Delta smelt, the less-known longfin smelt, and the green sturgeon. What these fish have in common, aside from the misfortune of their deteriorating ecosystem, is that they live in salty water as adults but migrate back to freshwater to spawn. And this is part of their undoing in today’s Delta.

At the southern tip of the Delta, two sets of pumps drain water into state and federal water projects, respectively. Sucking water south through the Delta disturbs the natural east-west flow of water between the rivers and the sea. “The south Delta is more like a lake,” said UC Davis fish biologist Peter Moyle, explaining that migratory fish navigate by tidal currents. “It’s confusing to the fish, they don’t know where to go.” Another problem is that the pumps crush fish.

The proposed tunnels could help solve both problems. About 30 miles long, 40 feet across, and up to 150 feet underground, the tunnels would carry water from the northern tip of the Delta to the pumps in the south. “Moving water directly to the pumps could be less confusing to the fish,” Moyle said. “That’s the theory, anyway.”

The tunnel intakes would be like three gigantic mouths on the Sacramento River, each capable of gulping up to 22,000 gallons per second. While the plan also calls for screens designed to protect fish, the intakes could still be risky for fish. So the project can’t go forward without “incidental take” permits for endangered fish from wildlife.
agencies; these permits allow harm to listed species or their habitat in exchange for habitat conservation. And permitting the BDCP’s vision for the tunnels looked unlikely, in part given the U.S. Fish and Wildlife Service’s 30 pages of “red flag” comments.

BDCP was a 50-year plan that bundled the tunnels with large-scale restoration to meet the 2009 Delta Reform Act’s goals of water reliability and ecosystem restoration. According to the state, combining the two projects was a major holdup to permitting the tunnels. Wildlife biologists thought the long-term impact on endangered species was too uncertain, and doubted that the BDCP could deliver the extensive habitat restoration it promised.

Now the state has split BDCP into California WaterFix and California EcoRestore. This means the tunnels are no longer linked to a 50-year permit and large-scale restoration. The new plan does include up to 15,600 acres of habitat restoration and protection, but this is only about a tenth of what BDCP promised. But while separating BDCP into two parts may facilitate permitting the tunnels, critics are as vocal as ever.

Doug Obegi, an attorney with the Natural Resources Defense Council’s Water Program, said the NRDC is open to rerouting water from the north Delta to the south. But he doesn’t like the state plan. “Moving the point of diversion doesn’t address the primary problem that outflows from the Delta are too low,” he said, adding that outflow to the sea correlates with the health of Delta fish populations. “New intakes would increase the potential to take water from the Delta, and the State Water Resources Control Board has waived a lot of environmental flows during the drought.”

The board acknowledged in a 2010 report that recent Delta outflows are too low for fish. According to the report, we would ideally let 75 percent of the Delta’s water flow through it and out to sea during the rainy season. But in dry years, outflows have been as low as 30 percent. By law, the board must balance environmental water needs of Delta fish populations. “New intakes would increase the potential to take water from the Delta, and the State Water Resources Control Board has waived a lot of environmental flows during the drought.”

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with those of cities, agriculture, and recreation.

Fish need water most during dry years. “When flow is high, salmon just pass through the Delta,” said Jeffrey Mount, a fellow at the Public Policy Institute of California’s Water Policy Center. “When flow is low, it’s hard for them to get through without being picked off by non-native predators,” which include two species of catfish and several species of bass.

Mount understands why the state is moving forward with the twin tunnels. “The current strategy has not worked and the state needs to work towards a decision,” he said. And uncertainty over the tunnels is unavoidable. “It’s a big experiment, and we don’t really know what the environmental benefits will be,” he added, explaining that it’s hard to predict how climate change will affect future droughts and sea level rise.

As long as we use water from the Delta, we are in for an engineering fix one way or another. “It’s an engineered landscape — we have eliminated all of the original Delta,” Mount said. “An engineering solution is inevitable.” The only question is whether we will get to choose how and when to do it, or whether we will let a catastrophe like levee failure dictate the terms. Either way, people will survive. But we’ve been getting nowhere on a fix for decades and the longer we delay, the closer the Delta’s endangered fish slide toward extinction.

That said, Mount is “agnostic” on California WaterFix, citing its colossal expense. Costs could run $15 billion, according to the California Department of Water Resources, the lead state agency on California WaterFix.

We can’t vote on the latest incarnation of the twin tunnels, but we can make our voices heard. You can learn more about California WaterFix at www.californiawaterfix.com and can send comments to BDCPComments@icfi.com or BDCP/California WaterFix Comments, P.O. Box 1919, Sacramento, CA 95812.

Robin Meadows covers water for the Monitor.