“We don't manage water, water manages us.” - African matriarch

FLAG EXPEDITION REPORT
Explorers Club Flag Ninety-Three
Wings WorldQuest Flag Number Thirteen

No Water No Life®
Mara River Basin Expedition
Kenya and Tanzania • September and October 2009

Submitted by
Alison M. Jones, March 2010
www.nowater-nolife.org
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EXECUTIVE SUMMARY

TITLE OF EXPEDITION  The Mara River Basin Expedition for No Water No Life:

DATES OF EXPEDITION  September 15 to October 15, 2009

LOCATION OF EXPEDITION  The No Water No Life team followed the 254-mile (395-km) Mara River from its source in Kenya’s Mau Forest to its Tanzanian terminus at Lake Victoria. The Mara River Basin, considered an “Eighth Wonder of the World” due to its vast biodiversity, is one of six watersheds in North America and Africa being researched and documented by No Water No Life.

EXPEDITION PARTICIPANTS  
Alison M. Jones: No Water No Life Project Director and Lead Photographer
Alison Fast: No Water No Life Videographer
Tari Wako, Driver-Guid, James Robertson Traditional Safaris, Nairobi, Kenya
Joash Romeo, Guide, Mara River Airboat Safaris, Musoma, Tanzania
And assistance from The No Water No Life Advisory and Research Team and African-based consultants

FUNDING: Two Scott Pearlman Field Awards, a Towbin Foundation Grant, and private donations and in-kind donations by James Roberson of Ker & Downey Safaris and other organizations,

SPONSORS: The Explorers Club and WINGS WorldQuest (fiscal sponsor for No Water No Life) and granted their Expedition Flags. Others endorsing partners are International Rivers, Global Information Network, Mara Conservancy, Global Water Sustainability, International League of Conservation Photographers and Art for Conservation.

PURPOSE OF EXPEDITION was based on the No Water No Life Mission Statement. The goal was to document effects of a three-year drought and raise public awareness of threats to the Mara River Basin, consequences and sustainable management solutions. Special focus was on the need for assessment of reserve flows, regulation over water extraction and land usage. Related issues examined included:
- Deforestation of the headwaters complex
- The value and impact of tourism and agriculture
- Impacts of degradation from grazing and loss of pastoralists’ cattle
- Treatment of municipal and tourist lodge waste
- The development of migratory corridors
- The need for local and trans-boundary watershed education and scientific studies
- The role of the international community.

EXPEDITION TECHNIQUE: No Water No Life researched, photographed and questioned natural resource management in the Mara watershed -- or lack thereof -- throughout the expedition. Thirty-five stakeholders and stewards were interviewed for approximate durations of one hour each.
CONCLUSIONS: The three largest challenges facing the Mara River Basin are water availability, water quality and usage, all of which need to be addressed regional, national and transboundary governance policies regarding sustainable management practices. Without attention to these issues there will be an increase in poverty and likely conflict since humans and wildlife absolutely need access to water. Sustainable water availability can only be achieved by first undertaking scientific environmental assessments of water flow in the Mara River during all seasons. Then action plans for protection and distribution of water resources can be instituted and enforced.

All Mara watershed stakeholders met and interviewed by NWNL understood and support adaptation to changing economies and climatic patterns requires instituting rain harvesting, afforestation and more sustainable technology for farming and fishing. East Africa must address water deficiency by investing in scientific tools that can forecast and gauge water flow levels in order to establish when reserves are threatened and abstraction must be curtailed. However such mitigation and poverty reduction efforts, while enacted locally, need to be supported globally by the international community using both top-down policy and bottom-up grass root approaches. Additionally, discussions were held on the pros and cons of pricing water supplies. Many solutions are being considered from many different viewpoints, but they are always underlined with a grave sense of urgency.
NO WATER NO LIFE
MARA RIVER BASIN 2009 EXPEDITION
FLAG REPORT

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TITLE OF EXPEDITION
The Mara River Basin Expedition:
from its Source in the Mau Forest to its Terminus at Lake Victoria

DATES OF EXPEDITION
The expedition began September 15 and ended October 15, 2009

These dates were determined by the presence of the annual wildebeest migration in the Mara Triangle; the chance to witness the effects of a three-year drought; and the possibility of documenting El Nino rains ending that drought.

The expedition team hoped to document the contrast of a severe drought with flooding that could erode dry, compacted soil and be as damaging as the drought. However, while the expedition experienced some light rains in the Mau Forest, a few showers in the Mara Conservancy and some nighttime showers on Lake Victoria, the expected El Nino rains arrived after the day after the departure of the expedition team.

[Although predicted to be heavy, the October/November rains were gentle and soaking. However the March/April/May El Nino rains this year are proving to be torrential and causing severe flooding in northern Kenya. Results in the Mara River Basin are not yet known as of the publication date of this report; however meteorological reports are for a continued two months of torrential rains.]

Bila maji hakuna uhai – No Water No Life (in Swahili)
Ore meetai enkorre – Meetai enkishui. No Water No Life (in Maasai)
The Mara River Basin, considered an “Eighth Wonder of the World” due to its vast biodiversity, is one of six watersheds in North America and Africa being researched and documented by No Water No Life. The No Water No Life team followed the 254-mile (395-km) long Mara River from its source to its lake outlet.

The Mara River Basin is a transboundary sub-watershed of the Nile River Basin since the Mara River flows into Lake Victoria, the source of the White Nile. Focus was on degradation, management and lack of management of the Mara River’s Mau Forest headwaters in Kenya; its tributaries and plains; and its Musarura Swamp entering Lake Victoria in Tanzania.

A TRANSBOUNDARY WATERSHED

The Mara River Basin is 5,309 square miles (13,750 sq km), of which 65% is in Kenya and 35% in Tanzania. Basin altitudes range from 2,932 m at its source in the Mau Forest Escarpment to 1,134 m on Lake Victoria. The basin has important swamps including Enyapuiyapui Swamp in the Mau Forest; Musiara and Olpunyata Swamps in Kenya’s Maasai Mara; and Masarua Swamp in Tanzania.

The main perennial tributaries are the Amala and the Nyangores, which drain from the western Mau escarpment. As well, the Sand, Talek and Borogonja Rivers enter the Mara in Kenya’s Maasai Mara Game Reserve. In Tanzania, the Mori, Kenyo, Tambora and Nyambire Rivers drain the basin. Rainfall varies with altitude with mean annual rainfall ranging from 39 to 69 inches (1,000-1,750 mm) in the Mau Escarpment; 35 to 39 inches (900-1,000 mm) in the middle rangelands; and 27-33 inches (700-850 mm) in the lower Loita Hills and Musoma. Weather patterns are bi-modal, with rains falling between April and September, and again in November and December. However, due to climate change impacts on this pattern, predictions are no longer very dependable.

The five distinct physical, land-use sections of the Mara River Basin are comprised of:

- The forested Mau Complex, source of the Mara River
- Plains of large-scale agricultural farms, irrigated with water from the Mara River
- Open savannah grassland protected by conservancies and Maasai Mara National Reserve in Kenya and Serengeti National Park in Tanzania
- Pastoralists’ land used mostly for grazing by the Maasai
- Floodplains in Tanzania where the Mara River discharges into Lake Victoria
HUMAN RESIDENTS and WILDLIFE LOCATED in the MARA RIVER BASIN

The Mara Basin is home for 1.1 million people (775,000 in Kenya and 325,000 in Tanzania). The previously reliable high and well-distributed rainfalls in the highlands of this basin and its fertile soils have been favorable for agriculture, livestock and wildlife activities. Hence immigrants have been attracted into the basin, creating population growth rates as high as 7.5%. Musoma (Tanzania) and Bomet (Kenya) are the largest urban centers with about 120,000 and 95,000 residents respectively. The rest of the population resides in rural areas, where 64% live below the poverty line,

The Mara River Basin tribal cultures include the Ogiek, Kipsigis, Kikuyu, Kalenjin, Maasai, Wakuriya, Wajaluo, and Wajita. Despite current repetitions of droughts, the dominant social-economic activity remains crop farming. About 62% of the households are small-scale farmers. Livestock rearing is the second dominant activity. Tourism and wildlife are important economic activities, as exemplified by the Maasai Mara Game Reserve on the Kenyan side and the Serengeti National Park on the Tanzanian side.

The Mara-Serengeti ecosystem contains the most diverse combination of grazing mammals in the world, holding 400,000 wildlife and livestock. However the Mara’s world-renowned wildlife populations of ungulate herds (wildlebeest, zebra, gazelles…) and iconic predators (lion, leopard, cheetah…) are currently threatened since severe deforestation in the upper catchments and land degradation throughout are critically impacting the river flows and the ecosystem.

The growing human population is exerting high pressure on the limited land and water resources in the basin and the wildlife. In order to cope with this high pressure, there have been, and continue to be, ongoing changes and regulations in land and water-use patterns in the basin. The degradation of natural vegetation cover and soil conditions has led to changes in rainfall-runoff characteristics of the basin, which consequently change the river flow regimes. Major environmental changes resulting from the basin surface modifications observed in Mara River basin include high-peak stream flows, reduced base flows, enlarged river channels, and silt build-up along the river bed.

SPECIFIC GEOGRAPHIC FEATURES DOCUMENTED:

MAU FOREST: HEADWATERS OF THE MARA RIVER BASIN (Aerial Viewings)
Edge of the forest (00° 24’ 337”S, 35° 48’ 852”E and 00° 31’ 977” S, 35°44’ 241” E)
Start of Mara River (assumed) (00°39’ 462”S, 35° 42’ 188”E)
Tea Plantation owned by Moi, mid-forest (00° 37’ 157”S, 35°35’ 053”E)
Tea Buffer Zone (00° 44’ 313”S, 35° 27’ 511”E)
Burning of new plots (00° 17’ 305”S, 35° 32’ 700”E)
Mau Summit (00° 16’ 66”S, 35° 68’ 333”E)
Elburgon (00°18’00” S, 35°49’00” E)

LAKES and BAYS in THE MARA RIVER BASIN
Lake Victoria, Tanzania (01° S, 33° E)
Mara Bay, Tanzania (01° 30’ S, 33° 49’ 60” E)
Musoma Bay, Tanzania  (01° 30' 0" S, 33° 48' 0" E)

WETLANDS in THE MARA RIVER BASIN
Enyapuiyapui Swamp, Kenya
Musiara Swamp, Kenya (in Maasai Mara National Reserve  (1° 30' S, 35° 0' E)
Musarua Swamp, Tanzania  (c. 01° 27 ' - 1°37 ' S, 34°11' - 34°38' E)

MARA RIVER TRIBUTARIES
Amala River, Kenya
Nyangores River, Kenya
Chepkulo River, Kenya
Kagawet River
Talek River, Kenya
Sand River, Kenya and Tanzania

RIVERS OUTSIDE THE MARA RIVER BASIN
Molo River, Kenya
Njoro River, Kenya
Upper Saosa River, Kenya
Kiagia River, Kenya
Morey River, Tanzania

OTHER GEOLOGICAL FEATURES in THE MARA RIVER BASIN
The Mara Escarpment, Kenya
Isiria Escarpment, Kenya
Kileleoni Hills, Kenya
Aitong Hills and Aitong Plains, Kenya
Granite kopjes, Tanzania
EXPEDITION PARTICIPANTS

See ATTACHMENT 2a, Pages 51-53: TEAM BIOGRAPHIES

ON EXPEDITION

**No Water No Life Project Director and Lead Photographer**
Alison M. Jones, Alison Jones Photography, New York City, USA

**No Water No Life Videographer**
Alison Fast, Barefoot Workshops, Mississippi, USA

**Driver-Guides**
Tari Wako, James Robertson Traditional Safaris, Nairobi, Kenya
Joash Romeo, Mara River Airboat Safaris, Musoma, Tanzania

EXPEDITION ADVISORY AND RESEARCH TEAM

**No Water No Life Science Advisor**
Dr. Robin Sears, Dean of School of Field Studies, Boston, Massachusetts, USA

**No Water No Life Project Coordinator**
Robin MacEwan, Restoration Ecologist at Stantec, Northampton, Massachusetts, USA

**No Water No Life Expedition Base Manager**
Jasmine Graf, Office Manager at Alison Jones Photography, New York City

**No Water No Life Mara River Basin Researchers**
Melaina Macone, NWNL Research Intern at Sweet Briar College, Virginia, USA
Peter Berman, NWNL Videographer-Researcher, TV cameraman, Minnesota, USA

EXPEDITION CONSULTANTS

James Robertson, Chairman of Ker and Downey Safaris and Founding Board Member of the Mara Conservancy, Nairobi, Kenya

Andrew Nightingale, Farm Owner, Conservationist, Filmmaker, Njoro, Kenya

Ted Rademacher, Owner of Mara Airboat Safaris of Tanzania, Ohio, USA

Abigail Allison, geologist, Nairobi, Kenya
EXPEDITION DONORS AND SPONSORS

FUNDING

The expedition was funded by two Scott Pearlman Field Award grants, a Towbin Foundation grant, generous private donations and very significant in-kind donations by James Roberson of Ker & Downey Safaris. Other in-kind donations came from individuals and organizations, including Alison Jones Photography.

Appreciation is also extended to all who graciously gave time for interviews; to Brian Heath, Chief Executive of the Mara Conservancy, who contributed his time, piloting expertise and fuel for an emergency flight to the Maasai Dental Clinic; to Wilson Naitoi and his family who hosted the No Water No Life team in their boma; and to Simon Maturi and Mike who fed and pampered the team.

SPONSORS

WINGS WorldQuest and the Explorers Club supported the expedition by awarding it their Expedition Flag. As well, WINGS WorldQuest is the fiscal sponsor for No Water No Life. Others endorsing this expedition include International Rivers, Global Information Network, Mara Conservancy, Global Water Sustainability International League of Conservation Photographers, and Art for Conservation.

"Is it really so stupid to work for the zebras, lions and men who will walk the earth fifty years from now? And for those in a hundred or two hundred years’ time?" Grzimek, Serengeti Shall Not Die
PURPOSE OF EXPEDITION

I  PURPOSE of NO WATER NO LIFE
See ATTACHMENT 2-b, Page 54: No Water No Life: Goals and Objectives.

II  CRITERIA OF THE MARA RIVER BASIN as CASE STUDY

No Water No Life chose the Mara River Basin as a case-study watershed because it is seen as a watershed of global significance due to its extraordinary biodiversity that for centuries has fascinated explorers and all who love wildlife. Issues there are also being studied in many watersheds worldwide, including:

- Decline of keystone species (elephant, rhino, lion and others)
- Climate change (extended droughts and intense flooding)
- Unregulated water extraction (by commercial and small-scale farms, as well as human consumption)
- Timber extraction (causing loss of forest and water retention services)
- Fisheries management (seasonal and size restrictions)
- Habitat loss / fragmentation (by development, agriculture and forestry)
- Recreation (tourism, fishing, spiritual renewal)
- Pollution (from gold mining, agriculture, human and livestock effluent)
- Restoration efforts (at local grass-roots, national and international levels)

As with all No Water No Life expeditions, the team utilized research, still photography and video photography to investigate and document Mara River Basin characteristics, including:

- Hydrologic Systems (headwaters/source, rivers, lakes, wetlands…)
- Land Cover / Land Use (agriculture, silviculture, forest, development, national parks and conservancies)
- Biodiversity (including focus on species that are indicator, keystone, culturally significant, threatened, endangered, endemic, native / non-native and invasive)
- Habitat (riverine, wetland and aerial, terrestrial and aquatic corridors)
- Climate (historic, current and predicted changes in precipitation, temperature and seasonal/annual patterns)
- Human Impact: historic and current (population, economy, socio-cultural patterns, infrastructure, governance, political environment, stakeholder actions, and future development predictions)
- Watershed Management

III  PURPOSE of 2009 EXPEDITION to the MARA RIVER BASIN

- To establish the value of the Mara River as a lifeline for pastoralists, small-scale and commercial farmers, fishermen and the renowned biodiversity of wildebeest herds and iconic species of the Mara-Serengeti Ecosystem
To further research and document Mara River Basin issues, including:
-- Document the effects of the unusually long, ongoing three-year drought
-- Investigate deforestation and restoration plans for the Mau Forest
-- Assess impacts of current water extraction levels
-- Investigate extent of pollution and identify pollutants.
-- Study management policies of protected lands in the Mara watershed

To interview conservation contacts, focusing on solutions, such as:
-- Afforestation
-- More efficient irrigation and farming, and rain harvesting
-- Protection of riverine corridors
-- Establishment of critical water flows in order to set extraction regulations
-- Controls on fish extraction

There is hardly a more global or pressing issue facing the planet today than water. Over half the world’s population makes its living directly from freshwater resources. Securing water resources today is of paramount importance to individuals, local communities, states and the international community.

But water security is not just about water. The hydrological cycle substantially affects, and is impacted by, other current major security issues. It makes little sense to consider water security independent of climate change, food security, energy security – and the international cooperation required to deliver regional, state and human security.

(http://www.uea.ac.uk/watersecurity)
THE EXPEDITION EXPERIENCE

See ATTACHMENT 3: EXPEDITION DETAILS, pages 59 - 71
3a. ITINERARY, pp 59 - 64
3b. EXPEDITION SPECIES LIST, P 65
3c. MARA CONSERVANCY: History and Achievements, p 66
3d. MARA CONSERVANCY Monthly Report, Sept 09, P 67
3e. GLOWS – “MARA RIVER FLOWS,”-September 09 Report, PP 68-71

See ATTACHMENT 4: PHOTOGRAPHS P 72
(High-resolution PHOTOGRAPHS can be submitted separately on request)

EXPEDITION BACKGROUND: The Drought

Until recently, East Africa’s drought cycle has occurred once every ten years. But in the past decade, Kenya has been feeling the heat of climate change. Now droughts occur once every two to three years. In 2009, Kenya had its third consecutive year of drought, threatening the livelihood of already-vulnerable populations. Reports circulated of cattle being brought to city centers for grazing and starving herds searching in vain for water and food.

This Mara River Basin expedition took place against the backdrop of this three-year drought and political turmoil over plans to evict both legal and illegal settlers from the Mau Forest to restore its role as a water-retentive headwater for 12 of Kenya’s major rivers. The impetus for reforestation of the Mau by Prime Minister Raila Odinga came from the fact that all of the rivers flowing from the Mau were either drying up or already dry. On the team’s arrival in Kenya, the drought and degraded headwaters had already left many livestock dead, caused food insecurity and reduced water levels in lakes and rivers, thus depleting supplies for domestic consumption and agriculture.

This crisis of water scarcity caused economic havoc to Kenyan farmers, ranchers and pastoralists, as well as city dwellers as far away from the Mau Forest as Nairobi. UNEP’s environmental impact assessment expert, Henry Ndede, said, “If appropriate adaptation measures are not taken, we will witness severe food insecurity, problems of land degradation in search of elusive livelihoods, underdevelopment as water touches every aspect of development and an upsurge in the disease burden.” [http://bit.ly/9UVzj2](http://bit.ly/9UVzj2)

The effects of the drought are being heightened by other unresolved issues in Kenya:

- Kenya’s population is outstripping its land & natural resources.
- Most Kenyans earn less than $1 per day.
- Conflicts over water and livestock fuel ethnic tensions, raising security issues
- Corruption in government foils regulatory progress.

Given these overwhelming pressures, Odinga’s Mau Task Force report was passed by Kenya’s Parliament in Spring 2009 - an approval never before given to a Task Force Report. This
approval and the consequent creation of the Mau Forest Task Force Implementation Committee is being acclaimed as the most controversial and debated environmental action ever taken in Kenya, and perhaps even Africa.

EXpedition SUMMARY: A Focus on Watershed Management

No Water No Life researched, documented and questioned natural resource management in the Mara watershed -- or lack thereof -- throughout the expedition. Special focus was on the need for assessment of reserve flows, regulation over water extraction and land usage.

Related issues examined include:
• Deforestation of the headwaters complex
• Values and impacts of tourism and agriculture
• Impacts of degradation from grazing and loss of pastoralists’ cattle
• Treatment of municipal and tourist lodge waste
• Development of migratory corridors
• Need for local and trans-boundary watershed education and scientific studies
• Role of the international community.

Mara watershed stakeholders understand they must adapt to changing economies and climatic patterns with rain harvesting, afforestation and more sustainable technology for farming and fishing. However most mitigation and poverty reduction efforts need to be supported by the international community using both top-down policy and bottom-up grass root approaches. East Africa must address water deficiency by investing in scientific tools that can forecast and gauge water flow levels in order to establish when reserves are threatened and abstraction must be curtailed. Additionally discussions were held on the pros and cons of pricing water supplies. All these solutions are being considered from many different viewpoints, but they are always underlined with a grave sense of urgency.

The No Water No Life expedition experiences are described below according to five distinct land-use regions visited: The Mau Forest Headwaters, The Mara Plains, Protected Lands, Pastoralists’ Lands and The Mara Bay at Lake Victoria.

Pages 16-19 I THE MAU FOREST HEADWATERS: Addressing Deforestation
Pages 20-23 II THE MARA PLAINS: Commercial Agriculture’s Water Needs
Pages 24-32 III PROTECTED LANDS of the SERENGETI-MARA ECOSYSTEM:
          The Experiences of Olare Orok Conservancy and Mara Conservancy
Pages 33-35 IV PASTORALISTS’ LANDS: Facing Thirst
Pages 36-40 V THE MARA BAY AT LAKE VICTORIA: Fishing and Agriculture
I  THE MAU FOREST HEADWATERS:  Addressing Deforestation

VALUE of THE MAU FOREST HEADWATERS

The Mau Forest water catchment, the country’s largest closed canopy forest ecosystem with more than 1,544 sq miles (400,000 ha) of canopied trees. It is the single most important water catchment in the Rift Valley and western Kenya and directly or indirectly benefits some 5.5 million people. This forest is the source of 12 rivers, namely the Nzoia, Yala, Nyando, Sondu, and Mara which all flow into Lake Victoria; the Njoro, Naishi, Makalia, Enderit which all flow from east Mau into Lake Nakuru; the Ewaso Nyiro which flows into Lake Natron; the Molo River which flows into Lake Baringo; and the Kerio River which ends up in Lake Turkana. These rivers are habitat for yellow barbell, tiger fish, and Nile perch.

The montane forests of the Mau Complex are an important for water flow regulation, flood mitigation, water storage, groundwater recharge, water purification, micro-climate regulation, reduced soil erosion and siltation. The forests also provide other environmental services, including nutrient cycling and soil formation. In addition, their role in storing carbon makes the Mau Forest globally important for mitigating climate change.

The Mau Forest is the source for 60% of all the water that ends up in Lake Victoria. Thus Lake Victoria and livelihoods derived from it depend on water flow from the Mau Forest ecosystem. The multi-billion dollar tourism industry utilizing Lake Nakuru, Maasai Mara, Serengeti and other wildlife sanctuaries similarly require perennial water supplies in the Mara-Serengeti Ecosystem. Agriculture and food security throughout Kenya also rely on continuous water flows from a healthy water-retentive Mau Forest.

THREATS FACED in THE MAU FOREST HEADWATERS

Overview of Deforestation of the Mau Forest

Former President Moi’s government oversaw the illegal settlement thousands of families within the Mau’s protected reserves where they became dependent on the forest for their livelihood and everyday needs (cooking, firewood). The land was gazetted, subdivided into parcels and exploited without plans for reforestation. More than 25% of the forest cover - 247,105 acres (100,000ha) - has been destroyed in the last 15 years through illegal encroachment and logging, leaving Kenya with a mere 1.7% of forest cover instead of the recommended 10%. The current government is now faced with correcting these transgressions – at the risk of escalating tensions, such as the world witnessed in the wake of Kenya’s post-election violence only two years ago.

As Professor Wangari Maathai, Nobel Peace Prize winner, wrote in The Challenge for Africa (p 228), “Land (the promise and the loss of it) has been a battleground—used, much like ethnic identification, by unscrupulous leaders as a way to gain political advantage.”
Poverty and population growth are the twin root problems of much of the current
degradation and deforestation of the Mau Forest and its wetlands. The impact of this loss
of water-retentive ecosystems runs downstream affecting stakeholders at all levels: from
Maasai pastoralists to commercial farmers to luxury tourist lodge owners. This year all
twelve rivers stemming from the Mau Forest ran extremely low or completely dry,
affecting five to seven million who are dependent on waters from the Mau Forest.

In January 2010 Professor Wangari Maathai, explained that if deforestation continues,
Kenya’s water availability would be jeopardized:

It is estimated that per capita need of water is 1700m³. Kenyans are using 600m³,
which is less than half but by the year 2012, unless we are very aggressive in
protecting our forests and harvesting rainwater, it is estimated that Kenyans will
have a per capita of 190 m³, which would be precarious.

NWNL SITE VISITS & DOCUMENTATION in THE MAU FOREST HEADWATERS

• Aerial views of the Mau Forest during a 2-hour flyover in a Cessna 206 noting tea farms,
timber projects, deforestation, settlement, charcoal burning
• Mau Forest from Kericho entrance: Indigenous forest and tea plantation buffer zones
take pressure off the forest by offering a source of employment
• Mau Forest from Elburgon entrance:
  --Enyapuiyapui Swamp, source of Mara River
  --Molo River swamp, currently dry
  --Mariashoni, a Mau Forest town of 15,000 Luhya and Kalenjin people
  --Ogiek Primary School, headmistress and teacher
  --Local small villages and farmers
  --Cedar plantation owned by Timsales in the Kiptunga Forest
• Njoro River, used by locals for washing, laundry and water collection
• Establishment of eucalyptus farms outside of Forest Boundary
• Kiratu Sawmill in Elburgon
• Tea plantations in Kericho, owned by Kaisuga, Unilever and Finley
• Antique maps indicating changes in population, land use and forest cover
• Screening of film by Andrew Nightingale on degradation of Mau Forest
• Local village of small-scale farmers and Kenana Knitters women’s cooperative
• Charcoal kilns that burn more effectively and use less wood thus saves forests
• Clay cooking Pots that use less fuel due to design

SOLUTIONS in THE MAU FOREST HEADWATERS

The Mau Forest Task Force was appointed by the President’s Cabinet on July 30, 2009 to
be under the leadership of Raila Odinga Vice President of Kenya with the assistance of
international experts. Its report was completed and approved by Parliament on September
15, 2009. Its Implementation Commission, also under Odinga, has set up four approaches
to resettling residents of the Mau Forest, whether legal or illegal.
• Illegal settlers will be given funding for transportation back to their original home and a month’s worth of food.
• Legal settlers with letters or deeds will be compensated amounts determined on an individual basis.
• Large businesses within the forest, such as tea plantations, will be assessed for importance to the national economy and dealt with accordingly.
• Indigenous Ogiek and those who have married into the Ogiek tribe have more recently begun working as agricultural and livestock farmers within the forest. Thus they will be resettled on the perimeters of the forest boundary where they can legally pursue agricultural and livestock farming. The resettled Ogiek will be able to request permission to enter the forest for their sustainable traditions such as bee keeping and ceremonies.

Reforestation efforts have begun and will be continued. Groups contributing to the planting efforts include grassroots women’s organizations, Kenyan corporate executives and politicians. The Ogiek in Mariashoni have already pledge to protect the 20,000 seedlings already planted there. Fiscal support for this extensive reforestation of the Mau comes from Kenya, other Nile Basin countries and the international community.

Translocation of Mountain Gorillas to bamboo forests in the Mau has been suggested by some as a way to protect the Mau Forest and draw tourism income. Some feel the Mountain Bongo, an elusive, shy antelope, could draw tourism and others feel that the Mau needs a higher-profile, primate species. Given the forests’ high altitudes, mountain gorilla would be the appropriate primate, but it is difficult to find a large enough population. Furthermore others say that, although Rwandan mountain gorillas live in bamboo forests which do exist in the Mau, their food source is large amounts of gallium vines and wild celery which need heavy amounts of moisture that that do not exist in the Mau Forest.

Diversification of Employment can assist in supporting those traditionally reliant on agriculture or timber industries. Education in computer technology for residents of the region will open many new doors. As well, small micro businesses such as Kenana Knitters offer sustainable means of income. Begun ten years ago, this knitting concern now pays 250 knitters and 1500 people spinning wool, raising sheep and dying the wool. The products are now franchised by Starbucks.

Effective organizations working with local stakeholders and addressing afforestation in the Mau Forest include FOMAWA, FOMAU and The Green Belt Movement.

COMMENTS FROM INTERVIEWEES re: THE MAU FOREST HEADWATERS

JAMES ROBERTSON (Ker and Downey, Mara Conservancy): No Mau; no Mara.

JACOB MWANDUKA (FOMAWA): Over the years the Mau has lost over 70% of its forest due to human encroachment, illegal activities, illegal logging and charcoal burning. That has had a devastating impact on stakeholders downstream – approximately 1/3 of all
Kenyans – who depend on water from the Mau for food production, livestock, tourism and other industries.

HUGO WOOD (Mara Watershed RUA): The swamps are an important part of the forest in creating its water-retentive sponge effect. Thus plantation trees in the forest owned by timber companies that replaced swamps should be removed so that nature can restore its indigenous forest and its swamps. A forest is more than just trees.

JOSEPH TERER (NELSAP-NBI): The Mau Forest Task Force Report controversy is first time a parliament has taken note of an environmental policy issue. Vice-president Raila Odinga may be unpopular within his own government for his a stance on the Mau forest, but he has been applauded outside of Kenya for taking a hard line on environmental issues. Whether or not his move will pay off in political capital is yet to be seen, but people of Kenya are saying there is no other option.

MARTIN (small-scale farmer renting ¼ acre in the Mau Forest): I’m Kenyan, not just Kikuyu. People downstream lack water, so we must reforest the Mau. I am willing to leave. I just need some financial help to get started again.

CHRISTIAN LAMRECHTS (UNEP): The major degradation of the Mau Forest began in 1992 with the development of multi-party-ism and the introduction of “felling the forest for votes.” Now it is the “political interpretation” of how to implement the report that is consuming debate within Kenya. The nation must see this as “an aquifer crisis in a biodiversity hotspot” where the answers lie in reducing abstraction of water and compaction of sil and then restoring replenishment of the forest’s water retention services. The Mau Task Force Implementation Commission initial plan is to remove 1690 families immediately to recover 19,000 hectares (50,000 acre) in the South West Mau Forest Reserve. A fence can be installed after 100% of those living in the critical catchment areas are resettled, but only if communities want it.

NILE BASIN INITIATIVE, Joseph Terer: The root of environmental degradation is poverty, thus the urgency of the Mara watershed’s greatest issue is the ongoing cycle of population growth leading to environmental degradation and furthering poverty. The root of the Mara River water level flows and quality lie in the headwaters of the Mau Forest.

CONSERVATIONIST JOHNNY BAXENDALE: The reason the Kenyan Forest Service has been unable to be more efficient is they were reorganized three years ago from the old Forest Department and they are only now starting to be effective.

ANDREW NIGHTINGALE (Njoro landowner/farmer; filmmaker): No forest; no water.

WANGARI MAATHAI (Nobel Peace Prize winner; Founder Green Belt Movement) “Just as natural resources provide the basis for human development, they also serve as a buffer against the worst effects of climate change.” (The Challenge for Africa p 255)
II THE MARA PLAINS: Commercial Agriculture’s Water Needs

VALUE of THE MARA PLAINS

This area of both wooded and open grasslands, north of the renowned Maasai Mara National Reserve, are the wettest area of the Greater Mara. Much of Kenya depends on this fertile agricultural land.

THREATS in THE MARA PLAINS

Extraction of water from the Mara River for irrigation is not permitted, regulated or accounted for. In 2002 the National Water Act decentralized water use issues. Reserve water flows have yet to be established although Kenyan law has established that the human need for water is 24 liters per person per day. However Kenya’s Water Resource Management Authority is too weak, too small and inefficient.

Droughts have wrecked havoc on local farmers’ incomes. Crop failure is easily noted by the many fields of immature cornstalks turned brown that are useful only as fodder for cattle. Estimates are that now every one in five years brings a large and devastating drought.

Cattle numbers are increasing as droughts increase. Their tracks are causing massive erosion and their overgrazing is causing rainwater to flow off the land as if it were pavement. Topsoil runoff clogs dams and streams, causing havoc even inland. However the Maasai, whose culture revolves around cattle, have little incentive to reduce their herds, since their income from tourism and agriculture supports large numbers of livestock.

Other threats related to the agriculture practiced on these plains:

• Riverine buffer zones have not been established between plowed fields and rivers.
• Pesticides and sediment run from nearby fields into the river.
• E coli counts are rising due to untreated effluents.
• Upstream deforestation causes shorter flooding time and more turbid waters. When there is a storm over the Mau, the lower Mara River now floods for 1 day only with ferocity instead of the normal 2 to 3 day floods that were not as destructive.

NWNL SITE VISITS & DOCUMENTATION in THE MARA PLAINS

• Confluence of the Mara with the Chepkulo Rivers at Kamusiru.
• A run down the Mara River on oil-drum raft through Olerai Farm.
• Olerai Farm pump on Mara River, pulling 750,000 liters/hour for 10 hours/day.
• New well for 5-10,000 Kalenjin and Maasai residents, sponsored by Free the Children.
• Emarti School – Student choir rehearsing songs calling for peace and conservation.
• Mara Watershed River Users Association headquarters and tree nursery in Mulot.
• Shimoo Farm, irrigating water from the Chepkulo and Mara Rivers.

**SOLUTIONS in THE MARA PLAINS**

**The Mara Watershed River Users Association (Mara RUA):** An awareness that upstream and downstream stakeholders don’t communicate or coordinate enough along the Mara River has led to the formation of the Mara RUA. Farmers submitted permitting requests for water extraction and realized there was insufficient watershed management.

This organization seeks support of large- and small-scale farmers as well as lodges and camps. The Mara RUA believes that stakeholder management of water withdrawal and allowable numbers of pumps will lead to legislative enforcement based on the establishment of a critical water reserve needed to protect stakeholders and ecosystems downstream. This would prevent future over-extraction by upstream farmers that would affect stakeholders downstream. Amanda Subulusky and Chris Dutton of Global Water Sustainability (GLOWS) are currently setting scientific standards for the Mara River’s critical water reserve level by recording water flow levels and quality. As well, the RUA is trying to introduce stakeholders to biogas as a fuel alternative and to educate them on issues of health and pollution.

**Sustainable Farming Techniques and Crops.** Local commercial farms are using a combination of new farming methods to reduce daily irrigation hours from 10 hours to 4 hours of extraction from the Mara River:
• Zero-tilling is being practiced because plowing takes moisture out of the soil.
• Crops are being rotated to create avenues inside the soil for roots to develop.
  (For instance, no plowing is needed when wheat roots follow sunflowers.)
• Planting is timed so that harvesting rather than irrigation occurs during the dry season when water levels are lower.
• Crops are being planted that require less irrigation and/or less growing time than maize. Sweet potatoes, sunflower, grain amaranth, millet, cassava and soybeans mature in three months and yield three harvests per year. Maize only produces two harvests per year and has become so unreliable that it can no longer be counted on as a food staple or dependable income.

**Transition from a Group Farm to a Conservancy.** There are efforts underway to transform agricultural lands belonging to 100 stakeholders to form Enonkisha Conservancy. This 25,000-acre parcel would be contiguous with Ol Chorro and Olare Orok Conservancies and would offer wildlife viewing, horseback riding, a golf course, and membership cottages. It is estimated that such a conservancy would bring in as much if not more income for landowners than commercial farming. Local small stakeholders could then farm vegetables for tourist lodges, plant and harvest eucalyptus trees, and tend beehives. This would offer a more environmentally sustainable alternative for farmers currently struggling against constant droughts.
Communal Efforts: Several stakeholders suggested that Maasai pastoralism and communal approaches would be a good model for Mara River Basin stakeholders since larger, group lots are more economically viable. It is felt that individual stakeholders would reap greater profits if they worked together.

Additional solutions to reduce degradation of these plains include:

- Promotion of use of biogas or dung/grass briquettes rather than fuel wood or charcoal
- Increased education on health and pollution issues
- Cooperation with Water Resources Management Authority on extraction
- Sewage treatment in Bomet and Mulot (on the Amala, a Mara River tributary) It is estimated that a sewage management process would cost US$200,000 (K Sh. 400 million).
- Dissemination of meteorologists reports to farmers who can no longer rely on traditional rain patterns or signs of impending weather
- Restoration of riparian buffers, terracing and regulation of agricultural inputs
- Establishment of rain storage capacity. For instance, there are no cisterns in Bomet.
- Payment for Environmental Resources (PES): Upstream providers, such as stakeholders protecting forests and wetlands, could be paid from assessments on downstream users, such as County Councils and lodges.

Linkages between Peace, Agriculture and Conservation There is a new awareness in Kenya of the importance of peace following the country’s post election violence in January 2008. The expedition team noted the omnipresence of post-election graffiti spelling out “Peace.” Kenyans of all socio-economic levels feel the country came too close to imploding like Rwanda with its tribally focused violence. Across the country there is now a chorus of “We are Kenyans first!”

The voices that say Kenya must have peace to support its agriculture, tourism and conservation are those of politicians, small-scale farmers and rural school choirs. Other stakeholders say conservation and food production must exist if peace is to thrive. Whichever comes first Kenyans have accepted the linkage between peace and protection of the country’s assets and natural resources.

COMMENTS FROM INTERVIEWEES re: THE MARA PLAINS

TARQUIN WOOD (Owner, Olerai Farm): There’s no maize now for 124 miles (200 km) around between here and North Kenya due to this drought. There are hungry people. We’ve kept our farm going because of our large pumps. In the future, I see more and more pumps coming along this river. The impacts of that will be similar to current situations on other Kenyan rivers that are five years ahead of us technologically. Those rivers don’t even flow to the end. They are being sucked dry – some for the first time in living history – because upstream there is a pump every twenty meters watering cabbages and tomatoes – just feeding people.

Establishing a River Users Association (RUA) on the Mara has been an uphill struggle because nobody is really interested. It’s hard to get to the big businesses that use the river: the lodges and other commercial farmers. So the RUA would like to charge everybody who uses the river in amounts relative to one’s usage. If I know water is not for free, I will
We have a Grade B Farm in a Grade A conservation area. As farmers in this area, we would not be able to survive without the river. Basically we should think of another plan. It’s just non-economical to think of farming without serious irrigation. We should think of a conservancy approach that would allow pastoralists’ livestock to coexist with wildlife.

**CHRIS DUTTON,** Scientist for GLOWS “Raising awareness is about neighbors educating neighbors.”

**KENYAN CONSERVATIONIST:** Every drop of water should be paid for, and that money should be put towards the government’s management of catchment areas.

**LIPPA WOOD** (wife of Tarquin Wood): The Mara Watershed River Users Association is a great organization with the potential to help people on all scales who are using the Mara River, or based around it. The RUA can help preserve the river by monitoring water usage, setting up a database, creating tree-planting programs and river-bank restoration and rain harvesting. The stakeholders need to be more coordinated in their efforts.
III PROTECTED LANDS of the SERENGETI-MARA ECOSYSTEM:
The Experiences of Olare Orok Conservancy and Mara Conservancy

Due to constraints of time and the difficulty of border crossing logistics, No Water No Life expedition team documentation of protected land focused on Olare Orok and the Maasai Mara Game Reserve, since the wildebeest migration was in this northern section of the Mara-Serengeti Ecosystem. The Serengeti National Park, which adjoins the Maasai Mara along the Kenya/Tanzania border, is part of the same ecosystem and has the same species although there are differences in terrain and management.

VALUE of PROTECTED LANDS of the SERENGETI-MARA ECOSYSTEM

The Serengeti ecosystem is one of the oldest on earth. The essential features of climate, vegetation and fauna have barely changed in the past million years. Fossils of early man have been discovered in its Olduvai Gorge indicating human life there about two million years ago. Two World Heritage Sites and two Biosphere Reserves have been established within this ecosystem.

Quick History of Kenya’s Maasai Mara National Reserve

The Mara Triangle, a 200 square-mile (520 sq km) area between the Siria Escarpment, the Tanzania border and the Mara River was declared a National Game Reserve in 1948 and shooting was regulated. In 1961 the Reserve was brought under the direct control of the Narok Country Council and its borders extended east of the river to encompass a 700 square-mile (1813 sq km) area. In 1984 three sections were excised and the Masai Mara National Reserve was reduced to its present size of about 583 square miles (1510 sq km). In 1995 the control of the Reserve was divided between Narok County Council east of the Mara River and the Trans Mara Country Council west of the Mara River. In 2001 the Mara Conservancy was formed to manage the western Mara Triangle.

Quick History of Tanzania’s Serengeti National Park

In 1951 Serengeti National Park was declared by the Tanzania Government to encompass the present Serengeti, plus the Ngorongoro Area and surrounding Crater Highlands, including Olduvai Gorge. However since much of the southern side was already claimed by the Maasai, it was divided in 1959 into the present-day 5,700 square-mile (14,763 sq km) Serengeti National Park and the 3000 square-mile (7770 sq km) Ngorongoro Conservation Area which is home for Maasai pastoralists.
Value of Olare Orok Conservancy (www.oocmara.com)

The Olare Orok Conservancy (OOC) forms part of a vital buffer zone between the formally protected Masai Mara National Reserve (MMNR) and the wildlife dispersal areas surrounding it. It encompasses the lower river valleys of the Olare Orok and Ntiakitiak Rivers and associated riverine woodland. In May 2006 Chief Kapeen Sayialel, Ron Beaton and Jake Grieves-Cook set up the Olare Orok Conservancy. This new conservancy evolved because its lands were not usable for livestock grazing due to the presence of tse-tse flies.

Olare Orok currently includes a population of 25,000 Maasai, i.e.: one Maasai for every ten acres. The initial area consisted of 152 landowners covering approximately 20,262 acres (8200 ha) of land. There were 472 tenant Masai pastoralists who agreed to move out of the core area onto adjoining land. Maasai, leaders, tourism partners and donors working together have created a paradigm that gives Maasai landowners sustainable financial remuneration from tourism and conservation. These pastoralist landowners now lease their land within the Olare Orok Conservancy to Tourism Partners. They agree not to live in the area and only graze their cattle within that area under a zoning managed agreement in times of drought. In return Tourism Partners pays a sustainable rent for the land and bed night fees to give the Maasai a viable income to relieve poverty in the area. Grass within the core area is harvested on a rotational zoned basis to be used a dry-weather food bank for the landowners.

Value of the Maasai Mara National Reserve.

See Attachment 3-d. MARA CONSERVANCY: Sept 09 Executive Report, p. 67
Attachment 3-e. GLOWS “MARA RIVER FLOWS” September 09 Report p. 68-71

The Masai Mara National Reserve (Center at 01 30' S, 35 00' E; Altitude 4,921 – 7,119 ft (1500 to 2170 m) was nominated for designation as a World Heritage Site in 1996 in recognition of the 450 species of flora found here. It is 700 sq mi (181,200 ha) and the surrounding wildlife dispersal areas are 1864 sq mi (482,800 ha). The Masai Mara National Reserve is owned and managed by the Narok County Council and Transmara County Council. There are now about 4,000 beds in the Greater Mara Ecosystem: 1,000 are in the Reserve and 3,000 in conservancies outside Reserve

Habitats in the Masai Mara are varied, including open rolling grassland, riverine forest, Acacia woodland, swamps, non-deciduous thickets, boulder-strewn escarpments, and Acacia, Croton and Tarchonanthus scrub. These ecosystems and the Mara River support a spectacular array of wildlife.

To the north, east and west are large parcels of land demarcated as group ranches, owned and inhabited by the semi-nomadic pastoral Maasai people. This communal land forms an extensive wildlife dispersal area for the reserve, comprising the group ranches of Siana at 587 sq. mi. (152,000 ha), Koiyaki at 462 sq. mi. (94,000 ha), Olkinyei at 308 sq. mi. (80,000 ha), Lemek at 254 sq. mi. (66,000 ha), Kimindet at 142 sq. mi. (37,000 ha), Olorien at 100 sq. mi. (26,000 ha), Olchorro Ouirwa at 45 sq. mi. (11,800 ha), Kerinkani at 31 sq. mi. (8,100 ha) and
Angata Baragoi at 30 sq. mi. (7,900 ha). Where the rainfall is erratic and unpredictable, the resulting fixed, small land-holdings are widely regarded as ecologically inappropriate, unable to reliably support either farming or ranching. As subdivision proceeds, the movement of wildlife is inevitably impeded, and human-wildlife conflict increases.

**THREATS to PROTECTED LANDS of the SERENGETI-MARA ECOSYSTEM**

**Natural Resources, Wildlife and Indigenous Community Conflicts.**

Conservationists created Kenya’s Maasai Mara National Reserve and Tanzania’s Serengeti National Park after rinderpest destroyed local human communities and livestock. It was decided to exclude humans and their cattle in order to protect the unique biodiversity of this ecosystem, a position supported by German biologist Bernhard Grzimek who in 1960 wrote the book Serengeti Shall Not Die and directed the film of the same name. “A National Park must remain a piece of primordial wilderness to be effective,” he wrote. “No men, not even native ones, should live inside its borders…. The herds of Maasai cattle added to the herds of wildebeest would be more than the Serengeti has room for. During their constant wanderings the Maasai cut down the trees to build new huts and to make kraals and thorn shelters for their animals. This means that the shade round the remaining water holes is destroyed and the soil becomes arid. They already keep the wild animals away from the water holes during the dry season.”

Now however, poaching, droughts and the lack of migratory corridors are causing wildlife to decline even in national parks where cattle and settlements are prohibited. World Wildlife Fund (WWF) conducted a species count between 1989 and 2003 within the Maasai Mara of hoofed species. According to this study, six species including giraffes, impala, warthogs, topis and waterbucks have declined significantly at an alarming rate in the reserve. The study says that losses were as high as 95 percent for giraffes, 80 percent for warthogs, 76 percent for hartebeest and 67 percent for impala.

--- Information and Quotes from *Serengeti Shall Not Die*

The Mara River bisects and is a lifeline for the internationally renowned Maasai Mara National Reserve and Serengeti National Park as well as many contiguous community-based conservancies. The great numbers of international visitors to witness the wildlife spectacles within these protected lands has established the global importance of the watershed. Furthermore, as stated by the Chief Executive of the Mara Conservancy, although the Mara River is not one of Africa’s major rivers, it clearly exemplifies the problems of many of Africa’s rivers as well as threats to Africa’s unique biodiversity.

In Yale Magazine 360 in Jan 2010 Fred Pearce set the US model of national parks against the more complex realities of Africa. He stated that the test bed for finding a successful model of protected lands would be found in Africa where it is predicted that there will be more than a billion additional people by 2050. Already there are examples, such as the Mara
Conservancy, that recognize that local communities must both profit from wildlife tourism and commit to preserving the ecosystems if the great biodiversity of Africa is to survive.

**Low river levels, due to climate change, deforestation and upstream extraction** In a semi-arid landscape like the Mara River Basin, there are many competing users for the river’s limited resources. There are ongoing efforts to secure sufficient and sustainable flows in the river in order to support the biodiversity of the Serengeti-Mara Plains, a source of critically needed tourist income.

The Kenya Water Act (2002) provides for a reserve to be accounted for in all bodies of water. (Both Kenya and Tanzania establish basic requirements for human need that exceed those of the US.) But, despite strong language that protects this reserve level by restricting extraction, there has been no enforcement especially since the government has decentralized its authority. As well, here are currently no functional staff gauges on the main stem Mara River. Many have been washed away in floods. Other gauges have spotty historical records that end in the ‘90s. So there are no references by which to judge today’s river levels.

An established reserve level would ensure the presence of sufficient quantity and quality of water to sustain basic human and wildlife needs and aquatic ecosystems upstream and downstream. The reserve level would prioritize water allocations, so when the river falls too low, certain abstractions would be required by law to cease or be adjusted, keeping in mind that international standards state that humans need 25 liters per day of water.

Setting reserve criteria is particularly important in the face of a 3% rise in population growth in the upper catchment from the Mau Forest to Mulot. Thus there will be even more abstraction occurring in the future.

Scientist Subalusky explained that due to climate change, deforestation and extraction, “dry season flows have steadily decreased, while flood events have gotten larger. In 2009 the Maasai Mara experienced the lowest water levels in memory in what is typically “the wettest” area of Kenya. The shallow levels disrupted the spectacular migration pattern of 1.5 million wildebeest, 250,000 zebras and a host of carnivores. Mara Conservancy Chief Executive Brian Heath explained:

The wildebeest are just walking across the river. They’re not trying to swim through anymore, so consequently there are no large-scale die-offs occurring from wildebeests drowning in the river. Typically, in this stretch of the river, we would have possibly hundreds of dead wildebeest at a time floating down the river and floating in stagnant pools. But this year, only a few have drowned. The crocodiles don’t have the carcasses to feed on.

Going into the next part of the migration, the wildebeest population will be higher than normal, and a whole host of other potential impacts could be changing the system in a number of ways. We’re now witnessing some real potential disruption in the ecosystem, tied with these falling water levels, both through the wildebeest migration and the subsequent impacts that that migration has on the whole river ecosystem.
**Increasing Visitor Usage:** The Maasai Mara, which has the largest number of lodges and tented camps of any park in East Africa, and other conservancies have increased their bed nights to the extent that human effluent produced by tourists has affected water quality. Currently there are 4000 beds in the Greater Mara Ecosystem. Of that number, 3000 are outside the National Reserve and are therefore unregulated. Ironically the impact of this heavy tourism is the addition of human effluent and waste that undermines water supplies crucial to the ecosystem’s biodiversity and habitats – the draw that brings tourism here in the first place. As well, increasing numbers of visitors closes off wildlife movement.

**Effluent Raises Levels of e coli and Water-Related Disease** GLOWS scientists Amanda Subalusky and Chris Dutton measured water levels that were lower than people had ever seen. River levels were at least half of recommended levels for the very driest reserve flow measurements. As water levels fall, they witnessed rise of e coli and water born diseases as a result of human, livestock and wildlife effluent.

As discussed in previous paragraph, some of the increase in pollution is due to greater numbers of visitors. As well, increased populations in surrounding towns such as Talek are degrading the water quality. Measurements taken in Talek summer 2009 by Subalusky and Dutton indicate that e coli levels are 25 times higher than what is deemed acceptable. As well, car washing in the river releases phosphates from soap and women use cheap soap for their laundry, which is high in phosphates.

Maasai Mara stakeholders started to see ecosystem breakdowns triggering significant fish kills and typhoid outbreaks in the basin. Subalusky commented, “I think one of the biggest challenges on managing the Mara River is that there’s just a lack of monitoring data available. So, there’s no way to know what the river level or the river quality is today relative to other seasons and other drought years.”

**Co-existence of Cattle and Wildlife** in protected areas has been a long-standing issue of dispute between game wardens and pastoralist stakeholders. The reasons for not co-mingling Maasai herds and wildlife range from competition for grazing land to the spread of livestock diseases to wildlife in National Reserves and Parks.

**Lack of Governmental Regulations:** According to scientist Amanda Subalusky, “The main problem is the lack of resources to enforce laws.”

**NWNL SITE VISITS & DOCUMENTATION of PROTECTED LANDS of the SERENGETI-MARA ECOSYSTEM**

Drive from Olerai to Olare Orok past Isiria Escarpment, Aitong Hill, Aitong Plains, Maasai manyattas and goats, windmills, Aitong town’s windmill and pump, while noting whistling thorns (acacia depanalobium), gum Arabic (acacia nilotica), ungulates (wildebeest, eland, topi, Thompson and Grants gazelles) and birds (cory bustards, lilac-breasted roller)

Olare Orok Conservancy
The Mara Conservancy (See Attachment 3-e for Expedition Species List)
Maasai Mara National Reserve, managed by the Narok County Council
Meetings with Koiyaki Wilderness Guiding School founder (Jackson Looseyia) and
graduate (Wilson Naitoi)
Talek Town
Serena Lodge and Rekero Tented Camp
Meetings with GLOWS Scientists: Amanda Subalusky and Chris Dutton
Meetings with Disney filmmakers Owen Newman and Amanda Barrett

SOLUTIONS for PROTECTED LANDS of the SERENGETI-MARA ECOSYSTEM

The Maasai Mara National Reserve Ten-Year Management Plan (2009-2019) This is the
first such management plan in over 25 years. Organized by the Mara Conservancy and
written with input from representatives of both the Trans-Mara and Narok County
Councill, this plan addresses the following issues that pertain to the entire National
Reserve: water quality and quantity; forest degradation; climate change adaptivity: the
connectivity of migratory corridors; protection of endangered species and acres of critical
habitat; and Conservation Economy." The goals of this 10-year plan are to:

• ensure the survival of this priceless and natural heritage of the Maasai and Kenya
• generate optimum economic benefits for the local Maasai Districts and all Kenyans

The management plan considers each of the Reserve’s species is an indicator for the health
of the entire old-growth ecosystem. Input on this plan came from the local community
policy makers, tourism industry, ecologists, scientists and Reserve Managers. All
stakeholders have agreed that there will be no new development until this management
plan is adopted.

-- Ecosystem zoning that will regulate visitor usage is the core of this Management Plan. to
prioritize stresses, the greatest being on the riverine forest zone which gets 10 times the
usage of other high-use areas. In this 1 mile- (1.5 km-) wide strip on each side of the rivers,
there will be no more permanent camps or off-road driving. Other prioritized concerns are
the rhino breeding areas and wildebeest crossing points. All high use areas will have a
surcharge for usage.

-- Recommends that 15 of 140 current camps/lodges be removed. The 15 are illegal because
they are in the heritage exclusion zone and have no licenses to operate, thus are supposedly
limited to only two weeks of occupancy. There are particularly too many camps along the
Talek River that effectively stop wildlife movement and migration.

-- Recommends that all 40 leases given to individual Maasai be revoked and the revenue
from those leases should go directly to the County Council.

Constructed wetlands. Siana Springs treatment and testing of water is exemplary. At
Olanana Lodge there are now constructed wetlands, but they would flood in high water as
they are right on the river. Rekero Tented Camp now has a 230-262 foot (70-80 m) soak way
and septic tanks that are place 50 meters from the Talek River.
Koiyaki Wilderness Guiding School is a capacity-building facility that trains young Maasai women and men about the environment and tour guiding, thus prompting students to carry the conservation message back to their families and communities. The school’s curriculum focuses on professional safari guiding, wildlife management and land management teaching them:

- Ecology
- Wildlife tracking
- Camp management
- First aid and fire prevention
- Herbalism
- Vehicle maintenance
- Accounting
- Vehicle maintenance
- Communications and IT

Before this school was founded, less than 20% of lodge staff members in the Maasai Mara were Maasai. Now 25 Maasai students graduate per year as guides and/or managers ready to work in conservancies or national reserves. ([http://www.koiyaki.com](http://www.koiyaki.com))

Sustainable ranching and agricultural ventures within conservancies could supplement their management solutions and need for profit, by allocating 25% of the conservancy at any one time to a communal, commercial herd; or rotate such cattle through sectors of a conservancy to prevent degradation. The herds would be placed in stockades for protection at night. Other considerations include agriculture as a form of land income within one sector of a conservancy, but in most cases there’s not enough rainfall to sustain cash crops. Proposals are also being made to change Kenya’s law that all wildlife belongs to the government. Then conservancies could trans-locate and sell surplus wildlife to stock other regions of Africa that need certain species.

**Governmental Regulations:** Kenya’s national government has established the carrying capacity of livestock and placed agricultural restrictions on farming on slopes of 30 degrees or more. The Trans Mara County Council is buying back hilltops to prevent any further erosion.

**Scientific Research** by Amanda Subalusky and Christopher Dutton, who have been in the Mara River Basin for the last couple of years, work as scientists for Florida International University through the Global Water for Sustainability (GLOWS) program. GLOWS is a consortium financed by the United States Agency for International Development (USAID). GLOWS mission is to increase social, economic and environmental benefits to people of the developing world through clean water, healthy aquatic ecosystems and sustainable water resources management. Amanda is their Research Coordinator in the Mara River Basin, monitoring in the river to define reserve flow recommendations and work with NGOs and government authorities to implement the findings. Chris is the Coordinator for the Trans-boundary Water for Biodiversity and Human Health in the Mara River Basin (TWB-MRB) program, which brings together FIU, WWF, WorldVision and CARE to implement Integrated Water Resources Management in the Mara River Basin.

These scientists are working with a mere 4 years baseline of documented levels of water quality in the Mara watershed. Originally focusing on threats to the health of biodiversity and humans, these scientists realized the biggest issue was the quality and level of river flows as they saw more water extraction is planned for the future. The lack of supporting data undermines any efforts to enforce laws limiting water abstraction levels, setting up potential conflicts amongst different stakeholder groups.
Thus Subalusky and Dutton are testing water quality (salinity and dissolved oxygen levels) and invertebrates in oxygenated ripples of the Mara River using kick-net samplings and they are measuring water flow levels using four transects and surveying equipment.

**Equality:** Chris Dutton, scientist with GLOWS: “The main problem is the need for more communications upstream and downstream between the haves and the have-nots.”
Amanda Subalusky, scientist with GLOWS: “It’s time to stop blaming just lodges, large-scale farmers or Mau settlers. We need to also focus on small-scale farmers. They have many options for better practices. Everyone should just look at themselves and put in place best management practices.”

**COMMENTS FROM INTERVIEWEES re: PROTECTED LANDS of the SERENGETI-MARA ECOSYSTEM**

**BRIAN HEATH, Chief Executive of the Mara Conservancy, on Tourism:**

Not only is tourism absolutely essential for the livelihood of this river, but it’s also an absolutely crucial to Kenya’s tourism industry. Tourism provides probably in the region of twenty million dollars a year in park fees to the local authorities. It’s very, very important as a creator of job opportunities. I should think nearly a hundred kilometers of the Mara River goes through protected areas, either the Masai Mara Game Reserve or Serengeti National Park, and tourism is incredibly important in sustaining that portion of the river in terms of the animals that live in the river, the crocodiles, the fish, the hippos, the animals that rely on the river for their source of water in the dry season and so on.

Anything that destroys the Mara will have a huge impact on the river and thus a potentially huge impact on things like the migration and the long term. Degradation of the Mau Forest headwaters already has an impact on the life of things like hippo and crocodiles and all the resident animals that rely on this river very much on the dry season.

**AMANDA SUBALUSKY, research coordinator for Florida International University, USAID funded project under The Global Water for Sustainability program.**

I think the primary threat to the Mara River Basin is change from natural land cover to more manmade land cover. Nationally, Kenya has had a 30% loss of forest and a 200% increase in agricultural land over the last 30 years. So, when it rains, all the water rushes off in big high peaks, but there’s nothing left to seep in and support the river’s flows when the low dry seasons come.

Then, the second main threat, I think is water quantity. We have seen remarkable declines in water quality as flow levels decline. When you have a dry, very dry year in particular the dry seasons of those dry years, the river is already running very low.

The third major challenge for the Mara River Basin is wastewater discharge entering into the river when you have very low flows and high effluence coming into the river. You combine that with fairly high levels of run-off and you can get real declines in water...
quality. So, we’re really trying to look at how river levels change over time. And we need to stop withdrawal from the river during droughts by developing rain storage capacity.

EMILE ZOLA: The fate of animals is of greater importance to me than the fear of appearing ridiculous; it is indissolubly connected with the fate of men.

BERNHA RD AND MICHAEL GRZIMEK (Serengeti Shall Not Die) “What is the use of the Serengeti National Park when the protected animals have to leave it every dry season, only to be killed in huge numbers? Inside the borders poaching can be fairly well controlled, but even today the boundaries are not large enough to sustain the animals all the year round. The National Park is therefore no guarantee that the last, great, natural wonders of Africa will be preserved.”

RON BEATON (Patron of Koiyaki Wilderness Guiding School): Land management is probably the most important component that we teach at Koiyaki Wilderness Guiding School because at the end of the day, our students’ communities will have to look for the best source of income from the land that is compatible with the eco-tourism or conservation. Land management is a component that links in everything. We’ve got to create a situation where the Maasai landowners get the best possible income. They’re not going into wildlife tourism if they wont earn enough money from that form of land use.

JACKSON LOOSEYIA (Maasai Founder of Koiyaki Wilderness Guiding School): The preservation of the Maasai Mara National Reserve and therefore the Mara River relies upon whether the resident Maasai communities – who own this land – know they can benefit from this extraordinary ecosystem. Our school fosters a better understanding amongst Maasai communities that tourism creates alternatives and economic benefits for them. They need to know they no longer have to rely solely on a cattle economy, which is threatened today by climate-change’s droughts and reduced acreage of grazing lands.
IV PASTORALISTS’ LANDS: Facing Thirst

The Maasai Culture, Cattle And Water (as explained in Serengeti Shall Not Die)

The Maasai lived a pastoral life and traded their cattle for the fruit and grain of their agricultural neighbours. Grzimek wrote of the Maasai god, “Engai is a single, benevolent deity who sends them rain.” Grzimek continued, “The whole Maasai culture revolves around their cattle. In their language Maasai and cattle are synonymous, there is only one word for both concepts. During the dry season herdsmen will carry small calves for hours until they find water. In the south [the Masai morans (warriors) are] in charge of the subterranean water holes, where the herd are driven thirty feet below the level of the ground. The water is brought up from a still lower level by four morans standing one on the shoulders of the other against a flat wall and handing up cowhide buckets.”

VALUE of PASTORALISM

The Maasai, like most Africans, have long been aware of their vulnerability to extreme weather disruptions and they adapted by establishing a pattern of traveling from area to area as needed. This nomadic lifestyle of Maasai and other pastoralists has traditionally served them and their environment well, since migratory lifestyles maximize potential access to water for livestock and humans and protect land from being overgrazed. In the 21st century the knowledge of where rains are falling is being communicated, not by appointed runners, but by the ubiquitous cell phone.

THREATS to PASTORALISM

In today’s East Africa, increased population and fenced agricultural lands have hindered the ability to move at will for both for wildlife and pastoralists. As well, a dramatic increase in Maasai and cattle numbers in the last twenty years has degraded the environment with resulting effects:

• Grazing lands have been over-utilized and destroyed, causing erosion and sedimentation in the rivers
• Wood lots have been destroyed as trees are cut for fuel wood and fences to protect families and livestock from predators such as lion, leopard and cheetah.
• Rivers have been polluted and eroded by livestock coming to water

* The increase in severity and length of droughts, followed by El Nino flooding, causes further degradation since Maasai grazing has caused disappearance of soil that could hold the moisture.

These conditions are creating a vicious cycle of poverty and degradation by drought especially amongst the pastoralists. Drought causes a loss of livestock due to no grass and no water. They seek other pastures, leaving women and children behind. In these travels
they move across protected lands and face danger from wild predators. The loss of their livestock creates a loss of livelihood, which creates poverty, which leads them to cut down trees and burn charcoal for income, which fosters greater drought devastation.

The expedition met and interviewed Maasai pastoralists who had traveled seven days over a distance of more than 620 miles (1000 km) from the Tanzanian border without food or water for cattle or themselves to search for green pastures. During this trek, they had lost one quarter of their herd. The Maasai do not have a future tense in their language, so when asked about the future of their cattle, they merely said, “It is in God’s hands. Only God knows the end of our suffering.”

Unfortunately it is expected that when the rains do come, the cattle will be too weak to withstand the accompanying cold temperatures and dietary change of moist fodder. Thus, like the hippos, many more cattle will die.

**NWNL SITE VISITS & DOCUMENTATION of PASTORALISM**

--Goat feast in Maasai manyatta on the Mara Escarpment
--Documented of some of the 30,000-40,000 starving Maasai cows being driven to the TransMara Escarpment - the only remaining grazing lands per Maasai cell phone communications - from as far away as Narok and Nairobi
--Kiagia River (boundary between Maasai and Wakuria territories)
--Lolgorian

**SOLUTIONS for PASTORALISM**

Diversification away from livestock and into bee-keeping, beading and briquette-making (using cow dung and grass).

Traditionally the Masai have depended on always having plenty of water for cattle, so they valued quantity of cattle over quality. This is slowly changing and the Maasai are being included in the Mara Watershed RUA.

It is important to teach the Maasai about water conservation so women don’t spend so much of their day collecting water. According to Ron Beaton’s interview, in some areas a Maasai woman spends probably 80% of her day collecting water and firewood. Therefore, Beaton says, the Maasai must learn to use alternative solar lamps and thermal stoves, as well as to cut and bale grasses, rather than burn the long grasses in protected areas that ungulates won’t eat. Such harvested fodder to feed cattle during the dry season would last for 5 years.

The young need to be taught to use new technologies such as the computer to implant new technology and information from the outside world and network it back to their families.
COMMENTS from INTERVIEWEES on PASTORALISM

RON BEATON: One of the main challenges is to try to reverse the degradation of land caused by a huge increase in human population and their cattle, since this results in pasture being degraded and erosion taking place. Rainfall patterns actually have been changed by deforestation and the rivers are drying up. This can be reversed through education. But, we’re at a knife edge. Something has got to be done now, and the best way to do this, we feel, is through education of the young people. It all has to happen at the grassroots level because of the poor levels of political leadership in Africa.

JOSEPH TERERER, NBI: We need actions, not words.”

MAASAI: We used to be one family in this manyatta. Now we are over 700 people.

MAASAI: Without our cattle, we are nothing.

EMARTI PRIMARY SCHOOL CHOIR (song to be sung to the national government): Please protect our rivers so we can get out of poverty and have peace
THE MARA BAY AT LAKE VICTORIA: Fishing and Agriculture

Exploration of Lake Victoria

In August 1858, [John Hanning] Speke saw the largest lake in Africa, a sheet of water larger than the whole of Ireland. When [Sir Richard Francis] Burton heard Speke’s story he doubted whether Lake Victoria really gave birth to the Nile, and therefore set out again in 1860, accompanied by James Augustus Grant, who gave his name to a beautiful gazelle. In July 1862 these two stood, deeply moved, and saw the waterfalls in which the Nile flows from Lake Victoria.

– Grzimek, Serengeti Shall Not Die

VALUE of WETLANDS and MARA BAY at LAKE VICTORIA

Lake Victoria, the world’s second largest fresh water lake, covers an open surface area of 26,563 sq mi (68,800 km2). It is a transboundary lake with shores in Tanzania, Kenya and Uganda – three of the ten riparian countries of the Nile River Basin. The human population of the Nile River Basin itself is 160 million; yet the entire population of those ten countries is 300,000. This figure, 40% of Africa’s population, represents those who directly or indirectly depend on the Nile River Basin for survival.

Many consider Lake Victoria Basin, with its population of over 35 million inhabitants, as the richest region in East Africa. The basin contains also valuable natural resources with large fish populations, wildlife diversity, fertile soils for agricultural and favorable climate. The region offers opportunities for industry, hydro-electricity and mineral resources in an area of one of the world’s densest and most rapidly expanding populations, averaging over 3%. Yet this increasing human footprint is exerting enormous pressure on the lake’s ecosystems and natural resource, creating an ecologic imbalance worthy of concern. No Water No Life investigated the impacts of these increasing challenges on the area’s water resource systems.

The Musarura Swamp (c. 1°27’-1°37’S/34°11’-34°38’E) at the terminus of the Mara River as it enters Lake Victoria, is a riverine wetland, approximately 27 miles (45 km) long and up to 8.6 miles (14 km) wide. Fished and unprotected, this permanent papyrus swamp is approximately 115 acres (30,000 ha), situated 18.6 miles (30 km) east of Musoma.

The Masarura (or Mara) Swamp is bordered by a lacustrine plain that has been created by the sediments brought down by the river over the course of time. WWF states that the heavy rains of the 1960’s led to a significant expansion of the swamp. Additionally, in the past 30 years, this wetlands area has grown 340%. Statistic agree, saying that from 1986 to 2006, the Masaarura Swamp grew from 2 sq miles (20 sq km) to 24 Sq miles (63 sq km). This is because the change of land cover and use in the Upper Catchment has caused severe soil erosion that has been deposited downstream on these flat plains.

The positive function of this papyrus swamp is that it filters and cleans the Mara’s polluted
waters before they enter Lake Victoria. This is why the Mara River is one of the few entering Lake Victoria that do not create dead zones.

**THREATS to WETLANDS and MARA BAY at LAKE VICTORIA**

The increasingly larger human footprint, due to population growth in the Lake Victoria Basin at over 3%, is exerting enormous pressure on the lake’s ecosystems and natural resource, creating an ecologic imbalance. Those challenges are particularly affecting the area’s water resource systems. From aerial surveys it seems that the Mara Swamp was probably originally part of Lake Victoria. But large-scale water extraction could have changed the hydrology. Today it is estimated that 2/3 of the waters are withdrawn by humans. Silt from upstream erosion and blockage by the Mara River Suspension Bridge have created extensive marsh development.

**Pollution in Tanzania’s Mara River Basin:**

**Upstream pollution** causes local water-related diseases such as worms, malaria and dysentery, as seen at the Tarime Orphanage. Human effluent occurs here as well as upstream, as do habits of washing clothing, bikes and bodies with phosphate-producing soaps.

**Gold mining** pollution: The water quality of Tanzania’s Tigithe River, a tributary to the Lower Mara River, is be threatened by gold mining there. The large-scale mining by the Canadian Barrick Mines, a gold extraction business in partnership with other industries, uses cyanide and exposes sulfur oxide in its mining process. The small-scale miners use mercury to process gold in the streams. Local stakeholders’ have expressed concern over pollution and related diseases from Barrick Mines effluents for a couple of years to the Tanzanian government. Lack of results seem to be the cause of vandalization of linings of Barrick’s water pools, which in turn spilled and created further polluting hazards. There should be governmental regulations on polluters and industry efforts to educate and protect residents.

**NB:** *Despite a planned visit to Tigithe River Basin, his expedition found it was unable to visit due to the locals’ anger and the expedition’s need for more time than we had to establish community relations before documenting the Tigithe River’s pollution and related diseases.*

**Lack of infrastructure** of water pipes means most stakeholders have no access to running water. This causes typhoid and cholera in local people who drink polluted water directly from the river or, as seen in Musoma, children who drink from town ditches. One great challenge is that people are used to being sick, especially when the rains come. A woman observed at Kirumi on the banks of the Mara River collected dirty water one bucket at a time, taking 20 minutes to carry the water to her house and return again for the next bucket of dirty water. At the inland Masarura Dam, built in 1950 by the German colonial government, women and children collect buckets of water from this still body of water in which cattle were simultaneously drinking and defecating nearby. However, in this case, the community is told to always boil the water.
Recent **droughts** have been responsible for lowering water levels of the Masarura (Mara Swamp), thus decreasing space for fish and fish reproduction in its shallow waters. Changed rainfall patterns have challenged farmers’ efforts. A Yugoslavian study verifies that the weather pattern has become drier. Its rainfall data was collected from 1941 to 1976 and indicates that rain fell every month. Since there have been dramatic changes in the rainfall patterns.

**Encroachment of agricultural plots** on the banks of the Mara River, especially during the dry seasons, have changed the hydrology of the swamp and reduced its quality of the water. Local farmers often remove riverine fig trees and burn the papyrus along the peripheries of the Mara Swamp when water levels are lower to create additional crop fields. This destroys habitats for riverine wildlife and fish.

Agricultural plots are also created along the lakeshore to minimize the distance for carrying buckets of water to irrigate crops. A Tanzanian law requires a natural ecological barrier be maintained for 60 meters in from the lake, but this is not enforced.

**Decreasing fish populations** are hurting the fishermen using local dhows on L. Victoria and reed-boats in the Masarura (Mara) Swamp. As discussed, two contributing factors to this are the climate-change induced droughts that have lowered water levels in the lake and in shallow breeding areas and the incursion of agriculture into riverine forests and swamps. Other degradation causes include:

- Poaching owing to poverty and individual need to feed and support a family
- Effects of agro chemical inputs running off into the upstream reaches of the Mara River and the shores of Lake Victoria. A spider mite spray of horticultural vegetables created a large fish kill in Lake Victoria
- Use of small-mesh nets catch smaller, younger fish that haven’t started breeding yet
- Invasive papyrus stands take over fish habitats

**Invasive Flora:** Papyrus, introduced in the 1950’s, has spread dramatically in the Masarura (Mara) Bay. The density of the papyrus here has stopped navigation on this lowest reach of the Mara River. As a result our expedition could not access Lake Victoria from Kirumi via airboat although the depth of water was measured with an anchor line as 12 feet.

The papyrus is likened to a bottle stopper that holds back the Mara River, widening its width before entering L. Victoria. Ironically however it improves the water quality of Lake Victoria by filtering effluent and other contributors to dead zones that commonly occur in the lake at other rivers’ entry point. Papyrus also can be used commercially for crafts and cattle fodder. However its presence in the swamp affects and in places eliminates the fisheries.

Water hyacinth is another invasive which has some benefits. It catches polluting nutrients and thus cleanses the water. It is used commercially for manure (particularly in Uganda) and it helps the cyclid fish because they can hide from the larger and predatory Nile perch.
NWNL SITE VISITS & DOCUMENTATION of WETLANDS and MARA BAY at LAKE VICTORIA

- Tarime Orphanage
- Mara River Suspension Bridge (built 1885) at Kirumi
- Mara River Airboat trip up Masarura (Mara) Swamp
- Beach Management Unit fishing communities (Nile perch, tilapia, kamunga, catfish)
- Horticultural Farmers (tomatoes, okra, kale, peppers, watermelons, maize, onions, spinach, French beans leeks, butternut squash, zucchini, cauliflower, eggplant, cucumber, peas and amaranthus)
- Musarura Dam
- Meetings with international organizations working on the Mara River Basin: WWF, Nile Basin Initiative/NELSAP and Swedish Cooperative Center

SOLUTIONS for WETLANDS and MARA BAY at LAKE VICTORIA

**Transboundary solutions** to conserve bodies of water such as the Mara River and its Lake Victoria terminus must focus on collaboration upstream & downstream - and across borders. In the Mara watershed, it is essential that the upstream deforestation must be halted to stop sedimentation of the lower river. Riverine forests especially should be restored. Tree farming and tree planting efforts throughout the watershed will help stop erosion and increase biodiversity, as well as mitigate climate change. These are means by which stakeholders can act locally to correct global issues. Transboundary and international organizations exist to assist, including WWF, the Nile Basin Initiative, the Lake Victoria Basin Commission, the East Africa Community and other organizations. Their overall goal is to help create scenarios and harmonize policies that will address socio-economic issues, poverty and environmental degradation – all of which are affected by water availability, quality and usage.

**Governmental regulations** can require larger mesh nets and restrictions for fishing during breeding season. The Beach Management Units on L. Victoria report that dhow fishermen support these regulations.

**Diversification of income** from fishing could focus on microfinance support of raising dairy cattle, growing rice (being done successfully 31 miles (50 km) south of Musoma), tree farming for fuel wood and making crafts from swamp materials.

**Health education** can teach stakeholders about hygiene and that just because river or lake water “looks clean” it isn’t and still needs to be boiled. Up until now they have lacked the tradition of cleaning their water. As well, there’s a need for water filters and UV lights and a sufficient supply of firewood to enable stakeholders to be able to boil water. Alternative fuels could include solar cookers. These water-related health issues will be addressed in 2010 by Direct Relief International’s launch of a new 6-year Lake Victoria Basin Health Initiative that will encompass all existing health-related organizations (including AMREF, Marie Stopes and others).

**Installation of water pumps and pipes** can assist local horticultural farmers who currently spend 5 hours per day carrying water in buckets from the lake. Rain harvesting tanks
would provide more efficient access to water than pulling water up from wells in the ground or carrying it from rivers or dams, according to the Swedish Cooperative Centre.

**Improved agricultural techniques** could include crop rotation, which would build up a layer of hummus. Additionally, more robust agricultural methods can help farmers cope with periods of both more and less water.

**COMMENTS from INTERVIEWEES on WETLANDS and MARA BAY at LAKE VICTORIA**

RACHEL WOOD: Aerial views of the Mara Swamps would indicate that it was originally part of Lake Victoria

MANY - International community has a responsibility

FARMER: Even when it rains, the river level stays low.”

WWF, William Kasanga: Our Water Management Strategy for the Mara River Basin defines the three largest watershed challenges as water availability; water quality and pollution; and cooperative governance of this transboundary watershed. If those issues are not addressed there will be conflict since everyone depends on the river. Just as people move when the springs are dry, the wildebeest may move elsewhere as well for water, thus disrupting a lucrative tourist industry and the balance of biodiversity in this river basin. However if WWF’s management plan studies for the Mara River Basin become policy, farmers here on Lake Victoria’s Mara Bay like Samson and throughout the basin will be able to support themselves.

SWEDISH COOPERATIVE CENTER, Bjorn Horvath: We can expect adaptation from Tanzanian and Kenyan populations; but it is the international community that must be ultimately responsible for mitigation of climate change.

**ASSESSMENT OF THE EXPEDITION EXPERIENCE**

The expedition team received very enthusiastic welcomes from stakeholders and stewards, whether or not it had an introduction or common contact. Kenyans and Tanzanians expressed appreciation that **No Water No Life** is following their water scarcity and pollution issues. From international nonprofit managers to small-scale, uneducated farmers, all stakeholders noted they were aware of the effects of the condition of the Mara River on the well-being of many beyond this Mara sub-watershed of the Nile River Basin. As well, Kenyans seemed particularly committed to moving past the post-election mood of tribal violence and are now working together as “Kenyans first!”

The greatest impact of this **No Water No Life** expedition will likely be the project’s dissemination of information about Kenya’s orderly process, under Vice-President Raila Odinga, in reforesting the Mau Complex. The expedition’s 35 interviews revealed that
stakeholders of all levels accept the conclusions of the Mau Forest Task Force Report on the need to resettle illegal and legal stakeholders from the Mau Forest is necessary. The Mau Forest Task Force Report conclusions are precedent-setting in that they are based on the greater good of the nation and the region, rather than on tribal allegiances. Many say that Kenya’s approach to saving this critical water tower is the finest example of environmental action taken thus far in Africa. The expedition certainly highlights the extreme importance of conservation of wetlands and forest in the overall health of a watershed.

**No Water No Life** services to Mara River Basin stakeholders included:
- Sharing expedition photographs and interview transcriptions
- Raising stakeholder awareness to encourage stronger advocacy
- Connecting scientists and stakeholders so they can support each other’s work

**No Water No Life** believes that the establishment of upstream and downstream partnerships is a critical link to preserving the values and functions of a watershed.
EXPEDITION TECHNIQUES

PRE-EXPEDITION RESEARCH
See ATTACHMENT 2 – c, pages 55-58: No Water No Life Methodology.

Four years ago No Water No Life chose the Mara River Basin as one of six major watersheds. From that point on, the documentary approach to this preparing expedition was defined by the No Water No Life methodology. No Water No Life Founding Director Alison M. Jones established many of the contacts for this expedition. For 25 years she has traveled almost annually to East Africa documenting biodiversity, supporting conservation and addressing environmental and development issues.

The No Water No Life Research Report on the Mara River Basin, written in 2008 by intern Melaina Macone, determined the project’s “Basin Foci” and expedition goals. Alison Jones’s conservation involvement in the Mara River Basin, and many years of monitoring of ongoing issues and management solutions, further supported the project’s research.

PRE-EXPEDITION ARRANGEMENTS

All in all, this expedition was much more difficult to coordinate and to conduct than those conducted in North America, due to difficulty of contacting watershed stakeholders and the East African tradition of not planning ahead.

The Mara River Basin presented several language barriers. In addition, one cannot just drive where one wants due to game reserve regulations, difficult terrain and the current political anger in some areas of Mau Forest as the government removes settlers. Expensive photography permits were required for both still and video work.

No Water No Life was fortunate to have James Robertson as its consultant and coordinator facilitating logistics and communications before and during the expedition. He and his Office Manager Abigail Allison provided appropriate contacts for our goals, assisted us in planning the expedition route, and supplied a vehicle, camping equipment and staff and lodging while in Nairobi. Their support was invaluable.

EXPEDITION LOGISTICS and ROUTINE

Regional contacts for this expedition included:
• Conservation advocates and organizations
• Scientists and policy analysts
• Representatives of tourism and game reserve managers
• Lake Victoria fishermen
• Commercial and small-scale farmers and tea-pickers
• Educators and other public and private stakeholders.
The input from these contacts formed the documentary focus, which became the backbone of the expedition’s itinerary:

Most travel was done via a 4-wheel drive Toyota Landcruiser with a trailer for camping gear. Sites were also accessed via Maasai motorcycle, a float constructed on oil drums, an airboat and a Cessna 206.

The expedition filmed 35 lengthy *in situ* interviews with significant stakeholders. Local coverage of the expedition was published in GLOWS “The Mara Flows” September report (page ??), The Mara Conservancy Chief Executive’s Report (see page ??) and an email newsletter by Traditional Safaris - James Robertson.

The expedition’s daily routine included photographing, videoing interviewing, writing field notes, backing up and captioning images, and researching the “lay of the land.” Locales sought out included Mara riverbanks, indigenous forest, timber mills, commercial and small farms, protected national reserves and conservancies, tourist resorts, local access points for water collection and Lake Victoria fishing beaches.

The only desired improvement to this expedition would have been to extend the dates in order to allow more time for photography, video scenics (B-roll), meeting contacts and enjoyment of the beauty of this watershed and its biodiversity. The original plan however had to be reduced in time due to funding restrictions.

**ADVICE FOR OTHERS DOING SIMILAR WORK**

**ITINERARY PLANNING:**
- The itinerary of an expedition like this must be considered a “work in progress,” and should be kept as flexible as possible. Many times a source of valuable information unexpectedly appears, or one contact leads to another, necessitating a detour.
- Pre-departure planning to establish an itinerary in Africa is difficult because the culture tends to preclude planning more than a couple days ahead and email correspondence is less reliable in East Africa than in North America. Skype may offer a more effective alternative.

**FUNDING:**
- A budgetary cushion is needed for unexpected expenses. *No Water No Life* had last-minute added costs for a Kenyan film license; a pilot switch that meant a larger, more expensive plane for aerials; and additional expenses needed to be covered for our replacement videographer.
- Photographic prints from the expedition are nice tokens of appreciation on return for funders.

**TEAM BUILDING:**
- Be sure to have access to back-up team members with acceptable expertise. (Our original videographer was diagnosed with a serious disease 3 weeks before departure and NWNL was lucky to find an excellent replacement.)
• When going to foreign locales, it is best to have team members who have already been there and won’t spend the 1st half of the expedition in culture shock. All team members must be ready to hit the ground running.

TOKENS OF APPRECIATION: Press and interviewees appreciate receiving a business card, 1-page expedition description and a small gift for their time. (The latter should be easily pack-able. This expedition distributed No Water No Life Post-It pads with an African proverb on recycled paper and a bumper sticker with No Water No Life graphics and website.

VIDEO/INTERVIEWS:
• Interviewees should be placed in a setting appropriate to their concern.
• Find quiet locales to avoid audio distractions of wind, traffic and/or children.
• Extra footage and close-ups, should be taken as “B roll,” to provide imagery for videos of “talking heads.” There never seems to be enough B-roll footage.
• When interviewing students, it is best to separate them from presence of teachers or headmasters in order to get their true thoughts, rather than what they think they are supposed to say.

COMMUNICATIONS: Local knowledge is indispensable.
• Drivers and guides should be fluent in national and tribal languages and clearly understand and be able to communicate the expedition’s mission.
• It is courteous, impressive and bridge-building if team members learn some vocabulary and correct pronunciations of names and places. Our team knew the basic introductory greetings and Swahili words applicable to issues we were documenting, such as “maji” for water and “kuni” for firewood.”

7. HEALTH:
• Take plenty of anti-mosquito lotion to be used at dusk and through the evening in East Africa, as well as malarial prophylactics.
• One should avoid entering still or stagnant water in order to avoid bilharzia.
• Local treatment for flu symptoms was hot citronella tea and wads of steamed nasturium leaves. When taken with 5 days of TamiFlu (twice daily), they seemed to be the perfect remedy.
EXPEDITION RESULTS

See ATTACHMENT 4: EXPEDITION PHOTOS, page 72. High resolution photographs can be submitted on a separate CD on request.

EXPEDITION ACHIEVEMENTS

- Discussion of water usage and quality with partners upstream + downstream
- Establishment of partnerships among stakeholders, stewards and scientists
- Comparison of the Mara River issues with other local watersheds
- Study of the value of the Mara River within the greater Nile River Basin
- Observation of the parallels of Mara River to our other case-study watersheds

The expedition returned with photographs of natural freshwater resources and local conservation efforts, as well as images of change and degradation. There was a great variety of ecosystems to cover, beginning with the dense indigenous Mau Forest cut into ravines by waterways that have spread throughout Kenya for eons. Yet it was equally important to document the increase of human population, agriculture, livestock grazing and fishing in the Mara River Basin which all create a heavy demand on its water resources, habitats and hydrologic features.

The expedition learned that the Mara River Basin stakeholders are gaining knowledge of environmental issues thanks to the efforts of international watchdog and stewardship agencies, Kenyan government’s task forces, Internet research, river user associations, beach management units and a specialized school in wildlife training for Maasai. The No Water No Life saw communities facing David-and-Goliath struggles against climate change, commercial agriculture, government corruption, lack of sanitary treatment for effluents, and increasingly destructive recreational use. The result of this degradation is decreased resources and increased poverty with in watershed, creating an ever-increasing negative spiral. Yet, despite extensive logging, climate change and droughts, unregulated extraction of water, overgrazing by livestock and poaching, the team found many reasons for optimism within the watershed, due to increased environmental, vocational and technological education and international support of stakeholders’ socio-economic security.

QUANTIFIABLE EXPEDITION RESULTS

Mileage logged: 1,650 miles (2657 km) were covered in total. (1,255 km by 4WD from Nairobi to the Mau Forest to the Mara. 482 km by car Mara-Serena / Isebania round-trip. Approximately by car 650 km in Tanzania. 270 km flying from Mara-Serena to Nairobi.)
**Still photographs:** A final edit of 80 giga-bites (over 4000 images) of landscapes, wildlife and stakeholders that define the Mara watershed’s values and services, degradation and management solutions.

**Video:** 53 hours documenting the Mara River Basin and filming interviews with 35 significant voices of scientists, stewards, teachers, conservation managers, small-scale farmers and fishermen, pastoralists and wildlife guides rangers.

**Field notes:** Journal entries were made daily by the team for future reference.

**Research Resources:** Useful research resources were acquired during the expedition in the form of maps, books, brochures, research and assessment reports, baseline surveys and a film documentary on DVD.

**Publicity:** See Appendix 3c and 3d, pages 66 and 67. Since the expedition’s return coverage has appeared in many media (see www.nowater-nolife.org for No Water No Life press, lectures, Twitter and blogs.).

**SIGNIFICANCE OF EXPEDITION RESULTS**

The Mara River Basin Expedition documented watershed threats that are unique to this watershed as well as others that are found worldwide. Recent efforts to protect and preserve this fresh water resource can become a reference for other watershed stewards and advocacy groups. The expedition gathered information and documentation (noted in black) on each of its stated points of investigation (copied below in green font per “Purpose of Expedition, p 12-13).

-- **Document the effects of the unusually long, ongoing three-year drought:** This drought was seen to have notably affected the balance of biodiversity (wildebeest crossing of the Mara River), farmers (without water for irrigation) and cattle ranchers (with herds dying due to lack of water and grasses to graze).

-- **Investigate extent of pollution and identify pollutants:** Human, cattle and wildlife effluent waste, agricultural inputs’ runoff and mining are negatively impacting the Mara River water quality.

-- **Assess impacts of current water extraction levels:** small-scale and commercial farmers and municipalities are lowering water levels on an unregulated and unmeasured basis, with no regard for dry season

-- **Investigate deforestation and restoration plans for the Mau Forest:** Mara River stakeholders are coming to recognize that forests are a natural water retainer and purifier and thus provide a much less costly and a more effective flood management than man-made dams. Protection of headwaters’ ecosystems is an issue noted in all No Water No Life case-study watersheds.
Study management policies of protected lands in the Mara watershed: The focus of the Greater Maasai Mara Ecosystem reserve and conservancy managers is on protecting habitats of keystone and indicator species. This correlates to other No Water No Life case-study watersheds, such as:

-- Greater Yellowstone Ecosystem (in the Mississippi River Basin) focus on the role of the wolf in protecting the functions of riparian ecosystems
-- Darkwoods (a British Columbia initiative in the Upper Columbia River Basin) to protect the last remaining mountain caribou herds that also protects their habitat and water supplies.
-- Y2Y Yellowstone-to-Yukon Initiative (in the Upper Missouri-Mississippi River Basin) establishment and protection of protected corridors for wildlife

Meetings and interviews with stakeholders focused on solutions: Water flow levels, ground porosity, land cover, drought-efficient agriculture, water diversion, establishment of riverine and wildlife corridors, improved governance and regulatory enforcement, water-related diseases and replacement of natural resources are primary issues being studied by regional, national, international and transboundary agencies.

FUTURE USAGE of EXPEDITION RESULTS

The results of this expedition will be processed per the No Water No Life methodology established to insure fulfillment of its goals and objectives.

--Education of local stakeholders: The information gleaned in this expedition will help inform upstream and downstream watershed communities of the Mara River Basin and in other river basins worldwide. Many issues addressed in the Mara River Basin occur elsewhere. For instance much of sub-Saharan Africa is facing severely extended droughts causing water scarcity. And this issue is increasingly being felt worldwide. Other issues such as heavy extraction of water for irrigation, deforestation and pollution are also global problems.

--Accumulation of materials for NWNL’s stated goals: The two scientists and many stewards contacted by NWNL on this expedition will continue to be great assets as No Water No Life collects and disseminates its research upstream and downstream within the Mara River Basin, regionally and globally.

• Results from this expedition will be shared via email news blasts, exhibits, lectures, print publications and on the organization’s website in an effort to raise awareness of this river system’s freshwater issues and solutions.

• No Water No Life will continue to facilitate partnerships between its contacts with scientists, stewardship leaders and conservation groups. The project will stay in contact with these new friends and colleagues and hosts
who so generously offered lodging and shared information with the expedition team.

• New information gathered from the Mara River Basin will be included into No Water No Life research files on Mara River Basin issues of freshwater availability, quality and usage upstream and downstream.

• Results and conclusions from this expedition will be studied in comparison to the other five watersheds being studied by No Water No Life.

• Data, photos, stories, interviews, processes and other outcomes will become part of larger project outputs by No Water No Life, including print publications, development of student curriculum, and coalition building and a future book.

ADVICE FOR YOUNG EXPLORERS

• On expedition, ask frequently, and from as many sources as possible for verification of information and directions to desired destinations. Such cross-referencing definitely improves factual accuracy and chances of accessing remote destinations such as a quiet swamp that is the pinpoint source of the Mara River.

• Create the best photographs by being willing to get up early or wait for that “killer light.” East Africa’s equatorial sunrises and sunsets, while spectacular, are over much more quickly than those in European and American latitudes, so photographers must be ready, set up and able to move quickly.

• When on expedition, write as many notes, draw as many sketches and maps, and explore as much as possible during the day. At night, download, back up and caption photos, charge batteries if electricity is available, wash and dry out muddy socks, check the following day’s route -- and catch as much sleep as possible.
ATTACHMENT 1: Maps

No Water No Life
Case Study Watersheds

Mara River Basin Land Use
ON EXPEDITION:

Alison M. Jones, Expedition Leader; NWNL Project Director and Lead Photographer; Conservation Photography
Previously on the NWNL ’07 Columbia River Basin; ’05, ’07 and ’08 Omo River Basin; ’07 Blue Nile River Basin; ’08 Mississippi Delta and ’08 Greater Yellowstone Ecosystem Expeditions

Alison M. Jones has photographed for over 20 years in Africa, mostly for conservation and development programs. As she copiloted over thousands of miles of Africa’s rivers and lakeshores, she saw them as ribbons of life, and became immersed in studying global issues of water. She founded No Water No Life, LLC, as a nonprofit project using the power of photography to help disseminate science-based warnings of watershed degradation and to publicize successful stewardship programs. Her images are found in magazines, television, books, workshops, lectures, and exhibits. Granted an honorary Masters Degree in Photography from Brooks Institute, she is a Fellow of the International League of Conservation Photography, on the Board of North American Nature Photography Association and member of ASMP, the Explorers Club and Society of Environmental Journalists. She is a founding supporter of Kenya’s Mara Conservancy and was recently enrolled at Columbia University’s Center for Environmental Research and Conservation (CERC). Her web site is www.alisonjonesphoto.com.

Alison Fast, Project Videographer; Television Producer and Camera Woman
On the NWNL 2009 Mara River Expedition

Alison Fast is a Peabody Award-winning television producer and camera woman who has worked for NBC/Universal, BBC Worldwide and MTV Networks. She has documented the World Water Forum in Mexico City, the XXII International AIDS Conference in Mexico City and the Clinton Global Initiative in New York City. As a media instructor, consultant and Program Director for Barefoot Workshops, she has trained over thirty-five NGOs in Africa and the Middle East to use the power of media to better meet development goals. She uses grassroots storytelling to bridge diverse communities around the world and to work towards global strategies for peace and a sustainable future. In 2005, she participated in a Lakota Nation “spirit run,” covering 1600 miles on foot to call attention to the plight of the environment worldwide. She graduated in 1998 with a degree in Journalism from Boston University College of Communication.
Tari Wako, NWNL Driver and Guide-Kenya, Professional Wilderness Guide
On the NWNL 2009 Mara River Expedition

One of Kenya’s finest guides, Tari works in association with James Robertson, Chairman of Ker and Downey Safaris. He has achieved the Bronze Level Guiding Certificate from the Kenya Professional Safari Guides Association. Alison Jones had previously spent several weeks in the bush in Kenya with Tari benefiting his knowledge of the bush and wildlife species and his fluency in English, Kiswahili and 5 tribal dialects. His ability to both adapt and entertain in any given situation is a tribute to his upbringing as a Boran in the rugged and arid northern region of Kenya.

Joash Romeo, NWNL Driver and Guide- Tanzania, Operating Manager of Mara Airboat Safaris On the NWNL 2009 Mara River Expedition

Romeo maintains his career in tourism while maintaining many connections in Musoma and Tarime with politicians, NGO’s and stewardship groups. This allows him to better assist visitors and scientists who are investigating natural resource management, agriculture, fishing careers and even human issues such as orphan care. His local contacts are very useful as is his knowledge of local hydrology.

EDITION ADVISORY AND RESEARCH TEAM:

Robin Sears, Ph.D., NWNL Science Advisor, Forest Ecology

Robin R. Sears is a forest ecologist and dean at the School for Field Studies, an environmental field study abroad program based in Massachusetts. She has 15 years’ experience working with smallholder farmers in tropical rainforest countries on issues related to agriculture and forestry production, development and biodiversity conservation. Her research is on ecological and land use dynamics at the aquatic-terrestrial interface in seasonally flooded environments along the Amazon River and its major tributaries. Having climbed four glacial peaks in the Andes and Mexico, kayaked in Canada and the US, and hiked along and fished in innumerable mountain streams around the world, Robin appreciates the critical, complex nature of freshwater services.

Robin MacEwan, NWNL Coordinator, Environmental Resource Management
Previously on the NWNL 2007 Columbia River Basin and 2008 Greater Yellowstone Ecosystem Expeditions; and Coordinator of the 2008 Omo River Basin Expedition

Robin MacEwan is a restoration ecologist who specializes in wetland, riparian and upland environmental restoration and mitigation. Robin’s background includes development of environmental resource assessments and management plans, restoration and mitigation site design, wetland delineation, nonnative invasive species management, and mitigation site maintenance and monitoring. Robin has an M.S. in Resource Management from Antioch University and an M.A. in Landscape Design from the Conway School of Landscape Design.
James Robertson, Ker & Downey Safari Chairman, Director of Mara Conservancy and other Kenyan Conservancies, Nairobi Kenya

James Robertson, a 4th generation British Kenyan raised in the African bush, is a private safari guide in Eastern and Southern Africa. He is also a deeply committed, forward-thinking conservationist. He is chairman of the renowned Ker & Downey Safaris of Kenya; partner of Sokwe Camps and Asilia Lodges in Tanzania. As one of the founding directors of the Mara Conservancy, he contributed his knowledge of the strengths and weaknesses of Kenya’s parks and reserves to create a new paradigm of community-based conservation. James has contributed his knowledge and vision of conservation to other groups including Northern Rangelands Trust, Kenya Wildlife Trust, Kitirua Wildlife Conservancy.

Peter Berman, NWNL Videographer & Researcher, Former TV Photojournalist
On the NWNL 2009 Raritan River Basin Expedition

Peter Berman is a professional videographer/photographer specializing in environmental issues. As a WABC-TV photojournalist for 30 years, he covered numerous environmental issues, including the toxic waste site at General Motors in Tarrytown; sludge dumping in the Atlantic Ocean; radioactive releases of water into the Hudson River; fishing crisis in Long Island Sound; pharmaceutical pollution in the Atlantic; toxic waste by a battery company in the Hudson River; and toxic water pollution in Elizabeth, NJ. Now the owner of Insight Photo Video, his broadcast journalism background furthers the causes of the conservation and ecology community.

Molly Mehling, M.En., NWNL Science Advisor, Aquatic Biologist and Photographer

Molly Mehling is a research scientist, college educator and photographer using visual means to communicate about the nature and science of environmental issues. She has earned a B.S. Environmental Biology from Mount Union College, a Masters from the Institute of Environmental Sciences at Miami Univ. and is now a PhD candidate in Zoology at Miami Univ. As an aquatic biologist and environmental toxicologist, Molly has spent 10 years conducting research in headwater streams, wetlands, rivers and lake ecosystems. Her current research projects focus on using the biodiversity of littoral benthic macro-invertebrates as indicators of lake and watershed condition in the Sierra Nevadas and methyl mercury bioaccumulation in experimental stream mesocosm food webs. Using photography, Molly shares her enthusiasm for scientific discovery and the diversity of life, hoping this powerful communication tool can unify more stakeholders around sustainable solutions to current environmental challenges. Her web site is www.mollymehling.com

Melaina Macone, NWNL Intern, Undergraduate, Sweet Briar College

Melaina is pursuing Biochemistry and Mathematics expecting to graduate from Sweet Briar College in 2011. Melaina compiled a NWNL background report on the Mara River Basin in 2008. Previously she participated in a COSIP Transect Environmental Study and promoted an Environmental Awareness night. She has served as president for Global Affairs Forum and Model UN. She has won several academic awards and honors including Chemistry “Golden Test-tube” Award and First Year Honors Award at Sweet Briar College.
NO WATER NO LIFE - MISSION

No Water No Life is a long-term documentary project that combines the power of photography with science and stakeholder knowledge. Its mission is to provoke and support paradigm shifts in water protection and consumption by individuals, communities and industries. The project uses the entire watershed, also referred to as “river basin” or “drainage system,” as its unit of analysis, rather than just the river itself.

NO WATER NO LIFE - GOALS and OBJECTIVES

No Water No Life goals are to:

--Research and photograph the availability, usage and quality of North American and African fresh water supplies.

--Publish documentation of functions and values of fresh water resources; demands on river systems; impacts of watershed degradation; and conservation solutions and alternatives.

--Provide outreach tools and educational methodologies on documenting water resource issues that will foster watershed stewardship coalitions and support sustainable watershed policies across geopolitical boundaries.

No Water No Life focuses on the quantity and quality of fresh water resources, looking at demands on and control of this vital commodity. “The shortage of fresh, clean water is the greatest danger to which mankind has ever been exposed,” according to the UN Human Rights Commission. Today almost half the world lives in stressed watersheds. Threats to water availability, usage and quality are potentially as devastating as climate change predictions. By 2050 when water usage is expected to double, 1.7 billion will suffer from hydrological poverty according to Earth Policy Institute estimates.

Data and imagery collected from No Water No Life African and North American watersheds will be the foundation of a broad message to be delivered from and to developing and developed nations. The project intends to offer models for upstream-downstream solutions and to open doors to river-to-river partnerships.
NWNL METHODOLOGY
FOR INVESTIGATING AND DOCUMENTING A WATERSHED

This methodology can be applied to the Nile, the longest river in the world, or to a backyard stream. Everyone lives in a watershed; and the health of each and every watershed is key to the availability of clean fresh water. No Water No Life encourages use of this methodology outline for obtaining and sharing data with fellow stakeholders in order to provide effective stewardship of their fresh water resources.

I. Identify the chosen case study watershed’s Basin Characteristics that impact fresh water resource usage, quality and availability.

NWNL Basin Characteristics

Freshwater resource functions
Values/Services
Human populations (affecting or affected by fresh water resources in basin)
Biodiversity
Sources of pollution (point and non-point)
Proposed or existing major infrastructure projects
Spanning regional and/or national boundaries
Diversity of conditions between case studies
Socioeconomic
Climate
Management Approach
Dramatic visual potential
Historic management and/or documentation

II. Develop an informational Contacts/Resource list for researching the watershed.

NWNL Contacts/Resources

Watershed conservation organizations – international, national, state and local
Watershed Scientists / Researchers
Watershed Policy Analysts
Government agencies
Commercial / Public Stakeholders
Hydroelectric
Shipping & Transportation
Mining
Nuclear plants
Agribusiness & ranching
Recreation

Private stakeholders –
- Local stewardship organizations
- Representatives of indigenous cultures

Local press: Newspapers and magazines for interviews of/with NWNL Team
Museums, galleries, public spaces, such as a City Hall, for exhibits & lectures
Local conservation photographers

III. Explore available existing information compiled by large conservation
organizations relating to identified NWNL Basin Characteristics and select Basin
Foci to be studied within that chosen watershed.

IV. Locate recent and historical research and other relevant documents published
locally to further research Basin Foci.

V. Researchers coordinate with the Expedition Team on all NWNL Pre-expedition
Preparations.

NWNL Pre-Expedition Preparations

A. Identify and recommend expedition sites and route
B. Book meetings, interviews and tours
C. Identify educational student groups to follow the expedition (NWNL Outreach
Committee)
D. Check if there’s any need for photo permits.
E. Find Funding Sources (general and local)
   Grant writing
   Personal donations
F. Get Support Sponsorship / Expedition Partners
   Flag Status
   In-kind donations or gear
G. Website organization
   Expedition description to be posted
   Field notes to be sent – podcasts
   Student interaction / blogs
H. Logistics
   Travel to location: Book flights; get passports, visas, necessary meds/shots
   Lodging
   Expedition on-the-ground transportation
   Equipment List
   Maps
   Photo/video equipment (cameras, batteries, chargers, filters…)
   Field gear (binoculars, field notebooks, maps)
Personal gear (bug nets, trekking poles, boots, camping gear…)
Communications, IT
Carbon offset payment

Create a watershed narrative to give to contacts, which would include:
- Donors, Flags, other supporting and local partners
- Basin Foci, Goals and Objectives
- Any past expeditions in chosen watershed
- Itinerary being followed to study Basin Foci

Print expedition business cards, model releases, one-page narratives
Organize gifts of appreciation: photos, NWNL pens, NWNL caps…
Prepare a press packet, including:
- NWNL mission & story
- One-page narrative of chosen watershed
- Completed expedition narratives and/or itineraries
- List of Expedition Team with contacts, biographies & headshots
- Expected outputs: publications/reports, partnerships, lectures, exhibits, model for curriculum extension…

VI. During Expedition, researchers follow NWNL Expedition Activities and are available for team members’ queries from the field.

NWNL Expedition Team Activities

A. Photography & Video: Create images from shot lists
B. Notes:
   - Weather
   - Time
   - Location: Place name; Coordinates and Elevation;
   - Background Information
   - Flora & Fauna: Species ID, Behavior and Habitat
   - Human: Action/Activity
   - Any recommended books, contacts or further research resources
C. Get model releases signed (Name, address, telephone, e-mail, affiliation)
D. Record interviews and quotes from local contacts
E. Contact and be available for local press interviews of NWNL Team
F. Caption video media and download / caption photos nightly
G. Field Notes
   - Site description
   - Weather
   - Location
   - Species
   - Infrastructure
   - Land use
   - Habitat
   - Management
H. Notes from interviews.
I. Blog / Website Report
Weekly postings w/ images
Interactive component possibilities

J. Project Administration
Expense documentation and odometer readings
Daily communication with office staff when possible
Ongoing logistics coordination (in-the-field and office-based)

VII. Researchers work with the Expedition Team on “NWNL Post-Expedition Synthesis.”

**NWNL Post-Expedition Synthesis**

A. Write thank-you notes to all expedition contacts
B. Finish Field Notes and post on website
C. Collate raw material
   - Download and edit videotapes
   - Backup and edit still photographs
D. Disseminate material /data
   - Write requested Flag and Grant Reports
   - Post on website: Photos; Final itinerary with sites, contacts & affiliation
   - Blog
   - Magazine articles
E. Curriculum coordination with partners in watershed
F. Establish relationship of this watershed with other NWNL case-study watersheds
APPENDIX 3 – a

MARA RIVER BASIN
EXPEDITION ITINERARY Sept 15-Oct 14, 2009

Project Leader: Alison M. Jones
Project Coordinator: James Robertson
(Expedition Members: Alison M. Jones, Alison M. Fast, Tari Wako, Joash Romeo)

KENYA TRAVEL ARRANGEMENTS: James Robertson – Ker & Downey Safaris
Tel: + 254 20 891447 james@jamesrobertson.co.ke
In office: Abigail Allison + 254 720 911143 info@jamesrobertson.co.ke
FILMING LICENSE: Viewfinders EPZ Ltd Tel: (254) 20 4183582, viewfinders@africaonline.co.ke

Sep 15: NYC- ZURICH

Departure of Alison Jones to Kenya
Interviews on plane:
  Andrew Parker, UNICEF and former Kenyan: “There’s little chance of being able to
    enjoying the next 20 years in Kenya.”
  Italian missionary who has spent 52 years in East Africa: “Without water, it’s useless to
    try to start anything.”

Sep 16: NAIROBI

Alison Jones arrives in Nairobi
Meeting: Tari Wako, Review expedition plans
Meeting: Abigail Allison, Geologist and Manager for James Robertson Safaris on Mau
  Forest and Mara River geology. “This 3-year drought has wiped out the grass in the north
  of Kenya, so when the hard rains come, the soil that’s left will be completely washed away and
  not replaced for eons.”
  Overnight in Karen with James Robertson, Ker & Downey Safaris

Sep 17: NAIROBI: Expedition prep and interviews.

  Lunch: Kim Edmunds, Film editor and Safari guide, on tourism issues in Mara River Basin
  Meeting: Gerard Beaton, Owner/Mgr Rekero Camp-Maasai Mara, on tourism footprint
Departure of Alison Fast from Washington DC
Overnight in Karen with James Robertson, Ker & Downey Safaris

**Sep 18: NAIROBI**  Expedition preparation & interviews

- **Lunch:** Nigel Pavitt, Chmn., Mara Conservancy; James Robertson, Bd., Mara Conservancy
- Food provisioning for expedition
- Alison Fast arrives in Nairobi
- Overnight in Karen with James Robertson, Ker & Downey Safaris

**Sep 19: NAIROBI TO MAU FOREST:** via 4WD Land Cruiser with trailer

- Interview-video: James Robertson, Chmn, Ker & Downey Safaris; Founding Dir, Mara Conservancy, “No Mau, No Mara”
- Interview-video: Tari Wako, NWNL driver guide for Kenya from James Robertson Safaris
- Arrive **Njoro** (0-20'0N; 35-55'60E) in foothills of the Mau Forest above Lake Nakuru
- Meeting: Andrew Nightingale: Film-maker, farmer, conservationist; “No Forest, No Water.”
- Overnight: in Njoro at Kembu Camp (000° 17’59”S, 035° 54’00” E)

**Sep 20: MAU FOREST:** ground documentation

- Interview-video: Andrew Nightingale: Filmmaker, Farmer, Conservationist
  “No Forest, No River.”
- Meeting: Andrew Nightingale and Jacob Mwanduka: Historic maps of forest
- Interview-video: Jacob Mwanduka, FOMAWA (Friends of the Mau Forest)
- **Njoro River** – Document polluted run-off, river usage for laundry & washing & collection
- **Eucalyptus Farm** – Document sustainable timber farming
- Overnight: in Njoro at Kembu Camp (000° 17’59”S, 035° 54’00” E)

**Sep 21: MAU FOREST:** Aerial & ground documentation

- **Mau Forest fly-over,** Cessna 206 charter; pilot, Peter White: 2 hrs, aerial stills and video
- **Charcoal Farm,** with Andrew Nightingale and Jacob Mwanduka: A more sustainable alternative to fuelwood from indigenous forest
- **Elburgon and Mau Forest** with Jacob Mwanduka via 4WD: Document indigenous forest, local settlement, deforestation
- Interview-video: Martin Gathoga, small-scale farmer on ¼ acre lease for maize in Mau Forest
- Interview Rose Kipsiget and Joseph Lokorio, Ogiek-Mariashoni Primary School headmistress and teacher, respectively – Indigenous culture
- **Enyapuiajui Swamp:** Source of the Mara River
- Overnight: in Njoro at Kembu Camp (000° 17’59”S, 035° 54’00” E)

**Sep 22: MAU FOREST to ELBURGON to KERICHO**

- **Kenana Knitters Women’s Coop:** water used for washing & dying wool and growing plants that make the dye.
Elburgon, Kiratu Sawmill: Interview Frederick Chege Wdogo and Somon C Ngugi, Dir and Mgr of sawmill, respectively

Kericho: Tea plantations used as a buffer to protect Mau Forest
Overnight at Ray’s Place in Kericho (0° 24’ 0” South, 37° 1’ 0” E)

Sep 23: KERICHO to BOMET and MULOT to PLAINS north of Maasai Mara NR:

Tea Plantations and Mau Forest at sunrise: Tea-picking and crop spraying
Finley Tea Plantation: Commercial tea farming and horticulture
Upper Saosa River: Indigenous forest
Bomet: Nyangora River (tributary of Mara R.)
Mulot: Amala River (tributary of Mara R.) (0° -56’ 60 N, 35° 25 ’ 0 E)
Olerai – Meeting: Tarquin and Lippa Woods, commercial farmers
Overnight at Olerai Farm Campsite

Sep 24: PLAINS north of Maasai Mara NR:

Interview-video: Tarquin Woods (commercial farmer, conservationist)
Interview: Matalong Joshua, supervisor of Olerai Farm, on irrigation techniques
Interview-video: Johnstone Kimojino, Dir of Emarti Primary School
Mara River – Rowed downriver on float built on oil drums
Olerai Farm: Commercial farming, water extraction and irrigation
Overnight at Olerai Farm Campsite

Sep 25: PLAINS north of Maasai Mara NR:

Naratoi, Emarti Primary School: Interview-video school children by Mara River
Shimoo Farm, Document commercial farming, water extraction and irrigation
Overnight at Olerai Farm Campsite

Sep 26 PLAINS to OLERAI to OLARE OROK to MARA CONSERVANCY

Shimoo Farm, Document confluence of Amala and Nyangores (Chepkulo) Rivers to form Mara River and commercial farming pumps and pivot irrigation
Olare Orok Conservancy, Topi House: Interview-video Ron Beaton, Founder of Olare Orok and Koiyaki Wilderness Guiding School for local Maasai, Discussion of conservancy development.
Talek: Enter Mara Conservancy through gate in this drought-stricken town
Overnight in Mara Conservancy’s public campsite near Serena (1°24’19”S, 35°0’22”E)

Sep 27: MARA CONSERVANCY, MAASAI MARA NATIONAL RESERVE

Meeting: Wilson Naitoi, Maasai Game Warden: effect of drought on wildlife
Document wildebeest crossing Mara River at “Main Crossing”
Meeting: Brian Heath, Chief Executive, Mara Conservancy: effect of Mau deforestation on flow of Mara River in Mara Conservancy
Meeting: Amanda Barrett and Owen Newman, Disney film-makers doing documentary on Mara wildlife, on Mara River dry-season flows decreasing and flood events
Overnight in Mara Conservancy’s public campsite near Serena (1°24'19"S, 35°0'22"E)

Sep 28: MARA CONSERVANCY, MAASAI MARA NATIONAL RESERVE

Document wildlife in Mara Conservancy and wildebeest migration accessing water
Interview-video: Amanda Subalusky and Chris Dutton, scientists with GLOWS studying water flows and quality of Mara River
Overnight in Mara Conservancy’s public campsite near Serena (1°24'19"S, 35°0'22"E)

Sep 29: MARA CONSERVANCY, MAASAI MARA NATIONAL RESERVE

Interview-video, at confluence of Mara and Sand Rivers: Amanda Subalusky and Chris Dutton, scientists testing river invertebrates to determine oxygen levels and reading salinity
Document wildlife in Mara Conservancy and Narok side of Maasai Mara NR.
Rekero Camp: Interview Jackson Looseyia, Maasai co-owner of Rekero and wildlife guide: on camp and other lodges effluent disposal, education of Maasai who own the land, and impact of tourism on watershed
Overnight in Mara Conservancy’s public campsite near Serena (1°24'19"S, 35°0'22"E)

Sep 30: MARA CONSERVANCY, MAASAI MARA NATIONAL RESERVE

Interview/video and day tour with Brian Heath, Chief Exec of Mara Conservancy on new Maasai Mara NR Management Plan 2009-19, poaching and tourism. Drive to Salt Lick Marsh
Overnight in Mara Conservancy’s public campsite near Serena (1°24'19"S, 35°0'22"E)

Oct 1: MARA CONSERVANCY, MAASAI MARA NATIONAL RESERVE

Near Lolgorian, Trans-Mara Escarpment: visit Maasai manyatta for honorary goat BBQ
Meeting: Brian Heath, Amanda Barrett and Owen Newman – future of conservation in face of climate change and population growth
Overnight in Mara Conservancy’s public campsite near Serena (1°24'19"S, 35°0'22"E)

Oct 2: MARA CONSERVANCY, via Trans Mara and Isebania to MUSOMA, TANZANIA

Isebania: Cross border into Tanzania. Transfer from Tari Wako, Kenya driver/guide to Joash Romeo, Tanzania driver/guide 1 hr drive to Musoma.
Tarime, Angel House Orphanage: Interview-video Katherine Walker on water-related diseases and water availability (since orphanage has no running water)
Interview Joash Romeo,
Overnight at Mat Villa, Musoma (1° 30' 0" S, 33° 48' 0" E)

Oct 3: MARA RIVER SWAMP & BAY / LAKE VICTORIA AT MUSOMA

Kirumi: Mara River Airboat Safari in Musarura Swamp with Joash Romeo on Mara River
Masarura Dam: used for drinking water, cattle water and irrigation of fruit and vegetable plots
Overnight at Sentavin Hotel, Musoma (1° 30' 0" S, 33° 48' 0" E)

Oct 4: MARA RIVER SWAMP & BAY / LAKE VICTORIA AT MUSOMA

Musoma: Lakeside Fish Market and BMU (Beach Management Unit): Interviews with fishermen
Interview: Eranga Alois and Juma Malima on lakeside fishing
Interview Samson Gesase on lakeside horticultural farming coop for urban markets
Overnight at Sentavin Hotel, Musoma (1° 30' 0" S, 33° 48' 0" E)

Oct 5: MARA RIVER SWAMP & BAY / LAKE VICTORIA AT MUSOMA – World Habitat Day!

Nyarusurya Fish Market and BMU: Interview Charles Kaare and Abdallah Maiga, Chmn and Sec’y respectively, on fishing regulations
Swedish Cooperative Centre: Interview Bjorn Horvath, Proj Mgr of SCC’s Lake Victoria Development Programme on agro-forestry
World Wildlife Fund: Interview William Kasanga, Proj Exec, Mara River Programme on integrated water resource management and transboundary coordination
Nile Basin Initiative: Interview Joseph Terer, Proj Mgr NELSAP/Mara River Basin Mgt Proj: On inter-governmental organization of watersheds of 9 Nile countries and subsidiary action programs (SAP’s) – “We need actions, not words.”
Overnight at Tembo Beach Hotel, Musoma (1° 30' 0" S, 33° 48' 0" E)

Oct 6: MUSOMA TZ via MARA CONSERVANCY to NAIROBI

Meeting: Brian Heath and Will Deed at Serena on PR and Funding needed for conservancies
Overnight in Karen with James Robertson, Ker & Downey Safaris

Oct 7 NAIROBI Interviews of Nairobi stewards & conservationists working for Mara River Basin

Meeting: Johnny Baxendale, Safari guide, conservationist: on Kenya Forest Service
Interview-video: Dame Daphne Sheldrick of David Sheldrick Wildlife Trust, on Kenya Wildlife Service
Overnight in Karen with James Robertson, Ker & Downey Safaris

Oct 8 NAIROBI Interviews of Nairobi stewards & conservationists working for Mara River Basin
Kenya Wildlife Trust: Interview-video: Michael Wamithi, former Dir of KWS, now Dir KWT: on impacts of drought and human activity on Kenya’s biodiversity
Interview-video: Martin Forster, Chmn CMC Motors, Chmn Mara Conservancy Board, on role of corporations in conservation and education, future of Mara Conservancy
Mau Forest Implementation Commission: Interview-video: Christian Lambrechts, Policy and Programme Officer UNEP and member of Raila Odinga’s Mau Forest Task Force and Implementation Commission, on the set up and challenges of Mau Forest restoration
Overnight in Karen with James Robertson, Ker & Downey Safaris

Oct 9 NAIROBI Interviews of Nairobi stewards & conservationists working for Mara River Basin

Meeting: James Robertson, Chmn Ker and Downey Safaris, Bd of Mara Conservancy
On consultation and expedition results
Downloading of audio files and team review of expedition results
Meeting: Jeffrey Gettleman, East Africa Bureau Chief of NYTimes on influence of Somali/Al Qaeda influence in Kenya
Overnight in Karen with James Robertson, Ker & Downey Safaris

Oct 10 NAIROBI
Team review of expedition contacts met and not met, typing translations, etc…
Alison Jones stays on; and Alison Fast departs
Overnight in Karen with James Robertson, Ker & Downey Safaris

October 11-13: KILIFI on KENYA COAST
Alison Jones on working retreat with Kim Edwards, film editor and Safari Guide
Overnights at Tamarind Beach Hotel

Oct. 14: NAIROBI
Meeting: Mike and Judy Rainy
Meeting: Allan Earnshaw, owner Ker and Downey Safaris, and Chmn of Kenya Gov’t’s Private Sector Committee on political efforts to evict settlers and reforest the Mau
Alison Jones departs Nairobi
APPENDIX 3 - b

Maasai Mara National Reserve Species List
(only as noted in journal – thus incomplete)

MM: Maasai Mara  MF: Mau Forest  PL – Plains between MF and MM  MB – Mara Bay, Tanzania

Megafauna
Elephant -MM
Hippo - MM
Black Rhino -MM

Predators
Lion -MM
Hyena - MM
Serval cat -MM
Leopard -MM

Ungulates
Impala –MM, -PL
Maasai giraffe -MM
Common zebra –MM, –PL
Wildebeest –MM, –PL
Thompsons gazelles –MM, –PL
Grants gazelle –PL
Topi –MM, –PL
Defassa waterbuck -MM
Eland –MM, –PL
Dikdik –PL

Small Mammals
Egyptian Mongoose -MM

Primates
Colubus –MF

Reptiles
Agama lizard -MM
Nile crocodile -MM
Voh Hohnel’s chameleon –MF

Fish
Tilapia –MB
Nile Perch –MB
Kamunga –MB
Catfish -MB

Birds
Maasai ostrich -MM
Sprufoal plover -MM
Saddle-bill stork -MM
Grey-capped social weavers -MM
Black-chested snake eagle -MM

Yellow-bill stork –MM
Sacred ibis -MM
Hammerkop -MM
Harrier hawk (gymnogene) -MM
Kestrel -MM
Yellow-throated long claw –MM
Cuckowl -MM
Rufous-bellied heron -MM
Egyptian mongoose –MM
Guinea fowl –MM
Speckled mousebirds –MF
Silvery-cheeked mousebirds –MF

Trees
Sausage tree (kigelia Africana) -MM
Fig tree -MM
Podocarpus – MF, –PL
Hagenia Abyssinica -MF
Croton Microstachus -MF
Cassia Spectabilis – MF - garden
Grevelia -MF
Yellow-bark acacia –PL
Candelabra euphorbia –PL
Euclea divinora –PL
Croton megalocarpus –PL
Lelchwa (tarchonanthus camphorates –PL
Eleodendron buchaninii –PL
Casurina –PL
Pinus patula –PL
Seligna –PL
Maringa –PL
Cypress –PL
Whistling Thorn Acacia –PL
Gum Arabic (Acacia Nilotica)
HISTORY AND ACHIEVEMENTS OF THE MARA CONSERVANCY

HISTORY
In the year 2000 some of the local Maasai leaders became concerned about levels of mismanagement in the Mara Triangle, an area owned by the Maasai in the northwestern section of the world-famous Maasai Mara Game Reserve, Kenya. As a result the Mara Conservancy, a not-for-profit management company, was established to manage the Triangle on behalf of Trans-Mara County Council. A management agreement was signed on the 25th May 2001 and the Mara Conservancy started operations in the Mara Triangle on the 12th June. This created the first public/private sector partnership of its kind in the region and has led to an active and cooperative partnership between conservation professionals and the local Maasai community. This community-based conservation initiative has improved the overall management of one of the most visited and well known protected areas in the world.

WORK & ACHIEVEMENTS
The Mara Conservancy actively initiates and encourages conservation efforts within the Maasai Mara National Reserve. Ongoing achievements and goals include:

1. A complete clamp down on poaching in the Mara Triangle and surrounding area, in partnership with TANAPA rangers in Serengeti National Park.
2. Improvement of infrastructure by grading a network of all-weather roads within the Triangle, as well as access roads to camps and lodges outside of the Triangle.
4. Restoration of existing ranger stations and the installation of renewable energy and water harvesting systems.
5. Establishment of a transparent and modern revenue collection system.
6. Strengthened relationships between the Reserve and the surrounding areas by encouraging community projects, and reward schemes co-existing with wildlife.
7. Encouragement of sound eco-tourism principles among camps and lodges.

GOALS
Per the original Management Contract with the Maasai, the Mara Conservancy is dependent payments to Earthview Management as an independent, professional revenue collection agency. With this share of the revenue the Mara Conservancy is able to focus on the improvement and maintenance of the reserve’s infrastructure, as well as run very strong and successful Anti-Poaching and Anti-Animal Harassment Ranger Units. However, the Mara Conservancy is dealing with a serious lack of tourism facilities and is missing a massive opportunity to educate visitors on the importance of conserving the Maasai Mara. It is imperative to improve tourism facilities within the reserve that not only educate and inform, but that they also reduce the impact that tourism has on the reserve. There is also the need to create facilities that do not draw from our limited operating budget. All such projects therefore must be self-sustaining.
MARA CONSERVANCY MONTHLY REPORT

CHIEF EXECUTIVE’S REPORT FOR SEPTEMBER 2009
By Brian Heath  (Excerpt – for full PDF of this monthly report, contact NWNL)
NOTE: Mention made of No Water No Life expedition in bold face.

GENERAL

The month started with several days of rain and overcast days. There was a heavy thunderstorm on the 8th, which was then followed by two weeks of heavy and widespread rain that first brought in the wildebeest and then sent them South again. For a few days at the beginning of the month and then again around the 20th there were half a million wildebeest in the Triangle.

The Chief Executive met with Peter Browne, Associate Editor of Condé Nast Traveller on the 3rd. Condé Nast will be doing a feature on Abercrombie and Kent and the Masai Mara.

Ms Alison Jones, who is doing a documentary and articles on the Mara River for her organization No Water No Life, spent a few days in the Mara Triangle towards the end of the Month. Alison is a major supporter of the Mara Conservancy and we are delighted to have her back after a four-year absence.

Conservation Development Centre (CDC) and the President of the African Wildlife Foundation (AWF) gave a presentation on the second draft of the ten-year management plan to the full Council at Mara Serena on the 29th. The plan was well received and the Council has asked for one month to consider and deliberate on its contents.

The Parliamentary Select Committee on Local Government postponed their visit to Trans Mara at the last minute; it has now been rescheduled to October 16th.

WILDLIFE

The wildebeest returned to the Triangle in very large numbers over the first few days of September and concentrated along the escarpment and between Oloololo and Ngiro-are. However, a few days of rain from the 7th to the 13th, and the majority moved South into the Lemai Wedge for a few days before returning in even greater numbers around the 17th. The majority left again around the 23rd, but were beginning to trickle in again at the end of the month.

One lioness killed in a fight. She was first seen on the 9th with a very deep wound on her spine, the following day she hid in one of the culverts along the main Serena to Purungat road, she was found dead in the same place on the 11th. One other lioness, from the Oloololo pride, lost one of her two very young cubs on the 13th. This lioness allowed some half grown, and very boisterous, cubs to play with them and it is felt that they may have killed it.

An elephant calf was seen with a wire snare around its neck on the evening of the 19th. It was found again and darted by Dr D. Mijele on the 20th. The snare was removed and the calf revived. Dr Mijele was assisted by Kamande, one of the Anne Kent Taylor scouts, and our rangers from Oloololo Gate. One female elephant was found dead near the proposed Mara Enkai Camp on the escarpment on the 23rd. The tusks were recovered.
MARA RIVER FLOWS REPORT - SEPTEMBER 09
by Amanda Subulusky and Chris Dutton,
scientists with GLOWS, Global Water for Sustainability

Contact NWNL for full report. Mention of NWNL’s Expedition and interview in bold font at end of this report.

Mara River Flows

Greetings from the Mara River Basin, and thanks to all the folks who recently have been expressing interest in our research on the river and this newsletter: This is certainly an exciting time to be working on the Mara River. Although the Serengeti-Mara Ecosystem is one of the most famous conservation areas in the world, there has been a surprising paucity of research conducted on the river itself. Of course, there are a number of notable exceptions, but for the most part, people are hungry for information – actual data – about the current status of the river. We feel very fortunate to be able to present some of that here.

State of the River
Although a large portion of the basin continues to suffer the effects of a 3-year drought, we were relieved to see the short rains begin in late August. With regular rainfall in the upper catchment and in the northwestern portion of the Masai Mara National Reserve (historically the wettest area of the Reserve), the river has risen quite a bit this month, as you can see in the photos above. These pictures were taken from the Old Mara Bridge (OMB), just north of the Reserve. As you can see, water levels are up from last month, but they still are not as high as they were last year during this time, as shown here to the left.

We have been focusing a lot on dissolved oxygen (DO) recently, because nearly all stream organisms are sensitive to oxygen concentration; thus, it seems appropriate to discuss it in greater detail here. Dissolved oxygen levels can be affected by several variables [Hauer, F.R. and W.R. Hill.1996. Temperature, light, and oxygen. In Methods in Stream Ecology. F.R. Hauer and G.A. Lamberti, Eds. Academic Press, San Diego, California, USA]:

1. DO increases as temperature decreases.
2. DO decreases with decreasing atmospheric pressure associated with different elevations or barometric change of weather
3. DO decreases with increasing levels of nutrients via organic waste, as microbial processes consume the oxygen from the water.
4. DO may increase throughout the day, as photosynthesis by plants and algae releases oxygen, and decrease at night, as respiration reduces oxygen concentration.

These multiple variables can make it challenging to interpret the meaning of changing DO levels. For example, it may seem surprising at first that DO levels at the OMB actually dropped between August...
and September, although water levels were rising. However, one needs to note the time of day at which the samples were taken, as the lower levels were from samples taken earlier in the day. During October, we plan to conduct 24-hour sampling of the Mara River, during which we will document DO levels each hour, in order to gain a better understanding of the daily fluctuations in these parameters.

In most unpolluted streams and rivers, DO concentrations remain well above 80%, and levels below 30% are considered hypoxic and generally fatal for many fish species. Interestingly, on 8/7/2009 at our sample site at the New Mara Bridge, which is located on the border between the Masai Mara and the Serengeti, the DO was 30%. On the same day, at the Old Mara Bridge upstream of the protected areas, the DO was 84.2%. During the September sampling, DO levels at the New Mara Bridge had risen to 59.5%, although they remained fairly consistent at 78.5% at the OMB. As we described in the last newsletter, very low DO levels can be caused by very high nutrient concentrations in the water. This difference between DO levels at sites upstream and within the Reserve suggests that nutrient inputs may be higher inside the protected areas. Potential sources could be sewage effluent from tourism facilities, fecal deposition from hippos or effects of the wildebeest migration. However, the continued lack of significant wildebeest mortality events makes the latter source unlikely. This is a subject of great interest to us, and one we hope to be able to shed more light on in the future..

Research

With the completion of our intensive macro-invertebrate sampling in August, this month we had a bit more time to explore the river, look for future study sites and make some natural history observations. Here are two of the most striking...

For those of you not so familiar with the Mara, the wildebeest don't actually cross in one single, amazing spectacle. They actually ramble back and forth around the Reserve, occasionally coming upon the river and, in what seems like an almost random act of courage and bravado, one individual will get the courage up to dive in and swim across, followed with dedication by the rest of the herd. And they seem to do this fairly frequently at several well-defined “crossing points.” These points are marked on a map, and tourist vans jockey for good positions where their clients can sit and sip wine as they wait for this event to occur. Normally, a number of these crossings will result in the death of hundreds to thousands of wildebeest, either from crossing at too steep of a location, drownings or crocodile attacks.

Well, regardless of the number of sporadic crossings that have occurred this year, we haven’t seen the masses of bodies that we saw last year. This is likely due to the lower-than-usual water levels that have made it fairly easy for them to cross, and fairly difficult for the crocodiles to attack. We have been wondering about the effects of this low wildebeest mortality on the crocodiles of the Mara River, being a bit partial to these prehistoric beasts as we are. Indeed, during our travels this past week, we only saw two occurrences of crocodiles feeding on very small numbers of wildebeest carcasses, nothing like the average numbers of dead wildebeest that typically clog the river during this time of year. For example, during the last crossing of last year, the Mara Conservancy website estimated that 3-4,000 wildebeest perished. But in one location of the river, we came upon 29 adult crocodiles within a 300 m stretch, some of them remarkably large. Crocodiles are typically somewhat territorial, but the stench of something dead indicated they were hanging around together for a reason. Scouting the riverbanks, we spotted a dead hippo in the midst of the crocodiles. 29 crocodiles and 1 dead hippo! This is not the feast these guys are accustomed to at this time of year. It also makes us wonder if lower than normal water levels have led to increased aggression between hippos and crocs.
Which brings us to another interesting indication of the times...

While observing the river during a predicted rainstorm that never materialized, we did see several large crocodiles feeding on a single wildebeest carcass. However, to our surprise, several hippos from a group downstream moved in and “pushed” the crocodiles away from the carcass. We then observed these same hippos begin eating the wildebeest carcass. We watched this for close to 80 minutes and documented it with many photographs.


> Field biologist Joseph P. Dudley, formerly at Hwange National Park in Zimbabwe, observed a male hippo killing an impala ram that had swum through a pond to evade a wild dog. After eating some of the meat, the hippo returned to his herd. A few minutes later, ten more individuals from the group gathered at the floating carcass for a communal feast. Later a few of them climbed the pond’s banks to wrest another dead impala from wild dogs. “It seems almost incredible,” writes Dudley, “that carnivorous feeding behavior by hippos, even if of very infrequent occurrence, could have gone unreported for so long.” Perhaps, he opines, the behavior may have been attributable to “nutritional stress caused by severe drought conditions.”

This last remark by Dudley is particularly noteworthy. These “severe drought conditions” may be the same conditions we are currently experiencing in the Masai Mara National Reserve. We have asked several rangers and guides if they ever witnessed anything similar and they stated that, although they have seen hippos playing with wildebeest carcasses and perhaps nudging them or biting into them, they have never actually seen them consuming the meat. It was very clear in the photos that we have taken that the hippos involved were consuming the meat from the wildebeest carcass. Here is a photo of two hippos chewing on the head of the carcass while one of the large crocodiles was chewing on the foot. Not only does this possibly indicate nutritional stress within the Masai Mara, but this also raises the interesting specter of transfer of wildlife diseases to hippos through previously unknown pathways. In fact, the feeding of hippos on carcasses and the subsequent spread of anthrax was hypothesized to be the impetus for a large hippo die-off in Uganda in 2004. [Bhattacharya, S. 2004. Cannibalism may have spread anthrax in hippos. (New Scientist) [Online] (Updated 2 Dec 2004) http://www.newscientist.com/article/dn6818-cannibalism-may-have-spread-anthrax-in-hippos.html]

In other interesting research updates, we are excited to be working with Governor’s Camp to begin some really interesting sampling this month. As we mentioned in a previous newsletter, Governor’s Camp has been collecting daily rainfall data since 1999, providing one of the few complete and up-to-date rainfall records for the region. Not only have they agreed to share this data with us, but now, Patrick Beresford, in cooperation with the management of the camp, has agreed to assist us further by collecting monthly water samples of rainfall and groundwater, in addition to measuring groundwater depth. Using isotopic analysis, we plan to use the rainfall and groundwater data to determine the “signature” for both surface and groundwater in the area. Then, by analyzing samples of river water, we hope to determine what portion of the river is comprised of groundwater. I know this may seem a bit academic at first glance, but consider this... as river levels fall, people and industries increasingly drill wells and boreholes to tap groundwater for their abstraction needs, thinking this does not affect the river. But groundwater inevitably infiltrates into the river, probably playing a vital role in sustaining dry season flows. Anecdotal reports exist of falling groundwater levels, but there is little to no monitoring of this critical resource. By continuing to drain the groundwater, ultimately the surface waters will
suffer as well. Not only is this a great way for us to get some interesting and important data, but it is also an example of how private businesses can foster sustainability through contributions to research. In turn, we hope to repay them by assisting with their on-site water quality monitoring.

**Governance**
As exciting as research is, the real heart of the matter is implementing the findings and recommendations of the research. That is why we are so excited about a new partnership between USAID/East Africa and the East African Community. For the first stage of the partnership, USAID/EA has decided to give a three year, $3 million USD grant to the Lake Victoria Basin Commission (the sector of cooperation and management of the Mara River Basin. The aim is for these funds to support the implementation of the research and reports that WWF, FIU and other partners in the basin have been working on for the past few years, including a Biodiversity Action Plan, Environmental Flow Assessment and Strategic Environmental Assessment for the Mara River Basin. This is an exciting opportunity to see research findings implemented, and we look forward to keeping you posted as the program develops.

September also marked the first meeting of the Kenya National Stakeholder Forum for the Mara River Basin. This is a national group of governmental and non-governmental groups with a stake in the sustainable development of the MRB. Formation of this group establishes a working group for development of management plans in the basin, as well as an important platform for dialogue.

In early October, we look forward to another development in the governance of the MRB. WWF will be hosting a workshop on implementation of a Payment for Ecosystem Services (PES) scheme in the MRB. PES determines providers and buyers of ecosystem services, which in the case of a river basin is typically upstream and downstream residents, respectively. The PES approach is based on the understanding that, 1) ecosystems provide valuable services (clean water, biodiversity, etc.) for which people should be willing to pay, and 2) downstream residents benefit from the ecosystem services of the river sustained by good land and water resource management practices of upstream residents. Downstream residents can help sustain these ecosystem services upon which they depend by paying upstream residents to implement best management practices, which they otherwise may not be able to afford to do. Check out our blog for a recent MSc thesis by George Atisa, of FIU, to learn more about this innovative approach to conservation ([maraadventure.blogspot.com](http://maraadventure.blogspot.com)).

**Other Interesting Happenings**
We were honored this month to be part of a documentary on the Mara being conducted by Alison Jones and the documentary team at [No Water No Life](http://www.nowater-nolife.org). Alison is doing a comparative study of 6 river basins – 3 in Africa and 3 in North America – to raise awareness about the increasingly critical state of water resources and what can be done to conserve them. She also has a personal affinity to the Mara, as one of the founding members of the Mara Conservancy. We spent a day being interviewed and photographed by Alison Jones and the videographer Alison Fast, and also going to the river together to conduct some sampling. This was our first experience being interviewed in front of a camera on behalf of the river, and we hope we did justice to both the challenges and advances of conservation in the basin.

This month also saw the submission of the Tanzania iWASH program proposal that Chris has been helping to prepare. This program will utilize a very innovative and integrated approach to water resource management and service provision, which draws on the expertise of some of the most experienced partners in the region. So far, we have received supportive and excited feedback from USAID/Tanzania, and we look forward to receiving formal acceptance so we can see it on the ground.
High-resolution images can be submitted on separate CD on request. The following photo galleries are found on No Water No Life's website:

Source of the Mara – Mau Forest, Kenya:  
http://www.nowater-nolife.org/expeditions/mara/MauForest/index.html

Mid-Mara River – Plains, Protected Lands, and Pastoralists, Kenya:  
http://www.nowater-nolife.org/expeditions/mara/MidMara/index.html

Mouth of the Mara – Tanzania:  
http://www.nowater-nolife.org/expeditions/mara/LakeVictoria/index.html