Environmental Water Demand Statement for inclusion in Lower Rio Grande Regional Water Plan

Prepared by the Environmental Working Group

May, 2015

We recognize that "the environment" is a legitimate user of water in our region. Water is needed to keep the Rio Grande flowing, to support fish and wildlife, to sustain wetlands and bosques, and to provide for fishing and boating, to name just a few environmental water uses.

Although no water rights are currently administered explicitly on behalf of the environment, the environment is certainly using water allocated for other purposes. The Rio Grande flows, for example, when irrigation releases occur from Caballo Reservoir. An estimated 25,000 to 90,000 acre-feet per year are consumed by riparian vegetation along the river between Caballo and the state line.[1]

The current situation, however, in which water is only incidentally allocated to the environment is less than ideal. The environment clearly is not getting the water it needs, as evidenced by the dewatering of the river in the non-irrigation season, the disappearance of two-thirds of the original complement of native fish from this reach of the Rio Grande, and the dessication of the floodplain due to the elimination of spring/summer floods and falling groundwater levels.

The current Lower Rio Grande regional water plan does not contain current or projected demand figures for water use by the environment. Authors of the current plan acknowledged this deficiency and recommended that it be remedied in future plan updates. They wrote:

Currently, there is no accurate way to determine a demand value for the environment. This is an important consideration for planning within the region and studies are currently being conducted to assess the amount of water that is used for the environment and how much will be needed in the future.[2]

We are not aware of any comprehensive studies that have been done to assess total environmental demand. Consequently, we have attempted to develop a preliminary environmental water demand figure to include in this plan, recognizing that more research is needed to refine our estimate of how much water the environment needs.

We have defined "the environment" to be a healthy Rio Grande ecosystem that functions much as it did prior to the construction of dams, channelization, and extensive human alteration of its watershed, albeit at a reduced scale. We defined "environmental water demand" to be the amount of water needed to restore and maintain the Rio Grande in this condition.

We adopted the vision statement previously developed by the Alliance for the Rio Grande Heritage:

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[1] The New Mexico Lower Rio Grande Regional Water Plan, August, 2004, p. 7-166.
[2] Ibid. p. 7-166

We envision a Rio Grande that sustainably supports both the ecology and the biota of the river, and the needs of the human inhabitants of the region. To sustain the Rio Grande ecosystem and its native aquatic and riparian biodiversity, we need to promote flows that more closely resemble the historic hydrograph; re-establish the geomorphic processes and other characteristics that maintain the river's channel, floodplain and riparian corridor; control invasive species; and encourage land use and water resource management that promote and maintain such a system.[3]

We identified and attempted to quantify all of the various components of environmental water demand. Drawing upon the limited sources of information that exist, in combination with our informed judgement, we developed an estimated quantity for each demand component for inclusion in the plan until better data are available.

It should be noted that, except for evapotranspiration by floodplain vegetation and evaporation off open water, environmental water is not necessarily lost to the system and is potentially available for other users.

1. Year-round base flows. This is the amount of water that needs to be released annually from Caballo to maintain instream flows in the non-irrigation season. The primary purpose of these releases would be to keep fish and other aquatic organisms alive in the river, and to provide year-round opportunities for water-based recreation.

Given the current lack of aquatic habitat diversity in the river, simply running water down the existing channel will do little to benefit aquatic organisms. The amount of water needed to support aquatic life in the non-irrigation season could be substantially reduced by undertaking projects to increase aquatic habitat diversity, such as creating backwaters and side channels.

The amount of water needed to keep the river flowing in the non-irrigation season is dependent upon groundwater levels. In years of less than full allocation of Rio Grande Project water, farmers pump more groundwater to compensate for the lack of surface water, and groundwater levels drop. Consequently, a greater portion of water released into the river from Caballo Reservoir will soak into the ground to replenish the shallow aquifer, necessitating greater releases to provide base flows through the entire reach.

The amount of water needed for base flows is also complicated by the fact that the duration of the irrigation season depends upon the amount of Rio Grande Project water available in any given year. In a full allocation year, irrigation releases from Caballo Reservoir to the river occur from March into October, leaving four months in which irrigation releases do not occur. In water short years, however, the length of the irrigation season may be drastically reduced. For the purposes of calculating environmental demand, a full Project allocation and a four month non-irrigation season are assumed.

Current base flows in the river below Caballo Dam in the nonirrigation season result from seepage from the dam, groundwater accretion and treated municipal wastewater discharged to the river. Current base flows range (50% exceedance) from 20 cfs at Percha Dam to 100 cfs at the Montoya Drain.[4]

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[3] *Hope for A Living River: A Framework for a Restoration Vision for the Rio Grande, Alliance for the Rio Grande Heritage (2003) at p. v*, retrievable at http://www.fws.gov/bhg/

[4] CH2MHill, March, 2000. Biological Resources Technical Report, Volume 1. El Paso-Las Cruces Regional Sustainable Water Project, Figure 10-4.3

A modest increase in current base flows in tandem with aquatic habitat development would provide significant ecological benefits. Current flows could be increased by 55 cfs through the entire reach during the non-irrigation season by releasing 200 cfs at Caballo Dam, which amounts to 47,000 acre-feet released over four months.[5]

This should be considered a minimum volume. Releases to support boating would be larger, since the ideal flow rate for such activities is 2500 cfs or higher.

1. Peak flows. This is the amount of water needed to be released to mimic peak flows following snowmelt in the late spring and early summer. Such flows are important for flooding the river's banks, maintaining hydrologic connection between the river and its floodplain, recharging the shallow aquifer, regenerating and sustaining floodplain plant communities, providing spawning cues to native fish, reconnecting isolated aquatic floodplain habitats with the river, promoting nutrient cycling, and transporting sediment.

The U. S. Army Corps of Engineers estimates that a peak release of 9500 acre-feet would be needed every 3-5 years (for an annual average of 1900 to 3200 acre-feet) to inundate selected restoration sites within the Canalization Project, if timed to occur on top of normal irrigation releases.[6] This should be considered the minimum amount needed for peak flows, since the total area inundated would be less than 550 acres out of 9000 total acres within the CP.

2. Riparian evapotranspiration and open water evaporation from floodplain features. This includes the amount of water consumed by floodplain plant communities, through sequestration by plant tissues and evapotranspiration. The first is relatively insignificant compared to the latter and can be ignored. It also includes the amount of water evaporated from ponds, sloughs and other bodies of open water that provide important habitat for many species of fish and wildlife.

The current plan estimates that evapotranspiration from riparian vegetation between Caballo and the state line is 25,000-90,000 acre-feet in a full supply year.[7] Much of the floodplain between the levees is mowed annually by the International Boundary and Water Commission—U.S. Section, suppressing the establishment of mature woody vegetation. In addition, existing riparian plant communities are less diverse than they were historically, consisting predominantly of saltgrass and nonnative tamarisk.

One method to calculate consumptive use by floodplain vegetation is to estimate the proportion of various types of plant communities historically, calculate how much acreage each would cover if restored to roughly those same proportions within USIBWC's Canalization Project, and add up the consumptive use for each type of plant community within the entire Canalization Project.

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[5] Draft Environmental Impact Statement, El Paso-Las Cruces Regional Sustainable Water Project, April 2000, Table 3.3-3

[6] Conceptual Restoration Plan and Cumulative Effects Analysis, Rio Grande—Caballo Dam to American Dam, New Mexico and Texas. Prepared for United States Section International Boundary and Water Commission (USIBWC), by U.S. Army Corps of Engineers, Albuquerque District, 2009.

[7] The New Mexico Lower Rio Grande Regional Water Plan, 2004, p. 7-166.

Stotz analyzed cadastral survey reports and other sources to determine the proportions of floodplain plant communities historically associated with the Rio Grande in southern New Mexico.[8] Survey reports suggested the following distribution for the Mesilla Valley in 1857:

- Cottonwood timber—34.6 %
- No timber (includes areas dominated by mesquite or other shrubby growth, as well as areas with little or only low vegetation)—25.9%
- Cultivated land—23.8%
- River channel—9.1% (probably a slight overestimation, according to Stotz)
- Willow thicket—4.2%
- Pond, slough, marsh—1.9% (probably a slight underestimation, according to Stotz)
- Dry river channels—0.6%

The total acreage within the Canalization Project--including the levees but excluding the river channel--is approximately 9000 acres.[9] Assuming the levees comprise 10 percent of that acreage, the remaining area is 8100 acres. If we take out the cultivated area and river channel categories from the survey reports (since neither occur today on the floodway between the levees and river channel), and redistribute their acreage to the other categories evenly, and break out a meadow community type equal to half of the "no timber" category, we get a relative distribution of plant communities as indicated in the following table.

Applying ET rates[10] for each plant community type, it is possible to calculate a rough estimate of riparian ET demand. (The pan evaporation rate at NMSU was applied to the open water features.) Using this admittedly crude method, we estimate that floodplain plant communities and open water features would consume about 26,000 acre-feet of water per year. This is in line with the low-end of the estimated range of ET consumption in the current regional water plan. Further analysis is needed.

	Survey %	Adjusted %	Acreage in CP	ET Rate (ft/yr)	ET (af/yr)
Cottonwood timber	35%	42%	3114	4.8	14947
Shrub	13%	21%	1170	3.4	3978
Cultivated land	24%		2142		
River Channel	6%		540		
Willow thicket	4%	12%	378	4.9	1852
Pond, slough, marsh	4%	12%	360	7.8	2808
Dry river channels	1%		54		
Meadow	13%	21%	1170	2.4	2808
Total	100%		9000		26393

[8] Stotz, Nancy. Historic Reconstruction of the Ecology of the Rio Grande/Rio Bravo Channel and Floodplain in the Chihuahuan Desert. Report prepared for the Chihuahuan Desert Program, World Wildlife Fund, 2000.
[9] Elizabeth Verdecchia, USIBWC, personal communication, 2015.
[10] Using rates from USCOE, 2009, op. cit.

3. Groundwater recharge to support floodplain ecological communities. Riparian and wetland communities are dependent upon shallow groundwater. This demand component would be partially met by restoring peak flows. Modeling of surface water/groundwater interactions is required to quantify this aspect of environmental water demand.

4. Habitat needs of various native fish guilds. Most native fish species require areas of slow to moderate velocities for nursery and spawning habitat. These areas are largely lacking in the Rio Grande currently, as flows in the river are alternately too low (or nonexistent) during the non-irrigation months), or too fast during the irrigation season.[11] Further analysis is needed to determine the optimal combination of environmental flows and habitat restoration to sustain native fish.

5. Other ecological needs: mammals, herps, invertebrates, birds, etc.

In summary, we estimate environmental water demand in our region to be a minimum of about 75,000 acre-feet annually, as indicated in the following table.

Demand Component	Quantity (af/yr)
Baseflows during nonirrigation season	47,000
Peak flows	1900
Floodplain vegetation	26000
Total	74,900

[11] CH2MHill, March, 2000. Op. cit., p 10-4.22.