Indigenous Mapping for Integrating Traditional Knowledge to Enhance Community–Based Vegetation Management and Conservation: The Kumeyaay Basket Weavers of San José de la Zorra, México

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Abstract: Kumeyaay people were historically hunter-gatherers with a strong relationship with their natural resources. Due to various processes, such as missionary colonization, agrarian reform, and the definition of the border between the USA and Mexico in 1838, the Indigenous populations faced reduced mobility within their territory and modified their lifestyles, highly related to landscape and plants. One of their strong traditional practices associated with plant resources, basket-making, has likewise changed. Today, this activity is one of the most important sources of income for many of the families in the community. Nevertheless, this is being now threatened by the loss of vegetation cover, from which they obtain primary basket-making material and is now far from being environmentally and economically sustainable. An interdisciplinary group is addressing this problem from a multidisciplinary perspective and through a participatory methodological approach based on community mapping to enable the integration of local and scientific knowledge and to create vegetation management and conservation actions. Community-based Indigenous mapping has proven to be a powerful tool for the integration of traditional knowledge and its various dimensions, and knowledge integration between traditional and scientific knowledge has been successful. The project allowed for plant population analysis and adequate decision-making regarding natural resources management and conservation. The methods developed in this research represent significant progress in the development of internal capacities and empowerment of the community.

Keywords: transdisciplinary research; knowledge dialog; participatory mapping; qualitative analysis; community-based management

1. Introduction

Yumans are an ethno-linguistic family composed of 15 ethnic groups distributed in the states of Baja California and Sonora in Mexico and in the states of Arizona and California in the United States [1]. The Yuman groups in California are Tipai, Ipai; in Baja California, they are Kumeyaay, Pa Ipai, Kiliwa, and Cucapá; and in Arizona are the Cocopah, Maricopa, Quechan, Mojave, Yavapai, Hualapai, and Havasupai [2]. According to records of European explorers, missionaries, and various ethnographic studies, approximately 1300 years ago, the ancestors of the Yumans inhabited the bi-national region of California/Northern Baja California [3]. The Kumeyaay tribes and their sister Yuman tribes survived in the
vast territory of Baja California and California as hunter-gatherers, moving seasonally according to patterns of migration and reproduction of vegetal and animal species, as well as to the seasonality of climatic conditions [4]. The ancient Kumeyaay tribes have lived in wild environments, and their adaptation occurred through their tribal and social practices. These practices were varied and consisted of activities, such as plant gathering and wildlife hunting, as well as complex activities, such as controlled plant pruning, vegetation burning to control soil erosion, manipulation of oak acorn production, and pest control in pine and oak trees [5]. Prehistoric human hands have sculpted the bi-national region of California/Baja California since ancestral times. Anderson [6] compared these modifications in magnitude with the same region’s modifications by earthquakes, lava flows, floods, fires, and storms. In the same way, wild landscapes had a remarkable influence on the Kumeyaay way of living and cosmovision. Kumeyaay people view their natural landscape as a living home and have constructed a cultural landscape around it [7].

Due to various processes, such as missionary colonization, agrarian reform, and the definition of the border between the USA and Mexico in 1838, the Indigenous populations faced reduced mobility within their territory and modified their lifestyles. One of the consequences of these processes has been the alarming loss of their language, which is also a loss that diminishes the traditional knowledge because language is the main tool to build and organize the natural world, create taxonomies, and convey that knowledge [8]. Because the historical relationship between the landscape, plants, and the Kumeyaay Indians has been affected by these processes, traditional practices associated with plant resources have changed.

One practice that has been affected by these historical changes is basket-weaving from two plants, Spiny rush (*Juncus* sp.) and willow (*Salix* sp.). Historically, the Kumeyaay made baskets for collecting, preparing, and storing food. Nowadays, basket-weaving is still done in San Jose de la Zorra and to a lesser extent in Juntas de Nejí. Nevertheless, basket-making is nowadays an artisanal craft, and sales from this practice support the group’s subsistence, thus representing one of the most important monetary income for many of the families in Kumeyaay communities [8]. To collect plant material for the baskets, leaves from the willow tree and branches of spiny rush are strategically pruned to leave healthy plants to prune in the future. For spiny rush, they collect branches, dry them out for several days, and then unravel and soak the material in water to make it pliable [9]. Among the most common crafts are the “sawil”, which is a plate commonly used by the Indigenous people to clean seeds, and the “jilú”, a resembling cooking pot to store wild seeds [9].

The Kumeyaay Indigenous people have traditional knowledge about this ancient activity of pruning and basket-weaving. This knowledge is eroded, barely surviving, but there is a crucial body of knowledge that can be traceable through current expressions. These expressions are deeply rooted in the Kumeyaay culture and the self-regulatory moral rules to prevent the overuse of the plants. Examples of these are the fact that they only prune the plants three days after and before the full moon to acquire better quality material; and that women are not allowed to prune during their menstrual cycle because, otherwise, the plants become stained after drying. These beliefs are part of the Kumeyaay’s cosmovision and evoke ancient traditional activities and the associated knowledge. This type of ancient wisdom is referred to as traditional ecological knowledge (TEK). This knowledge is a cumulative body of knowledge about the relationships of living things and their environment, evolving through adaptive processes and transmitted through cultural forms from one generation to the other [10].

Nowadays, environmental science tends to prioritize the use of transdisciplinary approaches to incorporate a different kind of knowledge, including TEK. The use of these approaches underlies the recognition that environmental problems are intrinsically complex and need to be approached through a wide diversity of disciplines [11]. This way to do science resides on the shift from “science for society to science with society” [12–16]. These approaches are grounded on an ontological posture that enables logical interaction and communication between tacit and empirical knowledge with scientific knowledge, among
other perspectives and epistemologies [11,17]. Due to their intrinsic complexity, rural and Indigenous environmental problems demand this relatively novel way to do science: science with rural and Indigenous people rather than science for them.

In this context, participatory approaches stand out as a framework to address socio-environmental problems in rural and Indigenous backgrounds. Participatory approaches began in the early 1980s with a methodology called Rapid Rural Appraisal, which evolved into a family of approaches and methods now called Participatory Rural Appraisal [18,19]. Nowadays, these approaches are a widely used group of methods, of which participatory mapping is the most widespread vibrant area of practice, recognized as an area of study in its own right [20,21]. In this article, we refer to participatory mapping as the method in a general and broad sense, and Indigenous mapping to refer to the method implemented in this research.

Participatory mapping has proven to be a powerful tool for recovery and integrating traditional knowledge and its various dimensions with scientific knowledge [22–24]. The views and perspectives of local people can be represented spatially through participatory mapping and thus, encouraging an autonomous decision-making process independent of trends or patterns followed by local governments [25–27]. Moreover, it has proven to be useful in increasing public participation [28,29] and in promoting various dimensions of governance [30,31]. This method is also defined as a counter-mapping approach as it enables local communities to take control of the mapped spaces, challenging political limits and altering land use categories [32]. It should also be noted that creating participatory maps in itself claims to be an empowering process that enables local participants to make autonomous decisions and to transform those decisions according to their perspectives and desired outcomes [33–35]. Empowerment has been widely discussed and thus has several definitions. For this, it is necessary to describe how empowerment should be understood. In this research, empowerment is considered as a process of enhancing a group’s capacity to make purposive choices and to transform those choices into desired actions and outcomes [36]. Moreover, empowerment can be individual or collective, meaning, in the last case, societal change. Often these changes are described from anecdotal perspectives but are not measured. Thus, we do not know about the extent and duration of these changes [22]. Empowerment should be measured and described beyond anecdotal experiences [22].

In recent times, San José de la Zorra’s Kumeyaay community has begun to question the natural resources’ conservation status, which is the primary material for their traditional activity. Basket-weaving has changed from an ancient to an economy-driven activity. Because of this, the pressure to increase craft production is a determinant to increase monetary income. Due to this, there is more pressure on the plants and a noticeable reduction of spiny rush and willow coverage in the area. The Indigenous community needs to create a conservation and management plan for spiny brush and willow in order to improve basket-weaving activity to make it economically and ecologically sustainable. To do so, it is not only necessary but fundamental to recover traditional knowledge related to the activity. This conservation and management strategy cannot be conceived in any other manner than as a participatory and transdisciplinary process. Likewise, the participatory mapping should be a crucial tool to enable the recovery of Kumeyaay traditional knowledge and its integration with ecological perspectives.

In this article, we describe a process of participatory research based on a transdisciplinary paradigm. This process used Indigenous mapping as a crucial tool. The objectives to achieve are to map Indigenous knowledge and ecological aspects of spiny rush and willow and create a conservation and management plan that leads a community-based strategy to restore, manage and conserve the plants with importance for basket weavers, to promote the empowerment of the Indigenous community. First, in the material and methods section, we describe the iterative process based on research. Then we describe the results of each phase of the iterative process. After this, results are discussed, and lastly, based on results, a remarkable conclusion in the corresponding section.
2. Materials and Methods

The Kumeyaay community of San José de la Zorra is located between the municipalities of Ensenada, Tijuana and Tecate in Baja California, Mexico, approximately 45 km from the US–Mexico international border (Figure 1).

![Figure 1](image-url)  
**Figure 1.** Map with location of the Kumeyaay community. This figure shows the location of the polygon in relation to the municipalities of Ensenada, Rosarito and Tijuana. It also shows its macro-location in Baja California, Mexico and the proximity to the United States of America border.

This work was done by an interdisciplinary group of teachers, students, and researchers linked to the Graduate Master’s program in Arid Ecosystems Management (MEZA for its initials in Spanish) at the Autonomous University of Baja California [37]. Due to MEZA’s tradition and philosophy, it was possible to address this problem from a multidisciplinary perspective and through a participatory methodological approach. This approach is an iterative process consisting of six phases and various stages [38]. The six phases are:

1. Preparation;
2. Information;
3. Training;
4. Research;
5. Analysis;
6. Management.

Dynamic knowledge interexchange between the technical and local participants occurred during these stages, achieving continuous feedback throughout the process (Figure 2). The members adopt an ontological position of respect and recognition to this different kind of knowledge to address all the phases. This approach is known as knowledge dialog [17].
The material and methods section is described in accordance with the phases of the research. For didactical purposes, this section is described in a broad summarized manner as it underlies a participatory decision process.

2.1. Preparation Phase

The preparation phase corresponds to goal establishment and team members’ recognition. This phase is based on workshop development, in which all team members are acknowledged, and the transdisciplinary team is created.

2.2. Information and Training Phases

According to the iterative process described above, the information stage and training stage follow the preparation phase. These phases have similarities in the sense that both can be labeled as training. The difference lies in that the information phase considers the theoretical training, and the training phase considers the technical learning process or practical training. Nevertheless, both phases were developed based on participatory workshops. It should be highlighted that the workshops were intended to build and strengthen the self-diagnosis and community management of natural resources. Theoretical training (information phase) included topics, such as the life cycle of plants, plant physiology and ecology; sampling techniques of plant species; thematic maps, map projections, coordinate systems, and global positioning system (GPS). All the described topics were fully covered in four workshops. Technical training (training phase) took place in the field and included how to use the GPS, conduct plant sampling techniques, georeference sites, and integrate information in a database. Four workshops were developed in order to cover all areas of theoretical training.

2.3. Research Phase

Once information and training phases took place, the teams conducted the research activities. These activities were divided into Indigenous mapping sessions and participatory field surveys of spiny rush and willow.

Within the framework of the participatory research phase, the transdisciplinary team created a series of thematic maps of the community and the use of spiny rush and willow within the boundaries of the Kumeyaay community. For those thematic maps, the Kumeyaay members of the team took a key role in mapping historical and current pruning sites, as well those where they recognize sites with low and high plant densities. Roads, houses, places with cultural importance for the community, and traditional and economic activities were also mapped using the same method. The method consists of using a high-quality satellite image of the community and translucent paper over it, enabling the team to see the image and to map into detail the features of the satellite imagery (Figure 3). As part of mapping activities, a working session was carried out at the computer lab in the

![Figure 2. Iterative process of methodological approach. The six phases are shown in different rounded rectangles, and circles of colors represent the main activities of each phase; black arrows represent the continuous feedback on each phase. Source: own production based on Eaton et al. [39] and Jiménez [38].](image)
Faculty of Sciences of the Autonomous University of Baja California (UABC), where the members of the community learned to use Google Earth to generate thematic digital layers.

Figure 3. Kumeyaay members discussing and mapping the historical and current pruning sites of spiny rush and willow. The satellite imagery and transparent paper over it, which correspond to the Indigenous mapping method used in all mapping activities, can be seen in the image above.

Using all the thematic maps as a basis, the team decided on the places to conduct the field surveys. The team was divided into four smaller teams to conduct field activities and to cover all sites more effectively. The willow sampling method consisted of sampling plots of 20 m length per transect lines of 3 m wide separated by 50 m between sampling plots, and for the spiny rush 5 m radius circles with a separation of 50 m between sampling plots. (Figure 4). All teams surveyed a total of 242 sampling plots for Spiny rush and 247 sampling plots for willow, located on 4 four zones, respectively (Figure 5).

Figure 4. Sampling methods for each vegetative species. Above is the sampling method for willow, which consists of 3 × 20 m plots separated by 50 m per plot; the second image corresponding to the sampling method for the spiny rush, which is based on circle sampling plots with a 5 m radius separated by 50 m between sampling plots.
Figure 5. Map with the zones where the transdisciplinary team conducted the vegetation survey. The figure shows in red the polygon of the community of San José de La Zorra; blue wavy lines represent the most important streams. The houses and important sites are represented by red pentagons, and each zone with different colors. The green polygon is zone 1, the blue polygon zone 2, zone 3 is represented with a violet polygon, and the yellow polygon represents zone 4. All zones’ polygons are represented with a transparency of 50%.

For each individual of both vegetative species, height and two width measurements were taken (Figure 6). All data were recorded in a paper datasheet. Each sampling plot coordinates were recorded with GPS at universal transverse Mercator zone 11 projection and WGS 84 data.

Figure 6. Sampling vegetation techniques: (a) shows a member of the Kumeyaay community measuring the height of a spiny rush plant; (b) shows the transdisciplinary team recording measurements of willow plants.
Indigenous maps of the historical and current pruning sites were digitized using a digitizing tablet. The layers generated with Google Earth were compiled and ordered. Both products were exported to a vector format.

2.4. Analysis Phase

For the analysis phase, all data were analyzed on participatory workshops that promoted feedback and discussion about the data and results. All sub-teams evaluated their data and calculated the frequencies, densities, and volumes per site for both plant species. To calculate the volumes of each plant, the following equation was used:

\[ v = \left( \frac{\pi \cdot r^2 \cdot h}{3} \right) \cdot f \]  

(1)

This is a general formula to calculate the volume of a cone. We used the cone formula over spherical considering that the overall form of these two species is conical. Given that the plants are not a perfect geometric and solid cone and have spaces between branches and leaves, a correction factor (f) or morphic coefficient is applied, determining the plant volume as a fraction of the solid regular geometric figure of reference [39,40]. For spiny rush, the correction factor was 0.3 and 0.5 for willow. We used these correction factors comparing the volume determined by reference figure against the real volume occupied by the biomass of the plant. Once all the calculations were made, each group presented their results and discussed preliminary management and conservation options based on those results.

In addition, we analyzed the volume needed to create baskets and other art crafts. This calculation was made by the artisans of the team, which determined the required amount of both plants to create baskets and other crafts and calculated the average harvest amount of each plant per month. To see more detail of these calculations, see Eaton et al. [41]. Considering that artisans only prune spiny rush plants that measure over 1.11 m height and 2.51 m height for willow, the team calculated the available volumes per zone by adding the available volumes in the sampled site.

Within the framework of the analysis phase, a specific decision-making session where all the results of each group, including Indigenous mapping and results of vegetation analysis, was conducted to collectively decide the management and conservation actions for spiny rush and willow within the recognized boundaries of the Kumeyaay tribe. The Kumeyaay participants of the transdisciplinary team held a primary and key role during this session as they led the discussion and decided on management and conservation actions. This session was based on visualization of the results through Google Earth, where all vectorized data were presented, and by discussing the conservation status of spiny rush and willow based on the results of the ecological monitoring as well spatial distribution of the calculated volumes for each plant. By categorizing the surveyed zones based on available volumes of plants, their proximity to the houses, and threats for the plants, such as cattle, the Kumeyaay tribe decided the potential use and management rules.

In addition to the iterative process, a semi-structured interview was implemented after concluding the research. The interview was designed according to Soriano’s [42] criteria and was applied to learn participant opinions regarding the use of Indigenous mapping in the context of management of natural resources in their community and to evaluate the building capabilities process. It was applied to a representative sampling of 10 community members from a total of 16 participants. This interview asked if they were able to return to take plant samples, mark points with the GPS and generate layers with Google Earth, and regarding the usefulness and potential of these methods and Indigenous mapping.

The interviews were recorded with the proper consent of the people interviewed. For the analysis, the results were transcribed, then coded manually, analyzed and synthesized. This thematic analysis was implemented on the basis of Gibbs et al. [43].
3. Results

Considering that the project’s development was based on several phases, this section is described according to these phases to provide a more precise description of the results. Nevertheless, in the discussion section, the results are approached in a broader context.

3.1. Preparation Phase

Regarding the preparation phase, the main result was forming the transdisciplinary team. This team was composed of a wide variety of disciplines coming from natural science bachelor students with different interests, like plant physiology, ecology, community development, management, and conservation; academic/researchers with different backgrounds; Kumeyaay people with different roles in their community, such as artisans and cattle ranchers. Given the nature of the project and considering knowledge dialog as the ontological posture of the team, several ground rules were established to prioritize knowledge exchange. During this workshop, the team decided on the main goal and made agreements regarding the methods and techniques to conduct during the project’s process development.

3.2. Information and Training Phases

16 Kumeyaay members, 11 women and five men participated in the whole participatory process. The non-Kumeyaay members of the team were three women and three men. In total, 14 women and eight men participated during the entire process.

A total of four workshops were implemented for the theoretical workshops; four for the technical workshops, including the session in the cartography and computer lab of the Autonomous University of Baja California, and the vegetative reproduction workshop in Mexicali, Baja California.

3.3. Research Phase

The transdisciplinary team produced four maps with the location of houses and culturally, social, and economically important sites. On these maps, it is possible to see the houses of the families of the community and sites of shared interest, such as schools and traditional sites. Regard economic activities, the team created four maps with the precise polygons per each economic activity within and outside the boundaries of the tribe-recognized polygon. The mapped activities were cattle ranching and agriculture of local and neighboring ranches. Moreover, the team manages to rescue knowledge of historical pruning sites as well as sites where the Kumeyaay tribe has been collecting other vegetation for traditional activities, such as ceremonies and traditional medicine since ancestral times. Figure 7 shows two examples of these Indigenous thematic maps.

During the participatory research stage, the team evaluated a total of 247 sampling plots of willow and 274 sampling plots of the spiny rush. A total of 965 willow plants and 1112 spiny rush plants were measured.

3.4. Analysis Phase

According to the analysis of volumes and frequencies for willow, zone number 4 showed the lowest number of plants and volumes, followed by zone number 3 and 2, respectively. Zone number 1 showed the highest numbers of plants and volumes (Table 1). In contrast, the analysis of frequencies and volumes for spiny rush showed overall low frequencies and volumes in the zones. Zone 2 had no plants, and zone 1 had low numbers of plants and low volumes, followed by zone 4 and 3 with a few more plants and volumes (Table 2).
Figure 7. Indigenous thematic maps: (a) Example of a thematic map with the roads and streams of the community; (b) example of a thematic map with pruning sites for the spiny rush.

Table 1. Frequencies and volumes of willow per zone. This table shows the frequency and volume of willow per zone according to height categories. The final row represents the totals per zone. The total number of willow plants for all zones was 956, and the volume for all zones was 79.53 m$^3$.

| Height Category | Zone 1 | Zone 2 | Zone 3 | Zone 4 |
|----------------|--------|--------|--------|--------|
| 1 (0–1 m)      | 127 plants/2.48 m$^3$ | 0 plants/0 m$^3$ | 116 plants/5.02 m$^3$ | 7 plants/0.29 m$^3$ |
| 2 (1.01–2.50 m) | 144 plants/107.66 m$^3$ | 58 plants/86.44 m$^3$ | 36 plants/18.53 m$^3$ | 51 plants/73.93 m$^3$ |
| 3 (2.51–5 m)   | 160 plants/757.53 m$^3$ | 78 plants/526.46 m$^3$ | 66 plants/645.30 m$^3$ | 45 plants/258.38 m$^3$ |
| 4 (5.01–8 m)   | 46 plants/990.74 m$^3$ | 4 plants/56.81 m$^3$ | 21 plants/472.78 m$^3$ | 2 plants/15.63 m$^3$ |
| 5 (8 m–above)  | 0 plants/0 m$^3$ | 0 plants/0 m$^3$ | 3 plants/123.91 m$^3$ | 1 plant/46.51 m$^3$ |
| Totals         | 477 plants/1858.41 m$^3$ | 140 plants/669.71 m$^3$ | 242 plants/1265.54 m$^3$ | 106 plants/394.74 m$^3$ |

Table 2. Frequencies and volumes of spiny rush per zone. This table shows the frequency and volume of spiny rush per zone according to height categories. The final row represents the totals per zone. The total number of spiny rush plants for all zones was 1112, and the volume for all zones was 4188.0 m$^3$.

| Height Category | Zone 1 | Zone 2 | Zone 3 | Zone 4 |
|----------------|--------|--------|--------|--------|
| 1 (0–0.5 m)   | 28 plants/0.18 m$^3$ | 0 plants/0 m$^3$ | 664 plants/0.13 m$^3$ | 15 plants/0.31 m$^3$ |
| 2 (0.51–0.80 m) | 2 plants/0.02 m$^3$ | 0 plants/0 m$^3$ | 67 plants/0.45 m$^3$ | 27 plants/0.70 m$^3$ |
| 3 (0.81–1.10 m) | 2 plants/0.11 m$^3$ | 0 plants/0 m$^3$ | 57 plants/2.97 m$^3$ | 50 plants/0.64 m$^3$ |
| 4 (1.11–1.40 m) | 14 plants/2.22 m$^3$ | 0 plants/0 m$^3$ | 94 plants/13.67 m$^3$ | 22 plants/3.47 m$^3$ |
| 5 (1.41 m–above) | 0 plants/0 m$^3$ | 0 plants/0 m$^3$ | 50 plants/17.44 m$^3$ | 20 plant/18.40 m$^3$ |
| Totals         | 46 plants/2.54 m$^3$ | 0 plants/0 m$^3$ | 932 plants/34.67 m$^3$ | 134 plants/24.81 m$^3$ |

According to available volumes, zone 1 has 2.22 m$^3$ of spiny rush and 1748.27 m$^3$ of willow; zone 2 has 0 m$^3$ of spiny rush and 583.27 m$^3$ of willow; zone 3 has 31.11 m$^3$ of spiny rush and 1241.99 m$^3$ of willow, and zone 4 has 9.88 m$^3$ of spiny rush and 321.52 m$^3$ of willow. It is important to highlight here that available volumes were calculated on the basis that the artisans only prune spiny rush plants with a height over 1.41 m and 2.51 m for willow.

Based on the above results, three main conservation categories were defined:

- Conservation;
- Restoration;
- Usage.
The conservation category comprises areas where no pruning was allowed, and conservation actions should be prioritized. The restoration areas were classified as sites with a need to restore the vegetation and to implement actions to ensure reforestation success, and the usage category comprises areas where moderate use of both species was allowed. It is important to highlight that classification of the areas was based on the overall analysis of frequencies and available volumes of each plant species and the socioeconomic factors of the community, such as accessibility to sites. These decisions were taken by the Kumeyaay members of the team.

Given that zone 1 has scarce volumes of spiny rush and even though it has the highest available volumes of willow, it was classified as a restoration area. This decision was made by the Kumeyaay member based on the agreement to designate another zone for the usage of both plants. Zone 2 was also designated as a restoration area because it showed no spiny rush plants even though it is a historical pruning site and the second-lowest volume of willow. These two areas are the closest zones to the houses; therefore, they are the most commonly used as pruning sites and correspond to historical pruning sites. Considering these two areas are historically the most pressured zones, they were classified as restoration areas. Zone 3 has the highest available volumes of spiny rush and has the second-highest volume of willow. Because of this, it was classified as a usage area where pruning of both species was allowed. Zone 4 has a moderate amount of spiny rush and willow; therefore, it was cataloged as a conservation area.

Figure 8 shows the categories in their spatial location in relation to the houses and important sites as well to the community’s polygon. It should be noted that the areas go beyond the recognized limits of the current polygon, and the causes and implications of this are discussed in more detail further in the article.

Figure 8. Map with conservation and management categories. The figure shows the restoration category with a red polygon. The specific site designated by the Kumeyaay members as the site to be restored located in the northwest part of the community polygon. The usage category is presented by a green polygon, and the conservation category is represented by blue polygons.
3.5. Management Phase

The management phase corresponds to two main strategies, defined by the transdisciplinary team, the pruning strategy for the harvest areas and the restoration strategy for the restoration areas. It is important to highlight here that three main categories were defined based on the analysis phases: conservation where no pruning was allowed, and conservation actions should be prioritized; harvest areas where controlled and organized use of both species was allowed; and reforestation sites with a need to restore the vegetation and to implement actions to ensure reforestation success. Two main strategies were decided based on the results for harvest and restoration sites. The strategies were articulated on a broad conservation and management plan with detailed activities, goals, monitoring plan, and agreements [41].

For the harvest sites, the Kumeyaay tribe agreed to respect the potential use of each site and to continue with the pruning and basket-weaving activities, considering the attributes and limitations of each area. To conduct so, a set of agreements were made, which declares the actions allowed in each of the areas. Moreover, several commitments were made by each member of the team to continue improving the traditional activity in the context of sustainability. On these rules, the team members expressed the allowed activities and penalty fees in case of breach of the rules. The following list identifies the rules decided by and for the community:

- Avoid generating litter and properly dispose of any trash generated;
- Take care of the fences on the restoration site; it is forbidden to break them, cut them or knock them down. The person who does so will be charged a fine equivalent to the value of the damage caused;
- The door must always be closed when entering or leaving the fenced areas, and these will have restricted access so that only people with permission can access or be accompanied by someone in charge of taking care of the areas;
- It is strictly forbidden to put cattle in the reforestation areas since cows, goats and horses damage the raw material; In case any such animals are found within a reforestation area, the owner of the animal(s) will be fined $500.00 Mexican pesos;
- Cut only the amount of raw material to be worked or used and do it exclusively if you have the knowledge of the appropriate technique for it;
- Carry out raw material cuts in the appropriate areas for harvesting, avoiding doing so in plants that are in recovery;
- Cutting in reforestation areas will be prohibited;
- Take care of the plants; anyone caught mistreating the vegetation will be fined;
- Take necessary precautions to avoid starting forest fires;
- Staying committed to seeking support for reforestation and protection of the areas;
- Take care of the signs that are placed in the areas of interest.

This series of rules comprises all the agreements the community-made regarding utilization of all the areas, including restoration areas. Besides the rules, the community agrees on a series of commitments to continue improving the activity. These agreements can be found in the conservation strategy [41]. Although these commitments are secondary outcomes of this process, they are considered as part of the second stage of this process as it underlies management and conservation actions to be implemented in the future.

The strategy for the restoration sites was more technically complex and consisted of several stages. To properly implement restoration actions, the Kumeyaay tribe took a specific workshop to learn vegetative production methods specifically for willow and spiny rush. Once the tribe learned the methods, the transdisciplinary team conducted the vegetative reproduction of both plants within a greenhouse in the community. Naturally, this process took several months, and during these months, the tribe makes decisions regarding which sites to restore and prepare. The tribe decided to restore one site with low to no volumes of willow and spiny rush. It is important to highlight that this site is near the houses of the artisans and corresponds to a historical pruning site. This site is also located within a cattle ranching activities polygon. To prevent the cattle from eating
the young plants, the site was isolated by a cattle fence. Given the site is located within a stream, the team constructed a levee to promote water infiltration and to increase the availability of water for the plants. Once the site was prepared, spiny rush seedlings were planted in bulk. This restoration activity implied several stages that correspond to a future project [41] and, because of this, would not be discussed in further detail (Figure 9).

Figure 9. Evidence of the restoration site selection based on socioeconomic and cultural aspects as well as ecological features. The picture shows the site as well as the 3 main conservation actions for the site: Cattle fence, levee, and reforestation actions.

The semi-structured interviews yielded information that allowed us to evaluate the relevance and usefulness of the methods used. Regarding Indigenous mapping, they indicated that it was useful to locate areas with spiny rush and willow. When asked to talk about potential uses of Indigenous mapping, they mentioned that they recognize the usefulness of this activity through the following comments:

- “To learn where the boundaries of the community are located’’;
- “To identify sites where we have already worked and those that are still pending’’.

In addition, when asked if they could create thematic maps on their own and without additional training, all the interviewed locals declared themselves feeling capable of doing so.

When asked about their capability to again use Google Earth and use the GPS, two individuals said that they could do it again without further training; four of them that they could only if reminded how to do them; and another four did not attend this workshop thus will not be able to use Google Earth. Regarding plant species sampling, we had a more positive balance; nine people indicated that they would be able to do a sampling without further training, while one person indicated that he could do it, but with additional training. Regarding the use of a GPS, two individuals indicated that they could use it again without additional training; four that they could, but with additional training, and one person mentioned that he would not be able to use it again. The three individuals that did not attend the training on how to use a GPS were not evaluated. Likewise, participants emphasized the importance of plant sampling and the use of a GPS. Following are textual transcripts of some of the participants’ comments regarding the importance of sampling:

- “Because that way we know how many we have, and where there is more and where less’’;
- “To see how much it has grown’’; and
• “To know how many plants there are”.

GPS:
• “For the position”;
• “Yes, because you can mark the places where there is more or less on a map and that way you are not searching for the sites”; and
• “Yes, it shows you where the sample is”.

Regarding the Indigenous mapping, participants highlighted its usefulness in managing resources at a community level. They mentioned that it was useful to visualize the areas with greater density for each one of the plants, to visualize resource availability, among other things. Following are some of the textual quotes voiced by participants on the usefulness of Indigenous mapping:
• “To know what we have in the community”;
• “To better understand the results; at the end, we all had a good understanding”;
• “To locate areas where we can find more material”;
• “To learn more about the plant”;
• “To find the places where there is more spiny rush and willow, and those that do not have any”;
• “To see if the resource is running low, to know where to find it and where not”.

4. Discussion

First, we would like to highlight that the current research was triggered by the Kumeyaay’s concern about the conservation status of spiny rush and willow and the future of the basket-weaving activity. The Kumeyaay members approached UABC and MEZA’s program to express their concerns. Therefore, the project cannot be labeled as academically driven research but research to solve a socio-environmental problem in an Indigenous community by demand or inquiry of the local people themselves. Therefore, the methodological approach used in this research was transdisciplinary and participatory to enable the active participation of Kumeyaay members. The transdisciplinary team was formed by 22 persons, 16 of whom were Kumeyaay members. The iterative method implemented allowed for a gradual increase in involvement and participation of Kumeyaay people until higher participation was achieved. This proves that participatory approaches based on the knowledge dialog, as an ontological posture, can enhance the participation of locals [17]. In general, the transdisciplinary posture and the methodological approach allowed a constant knowledge interchange during all phases, thus enabling the active participation of all the members of the team. The process and phases were constructed based on other experiences and considering a pedagogical framework [38]. This can be used to address similar problems in Indigenous communities in Mexico. Each of the phases could be implemented independently, but we strongly recommend implementing the whole iterative process as it follows a logical sequence. Further work needs to be done, especially regarding theoretical and pedagogical context, to create a general framework applied to different contexts.

Indigenous mapping was an effective method to recover traditional knowledge associated with basket-weaving activity and to spatially represent it. One of the features that the Kumeyaay people managed to represent into a thematic map was the historical pruning sites for both vegetative species used for basketry activities and the culturally important sites (Figure 7). Similarly, Kumeyaay people brought up highly important knowledge about the activity that is not necessarily spatial-related knowledge. For example, during the information phase, the transdisciplinary team widely discussed plant physiology and ecology, among other topics. Due to the nature of the workshops, Kumeyaay members provided insightful information about plants, especially information related to pruning activities of spiny rush and willow. They outlined in detail the pruning process of both plants, including certain self-limitations rules. These internal rules for pruning are consis-
tent with the ones described in the literature [9]. Thus, we can conclude that the process is effective in recovering traditional knowledge, spatially related or not.

Our results also prove that the participatory process enables not only recovery of traditional knowledge, but to integrate it with scientific knowledge, according to other similar studies [23–28]. This was possible due to the knowledge exchange process, which enables bridging between different kinds of knowledge [11,17]. Technical workshops demonstrate that technical knowledge, such as ecological sampling methods of plants and the use of GPS, can be integrated based on these participatory methodological approaches. During the semi-structured interview, the Kumeyaay members expressed that they feel they are able to conduct ecological monitoring, and some expressed that they can use a GPS without additional training. This demonstrates that, at some level, the technical knowledge described successfully passed to the Kumeyaay people. As already described, the Kumeyaay artisans reported that they only prune spiny brush plants that are over 1.11 m in height and willow plants of 2.51 m in height. This information was crucial for the categorization of the areas and assigning management and conservation rules per area. This demonstrates that recovery and integration of traditional and scientific knowledge are crucial in our case for management and conservation decision-making. The challenges in working on recovery and integration of Indigenous knowledge have been addressed over time. We acknowledge that representation of Indigenous knowledge is controversial mainly due to local people’s perception as voiceless and marginalized [21]. We consider that both kinds of knowledge have similarities and can be easily integrated into the framework of participatory research because it considers the ontological position of recognizing a different kind of knowledge. Nevertheless, ethical considerations regarding traditional knowledge and local people should be considered when conducting participatory research [21].

The results of ecological monitoring of the research phase showed an arguable historical overuse of spiny brush in the area around the center of the community by identifying that spiny rush is nearly absent in zone 1 and completely absent in zone 2 (Table 2). It could be argued that spiny rush could be found in zones 1 and 2 in low frequencies and volumes because of natural phenomena, but those zones correspond to recognized historical pruning sites and mapped by the Kumeyaay people; they are close to the houses and thus are more available. According to this, these low numbers and volumes are explained by an extended use over time. The ecological explanation for the lack of spiny rush could be partially true, but in our study, we did not evaluate environmental factors that could be affecting the plants, such as changes in hydrological regimes, cattle impacts on the plants, plant diseases, and other. In contrast, zone 1 has remarkably high volumes of willow (Table 1). Our research lacks data to explain why this zone 1 has low volumes of a spiny rush but high volumes of willow even though it is a historical pruning site. Nevertheless, in general terms, willow is more abundant than spiny rush in all zones. Although there is no literature or data that described which plant they use the most, anecdotal experience shows that nowadays, the artisans use more spiny rush over willow. This could be a possible explanation. A participatory ecological assessment regarding ecological aspects of the plants is needed, and we highly recommend conducting these in the future. Besides the ecological inquiries derived from our study, the increase of ecological survey capabilities is the main result of the research phase.

During the research phase, the Kumeyaay members actively participated in conducting the ecological monitoring of spiny rush and willow. These capabilities were developed during the technical workshops and were the basis for the monitoring. This means that once the capabilities were acquired, they were immediately used to reinforce knowledge. These ecological assessment methods can be implemented for most Kumeyaay members without additional training. Hence, our results demonstrate that participatory methods are critical for building capacities on locals, which is consistent with other research [25–31]. Nevertheless, not all local people can use GPS, Google Earth, and conduct field surveys without additional training; further projects should consider proper additional training. In addition, taking into consideration that local people have the capacities to properly conduct
these activities without additional training, future technical workshops should consider providing the leading role to those locals already trained in teaching. Trained locals should become trainers and then strengthen the capacities and promote the empowerment and autonomy of the community.

The categorization of the zones was based on visualization of general and available volumes thru maps and digital maps. Although some statistical analysis could have been used, our study focused on enabling the decision-making process based on results of the ecological monitoring and perception of the Kumeyaay people regarding the availability of plants for pruning, using simple and basic numerical methods. This encouraged the autonomous decision process and empowerment of the community at some level, but it still needs to be evaluated. In general terms, categorization of the zones based on research and analysis conducted enabled a decision-making process in which the Kumeyaay took an important and crucial role. This means a strengthening of decision capabilities regarding the decision-making process for management and conservation of natural resources.

The pruning and restoration of zone agreements is a cornerstone for the community management of natural resources, as it underlies a series of rules to follow and the commitment of the local people to conserve spiny rush and willow. These are the core of the management strategy and demonstrate that the community is committed to managing their natural resources and establishing self-limitations. The restoration strategy is described in more detail in Eaton [41] and will not be discussed in further detail since it is not part of our results. Nevertheless, the decision to implement these restoration actions was taken in the current research. Therefore, this can be discussed in a broader sense. The restoration site was selected by the Kumeyaay members and was based on the volumes of spiny rush and willow. The restoration sites have low volumes of spiny rush and high volumes of willow. Despite the relatively high volumes of willow, the community declared the whole zone as a restoration area. Similar to this, part of zone 3 was considered as a conservation area even though it has good volumes of spiny rush and willow. It draws attention that the criteria to divide this area was the polygon of the community. This shows a decision made by political standards. The rest of zone 3 was declared a harvest area. Zone 4 was declared a conservation area as a whole and without dividing it by the community’s polygon. All this shows a highly autonomous process on which several factors, such as ecological, cultural, economic, and political, were taken into consideration to make a decision and according to standards that only the Kumeyaay people feel need to be considered.

Another thing to consider is that the restoration site is located outside of the boundaries of the community. The decision to map and implement restoration activities outside the boundaries of the rightful polygon denotes that the Kumeyaay tribe recognizes those territories as their own. Peluso [32] mentions the fact that locals can do their maps, and that allows them to take control of mapped spaces, challenge political spatial limits, and alter land use categories. Our case corresponds to this type of actions because the method used allowed locals to map their plant species and to take decisions on their management; even on areas that are not legally owned by them, but that they acknowledge as an ancestral territory and considered as part of the community’s spatial environment. This is an argumentative quality or act of defiance against the government and local rules not observed by their culture [32]. Even though we do not explicitly promote these defiance actions, we do pretend to highlight the fact that these decisions respond to the action-learning process, that generated great strengthening of abilities and thus autonomous decision-making concerning their resources and what they acknowledge as their territory and, in general, as building a vision of landscape and ecosystem conservation where the community takes priority over land tenure.

Another thing to consider about Indigenous mapping is the accessibility to the outcomes by Indigenous people. The results of the interview showed that Kumeyaay people prefer to have the maps in the paper other than stored on the web or other modern ways. Considering that most Indigenous communities do not have access to the Internet [44], this way to store the outcomes is the best alternative. Although our research does not
draw concerns about the accessibility and sharing of delicate data that can be used in harmful ways for the community, another project demonstrates that this is a real concern of Indigenous people [45]. Thus, future mapping projects should consider legal procedures to ensure the intellectual property of the data and the accessibility to the data.

The semi-structured interview corresponds to an ancillary analysis that can be conceived as part of the iterative process. However, we conduct this evaluation because this kind of process is not often evaluated. Since our research has several aspects that can be considered subjective, the social instrument implemented as needed. These subjective aspects, such as empowerment, should be measured and described beyond anecdotal experiences [22]. The interview was successful, as it gave data to evaluate the success and reliability of the methods. The semi-structured instrument was selected over other methods because it allows the interviewer and interviewee to talk freely over a question and to adapt the conversation during the dialog and, hence, delve deeper into a topic in a friendlier way, but without losing certain structure [46]. In our case, this instrument allows us to acquire rich conversations that enabled deep analysis. Regarding the subjective aspects of building capacities and empowerment of the Kumeyaay members, the qualitative instrument provided accurate and insightful data to conclude that building capacities were successful. Having literal quotes where local people state the possibility of conducting several methods implemented proves the success of knowledge transmission and strengthens and empowers the local community. At the same time, this provides insightful lessons about the methods conducted and specific guidelines for future projects.

Even though we suggest using semi-structured interviews to evaluate these processes, we also suggest conducting mixed approaches to evaluate participatory interventions. These evaluations should consider both the qualitative aspects of the research, but also quantitative ones. Despite the methods, we strongly suggest not left behind the opportunity to evaluate participatory and Indigenous mapping efforts. These measurements will provide a guideline for the improvement of the participatory methods and transdisciplinary research. Lastly, our research does not discuss restoration strategies and management and conservation actions to be implemented in the future. This is mainly because this project focused on a participatory mapping and research approach and decision-making process. It should be highlighted that the transdisciplinary team identified the next steps to continue working on behalf of management and conservation of spiny rush and willow and for the future of basket-weaving as a traditional and economic activity during this project. Therefore, we suggest continuing working on management and conservation strategies and, more importantly, monitoring and evaluating the success of these actions. This needs to be done in the context of transdisciplinary paradigms and prioritizing participatory approaches to promote the empowerment of the Kumeyaay tribe. Moreover, Indigenous mapping and participatory approaches can easily be added to interdisciplinary and transdisciplinary management and conservation of natural resources strategies worldwide. The scientific community should pay more attention to the benefits of these tools and promote their use in community-based contexts.

5. Conclusions

The iterative process used in the research promoted a dynamic exchange of knowledge and continuous feedback during all stages. This was possible because of the ontological posture called knowledge dialog, which is part of the tradition of MEZA’s program and transdisciplinary science. Due to this, this process allowed for building bridges between scientific and traditional knowledge and for incorporating both in order to map, evaluate, analyze, conclude, and decide on management and conservation actions. At the same time, it promoted the empowerment of the Indigenous community.

Indigenous mapping is highly effective in the recovery and integration of traditional knowledge and its different ways of expression and taxonomies. Nevertheless, future projects should consider proper ways to store, reproduce and give access to outcomes. Although our research does not discuss the property of the data, future projects also
need to take into account concerns about the intellectual property of data, outcomes, and accessibility.

Qualitative analysis of semi-structured interviews provided an approach to evaluating the success of Indigenous mapping and participatory tools implemented in the research process. This analysis also provided a measurement of subjective outcomes, such as empowerment and building capacities. It also showed that quantitative and mixed approaches need to be implemented in order to evaluate the success, reliability, and reproducibility of the participatory methods.

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References

1. Garduño, E. Los grupos yumanos de Baja California: ¿Indios de paz o indios de guerra? Una aproximación desde la teoría de la resistencia pasiva. Estud. Fron. 2010, 11, 185–205. [CrossRef]
2. Hinton, L.; Watahomigie, L.J. Spirit Mountain: An Anthology of Yuman Story and Song; University of Arizona Press: Chicago, IL, USA, 1984; ISBN 0816508437.
3. Gallegos, D.R.; Guerrero, M.; Bouscaren, S.; Bugbee, S. Otay/Kuchamaa Cultural Resource Background Study; Technical Report for USDI Bureau of Land Management: Carlsbad, CA, USA, 2002.
4. Garduño, E. Yumanos: Cucapá, kiliva, pa ipai, kumiai, 1st ed.; Comisión Nacional para el Desarrollo de los Pueblos Indígenas: México, México, 2015; ISBN 978-607-718-041-8. Available online: https://isbn.cloud/mx/editorial/comision-nacional-para-el-desarrollo-de-los-pueblos-indigenas/ (accessed on 12 January 2020).
5. Shipek, F. Kumeyaay plant husbandry: Fire, water, and erosion management systems. In Before the Wilderness: Environmental Management by Native Californians, 1st ed.; Anderson, K., Blackburn, T.C., Eds.; Ballena Press: CA, USA, 1993; pp. 379–388, ISBN 0879191260.
6. Anderson, K. Native Californians as ancient and contemporary cultivators. In Before the Wilderness: Environmental Management by Native Californias, 1st ed.; Anderson, K., Blackburn, T.C., Eds.; Ballena Press: CA, USA, 1994; pp. 151–174, ISBN 0879191260.
7. Gamble, L.; Wilken-Robertson, M. Kumeyaay Cultural Landscapes of Baja California’s Tijuana River Watershed. J. Calif. Great Basin Anthropol. 2008, 28, 127–152. [CrossRef]
8. Wilken, M.A. An ethnobotany of Baja California’s Kumeyaay Indians. Master Dissertation, San Diego State University, San Diego, CA, USA, 2012.
9. Artesania con fibras naturales del pueblo Kumiai de San José de la Zorra, Baja California. Available online: https://www.gob.mx/inpi/es/articulos/artesania-con-fibras-naturales-del-pueblo-kumiai-de-san-jose-de-la-zorra-b-c?idiom=es (accessed on 12 January 2020).
37. Vazquez, C.; Aguilar, C.; Benet, H.; Carmona, R.; De La Vega, T.; Espinosa, H.; Flores, M.; Franco, P.; Frias, I.; Guzmán, J.; et al. Twenty Years of Interdisciplinary Studies: The “MEZA” Program’s Contributions to Society, Ecology, and the Education of Postgraduate Students. *Ecol. Soc.* 2011, 16, 4. [CrossRef]

38. Jimenez-Velasco, C.E. Modelo de Manejo Participativo y Capacitación Comunitaria Para la Conservación de Recursos Naturales. Master Dissertation, Universidad Autónoma de Baja California, Ensenada, Mexico, 2015.

39. Ugalde, L. *Conceptos Básicos de Dasometría*, 1st ed.; Centro Agronómico tropical de investigación y enseñanza: Turrialba, Costa Rica, 1981; p. 37.

40. De La Vega, C.; Ramirez, H. *Dendrometría*, 3th ed.; Universidad Autónoma Chapingo: Texcoco, México, 2010; p. 312.

41. Eaton, R. *Artesanas y Artesanos Promotores del Desarrollo Sustentable y Custodios de sus Recursos Naturales*; Technical Report; National Commission for the Development of Indigenous People: Baja California, Mexico, 2013.

42. Rojas, R. *Guía para Realizar Investigaciones Sociales*, 38th ed.; Plaza y Valdez: Ciudad de México, México, 2013; pp. 197–255.

43. Gibbs, L.; Kealy, M.; Willis, K.; Green, J.; Welch, N.; Daly, J. What have sampling and data collection got to do with good qualitative research? *Aust. New Zealand J. Public Heal.* 2007, 31, 540–544. [CrossRef] [PubMed]

44. Taylor, D.R.F. Some recent development in the theory and practices of cibercartography: Applications in Indigenous mapping: An introduction. In *Development in the Theory and Practice of Cybercartography: Applications and Indigenous mapping*, 2nd ed.; Taylor, D.R.F., Lautiault, T.P., Eds.; Elsevier: Amsterdam, The Netherlands, 2014; ISBN 978-0-444-62713-1.

45. Raymond-Yakoubian, J.; Pulsifer, P.L.; Taylor, D.R.F.; Brattland, C.; Mustonen, T. Mapping and Indigenous People in the Arctic. In *Governing Arctic Seas: Regional Lessons from the Bering Strait and Barents Sea*, 1st ed.; Young, O.R., Berkman, P.A., Vylegzhanin, A.N., Eds.; Springer International Publishing: Gewerbestrasse, Switzerland, 2020; pp. 293–319, ISBN 2662–4516.

46. Diaz-Bravo, L.; Torruco-Garcia, U.; Martinez-Hernandez, M.; Varela-Ruiz, M. La entrevista, recursos flexible y dinámico. *Investig. Educ. Médica* 2013, 2, 162–167. [CrossRef]