Bodega Land Trust Winter, 1999/2000 Volume IV, Number 2

Newsletter

Bodega Land Trust

"...When we see land as a community to which we belong, we may begin to use it with love and respect." ... *Aldo Leopold (1886-1948), American Forester*

4600 Feet of Riparian Corridor Donated

by Sandy Sharp

BLT is very pleased to announce the donation of a conservation easement 300 feet wide and approximately 4600 feet long, for a total of about 32 acres. It constitutes a riparian corridor covering the west bank of the upper reach of Finley Creek. Of the major tributaries of Salmon Creek Finley is the closest to the ocean and is an important spawning ground for salmonids. There is no public access.

The easement, signed on Nov. 2, fulfills the donor's desire to have the property protected and maintained in its natural, "forever wild" state in perpetuity. Historically, Finley Creek has supported populations of the endangered coho salmon, California fresh water shrimp, and the threatened steelhead trout. In accepting the donation Bodega Land Trust accepts responsibility for seeing that the natural habitat is maintained in its current condition, and to improve it where possible. This is a major step forward toward our goal of preserving the remaining wild land in the Salmon Creek watershed.

A woody area on Finley Creek. Photo by Sandy Sharp

This easement is a good example of how a local land trust can serve its neighbors. While the larger organizations must focus on the larger and/or most threatened properties, a small local land trust can offer the same charitable services to the small land owner, who is otherwise left without access to those services. And some larger land owners may prefer to deal with people who are their neighbors.

Bodega Land Trust welcomes inquiries from any and all land owners who are interested in preserving their land while reducing their income tax, property tax and estate tax. We can also help with restorations of degraded land. We look forward to continuing to work with our neighbors and to announcing new easements in the future.

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Member: Land Trust Alliance

SALMON CREEK WATERSHED ECOLOGY

by Bill Cox, California Department of Fish and Game

This article is based on a talk given at Salmon Creek Watershed Day, May 30 1998

The focus today is on coho salmon and steelhead. Since both species are listed as threatened under the Endangered Species Act major emphasis is being placed on preservation and restoration. But where do we direct our management and restoration efforts? We must first understand the habitat requirements of these fish.

Within the Salmon Creek watershed coho have limited distribution in a select few tributaries: Fay, Finley, Coleman Valley, and Tannery (at least historically). They are very particular about their habitat; they like the 3Ds: deep, dark and dense; in other words, deep water, plenty of shade and a complex structure offering lots of places to hide. They also want the water to be cold: 50's to low-60's in the summer. Coho are associated with redwood or Douglas fir forest. They are intolerant of environmental change; therefore many of the streams which once supported coho no longer do.

Steelhead have similar habitat preferences to those of coho, but they are more oriented toward riffles and runs. They have wider habitat tolerances, and tolerate higher summer water temperature; thus they are better able to handle habitat change.

So, what is causing the decline of coho and steelhead? It's not El Nino. It's us. Everything we do. It's roads. It's logging, grazing, vineyards, subdivisions, and rural residential development. It's the fine sediment that comes from erosion. It's the clearing of riparian vegetation from along our streams. It's the diversion of water in the summer months.

But it's not just the salmon and steelhead. Many more species of fish are suffering than just steelhead and coho: roach, stickleback, and sculpin, to name three.

And it's not just the fish. More than just the streams, more than just the fish that live in these streams: redwood forest, the mixed evergreen forest, riparian forest, and oak woodland are diminished and impaired. Each natural community has its own assemblage of plants and animals which are dependent on the conditions provided by that community.

The riparian forests provide habitat for neotropical migrant songbirds on their annual migration; they are home to the yellow-billed cuckoo (now a rarity); they allow the dispersal of small mammals as they seek food and shelter, and provide breeding habitat for the western pond turtle. They stabilize our stream banks against erosion; they give shade and woody material needed by young fish. If Salmon Creek is in better condition than many others its wooded banks have much to do with it.

Human communities are generally in conflict with the natural ones. Urban development, rural residential development, vineyards, dairies, and rangeland threaten natural communities. Human communities have removed nearly all the riparian forests. Oak woodlands and mixed evergreen forests are being cleared and fragmented as agricultural and residential development moves into the hills, and that development is causing erosion which leads to sedimentation in the streams. Fine sediment is the most significant pollutant affecting our streams and fisheries. Water is being diverted from our streams, especially in the summer when it is most needed to support instream resources. Soil compaction has increased the rate of water run-off causing stream channel erosion and reduced summer flow.

In summer there is no surplus water: the fish need it all.

It's the whole watershed. My interest is primarily with the fish populations, but we cannot protect the fish by focusing only on the streams. We must also look to the riparian woodlands along the streams, to the grasslands and forests of the adjacent valleys and mountains. We must rethink our land management practices to maintain healthy riparian woodlands, to maintain the critical summer flow of water, and to keep the soil on the land and out of the streams.

SOME OBSERVATIONS ON SALMONID GENETICS

by Michael Banks with Hazel Flett

How can you tell the story of the coho in our creeks? The story is written in their genes. Learning to read and interpret this is the challenge, as Michael Banks described at Watershed Day and in conversation recently. Michael is a geneticist at Bodega Marine Lab (BML), part of a research team that is exploring the molecular genetics of coho, chinook and steelhead. They are concentrating on DNA as a source of information. Many of us remember from high school biology that DNA codes genetic information that determines the organism; Michael's team is examining the small differences that discriminate one population of fish from another. We'll look in a minute at where this leads. The point to grasp is that the research team is talking about ways of knowing, and then about ways of applying that knowledge to manage populations of salmon better and increase their chances of survival. For salmon are in trouble: wild populations of coho in California have declined to 1% of their abundance of 40 years ago and are now listed as an endangered species.

Since I am no geneticist, Michael explained some of the basics. There are different regions in the DNA of all organisms, some of which are under very strong selective constraint and have not changed over vast periods of time. For instance, some genes are identical across species as they code for important characteristics that are general to all life forms. Other regions of the genome evolve fast. In the last ten years people have started studying microsatellites, which are elements consisting of short fragments of DNA (2 to 10 base pairs) repeated in tandem. These are distributed throughout the genome and accumulate variance at a strikingly high rate, capturing genetic information about recent population history (the last 10,000 years). 'Highly variable nuclear DNA, such as microsatellites, make possible genealogical analysis or genetic discrimination among closely related fish populations', the team's report explains.

Thus when Michael's team were studying chinook salmon in the Sacramento River they were able to distinguish winter run fish (the rarest) from spring run by differences in their microsatellites, whereas protein studies showed all the runs as identical. The winter and spring runs have sufficiently distinct life histories to be two separate breeding populations which both now have separate Federal listing as endangered species.

The team has been studying coho salmon in Lagunitas Creek (Marin) and in the Russian River for three years; they are still figuring out what they can expect to learn by using molecular genetics techniques. They are developing DNA markers which allow distinction between juvenile coho from juvenile chinook in the same stream (juveniles are hard to tell apart) and coho spawned in one year from those spawned in another and in one creek from those in the next creek. They can extract enough DNA for these tests from a piece of fin or scales the size of a pin head and can use fin or scale samples from fish that have been dead as long as a week. They also use historic collections of fins and scales.

One team member, Kate Bucklin, wants to learn about the deep (long-term) history of coho from the genetics of present populations. Is this possible? Are the northern Californian coho unique? Or are they very similar to the coho up the coast to Alaska and over the Pacific to Japan and Russia? Kate intends to find out. She also plans to examine changes in genetic variability due to recent reductions in abundance.

Thinking back to his talk last year, Michael remembers that at that time they thought they had discovered a wild population of coho in the Russian River, quite different from the coho released by Warm Springs Hatchery. This caused great excitement, but the differences were so great as to raise suspicions. It turned out that the wild fish were a different species from the hatchery fish; they were chinook, the first wild chinook identified in the Russian River. It was this that led to research to find a simple genotyping test to allow rapid discrimination between coho, chinook, and steelhead. Who were these fish related to? Could they be the offspring of hatchery fish, just spawned in the wild? Further research should tell. Meanwhile they have

also found wild coho in the Russian River system, in Green Valley Creek.

Within the last year the team has started work on a big new study titled 'Population Genetics Criteria for Restoration of Coho Salmon in Northern California', funded by Sonoma County Water Agency. This is the most ambitious project in California to provide precise population level descriptions of coho. Since coho numbers have dropped so dramatically, there is a crucial need to characterize what genetic variation may still exist in the state. (More variation usually increases a species' chance of survival.) The definition the federal government (National Marine Fisheries Service) is using to assign genetic value at the population level is described as the Evolutionary Significant Unit. This classification allows populations of the same species to merit distinctive protective measures; for example, an individual creek that supports an isolated population may merit special protective status. This level of management precision has implications for how a watershed is managed and for coho sustainability.

As part of this research the team has established an archive of over 3,000 fish samples, collected by many different agencies and volunteers. They have developed a molecular tool kit for rapid genotyping which will be further improved by the addition of new markers from a coho and steelhead microsatellite library put together by Carolyn Greig. The team and especially Jeanne Robertson have made a preliminary characterization of Russian River and associated coho populations. Kate Bucklin's research, described above, is another part of the study. They plan to study populations to the southernmost extent of coho habitat (Santa Cruz County), and to use Geographic Information Systems computer methods to plot the genetic resources spatially and compare them with habitat restoration and water development proposals.

They are also beginning to include steelhead in their research, as we see both coho and steelhead as key indicators for successful restoration of local watersheds, and are deciding what questions to ask about steelhead.

"What we have in California," Michael emphasized, "is the last vestiges of our renowned native salmon stocks, with a great evolutionary history. We could still save them." There is hope in the recovery of winter run chinook in the Sacramento River from a scant 191 fish in 1991 (after several years of drought) to several thousand fish in recent years. Since the fish attained endangered species status, water diversions have been regulated and fishing curtailed; these changes, including a multi-agency supplementation program involving researchers from BML, plus several wet winters, have improved their chances of survival.

How can you help? Michael has a great interest in whether any coho have survived in the Salmon Creek system, and if so, what fish they are related to. The more genetically distinct the fish in an individual creek are, the stronger the case for protection. If anyone knows of coho spawning or finds a dead coho, please let the Marine Lab know (875-2077). They value anecdotal data as well. For example, someone in the town of Salmon Creek saw a coho recently, even though coho have not been seen regularly in the creek since the mid 1980s. They also appreciate fin samples from dead fish that might be coho. To send a sample, snip 1 square centimeter of fin or scales, put it on a piece of paper, dry it and send a description of the size of fish and when and where it was found, to Michael Banks, Box 247, Bodega Bay, CA 94923. He can extract DNA from it, identify the species, and begin relating it to the local populations of fish.

Siltation in lower Salmon Creek is a problem for coho. Conditions in the tributaries are probably better, but of course the fish have to swim through lower Salmon Creek to reach them. Michael appreciates ranchers' recognition of the need to fence animals out of the creek and to restore cover. Please support restoration efforts. The amount of water drawn from the creek is another problem for the fish. Though Michael did not say so, here is something else we could do to help, both individually and collectively: reduce water use.

In summary, successful restoration of our watersheds and their salmonid heritage is a challenging but very important goal for us all. This will necessitate the assimilation of knowledge about historical presence of spawning populations as well as contemporary observations, together with the information we may learn from DNA. Researchers at BML appreciate that their study will be significantly enhanced by greater access to local information and welcome any details you can provide.

STUDENTS MONITOR SALMON CREEK

by Mike Heffernon

In an ongoing attempt to become more ecosystem-literate, students in Mike Heffernon's 7th grade science classes are testing and analyzing Salmon Creek water from their school location along Bohemian Highway.

Approximately once a month, water samples are gathered, and students take turns testing for the presence of chemical compounds and other factors which are important in determining the relative "health" of a stream. So far, students have concluded that their stretch of Salmon Creek is "healthy" by virtue of adequate dissolved oxygen levels (cold water fishrequire at least 5 ppm), consistent neutral pH, low levels of nitrates &phosphates, and low coliform bacteria counts.

Students will continue this monitoring and begin comparing data with data taken from other stretches of Salmon Creek in order to see what other factors might affect stream health. Below is a summary of data taken so far:

Date	Location	Temp.	Depth	Flow Rate	pH	Oxygen	Carbon dioxide	Nitrate	Phosphate	E. coli	Col. bacteria
		(Celsius)	(cm)	(cm per sec)	(1-14)	(ppm)	(ppm)	(ppm)	(ppm)	(colo-nies/ml)	(colo-nies/ml)
9/21/98	stairs pool	13	>100	slow	7.5	4.5					
9/21/98	stairs riffle	13	8	67	7.5	6.8					
10/9/98	stairs riffle	11	40	slow	7.5	7.4	9	1	0.2		
11/3/98	stairs pool	9	>100	slow	7.5	8.2	12	1	0	0	0
11/3/98	stairs riffle	9	8	67	7.5	8.7	8	1	0	0	0
11/30/98	stairs riffle	11		fast	7.5	8.4	8.3	1	0	6	20
1/8/99	stairs riffle	4		fast	7	8	8.5	0	0	0	0
2/8/99	stairs riffle	5		fast	7	8.2	7.4	0	0	0	0
3/2/99	stairs riffle	6		fast	7	7.8	5	0	0	0	0
4/23/99	stairs riffle	10		fast	7	7.2	5	0	0	0	0

POINT OF VIEW

This column is made available to the public for the expression of personal opinions not necessarily those of BLT. Please feel free to submit your own.

Forests and Watersheds

Brock Dolman

From a talk at the Town Hall Coalition meeting of Sept. 9, 1999 on watershed and forest conversion to vineyards

Water is the primary basis of life and the future's thirst will be far worse than any imaginable famine. Our watersheds are in crisis! What has happened to the stupendous accounts of salmon so thick you could walk across the creek on their backs? When was the last time you saw the river run clear in winter? How much intact, unfragmented mature forest does your watershed have? How many "100-year floods" have the lower river communities experienced in recent years? The situation we are faced with is not an ecological problem, but a social disorder with long term ecological consequences. And please don't blame the seals for eating too many salmon!

The EPA's clean water action plan states that 50% of the nation's watersheds are polluted. The Russian River system is listed by the EPA as an "impaired" river, and its primary pollutant is sedimentation. The conversion of native forest lands, especially for hillside vineyards must be intensely scrutinized. It is estimated that in California people have destroyed over 90% of the historical riparian and flood plain forests. Less than 1% of old growth coniferous forests exist. Ecologically, oak woodlands are the most diverse ecosystems in California, providing critical habitat for over 2,000 plant, 160 bird, 80 mammal, 80 reptile and amphibian, and 5,000 insect species. Since 1950 in California over 1,000,000 acres of oak woodlands have been deforested for housing, industry, agriculture and ranching.

Data from the UC Division of Agriculture and Natural Resources has documented that in Sonoma County from 1990 to 1997 over 2,000 acres of woodlands have been replaced by vineyards. UC did not have data for west county areas that are not part of a named appellation. 1998 and 1999 have been busy years, so this number is certainly quite a bit higher now. Sonoma already has 46,000 acres of vineyards.

Why does deforestation concern me? Why should it concern you? Forests are the moderators and generators of life in every watershed:

forests make soil through leaf fall;

forests increase winter rainfall and summer fog precipitation;

forests slow water down and clean water;

forests enhance ground water recharge and maintain summer spring and stream flows;

forests purify the air;

forests moderate climate;

forests sequester carbon;

forests have intrinsic non-anthropocentric value;

and forests provide the structural and functional habitat for fish and wildlife. When I say forest here I am referring to oak woodlands, mixed tanoak and madrone forest, closed cone pine forest, riparian forest wetlands, and even chaparral, and savannah grasslands.

The cumulative impacts and overall watershed degradation for wildlife from the removal of forests for vineyards and development are:

the sheer quantitative loss of actual habitat;

a decrease in the qualitative function of the remnant habitat fragments;

a decrease in the carrying capacity of the watershed;

destruction of wildlife movement corridors due to the extensive fencing;

a net decrease in the overall biodiversity; and

an increase in winter frost and an increase in summer extremes due to the loss of climate buffering forest cover.

Among the numerous hydrological effects of deforestation are:

increased surface water temperatures,

increased nutrient loads,

spawning gravel embeddedness,

loss of stream structure and cover,

and reduced summer stream flows,

all of which are significantly harmful to breeding salmonids. Remember that the streams are the nursery areas for the salmon and this is where they come to breed.

As was said by J. Russell Smith in his landmark book Tree Crops: A Permanent Agriculture, 1929, "Man has carried to the hills the agriculture of the flat plain; the cycle of hill agriculture has thus too often been a one-time cycle: forest, field, plow, desert".

Development of large industrial vineyards in the already water scarce and ecologically impaired watersheds like the Russian River and Salmon Creek, for short term economic gain at a cost of long term environmental degradation, is unacceptable to the public trust. When the boom is over who will pay for the ecological consequences of the melting hillsides as, one by one, these abandoned, expensive, high maintenance drainage systems begin to plug up and fail?

The vineyard development ordinance must be amended not only with habitat, riparian forest, pesticide and ground water protections, but also a hillside vineyard decommissioning clause. This clause should be

written to ensure that the responsible development of our watershed hillsides will include upon vineyard abandonment, the removal of all grapes, fencing, support structures, drainage system, and roads; recontouring to restore the hydrological balance; surface erosion structures with infiltration basins; replanting with native forest species, and complete riparian in-stream and bank restoration.

This would be true cost pricing where the ecological externalities are part of the price of doing business. I believe in the right to farm but I also believe in the responsibility to cause no harm.

No matter how lucrative grapes are at this moment, these vineyard practices must not impinge upon the longevity of our watersheds, if we wish to sustain future generations.

The powers that be are fast at work creating ordinances that will functionally limit public input. Let the Board of Supervisors hear that the hillside vineyard development ordinance is entirely myopic in scope and caters to wine industry needs. The extension of the right to farm ordinance into rural residential areas must be considered a general plan amendment and not be allowed to simply be amended without public input. The California and Federal Farm Bureau Federations are attacking the EPA's determination of the Garcia River and 16 other north coast rivers, including the Russian, as being listed as impaired. De-listing the impaired river status will allow agriculture to increase the pollution of our public waterways. Ordinance by ordinance our rights to voice our concerns are being systematically limited. It is up to each and every one of us to decide whether these attacks on democracy amount to another nail in the coffin of endangered species or another kick in our butts to speak out. Do you consider our forests and watersheds to be a community or a commodity?

THANK YOU THANK YOU THANK YOU!

OUR CUP RUNNETH OVER!

The following helped make our last fund-raising dinner and silent auction a huge success:

Actors' Theatre Aloha California Style Gerry Anderson Anonymous Artisans' Co-op Hilary Atherton Auric Blends Belladonna Bodega Bay Surf Shop Bodega Pastures Sheep Branscomb Gallery California Academy of Sciences Ron Chamberlain Nancy Conkle Martha Cant Copperfields Books Victor Daniels The Dressmaker East-West Café Joy Fibben Frizelle-Enos Fiesta Market Hazel Flett Food for Thought Edgar Furlong Galleria Giovanni's Deli Gourmet au Bay Gourmet Goat Jim Grant Hand Goods Happy Woman Jewlery Company Harmony Farm Supply Hearth Song Toys Barbara Hoffmann Pottery IMA The Inn at the Tides Gay JacobsonJenner Inn Joy Ridge Pottery Robert Kourick Mary Koursa Landmark Gallery Leapin' Lizards! Fun Store Local Color Gallery Maureen Lomasney Lucas Wharf Madrone Audubon Society Eric and Buffy Menuez Milk and Honey Natural Connections Naturlich ***Flooring and Interiors The Navigator Northern Light Surf Shop Occidental Choir Ocean Waves Styling Salon Osmosis Pacific Shores Gift Shop Roberta Paskos Nick Peck People's Music Pastures Child Center Patagonia Clothing Quicksilver Mine Company Roadhouse Coffee Sandpiper Dockside Café San Francsco MOMA Santa Rosa Symphony Lydee Scudder Sea Cliff Designs Sebastopol Hardware Center Sharon's Garden Slice of Life Sonoma Coast Villa Sonoma Compost Lori Spellman Annie Springer Charlotte Smith Darrell Sukovitzen Sushi Osaka Laird Sutton Taylor Maid Organic Farms Janet Thornton Traditional Medicinals Trinity Herbs VillageBakery Vintage Gardens Vira @ Never Ends Lorene Warwick Photography Western Hills Rare Plants Wild Things Windwalkers Footware***

Ranch Planning and Watersheds

by Hazel Flett

Care of the land is primary for ranchers: their living depends on it. So when Joe Pozzi spoke about ranch planning at last year's Salmon Creek Watershed Day, we were hearing from someone with a big stake in the land. Joe's position as a fifth generation sheep and cattle rancher and also an outreach person for local creeks made him uniquely qualified to discuss a process which benefits both rancher and watershed.

Ranch planning entails inventorying ranch resources, assessing water quality concerns, evaluating existing management practices and setting goals. A plan can be the first step in dealing with environmental issues addressing non point source source source source pollution and can also be used by ranchers to make management decisions that will make them economically and ecologically sustainable.

Ranch planning was recognized nationally when a National Watershed Award was given by CF Industries to the Marin Coastal Enhancement Project in October 1998. The project was the first to offer ranch planning courses in this area and as a way of addressing water quality. UC Co-operative Extension coordinated the project and taught the course, along with staff from Natural Resources Conservation Service (NRCS), the Point Reyes National Seashore and Marin Agricultural Land Trust. The plans these ranchers wrote, when implemented, improve water quality at the local level and by voluntary means. Staff assists in finding grant money to help with implementation.

After taking part in the first course, I was keen that a similar course should be offered locally. With Bodega Land Trust sponsorship, UCCE offered a course for livestock producers in the Salmon Creek and Stemple Creek watersheds in spring 1997, and a course for dairy operators across a wider area was offered that same spring. Further courses were taught, and by the summer of 1999, 75 to 100 ranchers in Sonoma and Marin counties had attended courses and over 60,000 acres were included in plans. A course was offered this October, and another will be offered in February or March; please call Stephanie Larson at the Co-operative Extension for details: 527-2621.

So what comes out of these ranch plans? Let's start with ours, the one I know best. I'd been concerned for some time that to get our sheep to the barn we had to run them through a small seasonal creek, a tributary of a tributary of Salmon Creek. Inevitably all those hooves mean silt in the creek. So our first priority was a rocked animal crossing, plus some exclusionary fencing to keep them out of the creek in that heavily used field next to the barn. In two other areas exlusionary fencing to keep sheep out of the creeks also acts as cross fence and creates relatively small (10 - 15 acre) pastures which will help to improve our pasture rotation. Since the sheep do not have access to the creek, water has to be piped to these new pastures. We were lucky to be awarded an EQIP grant to help with the work on two out of these three projects. Environmental Quality Incentives Program grants from the U.S. Department of Agriculture reimburse 70% of the approved cost in the Russian River area and the dairy belt; the work can be spread over 5 years and the agreement may require (as ours does) photo monitoring, monitoring of the amount of vegetation at the end of the dry season and changes in management practices (in our case, better pasture rotation). These requirements are an encouragement to do things I've wanted to do anyway and the later years of the contract will focus on the extra cross-fence (temporary or permanent) that would allow a better rotation, that would rest most of the grass most of the time.

I talked to some of the other ranchers in the same course and found everyone making or planning to make improvements. One had fenced off 1/2 mile or so of creek bank on one side and was using the land on the other side of the creek as a riparian pasture for summer grazing only - until she has time, energy and money to fence off that bank too.

In Freestone another ranch planner has assessed her ranch's needs and applied for EQIP funding, unsuccessfully so far. She would like to fence animals out of the creek, divide the land into smaller, more numerous pastures, and develop springs to bring water to those pastures. Her land has abundant water, but this water has caused substantial erosion damage, which she wants to repair.

Another neighbor has been fencing his cows out of about a mile of Salmon Creek: a slow job, he comments, for anyone with a full-time job outside of ranching. This is the situation of many ranchers.

On Fay Creek cows are being fenced out of the creek for more than a mile. The Sonoma County Fish and Wildlife Advisory Board is meeting the cost of materials from its Salmon Creek Fund, while the ranchers are doing the work.

Much of our watershed is pastureland, and the rest largely forest. If erosion can be kept down ranching is a relatively benign land use for these coastal hills. Ranch planning that emphasizes healthy grassland and the protection of riparian areas helps the whole watershed.

Introduction to Well Monitoring

by Stephen Fuller-Rowell

Why it's Important:

If you have a well, it's a good idea to learn how it works. The survival of our species over the millennia has required a knowledge of where to find drinking water. Understanding your well can put you in touch with this key aspect of our human heritage. An automatic piped water supply is a blessing, yet it may sever our connection with the essentials of water if it is used without an awareness of what makes the water flow.

Types of Wells

There are three types of well commonly found in Sonoma County:

(a) Shallow wells in the gravel or alluvium beside creeks will continue to produce water so long as the creek continues to flow at the surface or below the ground.

(b) Wells in fractured hard rock draw water stored in cavities and fractures in the rock. Such wells are unpredictable and may dry up suddenly when all the stored water has been pumped out and withdrawal exceeds recharge. Recharge may be slow. A 72-hour pump test may sometimes help establish the capacity of such wells.

(c) Wells in water-bearing rock, such as sandstone, are the most common type of well found here. This type of well may be monitored and understood with a few simple tools and a little training.

Record Keeping

There are many variables that may affect the operation of a well. It is therefore essential to keep a permanent written record of your well-monitoring. Every monitoring session should record the date, the time, the weather, recent rainfall or drought, your procedures and your results.

As the property owner, you have access to the well drillers' report --the 'well log' -- for your well if you can find it. This will tell you what types of soil and rock the driller found when the well was drilled. It will also tell you what the approximate yield of your well was at that time. It will also tell you at what level the pump or intake was installed. If you cannot find your report, check with the Permit and Resource Management Department. They may have a copy and will allow owners to make a copy for their records.

As you accumulate information about your well, you will begin to understand how it changes over time. Eventually, you will be able to speak with authority about your well. This may be very important to you if your well yield or recharge rate begins to drop and you believe that this may be the result of someone else's actions. (Recharge may also drop when something goes wrong with your well and it needs the attention of a well expert.).

Definitions

Water Table: At some depth beneath the surface, soil and porous rocks are saturated with water. The surface of this saturated area is the water table. The water table moves up and down seasonally in response to rainfall, drought, and water use. It also moves up and down daily as trees and other vegetation respond to light and heat.

Well depth: This can be found on your Well Drillers Report.

Static Level: This is the distance from the top of the well to the surface of the water when the well has recharged completely.

Draw Down: When water is pumped from a well faster than the well is recharging, the water level drops.The distance between the static level and the level after pumping is the draw down.

Cone of Depression: As the water level drops, so does the water table in the soil and porous rock around the well. The water table forms an inverted cone around the well -- the cone of depression. If your well is very close to a neighbor's well, your cones of depression may overlap. In this case, the level in your neighbor's well will drop as you pump water from your well.

Recharge: As soon as the water level is lowered by pumping, water will immediately begin to flow back into the well from the surrounding soil and porous rock. This is recharge. Recharge increases with depth for the same reason that holes in the bottom of a barrel squirt water further than holes higher up. If you measure recharge and static levels several times a year for several years, you will become the world's expert on your own well.

Equipment Needed

To measure the recharge of your well, you will need:

1. Permanent notebook: If this is bound rather than loose-leaf or in a ring binder, no one will be able to question the authenticity of the document.
2. Watch with stop watch function
3. Calculator
4. Measuring stick marked in inches
5. 5 Gallon Bucket calibrated in gallons: You can do this very simply with a measuring cup and a felt tip pen.
6. Water detector: Redwood Creek Neighborhood Association uses a Fisher mScope that cost $288 in 1985. This battery operated device consists of a cable and a sensor that is lowered down the well. When the end touches water, a buzzer sounds and an LED lights up. Fisher has a web site: http://www.treasurenet.com/fisher. You can also make your own. Or, if you can see the water in your well, you could use a calibrated and weighted line.

Procedure

(a) Allow the static level to recover fully overnight.

(b) Note in your record book the date, the time of day, weather conditions, temperature, and recent rainfall or drought conditions.

(c) Thoroughly clear the area around the well to avoid contamination.

(d) Isolate the pressure tank, if there is one.

(e) Lower the water detector down the well and make a note of the static level.

(f) Turn on the well pump and continue pumping until the water level is approximately half way between the static level and the pump or intake level. Note how long it took to lower the water each 10 feet. (This measurement,
when adjusted for the recharge rate, will allow you to calculate the
pumping rate of your well pump.)

(g) Adjust the flow of water from the well by closing a valve until the water level in the well remains constant while pumping continues. At this point of constant recharge, the flow out of the well will be the same as the recharge rate. (If your pump is working well at full capacity and the water level does not go down, you will be one of the fortunate few whose well recharge rate exceeds the capacity of their well pump.)

(h) With the water level constant, fill the 5-gallon bucket and time it. You can now calculate the recharge rate at this depth. Note it in your record book.

(i) Now open up the valve and allow the water level to drop another 10 feet. Repeat steps (g) and (h) and note the recharge rate at the new depth. Continue checking recharge rates at different depths and note the results.

(j) Now shut off the well pump and allow the water level to rise. Note the time it takes to recover each 10 foot of well depth. This will allow you to confirm the recharge rate. The volume of each foot of water in your well depends upon the diameter of the well casing. This can be calculated by the following formula:

3.142 x (diameter(in feet)/2)2 x 7.49 (gallons in a cubic foot)

Most frequently found well casings are:

4 inches, 0.65 gallons/foot	6 inches, 1.47 gallons/foot
8 inches, 2.62 gallons/foot	12 inches, 5.88 gallons/foot
18 inches, 13.24 gallons/foot	24 inches, 23.54 gallons/foot

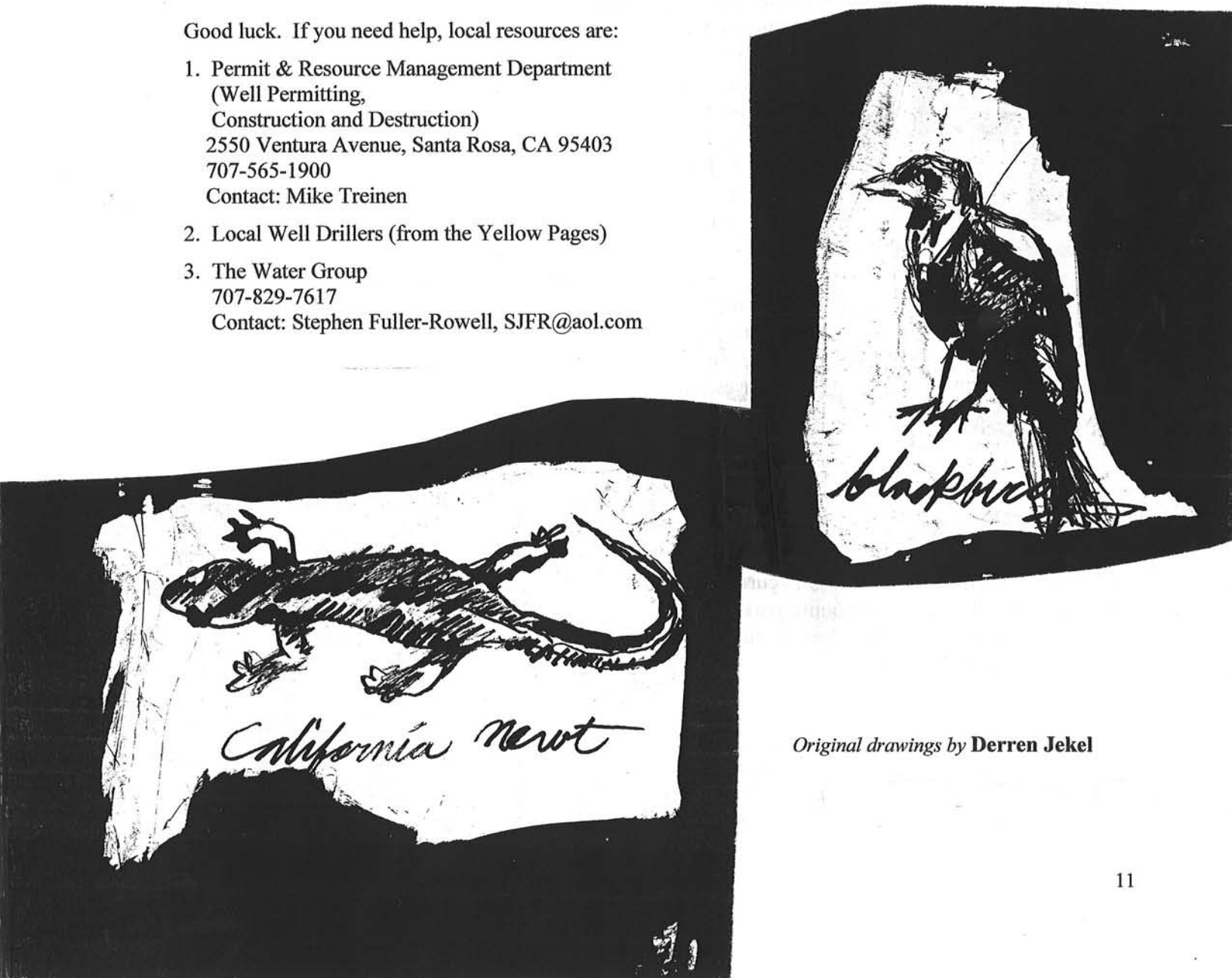
(k) Repeat steps (a) through (j) regularly throughout the year until you can correctly estimate what you are going to find during each monitoring session. At that point, you will have developed an understanding of your well. Make sure that you continue to use the same procedures every time and record your results.

Resources

As you begin to share the results of your well monitoring with your neighbors and help them measure their own wells, you will soon have a database that can be the foundation of a powerful community alliance that may be able to withstand any future threat to your neighborhood water supply.

Good luck. If you need help, local resources are:

1. Permit & Resource Management Department
   (Well Permitting,
   Construction and Destruction)
   2550 Ventura Avenue, Santa Rosa, CA 95403
   707-565-1900
   Contact: Mike Treinen
2. Local Well Drillers (from the Yellow Pages)
3. The Water Group
   707-829-7617
   Contact: Stephen Fuller-Rowell, SJFR@aol.com



Original drawings by **Derren Jekel**

EPA SELECTS SURFERS AS INDICATOR SPECIES FOR WATER QUALITY PROBLEMS

A year ago the North Coast Chapter of Surfrider Foundation began monitoring local coastal water quality as part of the group's national "Blue Water Task Force" program. Every winter, high levels of bacteria force the closure of Tomales Bay's oyster harvesting. High numbers of bacteria counts at beaches may also pose a health risk to humans.

Volunteers collect water samples and test for total coliform and *E. coli*. Total coliform provides a general measure of the water's bacterial content. Total coliform increases in proportion to the amount of decomposing organic matter. *E. coli* numbers correspond directly with the number of fecal coliforms. Fecal coliforms live in the lower intestine of all mammals, including humans. Many diseases, such as dysentery are associated with strains of waterborne bacteria. High *E. coli* counts at the beach indicate that human or animal waste is entering the water.

Surfrider Foundation regularly monitors the Salmon Creek surf zone, the Salmon Creek estuary (where children often play), the Russian River surf zone, and the Russian River estuary. Testing up and down the Sonoma and Marin Coasts showed that the four sites above consistently have the highest bacteria counts. Preliminary analysis of the data indicates that it is unsafe to surf or swim near any creek or river mouth during and up to 48 hours after any large rainfall. Surfrider Foundation currently is working with the state and county parks to post public health notices at beaches to inform and protect surfers and beachgoers.

The Surfrider Foundation is an international environmental organization dedicated to the protection and enhancement of the world's waves and beaches through conservation, research, education and local activism. For more information please contact Cara Keister, 875-3046 or cara.keister@mhn.com

POEMS

from The Backbone of Things Underfoot,
by Patti Trimble

Ode to a Leaf, to an Alder

Center yourself
for what is to come next -
the loss is not permanent.

Crescendo

The falls growl like a she-bear
a shadow is a rare trout -
suddenly my tongue
forgets all names.

What is Learned from River

Startled, beside my waking head,
yellow stripes sling body over boulder
conform, conform again,
remain the snake.

Counsel

The marriage of water to rock
proves no difference is irreconcilable,
given time.

Daybreak in Yosemite Zendo

Trees and rocks
how quietly they wait
for the whack of the sun across their
shoulders.

BLT Membership Form

I would like to join or continue my membership at ☐$10 ☐$20 ☐$50 ☐$100 ☐ Other

Please Make checks payable to: Bodega Land Trust and mail to: PO Box 254, Bodega, CA 94922

All donations are tax-deductible

I would like to become involved as:

- ☐ an interest group participant
- ☐ an advisor
- ☐ a Board member
- ☐ an occasional volunteer
- ☐ other:

My special interests are:

_____

My special skills are:

_____

A project I would like to see the Bodega Land Trust consider is:

_____

_____

ANNOUNCEMENTS

BLT'S WINTER WALK will take place on the Francheschi Ranch, 17400 Highway 1. Meet at 10:30 AM January 8. We will walk to the Estero. There will be much wildlife to look at, so bring lunch and good binoculars. The ranch is the first on the right going south from the intersection of Hwy. 12 and Hwy.1.

FAY CREEK PLANTING DAYS. Sundays in January (Jan. 9, 16 and 23), 10 AM – 3 PM. Help us plant a 2 1/2 acre riparian forest of native trees and shrubs along Fay Creek outside Bodega. Wear boots sand work clothes. Bring shovels and a bucket if you have them, and food and drink.

GROUNDWATER. The Sonoma County Board of Supervisors will consider a groundwater control ordinance on Tues., Jan. 11. Our groundwater levels are dropping! If you are concerned let them know, especially Mike Reilly at mreilly@sonoma-county.org or 527-2241.

FISCHER mSCOPE. The Town Hall Coalition is buying a Fischer mScope for well monitoring. If you would like to use it contact them at 874-9110 or townhall@sonic.net

FINANCIAL SUMMARY, 1998

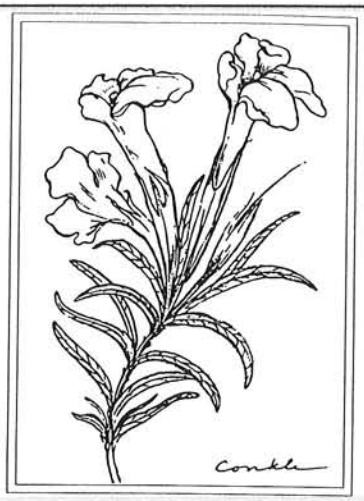
Income		
Grants:		
Fay Creek Fund		$5,317.96
Salmon Creek Watershed Day		$1,592.00
Memberships		$1,980.00
Promotional Items:		
Cookbooks	$1,452.68	
Notecards	$344.00	
T Shirts/decals	$107.00	
Total		$1,903.68
Dinners		$2,261.50
Interest		$331.04
	TOTAL Income	$13,386.18
Expenses		
Grants:		
Fay Creek Fund		$5,544.59
Salmon Creek Watershed Day		$1,031.72
Office		$450.68
Promotional Items		$1,999.72
Dinners		$357.96
Newsletters		$851.32
Insurance		$670.00
Education		$90.00
Dues and Fees		$160.00
	TOTAL Expenses	$11,155.99
	Net change	$2,230.19

B.L.T.'S NOTECARDS CONTINUE TO BE POPULAR

One of eight drawings in the series **"Wild Plants of the Salmon Creek Watershed"**. They are available as sets of notecards, at the following locations:-

Bodega: Bodega Landmark Studio; Artisans' Co-op; Northern Light Surf Shop
Occidental: Natural Connections
Sebastopol: Wild Things

Proceeds support B.L.T.



Sticky Monkey-flower (*Mimulus aurantiacus*)–

A drought-tolerant native, this perennial and evergreen shrub is found on dry slopes, and can be seen on Salmon Creek Road and in Bodega Bay along Route 1.

Birds are drawn to its showy orange flowers, which blossom spring through summer. If pruned after the first flowering, it may bloom all year.

Newsletter Staff: **Editors:** Mary Biggs, Ann Cassidy, and Hazel Flett
Design: Sandy Sharp

SPECIAL WATERSHED ISSUE II

Inside: Bill Cox, Michael Banks, Brock Dolman, Stephen Fuller-Rowell, Mike Jenson, Patti Trimble, Mike Heffernon's class

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