# The Quitobaquito Desert Pupfish, An Endangered Species within Organ Pipe Cactus National Monument: Historical Significance and Management Challenges

# ABSTRACT

The largest body of water at Organ Pipe Cactus National Monument is Quitobaquito springs and pond, home to the Quitobaquito desert pupfish (Cyprinodon macularius eremus). The fish was listed as endangered in 1986, along with identification of its critical habitat. The cultural significance of the Quitobaquito area dates to approximately 11,000 B.P. (before present). The natural resource significance is elevated by the existence of other endemic species. The Monument has primarily managed the area for its natural resource significance and critical habitat improvement for decades. Today, a major inventory and monitoring program exists for the pupfish and for water quality and quantity. Location of the area next to the international border and easy access makes the pupfish and its habitat vulnerable to a number of potential threats such as introduction of exotic species, chemical contamination, human use of the area, and water use for agricultural, domestic, and development purposes in Mexico. Although there is no immediate threat to the Quitobaquito springs or pupfish from groundwater use in Mexico, the potential does exist should water levels drop significantly. There are a number of intranational and international laws and policies that support protection of the Quitobaquito pupfish, and the pupfish in the Sonoyta River, which lies within the Pinacate y Gran Desierto de Altar Biosphere Reserve in Mexico (Organ Pipe Cactus National Monument's sister park).

# I. INTRODUCTION AND OVERVIEW

Organ Pipe Cactus National Monument (Organ Pipe), encompassing 133,598 hectares, was established by Presidential Proclamation No.

Gina Pearson is a Natural Resources Specialist with expertise in international affairs and wilderness management concerns. Charles W. Conner is a Biological Technician with expertise in pupfish management and border land-use issues. Both are employed by the National Park Service, Organ Pipe Cactus National Monument, Route 1, Box 100, Ajo, AZ 85321; (520) 387-6849; <gina\_pearson@nps.gov>; <charles\_conner@nps.gov>.

2232 on April 13, 1937, because of its historic and scientific interest.<sup>1</sup> On October 26, 1976, the International Man and the Biosphere Program (MAB) accepted Organ Pipe into the biosphere reserve system.<sup>2</sup> The purpose of MAB, a United Nations Educational, Scientific and Cultural Organization (UNESCO) concept, is to form a network of protected samples representing the world's major ecosystem types.<sup>3</sup> Each reserve is devoted to the conservation of nature and scientific research, and provides an unmanipulated standard against which influences of ecosystem use and human impact on the environment can be measured.<sup>4</sup> Organ Pipe provides such a standard for the North American Sonoran Desert Ecosystem.<sup>5</sup> On November 10, 1978, Congress designated 125,040 hectares of Organ Pipe provides opportunities for visitors to experience solitude, the night sky, wildlife viewing, hiking, and backpacking in a natural wilderness setting.

Organ Pipe is a lush desert ecosystem, with several mountain ranges, valleys, natural springs, canyons, and a biseasonal rainfall weather pattern, all of which allows for rich and varied plant and animal communities. Environmental heterogeneity makes Organ Pipe one of the most biologically diverse semi-arid areas in the world. Organ Pipe supports approximately 64 species of mammals, five species of amphibians, 43 species of reptiles, 277 species of birds, one species of fish, and 600 species of plants.<sup>7</sup> Eight animal species are federally listed as endangered: the

<sup>1.</sup> Proclamation No. 2232, 50 Stat. 1827, 1827 (1937) (codified at 16 U.S.C. § 431 note (1994) (Organ Pipe Cactus National Monument, Arizona)). See also U.S. DEP'T OF THE INTERIOR, NAT'L PARK SERV., ORGAN PIPE CACTUS NATIONAL MONUMENT: NATURAL AND CULTURAL RESOURCES MANAGEMENT PLAN 1 (1994) [hereinafter NATURAL & CULTURAL RESOURCES PLAN].

<sup>2.</sup> See NATURAL & CULTURAL RESOURCES PLAN, supra note 1, at 1; UNESCO-MABnet, List of the World Network of Biosphere Reserves (last modified Nov. 1999) <a href="http://www.unesco.org/mab/brlist.htm">http://www.unesco.org/mab/brlist.htm</a>.

<sup>3.</sup> See NATURAL & CULTURAL RESOURCES PLAN, supra note 1, at 1; UNESCO-MABnet, Frequently Asked Questions on Biosphere Reserves: Why Do We Need Biophere Reserves? (last modified Dec. 1999) <a href="http://www.unesco.org/mab/brfaq-2.htm">http://www.unesco.org/mab/brfaq-2.htm</a>.

<sup>4.</sup> See NATURAL & CULTURAL RESOURCES PLAN, supra note 1, at 1; UNESCO-MABnet, Frequently Asked Questions on Biosphere Reserves: What Is a Biosphere Reserve? (last modified Dec. 1999) <a href="http://www.unesco.org/mab/brfaq-0.htm">http://www.unesco.org/mab/brfaq-0.htm</a>.

<sup>5.</sup> See UNESCO-MABnet, Frequently Asked Questions on Biosphere Reserves: How Are Biosphere Reserves Selected? (last modified Dec. 1999) <a href="http://www.unesco.org/mab/brfaq-5.htm">http://www.unesco.org/mab/brfaq-5.htm</a>.

<sup>6.</sup> See National Parks & Recreation Act of 1978, Pub. L. No. 95-625, Title IV, § 401(7), 92 Stat. 3476, 3490 (codified at 16 U.S.C. § 1132 note (1994) (Organ Pipe Cactus Wilderness)); NATURAL & CULTURAL RESOURCES PLAN, *supra* note 1, at 1.

<sup>7.</sup> See U.S. DEP'T OF THE INTERIOR, NAT'L PARK SERV., ORGAN PIPE CACTUS NATIONAL MONUMENT: FINAL GENERAL MANAGEMENT PLAN, DEVELOPMENT CONCEPT PLANS, ENVIRONMENTAL IMPACT STATEMENT 27-28 (1996) [hereinafter GENERAL MANAGEMENT PLAN].

lesser long-nosed bat, Sonoran pronghom, peregrine falcon, brown pelican, cactus ferruginous pygmy-owl, Aplomado falcon, jaguarundi, and the Quitobaquito desert pupfish.<sup>8</sup> The jaguar, also an endangered species, has not been observed in Organ Pipe, but has been recorded on the adjacent lands of Cabeza Prieta National Wildlife Refuge and Tohono O'odham Nation.<sup>9</sup>

The southern boundary of Organ Pipe is shared with the state of Sonora, Mexico (the Sonoyta Valley) for approximately 50 kilometers.<sup>10</sup> According to the monument's 1994 Resources Management Plan, a main resource concern is the continued urbanization and agricultural development occurring in the Sonoyta Valley.<sup>11</sup> Sonoyta, directly adjacent to the south boundary, is a city of approximately 17,000 inhabitants (1996 census).<sup>12</sup> It should be noted that the surrounding Sonoyta Valley accounts for a significant addition to the population.<sup>13</sup> Herbicide and pesticide drift across the border into Organ Pipe, their potential effect on native plant and animal species, as well as the invasion of non-native plants from Mexico, are other resource concerns. Air quality, natural sound, and night sky are resources that may be impacted by adjacent international land uses. The monument's Water Resources Plan identifies irrigation practices in Mexico as a major impact to groundwater from external sources.<sup>14</sup> U.S. Geological Survey investigations revealed that the 1993 rates of groundwater withdrawals south of the border did not appear to affect discharge to springs in Organ Pipe.<sup>15</sup>

# II. SIGNIFICANCE OF THE QUITOBAQUITO REGION

## A. Archeological and Historical Resources

The Quitobaquito springs and pond, next to the international boundary, have been a center of human occupation for centuries. The Quitobaquito Basin represents the oldest continually occupied site within

- 11. NATURAL & CULTURAL RESOURCES PLAN, supra note 1, at 233.
- 12. See GENERAL MANAGEMENT PLAN, supra note 7, at 20.
- 13. See id.

15. See R.L. CARRUTH, HYDROGEOLOGY OF THE QUITOBAQUITO SPRINGS AND LA ABRA PLAIN AREA, ORGAN PIPE CACTUS NATIONAL MONUMENT, ARIZONA, AND SONORA, MEXICO 21-22 (U.S. Geological Survey Water Resources Investigations Report 95-4295, 1996).

<sup>8.</sup> See Endangered and Threatened Wildlife and Plants: Lists, 50 C.F.R. § 17.11 (1998).

<sup>9.</sup> See id.; Endangered and Threatened Wildlife and Plants: Notice of 90-Day Finding on Petition to List the Jaguar as Endangered in the United States, 58 Fed. Reg. 19,216; 19,217-18 (1993).

<sup>10.</sup> See JAMES J. BARNETT & DAVID SHARROW, WATER RESOURCES MANAGEMENT PLAN: ORGAN PIPE CACTUS NATIONAL MONUMENT 16 (1992).

<sup>14.</sup> BARNETT & SHARROW, supra note 10, at 40, 45.

Organ Pipe. Stone tools representing the San Dieguito I complex were identified in the Quitobaquito region, and dated at 11,000 B.P. (before present).<sup>16</sup> Other archeological investigations revealed four prehistoric sites at Quitobaquito.<sup>17</sup> The Hia C-ed O'odham (a contemporary Native American tribe) lived at Quitobaquito before the area became a monument.<sup>18</sup> Jim Orozco, the last Hia C-ed to occupy the site, left Quitobaquito in 1957.<sup>19</sup> Quitobaquito is a sacred site for the Tohono and Hia C-ed O'odham.<sup>20</sup> The O'odham use the site today for ceremonial and religious purposes, and it is listed on the National Register of Historic Places.<sup>21</sup>

Father Eusebio Francisco Kino, who led the establishment of several missions in northern Sonora and southern Arizona, brought livestock and agricultural practices to Sonoyta in the late 1600s.<sup>22</sup> One of the first recorded grazing activities in Organ Pipe occurred in 1698 when Father Kino visited the Sonoyta and Quitobaquito area.<sup>23</sup> He brought 85 head of horses and mules, which were pastured at Quitobaquito and along the Rio Sonoyta for four days.<sup>24</sup> By 1850, about 100 hectares were under cultivation in the Sonoyta Valley.<sup>25</sup>

As the gold rush era in California began, many people from Mexico traveled north to seek their fortune. They established a route that came to be known as *El Camino del Diablo.*<sup>26</sup> The route passed through Sonoyta along the Rio Sonoyta with a stop at Quitobaquito, then through what is

<sup>16.</sup> See NATURAL & CULTURAL RESOURCES PLAN, supra note 1, at 32.

<sup>17.</sup> See id.

<sup>18.</sup> See id. at 38.

<sup>19.</sup> See Peter L. Warren & Bill Hoy, Chronological Summary of the History of the Area Now Known as Organ Pipe Cactus National Monument, in ORGAN PIPE CACTUS NATIONAL MONUMENT BIOSPHERE RESERVE: ASSESSMENT OF SCIENTIFIC INFORMATION AND ACTIVITIES 23, 27 (Peter S. Bennett & R. Roy Johnson eds., 1990).

<sup>20.</sup> See GENERAL MANAGEMENT PLAN, supra note 7, at 33.

<sup>21.</sup> See id.; NATURAL & CULTURAL RESOURCES PLAN, supra note 1, at 38; National Register of Historic Places: Notification of Pending Nominations, 59 Fed. Reg. 17,398; 17,398 (1994).

<sup>22.</sup> See Herbert Eugene Bolton, Rim of Christendom: A Bibliography of Eusebio Francisco Kino Pacific Coast Pioneer vii, 232, 251-60 (1936).

<sup>23.</sup> See Warren & Hoy, supra note 19, at 23; FAY JACKSON SMITH ET AL., FATHER KINO IN ARIZONA 21 (1966).

<sup>24.</sup> See BOLTON, supra note 22, at 401; SMITH ET AL., supra note 23, at 21; PETER S. BENNETT & MICHAEL R. KUNZMANN, A HISTORY OF THE QUITOBAQUITO RESOURCE MANAGEMENT AREA, ORGAN PIPE CACTUS NATIONAL MONUMENT, ARIZONA 6 (Coop. Nat'l Park Resources Studies Unit Technical Report No. 26, 1989).

<sup>25.</sup> See Warren & Hoy, supra note 19, at 24.

<sup>26.</sup> See BILL BROYLES, ORGAN PIPE CACTUS NATIONAL MONUMENT: WHERE EDGES MEET 2 (1996); SMITH ET AL., supra note 23, at 21 n.76.

now the Cabeza Prieta National Wildlife Refuge to Yuma.<sup>27</sup> In 1861, the first American, Andrew Dorsey, lived in the Quitobaquito area.<sup>28</sup> He set up a store to trade with Mexicans, the O'odham, and travelers passing through.<sup>29</sup> The grave of José Lorenzo Sestier, a Frenchman who died in 1900, is located near Quitobaquito pond.<sup>30</sup>

# **B.** Natural Resources

Approximately 57,772 hectares of Organ Pipe and much of the Tohono O'odham Nation drain south to the Sonoyta River in Mexico.<sup>31</sup> The largest body of water at Organ Pipe is Quitobaquito springs and pond, home to the Quitobaquito desert pupfish (Cyprinodon macularius eremus).32 The fish was formally recognized as a distinct subspecies in 1987 by Miller and Fuiman.<sup>33</sup> The species is endemic to the spring complex, outflow channels, and pond at Quitobaquito.<sup>34</sup> All populations of C. macularius were listed as endangered in 1986.35 The Quitobaquito aquatic habitats, including the springs, channels, and pond, were designated as critical habitat for the Quitobaquito pupfish.<sup>36</sup> The only refugium is at Arizona State University.<sup>37</sup> Refugia existed in the past in Imperial Valley, Verde Valley, and other locations in Arizona.<sup>38</sup> These refugia populations naturally died off, or were intentionally eliminated because they were genetically contaminated and in areas outside of the pupfish's natural watershed.<sup>39</sup> The long-term goal is to establish a Quitobaquito pupfish refugium within its natural watershed, which is the Rio Sonoyta watershed.40

30. See NATURAL & CULTURAL RESOURCES PLAN, supra note 1, at 38.

32. See id. at 28; Endangered and Threatened Wildlife and Plants: Determination of Endangered Status and Critical Habitat for the Desert Pupfish, Final Rule, 51 Fed. Reg. 10,842; 10,843 (1986) [hereinafter Desert Pupfish Final Rule].

33. See ROBERT RUSH MILLER & LEE A. FUIMAN, STATUS OF CYPRINODON MACULARIUS EREMUS, A NEW SUBSPECIES OF PUPFISH FROM ORGAN PIPE CACTUS NATIONAL MONUMENT, ARIZONA (1987).

34. See Desert Pupfish Final Rule, 51 Fed. Reg. at 10,843.

35. See id.

36. See Critical Habitat: Fish and Wildlife, 50 C.F.R. § 17.95 (1998); Desert Pupfish Final Rule, 51 Fed. Reg. at 10,848.

- 37. See NATURAL & CULTURAL RESOURCES PLAN, supra note 1, at 485.
- 38. See Desert Pupfish Final Rule, 51 Fed. Reg. at 10,843.
- 39. See NATURAL & CULTURAL RESOURCES PLAN, supra note 1, at 485.

40. Interview with Tim Tibbitts, Wildlife Biologist, Organ Pipe Cactus National Monument (Nov. 23, 1998).

<sup>27.</sup> See BROYLES, supra note 26, at 2.

<sup>28.</sup> See id.

<sup>29.</sup> See id.

<sup>31.</sup> See BARNETT & SHARROW, supra note 10, at 23.

In 1995, genetic analysis began on the Quitobaquito pupfish and Rio Sonoyta pupfish.<sup>41</sup> Results are not yet available, but preliminary findings indicate that the two fish are the same species.<sup>42</sup> The morphology of pupfish changes rapidly when they are bred in different environments. Thus, if the fish are kept apart long enough they will diverge morphologically and genetically due to "founders" effect and genetic drift.<sup>43</sup> Regardless of whether the Rio Sonoyta pupfish and the Quitobaquito pupfish are conspecific,<sup>44</sup> both fishes are important resources that warrant binational cooperation for their protection.

Since 1975, a monitoring program has been conducted annually to assess the status of pupfish at Quitobaquito.<sup>45</sup> In 1988, census efforts became more consistent and were integrated into Organ Pipe's long-term ecological monitoring program.<sup>46</sup> Population estimates have ranged from a high of 7,294 individuals in 1975, to a low of 1,800 in 1981.<sup>47</sup> In 1993, the spring and fall censuses reported estimates of 2,305 and 4,299 fish in the pond respectively.<sup>48</sup> A 1995 census estimated 6,644 fish.<sup>49</sup> A different monitoring technique was tried in the 1998 census that minimized handling of the fish.<sup>50</sup> The effectiveness of this technique remains to be evaluated. Mortality during censuses has been very low, with an average rate of ten fish per census.<sup>51</sup> Monitoring efforts have so far revealed a population in good condition with a healthy distribution of age and size classes.<sup>52</sup> An important secondary goal of repetitive, informal surveys and the annual

51. See id.

<sup>41.</sup> See id.

<sup>42.</sup> See id.; ANTHONY A. ECHELLE, GENETIC VARIATION IN DESERT PUPFISH (1998). This was a final report prepared for the Arizona Fishery Resources Office by the Oklahoma State University Zoology Department and was received after the Binational Groundwater Conference. See ECHELLE. The report determined that the Quitobaquito/Rio Sonoyta populations are genetically the same, but represent a separate species, C. eremus. See id. at 1.

<sup>43.</sup> See ECHELLE, supra note 42, at 1.

<sup>44.</sup> See id.

<sup>45.</sup> See U.S. DEP'T OF THE INTERIOR, NAT'L PARK SERV., DRAFT GENERAL MANAGEMENT PLAN, DEVELOPMENT CONCEPT PLANS, ENVIRONMENTAL IMPACT STATEMENT: ORGAN PIPE CACTUS NATIONAL MONUMENT 73 (1995) [hereinafter DRAFT GENERAL MANAGEMENT PLAN].

<sup>46.</sup> See id.

<sup>47.</sup> See id.

<sup>48.</sup> See id.

<sup>49.</sup> See GENERAL MANAGEMENT PLAN, supra note 7, at 115.

<sup>50.</sup> See Interview with Tim Tibbitts, supra note 40.

<sup>52.</sup> See DRAFT GENERAL MANAGEMENT PLAN, supra note 45, at 73; GENERAL MANAGEMENT PLAN, supra note 7, at 115.

pupfish census at Quitobaquito is to identify and remove other fish species that may have been put into the pond or channel by visitors.<sup>53</sup>

There are other species of concern at Quitobaquito that warrant special attention, either because of rarity, extremely localized distribution, or public interest. These include but are not limited to the following:

1. Howarth's White (Ascia howarthi) is a rare species of butterfly found in the Quitobaquito management area and Aguajita Wash immediately to the east.<sup>54</sup> This species is host specific to its forage plant, the desert caper (Atamisquea emarginata), which occurs only in the area and in one other place nearby.<sup>55</sup>

2. Sonoran Mud Turtle (*Kinosternon sonoriense longifemorale*) is endemic to Quitobaquito and the Rio Sonoyta.<sup>56</sup> It is threatened by habitat loss and water diversion.<sup>57</sup>

3. Quitobaquito Springsnail (*Tryonia quitobaquitae*) is a tiny snail endemic to Quitobaquito.<sup>58</sup>

4. Yerba Mansa (Anemopsis californica) is a plant that occurs near springs and seeps.<sup>59</sup> It is subject to harvesting for its medicinal properties.<sup>60</sup>

Future management plans must also consider the special needs and preservation of these species; indeed, Organ Pipe is being managed to protect all of its unique and scarce natural resources.

# C. Quitobaquito Management Area: "A Wilderness Zone"

The Quitobaquito Springs and Pond are within designated wilderness.<sup>61</sup> Organ Pipe's 1996 General Management Plan (GMP)

<sup>53.</sup> See DRAFT GENERAL MANAGEMENT PLAN, supra note 45, at 73; GENERAL MANAGEMENT PLAN, supra note 7, at 29, 115.

<sup>54.</sup> See NATURAL & CULTURAL RESOURCES PLAN, supra note 1, at 485.

<sup>55.</sup> See id.

<sup>56.</sup> See Philip C. Rosen, Population Decline of Sonoran Mud Turtles at Quitobaquito Springs: Final Report 1 (1986).

<sup>57.</sup> See id.

<sup>58.</sup> See DRAFT GENERAL MANAGEMENT PLAN, supra note 45, at 73; Gerald A. Cole, Quitobaquito—The Springs and the Pool, in ORGAN PIPE CACTUS NATIONAL MONUMENT BIOSPHERE RESERVE: ASSESSMENT OF SCIENTIFIC INFORMATION AND ACTIVITIES, supra note 19, at 37, 38.

<sup>59.</sup> Personal Knowledge, author Charles Conner, Biological Science Technician.

<sup>60.</sup> See GENERAL MANAGEMENT PLAN, supra note 7, at 33.

<sup>61.</sup> See National Parks & Recreation Act of 1978, Pub. L. No. 95-625, Title IV, § 401(7), 92 Stat. 3476, 3490 (codified at 16 U.S.C. § 1132 note (1994) (Organ Pipe Cactus Wilderness)); NATURAL & CULTURAL RESOURCES PLAN, supra note 1, at 1.

identifies a development concept plan (DCP) for the Quitobaquito management area.<sup>62</sup> The DCP recommends the following:

1. a new trailhead with parking, interpretive information, and composting toilet along Puerto Blanco Drive;

2. a one-mile round-trip trail accessible to visitors with disabilities: and

3. the expansion of the size of the Quitobaquito Management Area.63

The GMP's final biological assessment states that the actions outlined in the Quitobaquito DCP would have an overall beneficial effect on the desert pupfish and its critical habitat by minimizing vegetation trampling along the pond's littoral zone.<sup>64</sup> Restricted access to the Quitobaquito area would reduce the risk of anthropogenic impacts.<sup>65</sup> The DCP has yet to be developed. Planning efforts will be tri-national in nature, including the Tohono O'odham Nation and Mexico.

Organ Pipe's 1994 Natural and Cultural Resources Management Plan identifies the need for an integrated management plan for the Quitobaquito area.<sup>66</sup> Three hundred years of grazing and ranching have caused substantial displacement from a natural state for the area's biotic communities.<sup>67</sup> Attempts by the National Park Service to clean up, restore, and improve the situation have at times made things worse.<sup>68</sup> Improper management actions taken in the past destroyed the Quitobaquito management area's historical fabric and damaged the natural resources. Between 1982 and 1985, extensive interdisciplinary studies of the area took place.<sup>69</sup> As a result of that effort, the following mitigating measures have been implemented:

1. management decisions are made to ensure maximum diversity while maintaining the appearance of naturalness; 2. spring water is fed to the pond through an open concrete canal, lined with protective vegetation;

3. shoal areas suitable for shorebirds and rearing of juvenile Sonoran mud turtles have been created:

69. See id.

<sup>62.</sup> GENERAL MANAGEMENT PLAN, supra note 7, at 37.

<sup>63.</sup> See id. at 40-41, 44-45, 49, 55-56.

<sup>64.</sup> See id. at 116.

<sup>65.</sup> See id.

<sup>66.</sup> NATURAL & CULTURAL RESOURCES PLAN, supra note 1, at 485.

<sup>67.</sup> See id.

<sup>68.</sup> See id.

4. the pupfish held in the Williams Spring and Bates Well refugia have been relocated to Arizona State University; and
5. pupfish populations are now monitored using an ecologically gentle technique.<sup>70</sup>

These actions should aid in returning Organ Pipe to its natural biological state and reverse the mistakes of the past.

## D. Groundwater Use in the Sonoyta Valley

Organ Pipe's entire southern boundary, almost 50 kilometers in length, is shared with the Sonoyta Valley in Mexico.<sup>71</sup> This area has been developed for irrigated agriculture in the last several decades. The 1991 report "Land Use Trends Surrounding Organ Pipe Cactus National Monument" summarized the situation well.

The Rio Sonoyta aguifer is a common water resource shared by the U.S. and Mexico. The southern portion of [Organ Pipe Cactus National Monument] ORPI forms part of the Rio Sonoyta watershed as well as the northern portion of the groundwater aquifer. The Mexican portion of the Sonoyta Valley is a prime site for agricultural development. Approximately 30,000 a [acres] had been developed for irrigated agriculture in the valley by the end of 1987. A considerable number of wells have been drilled to provide irrigation water for these lands. The Mexican government has invested in transportation and electrical infrastructure as well as in the administration of credit, production, and marketing programs to provide critical assistance for local farmers. Development of the agricultural resources has stimulated economic growth in the town of Sonoyta and throughout the Sonoyta Valley. This agricultural-based growth has been a positive force in the economy of northern Sonora. A large portion of the irrigated lands in the Sonoyta Valley is adjacent to the southern boundary of ORPI, which has raised concerns about the possible effects on the flora and fauna of the Monument. A primary concern is that continued or increased pumping in Mexico may lower the groundwater table and also reduce hydrostatic pressure at certain locations within ORPI such as Quitobaquito, Burro and Williams springs. Another concern is the intrusion of agricultural

<sup>70.</sup> See id.

<sup>71.</sup> See BARNETT & SHARROW, supra note 10, at 16.

chemicals into the Monument through air drift and transportation by insects.<sup>72</sup>

Brown concluded that by 1988 the total annual water withdrawal from the approximately 165 agricultural wells was more than 2.5 times the annual groundwater recharge rate.<sup>73</sup> There are moratoriums in effect on the drilling of new wells and on the expansion of the land developed for irrigated agriculture, but the existing *capacity* for water withdrawal is more than *six times* the groundwater recharge rate.<sup>74</sup>

The Brown report suggested development and implementation of monitoring protocols to track agricultural development and groundwater pumping.<sup>75</sup> Data on crop acreage, fertilizers and pesticides, and electrical consumption by well pumps have been acquired from Mexican agricultural agencies such as *Secretaría de Agricultura, Ganadería y Desarollo Rural* (SAGAR) (and *Secretarío de Agricultura y Recuros Hidrasulicos* (SARH) before it).<sup>76</sup> The electrical meter books for all the wells in the Rio Sonoyta Valley are borrowed from the CFE (*Comisión Federal de Electricidad*), photocopied and returned.<sup>77</sup> Using assumed pump efficiencies and best available depthto-water figures, the amount of water being pumped at each well is estimated from the electrical data. Copies of these results are given to SAGAR.<sup>78</sup> Repeat photography of the Mexican lands bordering Organ Pipe has been carried out since 1988.<sup>79</sup> The photos are taken twice a year from eight different photo points along the border (four each in the United States and Mexico), with copies provided to SAGAR.<sup>80</sup>

The well water pumping data has been inconsistent. In the past, SAGAR would mandate an annual three day shutdown of all the wells in the Rio Sonoyta Valley so that water levels could recuperate and stabilize, at which point well depths were measured.<sup>81</sup> This was accomplished in November and required three teams of monitoring personnel.<sup>82</sup> Monitoring of this type was last conducted in 1993, after which measurements were

81. See CARRUTH, supra note 15, at 9.

<sup>72.</sup> BRUCE BROWN, LAND USE TRENDS SURROUNDING ORGAN PIPE CACTUS NATIONAL MONUMENT 1-2 (Coop. Nat'l Park Resources Studies Unit Technical Report No. 39, 1991).

<sup>73.</sup> See id. at 17, 28.

<sup>74.</sup> See id. at 27, 31, 48.

<sup>75.</sup> See id. at 34-37, 49-50.

<sup>76.</sup> See id. at 7, 27, 29.

<sup>77.</sup> See id. at 27.

<sup>78.</sup> See id.

<sup>79.</sup> See id. at 35-36, 51; GINA PEARSON, ORGAN PIPE CACTUS NATIONAL MONUMENT TRI-NATIONAL MANAGEMENT CHALLENGES AND OPPORTUNITIES FOR COOPERATION WITH MEXICO AND THE TOHONO O'ODHAM NATION: A HISTORICAL PERSPECTIVE 17 (1998).

<sup>80.</sup> See PEARSON, supra note 79, at 17.

<sup>82.</sup> Personal Knowledge, author Charles Conner, Biological Science Technician.

curtailed due to lack of funds.<sup>83</sup> Wells are now monitored by a new agency that split from SAGAR, the CNA (*Comisión Nacional de Agua*), which has focused its efforts on the larger agricultural areas to the south near Guaymas, Hermosillo, and Caborca.<sup>84</sup> The Sonoyta data also are flawed because the depth-to-water measurements obtained were *static* levels, which did not reflect the depression in the water column created by the pumping of water from the well.<sup>85</sup> The pumps are generally run at full output, or not at all.<sup>86</sup> The *dynamic* (when the pump is operating) water level is lower than the static level. Figures for the dynamic depths have not been available since the Land Use Trends study was undertaken in 1987–1988.<sup>87</sup> The latest available figures for well depths, generally those from 1993, are being used until more current and reliable figures can be obtained.<sup>88</sup>

Other difficulties encountered in this effort are worth mentioning. Many of the access ports for sounding the wells are blocked by debris.<sup>89</sup> Many of the pumps are in poor condition and leak lubricating oil into the well.<sup>90</sup> Consequently, well depth may be very difficult or impossible to measure. A large amount of oil floating on top of the water column can depress the water level significantly, thus further confounding the measurements.

In spite of all the problems, which seem only to increase over time, the water pumping calculations are useful as a fair estimate because the most important and variable parameter in these calculations is the electrical consumption of the pumps.<sup>91</sup> As economic conditions fluctuate in the local agricultural community and in world markets, the amount of irrigation at each *ejido* (farming cooperative) and from each well varies.<sup>92</sup> Fields go in and out of production and at times the electricity is cut off to a well simply because the bills could not be paid,<sup>93</sup> especially after the hot season has ended. This was particularly evident during the agricultural slump that

- 85. See BROWN, supra note 72, at 27.
- 86. See id. at 19.
- 87. See id. at 23-24, tbl.9, 25-26 tbl.10.
- 88. See 1995 MONITORING REPORT, supra note 83, at 114.
- 89. See CARRUTH, supra note 15, at 18.
- 90. Personal Knowledge, author Charles Conner, Biological Science Technician.
- 91. See BROWN, supra note 72, at 22, 27.
- 92. See id. at 10-11, 14, 29.
- 93. See id. at 17, 22, 27.

<sup>83.</sup> See UNITED STATES DEP'T OF INTERIOR, GEOLOGICAL SURVEY & NAT'L PARK SERV., ORGAN PIPE CACTUS NATIONAL MONUMENT ECOLOGICAL MONITORING PROGRAM ANNUAL REPORT 1995 114 (1998) [hereinafter 1995 MONITORING REPORT].

<sup>84.</sup> Personal Knowledge, author Charles Conner, Biological Science Technician. Organ Pipe has tried to secure funding to assist in this project, and to drill a monitoring well near Quitobaquito, but without success. *See id.* 

was caused by low worldwide cotton prices in 1991 and 1992.<sup>94</sup> Hence, a 10 to 20 percent inaccuracy in well depth measurements is overwhelmed by the well-known and extreme variability in pump operations.

The calculated estimates for water withdrawal correlate quite well with the figures provided by SAGAR on crop acreage, see table 1.<sup>95</sup> These data suggest that the level of agricultural activity in the Sonoyta Valley is rebounding, almost to the earlier peak levels of 1989 and 1990.<sup>96</sup> Groundwater pumping calculations do not take into account the increasing withdrawal of water for domestic and industrial uses by the fast growing municipality of Sonoyta and its related *ejidos*. As this trend continues, agriculture may lose its position as the main player in the local economy, and water use priorities may shift toward municipal demands, as has happened in Arizona. It must also be mentioned that water is being pumped at an alarming rate in the desert to the south to supply the demands of the resort development at the coastal city of Puerto Peñasco, Sonora, 100 kilometers south of Sonoyta.

## E. Hydrogeology

The Quitobaquito Springs area appears to have as its water source the aquifer under the major north-south drainage of Aguajita Wash to the east and northeast.<sup>97</sup> Groundwater underlying this extensive and sometimes braided wash system flows through the fractured granite of the Quitobaquito Hills and emerges as a series of springs and seeps along the southwest edge of the hills.<sup>98</sup> The 1996 report "Hydrogeology of the Quitobaquito Springs and La Abra Plain Area, Arizona, and Sonora, Mexico,"<sup>99</sup> reported the following findings:

99. See id.

<sup>94.</sup> See PEARSON, supra note 79, at 16.

<sup>95.</sup> See id. at 17 tbl.2.

<sup>96.</sup> See id.

<sup>97.</sup> See CARRUTH, supra note 15, at 6, 9.

<sup>98.</sup> See id. at 9-10.

Year	Crop Acreage (ha)	Energy Usage (kWh x 10 <sup>6</sup> )	Water Withdrawal Based on Static Levels (m <sup>3</sup> x 10 <sup>6</sup> )	Water Withdrawal Based on Dynamic Levels (m <sup>3</sup> x 10 <sup>6</sup> )	Water Withdrawal Based on Dynamic Levels (acre-ft)
1989	5,234	42.0	111.6	87.6	71,002
1990	5,538	39.2	115.7	87.6	70,962
1991	5,139	32.8	108.0	75.2	60,910
1992	3,184	18.9	65.4	42.9	34,796
1993	3,197	19.6	62.8	43.3	35,083
1994	-	30.0	95.0	66.4	53,772
1995	-	30.5	91.0	67.2	54,483
1996	-	34.9	105.5	76.2	61,758
1997	4,677	35.7	100.8	75.3	61,015

## TABLE 1. COMPARATIVE WATER USE & CROP ACRE TOTALS FOR THE SONOYTA VALLEY, 1989–1997

1. There appears to be little or no correlation between spring flow, and rainfall or wet/dry periods, indicating sufficient groundwater storage to mitigate the effects of wet/dry periods on spring flow.<sup>100</sup>

2. The age of the water was less than 2,000 years and its source local.<sup>101</sup>

3. The water appears to emanate from a small saturated local groundwater flow system along the Aguajita Wash drainage that is isolated from the regional aquifer.<sup>102</sup> This larger regional aquifer underlies the drainage of the southern slope

<sup>100.</sup> See id. at 15, 22.

<sup>101.</sup> See id. at 14.

<sup>102.</sup> See id.

of the Puerto Blanco Mountains and is further to the east, extending to the Rio Sonoyta.<sup>103</sup>

4. And most importantly, there is a low permeability area that blocks the southern edge of the groundwater flow system that feeds Quitobaquito.<sup>104</sup> The entire recharge area (about 64.75 square kilometers) of the Quitobaquito springs is within Organ Pipe and is therefore considered safe from development that might affect spring discharge.<sup>105</sup>

The report also states

Present (1993) rates of ground-water withdrawals south of the international boundary, however, do not appear to affect water-level conditions in the local flow system or discharge to the springs. The altitude ... [and] relatively low permeable granite bedrock near the international boundary, however, may provide a semi-continuous barrier to and (or) delay the effect of a northwestward propagation of water-level declines caused by pumping near the Rio Sonoyta....If future pumping rates along the Rio Sonoyta greatly exceed present (1993) rates, it might be possible for the pumping effect to propagate through the ground-water system...and reach the recharge area for the local flow system.<sup>106</sup>

Carruth documented the long-term slow decline in the water table as determined by well depths, and strongly recommended continued monitoring of water levels on both sides of the boundary, as well as collection of pumping data from Mexico.<sup>107</sup>

# III. CURRENT MAINTENANCE AND MONITORING OF CRITICAL HABITAT AT QUITOBAQUITO

# A. A Brief History of the Quitobaquito Water Delivery System

The National Park Service is only the latest caretaker of this muchmanipulated water system. According to current knowledge, the first largescale water management began in the mid-1860s when a settler named Andrew Dorsey dug a pond and built a dam to hold water diverted from the two main spring sources.<sup>108</sup> Irrigation ditches watered many crops in

<sup>103.</sup> See id. at 3.

<sup>104.</sup> See id. at 22.

<sup>105.</sup> See id. at 21.

<sup>106.</sup> Id. at 22.

<sup>107.</sup> See id. at 18, 22.

<sup>108.</sup> See BARNETT & SHARROW, supra note 10, at 30.

fields that extended across the international border.<sup>109</sup> Various tenants of three cultures were dependent on Quitobaquito water for agriculture and livestock until the late 1950s when the National Park Service officially acquired the property.<sup>110</sup>

Park Service staff quickly began to realize the significance of taking over a man-made and man-maintained "natural resource." Without livestock and regular labor to keep ditches and pond edges clear, the system began to rapidly change, with reeds and other aquatic vegetation filling in watercourses and pond margins.<sup>111</sup> Maintenance staff was required to clear the ditch by hand.<sup>112</sup> Worried about the fate of the desert pupfish, the Superintendent decided to dredge the pond to a depth of about one meter in 1962, although scientists at the time warned that deeper and cooler water could allow non-native fish species to survive.<sup>113</sup>

Over the years, maintaining the water delivery system to the pond continued to be a problem. Various transport systems, above and below ground, were tried.<sup>114</sup> When scientists and managers realized that the channel was important as habitat for pupfish and other aquatic species as well as for water transport, the Quitobaquito Habitat Project was initiated.<sup>115</sup> In 1989, a "natural-appearing" concrete lined channel with pools, islands, and overhangs was constructed.<sup>116</sup> At the same time, the northeast spring was improved, and a Parshall flume was installed just below the confluence of the northeast and southwest springs.<sup>117</sup> The 1989 channel project was designed to

1. improve the flow of spring water to the pond, and monitor this flow; and

2. create better habitat for fish (and turtles) away from the pond (upstream and further from the international border).<sup>118</sup>

Although the 1989 Quitobaquito Habitat Project created a reliable water system and improved habitat, the current channel still requires weekly maintenance to clear aquatic vegetation.<sup>119</sup> Various wetlands species, including spikerush (*Eleocharis sp.*), bulrush (*Scirpus olneyi*), and cattail

<sup>109.</sup> See id.; BROYLES, supra note 26, at 2.

<sup>110.</sup> See Warren & Hoy, supra note 19, at 26-27.

<sup>111.</sup> See BARNETT & SHARROW, supra note 10, at 28.

<sup>112.</sup> See Cole, supra note 58, at 38.

<sup>113.</sup> See BENNETT & KUNZMANN, supra note 24, at 35-36, 53.

<sup>114.</sup> Personal Knowledge, author Charles Conner, Biological Science Technician.

<sup>115.</sup> See BARNETT & SHARROW, supra note 10, at 28.

<sup>116.</sup> See id.

<sup>117.</sup> See id. at 30.

<sup>118.</sup> See id. at 28.

<sup>119.</sup> See 1995 MONITORING REPORT, supra note 83, at 99.

(*Typha domingensis*), clog the channel if left unchecked.<sup>120</sup> Weekly clearing is necessary for unimpeded water transport to the pond. Vegetation and root masses are cleared in a minimally disruptive fashion in order to preserve as much aquatic invertebrate habitat and sediment substrate as possible, especially during the pupfish breeding season.

## **B.** Springs Monitoring and Discharge Assessment

In 1995, a U.S. Air Force funded wetlands conservation project allowed Organ Pipe to initiate much-needed surveillance of spring flow, water chemistry, and water temperature.<sup>121</sup> The objective of long-term monitoring of these parameters is to characterize the natural seasonal variation in the system, help interpret pupfish population fluctuations, and detect changes and threats.

#### 1. Water Temperature

Quitobaquito is classified as a warm spring, with a constant springhead temperature of approximately 25° Celsius, four degrees above the mean annual air temperature.<sup>122</sup> Although desert pupfish can tolerate up to 44.6° Celsius water temperature,<sup>123</sup> much higher than the maximum found in the Quitobaquito system, establishing baseline water temperatures is important for understanding seasonal breeding behavior and habitat preference.

Temperature loggers were deployed in three locations (midchannel, channel mouth, and the southeast pond corner) intermittently from March 1997 to September 1998.<sup>124</sup> These small data loggers were programmed at an office computer, then placed in submersible cases before field installation where continuous hourly temperature measurements were taken.<sup>125</sup> This data set has provided a clearer picture of daily and seasonal temperature variation in the channel and pond. On November 21, 1997, an unusual 11° Celsius temperature spike was recorded at two

124. Ami Pate, Biological Science Technician, Water Resources Monitoring, Organ Pipe Cactus National Monument.

125. See id.

<sup>120.</sup> See BENNETT & KUNZMANN, supra note 24, at 35; Cole, supra note 58, at 38.

<sup>121.</sup> Personal Knowledge, author Charles Conner, Biological Science Technician.

<sup>122.</sup> See T.W. ANDERSON & R.L. LANEY, RECONNAISSANCE OF GROUND-WATER CONDITIONS IN THE QUITOBAQUITO SPRING AND LA ABRA PLAIN AREA, ORGAN PIPE CACTUS NATIONAL MONUMENT, ARIZONA 4 (U.S. Geological Survey Administrative Report, 1978).

<sup>123.</sup> See Charles H. Lowe & Wallace G. Heath, Behavioral and Physiological Responses to Temperature in the Desert Pupfish Cyprinodon Macularius, 42 PHYSIOLOGICAL ZOOLOGY 53, 55-56, 58 (1969); Desert Pupfish Final Rule, 51 Fed. Reg. 10,842; 10,843 (1986).

different locations in a three-hour period, which could not be correlated with ambient air temperature conditions.<sup>126</sup>

## 2. Water Chemistry

Historic water chemistry data from previous investigations at Quitobaquito is comparable to current findings. In 1998, monument staff began a program of quarterly measurements of pH, conductivity, dissolved oxygen, and alkalinity at various stations in the channel and pond.<sup>127</sup> In June 1998, pH ranged from 7.54 at the southwest springhead to 9.56 in the center of the pond.<sup>128</sup> Kynard found that pH did not vary much throughout the year, due to buffering by large amounts of bicarbonates in the water.<sup>129</sup>

Pupfish are known to have survived dissolved oxygen concentrations as low as  $0.13 \text{ mg/l}^{130}$  Kynard found the range of dissolved oxygen in Quitobaquito to be well above this extreme, and pupfish captures did not correlate with dissolved oxygen levels.<sup>131</sup> In June 1998, the oxygen levels in the pond ranged from 5 mg/l at 8:20 in the morning to 15 mg/l at 6:10 in the evening.<sup>132</sup>

Future needs for water quality studies include semi-annual laboratory analysis of water samples for a full suite of anions, cations, nitrates, phosphates, lead, and arsenic; and analysis of water and sediment for pesticide residues.

#### 3. Spring Flow

Early management plans recognized that a high priority for pupfish preservation was the prevention of catastrophic changes in pond water level by maintaining the integrity of the dam, water delivery system, and springheads. The two springheads produced an average of 106 liters/minute from 1981–92.<sup>133</sup> Soon after the 1989 improvements of the northeast and southwest springs, the pond regularly overflowed into a channel system to the south of the pond, even during hot summer months.<sup>134</sup> In 1996, pond levels began to drop noticeably, and at present the

132. See Pate, supra note 124.

<sup>126.</sup> See id.

<sup>127.</sup> See id.

<sup>128.</sup> See id.

<sup>129.</sup> See BOYD E. KYNARD, DESERT PUPFISH AND THEIR HABITAT AT QUITOBAQUITO SPRINGS, ORGAN PIPE CACTUS NATIONAL MONUMENT 7 (Nat'l Park Serv. Technical Report No. 1, 1976).

<sup>130.</sup> See Desert Pupfish Final Rule, 51 Fed. Reg. 10,842; 10,843 (1986).

<sup>131.</sup> See KYNARD, supra note 129, at 9-10.

<sup>133.</sup> See CARRUTH, supra note 15, at 15.

<sup>134.</sup> See BARNETT & SHARROW, supra note 10, at 30.

pond rarely overflows into the outlet pipe.<sup>135</sup> This may be due to the gradual encroachment of vegetation and roots at the springheads and in the channel, decreasing flow to the pond.

In early 1999, a pressure transducer and data logger was to be installed at the Parshall flume just below the confluence of the northeast spring inlet pipe and the southwest spring. Continuous flow data will allow a better understanding of pond water levels in relation to groundwater flow, springhead integrity, and evaporation.

# IV. CRITICAL HABITAT MANAGEMENT CHALLENGES: THREATS TO THE QUITOBAQUITO SPRINGS/POND AND PUPFISH HEALTH

The desert pupfish habitat is of critical environmental concern because the fish is an endangered species. Current threats to its existence that have eliminated pupfish populations throughout most of its historic range include habitat loss and degradation, competition by exotic fishes, and pollution.<sup>136</sup> Existing and potential threats within Organ Pipe and outside from the state of Sonora, Mexico, are cause for constant worry. The popularity of Quitobaquito and the ease of access to the pond by visitors contribute to many scenarios, some of which could be disastrous.

## A. Introduction or Invasion of Exotic Species

The negative impact of non-native fish, amphibians, and plants is a real concern. Quitobaquito pupfish are the only endemic fish at Quitobaquito. In 1969, the Golden Shiner (*Notemigonus chrysoleucus*) was found in the pond.<sup>137</sup> These fish were eradicated at great cost, effort, and impact.<sup>138</sup> The potential for adverse effects of interspecific competition with non-native fish species on the Quitobaquito pupfish is high. In 1990, a small, relatively ephemeral pool at Aguajita Springs was found to contain several fish.<sup>139</sup> Three species were identified: pupfish (*Cyprinodon macularius*), mosquitofish (*Gambusia affinis*), and longfin dace (*Agosia chrysogaster*).<sup>140</sup> These fish all exist in the Rio Sonoyta, although their presence at Aguajita Springs clearly was an introduction. This

140. See id.

<sup>135.</sup> See Pate, supra note 124.

<sup>136.</sup> See Availability of a Draft Recovery Plan for Desert Pupfish for Review and Comment: Notice of Document Availability and Public Comment Period, 58 Fed. Reg. 6526, 6526 (1993).

<sup>137.</sup> See Cole, supra note 58, at 39.

<sup>138.</sup> See id.

<sup>139.</sup> Personal Knowledge, author Charles Conner, Biological Science Technician.

demonstrated the ease with which fish could be introduced at Quitobaquito, which is less than one kilometer away from Aguajita. Both of these waters are very close to the international boundary and Mexico Highway 2.

Threats to the natural habitat also exist from invasive plants such as Buffelgrass (*Pennisetum ciliare*), Sahara mustard (*Brassica tournefortii*), Malta star thistle (*Centaurea melitensis*), Rabbitsfoot grass (*Polypogon monspeliensis*), Bermuda grass (*Cynodon dactylon*), and Tamarisk (*Tamarix chinensis*).<sup>141</sup>

These exotic species transform and degrade the pupfish habitat and/or allow competition from non-endemic fishes that harm pupfish reproduction and population stability. Such changes created the endangered status of the pupfish and could push it into extinction if left unmonitored and uncontrolled.

# B. Contamination of Pupfish Habitat from Human Activities

Activities such as bathing, clothes washing, defecation, and urination have occurred in the past at Quitobaquito.<sup>142</sup> These activities could be associated with visitor or undocumented alien use. Quitobaquito, including the nearby springs, is an area for illegal border activity due to its location along the border and proximity to Mexico Highway 2, road access within Organ Pipe, and availability of natural resources. All such human impacts degrade the pupfish's habitat and threaten its continued existence.

# C. Chemical Contamination

Pollution is a threat that could greatly affect the entire Quitobaquito pond ecosystem. Leaching of hazardous chemicals from illegally dumped refuse, tires, and discarded building materials can easily occur. A tire dump exists just south of the boundary.<sup>143</sup> The proximity of the pond to the heavily traveled Mexico Highway 2 (approximately 100 meters) makes Quitobaquito vulnerable to potential spills from the many tanker trucks and other vehicles using this road. This route is the sole land link from the Mexican mainland to the cities of Mexicali, Tijuana, the agricultural region of northern Baja California, and the rest of the Baja peninsula.<sup>144</sup>

<sup>141.</sup> See 1995 MONITORING REPORT, supra note 83, at 104.

<sup>142.</sup> See PEARSON, supra note 79, at 3.

<sup>143.</sup> Personal Knowledge, author Charles Conner, Biological Science Technician.

<sup>144.</sup> See BROWN, supra note 72, at 4.

Pesticide drift from aerial spraying of agricultural fields to the south is another concern.<sup>145</sup> Fish kills at Quitobaquito in 1976 were attributed to lethal levels of methyl-parathion.<sup>146</sup>

# D. Off-Road Foot and Vehicular Traffic

Impacts on vegetation and soils from off-trail foot traffic and offroad driving can be quite serious due to the particularly fragile crusted soil of the area. Some of the impacts include vegetation trampling, woodcutting, fire use, and harvesting of plants such as the medicinal yerba mansa (*Anemopsis californica*).<sup>147</sup> These types of impacts may come from visitors to the area, undocumented aliens, Native American ceremonial use, or law enforcement operations. This type of habitat degradation has significant adverse impact on the entire spring ecosystem.

#### E. Water Supply

Disruption of water flow to the pond by damming of the spring channel occurs from time to time, and the outright sabotage of the spring water delivery system occurred in 1984.<sup>148</sup> The potential exists for this to happen again. As discussed above, changes in water level, temperature, or chemical composition can all have an adverse effect on pupfish survival.

On a long-term regional scale, the port city of Puerto Peñasco, Sonora, 100 kilometers<sup>149</sup> to the southwest, has been undergoing an accelerated pace of development as a major tourist center, with several large hotel and condominium complexes, trailer parks, and other facilities being built in the last few years, and more on the way. The water supply for this fast-growing town is entirely from deep wells, and new sources are being sought further out into the desert to the north, in the direction of Sonoyta. This increasing demand for scarce water supplies in an extremely arid environment is a situation that could cause major problems in the future, much as is happening in the state of Nevada with the Amargosa Valley and the ever-thirsty city of Las Vegas. There, land far away from the city is being acquired solely for the purpose of water extraction, with very real potential harm to springs, wildlife, and deep-rooted desert trees such as mesquite and ironwood.

<sup>145.</sup> See id. at 2.

<sup>146.</sup> See BOYD E. KYNARD, STUDY OF QUITOBAQUITO PUPFISH—PRESERVATION, HABITAT, AND POPULATION MONITORING 13 (1979).

<sup>147.</sup> See GENERAL MANAGEMENT PLAN, supra note 7, at 33.

<sup>148.</sup> Personal Knowledge, author Charles Conner, Biological Science Technician.

<sup>149.</sup> See BROWN, supra note 72, at 4.

# V. LEGAL MECHANISMS FOR PROTECTING THE QUITOBAQUITO PUPFISH AND ITS HABITAT

## A. Intranational Legislation, Law and Policies

#### 1. Organ Pipe and Wilderness Management

The National Park Service Organic Act of 1916, as amended, <sup>150</sup> sets forth the general management philosophy and mandate for all national park units:

to conserve the scenery and the natural and historic objects and the wildlife therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations.<sup>151</sup>

This congressional statement of the National Park Service's purpose and goal sets the high standard of preservation for all of Organ Pipe's natural resources, while permitting human enjoyment of them.

The Organ Pipe Enabling Legislation sets out the particular purpose of this national monument.<sup>152</sup> On April 13, 1937 through Presidential Proclamation No. 2232, Organ Pipe Cactus was established as a national monument, primarily for its historic and scientific interest.<sup>153</sup> There is no specific mention of the Quitobaquito springs, pond, or desert pupfish in the legislation. Because these resources are within the boundaries of the established monument, it is understood that they are of historic and scientific interest and must be protected as such. The Quitobaquito area came under the protection of the 1916 Organic Act when it became part of Organ Pipe.

The provisions of the 1964 Wilderness Act<sup>154</sup> are also applicable at Organ Pipe. As stated above, approximately 95 percent of Organ Pipe is designated wilderness, including the Quitobaquito Management Area.<sup>155</sup> The purpose of the National Wilderness Preservation System is "to secure

<sup>150.</sup> National Park Service Organic Act, ch. 408, 39 Stat. 535 (1916) (codified as amended in scattered sections of 16 U.S.C.).

<sup>151. 16</sup> U.S.C. § 1 (1994).

<sup>152.</sup> See Proclamation No. 2232, 50 Stat. 1827, 1827 (1937) (codified at 16 U.S.C. § 431 note (1994) (Organ Pipe Cactus National Monument, Arizona)).

<sup>153.</sup> Id.

<sup>154.</sup> Wilderness Act, Pub. L. No. 88-577, 78 Stat. 890 (1964) (codified at 16 U.S.C. § 1131 (1994)).

<sup>155.</sup> See National Parks & Recreation Act of 1978, Pub. L. No. 95-625, Title IV, § 401(7), 92 Stat. 3476, 3490 (codified at 16 U.S.C. § 1132 note (1994) (Organ Pipe Cactus Wilderness)).

for the American people of present and future generations the benefits of an enduring resource of wilderness."<sup>156</sup> The act defines wilderness as

an area where the earth and its community of life are untrammeled by man, where man himself is a visitor who does not remain...retaining its primeval character and influence, without permanent improvements or human habitation, which is protected and managed so as to preserve its natural conditions and which (1) generally appears to have been affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable...and may also contain ecological, geological, or other features of scientific, educational, scenic, or historical value.<sup>157</sup>

Regardless of whether the wilderness definition applies to Quitobaquito in the strict sense, the area is within congressionally designated wilderness. The extent of past intervention and active management is immaterial. Intensive management actions were and continue to be conducted in order to preserve the ecological, scientific, and educational wilderness resource values found at Quitobaquito.

### 2. Water and Species Management

The doctrine of Federal Reserved Water Rights is of critical importance to Organ Pipe and its mission.<sup>158</sup> Quitobaquito pond was withdrawn as Public Water Reserve No. 88, which was authorized in the general withdrawal act passed by Congress on June 25, 1910, and amended on August 24, 1912.<sup>159</sup> Public Water Reserve No. 88 basically withdrew "lands within one-forth mile" of Quitobaquito pond "from settlement, location, sale, or entry, and reserved for public use...."<sup>160</sup> Use was further defined in 1926 as "water holes or other bodies of water needed or used by the public for water purposes...shall, while so reserved, be kept and held open to the public use for such purposes...."<sup>161</sup> The state has not required the filing of water rights claims in the Quitobaquito Management Area springs and pond, which drain into Mexico.<sup>162</sup> This area is classified in the San Simon watershed for the state of Arizona.<sup>163</sup>

163. See id.

<sup>156. 16</sup> U.S.C. § 1131(a) (1994).

<sup>157. 16</sup> U.S.C. § 1131(c) (1994).

<sup>158.</sup> See BARNETT & SHARROW, supra note 10, at 51-52.

<sup>159.</sup> See Act of June 25, 1910, Pub. L. No. 303, ch. 421, 36 Stat. 847, amended by Act of Aug. 24, 1912, Pub. L. No. 316, ch. 369, 37 Stat. 497.

<sup>160.</sup> BARNETT & SHARROW, supra note 10, at 51-52.

<sup>161.</sup> Act of Dec. 29, 1916, Pub. L. No. 290, ch. 9, § 10, 39 Stat. 862, 865.

<sup>162.</sup> See BARNETT & SHARROW, supra note 10, at 52.

Cases regarding federal reserved water rights for the protection of pupfish have occurred in other U.S. National Parks. The most famous case involved the Devil's Hole pupfish (Cyprinodon diabolis) in Death Valley National Park.<sup>164</sup> Groundwater pumping outside of the park was lowering the water level in Devil's Hole and threatening the pupfish breeding habitat.<sup>165</sup> The U.S. Supreme Court determined there was a federally reserved water right at the Devil's Hole National Monument, giving the National Park Service the authority to mandate that "only the amount of water necessary to fulfill the purpose of the reservation, no more," remain in the pool at all times.<sup>166</sup> The Court affirmed that the level of the pool may be permitted to drop by outside groundwater pumping, but not so much as to impair its scientific value as a natural habitat for the pupfish species sought to be preserved, thus fulfilling the purpose of the proclamation setting aside Devil's Hole National Monument.<sup>167</sup> These same principles and federal objectives exist at Organ Pipe, so this case ruling, which favored the pupfish and mandated a minimum water level in Devil's Hole to assure its survival, is directly applicable to the Quitobaquito water resources required by the Desert pupfish. Keeping legal control of the necessary quantity of water to maintain Organ Pipe and all of its natural resources, but particularly the pupfish required pond levels, will be essential to meet long-term management goals.

The Federal Water Pollution Control Act, also known as the Clean Water Act,<sup>168</sup> provides indirect protection through a suite of nationwide water quality protection provisos designed to "restore and maintain the chemical, physical, and biological integrity of the Nation's waters."<sup>169</sup> This would include the waters of the National Park System. Federal legislation and regulations are generally implemented by the states, with the Environmental Protection Agency overseeing the program.<sup>170</sup> States have adopted anti-degradation standards based on three levels:

1. maintaining existing uses of a water segment and the quality level necessary to protect the uses;<sup>171</sup>

2. protection of existing water quality in segments where quality exceeds levels necessary to support propagation of

<sup>164.</sup> See Cappaert v. United States, 426 U.S. 128 (1976).

<sup>165.</sup> See id. at 128.

<sup>166.</sup> Id. at 141.

<sup>167.</sup> See id.

<sup>168.</sup> Federal Water Pollution Control Act of 1972, as amended, 33 U.S.C. §§ 1251-1376 (1994).

<sup>169. 33</sup> U.S.C. § 1251(a).

<sup>170.</sup> See 33 U.S.C. § 1313.

<sup>171.</sup> See 33 U.S.C. § 1313(d).

fish, shellfish, and wildlife and recreation in and on the water;<sup>172</sup> and

3. special protection for waters for which ordinary use classification may not suffice and which are classified as "Outstanding National Resource Waters" (ONRW) or are given a similar state designation.<sup>173</sup>

The ONRW designation, which would provide the highest level of antidegradation standards for these water resources and the pupfish, is appropriate for the Quitobaquito springs channel and pond area; however, it has not yet been considered.

The Endangered Species Act (ESA), as amended, <sup>174</sup> directly relates to the protection of the Quitobaquito pupfish and its established critical habitat. This act requires all entities using federal funding to consult with the Secretary of the Interior on activities that potentially impact endangered flora and fauna.<sup>175</sup> It requires agencies to protect endangered and threatened species as well as designated critical habitats.<sup>176</sup> Management and monitoring actions are coordinated with the U.S. Fish and Wildlife Service, which serves as the overseeing agency for endangered species in the United States.<sup>177</sup> The National Park Service must meet these statutory requirements at Organ Pipe for all the listed endangered species within its boundaries, and, in particular, the Quitobaquito pupfish.

## 3. Applicable Executive Orders

Under Executive Order 11,990, entitled Protection of Wetlands, federal agencies are "to avoid to the extent possible the long and short-term adverse impacts associated with the destruction or modification of wetlands and to avoid direct or indirect support of new construction in wetlands wherever there is a practicable alternative."<sup>178</sup> This order established a mandate for the National Park Service and other federal agencies "to preserve and enhance the natural and beneficial values of wetlands" and to minimize impacts to them when no practicable alternative to the proposed action exists.<sup>179</sup> Quitobaquito springs and pond are wetlands that certainly fall within the ambit of that directive.

<sup>172.</sup> See id.

<sup>173.</sup> See BARNETT & SHARROW, supra note 10, at 13.

<sup>174.</sup> Endangered Species Act of 1973, as amended, 16 U.S.C. §§ 1531-43 (1994).

<sup>175.</sup> See 16 U.S.C. § 1536.

<sup>176.</sup> See id.

<sup>177.</sup> See id.; Authorized Representative, 50 C.F.R. § 1.2 (1998).

<sup>178.</sup> Exec. Order No. 11,990, 42 Fed. Reg. 26,961; 26,961 (1977).

<sup>179.</sup> Id.

Executive Order 11,987 on exotic species stated that federal agencies "shall restrict the introduction of exotic species into the natural ecosystems on lands and waters which they own, lease, or hold for purposes of administration; and, shall encourage the States, local governments, and private citizens to prevent the introduction of exotic species into natural ecosystems of the United States."<sup>180</sup> However, this Order was revoked by President Clinton and replaced with Executive Order 13,112 on February 3, 1999.<sup>181</sup> The new order creates the Invasive Species Council, requires development of an Invasive Species Management Plan, and expands on the directives of the previous order.<sup>182</sup> The stated purpose of the new directive is "to prevent the introduction of invasive species and provide for their control and to minimize the economic, ecological, and human health impacts that invasive species cause."<sup>183</sup> Once again, Organ Pipe must be managed to comply with past and current Presidential directives regarding exotic species threatening the monument.

The Executive Order on environmental pollution, No. 12,088, requires federal agencies to ensure that "all necessary actions are taken for the prevention, control, and abatement of environmental pollution with respect to Federal facilities and activities under the control of the agency."<sup>184</sup> Further, the agencies must cooperate with the Environmental Protection Agency, state, intrastate, and local agencies to develop the "best techniques and methods available for the prevention, control, and abatement of environmental pollution."<sup>185</sup> These mandates apply to the National Park Service management of Organ Pipe and its surrounding environments, where pollution threats to the monument may originate.

### **B.** International Legislation and Agreements

# 1. Treaties and Statutes

The Convention on Nature Protection and Wildlife Preservation in the Western Hemisphere was a treaty signed by both Mexico and the United States.<sup>186</sup> This Convention expanded the previous 1936 United States and Mexico Convention for Protection of Migratory Birds and Game

<sup>180.</sup> Exec. Order No. 11,987, § 2(a), 42 Fed. Reg. 26,949; 26,949 (1977).

<sup>181.</sup> Exec. Order No. 13,112, 64 Fed. Reg. 6183 (1999), reprinted in 42 U.S.C. § 4321 note (1994).

<sup>182.</sup> See id. at §§ 3, 4, 5.

<sup>183.</sup> Id. at 6183.

<sup>184.</sup> Exec. Order No. 12,088, § 1-101, 43 Fed. Reg. 47,707; 47,707 (1978).

<sup>185.</sup> Id. at § 1-201.

<sup>186.</sup> Convention on Nature Protection and Wildlife Preservation in the Western Hemisphere, Oct. 12, 1940, 56 Stat. 1354, 1374, 161 U.N.T.S. 193.

Mammals<sup>187</sup> to include plants, endangered species, and collaboration in the development of human resources.<sup>188</sup> With the signing of this treaty, Mexico and the United States agreed that they would cooperate to protect endangered plant and animal species and their habitats and to preserve all objects of aesthetic, historic, or scientific value.<sup>189</sup> This agreement is an important foundation document for mutual enterprise of these two nations at Organ Pipe.

Mexico became a signatory to the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) in 1991.<sup>190</sup> This bilateral agreement gave more strength to existing international wildlife protection laws, such as the 1936 and 1941 Conventions. This treaty strictly regulates international trade of listed endangered species from the respective countries.<sup>191</sup> The U.S. Fish and Wildlife Service has played a major role in training Mexican officials in enforcing CITES regulations.<sup>192</sup>

The Water Utilization Treaty of 1944 established the International Boundary and Water Commission with a commission representative from the United States and Mexico.<sup>193</sup> The treaty outlined the allocation of the Colorado, Tijuana, and Rio Grande rivers.<sup>194</sup> Joint use of international waters was to be ranked in the following priority:

- 1. domestic and agricultural,
- 2. agriculture and stock,
- 3. electric power,
- 4. other industrial uses,
- 5. navigation,
- 6. fishing and hunting, and
- 7. any other beneficial use determined by the Commission.<sup>195</sup>

189. See Convention on Nature Protection and Wildlife Preservation in the Western Hemisphere, *supra* note 186, at 1356, 1364.

190. Convention on International Trade in Endangered Species of Wild Fauna and Flora, Mar. 3, 1973, 27 U.S.T. 1087, 993 U.N.T.S. 243.

<sup>187.</sup> Convention between the United States and Mexico for the Protection of Migratory Birds and Game Mammals, Feb. 7, 1936, U.S.–Mex., 50 Stat. 1311.

<sup>188.</sup> See Convention on Nature Protection and Wildlife Preservation in the Western Hemisphere, *supra* note 186, at 1356; U.S. DEP'T OF THE INTERIOR, FISH & WILDLIFE SERV. & THE DIRECTION GENERAL FOR CONSERVATION & ECOLOGICAL USE OF NATURAL RESOURCES OF MEXICO, SIXTY YEARS OF COOPERATION BETWEEN THE UNITED STATES AND MEXICO IN BIODIVERSITY CONSERVATION (1936-1996) 9 (1996) [hereinafter SIXTY YEARS OF COOPERATION].

<sup>191.</sup> See id. at art. II.

<sup>192.</sup> See SIXTY YEARS OF COOPERATION, supra note 188, at 11.

<sup>193.</sup> Treaty Regarding Utilization of Waters of the Colorado and Tijuana Rivers and the Rio Grande, Feb. 3, 1944, U.S.–Mex., 59 Stat. 1219, T.S. No. 994.

<sup>194.</sup> See id. at art. 3.

<sup>195.</sup> See id.; BARNETT & SHARROW, supra note 10, at 9.

Because of its location on the Mexican border, Organ Pipe has unique obligations to fulfill U.S. commitments made under this treaty with Mexico.

The American Indian Religious Freedom Act gives Native Americans the right to access religious sites, the right to use and possess sacred objects, and the freedom to worship through traditional ceremonial rites.<sup>196</sup> This act directly relates to the ceremonial activities that take place at Quitobaquito within the designated Wilderness by the Tohono and Hia Ced O'odham.

Through the International Wildlife Resources Conservation chapter of the International Environment Protection Act of 1983,<sup>197</sup> Congress directed the Secretary of State and Secretary of Interior to review "the effectiveness of existing United States international activities relating to the conservation of international wildlife resources" and to "develop recommendations to substantially improve existing capabilities."198 As a result, a report to Congress was prepared in 1984 that discussed current federal involvement in international wildlife resource conservation, proposed international wildlife resource conservation regions, and recommended an integrated plan of action.<sup>199</sup> The report highlights the fact that in 1982 President Reagan publicly supported the efforts of the International Union for Conservation of Nature and Natural Resources.<sup>200</sup> The President emphasized that "[i]nternational cooperation in the wise use and conservation of natural resources has become increasingly important as we strive for a better standard of living for all the world."<sup>201</sup> Nowhere is such cooperation more essential than at the borders of the United States and Mexico, at places like Organ Pipe.

The main purpose of the North American Free Trade Agreement of 1993 (NAFTA) is to promote, in a manner consistent with the environment, employment and economic growth in each member country through the expansion of trade and investment opportunities and the enhancement of the competitiveness of Canadian, Mexican, and U.S. firms in global markets.<sup>202</sup> Other international agreements followed to help support NAFTA. The Border Environment Cooperation Commission (BECC) and the North American Development Bank (NADBank) were

200. See id. at 9.

201. Id.

<sup>196.</sup> American Indian Religious Freedom Act, as amended, 42 U.S.C. § 1996 (1994).

<sup>197.</sup> International Environment Protection Act of 1983, Pub. L. No. 98-164, Title VII, § 704, 97 Stat. 1017, 1046-47.

<sup>198.</sup> Id. at § 704(a).

<sup>199.</sup> See U.S. DEP'T OF STATE & U.S. DEP'T OF THE INTERIOR, CONSERVING INTERNATIONAL WILDLIFE RESOURCES: THE UNITED STATES RESPONSE: A REPORT TO CONGRESS 41-47 (1984).

<sup>202.</sup> North American Free Trade Agreement, U.S.–Can.–Mex., Dec. 17, 1992, *implemented* by NAFTA Implementation Act, Pub. L. No. 103-182, 107 Stat. 2057 (1993).

created to develop, certify, and finance environmental infrastructure projects in the border area between the United States and Mexico.<sup>203</sup> The Commission for Environmental Cooperation (CEC) was created to promote environmental cooperation throughout North America.<sup>204</sup>

These treaties and statutes can be used to promote the Organ Pipe management plans in cooperation with Mexico. However, by supporting the economic development goals or permitted human uses of the area, they can also create potential conflicts for Organ Pipe's preservation.

## 2. Agreements and Committees

The purpose of the United States and Mexico Joint Committee for the Conservation of Wild Flora and Fauna is to coordinate bilateral efforts for the conservation of threatened or endangered species of wild flora and fauna, exchange of wildlife specimens, management of migratory birds, international wildlife law enforcement, and training.<sup>205</sup>

Agreement PR #313, which went into effect on June 19, 1978, fostered cooperation between the United States of America and the United Mexican States to protect and improve the environment in the Border area.<sup>206</sup>

The La Paz Agreement between Mexico and the United States was signed in 1983 for cooperation in protecting and improving the environment in the border area.<sup>207</sup> The purpose of this agreement was to protect, improve, and conserve the environment and to address the problems that affect it by agreeing to the "necessary measures to prevent and control pollution in the border area."<sup>208</sup>

On November 30, 1988, the Memorandum of Understanding between the United States National Park Service and Mexico's Ecology and Urban Development Agency (SEDUE) was signed by Mexico, and by the United States on January 24, 1989.<sup>209</sup> National Park Service employees and

208. Id. at art. 1.

<sup>203.</sup> See Agreement Between the Government of the United States of America and the Government of the United Mexican States Concerning the Establishment of a Border Environment Cooperation Commission and a North American Development Bank, Jan. 1, 1994, U.S.-Mex., T.I.A.S. No. 12,516.

<sup>204.</sup> See id. at § 1.

<sup>205.</sup> See SIXTY YEARS OF COOPERATION, supra note 188, at 11.

<sup>206.</sup> See U.S. DEP'T OF THE INTERIOR, NAT'L PARK SERV., STATEMENT FOR MANAGEMENT: ORGAN PIPE CACTUS NATIONAL MONUMENT ARIZONA 6 (1994).

<sup>207.</sup> See Agreement on Cooperation for the Protection and Improvement of the Environment in the Border Area, Aug. 14, 1983, U.S.-Mex., T.I.A.S. No. 10,827.

<sup>209.</sup> Memorandum of Understanding between National Park Service of the Department of the Interior of the United States of America and Secretariat of Urban Development and Ecology, United Mexican States on Cooperation in Management and Protection of National Parks and Other Protected Natural and Cultural Heritage Sites, Jan. 24, 1989, U.S.-Mex.,

their Mexico counterparts have been informally working together for many years on protected area management along the U.S.-Mexico Border. In 1988 these efforts became formalized through this Memorandum of Understanding (MOU) between the National Park Service and SEDUE, now Secretariat of Environment, Natural Resources, and Fisheries (SEMARNAP).<sup>210</sup> The intent of this agreement is collaboration between the United States and Mexico on the management and conservation of protected natural areas and their cultural resources.<sup>211</sup>

Along the U.S.-Mexico border, a need has long existed for a central office to help coordinate and fund National Park Service and Mexico work projects, and to disseminate information to the field regarding resources management, environmental education, training, and general protected-area management. The 1988 MOU, along with support from the National Park Service Southwest Regional Director and park superintendents, led to the establishment of the United States/Mexico Affairs Office of the National Park Service in 1991.<sup>212</sup> The initial emphasis of this office was to develop and coordinate training courses, conferences, and workshops in both the United States and Mexico.<sup>213</sup> Since 1994, efforts have concentrated on issue identification and management solutions among United States/Mexico border protected areas.<sup>214</sup> Office staff are members of several border environmental work groups, such as the Department of the Interior Border Field Coordinating Committee and Border XXI.<sup>215</sup>

The 1994 Border XXI Program was born out of the 1983 La Paz Agreement and the 1992 Integrated Environmental Plan for the U.S.-Mexico Border Area.<sup>216</sup> The program's mission is "to achieve a clean environment, protect public health and natural resources, and encourage sustainable development."<sup>217</sup> The primary goal of the program is "to promote sustainable development in the border region which 'meets the needs of the present without compromising the ability of future generations to meet their own needs.""<sup>218</sup> Border XXI is a broad program with workgroups detailed to all aspects of environmental health (air and

- 217. Id.
- 218. Id.

T.I.A.S. No. 11,599.

<sup>210.</sup> See id.

<sup>211.</sup> See id. at art. I.

<sup>212.</sup> Personal Knowledge, author Gina Pearson, International Program Assistant Coordinator.

<sup>213.</sup> See id.

<sup>214.</sup> See id.

<sup>215.</sup> See id.

<sup>216.</sup> See U.S. ENVTL. PROTECTION AGENCY, PUB. NO. EPA 160-S-96-001, U.S.-MEXICO BORDER XXI PROGRAM: EXECUTIVE SUMMARY 1 (1996).

water quality, hazardous and solid waste disposal, pollution prevention, and emergency response), human health, natural resources management, and cooperative enforcement.<sup>219</sup> The Environmental Protection Agency is the overall lead organization for the United States.<sup>220</sup> There are a number of international partners, both governmental and non-governmental. The National Park Service's main involvement has been in the area of air quality and natural resources management.<sup>221</sup> The Department of the Interior is the lead for the natural resources workgroup.<sup>222</sup>

In 1995 the Canada/Mexico/United States Trilateral Committee for Wildlife, Plants, and Ecosystem Conservation and Management was formed.<sup>223</sup> The purpose of this committee is to facilitate and enhance coordination, cooperation, and development of partnerships among the wildlife agencies of the three countries, and with other associated and interested entities, regarding projects and programs for the conservation and management of wildlife, plants, biological diversity, and ecosystems of mutual interest.<sup>224</sup> This committee essentially replaces previous trilateral committees on conservation such as the Conservation of Wetlands and Migratory Birds in 1988 and the Waterfowl Management Plan of 1994.<sup>225</sup> The committee works to ensure the implementation of previous trilateral resource management plans and agreements.<sup>226</sup>

In 1996, the Arizona and Sonora State governors signed an agreement to promote a Binational Sonoran Desert Biosphere Reserve Network to include Organ Pipe Cactus, the *Pinacate y Gran Desierto de Altar Biosphere Reserve, Alto Golfo de California y Delta del Rio Colorado Biosphere Reserve,* Cabeza Prieta National Wildlife Refuge, and Bureau of Land Management Areas of Critical Environmental Concern—an area covering over 1.6 million hectares.<sup>227</sup> The intent of the Network is to promote cross-

<sup>219.</sup> See id. at 3-6.

<sup>220.</sup> See id. at 1.

<sup>221.</sup> Personal Knowledge, author Gina Pearson, International Program Assistant Coordinator.

<sup>222.</sup> See Letter of Intent Between the Department of Interior (DOI) of the United States and the Secretariat of Environment, Natural Resources and Fisheries (SEMARNAP) of the United Mexican States for Joint Work in Natural Protected Areas on the United States-Mexico Border, May 5, 1997, U.S.-Mex., at 2 [hereinafter DOI & SEMARNAP Letter of Intent].

<sup>223.</sup> See id.

<sup>224.</sup> See SIXTY YEARS OF COOPERATION, supra note 188, at 12.

<sup>225.</sup> See id.

<sup>226.</sup> See id.

<sup>227.</sup> See Managing Natural and Cultural Resources and Promoting Sustainable Development in the Sonoran Desert Borderlands of Arizona and Sonora: A Proposal for Cooperative Resource Management Recognizing the Sovereignty of Adjoining Nations, 1996, State of Ariz., U.S.-State of Sonora, México, at 2-3.

border cooperation in managing shared natural resources, promote sustainable economic and community development, and preserve the rich cultural heritage of the region.<sup>228</sup>

On May 5, 1997, the U.S. Secretary of Interior and SEMARNAP signed a letter of intent for joint work in natural protected areas on the U.S.-Mexico border.<sup>229</sup> As stated, the two agencies are to expand existing cooperative activities in the conservation of border zone natural protected areas, and to consider new opportunities for cooperation in the protection of these areas.<sup>230</sup> The letter specified two pilot project areas, one in Arizona/Mexico and the other in Texas/Mexico.<sup>231</sup> The Arizona/Mexico region covers the following protected areas: in Mexico, the Alto Golfo de California y Delta del Rio Colorado Biosphere Reserve in Baja California and Sonora; and El Pinacate y Gran Desierto de Altar Biosphere Reserve in Sonora.<sup>232</sup> The adjacent protected areas in the United States include Organ Pipe Cactus National Monument and Cabeza Prieta National Wildlife Refuge in Arizona, Imperial National Wildlife Refuge in Arizona and California, and specific special management areas administered by the Bureau of Land Management in Arizona.<sup>233</sup> In October 1997, the first Letter of Intent Meeting for the Arizona/Mexico protected areas took place in Puerto Peñasco, Sonora.<sup>234</sup> From this meeting a work plan was developed for the areas of Organ Pipe Cactus National Monument, Cabeza Prieta National Wildlife Refuge, and El Pinacate Biosphere Reserve.<sup>235</sup> Follow-up meetings were held in Ajo, Arizona, in February 1999 and in Tucson, Arizona, in July 1999.<sup>236</sup> Accomplishments and future work projects were discussed.

# VI. CONCLUSION

The status of the Quitobaquito pupfish and its habitat is clear. The fish is an endangered species and has designated critical habitat. These factors alone are reason enough to protect this species through all legal mechanisms. After a cursory review of the above laws, policies, and agreements, there is no question that Organ Pipe Cactus National

<sup>228.</sup> See id. at 2.

<sup>229.</sup> DOI & SEMARNAP Letter of Intent, supra note 222, at 1.

<sup>230.</sup> See id.

<sup>231.</sup> See id. at 2-3.

<sup>232.</sup> See id. at 3.

<sup>233.</sup> See id.

<sup>234.</sup> Personal Knowledge, author Gina Pearson, International Program Assistant Coordinator.

<sup>235.</sup> See id.

<sup>236.</sup> See id.

Monument has the authority, responsibility, and legal requirements to protect the ecological integrity of the Quitobaquito pupfish and to preserve its critical habitat—the springs, channel, and pond.

Continued monitoring and management by the National Park Service of the Quitobaquito pupfish and its habitat is necessary for the survival of the species. Should future international land uses threaten habitat quality and survival of the fish, existing laws, accords and agreements with Mexico will be applied. To date, it has not been necessary to make a legal case for establishing minimum water flows or levels for the endangered Quitobaquito pupfish.