

Sumak Yaku Junta de Agua and Iluman Junta de Agua

PROJECTO AGUA AYNÍ: water security planning

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GOALS

To the esteemed, dedicated and forward-thinking directorio of the Sumak Yaku Water Junta & Iluman Water Junta who wish to enhance the quality and quantity of healthy water and are dedicated to making it available and affordable to all members of their community.

{In Spanish: (translator, please use Oscar's exact words, here they are>>) "Realizar previo estudio para diseñar cómo conservar la agua de lluvia para crear nuevas vertientes del agua con visión a Unos 30 años al futuro. Para el beneficio principalmente para las 10 comunidades y aprovechar también estas iniciativas con un turismo comunitario en el futuro."}

The request to us from Oscar Santillan, then president of the Sumak Yaku Water Junta was stated as: "design how to preserve the rain water to create new aspects of the water with a

vision to some 30 years into the future. For the benefit primarily for the 10 communities of Sumak Yaku and also to take advantage of these initiatives for community tourism in the future.

From this outreach to us by Oscar Santillan, we interpret the priority as recharging the water cycle, which has many related “aspects of water” to serve the community’s needs at present and for future generations. One of the many secondary benefits, is supporting community tourism.



Recharging the water-cycle is a lofty goal, but it is a goal that deserves full dedication to ensure the availability of water for the community. Many projects from around the world have shown that it is absolutely possible. Ignoring the situation would mean to become increasingly dependent on the high costs of machines and electricity and the petroleum-dependent, unhealthy model of working with water that is one of the main causes of the biodiversity crisis, and the eco-cide crisis, that has ensnared us all. Conversely, to succeed, or even to partially succeed would further embolden communities to be inspired to redirect water management to holistic, system-oriented methods that observe and respect nature, and even go so far as to look to it for guidance.

“Language is crucial to how we perceive the natural world. Think of the word “the environment”, an empty concept that creates no pictures in the mind. Wild animals and plants are described as “resources” or “stocks”, as if they belong to us and their role is to serve us.”
–George Monbiot, The Guardian

Similarly, some of the terms that are used to describe this methodology are rather cold. *Earthen water harvesting* specifies the aim of penetration of the water into the earth, but “harvest” implies that the water exists specifically for human use. In Permaculture terminology, the term *water retention landscaping* or, a variation, *keyline-design* is common, but is devoid of any intentionality of respect or gratitude for the water.

Ayni, in four letters, is worlds more descriptive, conveying that we are giving water back to the land, and includes the experience of gratitude and respect. Thus, we are offering the name *Proyecto Agua Ayni*, and will refer to *Agua Ayni* as the integrated methods presented here for giving more of the water back to the land for the purpose of recharging the water cycle.

For this goal to be attained, it must be supported by these essential factors:

-  Preserve intact ecosystems that are present.
-  Plan for inter-generational education of this methodology so it can be understood, fostered and valued for:
 1. integrated communal planning (that is, working gradually toward overview planning to include all of the communities serving both juntas)
 2. private and contracted land-holdings

- ✚ Trainings to address planning, implementation and maintainance of the systems for:
 - councils of the juntas
 - socios & socias of the general assembly
- ✚ Reliance on community-based resources such as mingas and community-generated education as much as possible
- ✚ Trainings would promote further understanding of the threats to the water supply: burning, clear-cutting, over-grazing, agro/ domestic/ industrial chemical & human waste contamination.
- ✚ To recharge not only the water cycle itself but also to recharge respect for water and rebuild healthy relationship with water, the basis of life, so it will be cared for by future generations.

Additional benefits of recharging the water cycle with these methods:

- ✚ Prevent erosion.
- ✚ Improve fertility of soil and agricultural production through increased ground water and nutrient capture.
- ✚ Enhance and diversify community tourism by creating an eco-tourism destination
- ✚ Save money
- ✚ Potentially help stabilize climate change

The temptation to clear-cut, burn, over-graze animals and use toxic chemicals, all for short-term gain, is great, and will be a growing challenge. However, these attacks on the natural world will consistently degrade the quality and quantity of water, and threaten the very existence of the water cycle, including the water table.

HOW? The Methodology:

Earth-shaping for rainfall penetration. The main method for increasing rainfall penetration involves digging small canals on contour (that is, they are level, or nearly level) to allow rainfall to penetrate into the ground, and prevent runoff from gaining velocity and carrying increasing amounts of sediment and causing erosion. The more water that can be sunken into the land, without de-stabilizing the slope, the better. Water penetrating into the earth feeds the water cycle by charging springs and aquifers and by supporting plant life which cycles water through transpiration and evaporation as well as regenerating biomass that cools the soil, another route for aiding rainfall penetration. These measures mimic the role that forests, mature grasslands or other intact ecosystems play in slowing and cooling rainwater which allows for penetration. To feed the water table, water must penetrate into the ground, not just run-off. The method also supports reforestation by providing water to trees planted on the down-hill side of the earthen filtration canals.

The honor of working with the Quechua people on this project highlights the quality that is missing in modern Western culture language to describe this methodology—because that element is present and alive in Quechua culture. It is the element of reciprocity –*ayni*—as well as respect and gratitude, which are not reflected in modern day language. This project is about giving water back to the land, with respect and gratitude. We are grateful that this interaction with the Quechua has brought this important distinction in language to our awareness.

There are various earth-shaping strategies for slowing rain run-off so it can penetrate into the land, contributing to the water-cycle. We will go into these variations a little later.

The community educational program is part of the project methodology. The workshop-mingas for the General Assembly is where we will weave in the important topics of:

1. Avoidance of toxic household cleaning & maintenance products and give options for biodegradable products (which could be a neighborhood artesanal business.)
2. Avoidance of toxic agricultural products such as herbicides, pesticides and fungicides.
3. Options for avoiding contamination from human waste will also be included.

Defining the Issue, why is this needed?: Across the face of Madre Tierra, these same urgent issues are weaving people together with common concerns about a planet in peril. Quote from Masanobu Fukuoka, a well-known agroecologist from Japan comments on the scientific approach to ecosystem restoration, “those who break off a piece of nature lay hold of something that is dead, and, unaware that what they are examining is no longer what they think it to be, claim to understand nature.” Consideration of the many important interrelationships is the challenge.

When Oscar Santillan first spoke about this project to me, it was with concern for the lives of the grandchildren. This is very broad-minded thinking. Modern culture is in a trance, sleep-walking while furthering conditions that literally threaten existence of future generations. What will the population levels be 20, 30, or 40 years from now? 100 years? And what will be the availability of good enlivened water?

Forces are at play currently which threaten the current and future water availability. We can't rely on a single strand approach—a rich weaving, including the hand of the ancestors, together with knowledge from current Quechua culture and other modern nature-respecting methods is called for. Our dear friends Laura Santillan and Fernando Chimba have encouraged us that this is a job for an integrated team which includes both Quechua and people from “Western culture”.

In this regard, we perceive our role to be as “helpers”, providing suggestions based on our learning and experience. Robert and I see ourselves as catalysts. We aim to light the spark of awareness of the tremendous potential of these Agua Ayni methods as an untapped resource.

Truly, a “blind-spot” in the modern industrial age-- rain-water penetration in the earth was once highly valued and apparently very effective for many indigenous cultures in the past-- and the Andes is one of the world’s repositories of this ancient knowledge. We want to support the retrieval of this knowledge, and believe it could be a crucial key at this time when humanity’s survival is in question.

Some online resources for Andino traditional knowledge in rainwater “harvesting” methods:

Criadores de agua :La historia de una lucha contra las sequías
Gente Indigene de Peru “Criando Agua” con rituales y plantas
<https://www.youtube.com/watch?v=3juMJtwFA6w>

Heroes de Agua—despaciarse agua en terreo alta para recargar acuíferos y manantiales
<https://www.youtube.com/watch?v=TdKDyMgYyFw>

Canales de filtración antiguos de Perú
<http://www.aljazeera.com/programmes/earthrise/2015/05/peru-ancient-stone-canals-150525084924631.html>

Absalon Vesquez, Perú PhD, una de las cosas más importantes que podemos hacer contra el cambio climático es sembrar árboles y construir zanjas de filtración para captar agua de lluvia. Terrazas. Muchas palabras, no mucha información.
<https://www.youtube.com/watch?v=7xEaQxqdE74>

We encourage integration of local indigenous traditions that may help the water cycle of Imbabura heal. We have seen some of the *Crianza de Agua* methods of the Kogi of N. Columbia and the pre-Incan Palta and Saraguru of S. Ecuador. For years, we have studied the work of Viktor Schauberger, a water genius from Austria in the 1920s. We realize that much of what is considered to be insightful about his work is simply that he was not colonized by modern-day academic thinking, and observed the wisdom of nature with a keen eye, and let himself be inspired by it. How do we re-ignite that bond with nature? That is the question.

Links for Viktor Schauberger’s work in Spanish:
<https://www.youtube.com/watch?v=POt-cozwdM> (7 min)
<https://www.youtube.com/watch?v=SU-GMQkSWmc&t=944s> (1:15 min)

We see our role as helping the community link up current-day practices with traditional knowledge to form a multi-level approach. We are suggesting multi-level educational forums, for all age levels, and all economic levels, with the potential to genuinely shift how water is regarded and related to. Training can empower local leaders to take the reins and go

forward, equipped to complete the implementation that we have started, and with solid knowledge of how to advance the plan, modify for inevitable changes and maintain the system in good working condition.

This is a big project, and it could feel overwhelming. We feel it is important to take it a step at a time. In this planning document, we are aiming at creating a clear step-by-step process, with clear priorities for where to begin and how to proceed.

Economizing Priorities

As important as it is to be comprehensive, addressing the issue accurately as a web of relationships, it is equally important to honor financial realities and to prioritize in terms of

- 1) urgency
- 2) potential long-range impacts
- 3) actual costs
- 4) staying open to all available resources
- 5) using community-based resources as much as possible

Further Description of methodology:

Water security is a huge concern in our world and many news sources claim that water scarcity will provoke coming wars. Strangely, strategies for re-charging the water-cycle and conservation of rainwater is only now beginning to emerge on the scene. Rather, strategies that use more and more infrastructure, miles & miles of pipe, bigger pumps, larger concrete or plastic lined reservoirs stubbornly persists. Sadly, this type of over-engineering approach is obviously part of the “big picture” problem. To plan for penetrating and storing rainwater in the earth is very progressive.

Digging canals on contour, so they are level, or with a specific very slight slope is the primary method. These canals can be referred to simply as “penetration canals”, also called “swales”, yet if they have a slope, even though slight, they become “diversion canals” because their purpose is to take the water in a specific direction. Local factors such as degree of slope, soil type, and/or the desire to connect with other structures will determine the width, depth and degree of canal slope. In the literature, there are recommendations to not dig contour canals (swales) on slopes exceeding 17 %. In Ecuador, where the topography is extreme, that guideline would be very limiting. Over 5 years of application, here in Loja province, including the winter of 2017 with high levels of rainfall, and many extreme rain events, we have found that slopes up to 45% hold up fine, with appropriate adaptations.

These adaptations include:

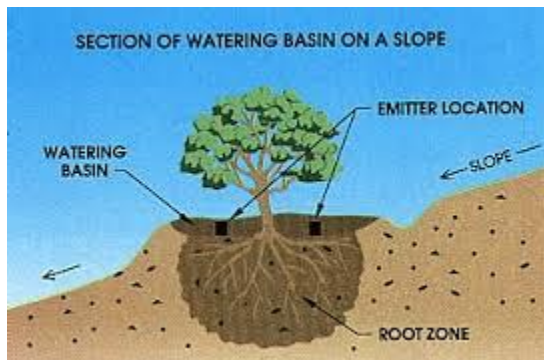
- with increasing degrees of slope on the land where they are being implemented,
 - a. canal size should be increasingly smaller in terms of width and depth

- b. degree of slope within the canal should also increase (eg. From .01 as to much as 2%)
- c. start small and test the stability of the canal for a full year before increasing its size

The general idea is simply that larger canals will accumulate more water weight, thus, with higher degrees of slope on the land, decrease the capacity for accumulation of water volume and move the water off faster with more “fall” (caida). As with most interventions with nature, it is very much a matter of continuing observation after implementation, and ongoing adaptation.

Penetration canals on land that has more than a 50 degree slope is not recommended, rather, planting of individual trees with raincatchment basins is recommended on more severe slopes.

Image:



More specifications available at a later date.

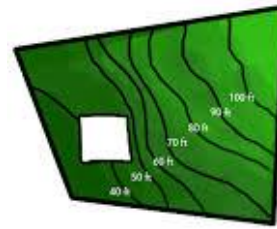
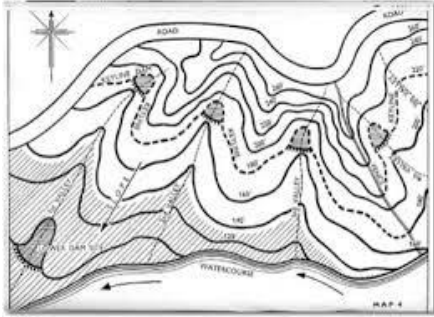
The intention with penetration canals being nearly level is also to prevent rainwater runoff from gaining velocity and carrying increasing amounts of sediment and causing erosion. The more water that can be sunken into the land, without destabilizing the slope, the better. Slope destabilization is a risk, and the principle of “start small and slow, then increase after proven

performance” definitely applies. If the penetration-canal functions well through a full year, very gradually increase the dimensions, by only 5-10 cm. deeper, 5-10 cm wider each year, unless the situation is clearly devoid of risk of land slippage.

Distinction between contour canals and Keyline Design:

We are using the term “penetration-canal” rather than “contour canal” because on agriculturally productive land that can be worked by tractors, the method “Keyline” will favor high production. In Keyline, the Keypoint (define) is determined and a contour canal is established off the keypoint. The key point can be defined as the point where the lower and flatter portion of a valley floor suddenly steepens. The **keyline** is then measured by staking a contour line through the keypoint, and continuing on across the slope. Working downhill from there, the canals can be parallel, more or less, to the original contour canal. Otherwise, because contour canals will constantly change their distance to the next line, with topographic changes, working with tractors becomes awkward.

Examples of contour filtration canals (swales):



Aerial View



Side View



Examples of Keyline design
(canals run parallel to the original
"keyline"):



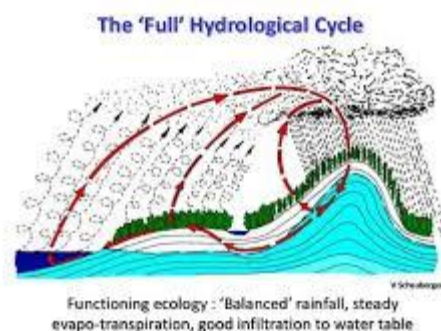
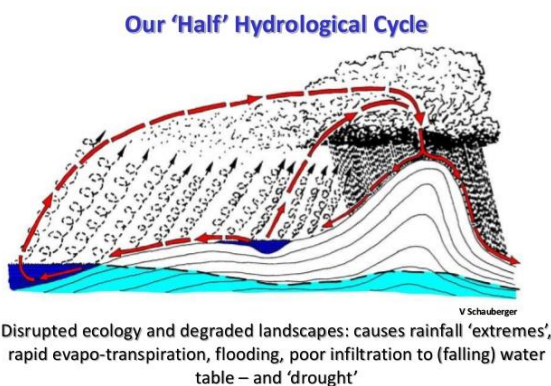


If the land is going to be worked only with hand tools, contour canals are favorable.

If the land is going to be worked with tractors, Keyline is favorable.

Flora. Water penetrating into the earth also feeds the water cycle by supporting plant life which cycles water through transpiration and evaporation as well as returning biomass that cools the soil, another route for aiding rainfall penetration. The method also supports reforestation by providing water to trees planted on the earthen filtration canals. These trees should be selected for increasing biodiversity and for potential multiple benefits such as forage, marketable fruits and nuts, and/ or lumber. *Local knowledge combined with input from an ethnobotanical specialist is recommended for this plant selection process.* These measures mimic the role that intact ecosystems such as forests, or mature grasslands play in slowing and cooling rainwater which allows for penetration.

Distinction of full water-cycle and half water-cycle: In the modern world-view, the water cycle is seen this way (image of half-water cycle). Viktor Schaubberger, the self-taught naturalist from the 20s and 30s recognized the difference between the half water cycle and the full water cycle .



The purpose of this method is to restore the full water-cycle. This means “giving back” to the water-cycle.

The water cycle is not disrupted instantaneously, nor is it healed instantaneously. It takes time. It may be 3-5 years before results are clearly visible. Or, they may be visible within the first year.

Considerations in building small earthen dams: The amount of water that is returned to the water cycle can be increased significantly by including small earthen dams in the system. These can range in size from the size of a small bucket, to an actual reservoir. For more on this topic, see the listing for “building small earthen dams” under “Recommendations” on page 18.

This is a great video of indigenous people in Peru building a dike for a high-altitude reservoir:

Construcion de cocha de filtracion,. <https://www.youtube.com/watch?v=Xt9e7eWhOME>

Posos/cochas para guardar/ y para filtrar agua
<https://www.youtube.com/watch?v=XA1qxKCp2aA>

This type of small reservoir may be possible at the high-altitude plateau on Imbabura, and should be be part of the observation considerations that happen during a maintenance visit to the existing lagunas at this altitude.

INFORMATION TO INFLUENCE ACTIONS

Keyline Design / Contour water-penetrating canals

Note in this photo where the steep terrain starts to flatten. This is the area, below the Corazon de Imbabura is where I recommend identifying the first keypoint and measuring the first Keyline from there. It would be below the altitude of the forests. We don't want to disturb the forest, but want to start the filtration canals as high up on the mountain as possible, within

guidelines. This would be the site of the first training team practicums as well as the socios/socias training-minga practicums, which are described in more detail below.



On this photo, below, I have sketched in red, a potential location for the first keyline. Penetration canals would go out to both sides of the Corazon quebrada, and be repeated in subsequent parallel canals downhill. The specific locations would be determined when on-site.



The system would gradually extend to the approximate 9 km.length of the terrain served by the juntas, guided by the Planning Committee and the Education Committee. This would be the communal system, and would start below the elevation

of the existing forests, and primarily above the residences, wrapping around the mountain within the Junta's domain, as contiguously as possible. However, the canals can be segmented, because their purpose is not to direct water somewhere, but to sink water into the land. I am imagining in some areas there would be approximately 5 canals, running parallel to each other between the forest and the houses. Other areas would have more

cleared land and would need more penetration canals, perhaps as many as 10. Distance between the canals can vary, and would be decided as the project unfolds. See more under “Recommendations”.

Tree-line & Interventions for the Illuman Spring

These photos bring up the question: Where is the true *tree-line* of Imbabura? And what is the most appropriate intervention for the Illuman Spring?

How high is the true *treeline* on Imbabura?

“The **tree line** is the edge of the habitat at which trees are capable of growing. It is found at high elevations and in frigid environments. Beyond the tree line, trees cannot tolerate the environmental conditions. The tree line should not be confused with a lower **timberline** or **forest line**, which is the line where trees form a forest with a closed canopy.” Source: Wikipedea

Tree line varies with many factors, such as latitude, wind, water, soil.

To what altitude levels should trees on Imbabura naturally grow?

Here are some examples of treeline in other Andean locations: (Source: Wikipedia)

Location	Approx. latitude	Approx. elevation of tree line 3,900 m.	Approx. elevation of tree line 12,800 ft.	Notes
Andes, Peru	11°S	3,900	12,800	East side; on west side tree growth is restricted by dryness
Andes, Bolivia	18°S	5,200	17,100	Western Cordillera; highest treeline in the world on the slopes of Sajama Volcano (Polylepis tarapacana)
		4,100	13,500	Eastern Cordillera; treeline is lower because of lower solar radiation (more humid climate)

Imbabura altitude : (Source: Wikipedia)

Elevation

4,630 m (15,190 ft)

From this glance, since these elevations listed are from more Southern latitudes that would seem to have more harsh conditions, it would seem that the elevation of tree line on Imbabura may be caused more from the various drivers of deforestation than from natural conditions. This is worth further study, and perhaps indicates tree-planting efforts above the current level where trees exist, which may not be the true “tree line”.

Considerations for the Iluman Spring This question is most relevant to the issue of the the Iluman spring, and potentially could be increased, perhaps increased significantly enough to also assist Sumak Yaku’s needs.

We want to know what the elevation of the spring is. Have any staff returned to the spring? Could they take a GPS elevation reading? And send photos please? Or of the laguna on the plateau? Is the spring in the caldera at the top of the mountain? Or at the level of the plateau below the summit?

For the Iluman spring, from the trailhead at the organic dairy farm, how many hours walking?/ how many kilometers is it to the Spring?

It appears to me that there are two main avenues of investigating the potential of improving the spring:

1) Direct observation of the conditions of flora and fauna at the spring and within a kilometer or more surrounding. Are there grazing domestic animals? If so, all possible measures to stop grazing is highly recommended. Are there wild animals, in numbers? Make a plant list of the plants that are there. Do you know if the area around the spring had trees in the past? Has it every had a spring-house (a small structure) covering it?

How close are the trees? What species? It was mentioned that there are some *Polylepsis* relatively close by. Investigate the altitude range of *Polylepsis* at 0 latitude with ethnobotanical records. Consider transplanting more around the spring and/ or starting some from seed at a similar altitude level. These would need to be cared for, which would mean visiting the spring more often than the current monthly practice. Could volunteers help with this? That is, volunteers with knowledge of how to care for tender young plants. Our research revealed one study that said that attempts at germinating or transplanting *Polylepsis* were not very successful. This could be inquired about further.

2) The other option would be academic approach, which would mean contacting an ethnobotanist specialist that works with high altitude equatorial ecosystems for advice. I have spoken to one Ecuadorean ethnobotanist about this on a casual basis (no funding has been approved).

I recommend some combination of approaches.

Recharging the Illuman Spring

A spring is one component of a water cycle. In a design for restoration, it cannot be isolated from the rest of the water cycle. In this method, we are creating contour canals and small earthen dams in key areas to increase the amount of water that can penetrate and return into the water cycle. This water feeds the spring.

Thus, for the Illuman junta we also want to return as much water to the land as possible, in multiple ways, and multiple locations, over extended periods of time.

Intact ecosystems such as forests or mature grasslands such as the *paramo* allow water to penetrate back into the land and some of this water is returned to the deep levels of the full water cycle. Land that is denuded causes run-off for two reasons:

1) the foliage slows the water's path to assist penetration and also,
2) the foliage cools the land. If the land is hotter than the air, the water will not penetrate. Denuded land in general allows only the half water-cycle to occur, rather than the full water cycle which supports the regeneration of true springs.

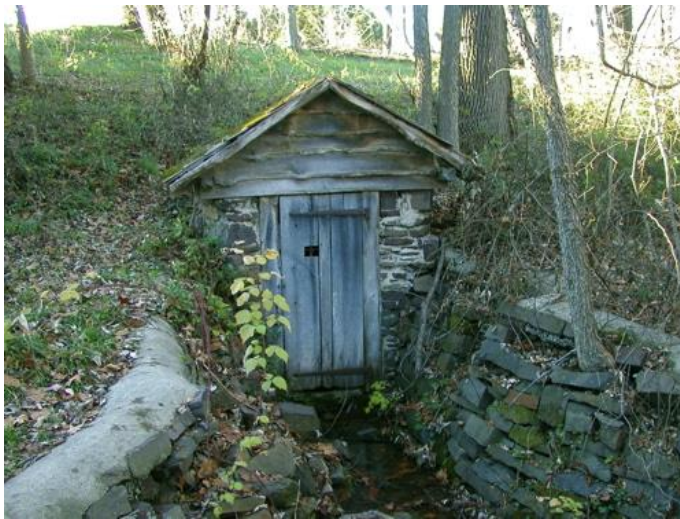
Some things can be done to protect the spring at "the source". These are important, but only one part of the solution. For example, a spring house may be a good idea. Victor Schauberger tells a story that in the highlands of the Alps, he came across a spring with a dilapidated, broken-down spring house over it. He asked his workers to take it down. Within a few days, the spring dried up. They built a new house, and the spring came back.

This is not to say that a "spring house is always the answer", but a good story to indicate how sensitive springs are, and that a spring house should be considered.

Important considerations include:

- the main reason for a spring house, or shelter is to cool the spring
- type of construction material, probably rock.
- dimensions: just enough to cover the spring and possible to make it big enough to create a place for sleeping for 1-2 persons, if that would be useful for spring maintenance
- minimal use hand-tools, perhaps only 1-2 persons working on the structure. the spring itself might be damaged by damaging the spring's surroundings in the construction process.

Some photos of spring houses that are well-integrated with the natural surroundings:



From Callum Coats book, *Living Energies*, (page 114) An important distinction is the difference between a true spring and a seep. A true spring comes from deep in the earth and is very high in dissolved carbon and minerals. It is of the highest possible quality for drinking. It's state of vitality is affirmed by it's shimmering vibrant and blueish color.

A seepage is not as deep, less mineralized, less charged with carbon, with less life forces. A spring does not have upward force that eventually brings it to surface until it is "mature", that is, it is fully mineralized and charged with life forces. An essential part of this emergence process is the specific temperature of 4 degrees Centigrade. Schauberger's understanding was that the temperature of water effected many of its other qualities. He measured the ideal temperature for water for being most vital, lively, healthy and charged with life forces to be 4 degrees Centigrade.

Again, from *Living Energies*, pg 121 "with full forest cover, the ground temperature is cooler than the rainwater ... falling on the cooler ground, the water is readily absorbed".

Schauberger's work is very interesting, and in many ways reminiscent of many indigenous observations and practices. Some of his work may be helpful for indigenous people in the restoration and re-assembly of some of the ancient water wisdom of "crianza de agua". This video in Spanish provides some insights into his work: LOS SECRETOS DEL AGUA (comprehend and copy nature) VIKTOR SCHAUBERGER (en español) 2008

<https://www.youtube.com/watch?v=SU-GMQkSWmc&t=864s>

See RECOMMENDATIONS for our suggestions about interventions for the Iluman Spring.

Potentially Storing Water from "The Heart of Imbabura"

Is it true that "the heart", on the Western side, has a special energy? That it has not been climbed? That it may have some qualities that have led to people claiming that it is "enchanted"? When Robert and I walked the area below "the heart", we talked about the potentialities of diverting water off of the heart to be stored at a higher altitude than the highest current storage tank in Sumak Yaku. That would be an obvious advantage in terms of gravity feed and saving electric energy now used on pumping. However, does local knowledge run counter to this idea? Does local knowledge indicate that water off of the heart should not be stored for spiritual reasons, or for respect for the beliefs of elders?

If that is not the case, it looks to us that the idea of storing water run-off from the heart has potential and is worth studying. Our suggestion: 1) Over the next rainy season of 2017-2018, study water volumes coming out of the ravine flowing out of the heart to estimate if the volume itself would be enough water to justify building a reservoir. Calculate usable run-off. How much of Sumak Yaku's water needs would it satisfy? When does the flow begin/ end? How long a period does it run steady? 2) If the water volume from this source merits building a reservoir, search for the appropriate engineers for that job, and begin budgeting for such a project, considering how much money would be saved by eliminating that percentage of electricity costs. A water filtering system would also be needed, for example a sand filter.

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PRIORITIES AND SEQUENCE for the Agua Ayni Project: (details below)

Phase I: further observation & planning, training local leaders in earthen rainwater-filtration from an integrated ecosystem-oriented perspective, local trainers then begin training of interested junta members, then implementation begins with a pilot project via mingas. With good conditions, this Phase I can be achieved before strong onset of the rainy season, 2017-2018.

Phase II: The following dry season, beginning when the ground is dry enough to work. (May or June?). Re-assessment, modification of plans if needed, training of interested junta members continues, mingas go into action. The mapping, planning, implementation and maintenance schedule for the entire system comes together step by step.

Further detail:

PHASE I

I. Observation and Planning:

- 1) Observation: further observation and mapping on Imbabura, to be continued long-term
 - watersheds, springs, surface flows & evidence of subterranean flows
 - topography & how it affects penetration canal system
 - flora
 - fauna
 - actions taken by communities on other parts of the mountain, such as chemical contamination, logging, fires

2) Communal Planning:

-- **Planning Committee** to initiate and evolve system-oriented Ayni Agua plan integrating overview, including both Sumak Waku and Iluman juntas. To form protocols for prioritizing sequence, where to begin, how to choose next steps, problem-solving, monitoring & maintenance.

Zia can be available, if requested, to help evolve the overall *Ayni Agua* integrated plan for Sumak Waku and Iluman Juntas. This is recommended. We also suggest designating funds for some other experiences experts to contribute on specific topics. See more under Budget Considerations.

Guidelines for Planning Committee, Process of Project Development:

1. Review project goals & perhaps modify
2. Continue to information gathering
3. Continue to evolve the map of the project area, map the *sectors* (outside influences), integrate topographic lines, info regarding water flows with the mapped location of communities. Continue to evolve diagrams of current and changing hydrological pathways.
4. Study & annually upgrade FODA (Fortalezas (factores críticos positivos), Oportunidades, Debilidades, (factores críticos negativos que se deben eliminar o reducir) y Amenazas, (aspectos negativos externos que podrían obstaculizar el logro de nuestros objetivos).
5. Describe the proposed actions, and various options
6. Map proposals on topo map.
7. Estimate budget.
8. Describe program of work, with estimated timeline. Provide options.

Education Committee to integrate with **Planning Committee**. Meeting needs for labor forces by teaching more people the methods, and directing field practicum portion of the workshops to help get the work done! Plan additional mingas, as needed.

- Continue to evolve planning for multi-generational education of junta socios & socios and families
- Plan for workshops to include range of Agua ayni methods—theory & practice, planning, implementation, maintenance
- promotion of conscious use of water & care to not contaminate with toxic agricultural chemicals, human waste or other contaminants

3) Encourage Planning & Implementation of Private Property funded by and implemented by landowners, with planning support from the project

4) Outreach to other communities. *Life is a web. We are all connected. Share successes, challenges, problems with other communities.*

II. TRAINING (described in more detail below)

A. Training local leaders: Zia's training team of 3-4 experienced with this method to train approximately 20 local leaders to train Junta socios/as. Theory & Practice, ½ day theory, ½ day practice for 3 days

B. Local trainers train interested junta members Theory & Practice, teacher-student ratio, not more than 15 students per teacher, with experienced assistant for field practicum, ½ day theory, ½ day practice for 2 days. Some trainers work with training youth. If there are organizations within the Juntas, such as for women, or artesanos, work with their groups, customizing the training for them

C. Implementation of Phase I pilot project via training-mingas

III. Assessment of Phase I Collaboration of Educational and Planning Committees assess Phase I. SWOT Analysis (FODA) ---risks, potential seepage or rupture with water travelling into unwanted location. Solution: use the principle, start small and build larger upon assessment. Keep catchment areas and contour canals small, build larger gradually.

PHASE II: to begin when ground can be worked after rainy season, 2018. Perhaps in May or June?

Local Trainers provide another round of training to interested junta socios. Those who took the first training can choose to review the training if they want.

Observe/ Reassess/ Modify Plans. Option: If desired, Zia can participate in this early dry-season 2018 assessment period followed by training & action of Phase II—implementing the plans of the Planning & Maintenance Committees.

Sumak Yaku trainers go into action with training/Mingas for Phase II Action, continuing throughout the dry season with minga-trainings every 2 weeks, or every month.

GOING FORWARD, THE NEXT STEPS

Our question: How can we empower the Sumak Yaku directorio and members to go forward for successful implementation in the most cost-effective way possible? The forces that are undermining water security are well underway. Going forward with careful, but steady steps is critical.

Robert and I have put a lot of work into this plan, aiming to provide a manual that will help make this project a success. I have identified several places where my involvement, Zia, is possible.

Obviously, the juntas can choose to use this plan, or not, and my involvement, or not.

Please have a look at our brief bio sketches, at the end of the document, to see our experience with helping to organize and execute many projects, especially those involving education, over several decades of experience, to help you make the right decision to have our involvement, or not.

OUR RECOMMENDATIONS

Option I Zia returns at a point between mid-September to mid-October to realize the following tasks. Robert will not be able to make it, as he is back at teaching school. Zia would like to be accompanied by a helper for the first 3 days, and an additional helper for training the local trainers, that has been an active participant in her trainings, and applying the method on her farm and for her consultation clients. For cost estimate, see **Costs**, below. Suggested schedule for that site visite:

Day 1. Zone de Corazon de Imbabura. Do drainage tests beside two large quebradas, and at mid-point between them.

Observation and staking to establish the optimal location for the *keyline* (baseline for further canals.) Measure how long a contiguous contour-ditch can be dug on the *keyline*. This is a key for planning future work, including practicums for trainings, mingas, and general efficient organizing.

Determine distance between canals and mark subsequent parallel canals downhill from the keyline, considering property lines, etc.

Interface with Junta directorio and staff to get permission to dig the penetration canals on these properties. Important!!

Day 2 & 3. Visit the Iluman spring and make suggested observations. For a list of these observations, and questions about the spring, see above.

Day 4. Orient team of trainers to the locale. This team, that have experience with Zia on the method will provide training for a team of Sumak Yaku trainers, who will in turn, train the junta socios/socias. We suggest preparing a majority of people in the community to understand how to plan, implement and maintain these systems.

Zia trains trainers> who train local training team> who train junta socios/socias

Zia > trains trainers	#'s	who train local training team>	#'s	who train junta socios/socias	#'s
Training team of experienced people	4	People to become local trainers are selected from local leaders, staff or directorio members for a 3 day training	20	Interested members who would like to participate in a 2 day training, learning theory and applying to communal plan and to a chose private property	Approx. 140 to participate in first 2 day training /minga
1:7 or 1:10 teacher>student ratio		1:7 or 1:10 teacher>student ratio		1:7 or 1:10 teacher>student ratio	

This plan will allow for a 1:7 or 1:10 teacher>student ratio, which will be especially important in the field practicum portion of the training, which will be about 50% of the training time. As much as this methodology looks very simple, and in many ways it is, I assure you that it is easy to make mistakes that cost time and money. Thus, I suggest bringing in trainers that have taken the Permaculture Design Certificate Course and that have experience in this method, and, preferably, also in working with me on projects.

Orientation of the experienced training team:

- Onsite: a. View the project area from a distance, such as from Condor Park.
- b. Review our report together, relative to the visible landscape and topography
- c. Visit the Corazon Zone to observe the lines they will be overseeing local trainers on.
- d. visit a local farm which is interested in implementing the method.

For your cost estimation purposes, I suggest having 3 members on this training team in addition to Zia. Thus if one is unable to participate, a team of 3 total (Zia & 2 others) could still be successful, but 4 trainers would allow for training more local trainers.

Day 5 & 6 & 7:

Training for Sumak Yaku trainers: (Detailed Outline & support materials to be delivered upon contracting.)

Theory: Provide indepth information about the theory of the method and it's application in many climates and cultures.

Considerations in system design:

Weather patterns

1. Precipitation, chart on monthly basis

2. Wind patterns, direction and chart of monthly basis

Consider Water movement patterns

1. Study & give long-term consideration to water flows in large and small quebradas (A committee should be formed to be in charge of this.)
2. Plan maintenance visit to the existing lagunas at high altitude on the Imbabura plateau. Is it possible to reinforce containment of the water on these lagunas?
3. Considerations in choosing optimal elevation levels for contour canals; how many; distance apart
4. Topography: reading the topography on topo maps/ note topographical features from walking the ground
5. Estimation of usable run-off relative to plans for small earthen dams (posos)
6. Importance of including spillway. Plan for Spillways (derramadero): sill or desagua via pipe, location, frequency on canal line
7. Sediment & maintenance scheduling
8. Maintenance: Leaks, appropriate intervention

Considerations in building small earthen dams

1. Considerations in location. What conditions are ideal? (depression of natural place where water will accumulate, ground-water near surface, or a "seep", soil is high enough clay to hold water, but porous enough to filter.)
2. Considerations in soil type, drainage rate, volume relative to water weight, slope angle
3. Appropriate degree of slope (fall) within the contour canals (depends upon degree of slope of the land, soil type, estimated amount of run-off, etc.)

Contamination Issues:

1. Considerations in choices of household cleaning products
2. Considerations in ecological human waste management: 2 chamber dry toilets, banyo ecologico <http://www.fundacioninteris.org/> (hecho de un equipo de Guayaquil en respuesta de necesidades higienico de victimas de terremoto de Manabi, pero bien opcion tambien), biodigestors que sirven doble funcion de fabricar metano que puedan usar para cocinar.
4. Considerations in choices of agricultural products which introduce poisons into the natural world

Practicum: Following the principle, "begin with slow, small steps" we will begin implementation during this training by measuring the contour off of the key-point Zia has marked 3 days earlier below the Corazon.

This area, is a good starting place for these reasons:

- 1) Reasonable degree of slope, relatively flat
- 2) Close below the current level of forests. We want to start the system as close to the existing forest as possible without interrupting them or harming them in any way.
- 3) Relatively uniform topography except for the two large quebradas
- 4) Free of rocky outcroppings
- 5) Here, the training team can learn to use the contour-measuring tools, the A frame and water-level and begin implementation to give a feeling of accomplishment.
- 6) Choose location and dig at least one small dam to be in-line with the penetration canal/s

- 7) Choose location and dig at least one “gabion-style” filtration dam within a micro-quebrada, with the purpose of slowing the water and sediment flowing down the micro-quebrada (establish guidelines for scale of micro-quebradas are appropriate to work with in this way).

Day 8 Day of Rest (domingo?)

Day 8 & 10 First Training, delivered by Sumak Yaku Trainers for junta socios/socias

Outline & support materials to be delivered upon contract.

Costs: The costs of this proposal, because it is focused on training local people to take charge of the project, is extremely low for the return of future water security.

The Phase I visit for training the Sumak Yaku training team and supervising their first training with socios & socias would be 9 paid days for Zia @ \$100./day. Please consider that planning details of a three day training will require many days of work, but will then be available as a template for local trainers to rely upon, or modify as local needs and conditions change.

The experienced trainers that I suggest bringing to train local trainers would total 14 days of work I estimate their costs at approximately \$30./day which would include their travel costs, if housing with junta socios/socias can be provided. Total “trainer assistant” budget totals: \$420.

Consider consulting with an ethno-botanist, or local plant specialist.

Add an additional \$500-1000. for other professionals to be called upon as needed, such as topography mapping or additional perspectives on Keyline design. Equipment such as laser levels and GPS technical locators might be considered, although this work can be done accurately with tools that have almost zero costs.

Lower Cost Option: Zia trains local training team directly (no experienced personnel to help with training), with 3 days of Phase I observations and 3 days of training, two days of supervising Sumak Yaku’s training team on their first training of socio/a members, one day to spend with Education and Planning Committees for total of 9 days @\$900.

Phase II: Zia visits to evaluate Phase I, and help establish rhythm of trainings for Phase II, upon beginning work in May or June of 2018—3 days, \$300.

Mas Economico Opcion: Zia vuelva in Otono para 3 dias, para avanzar el planificacion, mapas, prioridades y comunicar con gente local que serian los capacitadores de los metodos. \$300.

Biographical background:

Zia Parker, M.A., C.M.T. es un mentor e instructor de sostenibilidad, un profesor, diseñadora y consultor de de Permacultura, y un organizador comunitario. por más de 30 años , en África, Asia y Norteamérica Zia teje los pueblos indígenas y sus conocimientos con las metodologías amistoso de la tierra que vienen del mundo moderno. Hace 5 años, cuando ha movido al Ecuador con su esposo, ella ha continuado coordinando las Cursos Internacional de la Permacultura, que ella ha hecho desde 1991. Tambien, esta muy ocupada con la asesoria de sostenibilidad; y desarrollo de Finca Vida Verde como un modelo del conservación de agua de lluvia, y la agroecología.

Para obtener más información sobre sus antecedentes, consulte la Hoja de Vida adjunto.

Robert David Mceldowney

1970 BA degree in Religion and Philosophy, Maryville College, Maryville Tenn.

1971 US Peace Corps training in sub-tropical agriculture and animal husbandry in India

1972 Crew labor worker on a large commercial landscaping company, Duncan Landscape,
Youngstown, Ohio

1973 Counselor at a large innovative state-run school for the specially challenged in Enumclaw, Wa.
my ward was with the most mentally and emotionally challenged.

1974 Began studying sub-tropical organic agriculture full time on the Big Island,Hawaii

1975-1985 Created and managed several small farms and gardens in Hawaii

1986 Completed the foundation year training for Waldorf teachers (Steiner Education) , Emerson College,
E. Sussex, England

1987 Completed the year and a half intensive organic agriculture training in Biodynamics at Rudolf Steiner
College,
Sacramento, Ca

1988-1992 Created and maintained organic gardens as part of care taking positions

1993 Completed a 5 year part-time training in Spacial Dynamics, to teach movement therapy thru games
and activities

to children and adults, Spacial Dynamics Institute, New York

1994-2002 Taught movement skills to children in Waldorf Schools
and maintained organic gardens

2003-2006 Owned and managed a 5 acre organic orchard and garden, in Hawaii

2007-2008 Taught movement classes and created an organic garden on Orcas Island, Wa.

2009-2011 Volunteered at an organic herb farm run by Zia Parker

Took the Permaculture Design Course in 3 different locations

2012-Present Owned and guided the Finca Vida Verde organic farm in Vilcabamba, Ecuador

Taught Biodynamics and helped to manage the Permaculture Design Course for 4 years in
Vilcabamba.

Addendum: These maps & graphical material can be further coordinated and integrated upon contracting:

