Bulletin On the Ecological and Environmental Monitoring Results of the Three Gorges Project 2003

State Environmental Protection Administration

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Content

Summary

2002 is the second year of the three-year battle to tackle the most difficult tasks in the Three Gorges Project as well as a critical period for water storage in the second stage of the Project. Major annual control targets were achieved on the whole and image targets of different stages were realized on or ahead of schedule.

In 2002, monitoring was carried out according to plans by the ecological and environmental monitoring network of the Yangtze River Three Gorges Project. Monitoring results indicated that:
Social and economic development in the reservoir area was rapid with the Gross Domestic Production (GDP) increasing by 11.0% compared with the previous year. The industrial structure was further optimized with accruements in the second and tertiary industries increasing in terms of their proportions in the GDP. People living in the reservoir area saw improvement in their living standards and the public health was generally normal. Settlement of migrants, restructuring of relocated enterprises and protection of the environment all went on smoothly.

In 2002, the overall ecological situation of the Three Gorges reservoir area remained unchanged generally. The climate was relatively warm, with normal or relatively much precipitation in most areas. Rainfall in the flood season was normal, but temporally and spatially unbalanced. Water quality of key fishery water bodies was good on the whole, while some areas were polluted to some extent; total amount of natural fishing rose to certain degree. Restructuring of agricultural industry was strengthened. With acceleration in farmland reversion to forest and grassland, the area of farmland was reduced in a large number and backup wasteland appropriate for agriculture was in short. Agricultural production still focused on grains; soil fertility of farmland decreased, but its heavy metal content was at the normal level. Orange production was not influenced

In 2002, earthquake activities in the Three Gorges reservoir area were at the normal level and earthquake intensity was weaker compared with that of the previous year. In Yiling, Zigui, Xingshan and Badong-districts and counties in the Three Gorges reservoir area under the jurisdiction of Hubei Province there were 199 places with geographic disasters of landslips and collapses. Early warning of geographic disasters monitoring was initiated in an all-round way, which successfully forecasted collapses, landslips and mud-rock flows in 38 places. Geographic disasters treatment of the reservoir area was sped up and going on smoothly on the whole.

In 2002, the eco-environmental experimental stations achieved periodical results in monitoring research.

In 2002, various types of pollutants discharged from key industrial sources that discharge wastewater directly into the Yangtze River increased by 23.8% compared with the previous year, with major pollutions being COD and amania nitrogen. The total amount of urban wastewater discharged directly into the Yangtze River was 0.319 billion tons with major pollutants being total phosphorus, BOD_5 and COD. Vessel oil wastewater treatment rate was 92.6%; vessel pollution accidents occurred 20 times in the whole year, about 50% less than the previous year and with no vital or big accidents happening. Total application amount of fertilizers and pesticides in the reservoir area decreased and the use of low poisonous pesticides such as organic nitrogen increased. However, fertilizers were still not used with a rational ratio.

In 2002, water quality of the Three Gorges reservoir area of the Yangtze River was fairly good on the whole, mostly at or superior to Grade III and relatively inferior in the flood season. Overall environmental quality of the construction area was good.

Chapter 1 Progress of the Three Gorges Project

The year 2002 is the second year of the three-year battle to tackle the most difficult tasks in the Three Gorges Engineering Project as well as a critical period for water storage in the second stage of the Project. With the concerted efforts of all parties participating in the project, major annual control targets were achieved on the whole and image targets of different stages were realized on or ahead of schedule.

In 2002, seven major engineering projects were completed in the Three Gorges Project: ① the 185 m passage on the left part on top of the dam was completed at the end of April and linked up in mid May; ② the dam was open for water inflow in the upper reaches on May 1 for the second stage project and dismantlement of 410 m of the mouth gate was completed on October 25; ③ test on the permanent lock without water began on July and ended on August 15; test with water began on September 1 ahead of schedule and the navigation course in the lower reaches was filled with water on September 19; ④ concrete pouring of the left bank dam (except the section of temporary lock) all reached the designed height of 185 m on October 26; ⑤ river damming by the navigation open dyke succeeded on November 6 ahead of schedule and water from the dam bottom was pumped to the height of 45 m; ⑥ concrete pouring of the RCC cofferdam began on December 12 ahead of schedule and reached the height of 70 m at the high dyke section and 53 m at the low dyke section by the end of the year; ⑦ installment of No.2 and No. 5 generator sets were essentially completed by the end of December.

In 2002, major engineering work completed in the Three Gorges Project was: 1.5491 million m^3 of concrete pouring; 54,132 tons of metal structure and electronic machine buried and installed; 5,440 tons of generator sets buried and 15,350 tons of generator sets installed; 51,532 m of fixing grouting; 50,832 m of curtain grouting; 76,871 m^2 of joint grouting; digging of 12.7106 million m^3 of earth and stones; filling and construction of 6.7637 million m^3 of earth and stones; 14,117 m^3 of bitumen concrete wall and 21,359 m^2 of concrete leakage prevention wall.

Chapter 2 Economic and Social Development

2.1 Population, Society and Economy

By the end of 2002, the total population in the Three Gorges reservoir area was 19.7207 million, with an increase of 5% compared with that by the end of the previous year, among which the agricultural population was 14.2543 million and the non-agriculture population was 5.4664 million. Non-agricultural population accounted for 27.7% of the total population, with 1 percentage point higher than 2001.

In 2002, GDP of the reservoir area was 141.377 billion yuan, 11.0% over 2001 based on comparable prices. Among this, GDP of reservoir areas under the jurisdiction of Chongqing and Hubei was 127.333 billion yuan and 14.044 billion yuan,11.3% and 8.0% over 2001 respectively. The increased value of the primary industry of the reservoir area was 19.092 billion yuan, 2.5% over 2001, the increased value of the secondary industry was 66.411 billion yuan, 13.0% over 2001 and the increased value of the tertiary industry was 55.874 billion yuan, 11.8% over 2001. The industrial structure was further optimized and ratio of increased value of the primary, secondary and tertiary industries in GDP was adjusted from 14.9：46.7：38.4 in 2001 to 13.5：47.0：39.5.

Table 2-1 Major Statistical Indicators of Economic and Social Development of the Reservoir Area in 2002

Indicator	Indicator Value	Increase over 2001(%)
Total grain output(ten thousand tons)	655.21	+3.2
Oil plants output (ten thousand tons)	19.01	-2.9
Tobacco output (ten thousand tons)	4.41	+16.3
Total meat output (ten thousand tons)	107.76	+4.4
Aquatic product output(ten thousand tons)	12.72	+4.8
Increased value of TVEs (100 million yuan)	264.57	+19.7
Financial income of local budget (100 million yuan)	63.92	+10.9
Fixed assets investment of the whole society (100 million yuan)	771.51	+21.0
Total retail value of social consumer goods (100 million yuan)	583.89	+12.5
Per capita governable income of urban residents (yuan)	7052	+9.7
Per capita net income of rural residents (yuan)	2008	+5.5
Savings of urban and rural residents (100 million yuan)	1253.13	+22.7

Economy of different sectors in the reservoir area continued to develop rapidly. In 2002, the increased value in industry was 46.426 billion yuan, 11.8% over 2001 based on comparable prices; the increased value in construction sector was 19.985 billion yuan, 15.6% over 2001; Freight transportation of the whole society was 250.4 million tons, 25.0% over 2001; transportation of passengers was 44.323 million people·time with an increase of 8.4% and postal and communication hit 537.631 million yuan in business with an increase of 18.7%.

In 2002, the financial budgetary expenses on education and public health in the reservoir area increased

by 2.194 billion yuan and 531 million yuan, 21.8% and 0.1% over 2001 respectively. By the end of the year, there were altogether 636,500 technicians in the reservoir area, 17.5% over those by the end of 2001; for every ten thousand primary and middle school students, there were 495 full-time teachers, 7 people less than those at the end of 2001; broadcast and TV coverage rates were 95.2% and 96.7%, 0.8 and 0.5 percentage points over 2001 respectively.

2.2 Migration Settlement

In 2002, migration settlement went on smoothly, with tasks of countryside, cities and towns all completed ahead of schedule. The number of people removed and resettled was 263,712; the efficient reconstruction area of various types of buildings was 7.0656 million m^2 and the number of industrial and mineral enterprises removed was 190.

●Countryside

The number of rural migrants was 57987. New constructions included 103 ponds, 14 aqueducts, and 59 roads of 171.18 km in total in the rural area. Houses built covered 1.7652 million m^2, including 1.7574 million m^2 for migrants. Migrants removed out of the Three Gorges reservoir area were accepted by 11provinces (municipalities). These migrants contracted land of 15.6483 million m^2, and built houses of 794,200 m^2 and roads of 1433.67 km. Matched construction included 7.9564 million m^2 of water conservancy facilities, 783,100 m of domestic water supply pipelines, and 593,400 m of electricity transmission lines and 724,100 m of communication lines.

●Cities

In the urban area, 184,188 residents were removed.12.4416 million m^2 of land was flattened. 41.42 km of new roads were constructed. Four water supply projects were finished with a water supply capacity of 10,000 tons.151, 800 m of electricity transmission and conversion lines and 147,200 m of broadcasting and TV lines were laid, and 4.1062 million m^2 of buildings were constructed with 2.8812 million m^2 for resident housing.

●Towns

In towns, 21,537 people were removed and 1.1942 million m^2 of buildings were constructed with 824,600 m^2 for resident housing.

●Industrial and mineral enterprises

190 industrial and mineral enterprises were removed and reconstructed. The 31,437yuan fund gap was completly filled for resettlement of employees of closed and bankrupt enterprises below the 135 m water level. 439 enterprises were inspected and bad and non-performing debts of 4.6 billion yuan were canceled after verification. Among these, close and bankruptcy of 302 enterprises were ascertained and 2.36 billion of bad and non-performing debts of them were canceled after verification. Transferred payment of provincial and municipal budget was more than 0.15 billion yuan.

●Special projects

12 Roads totaled 230.19 km and 2296.93 m of large and medium-sized bridges were reconstructed. 63 docks, 27 water power stations and 25 water-pumping stations were constructed. 766,000 m of electricity transmission and conversion lines, 662,900 m of communication lines and 1,856,400 m of

broadcasting and TV lines were laid. 16 post offices and 20 broadcasting and TV transferring stations were constructed.

●Environmental protection

A total of 33.8733 million yuan was invested in migration and environmental protection. Among these, 19.713 million yuan was used for environmental protection in migration construction of cities and towns, 6.4762 million yuan for public health protection, 3.1504 million yuan for ecological reconstrution and 3.7992 million yuan for environmental monitoring and management.

In 2002, construction of urban sewage treatment plants and garbage disposal plants were notably sped up. Construction of the four urban sewage treatment plants and four garbage disposal plants in four counties (districts) in Hebei Province was 95% on schedule and expected to be completed before the end of June 2003. Early preparation of 17 sewage treatment and garbage disposal projects in key towns along the river was basically completed. Construction of the 19 urban sewage treatment plants and 13 garbage disposal plants in the 13 counties (districts) of Chongqing went on well and it was expected that all of the garbage disposal plants could be put into operation by the end of June, 2003 and parts of the sewage treatment plants would be equipped with treatment capacities.

●Cleaning of the reservoir bottom

Cleaning of the reservoir bottom in the second stage of the Three Gorges Project was key in migration in 2002. The Three Gorges Project Construction Commission of the State Council, in coordination with the Ministry of Health and the State Environmental Protection Administration, etc. , formulated a number of regulations including Regulation on Bottom Cleaning of Water-Stored Reservoir in the Second Stage of the Three Gorges Project, Technical Requirements on Clearing of Buildings and Forest Trees in the Bottom of Reservoirs in the Three Gorges of the Yangtze River, Technical Criteria on Cleaning Up of Reservoir Bottoms in the Three Gorges of the Yangtze River and Technical Criteria on Cleaning Up of Solid Wastes in Reservoir Bottoms in the Three Gorges of the Yangtze River, etc. It also developed the Scheme on Bottom Cleaning of Water-Stored Reservoir in the Second Stage of the Three Gorges Project.

By the end of 2002, buildings of 11.9821 million m^2 were cleared up; common pollutant sources of 3.3512 millions m^2 and infectious pollutant sources of 976,700 m^2 were disinfected; wood patches of 31666.50 mu were cleared up and solid wastes of 4.7131 million tons were disposed of.

●Twinning support

In 2002, twinning support of 1.52 billion yuan was input to the Three Gorges reservoir area. These included 422 economic cooperation projects with 1.4 billion yuan of funds in place and 0.12 billion yuan for public welfare projects.

In order to help migrants improve their living, realize long-term stability of the reservoir area and make full use of the resources to develop advantageous industries, Program on Orange Industry Development in the Three Gorges Reservoir Area and Program on Grass-Feeding Stock Raising in the Three Gorges Reservoir Area were developed, and relevant projects have been initiated.

Chapter 3 State of the Natural Ecological Environment

3.1Climate

In 2002, climate in the Three Gorges reservoir area was relatively warm, with the annual average temperature being 17.9℃, 0.4℃ higher than normal years. Rainfall in most places was normal or a little more with the annual average rainfall of 1254mm, about 10% more than normal years. Rainfall in the flood season was normal, but not balanced in time and space. Major climatic disasters in the reservoir area were low temperature and rain in spring and August, heat and drought in summer, storms and induced floods, mud-rock flows and hails.

Table 3-1 Monitoring Results of Meteorological Elements in Meteorological Stations in the Three Gorges Reservoir Area in 2002

Name of Station	Average Temperature (℃)	Comparative Humidity (%)	Rainfall (mm)	Evaporation (mm)	Average Wind speed (m/s)	Sunshine Hours (h)	Foggy Days (d)	Thunder Storm Days (d)
Chongqing	18.8	81	1421.0	606.5	1.7	1145.6	29	41
Changshou	17.9	82	1232.3	1164.1	1.4	1331.4	48	49
Fuling	18.5	80	1216.2	693.2	0.4	1334.7	92	48
Wanzhou	18.6	80	1072.7	667.7	0.5	1413.7	26	54
Fengjie	16.5	75	1290.6	825.2	2.0	1733.1	27	47
Wushan	18.3	71	1071.8	1583.3	1.6	1735.5	8	44
Badong	17.4	71	1097.8	1577.7	1.9	1526.7	72	48
Zigui	16.9	77	1682.2	1151.6	1.1	1735.0	0	41
Bahekou	17.5	80	1442.6	1234.0	1.6	1371.6	1	34
Yichang	17.5	79	1632.1	1323.1	1.2	1523.4	11	39

The average rainfall in the reservoir area was 1070-1682mm. Its spatial and temporal distribution features were: there was relatively much rainfall in the east and west parts of the reservoir area and basically normal in the middle part. Rainfall in winter of 2001/2002 and spring of 2002 was continuously much, normal in summer and obviously less in autumn. Heavy rains and rainstorms were concentrated in spring and summer. Rainfall between March and August totaled 866 mm, accounting for 70% of the annual rainfall in the reservoir area. Rainfall peaked in May, about 40% more than that of the same period of normal years. Rainfall distribution in the flood season (between June and August) was imbalanced. Rainfall was relatively much in June and August and less in July. Average rainfall in autumn in the reservoir area was more than 40% less than normal years, which was good to river damming flowing for leading open dykes.

In 2002, climate in the Three Gorges reservoir area was relatively warm, which was more so in the west part than in the east part. Relatively high temperature was the most obvious in January, February, June and July. In February, temperature measured in all representative meteorological stations was over 2.0℃ higher than normal years. Yichang had a more than 3.5℃ higher temperature in two successive months and an abnormal warm winter. Most places went through broil weather in June and July. Days with temperature higher than or equal to 35℃ amounted to 26-28 in Badong, Yichang, Zigui and Bahekou. Most places in Chongqing had an extremely high

temperature of 39℃ and over 40℃ in parts of the area. Temperature in April, May and August was relatively low at large and the most so in May. The Average temperature measured in most representative stations in may was 1-2℃ lower than that of the same period in normal years and 2.1-2.5℃ lower in Fengjie, Wushanand Badong. Between late April and May, most places experienced typically unusual coal spell in an otherwise warm spring. In August, stations in the reservoir area all measured a temperature 1-2℃ lower than that of the same period of normal years and nearly 3℃ lower in Fengjie and Wushan. The summer was featured with notably low temperature.

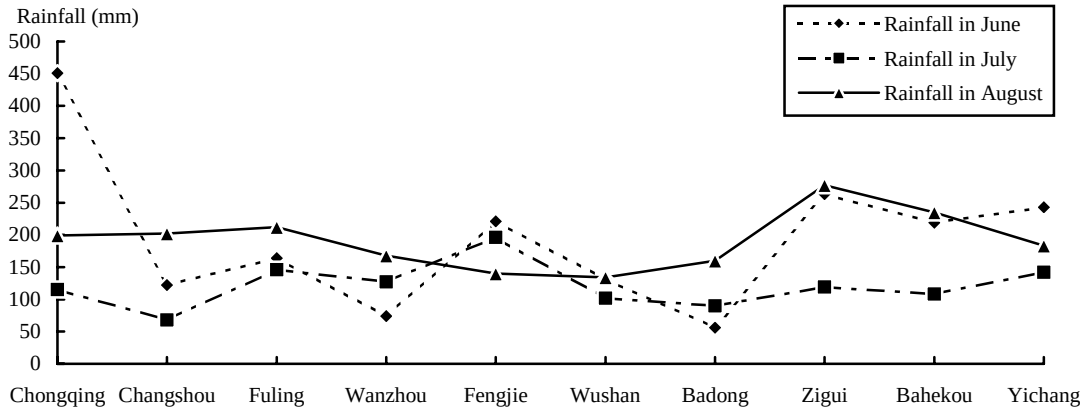

Chart 3-1 Rainfall Distribution Curve in June, July and August of 2002 in the Three Gorges Reservoir Area

In 2002, the average wind speed in the Three Gorges reservoir area was 1.3 m/s, which as close to that of normal years. In all stations, seasonal changes and monthly changes of average wind speed were not much.

Average foggy days in the Three Gorges reservoir area numbered 34.9, 0.8 days more than normal years. The spatial and temporal distribution features were: foggy days in Wanzhou and areas west of it mainly occurred in autumn and winter; and foggy days in areas east of Wanzhou occurred mostly in winter and spring or spring and summer. Fuling continued to be the area with the most of foggy days after 2001. No foggy day occurred in Zigui and only one day in Bahekou.

The average comparative humidity in the Three Gorges reservoir area was 77%, close to that of normal years and changing little in different seasons. Comparative humidity in the west part was higher than that in the east part. The average evaporation in the reservoir area was 1055 mm, 15% less than that of normal years. Evaporation went down from the east to the west. In terms of seasonal distribution, it was continuous lower in winter, spring and summer, which was especially so in summer in Chongqing with less than half of that of normal years in the same period in June, July and August. Evaporation peaked in autumn, with the seasonal average 10% higher than that of normal years.

In 2002, major meteorological disasters in the Three Gorges reservoir area were the cold spell in spring, low temperature and continuous rain in August and high temperature and drought, rainstorms and hails in summer.

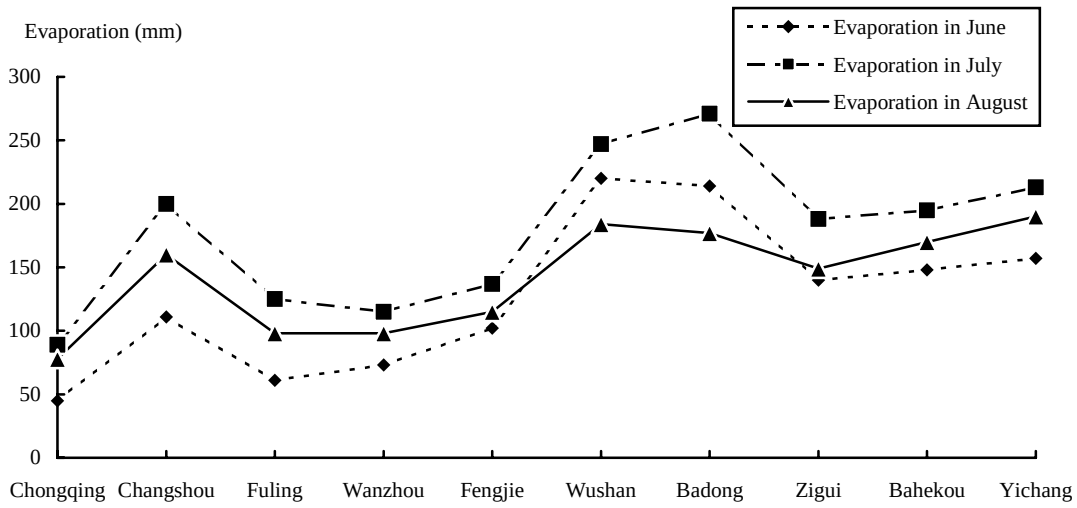

Chart 3-2 Evaporation Distribution Curve in June, July and August of 2002 in the Three Gorges Reservoir Area

In spring, most places in the reservoir area were affected by strong cold currents with three spells of low temperature and continuous rain. The longest period was in the latter part of the second ten days of April and the first ten days of May, with over successive ten days of rain. Average daily temperature measured in most stations fell to below 12℃, which featured the typical cold spell in an otherwise warm spring and May. Continuous cold weather and rain had some impacts on agriculture in the reservoir area: harvests of crops sown in late spring were delayed; the rape and wheat germinated and went moldy to different degrees; paddy seedlings turned green slowly and some rotted in the fields; vegetable growth was hampered.

In winter, spring and summer, most places in the reservoir area experienced relatively much rainfall. Strong convection weather occurred frequently, which caused a number of heavy rainstorms and storm induced disasters such as floods, landslips and mud-rock flows. These disasters had an impact on 13.2766 million people, directly affected 8.4978 million people and caused direct economic losses of 2.31 billion yuan.

In July, the east part of the reservoir area experienced higher temperature. Especially in the second and last ten days of July hot weather occurred of which the highest temperature in the daytime of over ten days in succession exceeded 35℃ (39.6℃ in parts of the area). Rainfall was less and parts of the area were subject to serious drought. High temperature and drought in Changshou, Wanzhou, Fengjie, Fengdu and Yichang caused difficulty in drinking water supply for human and livestock and serious losses to agriculture.

Besides, disastrous weather such as heavy frog, hazes, snow and freezing, hail and thunderstorm and lightning occurred in parts of the reservoir area and also caused losses to industrial and agricultural production, traffic and transportation and electric transmission lines, which affected people's normal life.

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3.2Terrestrial Plants

In 2002, supplementary surveys were conducted on plant species in the Three Gorges reservoir area and no new plant species was discovered. Surveys on wild plant resources and appraisal and analysis on collected specimen showed that the Three Gorges reservoir area was endowed with abundant terrestrial plant resources and extremely rich biodiversity. Plant families in the reservoir area accounted for over half of the national total; plant genera accounted for over 40% of the national total and plant species accounted for 22% of the national total.

According to preliminary analysis, forest vegetation in the Three Gorges reservoir area could be classified into 15 community groups and 76 communities. Living types classification of spermatophyte based on genus showed that there were 299 genera of arbor (among which were 112 genera of evergreen arbor and 187 genera of defoliating arbor), 245 genera of shrubs and semi-shrubs, 801 genera of herbage, 75 genera of vine and 8 genera of bamboo, accounting for 20.9%, 17.2%, 56.1%, 5.3% and 0.6% of the total genera in the area respectively.

At present, there were 150 species of plants in the Three Gorges reservoir area in the list for national protection and 51 species of rare and endangered plants, accounting for 13.1% of the 388 national level species. Among them,
8 were endangered species, 19 were rare species and 24 were species turning endangered. Species distributed in areas less than altitude of 400 m were mainly Magnolia Officinalis, Phoebe Zhennan, Adiantum reniforme var. Sinense and Glycine soja. In 2002, monitoring was carried out on 20 plant species of national protection such as Davidia involucrata and Cibotium barometz, which showed that these plants were growing well.

3.3Terrestrial Animals

In 2002, monitoring and surveys on birds recorded 391 species in accumulation, with 13 ones over 2001's record of 378 species and closer to the number deduced from theoretic analysis on bird species in the reservoirarea (about 400 species).

In monitoring and surveys on reptiles, spots where Protobothrops jerdonii were discovered expanded from 1 to 3. Record of one alien species-spotted deer in Minor Shennongjia in Badong County was added into beast species, which was the wild strain coming from domesticated individuals set in the wild from the Shennongjia Nature Reserve more than ten years ago.

Although there was a quite large area of insulation belt between golden monkeys' habitat in Minor Shennongjia of Badong County and Shennongjia, a narrow habitat "corridor" existed in both the east and west ends which golden monkeys could go through. This formed a habitat that could be jointly used by a number of golden monkey populations in the south of Shennongjia and Minor Shennongjia. The number of golden monkeys using this area jointly and those living in habitat in the south of Shennongjia was no less than 600~800.

Presbytis francoisi population was discovered in the Furong River Valley in the border area of Wulong County and Pengshui County of Chongqing was made in the end of December of 2000. Years of monitoring and surveys after that revealed that places where Presbytis francoisi looked for food, and slept, and collected minerals to eat were mostly located in areas at altitude of 250-350 m.

Besides, mandarin ducks were observed in three spots in Zigui Section, Zhong County Section and Wushan Section in the main course of the Yangtze River.

3.4 Fishery Resources and Environment

3.4.1 Fishery resources

In 2002, the natural fishing catch in the Three Gorges reservoir area, the section down the dam, Dongting Lake, Poyang Lake and the estuary area was 78,459 tons, 17% over that of 2001.Catch of common carp, crucian carp and tapertail anchovy rose to some extent, that of the four major home fish, bronze gudgeon and largemouth bronze remained the same with the previous year and that of eel and Chinese turtle crab dropped.

Reservoir area: in 2002, the natural fishing catch in the Three Gorges reservoir area was 2,935 tons, a little less than that of 2001. The composition of the catch was 596 tons of river Parasilutus asotus, 548 tons of bronze gudgeon, 402 tons of largemouth bronze gudgeon, 362 tons of common carp, 251 tons of Pseudobagrus, 230 tons of Leiocassis longirostris, 217 tons of grass carp and 177 tons of silver carp.

Monitoring of fishing catch showed that six fishes including bronze gudgeon, largemouth bronze gudgeon, river Parasilutus asotus, common carp, Pseudobagrus and Leiocassis longirostris accounted for 81% of the total catch, remaining the major economic fishes in the reservoir area.

Section down the dam: in 2002, the natural fishing catch in the section down the dam was 2,800 tons, a little less than that of 2001. The composition of the catch was 1077 tons of bronze gudgeon, 290 tons of river Parasilutus asotus, 489 tons of common carp, 150 tons of Pseudobagrus, 109 tons of grass carp, 142 tons of silver carp, 51 tons of snail carp and 34 tons of fathead.

Monitoring result on the catch composition was different from that of 2001. Bronze gudgeon accounted for 38% of the total, becoming the main economic fish in section down the dam. Biological

compositions of the catch showed that grass carp and common carp caught were small and young.

Spawning sites of the "Four Major Home fishes": Monitoring result in May and June 2002 showed that the fry run-off amount of the "four major home fishes" in Yunyang section of the reservoir area was 356 million tails; that in Sanzhou section of Jianli was 1.9 billion tails, with little change compared with 2001; and fry run-off amount in Wuxue section was 2.225 billion tails.

Dongting Lake: in 2002, the total catch of the entire lake was 32,564 tons, 9% over that of 2001. There were 47 spawning sites of common carp and crucian carp, covering an area of 305 km^2. There were 215,000 tails of spawning common carp, weighting at 388 tons and their spawn amount reaching 6.025 billion, 16%, 11% and 7% over the previous year respectively. There were 298,000 tails of spawning crucian carp, weighting at 388 tons and their spawn amount reaching 3.936 billion, 7%, 5% and 5% over the previous year respectively.

There were 34 feeding sites, covering an area of 824 km^2. Among them, 13 were in east Dongting Lake, being 494 km^2; 16 were in south Dongting Lake, being 131 km^2 and 5 were in west Dongting Lake, being 199 km^2. Main fishes in the feeding sites were common carp, crucian carp, silver carp, fathead, snail carp, grass carp, river Parasilurus asotus and Siniperca chuatsi and the amount of the feeding community was 7.2 billion tails.

Poyang Lake: the total catch of the entire lake in 2002 was 39,300 tons, 31.0% over that of 2001. There were 33 spawning sites and the spawn amount was 5 billion, 23% over the previous year. Among these, the spawn amount was 1.953 billion in the southern part, 1.627 billion in the eastern part and 1.42 billion in the western part.

The spawning sites for common carp and crucian carp in the Poyang Lake in 2002 covered an area of 660 km^2, among which 300 km^2 were in the southern part, 190 km^2 were in the eastern part and 170 km^2 were in the western part. The feeding sites covered an area of about 600 km^2, 21% over that of 2001.

Estuary area: in 2002, biological indicators of tapertail anchovy were all lower than that of 2001. The total output and total value of individual ship in the entire flood season were both higher than that of 2001 and the total catch was 857.81 tons, much higher than that of 2001.

In 2002, catch intensity of parent crabs was relatively low. The catch amount was 768.65 kg, only 20% of that in 2001 and various biological indicators continued to decrease. From 1999 to 2002, output of parent crabs was on the decrease year by year. Continuous decrease in the total catch and biological indicators showed that the perspective of parent crab resources was not optimistic.

In 2002, the output of crabling in the estuary area was low, with almost no output in the southern part and the catch in the northern part mainly concentrated in areas near the beach and in the harbor. The number of eel catching ship dropped significantly. The total output was 12.061 million tails (about 1724.72 kg), a large reduction compared with 2001. But total output of individual ship was not notably reduced.

3.4.2 Fishery environment

In 2002, Seven monitoring stations (Yibin Station, Banan Station, Wanzhou Station, Jingzhou Station, Yueyang Station, Lake Outlet Station and Estuary Station) were set up in the mainstream of the Yangtze River, Dongting Lake and the estuary area and monitoring was carried out on water quality of key fishery water bodies in the Yangtze River basin. The result showed that according to the Fishery Water Quality Standards (GB11607－89), water quality of key fishery water bodies in the Yangtze River basin was sound on the whole, which generally could meet the growing and breeding requirements of fishes. But parts of the water bodies were polluted to some extent,with the major pollutants exceeding standard being total copper, oil, volatile phenol and non-ion ammonia.

Major pollutants exceeding the standards in the fishery water bodies were total copper, oil and non-ion ammonia in the upper reaches of the Yangtze River In 2002.Monitoring values on total copper in the three functional periods of fishes all exceeded the standard, with the exceeding rate being 100% in Yibin. Monitoring values on oils in Banan exceeded the standard in breeding and rearing periods, with the exceeding rate being 100%. Monitoring values on non-ion ammonia in Wanzhou exceeded the standard in the rearing period, with the exceeding rate being 33.3%.

Major pollutants exceeding the standards in the fishery water bodies in the middle reaches of the Yangtze River were total copper, oils, total zinc, lead and non-ion ammonia. Monitoring which was carried out in 6 water bodies in the fish breading period showed that exceeding rates of total copper and oil were 83.3% and 33.3% respectively and those of non-ion ammonia, total lead and total zinc were all 16.7%. Monitoring which was carried out in 4 water bodies in the fish rearing period showed that exceeding rate of total copper was 100%, those of non-ion ammonia and total lead were both 50.0% and that of total zinc was 25.0%. Monitoring which was carried our in 4 water bodies in the fish wintering period showed that exceeding rates of total copper and total zinc were 75.0% and 25.0% respectively.

Monitoring result on the spawning sites of the four major home fishes in the section from Yichang to Chenglingji of the Yangtze River showed that in May and June of 2002, water temperature ranged from 18.4-26.0℃ in the Jianli section of the Yangtze River. Total copper and non-ion ammonia exceeded the standards in all the monitored sections and oil, total zinc and lead exceeded the standards in parts of the monitored sites in Jianli. Water quality, water temperature, water level and flow change in the spawning sites were suitable for breeding of the four major home fishes.

Major pollutant exceeding the standards in the fishery water bodies of Dongting Lake was total copper, exceeding rates of which in the breeding and wintering periods were 37.5% and 28.6% respectively. Water quality of Dongting Lake was improved to some extent compared with 2001.

Major pollutants exceeding the standards in the estuary area of the Yangtze River were total mercury, volatile phenol, oil and total copper. In the eel season, monitoring values of volatile phenol and oil exceeded the standards with their exceeding rates both being 50.0%. In the tapertail anchovy season, monitoring values of volatile phenol, oil and total mercury exceeded the standards with their exceeding rates being 42.9%, 28.6% and 50.0%. In the winter crab season, monitoring value of total copper exceeded the standard with its exceeding rate being 33.3%.

3.5 Peculiar Fishes and Rare Aquatic Animals

3.5.1 Peculiar fishes in the upper reaches of the Yangtze River

In the two field surveys conducted in spring and autumn of 2002 in Yibin, Hejiang and Mudong sections in the upper reaches and Yichang section in the middle reaches of the Yangtze River, 91 species (sub-species) of fishes were collected. Among them, 24 were peculiar fishes in the upper reaches of the Yangtze River, accounting for 51.0% of the peculiar fish species affected by the Three Gorges Project. Of all species, 43 were observed in Yibin section, including 11 peculiar species; 78 species (sub-species) were observed in Hejiang section including 20 peculiar species (sub-species); 39 species (sub-species) were observed in Mudong section including 9 peculiar species (sub-species); and 57 species were observed in Yichang section including 6 peculiar species (sub-species). Platysmacheilus nudiventris and Sinogastromyzon Sichangensis were observed for the first time after monitoring was carried out in 1997. In the investigated river sections, the number of peculiar species, their distribution scope and their proportion in commercial fishery did not notably change.

3.5.2 Rare fishes and Lipotes vexillifer

In 2002, Chinese sturgeon (Acipenser sinensis) spawned for two times, which were on October 27 and November 9. Spawning sites were confined in the about 5 km section from Gezhou Dam down to Miaozui in Yichang and no spawning was found in the section from Miaozui to Gulaobei (where spawning sites of Chinese sturgeon were found by monitoring in the past). Spawning scale of the first time was larger than that of the second time and the total scale of these two times was notably larger than that in 2001. Fecundation rate of Chinese sturgeon eggs was higher than that of past years. There were 11 fishes eating the eggs, mainly bronze gudgeon, Pelteobagrus vachelli and largemouth bronze gudgeon.

According to the result of sonar detection, the number of Chinese sturgeon in the section between downstream Gezhou Dam and Zhenjiangge was between 308 and 436 and that in the section between Zhenjiangge and Gulaobei was estimated to be 1395-2141. In 2002, the number of breeding Chinese sturgeon was more than that in 2000 and 2001. The number of breeding Chinese sturgeon distributed in the spawning sites accounted for 16.9-18.1% of that in the section of downstream Gezhou Dam and Gulaobei.

In 2002, mistakenly catch of the rare fishes-Acipenser dabryanus and Psephurus gladius did not taken place in the section from Shangzhongba in Jiaotan Village in Hejiang to Tongqianwan in Wanglong Village in the upper reaches of the Yangtze River. One Myxocyprinus asiaticus weighted at 12 kg was mistakenly caught. No catch of Chinese paddle fish, River Sturgeon or Chinese sucker was recorded in Yibin and Mudong sections. No activity of Chinese paddle fish was observed in Yichang section in the middle reaches of the Yangtze River. Mistaken catch of one Psephurus gladius was recorded in Nanjing section in the lower reaches of the Yangtze River. No mistaken catch of Chinese sucker was recorded in Yichang section.

In 2002, two Lipotes vexillifer were observed in the Lipotes vexillifer Reserve in Xinluo section of the Yangtze River. More than ten groups of River Dolphins and scores of River Dolphin individuals were observed in the section between Wuhan and Meizixi.

3.6 Agricultural Ecology

3.6.1 Ecological environment of agriculture fields

In 2002, surveys were conducted on 194 towns and villages in 19 counties in the reservoir area with the same survey base as 2001. Investigation results showed that agricultural restructuring was strengthened in the Three Gorges reservoir area. Farmland reversion to forest and grassland was accelerated and agricultural planting and sowing fields dropped greatly in area. Backup wasteland suitable for agriculture was not much and reversion of slope farmland was sped up. Re-cropping index of farmland was high and agricultural production still concentrated on grain crop cultivation. Soil fertility of agricultural fields in the reservoir area decreased and its heavy metal content was normal.

In 2002, total sowing area in the reservoir area was 567,391 hectare, 8.5% less than that in 2001. Among these, the area of grain crops was 439,856 hectare and that of economic crops was 127,535 hectare, accounting for 77.5% and 22.5% of the total respectively. Compared with 2001, the proportion of economic crops was raised because the area of orange plantations increased and that of grain crops decreased.

Surveys on cultivation of slope farmland showed that ecological rehabilitation focused on farmland reversion to forest and grassland was actively carried out in 14 counties and cities in the reservoir area. The area of slope farmland over 25 degrees reversed to forest and grassland totaled 9361.37 hectare, with an increase of 9.3% compared with that of the 12 counties and cities investigated in 2001.

In terms of cultivation types, paddy fields mainly grew crops with two harvests per year, accounting for 59.6% and 3.8 percentage points less than that of 2001; arid land mainly grew crops with three harvests per year, accounting for 63.9% and a little more than that of 2001. Because farming activities were frequent in the reservoir area and there were several harvests in one year, slope farmland was still the main factor causing water and soil erosion.

Monitoring results of the fixed soil monitoring stations of 44 representative paddy fields and arid fields showed that soil contents of nitrogen, phosphorus and potassium were basically the same as those of 2001 and contents of heavy metals were within the background value and attained the first level standard of the soil environmental quality.

3.6.2 Investigation on the influence of orange belts

In 2002, the results monitoring and investigation on the 194 towns and villages in the 19 counties in the reservoir area showed that: orange production in the reservoir area was normal; orange quality did not have qualitative change and no abnormality was discovered by soil examination of the orange belts.

The orange cultivation area in the reservoir area was 27,514 hectare, a little more than that of 2001. Total yield was 268,900 tons, remaining the same as that of 2001. Yield per mu was 651.8 kg, a little less than that of 2001. Investigation on yield proportion of oranges of different qualities showed that the first level, second level and third level oranges accounted for 42.6%, 39.6% and 17.8% respectively. Compared with that of 2001, the proportion of the first level oranges dropped by 7.3 percentage points and proportions of the second and third level oranges rose by 5.1% and 2.1% respectively.

Monitoring results of orange quality in the reservoir area showed that moisture content of oranges ranged from 83.5% to 88.5% with an average of 85.7%; vitamin C content ranged from 163.5 mg/100g to 425.4 mg/100g orange with an average of 245.5mg/100 g orange; and sugar content ranged from 6.5% to 12.6% with an
average of 9.3%. Results of examination on pesticide residues in oranges showed that the content of parathion methyl was 0-0.005mg/kg and less than 0.005mg/kg in all oranges and methamidophos was not found. The pesticide residue indicators met the food hygiene standard.

For the soil in the orange belts, the contents of total nitrogen, total phosphorus, total potassium, alkali dissolved nitrogen, quick-acting phosphorus and quick-acting potassium didn't change much. The contents of heavy metals were with the background value and attained the first level standard of the soil environmental quality.

3.6.3 Rural energy

The results monitoring and investigation on 192 villages and towns in the 19 counties of the reservoir area in 2002 showed that: the energy in the rural areas still mainly depended on the direct combustion of straw; the proportion of small hydropower rose; the area of fuel wood forests decreased; the proportion of biogas-the biological energy rose greatly, but still very small in the rural energy structure. The proportion of straw combustion, small coal kilns, small hydropower, fuel wood and biogas was 37.3%, 27.3%, 18.4%, 13.3% and 3.7% respectively. Among these, the proportion of biogas rose by 1.05 percentage points than that of 2001.

Investigation on the number of biogas pools and biogas production amount in the rural areas showed that in the 1.0864 million rural families in the reservoir area, there were 51,740 biogas pools with an annual production of 18.7037 million m^3. Due to large-scale spreading of biogas bonded ecological homestead construction and high-efficiency eco-agricultural construction in the reservoir area, there were 4.76 biogas pools per hundred families, with biogas production of 17.22 m3 per family in the whole year, rising by 70.6% and 77.3% respectively compared with that in 2001. However, biological energy accounted for only 3.7% of total energies needed, far from meeting the energy demand of the rural area.

The area of fire wood forest in the reservoir was 41,474 hectare, 0.038 hectare per family. Fuel wood production amount was 2.9284 tons, 2.69 tons per family. Compared with that of 2001, the area of fire wood forest decreased by 10,187 hectare, the average area of fire wood forest per family dropped by 17.4% and the average fire wood amount per family rose by 0.15 tons.

3.6.4 Insect pests of crops

In 2002, the results monitoring and investigation on 192 towns and villages in the 19 counties in the reservoir area and the key monitoring and forecasting stations of Yunyang, Kai County, Zhong County and Zigui showed that: the area affected by insect pests decreased significantly, control rate rose and no explosion and major harm of certain insect pest took place. The extent of insect pest of crops in the reservoir area was medium. Total area affected by insect pests was 483,167 hectare·times, 19.0% less than that of 2001. Area controlled was 326,293 hectare·times, 26.6% less than that of 2001; control rate was 77.9%, 3.3% higher than that of 2001; grain loss recovered was 110,444.4 tons and actual loss was

39,728.6 tons. The base number of the snout moth's lava over the winter in the rice paddy fields in the reservoir area was 1542 per hectare.

Table 3-2 Statistics of Main Crop Insects Pest in the Three Gorges Reservoir Area in 2002

Type of Insects Pest	Area Affected (Hectare · times)	Area Controlled (Hectare · times)	Losses Recovered (t)	Actual Losses (t)	Extent of Pest
Rice blast	21026.67	29680.00	13561.10	2236.87	Medium to light
Sheath and culm blight of rice	33166.67	26386.67	5470.89	1175.91	Medium to light
Wheat ibberellic Disease	19246.67	12713.33	2418.30	2599.46	Light
Potato late disease	26093.33	24933.33	13548.76	2218.87	Medium to light
Rice paddy bores	83460.00	94513.33	12098.89	3767.56	Medium to serious
Rice flying flea	31980.00	41366.67	20498.72	1598.16	Medium
Orange red and yellow spiders	41326.67	45273.33	12846.59	2946.52	Medium
Rats	226866.67	101426.67	30001.16	23185.21	Medium

3.7 Geological Disasters

3.7.1 Earthquakes

In 2002, there were 61 times of $M_L \geqslant 2.0$ earthquakes occurred in the Three Gorges reservoir area and surrounding areas (28° -34° north latitude and 108° -114° east longitude), among which there were 4 times of $M_L \geqslant 3.0$ earthquakes. The highest level earthquakes ($M_L = 3.7$) happened in Xiaoji, Xiangyang District of Xiangfan City at 19:08 on March 18, 2002. Earthquake intensity was weaker than that of 2001. Earthquakes mainly concentrated in Yuan'an, Zhongxiang, and areas near Zigui, Geheyan reservoir area of Qingjiang, Wushan County and Shizhu County of Chongqing. Geheyan reservoir area was subject to relatively high frequency of earthquakes and other places experienced lower earthquake frequency. Analysis results on earthquake activities and premonitoring materials showed that earthquake activities in this area in 2002 were basically at a normal level.

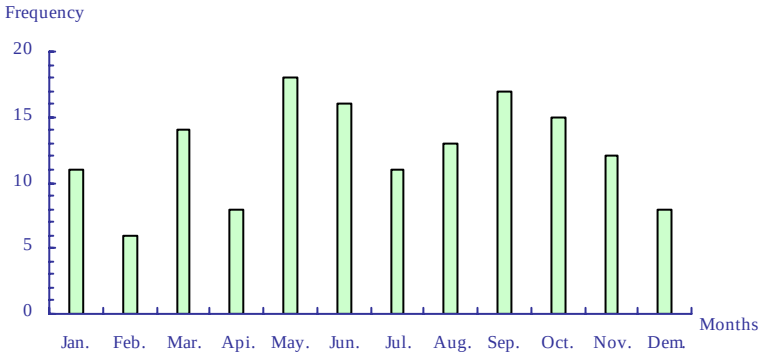

Table 3-3 Earthquake frequency in the Three Gorges Reservoir Area and Surrounding Area in 2002

3.7.2 Landslips, collapses and mud-rock flows

● **Basic situation**

In 2002, in the scope of the Three Gorges reservoir area, there were 199 places experiencing new landslips and collapses in counties (districts) including Yiling, Zigui, Xingshan and Badong, etc. in Hubei Province，and there were over 4100 places known undergoing old and new landslips and

collapses in counties (districts) of Wushan, Fengjie, Yunyang, Wanzhou, Kaixian, Zhongxian, Shizhu, Fengdu, Fuling, Wulong, Changshou, Banan, Jiangjin and the main urban area Chongqing Municipality (including Yuzhong District, Yubei District, Shapingba District, Jiulongpo District, Dadukou District, Beibei District, Nan'an District and Jiangbei District). Monitoring and early warning and monitoring and prevention by the public were carried out by the land resources agencies of all counties (districts). Therefore, the large numbers of landslips and collapses only caused certain economic losses. People all safely removed and evacuated.

● **Monitoring and early warning**

In March 2002, monitoring and early warning program on geological disasters in the Three Gorges reservoir area was launched in an all round way. After that, field surveys, location design and construction were carried out for professional monitoring. Public monitoring and prevention was organized by land resources agencies in counties (districts), towns and villages. Monitoring and early warning made preliminary achievements.

In 2002, landslips, collapses and mud-rock flows in 38 places were successfully forecasted. Residents were evacuated in time. Over 1000 people were free from hurt and death.

● **Fully implementation of the geological disasters control program in the reservoir area**

In 2002, member agencies of the Leading Group for Geological Disasters Control in the Three Georges Reservoir Area further strengthened guidance, coordination, supervision and examination according to requirements of the central Communist Party and deploy of the State Council and fully implemented the Overall Programming on Geological Disasters Control in the Three Gorges Reservoir Area approved by the State Council. Geological disasters control of the reservoir area sped up continuously and went on smoothly on the whole, which laid the foundation for task completion on schedule.

By December 31, 2002, among the 197 proposed collapse and landslip control projects in Hubei Province and Chongqing Municipality (plus Youxia and Shixia sections of Xingzi Road), 195 were started or changed to other treatment measures, accounting to 99.0% of the total in programming. Among the 81 bank collapse control projects in programming, 73 were started, accounting for 90.1% of the total. Steep slope adjustment projects in 195 places were started and those in 152 places were completed. A total of 1.09437 billion yuan was invested in the control projects.

In order to guarantee safety of the reservoir area after water stored in the 135 m high dam (section up the dam) of the Three Gorges Project, the first group of geological disasters control projects have been brought in tight implementation. The first stage geological disasters control projects will be completed before water stored to the 135 m level in section up the dam in June 2003.

Chapter 4 Monitoring and Researches of Eco-Environmental Experimental Stations

4.1 Wanzhou Eco-Environmental Experimental Station

In 2002, Wanzhou Eco-Environmental Experimental Station conducted experimental observation on compound cultivation of grain, economic crops and fruits on ridges in slope fields, experimental observation on hedgerow technology in slope land, and experimental observation on high-quality grazing grass cultivation. Demonstration and extension were conducted in 200 mu in Tangpu Village of Changling Town, Wanzhou Region, and Zhuxi Town in Kai County, using compound cultivation of grain, economic crops and fruits, and hedgerow technology in slope farmlands, respectively. King Grass was extended in regions of Longbao, Changling, Changtan, Guyu, Xintian Farm, Zhuxi and Fuling Farm by 500 mu, which gave out good results of demonstration and extension.

4.1.1 Experiment on compound cultivation of grain, economic crops and fruits on ridges in slope farmlands

In 2002, three modes of cultivation were tested and observed, including compound cultivation of grain, economic crops and fruits on ridges, compound cultivation of grain, economic crops and fruits on flat lands, and compound cultivation of grain and economic crops on flat lands. The crops were corn, wheat, peanuts, soybeans and shaddocks. The results indicated that the mixture cultivation of grain and economic fruits changed the level cultivation along the slope cultivated land to grid ridge culture crossing the slope, and changed the single grain cultivation to the mixture of agriculture and forestry, which had a significant effect on the increasing the activating soil layer of the cultivated slope land, increasing the water holding capacity and fertility of the soil, reducing drought and soil erosion and the productivity of the cultivated land system on the slopes.

4.1.2 Experiment on hedgerow technology in slope fields

In 2002, the hedgerow technology using King Grass - shaddock - peanuts and all-crop technology using wheat - corn - sweet potatoes were tested. As compared with the all-crop technology, the hedgerow technology using King Grass showed significant effects for reducing angle and length of the slope, improving physical and chemical nature of soil, lowering soil erosion, and raising productivity of the lands.

4.1.3 Cultivation of high-quality grazing grass

The King Grass was selected for testing cultivation of high-quality grazing grass. Experimental observation was conducted on its biological characteristics and cultivation modes.

● **Biological characteristics of King Grass**

The biological nature of King Grass varied according to their location at different altitudes. In low, medium and high altitude areas, the growth periods of King Grass were 317, 264 and 245 days, respectively.

King Grass is not cold resistant. At temperature above 0 ℃, the aboveground plant can live through

the winter safely, but the gemmules on top of stalk can be damaged. At temperature below minus 2-3 ℃, the gemmules will be frozen to death, while the stem beneath the ground can live safely through winter. Regarding preservation, both the method of burying and the method of covering can achieve good results in low-altitude areas. In middle or high altitude areas, the burying method is better for preservation of axillary buds.

● **Modes of King Grass cultivation**

King Grass can grow healthily in many kinds of soil like purple soil, yellow soil, alluvion soil and lime soil. Under the different land conditions in the reservoir area, various cultivation modes can be applied accordingly, for example, the mode of King Grass + economic woods, herbs and grazing grass, the mode of cultivation on sharp slope, the mode of cultivation on ridges and banks, the mode of green fence around fruit gardens and planting on the slope road sides, and the mode of cultivation in belts dying out.

4.2 Zigui Eco-Environmental Experimental Station

In 2002, the monitoring and research continued on soil erosion in the front of the Three Gorges reservoir area and the impact of different levels of nitrogen and kalium fertilizers on ginger production in light yellow soil areas at altitude of 600-900 m in the front of the Three Gorges reservoir area.

4.2.1 Monitoring of soil erosion

Soil erosion is one of the major characteristics in the slope dry lands in the reservoir area. The Station adopted multiple methods of soil conservation for monitoring their effectiveness.

The results showed that for fruit gardens, under different conservation methods, the runoff coefficients ranged between 0.01 and 0.12, the sand losses ranged between 0.004 and 0.935 kg, and the soil erosion were 0.09 - 20.63 t / km^2. For grain fields, under different conservation methods, the runoff coefficients ranged between 0.01 and 0.39, the sand losses in each small area were 0.004 - 0.357 km, and the soil erosion was 0.01 - 8.59 t / $km^{2.}$

As indicated from the results, the runoff amount, runoff coefficients, sand contents and soil erosion were all relatively small under different treatment methods like covering the fruit gardens with live plants (cultivation of aged trifolium repens under navel orange trees), covering the fruit gardens with dead plants (laying crop straws under navel orange trees) and building plant filtration belts in grain fields.

4.2.2 Experiment and demonstration on integrated treatment of dry slope lands and fertilization of soil with high productivity, high stability and high quality

Experiment and research were conducted on the impact of different level of usage of nitrogen and kalium fertilizers on ginger production in light yellow soil area in the front of the Three Gorges reservoir area. The results indicated that in the yellow soil area at altitude of 1000 m, the use of kalium fertilizers, organic fertilizers, compound fertilizers (organic and chemical fertilizers) and organic biological compound fertilizers was good for increasing production of ginger grown in one year. The most satisfactory way for raising ginger production was to use organic fertilizers plus appropriate

amount of carbamide. Excessive use of kalium fertilizers could not result in increase of productivity, and appropriate amount ought to be used. It was good when using kalium fertilizers at the rate of 15-16 kg/mu. Further experiment will be needed to see whether the use of organic fertilizers with nitrogen, phosphorus and kalium fertilizers together could result in a better result.

4.3 Xiaogang Eco-Environmental Monitoring Station

In 2002, continuous observation was conducted on ground water dynamics and soil gleization indicators under different levels along the route between Xiaogang and Shi Dock, and the water balance regarding precipitation and evaporation within Xiaogang Station. Research was also conducted on the relationship between underground water level and the water level of the Yangtze River using the data of water level of the Yangtze River and Honghe River in 2002.

4.3.1 Monitoring of ground water dynamics

The area of Hong Lake is geographically plain and broad. The altitude ranges between 22.0 and 25.0 m, with relative altitude difference less than 2 m and slope less than 5%. The ground water includes mainly the pore water in the Fourth type of unconsolidated rock (phreatic water and pressure water) and deep crackwater. The Fourth type pore pressure water is formed from Holocene sand and sandy gravel, and abundant in quantity. The elevation of the top plate of water resisting layer is above 9 m, while the altitude of channel line is generally below 5 m above Yellow Sea Baseplane. Therefore, the Yangtze River influences the pressure water by cutting through the top plate.

In 2002, the highest monthly mean water level occurred in August in all observation wells, while the lowest were found mostly in February and sometimes in January. The annual average of groundwater level ranged between 21.45 and 22.64 m, while highest groundwater level was 21.90-23.34 m and the lowest was 20.89-21.55 m. The variation of groundwater level was 0.89-2.41 m.

The analysis on correlation between groundwater level and the water level of the Yangtze River indicated that significant linear correlation among pressure water level, groundwater level and the water level of the Yangtze River.

Table 4-1 Correlation coefficients between groundwater level and water level in the Yangtze River

Observation well	A	B	C	D	E
Groundwater	0.779	0.796	0.939	0.901	0.442
Pressure water	0.884	0.775	0.857	0.857	0.391

4.3.2 Monitoring of soil gleization indicators

In 2002, the monitoring of soil gleization indicators was continued for sections with different gleization levels from Xiaogang Farm to Shi Dock. The indicators were the same as 2001. According the monitoring results, the soil gleization indicators were not only varied under different gleization level of the soil, but also influenced by the land utilization status.

According to the observation on gleization indicators in different cross-sections of soil, the Eh, total reduced materials, activated reducing materials and Fe^{2+} showed different changing patterns with deepening of the soil layer. The Eh and Fe2+ decreased gradually from surface layer to plow sole layer

and core soil layer. The highest contents of total reducing substances and activated reducing substances were found in the surface layer, while the lowest contents were in the plow sole layer.

4.4 Terrestrial Plant Species Protection Station

In 2002, the experiments and monitoring in the station included meteorological monitoring, setting up a sample belt for monitoring biodiversity, ecological research on Adiantum reniforme var. Sinense and Myricaria laxiflora, and the conservation of rare and endangered plants using ex-situ approach.

4.4.1 Meteorological monitoring

In 2002, the annual mean temperature in Longmen River area was 10.4 ℃, while the highest was 32.5 ℃ and the lowest was -8.8 ℃. The average temperature was 20.8 ℃ in July and 1.1 ℃ in January. The monthly mean temperatures varied little compared with those in 1997 - 2002. The annual precipitation was 1421.9 mm, while the precipitation in August reached as high as 347.0 mm. There was little difference between the precipitation in 2002 and the multi-year annual average (1391.4 mm), but the monthly distribution of precipitation varied significantly. The precipitation in April, May and August increased significantly compared with the average of the past years. The precipitation in April, May and August reached 207.5mm, 217.2mm and 347.0 mm, increasing by 97.2mm, 50.8mm and 94.4 mm, respectively.

4.4.2 Monitoring of biodiversity

In October 2002, the setting-up and investigation of monitoring belt in Zigui was completed. The fixed monitoring belt of Zigui was located at Shuitianba Town, Zigui County, Hubei Province, with altitude of 208-1045 m. Shuitianba Town is geographically located at 31° 04' north latitude and 110° 40' east longitude. Due to the long period of influences of human activities, the forests in this area have almost completely destroyed, with only some Pinus tabufaeformis Forest, Pinus massoniana Forest, Cunninghamia lanceolata Forest and Cypressus funsbris Forest growing above altitude of 800 m. Natural vegetation (mainly scrub or grassland) is rare seen below altitude of 600 m. Most of the vegetation has been transformed into farmlands or fruit gardens. In recent years, many mountainous areas in Shuitianba Town were designated as zones in which chopping is prohibited. As the influence of human activities was relatively heavy, the research in this area on the impact of human activities on terrestrial vegetation as well as their restoration is valuable.

The Zigui monitoring belt is composed of 8 fixed monitoring quadrats varying with altitude gradient varied continuously. The investigation in the quadrats was conducted on over 60 species higher plants. The species were mainly from Gramineae, Rosaceae, Cyperaceae, Myrsinaceae, Symplocaceae, Rubiaceae, etc. A total of 8 types of vegetation were found from lower to higher altitude in the entire monitoring belt, including young Cunninghamia lanceolata Forest, young Robinia pseudoacacia Forest, Pyracantha fortuneana Scrub, Cypressus funsbris Forest, Ligustrun quihoui Scrub, Pinus tabufaeformis Forest, Coriaria sinica Scrub, Heteropogon contortus Grassland.

4.4.3 Ex-situ conservation of rare and endangered plants

At the end of 2002, a total of 35 rare and endangered plant species in the reservoir area had been conserved using ex-situ approach. Most of them were in good condition. The major work of 2002 was to strengthen cultivation management and breeding experiment, and to further increase the quantity of

the rare and endangered species for cultivation to ensure long-term conservation of these species.

The plants that need particular conservation in the reservoir area include Myricaria laxiflora, Adiantum reniforme var. Sinense and Chuanminshen violaceum. According to literatures and the finding in recent years, except in areas at altitude of 80-380 m in the Three Gorges reservoir area, Chuanminshen violaceum is also grown in Qingbei River, Jintang, Jianyang, Cangxi, Weiyuan, Beichuan, Pingwu and Bazhong of Sichuan Province as well as in Dangyang of Hubei Province. The Three Gorges Project places no much negative effect on its survival. Myricaria laxiflora is mainly distributed with limited amount in the reservoir area at altitude of 80-430 m. Adiantum reniforme var. Sinense is distributed in the reservoir area at altitude of 80-130 m. When the second phase water impounding starts and the power generation begins, all of the Adiantum reniforme var. Sinense in the area will be submerged. Currently, the rescuing protection methods have been applied to Myricaria laxiflora and Adiantum reniforme var. Sinense, which basically safeguards the long-term survival of the two species.

4.5 Estuary Eco-Environmental Monitoring Station

In 2002, the station continued its monitoring and research on the water salinity dynamics in the border section between land and sea as well as the water eco-environmental monitoring in estuary areas.

4.5.1 Water salinity dynamics

Three monitoring sections in Yinyang Town, Daxing Town and Xinglongsha High-quality Seed Farm were set up at the border of land and sea, about 4, 22, and 35 km away from the river mouths. Three monitoring points were established for each section, mainly for monitoring water quality of the main streams, water quality inside the water gates near the sections, soil electronic conductivity, soil water contents (indicated by negative pressure of the soil), groundwater level and the groundwater electronic conductivity.

The monitoring results showed that the burial depth of ground water decreased when precipitation increased, but increased when surface evaporation increased. The water content of the soil is controlled jointly by burial depth of ground water, precipitation and evaporation. The impact of burial depth of ground water is more significant and direct. The negative pressure of soil is in consistence with the changing pattern of the burial depth of ground water, in that it increases when the burial depth of ground water increases. It changes seasonally during the year. Generally, the soil negative pressure has the lowest value in winters and springs when the water content of soil is the highest. The biggest soil negative pressure occurs in summers and autumns when the soil water content is the lowest. Particularly, the maximum soil negative pressure is measured in August and September.

The burial depth of groundwater in estuaries is generally less than 1 m. In recent years, there is a tendency of groundwater level rising with very small hydrolic grade and poor condition of water salinity discharge. Precipitation, evaporation, groundwater level and groundwater mineralization are generally the most important factors affecting the salt content of soil. This is particularly true for soil layer over 40cm. Among these factors, the groundwater mineralization has more clear and direct control of the salt content of soil. Soil electroconductivity increases when the groundwater mineralization increases. In spring and summer, the precipitation increases; the groundwater level rises; more salt in soil is eluviated. Therefore, the salt content of soil decreases, with the lowest in summers.

In autumn and winter, the precipitation is reduced and evaporation is dominant, resulting in a decrease of groundwater level and the salt content of soil increases due the accumulation of salt.

Except for meteorological factors, groundwater level and its mineralization, the salt dynamics in soil water is also affected by the Yangtze River, in land waters and conditions of irrigation and drainage. The river water and in-land water can influence the salt content of groundwater in the sensitive area at the Yangtze River mouth. Within 500 m inside the levee of the Yangtze River, the river water is the dominant factor affecting salt content of the groundwater. Beyond this range, the groundwater is more related with in-land waters. The mineralization of river water is in negative correlation with the river water level, in which the mineralization of river water increases when the river water level drops.

In view of the changing pattern of salt content of soil between different years, the salt content of soil in the ploughing layer at the Yangtze River mouth showed a tendency of decreasing for many years, which indicated a state of natural eluviation of salt.

4.5.2 Non-biological environment

● **Hydrological factors**

The distribution pattern of water temperature, salinity and transparency were the same as previous years. The monitored water temperature and salinity were slightly higher than those of 2001. The temperature of water inside the Yangtze River mouth was between 14.86 and 21.55 ℃, with an average of 17.75 ℃. The salinity within the Yangtze River mouth was less than 3, while the salinity outside the river mouth ranged between 7.76 and 33.72, with an average of 29.93. The monitored transparency dropped to some extent with the lowest 0.1 m and the highest 8.0 m.

● **Water chemistry factors**

The average monitored values of 7 indicators including dissolved oxygen, pH, COD, nitrate, nitrite, ammonia nitrogen and total nitrogen were lower than those of 2001, but the averages of other 3 indicators including phosphate, silicate and total phosphorus were higher than those of 2001.

● **Sedimentation factors**

The distribution of ignition loss of soliquoid was the same as the soliquoid, and this coincided with the previous investigations. The content of soliquoid in the investigation area ranged between 0.8 and 1682.0 mg/L, with an average of 93.3 mg/L, about 48.3% of that in 2001. The ignition loss of soliquoid ranged between 0.1 and 78.0 mg/L, with an average of 8.7 mg/L, about 58.0% of that in 2001.

4.5.3 Biological environment

● **Chlorophyl A and primary productivity**

In 2002, the content of chlorophyl A and primary productivity were all significantly lower than the previous years. The content of chlorophyl A ranged between 0.053 and 1.028 mg/m^3, with an average of 0.265 mg/m^3. In most stations, the content of chlorophyll was below 0.3 mg/m^3. The primary productivity was 0.616-285.454 mg C/m$^2\cdot$d, with an average of 45.571 mg C/m$^2\cdot$d. The primary productivity at each station in the river channel was very low, i.e., below 3 mg C/m$^2\cdot$d.

● **Phytoplankton**

A total of 89 species of phytoplankton were collected and examined during the monitoring and investigation, including varieties and modifications. Among these, there were 64 species of diatom, 22 species of inoflagellate, and one blue algae and one green algae. The number of phytoplankton in the investigation area was 1.26×10^4 - $741.4\times10^4/m^3$. The average number of phytoplankton in the investigation area was about 1/200 of 1998 and 1/100 of 2000 respectively.

● **Zooplankton**

According to historical data, the density of zooplankton in the investigation area showed a tendency of decrease from year to year. In 2002, the decrease showed particularly dramatic, with the total average density of only $86.5/m^3$, which was a half of 2000 and 1/10 of 1999. The total average density of zooplankton was significantly different in different geographical locations. The variation was mainly observed along the river. It gradually increased downstream from the river mouth and then decreased.

● **Benthos**

In 2002, the number of benthos species, its biomass and density were both higher than the investigation records of previous years. In the investigation samples, there were a total of 144 species of active benthos. Among these, 77 were polychaeta, accounting for 53.5%, 38 were mollusk, accounting for 26.4%, 16 were carapace, accounting for 11.1%, 5 were echinoderm, accounting for 3.5%, and 8 were others, accounting for 5.6%. The average of total biomass in the samples was 28.14 g/m^3. The average biomass of each type was 12.51 g/m^3 for mollusk, 5.78 g/m^3 for carapace, 5.42 g/m^3 for polychaeta, 3.25 g/m^3 for echinoderm, and 1.18 g/m^3 for others.

● **Fish plankton**

By using vertical trawl sampling, 9 fish planktons were caught including 5 spawns, all of which were floating spawns, and 4 fry fish. By using horizontal trawl net sampling, 55 fish planktons were collected including 30 spawns, 25 fry fish. There were 11 species. 7 species were identified including 2 species of eel and pipefish.

4.5.4 Fishery resources

In the investigation of fishery resources, a total of 73 species of biological resources were obtained, including 9236 fish species, weighing 61042 g totally and 7.00 g each on an average. Among these, there were 47 species of fish, 13 species of shrimp, 5 species of crab, 5 species of antispdix, and 1 species of jellyfish, cowfish and pomfret each. In all kind of species, hair tail, Pampus argenteus, yellow crucian and jellyfish belong to dominant species in autumn.

Different from the previous years, jellyfish became the dominant species. Although its number was not high, its biomass density was absolutely dominant. The phenomenon that jellyfish became dominant indicated that the ecological productivity in the Yangtze River estuary was degrading.

4.6 Peculiar Fish Experimental Station

In 2002, the major target for peculiar fish experiment was Megalobrama pellegrini. The repeating experiment on artificial propagation of Ancherythroculter nigrocauda was conducted in the mean time, and informations were further collected on biology and artificial propagation of other peculiar fish.

In 2002, a total of 759 fish were anatomized. Another 400 live Megalobrama pellegrini were used for domestication and artificial propagation experiment. According to information, the age structure of Megalobrama pellegrini was relatively simple. The fish under 3 years old took 94% of the total, with sex ratio near 1:1. Megalobrama pellegrini become sexually mature at 2 years old. In the propagation group, the number of fish at 2 or 3 years old accounted for 79.1%. The supplementary fish that were in early sexual mature accounted for 57.3%. In the spawning group, the number of male fish was larger than female fish's. The difference between numbers of male and female fish during group spawning might be very large. The fry fish of Megalobrama pellegrini mainly eat algae, while the fish with body longer than 120 mm mainly eat Limnoperna lacustris and water plants. The propagation season is from April to July, but occasional propagaton may occur from spring to autumn. Group spawning is generally in April and May. The habitat of Megalobrama pellegrini needs not only deep water for hiding and living through winters, but also the aquatic organisms represented by float grass. Its propagation requires water temperature being above 18℃ and stimulation of flowing water. Although Megalobrama pellegrini is a species laying viscid eggs, its group spawning usually takes place in tough waters at the outlets of power plants. The running water is one of the necessary conditions for its propagation.

In 2002, the Peculiar Fish Experimental Station adopted on-site artificial insemination and induced spawning to conduct 8 artificial propagation experiments on Megalobrama pellegrini. A total of 20,000 primary fry fish were obtained. Through the experiment, the knowledge and technology of artificial propagation in terms of types of medicines and doeses to be used were basically obtained. It also observed the fetation and its growing up for the first time, which laid basis for further experiment in the future.

Between April and July, artificial propagation was conducted for 8 times on Ancherythroculter nigrocauda in order to verify and complement the result of the previous year. All of the 8 experiments fulfilled their objectives. A total of 234000 germ cells were obtained and 154000 baby fish were hatched. The average fecundation rate was 65.4±31.6%, with an average birth rate of 37.2±36.1%.

Chapter 5 State of Pollution Sources Discharge

5.1 Investigation and Monitoring on Key Industrial Wastewater Pollution Sources

In 2002, the 60 key industrial pollution sources that discharge wastewater to the Yangtze River directly discharged a total of 0.144 billion tons of industrial wastewater into the Yangtze River, with an increase of 33.3% compared with 2001. The largest amount of industrial wastewater discharge was from the main urban area of Chongqing Municipality (including districts of Banan, Dadukou, Jiulongpo, Nan'an, Yuzhong, Jiangbei, and Yubei), with a discharge of 49.308 million tons, accounting for 34.3% of the total.

In 2002, the 60 key industrial pollution sources that discharge wastewater to the Yangtze River directly discharged a total of 9900 tons of various pollutants, with an increase of 23.8% compared with 2001. Among these pollutants, COD was 9436.2 tons, ammonia nitrogen was 440.6 tons, and hexad chromium was 654.0 kg, increasing by 24.4%, 35.7%, and 109.6% compared with 2001, respectively. The oil were 68.7 tons, volatile phenol was 436.7 kg, cyanides was 17.3 kg and lead was 91.8 kg, decreasing by 11.4%, 9.2%, 95.8% and 9.0%, respectively, compared with 2001. Major pollutants were COD and ammonia nitrogen with cumulative pollution loading up to 92.4%. Major areas of pollutant emission centered on districts of Changshou, Fuling, Jiulongpo and Jiangjin City, with cumulative pollution loading up to 85.7%.

In 2002, the major industrial sectors of the 60 key industrial pollution sources that discharge pollutant directly to the Yangtze River were production and supply of electricity, coal gases and water, as well as manufacturing of chemical materials and products, chemical fibre, and leather and fur products. Their pollution loading accounted for 87.0%, and the wastewater discharge took 91.8% of the total industrial wasterwater discharge.

5.2 Investigation and Monitoring on Urban Wastewater

In 2002, there were 67 outlets that discharged urban wasterwater directly into the Yangtze River, with total discharge of 319 million tons. The wastewater discharges from main urban area of Chongqing Municipality, Wanzhou District and Fulin District were 191 million tons, 35 million tons and 23 million tons, accounting for 59.9%, 11.0% and 7.2% of the total, respectively.

The total pollutants in the urban wastewater amounted 205800 tons, in which COD and BOD_5 were 124300 tons and 60500 tons, accounting for 60.4% and 29.4%, respectively. The major pollutants were total phosphorus, COD and BOD_5, with pollution loading 47.3%, 24.9% and 15.4%, respectively. Their accumulative loading reached 87.6%. The pollutants in the wastewater came mainly from main urban area of Chongqing Municipality, Wanzhou District, Fuling District and Changshou District, with pollution loading 60.0%, 10.9%, 7.1% and 4.3%, respectively, totaling 82.3%.

Table 5-1 Discharge of Pollutants from 60 Key Industrial Wastewater Sources that Discharged Wastewater Directly into the Yangtze River in the Three Gorges Reservoir Area in 2002

Region	Wastewater discharge (10,000 tons)	COD (t)	Petroleum (t)	Ammonia nitrogen (t)	Hg (Kg)	Cd (Kg)	Cr^{+6} (Kg)	Pb (Kg)	As (Kg)	Volatile Phenol (Kg)	Cyanide (Kg)
Jiangjin	3321.0	645.7	0.2	38.4	—	—	—	—	—	16.7	11.7
Banan	487.7	162.1	0.6	32.7	—	—	—	82.0	—	—	—
Dadukou	33.8	68.7	1.7	-	—	—	—	—	—	—	—
Jiulongpo	3581.0	1007.1	43.1	66.0	—	—	450.0	3.7	—	—	—
Yuzhong	24.2	36.0	-	-	—	—	—	—	—	—	—
Nan'an	54.4	55.4	0.4	-	—	—	—	—	—	—	—
Jiangbei	625.4	161.4	3.2	-	—	—	25.2	6.1	—	—	—
Yubei	124.3	137.7	0.5	6.0	—	—	—	—	—	—	5.6
Changshou	2432.5	4249.6	18.9	13.8	—	—	128.8	-	—	420.0	-
Fuling	2706.9	1961.6	0.2	283.7	—	—	50.0	-	—	—	—
Fengdu	15.4	11.0	—	—	—	—	—	—	—	—	—
Zhong County	46.4	11.6	—	—	—	—	—	—	—	—	—
Wanzhou	295.5	617.4	—	—	—	—	—	—	—	—	—
Yunyang	609.8	277.5	—	—	—	—	—	—	—	—	—
Fengjie	30.5	33.4	—	—	—	—	—	—	—	—	—
Total	14388.8	9436.2	68.8	440.6	—	—	654.0	91.8	—	436.7	17.3

Table 5-2 Statistics of Wastewater Directly Discharged into Yangtze River in the Three Gorges Reservoir Area in 2002

City	Number of outlets *	Discharge (10000 t)	COD (t)	BOD_5 (t)	Ammonia nitrogen (t)	Total Nitrogen (t)	Total Phosphorus (t)	Volatile phenol (t)	Total (t)
Jiangjin	1	338.78	1321.23	643.68	81.31	121.96	20.33	0.20	2188.71
Banan	2	844.84	3294.86	1605.19	202.76	304.14	50.69	0.51	5458.15
Main urban Area of Chongqing	19*	19112.22	74537.67	36313.22	4586.93	6880.40	1146.73	11.47	123476.42
Changshou	3	1372.00	5350.78	2606.79	329.28	493.92	82.32	0.82	8863.91
Fuling	8	2259.44	8811.82	4292.94	542.27	813.40	135.57	1.36	14597.34
Fengdu	5	548.22	2138.06	1041.62	131.57	197.36	32.89	0.33	3541.84
Zhong County	2	785.43	3063.19	1492.32	188.50	282.76	47.13	0.47	5074.36
Wangzhou	9	3470.41	13534.60	6593.78	832.90	1249.35	208.22	2.08	22420.93
Shizhu	1	73.58	286.95	139.80	17.66	26.49	4.41	0.04	475.35
Yunyang	2	489.93	1910.72	930.86	117.58	176.37	29.40	0.29	3165.23
Fengjie	4	910.98	3552.82	1730.86	218.64	327.95	54.66	0.55	5885.47
Wushan	4	731.11	2851.32	1389.10	175.47	263.20	43.87	0.44	4723.39
Badong	5	761.11	2968.33	1446.11	182.67	274.00	45.67	0.46	4917.24
Zigui	2	161.89	631.36	307.59	38.85	58.28	9.71	0.10	1045.89
Total	67	31859.94	124253.71	60533.86	7646.39	11469.58	1911.6	19.12	205834.23

*For the main urban area of Chongqing Municipality, only the outlets that discharge wastewater into the Yangtze River were included, while the outlets that discharge wastewater into Jialing River were excluded.

5.3 Investigation on Urban Garbage

In 2002, a total of 1.913 million tons of urban garbage was generated in the area of Three-Gorges Reservoir. The main urban area of Chongqing Municipality generated the largest amount, i.e., 1.237 million tons. All of the piled garbage was treated when conducting reservoir clean-up. The garbage from the districts and counties along the river was all moved to temporary sites for storage.

5.4 Investigation on Pollution in Towns to Be Moved Out

In 2002, investigation was conducted again on pollutant discharges from the 92 key counties and towns to be moved out. Their total pollution loading accounted for 80% of the total. The number of permanent residents in these towns was 1.241 million (for some towns, only the residents to be moved out were considered). The annual wastewater discharge reached 69 million tons, with 23800 tons of COD, 11200 tons of BOD_5, 2100 tons of ammonia nitrogen and 420 tons of total phosphorus. The annual domestic garbage generation was 0.46 million tons, most of which was piled up along the river banks and valleys while only a small portion was treated by composting and combustion. The accumulative garbage reached about 2.49 million tons, of which large amount was in Wanzhou District, Kai County, Fengdu County and Fuling District.

In 2002, a total of 237 township enterprises were re-examined in 12 industrial sectors including food and beverage processing, tobacco industry, chemical industry and textile industry. The annual wastewater discharge from the township enterprises to be moved out was 9.2316 million tons, of which 7.1829 tons were treated, with a treatment rate of 77.8%. Major pollutants were COD and BOD_5, i.e., 1511.78 tons and 1161.95 tons, respectively. The solid waste generated from these enterprises was 0.376 million tons annually, of which 0.163 million tons were reused while 0.0726 million tons were disposed. The accumulated wastes reached 47.818 million tons.

As the clean-up of the reservoir and the work of "total amount control and reaching the quality standard and emission standard" were further consolidated and the heavier polluting enterprises were gradually closed down, suspended, merged or transformed, the pollution in the towns to be moved out from the reservoir area was alleviated to some extent. As compared with 2000, the pollutant loading from various industries, especially the construction material manufacturing, chemical industry and textile industry, was reduced respectively,

5.5 Monitoring of Pesticides and Chemical Fertilizers in the Reservoir Area

In 2002, the use of pesticides and chemical fertilizers in the 19 counties and 194 towns in the reservoir area was investigated and monitored. The result showed that the use of chemical fertilizers had a trend of declining but the ratios of their use were still not reasonable. It was still common that the use of nitrogen and phosphorus fertilizers was emphasized while the kalium fertilizers were ignored. This resulted in a decrease of absorption in the crops and over loss of nitrogen and phosphorus, which in turn resulted in pollution in the Yangtze River. The total consumption of pesticides was reduced and the composition changed. The organic phosphorus pesticides were used in the largest amount, but the ratio in total pesticide consumption was reduced. The parts of low poisonous pesticides such as organic nitrogen were increased.

5.5.1 Chemical fertilizers

In 2002, the total use of chemical fertilizers, calculated as pure amount, was 0.1287 million tons, 7.2% decrease compared with 2001, in which 88500 tons were nitrogen fertilizers, 27900 tons were phosphorus fertilizers and 12200 tons were kalium fertilizers. The ratio of nitrogen, phosphorus and kalium was 1:0.31:0.14. The per-hectare use of fertilizers was 554.31 kg, 2.2% decrease compared with 2001.

Table 5-3 Use, Utilization and Loss of Chemical Fertilizers in the Reservoir Area in 2002

Type of fertilizer	Total use (10,000 t)	Total loss (10,000 t)	Utilization rate by crops %	Residue rate in soil %	Surface runoff rate %	Ground leaching rate %	Volatilization of Gaseous nitrogen %	Phosphorus fixed in soil %
Nitrogen	8.85	0.90	35.16	30.31	9.53	0.54	24.46	
Phosphorus	2.79	0.17	34.16	13.18	5.27	0.72		46.67
Kalium	1.22	—	—	—	—	—	—	—
Total	12.87	—	—	—	—	—	—	—

5.5.2 Pesticides

In 2002, the use of pesticides, calculated as pure amount, in the reservoir area was 779.40 tons, 0.9% decrease from 2001. The use per hectare was 3.36 kg, increased by 4.3% compared with 2001. Major reason was the continued decline of arable land in the reservoir area. The order of different pesticides in terms of their consumption was organic phosphorus > organic nitrogen > pyethroids > herbicides.

Table 5-4 Use of Pesticides in the Reservoir Area in 2002

Type of pesticides	Amount used (t)	Percentage (%)
Organic phosphorus	478.28	61.36
Organic nitrogen	95.93	12.31
Pyethroids	75.57	9.70
Herbicides	36.12	4.63
Others	93.50	12.00
Total	779.40	100.00

5.6 Monitoring of Mobile Pollution Sources

5.6.1 Basic situation

In 2002, the Gezhouba lock and the temporary lock of the Three Gorges operated a total of 16361 times for passing through a total of 82493 vessel·times, which transported 2.63 million passengers, 22.14 million tons of cargo. The above figures represented 110%, 104%, 97% and 135% of those in 2001, respectively.

In 2002, investigation was done on installation and use of equipment for prevention of oil pollution in 329 vessels. The equipment was relatively well installed in large vessels, while the installation and use of oil-water separators in cargo ships were not satisfied. Most of the vessels did not install sewage storage and treatment facilities, and the sewerage was discharged directly into the river.

5.6.2 Oil-containing wastewater from vessels

In 2002, there were more than 130 shipping companies in the reservoir area with over 7200 vessels, of which about 5700 vessels discharged oil-containing wastewater. 0.511 million tons of oil-containing wastewater was discharged, 40.0% decrease from 2001. Total pollutants amounted to 79.1 tons, of which 56.2 tons were oil and 22.9 tons were suspended substances. Compared with 2001, the oil increased by 66.7% and the suspended substances reduced by 66.9%. The total oil-containing wastewater treated were 473000 tons, about 92.6% of the total, which decreased by 6 percentage points compared with 2001. The amount of treated wastewater reaching the discharge standard was 412000 tons, decreased by 6.0% compared with 2001. The percentage of wastewater reaching the standard was 87.1%, decreased by 7.2 percentage points compared with 2001.

Table 5-5 Discharge of Major Pollutants in Oil-containing Wastewater

Type of vessels	Oil-containing wastewater (10,000t)		Oil (t)		Suspended substances (t)	
	Discharge	Percentage (%)	Discharge	Percentage (%)	Discharge	Percentage (%)
Tour vessels	2.2	4.3	0.1	0.2	1.0	4.2
Passenger ships	28.2	55.2	9.6	17.1	8.7	37.9
Cargo ships	11.4	22.3	45.1	80.2	11.3	49.2
Tugboats	4.2	8.2	0.6	1.1	0.8	3.6
Others	5.1	10.0	0.8	1.4	1.2	5.1
Total	51.1	100.0	56.2	100.0	22.9	100.0

5.6.3 Sewage

In 2002, the total number of passengers transported in the reservoir area was 15.54 million. Total number of crew members transported was about 50,000. About 1.36 million tons of sewage was discharged into the river. Among the pollutants, COD, BOD_5 total phosphorus and ammonia nitrogen were 410 tons, 200 tons, 1.1 tons and 54 tons, accounting for 61.6%, 30.1%, 0.2% and 8.1% of the total, respectively.

5.6.4 Pollution accidents of vessels

In 2002, a total of 20 pollution accidents of vessels occurred in the reservoir area, 50% decrease from 2001. There were no severe or big pollution accidents of vessels. Most of the accidents were small or general in nature. The accidents resulted from improper operation accounted for 75%, of which 45% were oil pollution accidents and 30% were garbage pollution accidents.

Chapter 6 Status of Environmental Quality

6.1 Environmental Monitoring

In 2002, the monitoring of environmental quality in the Three Gorges reservoir area included: Monitoring of water quality of the river in urban section, and Monitoring of pollution belt along the river bank in urban section, and Monitoring of the water quality of the middle and lower reaches of the Yangtze River and Monitoring of environmental quality in construction area.

6.1.1 Monitoring of water quality of the river in urban sections

In 2002, 16 monitoring sections were set up in the Three Gorges reservoir area. Monitoring on water quality of rivers in urban sections in the reservoir area was conducted for 6 times during three period: dry season (February), normal season (May) and flood season (August).

6.1.2 Monitoring of pollution belt along the river banks of urban sections

In 2002, monitoring of water quality along the river bank of the Yangtze River and Jialing River in the main urban area of Chongqing Municipality was conducted during two periods: dry season (March), and normal season (November). 12 sections for sample collection were established in the 40 km long river course of the Yangtze River. 8 sections for sample collection were set up in the 25.6 km long river course of Jialing River. 6 sample collection points were set up with different distances in each section to collect surface water sample 0.5 m depth under the water surface and analyze. The water depth, flow speed and the distance to the bank of the sample collection points were also measured. Three items were monitored: permanganate index, total ammonia and total phosphorus.

6.1.3 Monitoring of water quality in middle and lower reaches of the Yangtze River

In 2002, the monitoring sections in middle and lower reaches of the Yangtze River were Guandukou of Badong, Badong Hydrometric Station, Nanjingguan of Yichang, No. 37 Dock of Hankou, and downwards Wusongkou of Shanghai. The section of downwards Wusongkou was monitored for 6 times in a single month, while the rest sections were monitored for 12 times, once a month.

6.1.4 Monitoring of environmental quality in construction area

In 2002, the monitoring of environmental quality included the hydrological and meteorological observation in the construction area, air quality, noise in functional zones, water quality in mainstream of the Yangtze River and in the water area near the bank.

6.2 Water Quality of the River in Urban Sections

6.2.1 Water quality

15 indicators were selected for single factor assessment, listing as pH, dissolved oxygen, COD, permanganate index, BOD_5 for five days, ammonia nitrogen, volatile phenol, oil, Cr^{6+}, total phosphorus, lead, mercury, arsenic, cadmium, cyanide. In 2002, the overall water quality of river in urban section in the Three Gorges reservoir area was good. The sections with water quality meeting or being better than the water quality standard for Grade III accounted for 93.8% of the total monitored sections.

Dry Season: the overall water quality of rivers in urban section in the Three Gorges reservoir area was

generally good. The sections with water quality meeting standard for Grade II, Grade III and Grade IV accounted for 68.8%, 25.0% and 6.2% of the total monitored sections respectively.

Normal Season: the overall water quality of rivers in urban section in the Three Gorges reservoir area was relatively good. There were no sections with water quality reaching standard for Grade II. The sections with water quality meeting standard for Grade III and Grade IV accounted for 87.5% and 12.5% of the total monitored sections respectively.

Flood Season: the overall water quality of rivers in urban section in the Three Gorges reservoir area was fairly good. The sections with water quality meeting standard for Grade II, Grade III and Grade IV accounted for 25%, 56.2% and 18.8% of the total monitored sections respectively.

Table 6-1 Assessment Result of the Water Quality of River in Urban Sections in the Three Gorges Reservoir Area in 2002

City	Section	Grades of Water Quality and Times of over the Standard			
		Dry Season	Normal Season	Flood Season	Whole Year
Chongqing	Zhutuo	Ⅱ	Ⅲ	Ⅲ	Ⅱ
	Huangqian	Ⅱ	Ⅲ	Ⅲ	Ⅱ
	Wanglongmen	Ⅱ	Ⅲ	Ⅱ	Ⅱ
	Cuntan	Ⅱ	Ⅲ	Ⅲ	Ⅱ
Changshou	Huangcaoxia	Ⅱ	Ⅲ	Ⅲ	Ⅲ
Fuling	Yazuishi	Ⅱ	Ⅲ	Ⅱ	Ⅱ
	Hongguangqiao	Ⅲ	Ⅲ	Ⅲ	Ⅲ
	Qingxichang	Ⅱ	Ⅲ	Ⅱ	Ⅱ
Fengdu	Mishiquan	Ⅲ	Ⅲ	Ⅲ	Ⅲ
Zhong County	Pangzituo	Ⅱ	Ⅲ	Ⅲ	Ⅲ
	Lianerji	Ⅱ	Ⅳ Total Phosphorus (0.04)	Ⅲ	Ⅲ
Wanzhou	Tongziyuan	Ⅳ Total Phosphorus (0.01)	Ⅲ	Ⅳ Total Phosphorus (0.13)	Ⅲ
	Shaiwangba	Ⅲ	Ⅳ Total Phosphorus (0.27)	Ⅳ Total Phosphorus (0.31)	Ⅳ Total Phosphorus (0.13)
Yunyang	Xiayansi	Ⅱ	Ⅲ	Ⅳ Oil (0.04)	Ⅲ
Fengjie	Baidicheng	Ⅲ	Ⅲ	Ⅲ	Ⅲ
Wushan	Beishi	Ⅱ	Ⅲ	Ⅱ	Ⅱ

Note: Water Quality Standard for Surface Water Environment (GB3838－2002) was adopted for assessment. The times exceeding the standard were calculated based on the standard for Grade Ⅲ.

6.2.2 Annual variation

In 2002, the water quality of the river in urban sections in the Three Gorges reservoir area in different water seasons decreased compared with 2001. However, the water quality in different water seasons mostly met or was better than the standard for Grade III.

Table 6-2 Comparison of the Annual Variation of Water Quality of River in Urban Sections in the Three Gorges Reservoir Area

Item \ Season / Year		Dry Season			Normal Season			Flood Season		
		2000	2001	2002	2000	2001	2002	2000	2001	2002
Total Number of Monitored Sections		16	15	16	16	15	16	16	15	16
Sections with Grade III Water Quality or Better than Grade III	Number	13	15	15	8	15	14	15	14	13
	Percentage %	81.2	100	93.8	50.0	100	87.5	93.8	93.3	81.2

6.3 Pollution Belt Along the River Bank

6.3.1 Deployment of monitoring sections and points

20 sections were deployed in the river in main urban area of Chongqing Municipality in March and November of 2002 to conduct monitoring on pollution belts along the bank, which were from Qiezixi to Tangjiatuo of the Yangtze River (40 km), and from Jingkou to Chaotianmen of Jialing River (25.6 kilometer).

6.3.2 Pollution belt along the river bank in main urban area of Chongqing Municipality

The pollution belts with pollution exceeding the baseline level and standard existed along the banks of the Yangtze River and Jialing River in the main urban area of Chongqing Municipality and were mainly caused by pollution discharge from the city.

Table 6-3 Scope of pollution belts along river bank of the main urban area of Chongqing Municipality in 2002

Name of Rivers	Number of Large scale Discharge Outlets	Season	Pollution Indicator	Bank	Scope of Pollution Belt Exceeding the Baseline			Scope of Pollution Belt Exceeding the Standard		
					Length (m)	Width (m)	Area (m^2)	Length (m)	Width (m)	Area (m^2)
Yangtze River	20	Normal	Permanganate Index	Left	25000	110	2750000	1270	6	7620
				Right	20500	100	2050000	1025	5	5125
			Total Nitrogen	Left	32500	120	3900000	/	/	/
				Right	21600	100	2160000	/	/	/
			Total Phosphorus	Left	2000	100	200000	100	5	500
				Right	/	/	/	/	/	/
		Dry	Permanganate Index	Left	36000	150	5400000	1800	8	14400
				Right	18500	120	2220000	925	6	5550
			Total Nitrogen	Left	33000	120	3960000	/	/	/
				Right	24100	100	2410000	/	/	/
			Total Phosphorus	Left	9500	110	1045000	475	6	2850
				Right	5600	90	504000	280	5	1400
Jialing River	8	Normal	Permanganate Index	Left	17000	80	1360000	850	4	3400
				Right	13200	120	1584000	660	6	3960
			Total Nitrogen	Left	10900	100	1090000	/	/	/
				Right	13200	120	1584000	/	/	/
			Total Phosphorus	Left	22000	150	3300000	2200	15	33000
				Right	25000	160	4000000	2500	16	40000
		Dry	Permanganate Index	Left	10400	110	1144000	520	6	3120
				Right	13200	130	1716000	660	7	4620
			Total Nitrogen	Left	8000	80	640000	/	/	/

				Right	9900	80	792000	/	/	/
			Total Phosphorus	Left	22000	150	3300000	2200	15	33000
				Right	25000	150	3750000	2500	15	37500

●Normal season

The pollution belt with pollution exceeding the baseline level in the left bank of the Yangtze River was 32.5 km long, 120 m wide and that in the right bank was 21.6 km long and 100 m wide, which accounted for 81.2% and 54% of the length of monitored river sections, respectively, and 26.6% and 22.2% of the width of monitored river sections, respectively. The pollution belt with pollution exceeding the baseline level in the left bank of Jialing River was 22 km long, 150 m wide and that in the right bank was 25 km long and 160 m wide, which accounted for 81.5% and 92.6% of the length of monitored river sections, respectively, and 42.8% and 45.7% of the width of monitored river sections, respectively.

The pollution belt with pollution exceeding the standard in the left bank of the Yangtze River was 1270 m long, 6 m wide and that in the right bank was 1025 m long and 5 m wide, which accounted for 3.2% and 2.6% of the length of monitored river sections, respectively, and 1.3% and 1.1% of the width of monitored river sections, respectively. The pollution belt with pollution exceeding the standard in the left bank of Jialing River was 2200 m long, 15 m wide and that in the right bank was 2500 m long and 16 m wide, which accounted for 8.1% and 9.2% of the length of monitored river sections, respectively, and 4.3% and 4.6% of the width of monitored river sections, respectively.

●Dry season

The pollution belt with pollution exceeding the baseline level in the left bank of the Yangtze River was 36 km long, 150 m wide and that in the right bank was 24.1 km long and 100 m wide, which accounted for 90% and 60.2% of the length of monitored river sections, respectively, and 37.5% and 25% of the width of monitored river sections, respectively. The pollution belt with pollution exceeding the baseline level in the left bank of Jialing River was 22 km long, 150 m wide and that in the right bank was 25 km long and 150 m wide, which accounted for 81.5% and 92.6% of the length of monitored river sections, respectively, and 42.5% and 42.5% of the width of monitored river sections, respectively.

The pollution belt with pollution exceeding the standard in the left bank of the Yangtze River was 1800 m long, 8 m wide and that in the right bank was 930 m long and 6 m wide, which accounted for 4.5% and 2.3% of the length of monitored river sections, respectively, and 0.2% and 0.1% of the width of monitored river sections, respectively. The pollution belt with pollution exceeding the standard in the left bank of Jialing River was 2200 m long, 15 m wide and that in the right bank was 2200 m long and 15 m wide, which accounting for 8.1% and 9.2% of the length of monitored river sections, respectively, and 4.3% and 4.3% of the width of monitored river sections, respectively.

6.4 Water Quality in Middle and Lower Reaches of the Yangtze River

11 indicators were selected for single factor assessment, including pH, permanganate index, volatile phenol, oil, Cr^{6+}, total phosphorus, lead, mercury, arsenic, cadmium, and copper. The result indicated that the water quality in middle and lower reaches of the Yangtze River in 2002 was rather poor with

the annual water quality meeting standard for Grade IV in each section.

6.4.1 Seasonal variation

The water quality in different seasons showed that the water quality in the first quarter mainly met standard for Grade III with petroleum and total phosphorous exceeding the standard in certain sections. The water quality in the second and fourth quarter mainly met the standard for Grade IV with total phosphorous and oil as the major pollutants. The water quality in the third quarter met the standard for Grade V because total phosphorous exceeded standard of in the sections of Guandukou, Badong Hydrometric Station and Nanjinguan.

Table 6-4 Seasonal Assessment Result of Water Quality in Middle and Lower Reaches of theYangtze River in 2002

Name of Sections	Grades of Water and Times over the Standards				
	First Quarter	Second Quarter	Third Quarter	Fourth Quarter	Whole Year
Guandukou	Ⅲ	Ⅳ Total Phosphorus (0.13)	Ⅴ Total Phosphorus (0.66)	Ⅳ Oil (1.73)	Ⅳ Oil (0.43) Total Phosphorus (0.11)
Badong Hydrometric Station	Ⅲ	Ⅳ Total Phosphorus (0.15)	Ⅴ Total Phosphorus (0.68)	Ⅳ Oil (2.73) Total Phosphorus (0.02)	Ⅳ Oil (0.68) Total Phosphorus (0.11)
Nanjinguan	Ⅲ	Ⅳ Oil (1.00)	Ⅴ Total Phosphorus (0.64)	Ⅳ Oil (3.67) Total Phosphorus (0.02)	Ⅳ Oil (0.92) Total Phosphorus (0.06)
Hankou	Ⅳ Oil (0.40)	Ⅲ	Ⅲ	Ⅲ	Ⅳ Oil (0.35)
Downward of Wushankou	Ⅳ Total Phosphorus (0.39)	Ⅳ Total Phosphorus (0.20)	Ⅲ	Ⅳ Total Phosphorus (0.15)	Ⅳ Total Phosphorus (0.19)

6.4.2 Comparison analysis of clear and muddy water samples

The analysis result of the comparision between clear water samples and muddy water samples indicated that the content of seven measured indicators (permanganate index, total phosphorous, mercury, lead, cadmium and arsenic) in muddy water samples were obviously higher than those in clear water samples, in which the difference of total phosphorous, copper, permanganate index and lead was even more outstanding. The difference between clear water samples and muddy water samples in the main stream of the Yangtze River was bigger than that in the tributaries. The change trend of each monitored sections showed that the concentration of monitored indicators in muddy water samples differed obviously with the change of the water period. However, that in clear water samples was rather steady.

The analysis of the changes of permanganate index and lead in clean water and muddy water samples showed that there were certain inter-relations between the content of permanganate index and lead and the content of suspended particles in muddy water samples.

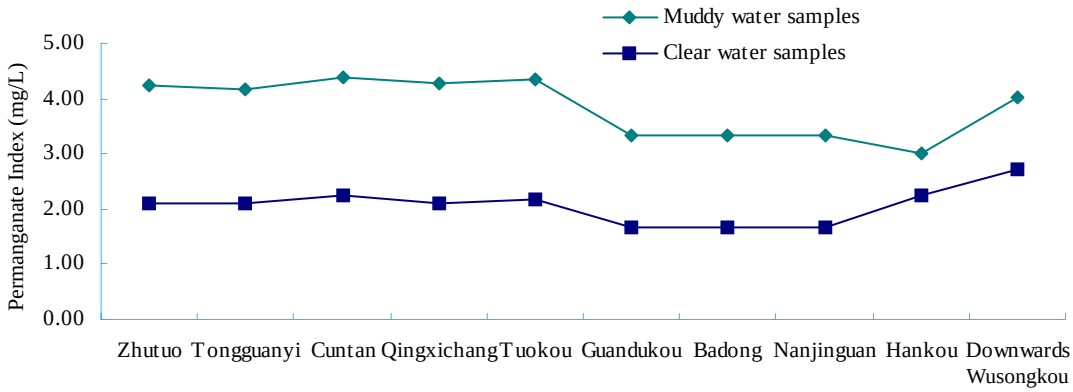

Chart 6-1 Variation Trend of Annual Average Value of Permanganate Index along the Course in Mainstream of the Yangtze River in 2002

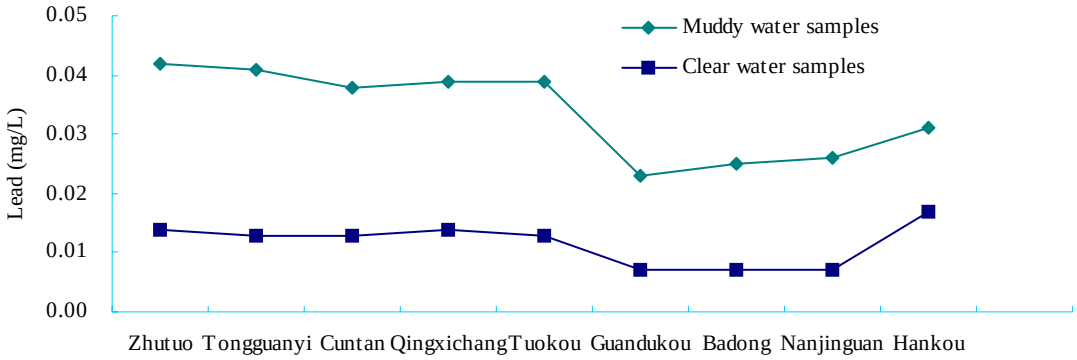

Chart 6-2 Variation Trend of Annual Average Value of Lead along the Course in Mainstream of the Yangtze River in 2002

6.5 Environmental Quality in Construction Area

6.5.1 Hydrology and meteorology

1) Characteristics of hydrology

In 2002, the statistical results from Huanglingmiao Hydrometric station showed that the average flux in the entire year was 12400 m^3/s. The maximum flux was 48800 m^3/s on August 19. The minimum flux was 3430 m^3/s on February 17. The annual average runoff was 3.915 $\times 10^{11}$ m^3. The runoff modulus was 1.24×10^{-2} $m^3/s \cdot km^2$. The runoff depth was 390.4mm. The average sand transmission rate was 7.76 t/s. The average sand content was 0.626 kg/m^3. The section's average maximum sand content was 2.16kg/ m^3 on October 14. The section's average minimum sand content was 0.014kg/ m^3 on December 29.

2) Characteristics of climate

In 2002, there was obvious rich precipitation in the construction area of the Three Gorges Project. The temperature was a little bit higher and there were more disastrous weathers such as thunderstorms than those of the past years.

Table 6-5 Monthly Statistics of Flux in Huanglingmiao Hydrometric Station in 2002

Month	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
Average	4660	4610	5740	6910	14600	22700	20200	32800	12400	10400	7750	5460
Max	5670	6630	8470	12500	21400	33000	26300	48800	20400	13200	9940	6720
Min	3860	3430	4600	4500	9060	11500	13600	19800	9700	8450	6600	4400

Table 6-6 Monthly Statistics of Sand Content in Huanglingmiao Hydrometric Station in 2002

Month	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
Average	0.025	0.024	0.042	0.142	0.339	0.938	0.708	1.25	0.411	0.334	0.081	0.022
Max	0.031	0.050	0.075	0.428	0.936	1.85	1.12	2.06	0.876	2.16	0.119	0.036
Min	0.019	0.015	0.019	0.018	0.127	0.232	0.464	0.562	0.180	0.110	0.036	0.014

● **Precipitation:** The precipitation in the construction area was 1445.2 mm, 25% more than the average in the past years, and distributed unevenly in different months. The number of months with rich precipitation reached to nine months with the richest precipitation in April, nearly as much as twice of the average in the past years. It was considered as the richest precipitation since the Three Gorges Station had record. The number of rainy days in the whole year (precipitation ≥0.1 mm) was 144 days, six days more than the average in the past years. The days with precipitation≥10 mm was 46 days, 10 days more than the average in the past years. There were 22 days continuously with no precipitation in the entire year. That was from December 21, 2001 to January 11, 2002. 5 storms occurred in the whole year with precipitation above 50mm and the heaviest reaching to 73.9 mm on May 13. 34 thunderstorms occurred in the whole year, a little bit more than the average in the past years.

● **Temperature:** The average temperature in the construction area was 17.5℃, a little higher than the average in the past years. The temperature was obviously higher from January to March and obviously lower in December. The annual average highest temperature was 23.0℃, higher by 0.4℃ than the average in the past years. The annual average lowest temperature was 13.8℃, higher by 0.6℃ than the average in the past years. The number of days with temperature higher than 37℃ in the year was 12 days, six days each in July and August. The number of days with temperature below 0℃ was 4 days, appearing in December. The extremely highest temperature in the year was 39.2℃, appearing on July 13 and July 15. The extremely lowest temperature in the year was -1.7℃, appearing on December 26.

● **Wind speed and direction:** The average wind speed in the construction area was 1.6 meter/second, the same as the average in the past years. The maximum wind speed in the year was 21.6 m/s on June 7. The wind direction in the year was normally NNW with the occurrence frequency of 21%.

● **Sunshine:** The number of hours with sunshine in the whole year was 1364.7 hours, accounting for 31% and the same as in normal years.

Table 6-7 Monthly Average Temperatures, Precipitation and Wind Speed in Construction Area of the Three Gorges Project in 2002

Month		Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dem.	Whole year
Precipitation	Rainfall (mm)	8.3	61.9	73.7	220.8	225.3	219.2	108.3	235.4	115.9	62.2	79.0	35.2	1445.2
	Difference from historical average (%)	-66	+108	+35	+195	+64	+40	-52	+27	+13	-44	+83	+81	+25
Temperature	Temperature(℃)	8.3	10.2	14.6	16.6	19.8	26.5	28.0	25.9	23.1	18.1	12.4	6.8	17.5
	Difference from historical average (%)	+48	+28	+28	-6	-10	+6	+2	-5	+1	+2	-2	-16	+2
Wind Speed	Average (m/s)	1.8	1.3	1.9	1.7	1.3	1.5	1.3	1.5	1.7	1.8	1.6	1.5	
	Max (m/s)	7.6	7.3	8.9	8.8	7.7	11.2	9.8	11.5	6.4	8.2	7.5	6.7	
	Extreme (m/s)	12.3	11.2	14.5	16.6	11.0	21.6	16.7	16.4	9.7	12.5	11.9	10.4	

6.5.2 Air quality

In 2002, the annual average concentration of SO_2 in the construction area was 0.012 mg/m^3, and that of NO_2 was 0.025 mg/m^3, which met the Air Quality Standard (GB 3095-1996) for Grade I. The daily average concentration of the two indexes all reached or was better than the standard for Grade II. The annual average concentration of TSP was 0.262 mg/m^3, meeting the Air Quality Standard (GB 3095-1996) for Grade III. The annual average concentrations of SO_2, NO_2 and TSP remained the same as 2001.

6.5.3 Noise

The noise in working and residential areas was evaluated based on the Noise Standard for Urban Area (GB 3096-93). The daytime noise in working and residential areas basically met the standard for Grade II. The noise at night exceeded the standard for Grade II a little bit. The noise in the daytime and night in the construction area, the noise on the site and the noise on traffic roads attained the requirement of the threshold of 90 dB set by national Design Norms for Noise Control in Industrial Enterprises (GBJ87-85) for production workshops and operation site. The noise in certain trunk roads exceeded the standard.

6.5.4 Water quality

In 2002, the overall water quality in the main stream of the Yangtze River and along the bank in the construction area was pretty good. The water quality in each quarter met or was better than the water quality standard for Grade III.

Table 6-8 Assessment Results of Water Quality in Sections of Mainstream In Construction Area in 2002

Name of Sections	First Quarter	Second Quarter	Third Quarter	Fourth Quarter
Taipingxi	Ⅰ	Ⅱ	Ⅲ	Ⅱ
Dongyuemiao	Ⅰ	Ⅱ	Ⅲ	Ⅱ
Letianxi	Ⅰ	Ⅱ	Ⅲ	Ⅱ

Table 6-9 Assessment Results of Water Quality Along the Bank of the River in Construction Area in 2002

Name of Monitoring Points		First Quarter	Second Quarter	Third Quarter	Fourth Quarter
Left Bank (30m away from the Bank)	Shangweiyan	I	II	III	I
	Xiaweiyan	I	II	III	II
	Navigation Route in Downstream	II	II	II	II
	Bahekou	II	II	II	I
	Yingzizui	II	II	III	II
	Zhaniuwan	I	II	III	I
	Xia'anxi	I	II	III	I
Right Bank (30m away from the Bank)	Laomaoping Town	I	II	III	I
	River mouth of Maopingxi	II	II	III	II
	Gaojiaxi	I	II	III	I
	Baimaozi	I	II	III	I
	Yangjiawan	II	II	III	II
	Daishi	II	II	III	I

Chapter 7 Public Health in the Reservoir Area

7.1 Basic Situation

The monitoring scale and items in 2002 were the same as that in 2001, including Chongqing, Wanzhou district of Chongqing, Fengdu County and Yichang of Hubei province. The total number of people monitored was 469,759, 40,196 less than that in 2001, which was mainly caused by the adjustment of monitoring points. The gender ratio of male and female was 1.03:1.

In 2002, there were altogether 374 medical institutions at various levels in monitoring points, 45 less than that in 2001, mainly caused by the emigration of people from the Three Gorges reservoir area. The total number of medical people of various types at different level was 4404, 267 more than that in 2001. There were 3346 hospital beds in the medical institutions, 302 more than that in 2001.

7.2 Statistics of Lives

7.2.1 Birth and death

In 2002, 3345 people were born within the monitoring range, among which 1709 were males and 1636 were females. The birthrate was 7.12‰, a slight decrease compared with 2001. 2754 people died with the mortality rate of 586.25/100 thousand, among whom 1502 were male with mortality rate of 646.07/100 thousand, and 1252 were female with mortality rate of 527.64/100 thousand. Compared with 2001, the total mortality rate was decreased by 2.53% and the mortality rate of male and female decreased by 3.41% and 2.43%, respectively. 53 babies died with 30 male babies and 23 female babies. The mortality rate of babies was 15.85‰, decreased by 1.04‰ comparing with 2001, the same as the baby mortality rate in the country.

7.2.2 Analysis of death cause

According to the classification standard for ICD-9 diseases, the following ranked the first five diseases causing people's death: the circulatory system diseases (33.4%), malignant tumor (20.1%), respiratory system disease (17.0%), damnification and poisoning (12.8%), and unidentified diseases (4.7%). The death cases caused by the above five types of diseases accounted for 88.0% of the total death, indicating this five types of diseases were the major causes for the death of people in the Three Gorges reservoir area. Compared with 2001, the diseased exchanging ranks were malignant tumor and respiratory system diseases, and the alimentary system diseases and unidentified diseases. The percentage of people died from circulatory system disease increased slightly and the percentage of people died from respiratory system diseases decreased a little.

7.3 Monitoring of Diseases

7.3.1 Monitoring of infectious diseases

In 2002, 3414 cases of infectious diseases were reported from different monitoring points with no death case. Among those, one type of legal category A infectious disease was reported with 4 cases (cholera), 15 types of category B infectious disease were reported with 2371 cases. The ratio of the total disease incidence of category A and B was 404.70/100 thousand. 5 types of category C disease were reported

with 1039 cases, the ratio of disease incidence was 177.05/100 thousand. Compared with 2001, the incidence ratio of category A and B infectious disease decreased by 9.8%, and the incidence ratio of category C infectious disease decreased by 23.3%.

In 2002, the order of the disease incidence of the first five category B infectious diseases was: pulmonary tuberculosis (128.48/100 thousand), virus hepatitis (101.56/100 thousand), dysentery (99.51/100 thousand), gonorrhea (48.22/100 thousand), measles (15.17/100 thousand). Compared with 2001, the order of the first four category B infectious diseases remained the same. However, the disease ranked as the fifth changed from syphilis to measles.

Compared with 2001, the incidence of alimentary system disease increased and ranked as the first. The incidence of respiratory system disease decreased obviously. The disease incidence caused by natural disease source remained at low level. The newly added category A infectious disease was cholera, category B infectious diseases were Aids and HIV recessive infection. Aids and HIV recessive infection were reported for the first time in the monitoring area. The number of cases of reported disease incidence of five types of category B infectious disease increased. The order was: scarlet fever (155.6%), measles (98.3%), malaria (70.4%), typhoid fever (52.9%), dysentery (7.9%). The cases of other types of diseases decreased. Among those, the number of cases of gonorrhea, syphilis and pulmonary tuberculosis were decreased obviously.

In 2002, there were reported cases of infectious disease every month from monitoring sites. From April to October, there were more than 200 cases of category A and B infectious diseases. However, the peak was not so obvious, which indicated the incidence of infectious disease scattered and there was no outbreak of epidemics. Two peak periods for incidence of category C infectious disease appeared in June and September. The major cause was the outbreak of urticaria and conjunctivitis epidemics and the increase of the cases of infectious diarrhea in summer.

7.3.2 Monitoring of endemic diseases

The monitoring results of the endemic diseases showed that the endemic fluorine poisoning only occurred in Fengjie County. The positive reaction rate reached to 32.25%. The monitoring points were not hit by the paragoniasis epidemics. The cases of endemic thyroid enlargement were found in four monitoring points. However, the intensity still belonged to a rather low level. The rate of thyroid enlargement incidence of children from 8 to 10 was 6.0%-13.2%, less than 20.0%.

7.3.3 Serum test

The antiserum tests of 200 samples of the epidemic hemorrhagic fever were tested in 2002, with positive rate of 3.5%. The antiserum tests of 197 samples of encephalitis B were conducted, with positive rate of 17.3%. The antiserum tests of 571 samples of leptospirosis were conducted, with positive rate of 22.4%. Compared with monitoring results in 1998 and 2000, the antiserum level of encephalitis B and leptosirosis decreased a little bit. The antiserum level of epidemic hemorrhagic fever remained low. With the water storage in Three Gorges Reservoir and the migration of host animals in the reservoir area, the monitor of animal infectious source and the natural epidemic source disease should be enforced.

7.4 Monitoring of Biological Media

In 2002, anti-mouse campaign carried out for the cleanup of the reservoir made the density of indoor and outdoor mice lower than that of 2001. The density of indoor mice decreased from 2.8% to 2.1% and the outdoor from 4.9% to 3.8%.

In indoor areas, the brown mice were the superior kind, accounting for 65.9%. The small mice ranked the second, accounting for 24.4%. Besides, there were also yellow-breast mice and the black strip rats occasionally invading from outdoor. In the field, the small insectivora were the dominant kind, accounting for 62.5%. The brown mice and black strip rats ranked as the second, accounting for 18.1% and 10.9%, respectively. As the host animals for epidemic hemorrhagic fever and leptospirosis, the percentage of black strip rats remained at low level.

In 2002, the leptospirosis cultured in the kidney of animals in each monitoring points showed negative response. The black strip rats were not caught in the monitoring point of Yichang. The positive rate of epidemic hemorrhagic fever tested from 13 lung samples of other kinds of mice was as high as 15.38%. The attention should be highly paid to this situation.

In 2002, the density of mosquito in the livestock sty was higher than that in door in each monitoring point. The total density of mosquitoes in the livestock sty was 135.77/room·manhour, lower than that in 2001, which was 178.1/room · manhour. The total density of mosquitoes in the room was 41.98/room · manhour, lower than that of 2001, which was 69.0/room · manhour.

The peak period for the density of indoor mosquitoes was the first half of June in Chongqing and Yichang, and the first half of July in Fengdu and Wanzhou. The peak period for the density of mosquitoes in the livestock sty was the second half of June in Chongqing and the second half of July in Fengdu. The peak period in Wanzhou and Yichang was the first half of July.

The armigers subalbatus were the dominant kind both in door and in the livestock sty, accounting for 49.1% and 50.8%, respectively. The culicine mosquitoes ranked the second, accounting for 30.5% and 18.1%, respectively.

Chief Compilation Institution

China National Environmental Monitoring Center

Compilation Members

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Hubei Provincial Statistics Bureau
Chongqing Municipal Statistics Bureau
Chongqing Municipal Environmental Monitoring Center
Geological Calamity Monitoring Center in the Three Gorges Reservoir Area, Ministry of Territory and Resources
Environmental Protection Center of Ministry of Communication
Water Conservation Committee of the Yangtze River
Office of the Fishery Resources Management of the Yangtze River
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