SCIENTIFIC WORKSHOP ON THE PROVISION OF ENVIRONMENTAL FLOWS IN MEDITERRANEAN EPHEMERAL RIVERS.

MADRID, 18 SEPTEMBER 2004

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IUCN – CENTRE FOR MEDITERRANEAN COOPERATION

Report prepared by César Alcácer
Water Programme Officer

TABLE OF CONTENTS

INDEX OF TABLES

WORKSHOP PROCEEDINGS

(DRAFT)

IUCN Centre for Mediterranean Cooperation

SCIENTIFIC WORKSHOP ON
THE PROVISION OF ENVIRONMENTAL FLOWS IN MEDITERRANEAN EPHEMERAL RIVERS
September 18th 2004, at 9:00h, Madrid

The following is a draft version of the proceedings of the "IUCN Workshop on the provision of environmental flows in Mediterranean ephemeral rivers" held in Madrid on Septembe 18th 2004r. This document incorporates a summary of the discussions, a listing of issues that emerged and recommendations for next steps, and it is supported by the discussion papers and additional documentation that can be found at the Annexes. This draft is being circulated to participants for their comment and hopefully to stimulate further dialogue on how best to take this forward. After incorporating comments and suggestions from participants, the proceedings of the workshop will be circulated more widely and placed on the IUCN-Med website.

BACKGROUND

The IUCN Centre for Mediterranean Cooperation supports Members' efforts to develop, adapt and utilize management tools for integrated water management, particularly to bring freshwater ecosystem and wetlands conservation and protection concerns into mainstream planning and management at the catchment scale. A suitable management tool recently emerged is Environmental flows assessments (EFAs). EFAs explicitly link wetland site management concerns to basin management actions and have direct relevance for implementing policy commitments such as embodied under RAMSAR for wetland conservation and management, and the EU-WFD.

In an environment of water scarcity and competition for water like the Mediterranean region, River Basins Organizations are more and more perceived as the key managerial actor at the basin level, which have to face not only the challenges of traditional water users, but also those from ecosystem needs in order to ensure the ecosystem health, economic development, equity and the rest of benefits that healthy rivers, both in the surface and groundwater phases, bring to society.

A key scientific gap has been identified. The lack of scientific understanding and experience with environmental flow assessment in intermittent rivers, which are common in the Mediterranean, are regarded as a limitation to basin management in the region. Most of the current EFA research, methodologies, and experience are related to temperate climates and base flow rivers. To address this gap, the Centre intends to establish a network of experts to help catalyse activities in this field. This working group meeting represents the first step towards this goal.

SUMMARY OF DISCUSSIONS

Initially the participants (see Annex III) introduced themselves, the interest and involvement of their organization in the topic and their expectations for the workshop. This was followed by a presentation from César Alcácer, IUCN-Med Water Programme Officer, regarding the role of IUCN-Med and its interest in convening the meeting. Larry Haas, IUCN-Med consultant, gave a presentation on the importance of environmental flows in Integrated Catchment Management, to provide the context for the discussion. Overhead power point presentations are available as Annex VI and VII respectively. After that, the authors of the discussion papers presented their work followed by round table sessions.

PRESENTATIONS

Presentation 1: "Basic Components of an ephemeral stream in the Mediterranean: Study case of the Zegzel-Cherraa system in Morocco", by Dr. Mohammed Melhaoui.

Dr. Mohammed Melhaoui, professor of at the Faculty of Sciences at the University of Oujda (Morocco) presented the discussion paper on the biotic components of ephemeral streams in the Mediterranean. He focused his presentation on the Zegzel-Cherraa system, which is a representative Mediterranean watercourse. This stream is particularly interesting because it has three differentiated sections: a perennial (upper zone), an intermittent (middle zone) and an ephemeral one (lower zone). This was useful to identify the main features that distinguish the ephemeral streams compared to the perennial ecosystems. The riparian vegetation pattern goes from more water demanding upstream (willows, reeds…) to more drought resistant downstream (Nerium, Tamarix). The upper and middle sections (the ones with flow secured for at least some period of the year) are characterized by the presence of Chara vulgaris (stonewort) which is an indicator of Calcium. However, they differ from the existing fauna. Ichtiofauna (Barbus sp) can only be seen in the upper reach, and macroinvertebrates go from rheophilic upstream to limnophilic downstream. The lower section is characterized by river bed colonization from riparian communities.

He highlighted the importance of flood events in ephemeral rivers, due to their role in sediment transport, aquifer recharging and a variety of ecological processes such as the spawning of fish, transport of macroinvertebrate eggs, germination of back seeds, etc. Another important ecological factor is the trophic discontinuity between assemblages, what related to the fact that the River Continuum Concept does not apply in these ecosystem. He stressed the importance of these ecosystems, which have positive impacts on agriculture, drinking water, recreational fishing and regeneration processes, ecotourism, spiritual fulfilling and maintenance of wetlands. He concluded the presentation remarking the importance of taking further steps in the protection of these ecosystems by the authorities, with public participation including local communities and leaning on scientific knowledge. Overhead of this presentation can be found in annex VI.

Presentation 2: "Hydrological aspects of ephemeral and intermittent streams", by Dr. Andres Sahuquillo.

Dr. Andrés Sahuquillo, professor at the Universidad Politécnica de Valencia (Spain) presented the discussion paper on the abiotic components of ephemeral and intermittent streams in the Mediterranean. He started the presentation describing the different types of streams regarding their interaction with the aquifers. Permanent rivers (those with a permanent flow all year round) may be *gaining* if they are fed from a connected aquifer or *losing* if their base flow feed the connected aquifer (which can feed the same stream downstream). "Perched" rivers are streams which are disconnected from the aquifer (naturally or induced by man activities), with constant vertical losses. Intermittent river flows can occur due to regional groundwater head oscillation due to differences in accumulated groundwater recharge during wet and dry periods, becoming dry when the groundwater head is below the river bed. Another factor causing intermittency in flow is high evapotraspiration rates in the riverside fringe, especially in low pervious basins. Ephemeral rivers flow only in response to specific rainfall events, being the norm in arid and semi-arid basins.

An important factor in ephemeral rivers is transmission losses. This can be seepage (aquifer recharge, which depends on the hydraulic properties of the channel and existing material) or evapotranspiration (that depends on local meteorological conditions and riparian vegetation characteristics). Groundwater

recharge is seen as a key managerial aspect in these ecosystems, since associated aquifers may have positive impacts downstream, such as in maintaining coastal wetlands or in supplying water for local communities. He emphasized the role that existing dams in these watercourses, since they not only may help in flood control protecting downstream communities, but may also be used to increase seepage if the hydraulic properties are adequate. He noted that the two main environmental concerns related to ephemeral streams are overexploitation of associated aquifers (that can even turn intermittent rivers into ephemeral) and groundwater contamination (salinity, nutrients and other chemicals) from human activities. He concluded the presentation underlined the valuable resource held in these aquifers, and mentioning the alternative of joint use with surface water in order to optimize the social and environmental benefits. Overhead of this presentation can be found in Annex VII.

ROUND TABLE 1: ECOHYDROLOGY AND HYDROGEOLOGY DRIVERS OF EPHEMERAL RIVERS. MANAGEMENT IMPLICATIONS.

Current views on stream ecosystems are based on three theories: The river continuum concept (RCC), flood pulse concept (FPC) and the riverine productivity model (RPM). Each one of these theories helps to explain how the ecosystems get organized. They have become really helpful for water managers in order to understand and include the environmental component in their work. Mediterranean ephemeral and intermittent watercourses are singular ecosystems under human pressure where water managers lack enough information to manage them properly. The main objective of this round table was to identify if any of these theories can explain the mechanisms within these ecosystems and in any case, what are the main drivers underpinning the "good ecological status" of intermittent/ephemeral rivers.

Participants agreed that all theories may apply at some point to the processes in these ecosystems; RCC may apply when there is a connecting flow; FPC is seen as relevant in these ecosystems but presents the obstacle that flood pulse is being altered by humans and there is increasing difficulties in predicting rainfall in time and magnitude due to climate change it was noted that; RPM might be relevant but there is not enough known. More knowledge regarding the functioning of these ecosystems is needed.

A complete list of indicators, drivers and processes mentioned by the participants is presented in Table 1. These can be identified as abiotic and biotic. A main aspect raised was the organization/hierarchy of these drivers, that is, what and how drivers influence the others. The overall sense is that most of them are linked. Permeability is a function of the sediment load that is affected by the vegetation cover within the catchment which is itself affected by human land use and activities. Therefore, human and natural processes usually go together. This was linked to the positive and negative impacts of dams in ephemeral rivers. Although dams can increase infiltration, they are also sediment traps that increase erosion downstream changing the composition and distribution of riparian vegetation. Hence the importance of how they are operated. Integrated Catchment Management was therefore identified as relevant in these systems.

The concept of human influence led to the conclusion that policies can be identified as drivers too, since policies are what drive human pressures. Policy fields related to the discussion matter are Energy, Agriculture and Urbanization/Land Use. No further comments were made on this issue.

The managerial aspects were also considered. Flow should not be automatically managed, but as a consequence of environmental planning, without the need of transforming (or restoring) the whole ecosystem. Participants remarked the importance of deciding in advance what it is desired, flood

alleviation, Good Ecological Staturs (GES)[1] related to these systems, agriculture supply, etc. in order to manage these systems properly. The interaction between surface water and ground water was also regarded as crucial for the proper management of these ecosystems. Representative from the Instituto GeoMinero de España (IGME)[2] mentioned the joint use of surface water and ground water as Best Management Practice (BMP), that is using ground water during the dry period and using the surface water to recharge the aquifers during the wet season. However, this joint may find other obstacles beyond the technical ones (i.e. dams, weirs, soil permeability, ect.) such as the water rights and local laws. Groundwater is usually seen as cheaper than surface water, but this is function of the lack of externalization of the costs. More reliable studies on the real cost of water may help the decision making process.

The perception of the stream was also seen as important, since stakeholders do not always perceive these systems as rivers/watercourses. The drier the climate the more susceptible the floodplains are to crowding and the risk of flooding becomes higher. Increase awareness of politicians and local stakeholders was recognized to be an important factor leading to the conservation and sustainable use and management of ephemeral rivers. Participants recognized how little it is known about the functioning of these ecosystems, as well as about the scale of the problem in the Mediterranean basin.

[1] EU-Water Framework Directive (2000)
[2] Spanish Geological Survey

Table 1: Key ecological and hydro ecological drivers underpinning health "good ecological status" of intermittent / ephemeral rivers		
	Drivers	Factors: What are the main factors and implications for flow management?
	Hydro-Ecological Abiotic Drivers ▪ **The interaction of drivers must be seen in a system context.**	
1	Surface water flow regime	▪ flood regimes (quantity, time, frequency, duration etc) ▪ effects of multiple flood pulses of different size and timing ▪ scale effects ▪ dynamics of standing pools (size and connection depend on magnitude of flood, ▪ flows critical in cyclical regeneration processes, species survival
2	Interaction of surface and ground water	▪ rivers in receiving and loosing situations relative to groundwater (i.e. relative hydraulic head of groundwater and stream) ▪ aquifer properties ▪ permeability of river bed ▪ time dimensions in subsurface flows
3	Geology aspects	▪ sediment mechanisms (including mud flow) ▪ water quality implications ▪ infiltration ▪ channel morphology ▪ dynamics of nutrients ▪ permeability of river bed
4	Climate	▪ precipitation and evapotranspiration ▪ thermal regimes
5	Human Impacts	▪ Actions on top of natural processes that modify flow regimes and exacerbate adverse consequences (e.g. for species, ecosystem services / processes / river dynamics) ▪ Such actions include river abstractions and diversions, standing pool abstractions, groundwater pumping beyond recharge, other flow regulation actions ▪ Other impacts are increases in fragility in ephemeral river ecosystems and /or increased vulnerability to flood and drought extremes ▪ Human influences on erosion dynamics (land use, flow regulation structures) ▪ Land use policies and management practices ▪ Demographic and economic development pressures (e.g. waste water discharge, pollution, contamination of aquifers) Environmental sensitivity of policy and management practices adopted: e.g. ▪ Subsidy/incentive/disincentive in the water sector and through the agricultural system promoting sustainable or unsustainable practices (e.g. conjunctive use or over abstraction from rivers) ▪ Strategies adopted for the operation of dams/reservoirs and total implications of infrastructure on flow regimes ▪ Groundwater pumping and groundwater management policies
6	Watershed Conditions	▪ Existing conditions ▪ dryland or irrigated agriculture context and practices ▪ scale effects
7	Geographic location	▪ topography, altitude ▪ distance from sea impacting carbon cycles
8	Water quality status	▪ as a function of the relationship of flow regimes to water quantity and human actions ▪ nutrient flows ▪ temp, DO, levels
9	Sources of energy	▪ dynamics of carbon cycle ▪ Linked to river continuum concepts - (3 models are available exchanges with flood plain
10	Riparian vegetation	▪ Habitat conditions

		▪ Source of nutrients, buffers
11	Awareness and Knowledge	▪ Advancement of understanding of the ecological and hydrological processes of ephemeral rivers ▪ Availability and quality of data ▪ Management tools employed
12	Other contextual aspects for considering drivers	▪ Integrating context – must consider dynamic and interactive processes instead of single drivers in isolation - think about cycles and linkages of drivers and systems perspectives ▪ A central aspect is interaction of human and natural systems ▪ Role of Indicators ▪ Need a diagram to capture feedbacks ▪ Importance of providing the geomorphic history ▪ Changing dynamics of processes ▪ Redefining / adapting connectivity
	Biotic Responses and Impacts ▪ There is a need for an integrating framework based on an understanding of how systems work. ▪ Should look systematically at key processes in rivers and how they interact ▪ What are fundamental processes and tendencies (e.g. where does riparian vegetation come into it) ▪ Then consider how human actions impact on the situation ▪ In the Med this can be relate this to good ecological status generally (WFD).	
1	Flow and Water Quality Dynamics	▪ Ephemeral rivers are more vulnerable, as there is less water to dilute pollution
2	Flood and Sediment Dynamics	▪ Binary system: Major flood events transport all sediments. Then post flood flows rework sediment distribution (as opposed to base flow rivers ▪ Flood hazard links and related mitigation and coping strategies (risk practices)
3	Flow Regimes and Ecosystem Processes	▪ Impact on life histories ▪ Ecosystem Production ▪ Ecosystem Services
4	WFD Linkage	▪ The WFD applies to all water bodies and wetlands fed by surface or ground water sources ▪ Perception of the risk as prescribed in the WFD process ▪ Possibly link analysis to other initiatives that attempt to define ecological status in Med rivers that exhibit these characteristics (e.g. Jucar Basin in Spain as a WFD Pilot) ▪ Also there is analysis at t he Eco region level in the Med that offers a reference condition related to general health. Assessment methodologies have been prepared. ▪ Two examples are: classification system based on 5th framework project PAQANN, macro invertebrates – based on benchmark catchment and then looking at how impacted rivers are different. And a basin classification based on fish.
	Other contextual considerations	▪ Tensions between general model / frameworks and specificity.

ROUND TABLE 2: EXISTING GAPS IN THE SCIENTIFIC RESEARCH IN INTERMITTENT RIVERS.: ACTIONS FOR IMPROVEMENT.

This session started with the statement that water managers can manage better with sound scientific information available. Therefore, the question to pose was what are the main actions to take in order to address the gaps (partially identified in session 1) in this ecosystems thus helping the sustainable management of ephemeral watercourses.

It was suggested the creation of a project database linked other existing databases (such as FAME). This may be done at two levels: 1) a list of projects and 2) a list of issues targeted by different agencies or partners (so the data gaps are completed with the help and benefit of everybody). However, correspondence between watercourses may be an issue before knowing which the drivers are, since not all may be similar and compatible. A first approach to deal with this may be to map the watercourses according to previously defined parameters and identify which ones become relevant, where and how. This might be done to identify possible clusters in space using GIS methodologies. Related to this question was the relevance of the scale of study since it is function of the issue (e.g. flood risk assessments need high rainfall and gauging stations density capable to provide real-time data every 5 minutes, whereas groundwater studies need other strategy).

There was a critical look at how environmental flow assessments methodologies (EFAs) should be adapted into ephemeral rivers, since they are usually designed for base flow streams, and what are the weaknesses of the existing methods. How can the management of environmental flows be integrated in basin management? A first aspect in this matter was at the social level. Again, public awareness is regarded to be especially relevant in these areas, in order to protect them and avoid situations where they are used as wastelands. Therefore, increasing the flow in communication, information and participation is one of the key issues to solve.

Communication was considered to be important within the management and scientific communities, which is currently regarded as poor. Managers need numbers/data in order to manage, and this reliable data must be provided by scientists. It was noted that this lack of communication exists among scientific fields, such as biology and hydrology, which now work disconnected; actions bridging fields of expertise will help scientist provide significant management indicators. However, to do so, they first need to work on defined guidelines.

Participants agreed that there is a political struggle added to these ecosystems, dealing with property rights, local laws and human activities, and that a policy analysis of what is in the region will be useful. Related to this last point was the reference to the EU-Water Framework Directive[3] and its GES. The inclusion of GES into the negotiation table is delicate since its definition is also difficult. Although it was understood that GES will aim for the conservation of the aquatic ecosystems, the strict sense of GES may lead to extremes in application, and may put away the socioeconomic aspects, which are crucial for sustainable management.

The understanding of the vulnerability of ephemeral watercourses (compared to perennial ones) also came up as a gap to be solved. This aspect might be also linked to the awareness of the importance of these rivers and the associated ecosystem services, in the form of who gains and who losses with the new allocation. The evaluation and valuation of these services will become more relevant with a better understanding of theses ecosystems. A list of the issues raised during the session is exposed in Table 2.

[3] Water Framework Directive

Table 2: Research to Address Gaps		
	Issue	Elements / Actions
1	Typology / classification of ephemeral rivers for the Mediterranean	▪ Suggestions are provided in the Background Papers ▪ Build on EU River Classification work ▪ Recognize limitations in a broad approach – look at statistical approach with relevant variables: e.g. look at literature, prepare cluster analysis, project on maps e.g. GIS and remote sensing, link to other factors ▪ Provides a framework for identifying academic research ▪ At a practical level the classification may be incorporated as guidance for EFA exercises for ephemeral rivers, where a particular river may have different stretches (e.g. as in Mohammed's presentation)
2	Broad synthesis of existing research on ephemeral rivers	▪ Prepare a broad synthesis paper the builds on existing research and understanding on fundamental characteristics of processes in ephemeral rivers ▪ 4 key Research papers Angela referred to ▪ Characteristics and processes of ephemeral rivers ▪ How do processes transform to create a new situation when placed under stress
3	Research on Sediment Dynamics – linked to infrastructure management	▪ Related to management of infrastructure (e.g. position of sediment in dams and management of sediment during maintenance – sediment releases) ▪ Distinctive aspects in ephemeral -Rivers (e.g. toxic sediments to ground water)
4	Database of existing research / demonstration projects	▪ Inventory and profile EU Funded projects where teams have been working (e.g. fish and invertebrate baseline studies) ▪ Consider projects targeted by Agencies (e.g. France, Germany, UK)
5	Baseline Data Collection Requirements	▪ Identify typical data requirements for EFA in ephemeral rivers (e.g. meteorological, hydraulic, biotic conditions / responses) ▪ Concern is little or less information on flows in ephemeral rivers. (weather stations are low density) ▪ What are requirements to improve capacity for baseline measurement ▪ Look at Friend Project – Med component contact on French lead
6	Review of opportunities to adapt existing Methodology and Tools	▪ Critical review of how existing methods for EFA can be adapted to ephemeral rivers ▪ At the same time, look at weaknesses in existing EF frameworks and procedures in Med context more generally
7	Case Studies / Demonstrations	▪ Five general categories ▪ Test releases to see how a river changes under different release regimes / measures ▪ Monitoring of post-event responses (drought or flood) episodes under a regional (SWAT-Team) approach ▪ Case study profile of exercises where an EFA has been successfully prepared (and provisions made) ▪ Systematically ex-post examine what has been done – benchmarking methodology ▪ Review adaptive management literature to bring into E-Rivers
8	Regional /Global Biodiversity Contribution of Ephemeral Rivers	▪ Franz Barlein Research on migratory birds and regional ecological significance ▪ Implication of loss of habitat / support systems (AEWA Convention)
9	Interaction of Ephemeral Rivers and coastal zones	▪ Look at hydrological interactions and dynamics on coastal zones ▪ Integrated Coastal Zone management and E-River Flow Regime / Management ▪ Refer to MedWet Initiatives
10	Participation mechanisms for EFAs in E-Rivers	▪ Identify what is different in regard to base flow rivers ▪ Critical issues e.g. water quality, flood linkage
11	Hydraulic Parameters and Indicators	▪ Provide a synthesis review of range of technical issues involved ▪ Concentration times ▪ Permeability

		▪ Hydro geological parameters of aquifers ▪ Channel morphology
12	Linkage of EF needs and provision to Drought and Flood Management Policies and Programmes	▪ Dynamic behaviour, geomorphologic studies ▪ Isolated water bodies, refugia understand which are important and vulnerable, how they are created and maintained, – e.g. what can't be done during drought episodes ▪ What to do in river flow regulation when rains return for re-colonization ▪ Artificial floods
13	Resilience of ecosystems in Ephemeral/Intermittent-Rivers to flow regulation change	▪ Water regime requirements for different environmental conditions ▪ Adaptive management dimensions – Kai Lee extrapolation on river systems, ▪ Temporal dimensions ▪ Implications for setting flow management objectives and system of tradeoffs ▪ Sensitivity and vulnerability assessment and implications compared to perennial systems ▪ Longer term studies on systems that are not modified in order to provide a reference point ▪ Cross reference IUCN ECM work on hot spots and vulnerable systems
14	Communication and Mechanisms	▪ What information do different actors need (e.g. how long can a dry river remain before irreversible ecological loss, or pollution of aquifers, etc). ▪ What methodologies are available ▪ What do laws and regulations prescribe ▪ Research into how decision are made ▪ Opportunities for campaigns, awareness raising
15	Ecological goods and services – Socioeconomic Implications	▪ See Mohammad's paper ▪ Who gains and who loses ▪ Gender dimensions
16	WFD Application for Ephemeral Rivers	▪ Situation Analysis ▪ Definition of Good Ecological status in Eph. Rivers how to handle this in the WFD context. ▪ Application of the procedural steps in the WFD

ROUND TABLE 3: BASIS FOR ITS ESTABLISHMENT AND DEVELOPMENT OF AN INTERMITTENT/EPHEMERAL RIVERS NETWORK.

Participants noted the need for learning more about this type of watercourses. The creation of a network of experts was envisaged as a possibility, but once it has a clear mandate and not before the "situation analysis" has been conducted. Participants mentioned that in order to be successful, the network should be based on two keystones: a knowledge database and the active linkage to other networks. The main goal of the network will be knowledge exchange and building activities. A core group of members will be responsible for the advising role, meeting periodically to define the main lines of activities. The network will feed from a wider group of members with wider expertise, which will include key actors across the region.

Participants noted that regarding the level of knowledge of these systems, at this very moment the potential future activities will follow a stepped approach. For the time being, the discussion will be electronic until the next meeting is held. A distribution list will be built with the help of all the participants in order to reach a wider audience, thus enhancing the network. This initial phase will focus on the development of synthesis documents relevant for the establishment and functioning of the network, such as a literature review, a scoping study to define the scale of the problem and a review of the policies in the Mediterranean affecting these ecosystems, sponsored by IUCN-Med. Mike Acreman, from the Center for Hydrology and ecology, accepted to be in charge of the study on the EFA tools adaptable to ephemeral rivers.

The participants committed to review the discussion papers in order to convert them into baseline documents in the field. Once receive all the comments, the authors will incorporate them into the final documents. Table 3 presents the major points of this session.

Table 3: Expert and other Networks on Ephemeral Rivers – Basis for its establishment, linkage to other science or practitioner networks, mandate		
	Factor	Other Points
	General points	
1	▪ Need a mandate first ▪ Clarify what a network is ▪ Phased process	
	Specific Points	
2	Mandate and tasks	▪ Core group (advise on IUCN Role) ▪ Wider Group of Expertise (knowledge exchange)
3	Facilitation of the Network	Core Group ▪ Sharing of research papers ▪ need 1-2 events per year (potential meet in April) ▪ need funds to sponsor initiatives Wider group ▪ expanded network ▪ based on key actors in country projects and regional actors
4	Potential Activities	▪ Web based discussion ▪ Build into E-flows web pages of IUCN Med and IUCN/GWP ▪ Maintain a roster of experts in key areas ▪ Enable people to get together links to popular and scientific e-based sources ▪ Strategically sponsor research in an initial phase 1. synthesis of existing research/literature review 2. scooping study to dimension the scale of the problem 3. review of different national laws, and interpret the WFD on ephemeral rivers 4. review what may be done to adapt current EFA tools for ephemeral rivers
5	Funding	▪ IUCN core funding (some seed money) ▪ Partnership financing subsequently
6	Network Linkages to make	▪ Sixth Framework Initiative ▪ MEMBO linkages (network of river basin organizations) ▪ Other WFD Networks

CONCLUSIONS AND RECOMMENDATIONS

- Intermittent and ephemeral rivers are common features in the Mediterranean region which associated ecosystems hold an important number of environmental values and provide ecosystem services to human populations.

- Environmental flows, interpreted as the equilibrium between social, economic and environmental needs on basins where flow is regulated and there is a competition for water, can be a suitable management and decision-making tool in ephemeral rivers.

- There is a lack of knowledge regarding not only the functioning and associated values of these ecosystems but also the scope of the problem in the Mediterranean region. Vulnerability of these systems (compared to perennial streams) is unknown.

- Identified factors driving these systems or causing an impact on the biotic or abiotic component on them are:

    - Surface water flow regime: flow (in term of quantity, time, frequency, duration, etc.) is a critical factor in river ecology, affecting a number of vital processes such as spawning, regeneration and competition against invasive species. The flow regime (how much, when, for how long and how often)
    - Interaction of surface and ground water: in terms of connectivity and provision of flow, water quality, soil permeability, etc.
    - Geology and Geomorphology: sediments dynamics, soil properties, channel morphology… they are factors that define ephemeral rivers but also affected but how the watercourse "behaves".
    - Climate: hydrologic cycle and implications of climate change.
    - Human activities: at different scales, global (e.g. implications in Climate Change patterns), national (e.g. policies, demography) or local (e.g. overexploitation of aquifers, land use, etc.)
    - Watershed Conditions: desertification and erosion processes, natural or human driven, etc.
    - Geographic location: related to climate modifiers such as topography and altitude or distance from sea.
    - Water quality: related to flow regime and also impacted by human activities. The main features of interest are temperature, dissolved oxygen and nutrient flows.
    - Sources of energy: how the carbon cycle fits into the stream dynamics.
    - Riparian vegetation: in the sense of habitat conditions, buffer zone and carbon cycle dynamics.
    - Awareness and knowledge: increase of the scientific knowledge of these systems (functioning and processes) and awareness of populations.

- Identified factors can be related to each other (for example, poor watershed conditions may lead to an augment of the flood magnitude, reduction of water quality, increase of sediment transport and changes in permeability parameters); therefore, a hierarchy table organizing them will help to identify weighting and potential iterations between drivers.

- Human activities and their interaction with natural systems are a main aspect to consider in the sustainable management of these ecosystems. A revision of existing policies in the fields of

agriculture, environment, energy and land use is relevant to successfully tackle the existing threats in these ecosystems.

- The characteristics of the EU-Water Framework Directive[4] make of it an opportunity for the conservation of the ephemeral streams. It promotes the partipatory process; furthermore, water managers need to comply with it and scientists can provide the necessary knowledge to achieve the GES. The work proposed for the ephemeral watercourses network can be linked to the proposed classification and other parallel initiatives and organizations such as the pilot basins, existing databases to assess the current status of this systems, etc.

- Currently, there are fundamental scientific gaps regarding the sustainable management, ecological functioning and ecosystem values associated to these systems. Hence the creation of a scientific network on Mediterranean ephemeral streams will be helpful to close the existing breach. A main objective of the Network will be to make available sound scientific information on ephemeral and intermittent streams in the Mediterranean to water managers.

- The network will build its activities according to the identified gaps. Among them:

    - Typology/classification of ephemeral streams that can be built on the EU-WFD water bodies' classification work. This can be done through literature review, cluster analysis supported by geo-spatial tools such as GIS, etc. This classification can be incorporated as guidance for environmental flow assessments and will be especially helpful in assessing the scope of the problem and in identifying needs in academic research.
    - Potential work to be carried out on the characteristics and processes in ephemeral rivers:
        - Sediment dynamics.
        - Coastal zone interaction.
        - Hydraulic parameters and indicators.
        - Adaptation of or suitability of existing environmental flow methodologies.
        - Biodiversity.
        - Drought and flood management.
        - Resilience of ephemeral watercourses ecosystem to human impacts.
        - Ecological goods and ecosystem services.
        - Application of WFD for ephemeral watercourses.
        - Definition of the baseline data collection requirements.
        - Link up with existing research or demonstration projects/activities (MedWet, MENBO, IUCN Centre of Ecosystem Management, WFD and EU funded projects, AEWA convention, etc.).
        - Incorporate participation and communication mechanism.

- The Network needs a clear mandate and defined tasks to run. The network will consist of key country and regional actors, led by a core group that will meet periodically. IUCN will have an advisory role and during the starting phase, some seed money will be provided by IUCN to develop a situation analysis study. This study will consist of a review of the existing literature, a scoping study dimensioning the scale of the problem and a review of pan-Mediterranean water policies and WFD interpretation on ephemeral rivers. Subsequent financing will be mobilised through partnerships.
- The network will meet again in 2005; venue and date to be decided at a future time.

[4] The main objective of the EU-Water Framework directive is to achieve "Good Ecological Status" by 2015 in all water bodies and wetlands fed by surface or ground water sources.

ANNEXES

ANNEX I: PRE-MEETING BRIEFING

SCIENTIFIC WORKSHOP ON THE PROVISION OF ENVIRONMENTAL FLOWS IN MEDITERRANEAN EPHEMERAL RIVERS

Date: Saturday, September 18th 2004, at 9:00h.
Venue: Hotel Trafalgar, Madrid
Organizer: IUCN Centre for Mediterranean Cooperation

Background

The IUCN Centre for Mediterranean Cooperation supports Members efforts to develop, adapt and utilize management tools for integrated water management, particularly to bring freshwater ecosystem and wetlands conservation and protection concerns into mainstream planning and management at the catchment scale. To date the Centre has focused on environmental flow assessment (EFA) and provision as a practical management tool. The Centre will shortly publish a Resource Kit, "Environmental Flow Assessment and Provision in Mediterranean Watercourses: Concepts, Methods and Emerging Practices", and is in the process of developing professional training and pilot demonstration projects with Members.

In an environment of water scarcity and competition for water, River Basins Organizations are more and more perceived as the key managerial actor at the basin level, which have to face not only the challenges of the traditional water users, but also from the ecosystem needs in order to ensure the ecosystem health, economic development, equity (poverty alleviation??) and the rest of benefits that healthy rivers, both in the surface and groundwater phases, bring to society.

Environmental flows have turned up to be a suitable tool in those basins where there are competing water uses and regulated flows. EFAs also explicitly link wetland site management concerns to basin management actions and have direct relevance for implementing policy commitments such as embodied under RAMSAR for wetland conservation and management, and the EU-WFD, which seeks to achieve "good status" in the ecological quality freshwater bodies in EU-Mediterranean countries by 2015.

Presently a key gap in this field relates to the science, understanding and experience with environmental flow assessment in intermittent rivers, which are common in the Mediterranean situation. Most of the current EFA research, methodologies, and experience are related to temperate climates and base flow rivers. To address this gap, the Centre intends to establish a network of experts and researchers to help catalyse activities in this field. A first step will be to hold a scientific workshop in Madrid on September 18th 2004, for about 20 people. The event would consist in science-based discussions of the river dynamics and freshwater ecology of intermittent/ephemeral rivers impacting on EFAs. This will set out steps to improve the scientific understanding, management tools and capacities.

Objectives

Water managers' view and attitude has significantly changed as the conflicts among the water uses in their basin increased and with the adoption of Integrated Catchment Management as a framework for action. What was first a requirement to cope with human needs of water now includes the necessity to cover the environmental needs, which clearly have repercussions on human well-being too. Environmental flows are becoming to be regarded as a suitable tool to find the compromise between the socio-economic and environmental needs.

However, hydrological characteristics of Mediterranean watercourses do not resemblance to the rivers where the vast majority of EF methods have been developed, and therefore water managers in the Mediterranean region have difficulties to implement environmental flows regime programmes in their basin or to use them as evaluation tools.

The main goal on the meeting will be therefore to influence and help the water managers to better understand ephemeral/intermittent watercourses management, and to develop environmental flow regime programmes in them, by:

- Defining what the drivers of these ecosystems are, especially in relation to the provision and implementation of environmental flows regimes.
- Determining the research needs in the field.
- Establishing a network of scientists and managers.
- Developing clear guidelines to help water managers in the implementation of environmental flows.

Dynamics of the workshop

Two discussion papers will be presented during the workshop, one referring to the biotic component of ephemeral rivers (biology and hydroecology), and the other to the abiotic component (geomorphology, river dynamics and interaction with the associated groundwater systems).

The workshop will be attended by experts of both fields; although this first step is a scientific workshop, the water managers sector will be also represented by a member of the MENBO[5]. The short number of attendants (max.20) is intentional in order to encourage discussions and free flowing of ideas. After the introductory session, the meeting will be structure in round tables, according to the goals of the workshop. It is expected that the participants will share their own views and experiences to enrich the debate.

Clear products will be define after the workshop, although it is expected that the authors of the discussions papers will refine them and/or complete them with the results of the outputs of the meeting.

[5] Mediterranean Network of Basin Organizations.

ANNEX II: AGENDA.

9:00

Welcome to the participants.
Introduction of the participants' role and background.

9:20

Presentation of the Workshop
Background and objectives of the meeting (*César Alcácer*)

9:30

Environmental flows and Catchment Management (*Larry Haas)*

9:40

Presentation of the discussion papers.
"Biotic Components of Ephemeral Streams" *(Mohammed Melhaoui)*
"River dynamics of Intermittent/ephemeral rivers" *(Andrés Sahuquillo)*

11:00

Coffee Break

11:30

Round Table 1.
EcoHydrology and Hydrogeology drivers of Ephemeral rivers. Management implications.

13:30

Lunch
Restaurant yet to be decided

15:00

Round Table 2
Existing gaps in the Scientific Research in intermittent rivers. Actions for improvement.

Round Table 3
Intermittent/Ephemeral rivers network. Basis for its establishment and development.

16:00

Working Session
Development of scientific guidelines for the wise management of ephemeral watercourses.

18:00

Closure:

- Conclusions from the meeting.
- Products to be released.
- Following actions to be taken.

ANNEX III: LIST OF PARTICIPANTS.

Name	email	Position/Field of expertise
Cesar Alcacer	cesar.alcacer@iucn.org	IUCN Malaga – Water Programme Officer
Larry Haas	ljmhaas@spansurf.com	Consultant IUCN Malaga
José Antonio de la Orden	ja.delaorden@igme.es	Engineer of Mines – Department of Hydrogeology of the Spanish Geological Survey (IGME)
Rafael Sánchez	rsnavarro@macs.udl.es	Hydrologist and Forestry Engineer – Environmental Flows Methodologies Universidad de Barcelona
Andres Sahuquillo	asahuq@hma.upv.es	Water Resources Planning and Management – Ground water and Surface water interaction and conjunctive use - Ground Water Management - Polytechnic University of Valencia (Spain). Groundwater specialist.
Mohammed Melhaoui	melhaouimohammed@yahoo.fr	Hydrobiologist and Hydrological Management. Freshwater ecologist. Professor at the University of Oujda (Morocco).
Jackie King	jking@botzoo.uct.ac.za	Freshwater ecologist; specialist in EF assessment methods. (South Africa)
Mike Acreman	man@ceh.ac.uk	Hydrologist – Centre for Ecology and Hydrology (UK) – Specialist in Environmental Flows and Wetland Hydrology
Angela Arthington	a.arthington@griffith.edu.au	Professor freshwater ecology – Griffith University. Brisbane, Queensland 4111 (Australia) - Director Centre for Catchment and instream research.
Ana Camarasa	Ana.camarasa@uv.es	Dpt. Geography. U of Valencia – Flood risk assessment in ephemeral rivers.
Stefano Maran	maran@cesi.it	Researcher at CESI, Environmental flows and Integrated Water Resource Management (Italy)
Uygar Özesmi	uozesmi@erciyes.edu.tr	Erciyes University – Assistant professor of Environmental Sciences – (Turkey) UNDP-GEF-SGP, Environmental Specialist
María José López	maria.j.lopez@uv.es	Dpt. Geography - U of Valencia – (Lecturer Cartography and Remote Sensing). Flood risk assessment
Javier Paredes	jparedea@hma.upv.es	Water Ressource Planning and Management and Water Quality Modeling – on behalf of MENBO's Secretariat at Jucar RBO (Spain)

ANNEX IV. DISCUSSION PAPER: "BASIC COMPONENTS OF AN EPHEMERAL STREAM IN THE MEDITERRANEAN: STUDY CASE OF THE ZEGZEL-CHERRAA SYSTEM IN MOROCCO", by Dr. Mohammed Melhaoui.
See attachment "annex4.pdf".

ANNEX V. DISCUSSION PAPER: "HYDROLOGICAL ASPECTS OF EPHEMERAL AND INTERMITTENT STREAMS", by Dr. Andres Sahuquillo.
See attachment "annex5.pdf"

ANNEX VI. OVERHEADS PRESENTATION BY CÉSAR ALCÁCER
See attachment "annex6.pdf"

ANNEX VII. OVERHEADS PRESENTATION BY LARRY HAAS.
See attachment "annex7.pdf"

ANNEX VIII. OVERHEADS PRESENTATION BY DR. M ELHAOUI.
See attachment "annex8.pdf"

ANNEX IX. OVERHEADS PRESENTATION BY DR. SAHUQUILLO.
See attachment "annex9.pdf"