RAINWATER CONSERVATION SYSTEMS BY
COLE DESIGN MONTECITO

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US Fish and Wildlife, County of Santa Barbara, US Army Corps of Engineers

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COLD SPRINGS SANTA BARBARA 250 AF/YEAR PILOT PROJECT

81.5 Million Gallons

CONTROLLED FLOODWATER COLLECTION AND RELEASE SYSTEM

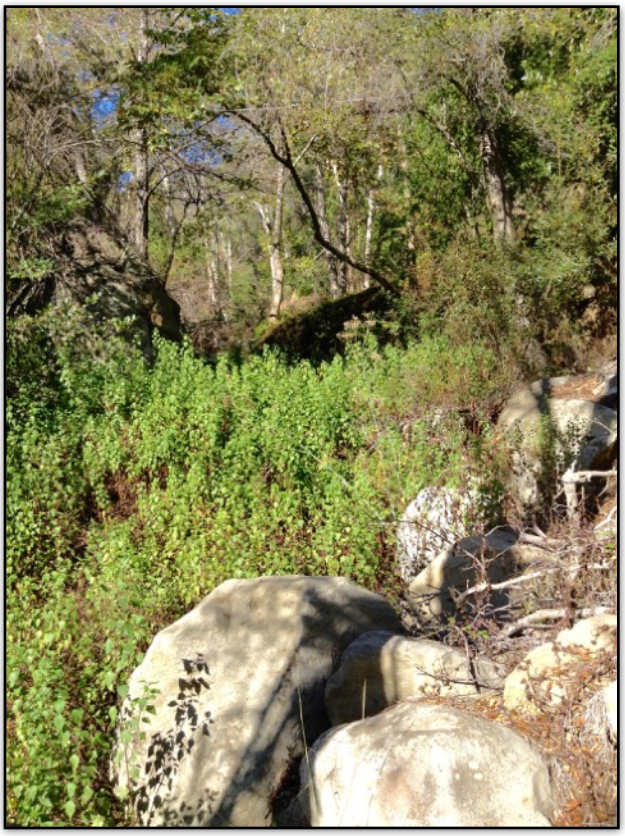
FOR STREAM AND FISH HABITAT RESTORATION AND PROTECTION

AND PARKS IRRIGATION/ GROUNDWATER RECHARGING

I am Monty Cole a longtime builder/designer in Montecito with a science background. I have 35 years experience in designing and building water drainage systems and am an EPA qualified Water Wise Landscape Professional. My company designs and installs rainwater catchment systems for estates, schools, businesses and homeowners in Santa Barbara County.

We recently designed a water catchment system for *Lotusland, which gathers and stores* in underground cisterns over 2,700,000 gallons per year for them at roughly *one cent a gallon*. We are using Lotusland parking lots, driveways and channels to collect water each rain and store it in underground cisterns. This water precludes well pumping and the attendant aquifer lowering and overburdening.

I want to bring a larger scale, *Riparian Habitat Sustaining* water storage and release system to the Cold Springs creek area, Santa Barbara. Here is my survey and proposal for a collection system and storage facility adjacent the *Cold Springs Creek debris basin.*



SITE RAINWATER AMOUNTS AND CALCULATIONS

Using Cold Springs Creek that flows out of the foothills across E. Mountain Drive, we can gather water during floods and peak rain events. The watershed feeding this crossing is 3,000' to10,000 wide and about 10,000' deep. From East Mountain Drive at the Cold Springs crossing, up to Camino Cielo at the top of the foothills...

The fact is on the coast we have nearly as much drainage area as the Cachuma reservoir watershed, and more rainfall... the difference is this water runs off in creeks and culverts to the ocean, instead of into a lake. If we added up all the major creeks on the Santa Barbara coast, the combined watershed is over 35 *square miles. (From 1974 Army Corps Chart Pg 9)*

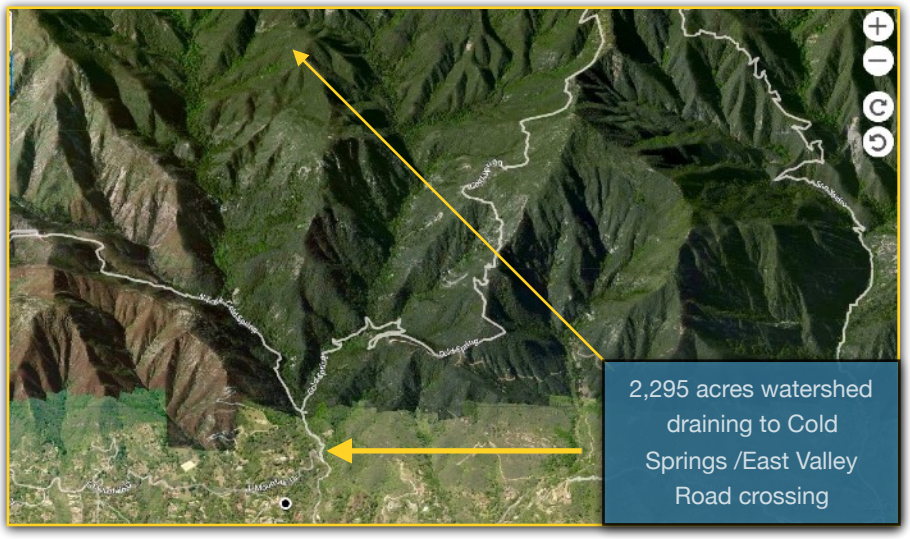
The area we are concerned with is completely uninhabited, consists of mostly sandstone hills, brush, creeks, pools, tributaries and a few hiking trails. We are talking about 2,295 acres of watershed, all draining to the crossing at E. Mountain Drive. We are using *a 30% coverage number*, so we assign 30% of this area as impermeable and it will drain to the Crossing at E. Mountain Drive. That gives 688 acres of usable drainage, creating 688 AF of water from one foot of rain, all draining across the East Mountain Drive crossing.

My design here involves collecting *peak runoff water* at the E. Mountain Drive Crossing (Crossing). At this point Cold Springs Creek is a boulder strune creek with house sized boulders to refrigerator sized rocks lining and filling the channel.

Our plan is to capture part of this relatively clean creek water, store it in new proposed cisterns on county property, and release water at later times for benefit to creek habitat and also to irrigate county parks, thus recharging groundwater.

From the creek crossing we capture and pipe water out of the creek channel and send it in 12" PVC pipes down to the debris basin area, 2,230 feet to the South.

Adjacent this debris dam there are three open areas owned by the county we recommend as locations for cistern storage of this water. A 200' X 300' X 14' cistern will hold 19.2 acre feet (AF) so three (3) will store 57.6 AF. That is 18,769,017 gallons.



THE NUMBERS

688 acres of drainage creates 688 acre feet of water with a foot of rain. One inch of rain creates 57 AF of water, or 18,682,124 million gallons. So when an inch of rain falls in a short period of time, East Mountain at the crossing receives 57 AF of clean rainwater.

That one inch *test rainfall* boils down to...

778,421 gallons per hour (GPH) (2.38 AF),

12,973 gallons per minute (GPM) and

216 gallons per second (GPS).

Thus, for a quick one inch rain we calculate a 24 hour average flow of 28.8 CFS at this crossing. This water is draining out of wilderness pools, falls and channels and then into a debris dam. We capture and save a small percentage (20%) of this water in storage cisterns. Then, between rains, and into the summer months, water is released as needed to keep riparian zones productive as viable habitat, and some is used to irrigate county parks.

East Mountain Drive Crossing / Cold Springs

2,295 Acres total water shed area

30% Runoff figure equals 688 acres of sandstone, brush, actually gets into Cold Springs Creek.

Creek drains over cement crossing at East Mountain Drive

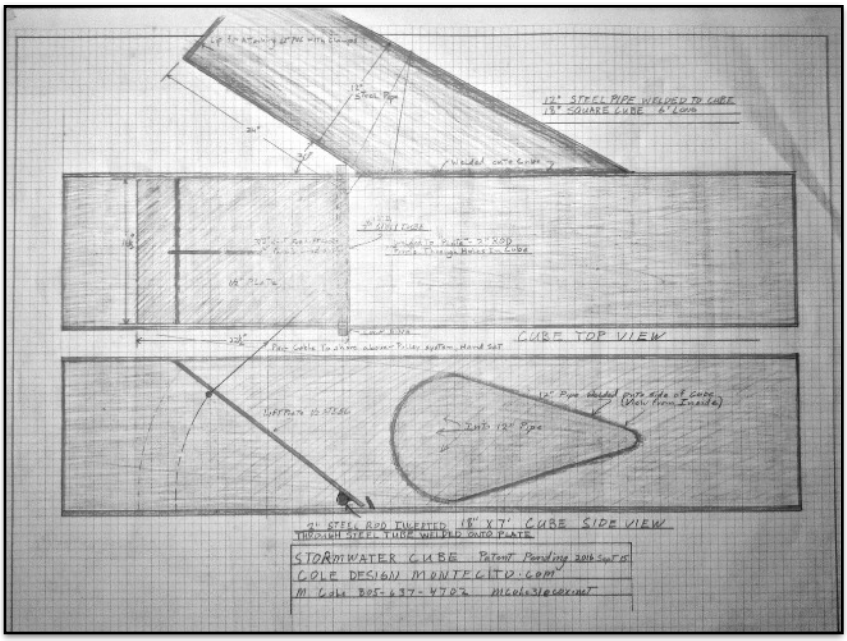
One inch rain creates 57 acre feet (AF) at the road/ creek crossing...

or 216 gallons per second (GPS) for 24 hours...

THE DESIGN

Here is an overview of the design. We gather water at the crossing mentioned using the *cube water diversion device*, which diverts water from the creek into a 12" pipe. From there we pipe this water along the upper reaches of the creek bank in a pipe, just below East Mountain Road... as it winds down past the debris basin. Water is carried in12" PVC pipes, 2270" feet down to the open areas adjacent the debris basin.

In this open area build underground storage cisterns 200' X 300' X 14' to store a total of 19.3 Acre feet of water. Simply put the County can now store 19.3 Acre feet water from a one inch rain. This one inch rain is a common occurrence and so if ten such rains occur the county now has stored and released 193 Acre Feet of fairly clean rain water. This stored water has served one beneficial purpose already by lessoning the flood peaks downstream. Secondly it can be released weeks later to



even out stream flows and thirdly, the stored water is piped out to county parks where it serves three more uses.

1) Irrigation of county parks.

2) Recharge groundwater below those parks

3) Lesson dependency on and costs of imported water, thus helping alleviate *CA's drought crisis*.

THE CUBE

This is my *patented device* shown on pg. 4. The cube safely and efficiently collects water from a rushing channel. These cubes are six feet long X 16" square steel tubes... that allow rushing

Debris Basin (right) and dam (left) from E. Mountain Drive looking west

water to pass straight through when open. Various sized and shaped cubes operate in differing conditions and efficiencies. The Cube is simply bolted onto a concrete slab in the creek bed or channel. If it gets destroyed, bolt in another one. They are relatively cheap.

The cube is closed or opened via a steel cable operated from above on a bridge or from the side, upper riverbank area. When closed, water entering the cube is redirected through a steel pipe exiting the side of the cube, and into PVC pipes installed on the upper banks of the river, creek or channel. From there, water moves downhill to storage in the new cisterns.

Area adjacent debris dam

Build cisterns here

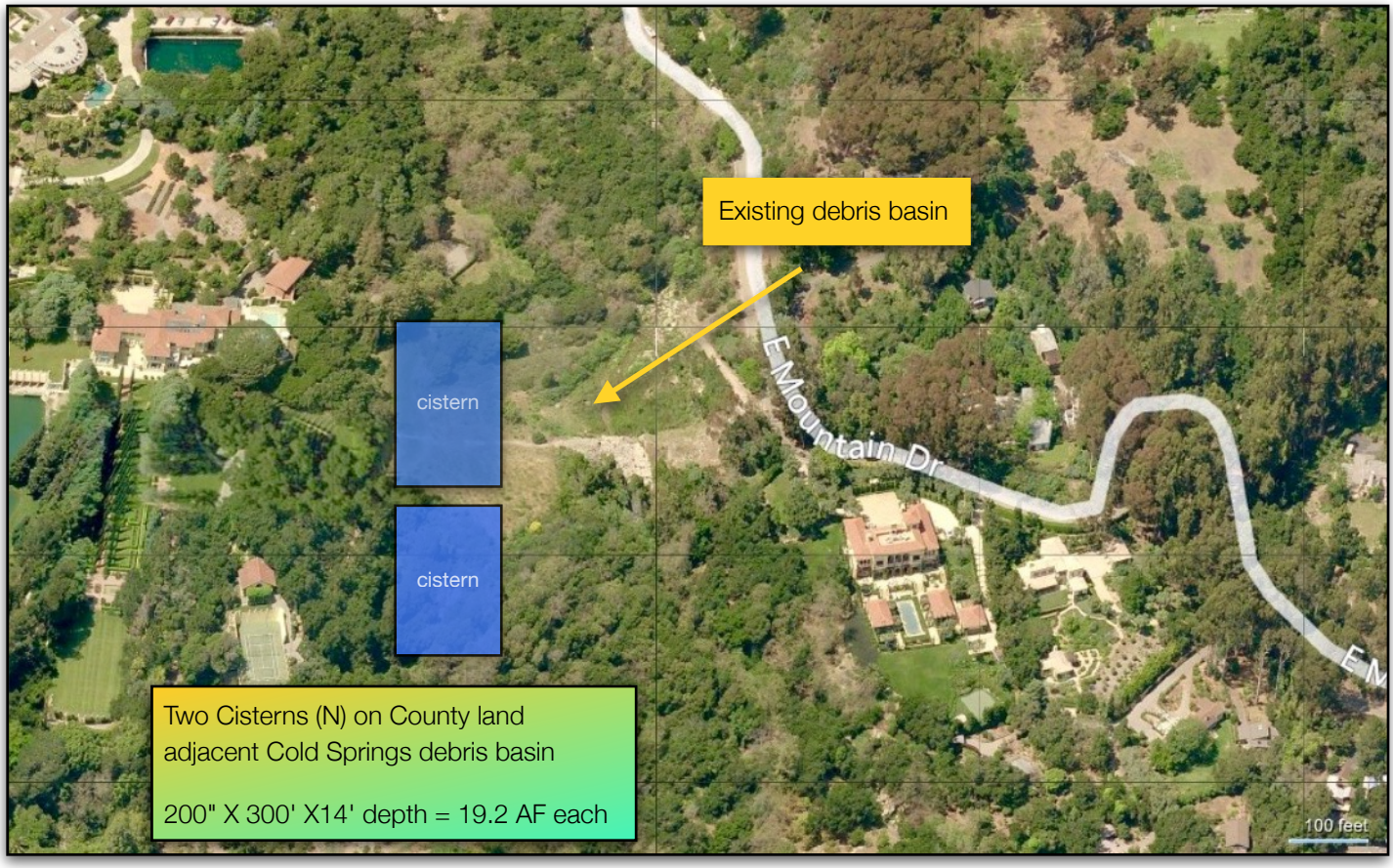
The cube thus pulls and extracts water out of the channel on command and sends water to storage. Once primed and running, the syphon effect adds to the force removing water from the creek or channel during or after floods.

This system has *only one moving part*, a steel plate on a pivot inside the cube. The plate operates to open or close the flow through the cube, thus diverting water out the side exit pipe. No dangerous electrical wires or motors to break and get torn out by flooding creeks. And no pipes getting broken by floods or jammed with rocks or sand.

CUBE OPERATION

This devise is simply operated by a pulley and cable system that is hand cranked and set from above the creek bank, and set in an open or closed position, depending on water flow rates and desired water extraction. This patented device solves this long time problem of channeling rushing water without a dam or weir and without massive concrete works or creek alterations, and without endangering any operating personal. The steel cube is simply bolted onto a slab in the creek bed. If it gets destroyed, another is installed, they are cheap.

Operators stand well above and away from a running creek and observe conditions. A hand crank pulls in a cable connected to the steel plate within the cube. As the plate closes off the end of the cube, water begins to flow into the exit pipe. A simple



flow rate meter at the downhill 12" pipe indicates flows and the plate is adjusted to achieve optimum settings.

As water begins to flow downhill through the pipes, other workers at the storage facilities communicate the rates of flow and confirm function. Basically it's an adjustable, indestructible valve placed where no electrical or hydraulic controls will function, in the middle of thousands of tons of rushing water.

(Fig 1) Cube Capture Rates for 7fps Stream Flow

@ 14"water height 16"X16" X 6' (2) Cubes

78.6 GPS Gallons Per Second

4,716 GPM Gallons Per Minute

282,960 GPH Gallons Per Hour

6,791,040 GPD Gallons Per Day

24 Hour Rate / 325,851 = 20.8 Acre Feet

CAPTURE RATES

The capture rates relate to how much water is taken per cube at various creek flow rates. Figure (1) is based on a *7 foot per second* (FPS) stream at a 14 inch height.

When securely installed in the creek channel, the cube gathers 39.3 gallons per second (GPS) as an average. With *two cubes installed* as I propose, the total water gathered is 78.6

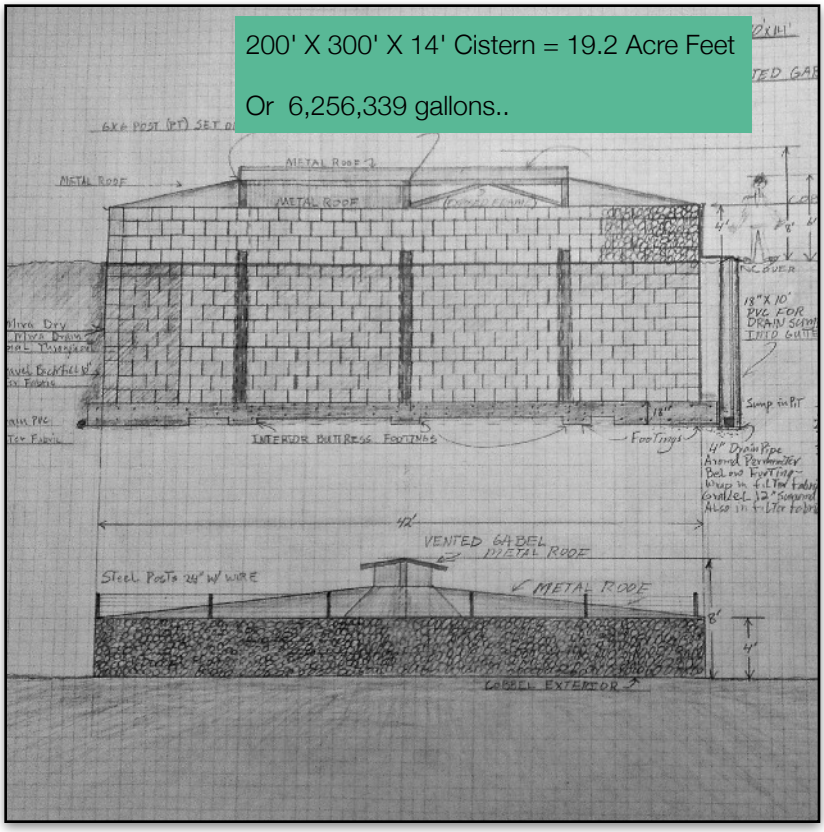
gallons per second GPS...

or 4,716 GPM Gallons Per Minute

282,960 GPH Gallons Per Hour 6,791,040 GPD Gallons Per Day

Divided by 325,851 = 20.8 Acre Feet captured...from a one inch rain...

So using this system, a one inch rain will produce 20.8 AF of storable water delivered to one or more new storage cisterns adjacent the Cold Springs debris basin.... And notice zero electrical costs. Zero because it's all gravity fed. Some pumps may be needed at the storage area to skim, filter or otherwise process the stored water.



STORAGE, USE VS COSTS

To store 38.4 acre feet at a time build two cisterns, 200' X 300' in the flat areas adjacent the debris basin as shown. A simple storage method is 12" block walled cisterns placed mostly underground with a cover or no cover. Easy to build and maintain and cheap.

This will provide local water for

Riparian maintenance and habitat sustainability

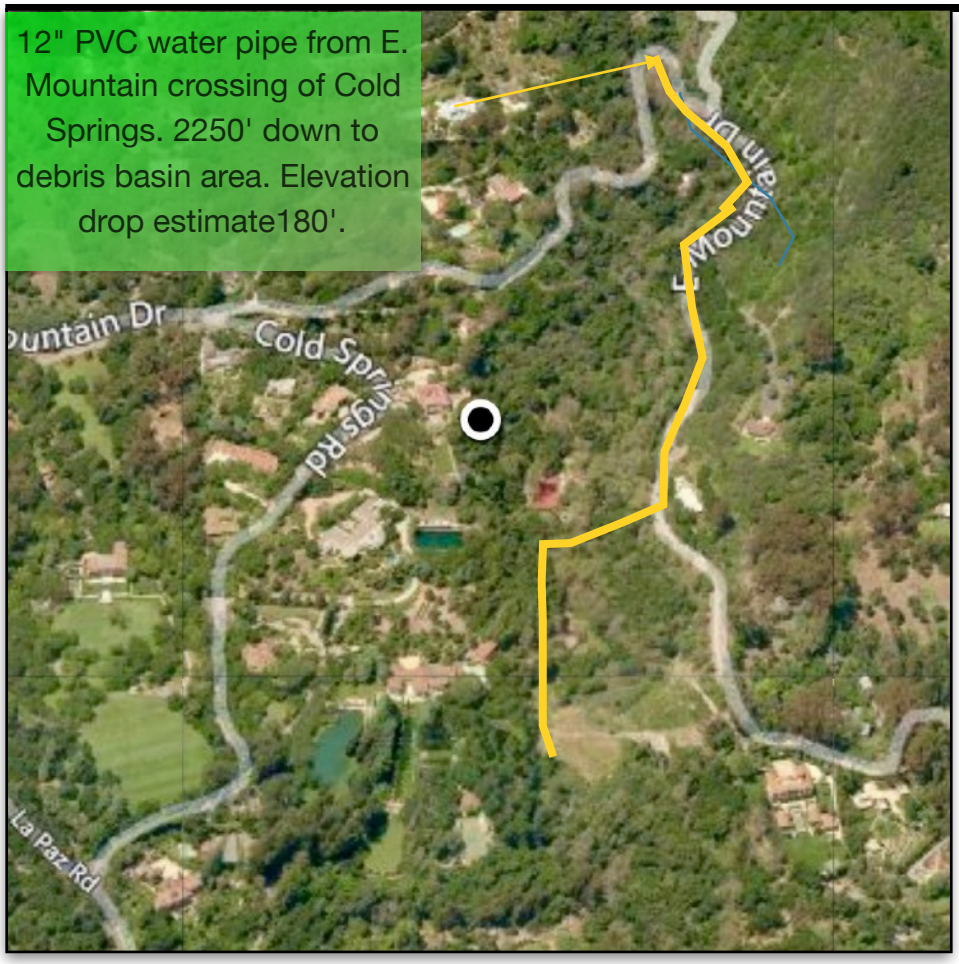
Flood peak control, creek erosion control

Fish habitat protection

And...County uses like

Parks irrigation and facilities,

Groundwater Recharge



When the next one inch rains fall, gather another 20.8 AF of water... this still allows 70% of floodwaters to pass, and nearly all the water taken is returned to the aquifer over time.

Even with a drought year rainfall of 12", that still can create 242.4 acre feet of fairly clean water.

If it were filtered and sold at Montecito prices of 1.4 cents per gallon, this water is valuable at $4561.91 per acre foot... times 12 inches of rain equals 242.2 AF X $4561.9 = *$1,105,807 dollars... per year. This project would pay for itself in a year.*

DESIGNS

These designs on show possible locations for new cisterns adjacent to the debris basin. There is a pressurized gas line running near this area, obviously a point of interest.

There is possible space for (4) new basins along this flat area up and down the creek. 19.2 Acre Feet per storage cistern would mean 76.8 AF of immediate storage. Stored water can be released back into the creek weeks after floods have passed and months into the drier seasons to protect riparian habitat.

Don't let your rainwater go down the drain.... We can Save you Thousand$

1974 Army Corps Stream Chart

PEAK FLOWS FOR INTERMEDIATE REGIONAL AND STANDARD PROJECT FLOODS*

Location	Distance upstream from mouth (miles)	Drainage area (square miles)	100-yr event Intermediate Regional Flood (cubic feet per second)	Standard Project Flood (cubic feet per second)
Montecito Creek				
at Highway 101	0.47	5.9	5,700	7,300
at East Valley Road	1.64	5.3	5,500	7,000
below confluence with Hot Springs Creek	2.25	4.8	5,000	6,500
Cold Springs Creek				
at elevation 500 feet	2.62	3.7	5,200**	6,700**
Hot Springs Creek				
above confluence with Montecito Creek	2.27	0.9	1,200	1,500
Oak Creek				
at Highway 101	0.16	1.4	1,800	2,300
at elevation 250 feet	1.73	0.4	600	800
San Ysidro Creek				
at Highway 101	0.20	3.9	3,500	4,400
at East Valley Road	1.62	3.4	3,500	4,300
at elevation 500 feet	2.27	3.0	5,000**	6,800**
[illegible]yon Creek				
[illegible]101	0.23	5.8	4,900	6,300
[illegible]luence with Picay Creek	2.10	3.0	3,100	4,000
above confluence with Picay Creek	2.11	2.1	2,400	3,100
at Romero Canyon Road	2.77	2.0	3,400**	4,600**
Buena Vista Creek				
above confluence with Romero Canyon Creek	0.01	2.2	2,800	3,600
below confluence of East and West Branches	0.80	1.6	2,200	2,800
East Branch Buena Vista Creek				
at East Valley Road	0.95	0.8	1,200	1,500
at Piedras Drive	1.43	0.3	800**	1,100**
West Branch Buena Vista Creek				
at Bella Vista Drive	0.98	0.7	1,600**	2,200**
Toro Canyon Creek				
at Highway 101	0.26	3.6	3,800	4,800
below confluence of East and West Branches	1.21	2.9	4,500**	6,200**

East Valley

ARMY CORPS SURVEY 1974

Army Corps of Engineers did a 1974 survey and found Cold Springs Creek at 500 feet elevation and 2.62 miles upstream from the ocean... produces in a standard flood... *6,700 CFS...cubic feet per second*. That's 50,116 GPS and thats one factor in section of this location.

The cube to cistern storage system I outline could be used in other county locations to varying degrees of efficiency.

Costs can pencil out under 1/2 cent/ gallon to capture and store rainwater in the Montecito hills. That's $1629/AF.

Also water can be sent out via 12" pipes running along the *creek corridors, placed at the top of the creek beds...* and sent to county parks, of golf courses, forested areas for irrigation and groundwater recharging through irrigation. It's a win-win for fish, wildlife, creeks and Parks.

RECYCLING FLOOD WATER

The continuing drought and the ability to maintain county parks and recreation calls out for these type solutions. I see every county park with some kind of rain/creek catchment system and onsite storage. Out of control flood water in creeks is wasted as mud out to the ocean. It causes great erosion in overburdened creek beds and fish can't use mud...fish need a slower, non muddy release of water... This will be provided by saving and slowly releasing storm waters back into the creek and park grounds. This water can now slowly percolate into aquifers and back into the ecosystem. With urban streets and other hardscape, even more instant runoff water is burdening creeks and fish habitat. With this type of system we can ameliorate the harm urban development causes to natural systems. So this is a fish program, that helps County parks too.

WATER TRANSFER

Water from the creek is carried via 12" PVC pipes located along the top of the creek bed. Instal six foot X 2" steel pipes just off the far shoulder of the roadway. Use small steel cable to support the 12" PVC pipes every 6' along the course. The pipe line will crossover the creek as shown and continue to the cistern storage and filtering areas. This method would require 375 pounded in pipes 2" X 6'. A very easy, cheap and effective transfer method along an existing county road.

CONCLUSIONS

There are many lots, roads surfaces, and drain creeks throughout the Montecito and the entire channel Island coast that would provide an incredible amount of water during the rain season.

From my investigations around Montecito, *there are some 30,000 acre feet* going down our drains and creeks every drought year. By capturing just a fraction of that we can cut erosion in creek beds, water our parks, slow water our creeks, riparian zones, wetlands, cut electrical use thus cutting our carbon footprint, and save a great deal of money.

Currently most of this water runs off, and with the added urban inflows, travels so fast it destroys stream beds and fish habitat. We should investigate and build structures to harness and control this resource and further protect the natural stream environments.

The major construction on these projects will be put out to bid, and by using the practical designs I have outlined, these projects can be completed economically. Save the rocks from excavation and reuse or sell. Clean the dirt and reuse or sell as compact-able fill. These are builder tricks I recommend that actually make money on projects.

My part in the process is to lease and instal my proprietary cubes into place, oversee, assist and monitor their operation, and recommend adjustments of operation.

These plans, excepting the cubes are offered as a concerned citizen.

Regards Monty Cole Cole Designs Montecito

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