Final Project

Ecological History of Los Laureles-Goat Canyon

Ld Arch 227: River Restoration

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Abstract

Los Laureles stream is an important tributary of the binational Tijuana River and drains directly into the Tijuana River Estuary located in the U.S. Los Laureles watershed has a set of communities that struggled to survive due to urban spawl, overpopulation, lack of resources, ecological degradation, among others, resulting in many public health issues and excessive erosion and sediment flow, not only affecting their own communities but also the estuary downstream.

Los Laureles stream was one of the amenities that the first settlers were attracted to. With time and over development, the natural resources were exhausted and the ties of the community to the natural feature were severed. Currently, there are efforts to address public health issues and erosion, by the government and civil and non-profit organizations from both sides of the border. In my fieldsurvey I encountered many residents with testimonies that helped clarify the sentiment of the community, I will reiterate some of the proposed solutions as well as recommend my own.

Introduction

The Tijuana River drains 1,750 square miles, mostly in Mexico, and discharges into the pacific. One-third of the watershed is in the U.S., and the remaining two-thirds are in Mexico. Located in one of the most transited borders in the world (Snibbe, 2019). The Tijuana River is an international watershed that faces many conflicting social issues hindering its ecological stability. Such as homelessness, decaying infrastructure, vandalism, lack of maintenance, pollution, and apathy for the river.

The most important feature of the alluvial valley is the Tijuana River Estuary, where the water from the river and tributaries drains into a wide valley and mixes with seawater carried in by the tied (Saffran *et. al.,* 2017.). Figure 1-01 delineates the watershed within the border region, and the inset location shows its position in the most southwestern region of the U.S.

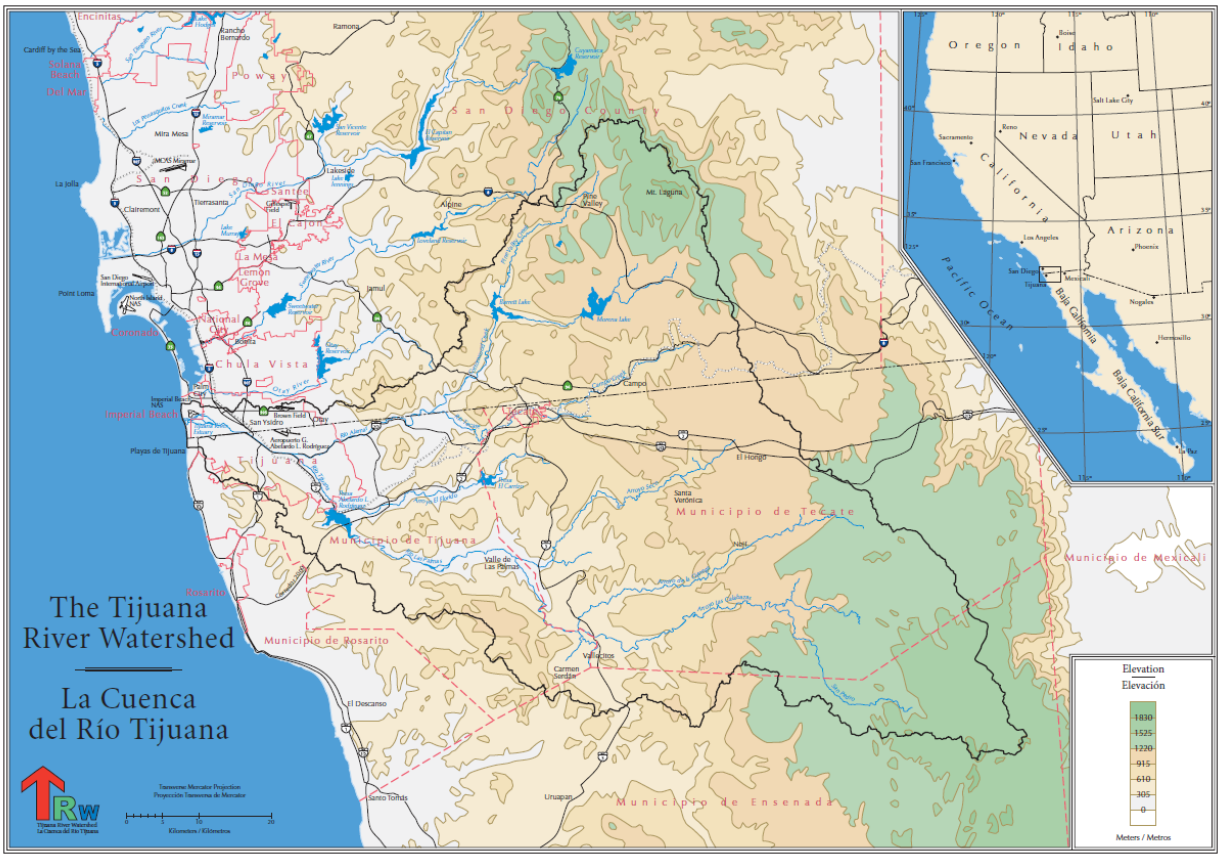


Figure 1-01 Tijuana River Watershed Atlas

History of Human Occupation

Over the past ten thousand years, native Kumeyaay (known as Kumiai in Mexico) used this region extensively for nutrition and resources (Saffran *et al.,* 2017*,* Gamble *et al.,* 2004.) As most of the vegetation was grasses and lower shrubs, indigenous people gathered fresh water, seeds, oils, roots, pigments, and materials for weaving and creating different artifacts. The working ecology in the salt marsh permitted the natives to gather and feed from various crustaceans, fish, and mollusks. Numerous archaeological investigations highlight the intimate relationship the Kumiai had with the surrounding vegetation (Wilken-Robertson, 2020.)

European missionaries settled around the 1700s, causing the decline of the native ecology as they introduced intensive grazing and agriculture with exotic plants that took over and displaced many native species. As the United States of America and

the United States of Mexico developed, they started to delineate political boundaries and eventually set up towns that represented the geographical edge of their political system. In the 1840s, the treaty of Guadalupe Hidalgo brought peace to the neighboring countries. Article v stipulated the landmarks of the official political border recognized by the republics of the United Mexican States and the United States of America (Tratado de Guadalupe Hidalgo, 1848.) This political division created one of the largest international watersheds and a complex hydrological system that respects no political boundaries.

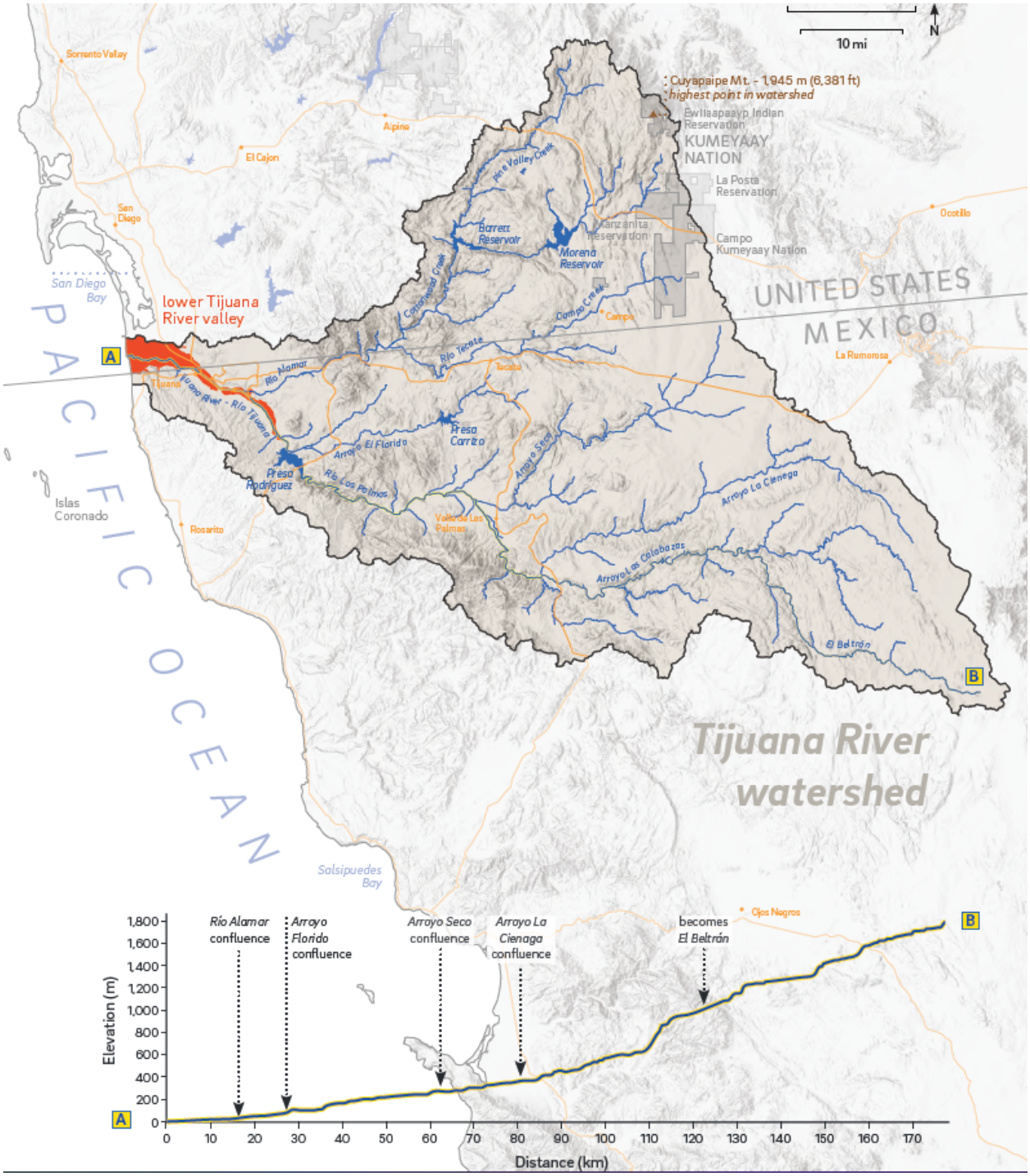


Figure 1-02 Watershed and elevation profile, Safran SM *et al.* 2017

Ecological Resource

Figure 1-02 shows the watershed of the Tijuana River, showing important tributaries and a longitudinal profile of elevation change along the channel. The Tijuana River Estuary is a complex system, consisting of a variety of habitats, including temporary streams, ponds, vernal pools, perennial freshwater wetlands, grassland/coastal sage scrub, riverwash/ riparian scrub, and river channel. (Saffran *et. al.,* 2017.) Besides the freshwater surface stream, there is subterranean water slowly flowing oceanward, as well as ocean tides that result in mixing and complex ecologies.

The convergence of these factors over time has created diverse habitats that support migratory animals as well as vegetation and coastal organisms. To highlight a few there are: San Diego Song sparrow (*Melospiza melodia cooperi*), Blue grosbeak *(Passerina caerulea salicaria*), Least Bell's vireo (*Vireo bellii pusillus*), Willow flycatcher (*Empidonax traillii extimus*) and flora species like Abronia maritima, Abronia umbellata, Ambrosia chamissonis, Atriplex leucophylla, Distichlis spicata, Rhus integrifolia, Spartina foliosa, Sarcocornia pacifica, Distichlis spicata, Monanthochloe littoralis, Arthrocnemum subterminal, Frankenia salina, Distichlis spicata, Anemopsis californica, Sporobolus airoides, Lathsenia glabrata ssp. Coulteri, Croton californicus, Baccharis pilularis, Artemisia californica, Malosma laurina, Rhus integrifolia (Saffran *et. al.,* 2017.)

Among the surface dwellers, we can count the "Pacific pocket mouse (*Perognathus longimembris pacificus*), California kingsnake (*Lampropeltis getulus californiae*) San Diego gopher snake (*Pituopis melanoeucus annectens*), side-blotched lizard (*Uta stansburiana*), coyote (*Canis latrans*) (Saffran *et. al.,* 2017.) Last but not least, some of the tidal organisms are "Molluscs (*Assiminea spp.*), California killifish, gaper clams (*Tresus nutallii*), ghost shrimp (*Palaemonetes paludosus*), Green Algae (*Rhizoclonium riparium*), Blue-green algae (*Microcoleus lyngbyaceus*), Diatoms(*Trachyneis aspera*). (Saffran *et. al.,* 2017.)

Given this biological diversity, it is not surprising that stakeholders sought to preserve the area from further development. Despite the efforts, it is still heavily impacted by the urban development in Los Laureles-Goat Canyon valley south of the

border. Due to its proximity to the estuary, it is one of the most monitored sites in the Tijuana River Watershed.

Los Laureles-Goat Canyon

The modern development and ecological decay of the Los Laureles (Goat Canyon in the U.S.) region can be traced back to the construction of the “Playas Road” that connects the Tijuana beach area to the rest of Tijuana. In 1959 the administration of Governor Braulio Maldonado (the first governor of Baja California) started the construction of the road to connect Playas with the rest of the city. Dynamite was used to slice the hills and make the road (Por las calles y colonias de Tijuana, 2002). Figures 1-03 and Figure 1-04 clearly show the splice of the canyon to create the road.

Figure 1-03 shows the slicing of the mesa in 1959. The picture was taken from Playas looking back to the east (Por las calles y colonias de Tijuana, 2002)

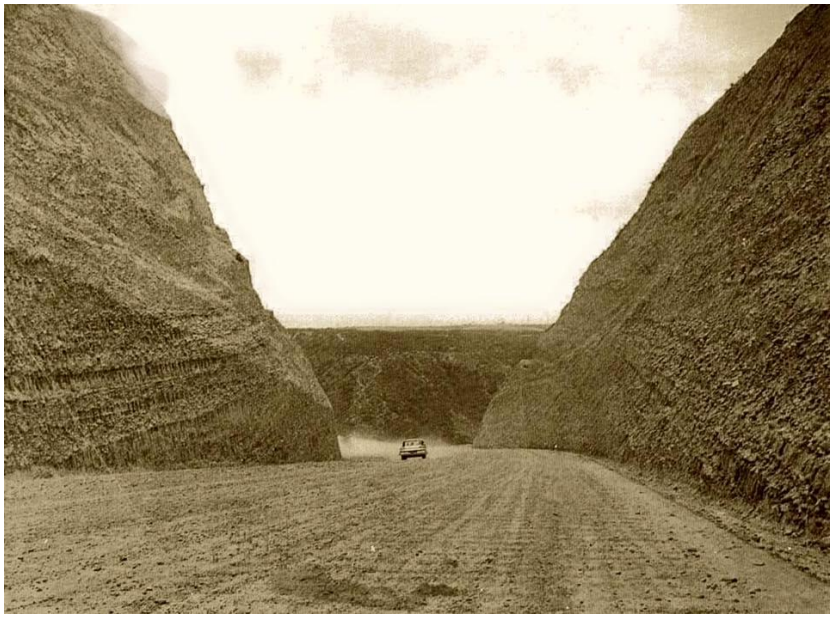


Figure 1-04 shows the cut of the mesa. The picture was taken within the cut area, looking back to the east (Por las calles y colonias de Tijuana, 2002).

There is no public record of the earthworks of the road, but one can speculate that the cut material from the splicing of the mesa served as fill material to elevate the road in Los Laureles-Goat canyon. Creating a barrier in the valley and forcing the hydrology that flows downstream from the south through pipes to connect to the estuary in the north.

The canyon's geology primarily consists of Cenozoic sedimentary rocks of the Oligocene, Miocene, Pliocene, and Pleistocene ages. In terms of soils, the lower basin and foothills are dominated by Entisols and Inceptisols, active floodplains and eroding slopes prevent the soil-forming factors of climate and vegetation from creating mature profiles. Further Inland, at slightly higher elevations with more stable vegetation cover, zonal soils (mature horizon development) are dominated by Alfisols and Mollisols (Tijuana River Watershed Atlas.)

The road to playas encouraged new development, and the development company Urbanizadora de Tijuana S.A. started sectioning lots in Playas de Tijuana (Padilla Corona, 2012,) smaller development companies started to look at the region, including the Macias family who sectioned and sold lots in the first communities within

Los Laureles canyon. Figure 1-05 depicts a typical canyon community (Crosby, Harry W., 1964.)

Figure 1-05 illustrates a typical canyon community, location within Tijuana not confirmed (Crosby, Harry W., 1964.)

The road infrastructure included channeling the immediately adjacent stream of Los Laureles. The proximity to the road and the picturesque valley of Los Laureles stimulated urban growth, increasing urbanization and channelizing the stream even further. Triggered by the high demand for residential land use by waves of immigrants that continually arrived in Tijuana (and still do), unscrupulous developers developed the region without regulation from the local government, disregarding local planning ordinances, and damaging the ecology.

The stream

Since the relationship between the estuary and Los Laureles canyon was uncovered, there have been a series of studies delineating Los Laureles subwatershed to identify the sources of pollution and detect hotspots of erosion that result in excess sediment downstream. Building upon these studies, my report focuses on rehabilitating the social connectivity of the community with the channelized stream.

The stream is completely urbanized and has lost the qualities that made it an attraction to the first community members, The current perspective of community members identify it as a hazard, it is not pleasant to look at or be around it, since odors emanate from it. Not to mention it is dangerous to be arond it when it rains.

The first step in reestablishing a connection between the community and the waterway is sanitation. (Wantzen *et. al.* 2019), there must be a good level of sanitation in order to accommodate human use around the area. At some point in the history of the channel, it was also used to flush sewers out of the community (IMPLAN, 2004.), continuous efforts are being made to provide residents with some type of waste system removal, so residents don't use the channel. Therefore water quality is continuously improving, nevertheless until water quality reaches optimal levels, it is better to create a visual connection to the waterway.

Methods

My investigation of the Los Laureles-Goat canyon ecological history is a compilation of archival records from the Municipality of Tijuana Planning Department (IMPLAN), Tijuana River National Estuarine Research Reserve (TRNERR), Tijuana Watershed Atlas, Tijuana River Valley Historical Ecology Investigation, Guadalupe Hidalgo Treaty, section v, Etnobotánical Kumiai by Wilken Robertson, City of Tijuana webpage resources, "Por las calles de Tijuana" historical series about communities in Tijuana, UCSD special collections archive of images. Besides the review of published literature I conducted oral interviews with local stakeholders like Delia Castellanos from Proyecto Fronterizo who shared the ongoing efforts as a civil organization as well as

answering questions regarding her experience as a former planning department official for the city of Tijuana. Oral interview with TRNERR Research coordinator Dr. Jeff Crooks, who informed me of the current state of the estuary and ongoing projects, and TRNERR Binational Liason Ana Xochitl Eguarte, who shared information on the process of collaborating on both sides of the border, and oral accounts from the community gathered at multiple points during the fieldwork conducted November 4th and 5th of 2022.

Los Laureles subwatershed is one of 31 subwatershed within the Tijuana River watershed (Atlas de Riesgos Naturales del Municipio de Tijuana, 2014). Los Laureles subwatershed is 4.69 square miles, in turn divided into seven micro watersheds. Figure 1-06 illustrate the location of the subwatershed Los Laureles and the stream.

Figure 1-06 Outlines the extent of the Los Laureles subwatershed with the stream.

The extensive investigation conducted by the City of Tijuana Planning Department (IMPLAN) in collaboration with national and binational organizations resulted in an in-depth sectioning of the subwatershed into micro watersheds that exhibit particular characteristics. Figure 1-07 shows how the subwatershed is further divided into seven micro watersheds.

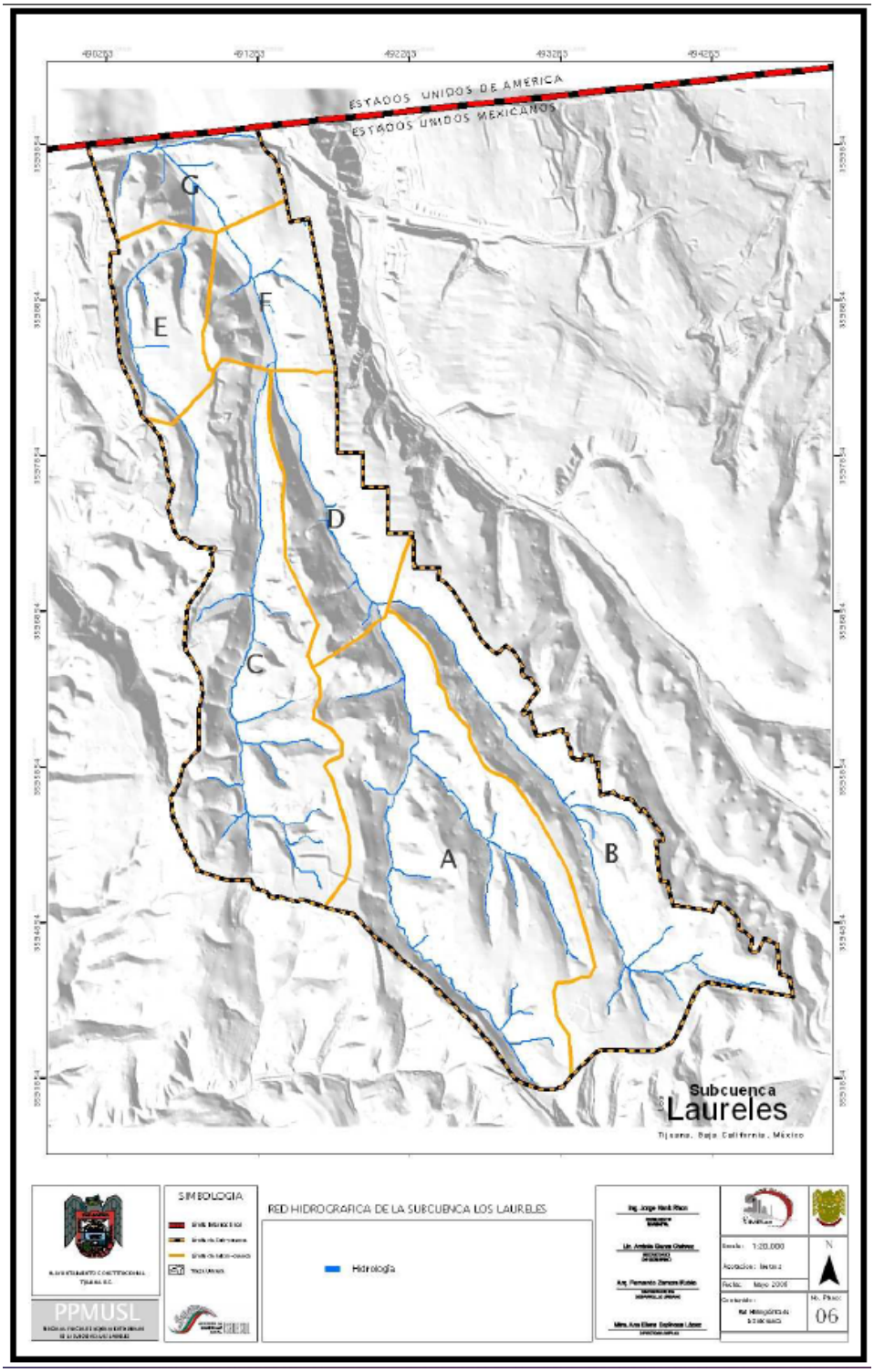


Figure 1-07 Deliniaring the subwatershed and hydrology of Los Laureles as well as the seven micro watersheds(IMPLAN, 2004.)

Table 1-01 outlines the general characteristics of each micro watershed. The urbanization state of each micro watershed supports the chronological establishment of migrants in the region, making the areas closest to the border more urbanized.

Name	Area (square miles)	Height above sea level (feet)	Longitude (feet)	Urbanization state
A (main channel)	1.12	131.23	10.82	mixed
B (right arm)	0.97	328.08	12.13	mixed
C (left arm)	1.11	180.44	9.84	90% not urbanized
D (intermediate zone)	0.39	65.61	6.23	mixed
E (lower left)	0.28	98.42	4.92	completely urbanized
F (lower right)	0.25	196.85	3.28	completely urbanized
G (border)	0.51	65.61	5.90	completely urbanized

Table 1-01 Characteristics of micro watersheds (Diagnostico Integral, 2004)

For clarity purposes I will refer to the Los Laureles subwatershed part of the Tijuana River watershed as Los Laureles watershed and the microwatershed regions as subwatershed of Los Laureles, given that the term watershed can be applied to different scales.

Decades of development

The earliest record of urban development captured by the city of Tijuana is from 1974 and calculates urban development at Los Laureles watershed at only 10.2%, after that, there are scarce records of the land use in this area, but another record dated 1986 mentions unusual sediment deposition at the end of the channel (Diagnostico Integral, 2004, PWA, 1999.) Considering the sudden influx of migrants looking to settle in Tijuana in the 1980s (D.Castellanos, Proyecto Fronterizo, personal communication, November 2022), we can understand how quickly the region became urbanized and the difficulties the local government had trying to cover the demand. Another factor is the presence of unscrupulous developers who worked outside the law and overdeveloped the region to make a profit. Because of the inability of the local government to enforce land use ordinances, predatory practices of developers were common in the area and were not subjected to legal consequences.

Between the 1970s and 1990s, there was a massive amount of earthwork in this region, leveling the sloping hills, creating terracings, and laying out gridwork to continue selling plots of land, targeting immigrants who were not informed of the city's zoning regulations (D. Castellanos, Proyecto Fronterizo, personal communication, November 2022.) The excessive urban development, scraped the native vegetation out, changed the topography of the land and in turned changed the morphology, producing excessive sediment to wash downstream. Hillsides and mesas were weakened by excessive terracing, residents had to provide their own sewer options since the city did not have utilities planned out for these areas. Hence residents started using the stream to flush out the human waste.

Sentiments

The inability to regularize property due to unlawful acquisition, the lack of city services, and the constant influx of migrants created a widespread sense of marginalization in the community that induced them to take matters into their hands and develop the land further by carving out more terraces in the hillsides, constructing their own homes, including plumbing lines that drained to the stream or in other cases septic tanks that were not properly built and maintained. By the 1990s, Los Laureles canyon

was well known for being a problematic area with many public health issues (Diagnóstico integral de la subcuenca hidrológica Los Laureles, 2004).

As urban development increased south of the border, north of the border consolidated its environmental protection efforts by establishing the Tijuana Slough National Wildlife Refuge in 1980. In 1982, it was designated as a Research Sanctuary, which gave way to the Tijuana River National Estuarine Research Reserve (TRNERR) (Saffran *et. al.,* 2017.) Launching a myriad of projects counteracting and investigating the negative effects the region was experiencing (Dr. J. Crooks, TRNERR, personal communication, November 2022.) As the region gained international attention as an ecological case study, the city of Tijuana expedited the efforts for infrastructure such as a sanitary sewer system that enhanced the community's quality of life, because it reached many dwellings in the valley and portions of the canyons that were not to steep. Specific infrastructure was placed to ameliorate the excessive sediment load downstream by constructing sandtraps. The channel no longer transported sewer, only urban runoff, and rainwater.

There have been many improvements to the problem of pollution in the region. Although the issue persists, the bigger issue lies in the amount of sediment transported every rainy season from Los Laureles into the estuary, suffocating and burying habitat in the estuary. Current dredging projects are being considered as a temporary solution (Dr. J. Crooks, TRNERR, personal communication, November 2022.)

Sediment deposition and pollution are symptoms of urban sprawl and squatting within Los Laureles canyon. The cause of these symptoms is complicated and out of this project's scope. I will only highlight the overarching factors: bureaucracy, lack of collaboration between agencies and elected officials, lack of resources, the apathy of immigrant settlers to the region's ecology, and local literacy levels, among others. (A. Eguiarte, TRNERR, personal communication, November 2022).

Diagnóstico integral de la subcuenca hidrológica Los Laureles, Tijuana, B.C. (Comprehensive diagnosis of the hydrological sub-basin Los Laureles in Tijuana Baja California) is a report produced in collaboration between IMPLAN, Instituto Mexicano de Tecnologia del Agua (Mexican Institute of water technology), International Community

Foundation, Coastal Training Program TRNERR, and Coastal Conservancy. The report offers solutions to the symptoms, acknowledges some of the causes, and proposes measures to regenerate the region. Among the ideas proposed are dry toilets to mitigate sewer pollution in dwellings with steep slopes, community recycling facilities to facilitate circular economy opportunities for community members, sand traps strategically located where most erosion occurs to prevent excessive sediment downstream, community native plant nursery to incentivize native plantings along the canyon and stop erosion and gully formation in the canyons. Among many options Hydroseeding is one of the alternatives proposed in the comprehensive plan, I would refrain from this alternative because it is not suitable for the region due to the topography of the region and maintenance.

In conversation with the community

To understand better the current conditions and extent of the urban development within the Los Laureles subwatershed, I am including a series of conversations with local community members that spontaneously occurred on my site visit as I was marking locations along the stream with e-trex Garmin hiking GPS on November 4th and 5th, 2022. Through these conversations, I better understood some of the communities' perspectives, struggles, and attitudes toward the stream.

Figure 1-22 illustrates the route taken in Los Laureles Basin and with arrows indicates where the photographs were taken.

Figure 1-22 Identified the route along the west fork of the stream and marks the locations of the interactions along the stream with the context of an aerial map.)

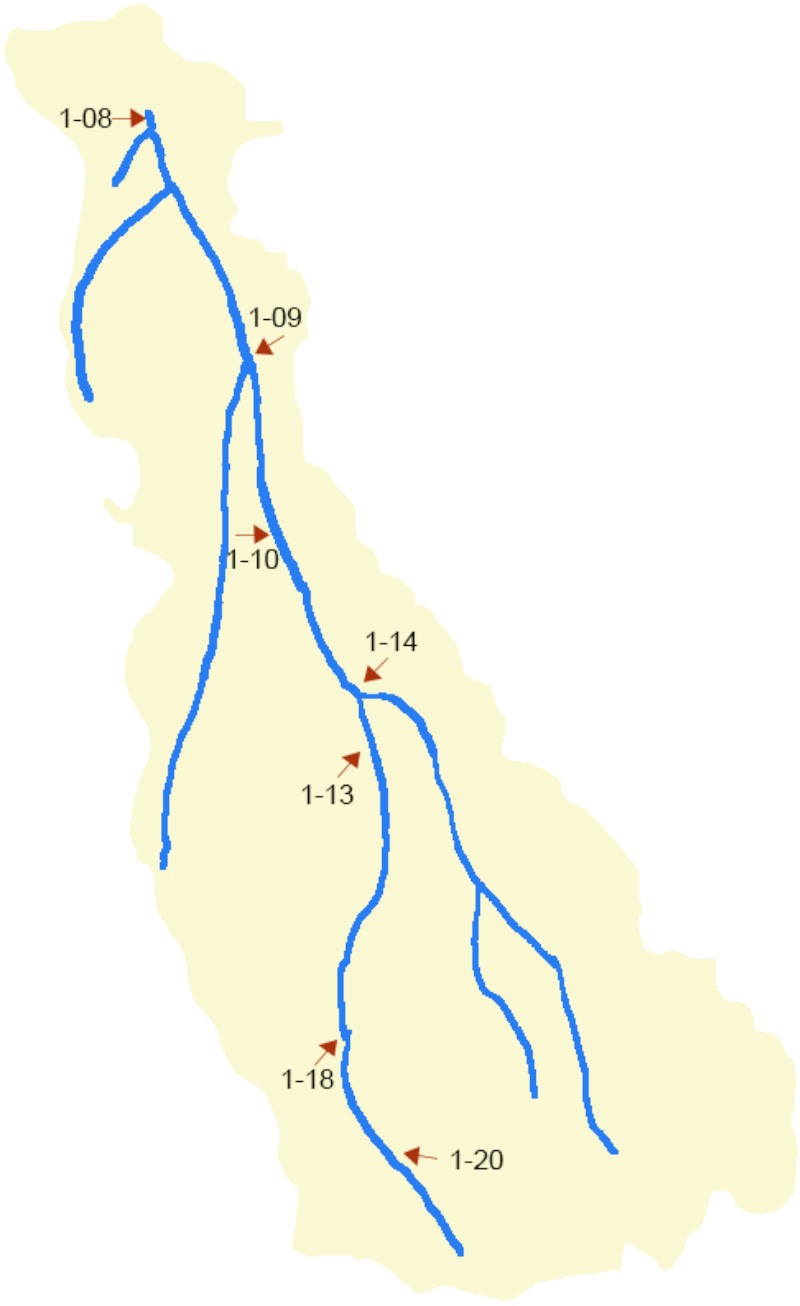


Figure 1-23 Shows the same information as figure 1-23 but without the aerial map for visual clarity.

As I was documenting the entrance of Los Laureles from the North side, micro watershed G, Figure 1-08, Tito Corrales approached me. He has been a resident of this area for over 6 years and expressed concern for the lack of infrastructure in the region. The rest of the conversation revolved around marginalization by the government. There was an apparent lack of information about the official land use zoning from the land he inhabited. Misses Licha who lives in the canyon overlooking this portion of the stream recounts how the area was regarded as pure wilderness only a few feet away from her parents house. “[My brothers and I,] ...we would go exploring ”.

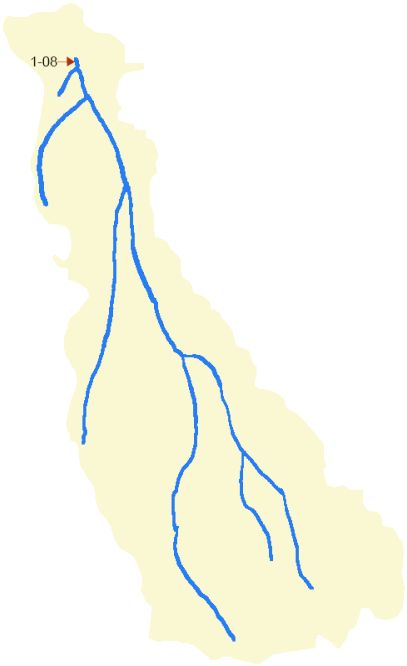


Figure 1-08 View of the informal settlement between Playas Road and the entrance of Los Laureles Community on the North (32.535358,-117.100402).

Figure 1-24 Shows the location of the first stop within Los Laureles watershed

When documenting the culvert/ pumping facility Los Laureles II Figure 1-09 that pumps sewage from the vicinities to be transported through pipes to the nearest treatment center. This facility is located at the entrance of sub watershed D, a cleaning crew swept the northern section of the channel. Natario y Firo were tasked to clean that portion a few days ago by local CESPT (Commission Estatal de Servicios Publicos Tijuana/ The State Commission of Public Services of Tijuana) workers. They mentioned

how hard it was to get a job, and this temporary job would do for a few days until they find something else. Both men claimed to be part of the community but were unaware of any problems relating to the channel. At this point of the stream, the surroundings are fully urbanized, with paved streets, lighting, and plumbing in nearby areas.

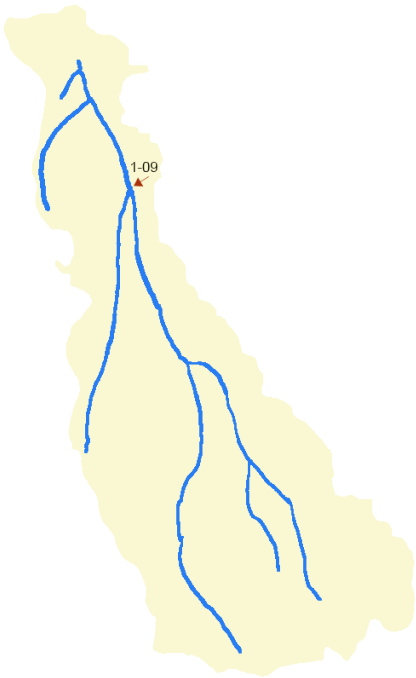


Figure 1-09 Culvert/Pumping station Los Laureles, (32.523478, -117.091621)

Figure 1-25 Shows the location of the second stop within Los Laureles watershed

Figure 1-10 and 1-11 are particularly interesting because it is a very active point since its the starting point for the local transit route. It is surrounded by convenience stores and churches. Carlo Perez parked his taxi in this location and waited for passengers to arrive. I asked about the recycle play structures, and he mentioned the project was a team effort between “some organization,” local churches, and community members, “we needed community spaces, we still do, and this is a good start.“ When I asked about the channel, he seemed well-informed about community issues and had a informed opinion about the channel and the sources of pollution. He noted that most people see the waterway as a hazard more than a benefit since, most of the time the

water is dirty and smells bad. He recognizes the efforts the community plays in keeping it clean but notes that it’s very hard to change people's habits.

Figure 1-10 and 1-11 transit stop and local park next to the channel (32.511724,-117.086461)

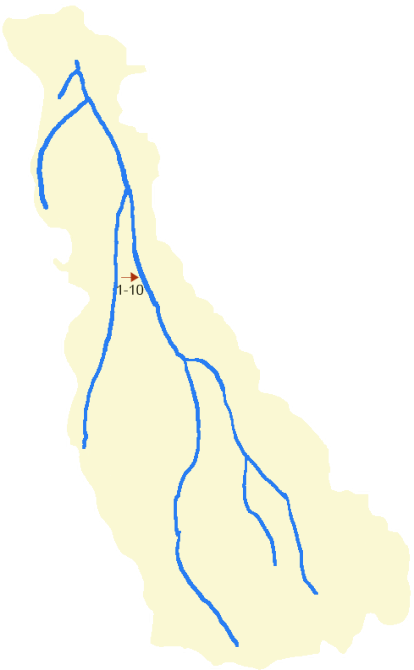


Figure 1-26 Shows the location of the third stop within Los Laureles watershed

As I continued to track the stream upwards, there was a point where the channel changed direction and was no longer visible from the street, looking at an aerial view of the region, I realized the stream was not culvered because there was dense vegetation forming a corridor between houses Figure1-12.

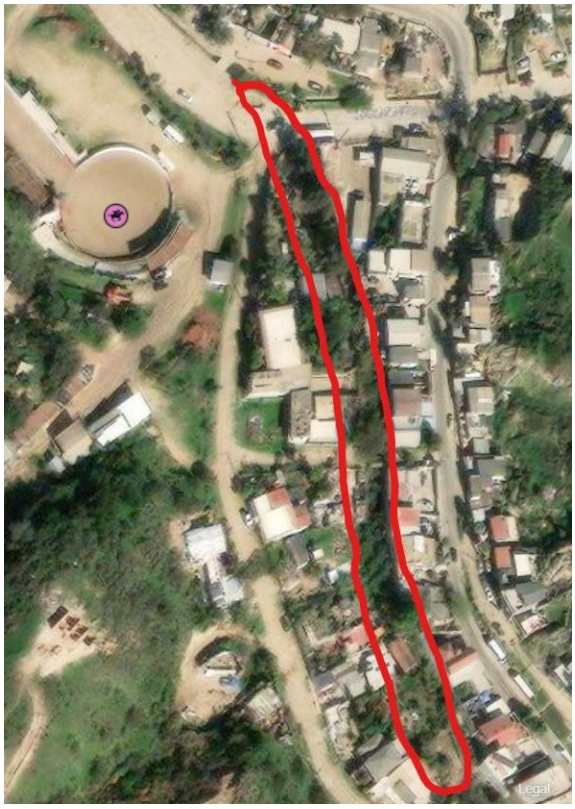


Figure 1-12 Aerial view showing dense vegetation. Figure 1-13 Above the channel looking down at the encroaching urban settlements (32.505925, -117.083453)

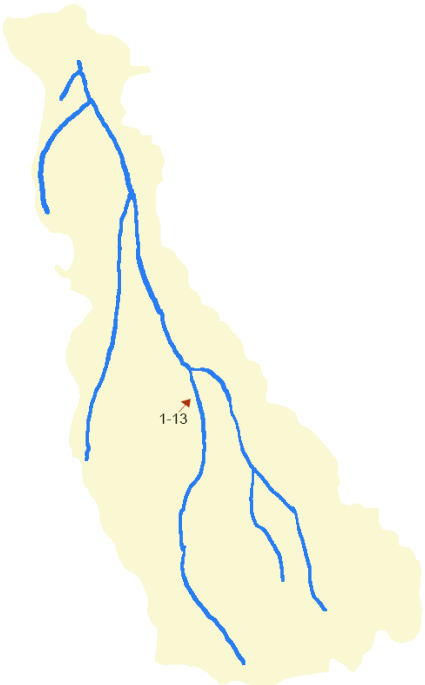
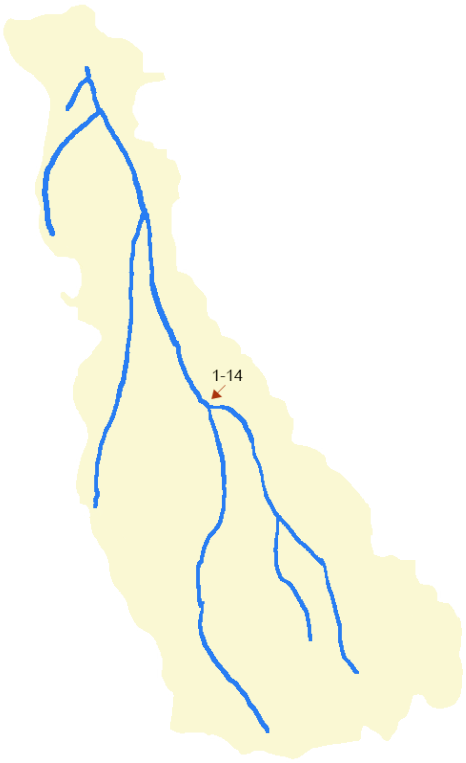


Figure 1-27 Shows the location of the fourth stop within Los Laureles watershed

Taking a closer look at the point where the channel changes direction it it not clear up to what extent it is formalized. Comparing it to the adjacent section Figure 1-14 shows the formality of the channel a few feet before the bend.Figure 1-17 shows the channel between properties. Incision is apparent by the exposure of footings, pollution from household chemicals is also aparent. This marks the end of sub watershed D.

Figure 1-14 Upper left shows the formalized channel along the street (32.509399, -117.084495). Figure 1-15 Upper right shows the bifurcation of the channel. Figure 1-16 Lower left shows the channel running under the street. Figure 1-17 Lower right shows the channel between residential lots.

Figure 1-28 Shows the location of the fifth stop within Los Laureles watershed



The development records of this area are not available to corroborate dates, but by analyzing the composition of this urban scape I can theorize that the residents established after the streets were laid but before the fomralization of the channel reached this area. This is important because when talking to the neighbors around Figure 1-13 it was evident they benefited from the ecological services the riparian corridor offered, Claudia Fernandez is a single mother of two, who lives in the riparian corridor with her mother who takes care of the children while she works, she does not spend much time at home but described the how much her mother enjoys the vegetation, “the kids seem to be learning a lot about plants.” On the downside, “Summer months are the worse because people upstream pour their waste into the channel and it smells horrible,” an easy fix is to avoid being home and the family takes it as an incentive to go out. Residents are aware it is a hazardous zone unable to do anything because for them this is home.

From this point on the stream runs between residential lots in sub watershed A, in and out of the streetscape until it emerges delineating a ranching area settled on the footsteps of a mesa. Further upstream following the westfork we find Parque Fronterizo. Figure 1-18 shows the stream unformalized and Parque Fronterizo in the right bank. And Figure 1-19 shows the amenities the park has (32.491122, -117.082843.)

Figure 1-18 Taken from the road that cuts across the stream looking north into the riparian corridor of the stream. Noting the tires along the banks used to stabilize the bank from erosion. Figure 1-19 is taken from the street looking into the terraces of the Fronterizo park (32.491122, -117.082843.)

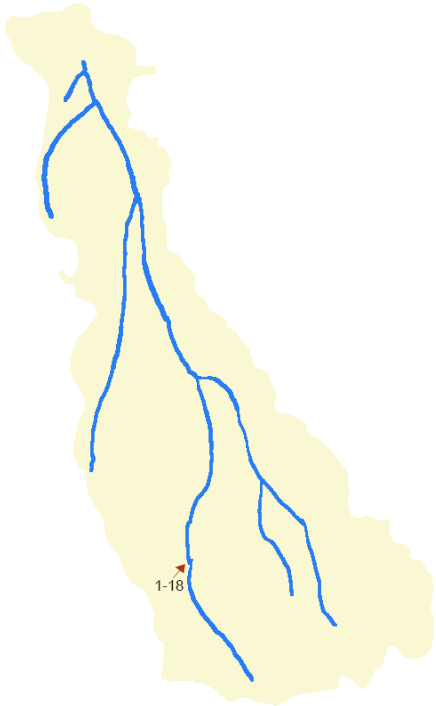


Figure 1-29 Shows the location of the sixth stop within Los Laureles watershed

Looking at the history of this park, Parque Fronterizo was inaugurated in 2012 as a solution for eroding terraces near the bank of the stream, Oscar Romo environmental activist and professor at UCSD in the urban planning department, worked with the community and several organizations to construct an eco friendly park for the community, where recycled materials were used in walls and retaining walls, also developed permeable pavers to let water seep in and reduce dust in the air (UCSD TV Los Laureles Canyon: Research in Action, 2009.)

On the other side of the road that divides the stream (Calle del Amanecer,) streetscape conditions change. The streets are not paved or leveled and its difficult to continue following the westfork of the sub watershed A. At this point I end my journey of the westfork of the sub watershed A within the subwatershed of Los Laureles (32.487092,-117.078721.)

Figure 1-20 shows the streetscape of the region (32.487092,-117.078721). Figure 1-21 is taken from Calle Amanecer looking South into the stream. At this point the channel is not urbanized, Acacias were planted to line the banks of the stream.

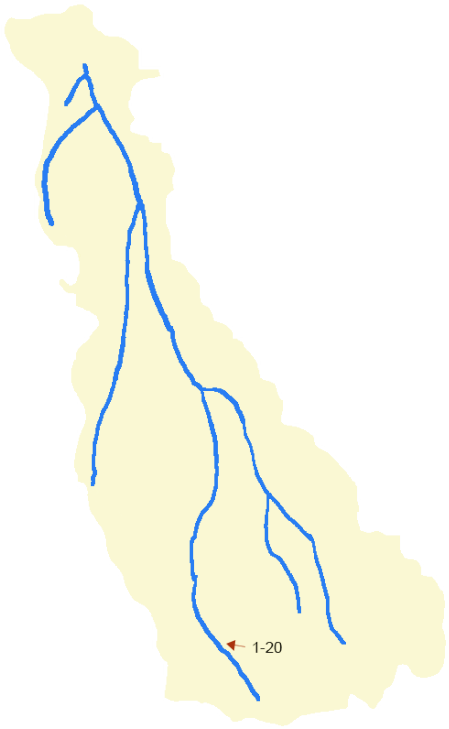


Figure 1-30 Shows the location of the seventh and last stop within Los Laureles watershed

Results

The history of Los Laureles Canyon is tied into the ecological degradation of the region. The founding members of this community had a connection to the stream and regarded the area as a sanctuary for diversity. Because Tijuana is a border town it develops at a much faster rate due to the constant waves of immigrants looking for better life opportunities. The Tijuana River Estuary is a sanctuary for many species and a working ecosystem that produces many benefits like food source for migrating birds as well as year round residences. As the political systems formalized in the region, the watershed and the ecology was divided between two nations. As the Mexican nation developed its territory the consequences were felt downstream in the Estuary as excessive loads of sediment washed downstream burying marshes and reducing the tidal prism.

It is important to conserve the estuary, therefore a series of investigations in Los Laureles gave insights of how much the development in the canyons and upstream in

the subwatershed was affecting the estuary. Los Laureles is a marginalized community that has experienced rapid urbanization and transformed it's seasonal stream into a flushing sewer system. As the circumstances in the community gained international attention, the city of Tijuana was pressured to resolve basic infrastructure in many sections of the watershed, and cooperate with international organizations to address the problems of pollution and sediment that are affecting the protected estuary.

In 2004, the city of Tijuana conducted a comprehensive diagnostics of the subwaterbasin and proposed several initiatives including: dry toilets for residents that are located in areas where plumbing lines are not feasible, an updates residential construction guideline specific to the region, sandtraps in strategic locations where erosion releases the most sediment, incentives for the community to recycle and to plant native species to stabalize banks and mesas. A number of organizations are working in the area and are promoting business development strategies to empower the community to make value out of the resources at hand.

All of these initiatives are well intended but have not come to fruition, when conducting my field research and speaking with community members (not a representative sample of the region, just a random occurence.) Most of them are unaware of the initiatives mentioned above. Parque fronterizo with Alter Terra and Proyecto Fronterizo were the only projects mentioned or viewed in the community.

Even though the previous studies are geared towards preventing deterioration of the Tijuan River Estuary, these same issues impact the comunities lives and play a big role in the quality of life of the inhabitants. By amending the relationship of the people with the stream there will be many benefits for the community and the ecology. Building upon the initiatives already proposed. Below is a list of projects easy to implement in the community.

- Making the information in the comprehensive diagnosis report accessible to the community. By informing people of their surroundings they will likely be curious about their own community and the role they play in the bigger landscape.

- Identify schools in the Los Laureles watershed and create a science project to make a scale model of their watershed, different schools could then meet and compare notes on the ecological and social characteristics of various subwatersheds within Los Laureles watershed.
- Harvesting and sewing native seeds and subsidizing them to the vendor who are established at farmers markets to commercialize and inform customers about native plants, this will allow a faster spread of native plants at a subsidized rate
- Where graywater runoff is identified, promoting native plants that treat greywater. List in Table 1-02 (Deva Luna, 2014)

Below suggestions can require infrastructure and build upon existing or proposed solutions to be executed in a medium timeframe:

- Exhibition corridor: This will be a transect of the subwatershed comprised of a portion of the stream and the adjacent canyon and execute a planting that resembles the landscape established before urban development. Providing a softbottom in the stream, stabilizing the banks with biodegradable mats, and establishing filtering material at the high ground of the channel bed so the water is cleaner.
- Provide a technical certification to residents promoting stweardship of the waterbasin.

Conclusion

Los Laureles canyon is an important tributary to the Tijuana River, and has the fortune and misfortune to be located in a borderland. Fortunate because of the increase in pollution and sediment that the urban development is having downstream in the estuary, burying the ecosystem, is stimulating advocates to respond to the social problematic of the region. This generates an international polemic thus putting pressure on local authorities to resolve the situation. The misfortune comes precisely from the fact of having a borderland location. It is an attractive place for immigrants that have no

ties to the community or ecology. Although the founding members were immigrants themselves, there is little difference between the modern immigrant and the founders.

Both arrived at Los Laureles Canyon with the hope of a better life, both took matters into their own hands and constructed their own dwellings. A difference I want to introduce is the decay of the ecosystem, government marginalization, and the impacts on the communities psyche. The natural stream that invited early settlers was converted into a concrete channel that once carried sewer, with time, sewer lines were installed, and water quality increased. Despite that, the channel's image will never be the same. The restorative properties of nature are well known and documented, and since the natural aspect of this community has been taken away, the community cannot recuperate from the lack of green infrastructure. We must realize that the struggle for better living conditions and the betterment of the environment are one and the same.

With this in mind, I am proposing to target the community's future leaders. By attracting youth with ecological activities about their watershed, curiosity can be instilled that will sprout care and engagement for their environment. Re-introducing native species and making them available to everyone will prevent erosion and help retain sediments ameliorating a major problem in the downstream estuary. While strategically placing native vegetation that filters greywater will improve water quality. As youth take action in their own community, a certificate of ecological stewardship will be available and allow for easier access to local stewardship jobs like the exhibition corridor/ecological center.

The community in Los Laureles watershed has struggled to meet their basic necessities, due to the marginalization of the local governments not investing in utilities and urban amenities. In the absence of an involved government, many social and non-profit institutions on both sides of the border have stepped in and helped the community move forward. Now, after decades of underrepresentation, the government expects a mentality change and the cooperation of the community for their new projects. Community members are hesitant to believe in the government's efforts in their community, nevertheless, this situation requires a leap of faith on both parts.

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- Figure 1-07 IMPLAN, Diagnóstico integral de la subcuenca hidrológica Los Laureles, Tijuana, B.C., 2004
- Table 1-01 IMPLAN, Diagnóstico integral de la subcuenca hidrológica Los Laureles, Tijuana, B.C., 2004
- Table 1-02 Deva Luna, Graywater in Your Garden, California Native Plant Society,Santa Clara Valley Chapter, 2014.

Tables

Table 1-02

Type	Common name	Botanical name
Perennials	Western Columbine	*Aquilegia formosa*
	Mugwort	*Artemisia douglasiana*
	Wild Ginger	*Asarum caudatum*
	Sedge	*Carex* (all)
	Stream Orchid	*Epipactis gigantea*
	Horsetail	*Equisetum*
	Wire Grass, Rush	*Juncus* (all)
	Scarlet Monkeyflower	*Mimulus cardinalis*
	Seep Monkeyflower	*Mimulus guttatus*
	Hooker Evening Primrose	*Oenothera elata*
	Redwood Sorrel	*Oxalis oregana*
	Monkeyflower Savory	*Satureja mimuloides*
	Golden-eyed Grass	*Sisyrinchium californicum*

	Goldenrod	*Solidago* (all except californica)
Grasses	Pacific Reedgrass	*Calamagrostis nutkaensis*
	Red Fescue	*Festuca rubra*
	Deer Grass	*Muhlenbergia rigens*
	Alkali Sacaton	*Sporobolus airodes*
Trees	Alder	*Alnus* (all)
	California sycamore	*Platanus racemosa*
	Cottonwood	*Quaking Aspen Populus* (all)
	Western Red Cedar	*Thuja plicata*
	California Bay	*Umbellularia californica*
	California Fan Palm	*Washingtonia filifera*
Shrubs & Subshrubs	Spicebush	*Calycanthus occidentalis*
	Creek Dogwood	*Cornus sericea*
	Poverty Weed	*Iva hayesiana*
	Pacific Wax Myrtle	*Myrica californica*
	Western Mock Orange	*Philadelphus lewsii*
	Golden Currant	*Ribes aureum var.gracillimum*
	Elderberry	*Sambucus* (all)