

**LAO PEOPLE'S DEMOCRATIC REPUBLIC  
NAM THEUN 2 HYDRO PROJECT**

**JOINT REPORT OF THE  
INTERNATIONAL ENVIRONMENTAL AND SOCIAL  
PANEL OF EXPERTS  
AND  
THE INTERNATIONAL ADVISORY GROUP**

David McDowell

Thayer Scudder

Lee M. Talbot

August 25, 2005

**JOINT REPORT OF THE  
INTERNATIONAL ENVIRONMENTAL AND SOCIAL  
PANEL OF EXPERTS  
AND  
THE INTERNATIONAL ADVISORY GROUP**

**For the Nam Theun 2 Hydro Project  
Lao People's Democratic Republic  
August 25, 2005**

---

**CONTENTS**

**Introduction**

**This Mission  
Summary of Activities**

**Findings and Recommendations – Labor Camp**

**Location of Dam Site Labor Camp  
Camp Rules  
Productive Use of Labor Camp Buildings  
Research on Elephant Movements  
Access from Ban Thalang  
Swidden on West Side of Reservoir**

**Findings and Recommendations – Nakai Plateau Resettlement**

**Introduction  
Resettlement Issues  
June 2005-May 2006 Resettlement  
The Nam Pan Irrigation Scheme  
Villages Resettling Around the NT2 Reservoir**

**Findings and Recommendations – WMPA**

**Findings and Recommendations – Salvage Logging Operation**

**Introduction  
Logging Trucks and Loggers' Camps  
Access and Exit Routes  
Increasing Benefits for Plateau Resettlers and Wildlife**

---

## INTRODUCTION

### **This Mission**

This is a joint report of the August 2005 mission of the International Environmental and Social Panel of Experts (POE) and the International Advisory Group (IAG) for the Nam Theun 2 (NT2) Project in the Lao People's Democratic Republic.<sup>1</sup> This brief mission was requested by the Government of Lao PDR (GOL) primarily so that the POE and IAG could review and assess the revised proposal and plans for the labor camp at the NT2 dam site. In addition the mission briefly reviewed the developments in the NT2 project since its previous visit in January 2005.

### **Summary of Activities**

Two members arrived in Vientiane August 7th and the third August 9<sup>th</sup>. The mission proceeded by road to Lak Sao where they were joined by Vilaysone Sourigna of GOL, John Harrison, Jean Foerster, and Pat Dye of NTPC and had a dinner meeting with the Governor of Khamkeut District.

On August 10<sup>th</sup> we visited the dam site, the location of the proposed labor camp site and the quarry (near road 8B), had a luncheon meeting with the District Governor in Lak Sao, then proceeded to Thakhek for a meeting with Khambay Damlath and Oday Soudaphone, Governor and Vice Governor of Khammouane Province, and a meeting with the staff of the Watershed Management and Protection Authority (WMPA) at their Thakhek office. We then drove to the NTPC Guest House at Nakai.

The following morning was spent on visits to the Pilot Resettlement Village, the intake construction, a meeting with the Governor of Nakai District, and visits to the construction sites associated with the power station and tunnel outlet. Following a luncheon meeting with the Head Contractor and main subcontractors for NT2 at the Head Contractor's camp near Gnommalath we drove back via the partially flooded road to Thakhek and Vientiane.

We spent the last day, August 12<sup>th</sup>, in Vientiane in review and discussions in detail with representatives of GOL, World Bank, ADB and NTPC. A meeting was also held with the H.E. Mr. Onneua Phommachanh, Minister of Industry and Handicrafts, and Chairman of the GOL Steering Committee for NT2.

---

<sup>1</sup> The members are:  
D. McDowell, IAG  
T. Scudder, POE  
L.M. Talbot, POE

## **FINDINGS AND RECOMMENDATIONS – LABOR CAMP**

### **Location of Dam Site Labor Camp**

The principal focus of the mission was the revised proposal of NTPC for the location of the camp site for the labor on the NT2 dam. The dam site is within the Corridor, a protected area that was established to protect the biodiversity in the area surrounding the gorge of the Nam Theun below the Nakai Plateau, and particularly to provide for movements of elephants and other wildlife off the plateau and possibly between the plateau and the limestone NBCA (protected area).

Unless it is very carefully planned and managed, a labor camp can represent a major disruption to the countryside and can be devastating to biodiversity. The camp for a work force attracts camp followers who are families of the workers and others who assemble to provide food and other goods and services. There are often three or more camp followers for each laborer. Experience throughout the world has shown that the uncontrolled and unplanned growth of labor camps with camp followers leads to severe problems of sanitation and other health issues, crime and security, and to a devastating drain on the biodiversity of the surroundings from the demands for food and other forest products.

Consequently, in 1997 it had been agreed that the camp site should be located outside of the Corridor because of the threat it would represent to the integrity of the Corridor's biodiversity, and that the laborers would be bussed in and out of the dam site. In January of 2005 it was agreed that there could be a carefully controlled camp for about 200 workers at the dam site but that the rest of the camp and followers would be outside the Corridor at the junction of the dam access road and road 8B. More recently, and primarily because of very substantial cost savings, NTPC proposed that all the work force (up to 650 at maximum) be located close to the dam site. They would be in a self contained, fenced and patrolled encampment (with a canteen providing three meals a day and with all other essential services). The labor force would have no access to the Corridor. There would be check points on the access road, and of greatest importance, there would be no camp followers.

After inspecting the area, reviewing the boundaries of the Corridor and adjacent NBCA (the protected area of the watershed), the location of existing villages, and reviewing what is known of wildlife movements, the mission concluded that a sealed-off and closely controlled camp adjacent to the dam site would provide a substantially lesser threat to the area's biodiversity and would constitute much less of an obstacle to movement of elephants and other wildlife, than would a small camp at the dam site and a large one at road 8b linked by frequent shuttle buses. It would also avoid potentially very serious social and health disruptions to the existing villages along 8b.

The junction of the dam access road and road 8b is also the location of a large (over 1,000 persons) Hmong settlement, a smaller Hmong village and a small Vietic one. It is also right on the border of the Corridor and NBCA, where the two join together. A

camp of two to three thousand laborers and camp followers at that location would severely impact the social structure, health and economy of the existing villages. It would also provide an immense demand for wildlife, wood and other forest products. It would be expected that the local villagers, known to be very effective hunters and foragers, would help provide these products to the camp. We anticipate that the result would be a major depletion of the biodiversity of both the Corridor and the adjacent NBCA areas.

Consequently, we have accepted the NTPC plan with one critically important provision which is supported by the NTPC and the GOL.

The critical provision is that there should be no camp followers at all along road 8b. The NTPC contractor volunteered that they would specify no camp followers (except possibly in Lak Sao) in the labor contracts, and the Governor strongly supported a complete ban on camp followers on 8b. **Should any camp followers be allowed, we strongly recommend that they be located in the town of Lak Sao itself.** There are water, sanitary, health, market and other facilities in the town, and an increased population would be consistent with the Governor's plans for the development of the town, and in our discussion with the Governor he seemed favorably inclined toward that solution. The company is obliged under the CA to contribute towards the cost of camp follower facilities and services---and will, as already noted, make considerable savings through the adoption of the revised siting proposal for the dam workers' camp.

### **Camp rules**

Add under Point 3 of Regulation for the Camp of Nam Theun 2 Project, Lao PDR (ITD-NCC JV Attachment 2), "Hunting and collecting, buying and selling of wildlife and non-timber forest products."

### **Productive use of labor camp buildings after the camp is closed.**

This recommendation involves the buildings that could remain after the labor camp is closed. Once the dam is complete the camp will be closed. Much of the site for the camp will be below the reservoir water level, and the buildings in that part of the site will be temporary and will be removed. We suggested that some of the buildings above water level be made more permanent so that they could be used by the project administration for other purposes, particularly for tourism. Subsequently the Head Contractor informed us that he intended permanent construction for some of those higher buildings and he would be very pleased to have them used productively for tourism after the construction is complete. Further landscaping and planting of the site by the contractors following inundation will enhance its subsequent use.

### **Research on Elephant Movements**

Remarkably little is known about the exact movements of the elephants in the Corridor, the Limestone NBCA, and nearby Nakai Plateau areas. We consider that it is urgent to learn about these movements and **recommend that movement studies, probably using radio transmitters, be undertaken as soon as possible and certainly within the 2005-2006 dry season.**

### **Access from Ban Thalang**

The labor camp will be effectively sealed off from the Corridor on the land side, but there is still the possibility of people coming down the Nam Theun by boat from the vicinity of Ban Thalang, and selling wildlife and forest produce. **Consequently we recommend that attention be given to controlling such potential trade.**

### **Swidden – Forest Clearance – along the west side of the reservoir.**

The mission noted what appeared to be recent forest clearance and cultivation across the river from the area of the labor camp. Presumably the villagers involved will be resettled in the near future, as the reservoir is completed. But attention should be given to avoiding forest clearance in the protected area along what will become the shore of the reservoir.

## **FINDINGS AND RECOMMENDATIONS NAKAI PLATEAU RESETTLEMENT**

### **Introduction**

Nakai Plateau resettlement was not a priority during our short visit. It will be a priority during our extended visit in January - February 2006. At that time all Group 1 villages and their future resettlement sites will be visited as will Oudomsouk resettlement so that we can assess how the resettlement process is proceeding. That said, as a result of our current visit, we believe it important to emphasize several points.

The resettlement with development schedule is tight with all Group 1 and Group 2 villages to be living at their new village sites by May 2007. In terms of planning, implementing, and coordination capacity, we were impressed by the documentation received including the 27 May 2005 Project Implementation Plan (PIP), the June 2005 – May 2006 Annual Implementation Plan (AIP) and the Progress Report for the month of June 2005. Also impressive were the new facilities at Nakai with district, RMU and RO staff all to be located in the same building. We were also pleased to hear that the RMU's Mr. Hoy, the RO's Mr. Beauchamp, the World Bank's Mr. Zhang and ADB's Ms. Huddleston are working together as a resettlement team with which we look forward to cooperating.

On the other hand, at the time of our next visit we expect to find a larger number of key fulltime RMU staff resident in Nakai. **We also recommend that NTPC, in**

**consultation with current members, quickly appoint a member to the Resettlement Committee.** Nor is it too early for the Resettlement Committee to establish guidelines and a flexible schedule for gradually increasing the resettlement with development capacity, expertise and responsibilities of the district staff so that Nakai District will be able to take over responsibility for future development once the RC and RMU cease to exist. In this regard, we were pleased to hear that the district will have its own budget for carrying out resettlement responsibilities by the end of August 2005. Finally, **we recommend that GOL and NTPC consider, with the assistance of the above mentioned resettlement team, whether or not a full time social scientist with extensive development-induced resettlement experience should be recruited as soon as possible by either the RMU or the RO.**

## **Resettlement Issues**

### Introduction

With dam closure scheduled for May 2008, we will be continually emphasizing the importance of synchronizing the construction time table with the schedule for the resettlement with development of all Nakai plateau villages. Repeating the phrase “resettlement with development” is intentional for it is not sufficient, as has all too often been the case with other large dam projects, to just accomplish the physical removal and housing of Group 1 and Group 2 households by the time of dam closure. At the time of removal water and sanitation supplies must be adequate, educational and public health facilities must be available, and livelihood activities must be underway - otherwise the global experience is that living standards will drop.

With both Group 1 and Group 2 households, the context in which resettlement with development must take place is different from that of the pilot village where a range of livelihood activities were available early on including accessibility of the Oudomsouk labor market. This will not be the case with most Group 1 villages, the completed removal of which is scheduled for May 2006. For example, unlike the pilot village where households could commence swidden cultivation at the new site prior to resettlement, none of the remaining Group 1 villages have initiated swidden cultivation at their selected resettlement sites. Furthermore, labor constraints can be expected in regard to initiating farming activities during the 2006 rainy season where housing and other resettlement infrastructure are still incomplete (see below).

### **June 2005 – May 2006 Resettlement**

The resettlement schedule for June 2005 – May 2006 is especially tight. It is also more complex than that for Group 2 villages the following year since it involves three major tasks. These are the resettlement of approximately 50 Oudomsouk families that will be impacted by the construction of Saddle Dam 12B, the resettlement of 67 Nam Nian and Sop Hia households to Ban Nam Pan in Khamkeut District and the resettlement close to the reservoir of the eight remaining Group 1 villages. **We recommend that resettlement activities by village be carefully scheduled as soon as possible.** While

Oudomsouk and Ban Nam Pan resettlement are dealt with separately in available documents, the remaining 8 Group 1 villages are lumped together.

Are all eight villages to be moved simultaneously during the coming dry season or will the development of the different village sites and the shifting of village households be staggered in time? Our analysis of the June 2005 – May 2006 work plan and the June 2005 Progress Report suggests that staggered site development and village shifting should be the preferred approach for several reasons. For one, the southern extension of Route 8B will not be complete by May 2006 (indeed contracts for the layout of half of the VG1 villages were awaiting completion of 8B's construction design in June 2005). For another, because of the possibility of delays (such as those already caused by the heavy 2005 rains), priority should be given to villages most at risk after completion of the coffer dam. For a third, are there sufficient, reliable contractors to undertake simultaneous development?

Our suggestion about staggered site development and village removal is not a recommendation. Rather, based on the questions asked, we are requesting that GOL and HTPC draw up a schedule for our benefit that deals with what we perceive as possible constraints. There is yet another constraint that concerns us. Page 54/111 in the June 2005 – May 2006 AIP states that resettler housing will be over 50 percent complete by the end of May 2006 in Ban Nam Pan and about 80 percent complete for the eight other Group 1 villages.<sup>2</sup> That suggests that some households will not have sufficient labor resources for housing construction and agricultural activities during the 2006 rainy season. If so, scheduling of the construction of individual households should pay attention to household labor resources. Moreover scheduling of the completion of a village's resettlement should pay attention to available employment opportunities with villages with less access to paid employment moved first so that they can commence agricultural activities during the 2006 rainy season.

Pages 46/111 – 49/111 also indicate that a number of other site development activities will extend beyond May 2006 including site preparation and road construction. What must not be delayed at the time of removal is availability of an adequate domestic water supply, adequate sanitation and adequate access to health facilities. In regard to water supplies, Page 70/152 in the 27 May 2005 PIP states that boreholes can be constructed in suitable areas. That is fine if there are sufficient suitable areas. In case they are not, all houses should be supplied with rainwater collection facilities (that option is mentioned on pp 74-75/152, but only as a possibility to be reviewed).

### **The Nam Pan Irrigation Scheme**

While priority must be given to each of the 10 Group 1 villages, the movement of 67 Ban Sop Hia and Ban Nam Nian households to Ban Nam Pan in Khamkeut District requires a different approach to the resettlement with development of the much larger number of villages and households who will resettle close to the reservoir. A major

---

<sup>2</sup> According to the 27 May 2005 PIP Ban Nam Pan village relocation will not be completed until July 2006 and the relocation of the 8 remaining VGI villages until September 2006.

difference is that Nam Pan is the site of a host village of 32 households. To reduce the potential for present and future conflict it is essential for resettlers and hosts to participate together in planning and implementing community activities and, as intended in current policy, for the planned livelihood benefits to be available to hosts and resettlers alike.

In regard to the Sop Hia and Nam Nian resettling households, livelihood activities between date of arrival and completion of the irrigation project over two years later requires special attention. Early on it will be important for host and resettlers to agree on what fields will be available for resettler ownership so that they can start cultivating them during the 2006 rainy season. To the extent possible, a major effort is required to find one employment opportunity for each household, including paid employment on completion of irrigation, road and community infrastructure. For that reason, a register of household members available for employment and of their skills should be completed for each household well before removal.

We are concerned about two aspects of the currently preferred Nam Pan 132 hectare irrigation project. Not only does 132 hectares leave no room for the formation of new families, but host households will be allocated only one hectare whereas resettling households will be receiving 1.5 hectares. All three communities contain families that vary in size and number including some in which new families can be expected to be formed through marriage within a short period of time. If an irrigation project of only 132 hectares is developed, subdivision of existing holdings can be expected to accommodate new families – a development that has proved to be impoverishing with small-scale irrigation projects elsewhere.

As for providing resettling households with larger irrigated fields than host households, that is a recipe for jealousy and conflicts unless host households have access to other arable fields outside the irrigated area which are not available to resettlers, which are of roughly equivalent value to the additional 0.5 hectares that resettlers will be receiving, and that the hosts consider to be an adequate substitute for their receiving a smaller irrigated holding. That can not be assumed without mapping and assessing the quality of host fields outside the irrigation scheme and without hosts and resettlers working together to reach a decision acceptable to both sides.

According to the undated pre-feasibility study draft report for the Nam Pan irrigation scheme, there is an expectation that additional surveying is expected to increase the irrigation scheme area to 172 hectares. That needs to be confirmed as soon as possible for an additional 40 hectares would, for example, allow the 32 Ban Nam Pan households to each receive an additional 0.5 hectare while leaving 24 hectares for the formation of new households.

### **Villages Resettling Around the NT2 Dam Reservoir**

Making available livelihood activities for those shifting to villages within the resettlement zone will also require special attention until such time as the Nakai Plateau Village Forest Association provides a source of livelihood and the reservoir-based

irrigation, fisheries and drawdown cultivation and grazing potential is available. As at Ban Nam Pan, during this transitional period from 2006 - 2008, unskilled wage labor during the NT2 construction period probably will be the major opportunity for the majority of households. As in the Ban Nam Pan case, a register of household members available for employment and of their skills should be completed for each household before removal with contractors and subcontractors required to give available resettler labor recruitment priority. The word “available” is important. Some households will not have available labor or what labor is available may be fully utilized during the process of removal and settling in. It is important that such households not be left behind.

## **FINDINGS AND RECOMMENDATIONS – WMPA**

Although time did not permit us to get into the watershed on this occasion we had a most useful briefing from and discussion with the WMPA Secretariat in Thakhek - where they are temporarily housed until they move permanently to new quarters in Nakai in September. The team has moved with commendable dispatch to make progress on a whole range of fronts. Their presentation recorded an active start to NBCA border demarcation (a particularly impressive achievement undertaken in collaboration with villages), patrolling and vehicle checking, conservation awareness raising in the villages including some PIZ villages, dissemination of regulations, cooperation moves with the Vietnam neighbors etc. All this has been initiated while the demanding administrative measures involved in starting up an entirely new and innovative institution have not been neglected. Planning for the new headquarters in Nakai, purchase of vehicles and boats, equipping of patrollers and - not the least important - recruitment of staff have been pursued.

We were less impressed with what is being done in fostering livelihood development. We would wish to underline how fundamental this work is to the success of the overall watershed venture. It is unrealistic to expect the villagers to stop all depredation of biodiversity resources without helping them find viable alternative sources of sustenance. Unless this work is initiated with vigor from the beginning a drop in income levels – or a return to hunting – is likely.

That specific reservation aside, we give full marks to the WMPA team for enthusiasm and energy. To the degree we have a general criticism it is that the team may have tried to move on too many fronts too soon. Prime Ministerial Decree No.39 and the SEMFOP are their guiding documents and these set out a plethora of aims and activities to be undertaken. A degree of prioritization of tasks in the first year is necessary. It is probably better to select a relatively narrow range of high priority activities and complete them successfully in the first year than to attempt to cover the field simultaneously. That requires some hard choices to be made as to what the top priorities are - and discipline in sticking to them once agreed. But establishing priorities and making them widely known and understood are the key to motivating staff and others, including the Board of Directors

The relative lack of prioritization thus far shows in the draft Work Plan, which records a suite of objectives and outputs but with little indication of what the most important tasks are in this first year. The POE has suggested informally to the Secretariat that in the interests of clarity and focus they move to defining outcomes rather than outputs and agree on a set of measurable, time-bound and specific indicators for each outcome so that all involved understand what the priorities are - and so that at the end of the current financial year (October 2006) it will be feasible to assess which of the most urgent tasks have been completed successfully and which have not.

The POE has been required to become thus involved because the Independent Monitoring Agency (IMA) for the WMPA provided for in the Concession Agreement has not yet been set up. The standby external "certification" agency is the POE. Hence the request from the GOL, the NTPC and the World Bank for us to get involved. We seek a revised and prioritized Work Plan before approving the documents - the Secretariat is working on such a revision.

We are assured that progress is being made on the establishment of the IMA. It is equally important that the Independent Auditor provided for in the CA be appointed with dispatch.

The delays in setting up the external monitoring agencies and in recruiting the three international technical assistance advisors are regrettable. The endeavor should be to have these important elements of the overall watershed management package in place by the start of the new financial year at the latest (1 October) not least to help share the burden being placed on the Secretariat staff in Thakhek. For our part we shall move quickly once the revised Work Plan is available, in part because the release of World Bank funds to the WMPA is apparently dependent on "certification" of the draft Work Plan and Budget.

## **FINDINGS AND RECOMMENDATIONS – SALVAGE LOGGING OPERATION**

### **Introduction**

On 5 August 2005 GOL requested POE guidance on the approach proposed for the Salvage Logging Operation (SLO) which is “to include due recognition of the social implications associated with the resettlement program and wildlife migration patterns in the plateau region” (Executive Summary, SLO, page 1). The POE endorses the Salvage Logging Operation, but emphasizes the importance of the following recommendations.

The purpose of the operation is to remove 300-400,000 m<sup>3</sup> of wood prior to the inundation of the NT2 reservoir that is currently scheduled for June 2008. Starting at the commencement of the 2005 dry season, it is estimated that “there will be an average of 58 and up to 100 truck movements per day during the dry period for the three years period of the operation” (SLO, page 4). Those three years will coincide with major construction and resettlement activities.

The proposed salvage logging is a major operation. Even if implemented according to best practice as recommended in the June 2005 logging report, it will have significant impacts not just on the resettlement program and wildlife but also on NT2 project construction regardless of how the operation is implemented on the plateau and regardless of the route or routes chosen for removing the wood from the Nakai Plateau.

There probably is no “best” mode of operation for what is best for one facet of the NT2 project is not apt to be “best” for other aspects. **Granted the complexities and capital resources involved, we recommend a transparent tendering process and we recommend the immediate development of a specific Code of Practice to be implemented by an independent Salvage Management Unit with a strong monitoring capacity.**

### **Logging Truck and Loggers Camps**

Siting of camps for logging trucks and loggers should conform to the same requirements and regulations as implemented for NT2 construction labor and camp followers. Regulations should emphasize in particular prohibition of hunting, collecting, buying and selling of wildlife and non-timber forest products.

### **Access and Exit Routes**

Three access and exit routes were mentioned during our August 2005 visit. One, apparently preferred by the SLO report writers, would be to Lax Sao along an upgraded Route 8B. Another would descend the escarpment immediately SW of Nam Malou via an upgraded existing road into the upper Nam Hinboun basin from where it would continue in a southeastern direction to join the main road to Thakhek near Gnommalath. The third would require upgrading an old track down the escarpment to Route 12 at the southeastern end of the Nakai Plateau. Using the main road to Thakhek from Oudomsouk was not mentioned as an option presumably because of interference with construction activities.

We believe that the southeastern route to Route 12 is the least desirable. The main reason is that a steady stream of logging trucks moving to and fro along that route could be expected to interfere with all resettlement activities with the exception of households moving to Ban Nam Pan in Khamkeut District. Since the resettlement schedule is very tight further interference could threaten its linkage to the construction timetable. A second disadvantage of the southeastern route would be the significantly greater distance to Lao markets.

Choosing between the other two routes involves tradeoffs regardless of which is selected. Moreover, we suspect that both will have to be used to an extent with one providing market access to Lak Sao and the other to Thakhek. An advantage of the Nam Malou route is that its upgrading would open up the upper Nam Hinboun basin for ecotourism and improve market access for upper basin villages. The main disadvantage would be the necessity to cross the 27 km channel between the regulating reservoir and

the XBF and the increased traffic congestion in the vicinity of Gnommalath. While congestion would also be a problem along the route to Lak Sao, we believe that the main threat there would be to wildlife unless access to the large Hmong village at Phonsa-art could be controlled and all camp followers were restricted to Lak Sao as recommended above.

### **Increasing Benefits for Nakai Plateau Resettlers and Wildlife**

Very careful monitoring is essential to ensure that logging does not encroach on either the restricted thousand islands area and on the resettlement zone. To better control trade in wildlife, further upgrading of the WMPA barrier near the Route 8B junction to the dam site would be essential along with monitoring of hunting and trapping activities in the adjacent villages of Phonkeo, Phonsa-art and Pakkatan. For resettlers, expert advice should be sought to access how the Salvage Logging Operation can be integrated with various aspects of the resettlement operation. Three examples follow:

- How can the Salvage Logging Operation assist the start up and operations of the Nakai Plateau Village Forestry Association through, for example, purchase and processing at the sawmill logs for the construction of resettlement housing and community buildings?
- Stockpiling of low value logging byproducts for use as fuel by resettlers
- If so advised by GOL and NTPC fisheries and water quality experts, leaving some woody biomass in carefully selected reservoir areas as future fish sanctuaries.