

Flora and Fauna Sampling Results at Los Alamos National Laboratory, New Mexico During 1995 and 1996

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Foreword

The mission of the New Mexico Environment Department DOE Oversight Bureau is to assure that activities at DOE facilities are protective of the public health and safety of the environment. The Bureau's activities are funded through a grant from the U.S. Department of Energy in accordance with the provisions set forth in the *Agreement-in-Principle between the State of New Mexico and the U.S. Department of Energy*. One of the primary objectives of the agreement is the development and implementation of a program of independent monitoring and oversight.

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Abstract

During 1995 and 1996, the DOE Oversight Bureau of the New Mexico Environment Department collected 26 flora and fauna samples along with the Los Alamos National Laboratory. The Department collected both independent and co-located samples and had them analyzed for some of the same radionuclide and metal constituents as the Laboratory. The analytical results were compared to background reference levels, Laboratory data and state or federal guidelines. Six measurements were above background reference levels established by the Laboratory. The Department's metal and radionuclide measurements were similar to the Laboratory's. For lead, all but two measurements were below the detection limit of 0.3 mg/kg, while the Laboratory's mean measurement was 3.7 mg/kg. Fish and insects were collected and analyzed for polychlorinated biphenyls, which were found in one fish at concentrations at or below the analytical quantitation limit. The Department measured mercury at concentrations ranging from 0.1 to 0.7 mg/kg in Cochiti Reservoir fish.

Introduction

The Los Alamos National Laboratory (LANL) Ecology Group (ESH-20) annually collects flora and fauna samples and analyzes them for metals and radiological constituents to evaluate the impact of laboratory operations on the human food chain. During 1995 and 1996, members of the New Mexico Environment Department (NMED) split a subset of LANL's surveillance samples and had them analyzed for some of the same constituents. We also collected independent samples and had them analyzed for constituents not evaluated by LANL. We checked samples for elevated measurements, investigated possible contaminants not monitored by LANL, compared concentrations of contaminants to applicable health-based guidelines, and evaluated any differences between our analytical results and theirs. We observed sample collection procedures, reviewed analytical methods, collected samples and evaluated the analytical results. This work is part of an ongoing assessment of LANL's ecological surveillance program.

Methods

Flora samples consisted of fruit, vegetables and herbs. Fauna samples consisted of deer, insects and fish. In 1995 and 1996 we collected 14 flora samples. Thirteen were collected at the same sites and analyzed for some of the same constituents as LANL. One flora sample (tea) was collected independently. We collected 12 fauna samples. Two were collected at the same sites and analyzed for some of the same constituents as LANL. Ten fish and insect samples were analyzed for polychlorinated biphenyls (PCBs) or mercury. The fish samples were analyzed for PCBs and mercury and the insect samples were analyzed for PCBs.

Sample locations were categorized by proximity to LANL. Regional samples were located greater than 15 km from LANL, perimeter samples were from inhabited areas in the vicinity of

the National Laboratory and on-site samples were taken within LANL boundaries. We collected samples from each location category.

Los Alamos National Laboratory's samples were analyzed at their in-house analytical chemical facility, CST-9. Our samples were analyzed by an independent commercial laboratory, Paragon Analytics Inc.

Collection

Split or co-located samples were collected identically in that enough material was harvested at each sample location to divide equally between LANL and NMED. Independent samples were collected following Environmental Protection Agency (EPA) guidelines. Sample collection and preparation methods for flora are described in "Produce Sampling and Processing for the Foodstuffs Monitoring Program," LANL-ESH-20-SF-OP-001,RO, 97. Collection and preparation methods for fish and game animals are described in "Fish Sampling and Processing for the Foodstuffs Monitoring Program," LANL-ESH-20-SF-OP-002, RO, 97 and "Game Animal Sampling and Processing for the Foodstuffs Monitoring Program," LANL-ESH-20-SF-OP-003,RO, 97.

Sample locations are shown in Figures 1 and 2. A regional sample of cucumbers was collected at Jemez Pueblo. Squash, spinach, herbal tea, green beans and apples were collected from perimeter locations. Crabapples, apples, nectarines, pears and peaches were collected from within LANL boundaries. Fish (northern pike, white bass, catfish, carp, crappie, and bluegill) were gill netted from several locations within Cochiti Reservoir. A catfish sample collected and ashed by LANL was split with NMED. Insects (damselflies and dragonflies) were collected from within LANL boundaries at the upper Sandia Canyon wetlands. The front shank of a deer was collected at TA-21/State Road 502.

Preparation

Sampling staff prepared most samples as for human consumption. Produce samples were washed and the fish were gutted and washed. Insects (after sorting into suborders) and the deer bone sample were bagged and submitted to the laboratory. Samples were further processed by the analytical laboratory. Each sample of fruit or vegetables was washed, homogenized and oven dried. Fruit, vegetables, one fish sample, and the deer bone were processed for some radionuclides and metal analysis. The analysis was reported on a dry weight basis. Fish and insect samples were processed for PCB and mercury analysis and reported on a wet weight basis. The fish samples were washed, heads and tails removed, and the muscle and bone were analyzed. The insect samples were homogenized. The deer bone was dried and ground. The tea sample was steeped, filtered, analyzed for radionuclides and metals, and reported as a fluid (mg/L or pCi/L).

The samples reported on a dry weight basis were oven dried until they ceased to lose weight. The dried samples were then ground and sieved before being dissolved and purified as required for each analytical method. The samples processed by LANL were dried using incrementally greater temperatures until the samples were ashed. By analyzing ashed samples, LANL was able to achieve lower detection levels than we could using oven dried samples. We obtained one ashed catfish sample from LANL to be analyzed by our commercial laboratory for comparison of the lower detection levels.

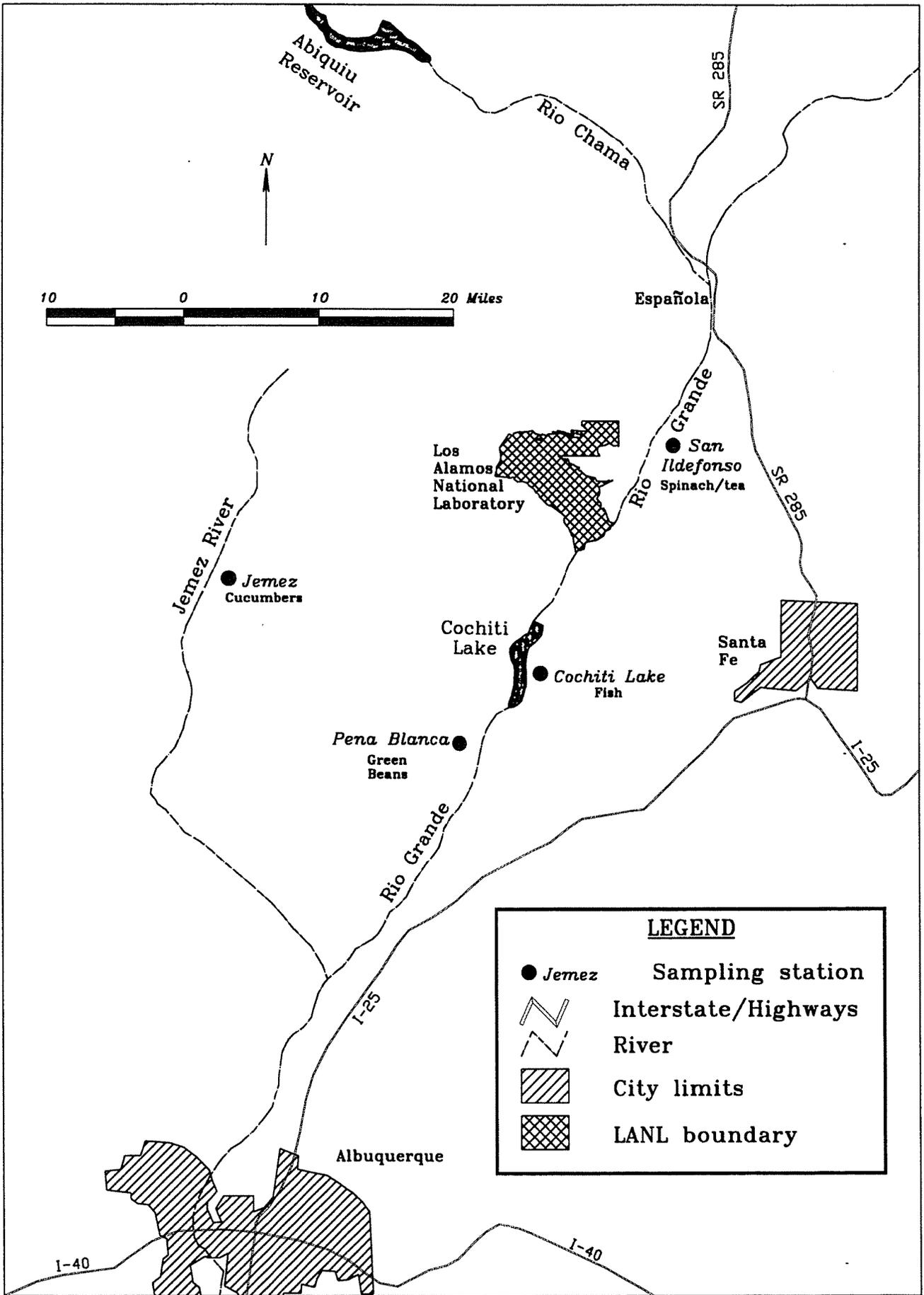


Figure 1. Flora/fauna sampling locations in relation to Los Alamos National Laboratory.

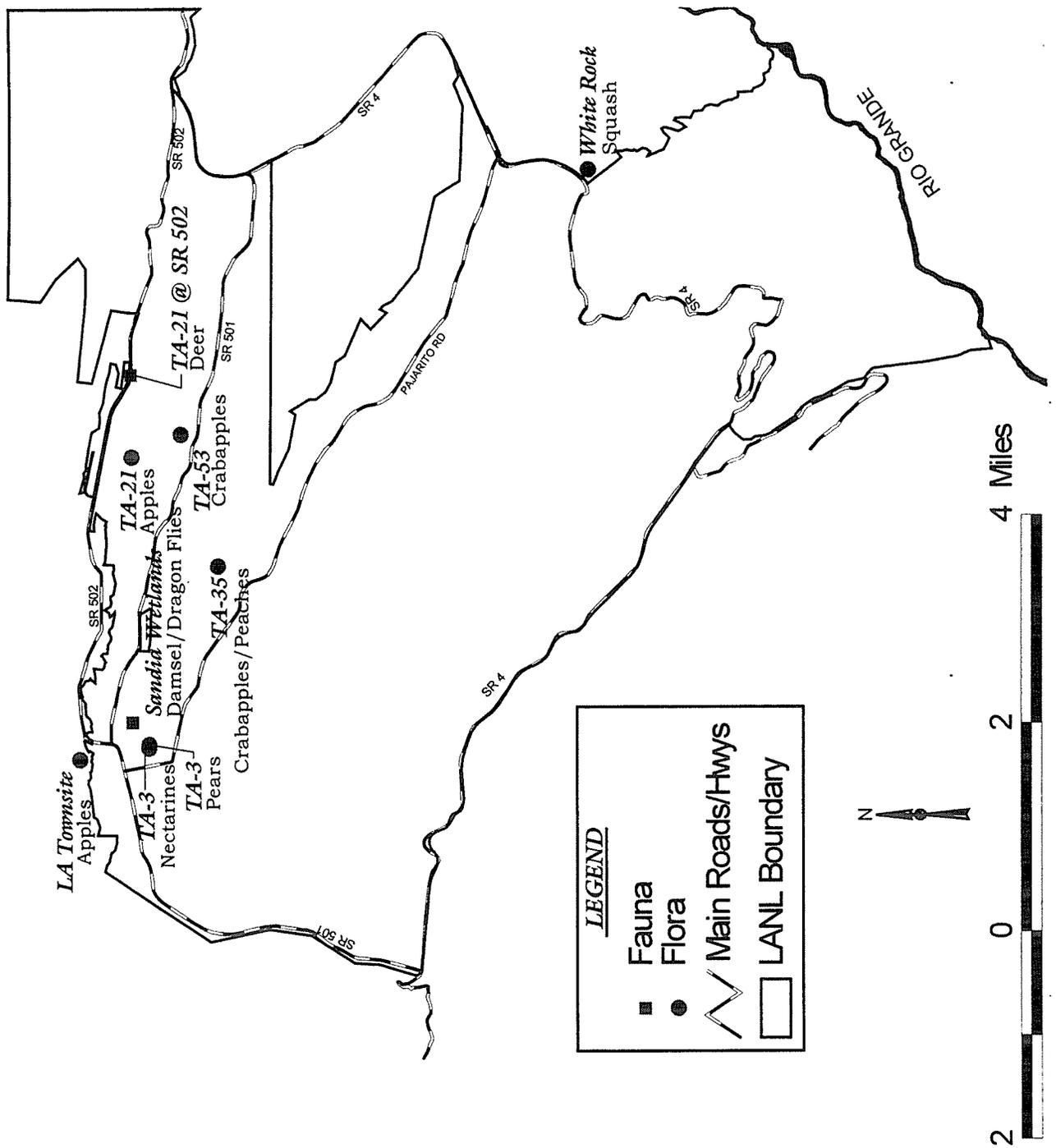


Figure 2. Onsite and perimeter 1995 - 1996 sampling locations.

Analytical

The radiological parameters most commonly measured by LANL are tritium, cesium-137, americium-241, strontium-90, plutonium isotopes, and total uranium. Heavy metals measured include silver, arsenic, barium, beryllium, cadmium, chromium, mercury, nickel, lead, antimony, selenium, and thallium. Our bureau measured lead, beryllium, cadmium, barium, mercury, PCBs, cesium-137, americium-241, isotopic plutonium, strontium-90, and uranium. Not all of our samples were analyzed for the same suite of constituents.

Analytical preparation methods varied depending on the parameter being measured. Gamma measurements for cesium-137 and americium-241 were made on a processed sample without chemical separation. Alpha spectrometry measurements for plutonium and the beta counting of strontium-90 and kinetic phosphorescence measurement for uranium were done on a digested and chemically separated sample. The metals were digested for total recoverable analysis. The PCBs were extracted from the solids using an appropriate solvent. Ash weight results for total uranium in the one catfish sample from LANL were converted to a dry weight concentration using 0.078 ash weight to dry weight ratio (Fresquez 1998).

Analytical methods are listed below.

Table 1 Analytical Methods

Analyte	Analytical Method
Cesium-137, Americium-241	Instrumental gamma-ray spectrometry using Ge(Li) detectors, without chemical separation
Plutonium	Ion exchange isolation and alpha spectrometry
Strontium-90	Ion exchange isolation and beta counting of daughter yttrium-90
Total Uranium	Kinetic phosphorescence analyses
Lead, Barium, Beryllium, Cadmium	EPA SW-846 methods, digestion by 3005A and 3050A, analyses by 6010A
Mercury	EPA SW-846 methods, analyses by CVAA 7471
Polychlorinated Biphenyls	EPA SW-846, extraction by 3540, cleanup by 3650, analysis by 8081

Data Evaluation and Comparison

We evaluated data quality by reviewing our quality assurance records and our laboratory's quality control parameters. Quality assurance records and procedures were found to be within acceptance criteria. All blanks and duplicates were within acceptance criteria. Except for the insect samples, all matrix spikes and matrix spike duplicates were within acceptance criteria. Due to insufficient sample volume, matrix spikes and matrix spike duplicates could not be run on the insects; instead a blank spike and blank spike duplicate were run.

Our bureau then evaluated the data by comparing it to reference levels and to LANL data. Reference levels included state and EPA guidelines and Regional Statistical Reference Levels (RSRLs). Regional Statistical Reference Levels are LANL's upper limit background concentrations, calculated as the mean plus two standard deviations of regional station measurements (ESP 1997). They are used to evaluate whether levels of contaminants are elevated at on-site or perimeter locations. The state of New Mexico has developed guidelines for the consumption of fish that contain mercury. Guidelines are provided by EPA for the consumption of fish that contain PCBs.

Results and Discussion

All data are included in Appendix A. The following is a discussion of the data.

In general, LANL's measurements were more sensitive than NMED's to the low levels of radionuclides found in these environmental samples.

Seven out of one hundred and eight NMED radionuclide and metal measurements which were at or above RSRLs are shaded in Table 2 below. Only the strontium-90 measurement in deer bone was confirmed by LANL to be above the RSRL.

Table 2 NMED Measurements above RSRLs

Media	Date	Location	Analyte	Units	NMED		LANL		RSRL
					Value	Unc	Value	Unc	
Crabapples	1995	TA-53	Pu-239/240	pCi/g	0.01	0.01	0.0000	0.00008	0.000679
Cucumbers	1996	Jemez	Sr-90	pCi/g	0.13	0.07	0.0667	0.0266	0.0756
Squash	1996	White Rock	Barium	mg/kg	30		10		27.43
Catfish	1995	Cochiti Lake	Uranium	ng/g	16.38	3.12	13.8	3.68	16.2
Deer Bone	1996	TA-21	Sr-90	pCi/g	3.18	0.65	2.193	0.258	1.029
White Bass	1996	Cochiti Lake	Mercury	mg/kg	0.7				0.4
Carp	1996	Cochiti Lake	Mercury	mg/kg	0.4				0.4

Lead concentrations reported by NMED were consistently less than the values reported by LANL. Values reported by NMED ranged from less than method detection limits to 0.4 mg/dry kg for TA-3 Nectarines, TA-35 Crabapples, TA-53 Crabapples, White Rock Squash, San Ildefonso Spinach, TA-3 Pears, TA-21 Apples, TA-35 Peaches, L.A. Townsite Apples and Pena Blanca Green Beans. The eleven paired LANL measurements ranged from 1.6 to 11.6 mg/dry kg.

Mercury concentrations in fish collected by NMED ranged from <0.1 mg/wet kg to 0.7 mg/wet kg. The mean of the NMED samples is 0.3 mg/wet kg which is similar to LANL's mean of bottom feeding fish from Cochiti Reservoir (0.287 mg/wet kg), and to LANL's background mean (0.342 mg/wet kg) from Abiquiu, Heron, and El Vado (ESP 1997). The highest concentration we measured (0.7 mg/wet kg) was in a composite sample of four 10 - 11.5 inch white bass, a surface feeding fish.

Because of concerns about mercury levels in fish, the State of New Mexico has issued fish consumption guidelines due to mercury contamination (NMDOH 1993). Based on a limited number of samples, the State Department of Health has estimated the expected concentration of mercury in fish from New Mexico reservoirs (Merker 1999). For each reservoir and species of fish, the guidance relates length of fish to expected mercury concentration with the longer fish being expected to contain higher concentrations of mercury. The fish consumption guidelines are based on this expected concentration of mercury. Only preliminary consumption guidelines are available for fish in Cochiti Reservoir and are included in Appendix B. Sufficient data has not been collected to relate Cochiti Reservoir white bass length to mercury concentrations. However, based on the measured concentration of 0.7 mg/wet kg in the composite sample, the white bass would fall in Guidance Group 3. Most other fish fell into groups one and two.

Two fish samples from Cochiti Reservoir contained PCBs. PCBs (Aroclor-1260) were reported in a small catfish sample at the quantitation limit of 100 µg/wet kg. A northern pike sample showed Aroclor-1260 at a level of 46 µg/ wet kg, which was below the quantitation limit. The EPA recommends consumption restrictions for fish containing PCBs (EPA 1997). A summary of recommended restrictions which apply to the consumption of fish containing 100 µg/kg PCBs (Aroclor-1254) is included in Appendix B.

A more comprehensive study would be required to define the distribution of mercury and PCBs in Cochiti Reservoir fish based upon trophic level, home range and age class.

Acknowledgments

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Analytical Data
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Table A-1. Flora Radionuclide/Metal analysis 1995 ^a

STATION ID	Date	Radionuclides				Radionuclides				Radionuclides				Radionuclides			
		NMED CS-137 pCi/dry/g	LANL CS-137 pCi/dry/g	UNC ^b	LANL AM-241 pCi/dry/g	NMED AM-241 pCi/dry/g	LANL AM-241 pCi/dry/g	UNC	NMED Pu-238 pCi/dry/g	LANL Pu-238 pCi/dry/g	UNC	NMED Pu-239/240 pCi/dry/g	LANL Pu-239/240 pCi/dry/g	UNC	NMED Pu-239/240 pCi/dry/g	LANL Pu-239/240 pCi/dry/g	UNC
LANL, TA-3 (nectarines)	08/95	<0.053 ^c	BDL ^d	0.048	<0.149	BDL	NA ^e	-	NA	0.0010	0.00020	0.00020	NA	-	0.00160	0.00020	
LANL, TA-35 (crabapples)	09/27/95	<0.051	BDL	0.019	<0.392	BDL	NA	-	NA	0.00000	0.00008	0.00008	NA	-	0.00000	0.00008	
LANL, TA-53 (crabapples)	10/02/95	<0.103	BDL	0.0048	<0.333	BDL	NA	-	<0.02	BDL	0.00028	0.00008	0.01	0.01	0.00004	0.00008	
OFF-SITE White Rock (squash)	08/27/95	<0.106	BDL	0.0476	<0.272	BDL	NA	-	NA	0.00000	0.00000	0.00000	NA	-	0.00014	0.00028	
San Ildefonso (spinach)	08/95	<0.164	BDL	0.048	<0.400	BDL	NA	-	<0.02	BDL	0.00000	0.00000	<0.02	BDL	0.00000	0.00000	
RSRL ^f				0.6901												0.000679	

Metals (mg/dry kg)		LANL	
NMED	Pb	mg/kg	mg/kg
<0.3	<0.3	2.00	2.00
<0.3	<0.3	0.20	0.20
<0.3	<0.3	6.00	6.00
<0.3	<0.3	0.40	0.40
<0.3	<0.3	0.50	0.50
-	-	9.04	9.04

STATION ID	Date	Radionuclides				Radionuclides			
		NMED Sr-90 pCi/dry/g	LANL Sr-90 pCi/dry/g	UNC	LANL Sr-90 pCi/dry/g	NMED Sr-90 pCi/dry/g	LANL Sr-90 pCi/dry/g	UNC	LANL Sr-90 pCi/dry/g
LANL, TA-3 (nectarines)	08/95	<0.12	BDL	0.010	<0.12	BDL	0.020	0.020	0.020
LANL, TA-35 (crabapples)	09/27/95	<0.12	BDL	0.032	<0.12	BDL	0.008	0.008	0.008
LANL, TA-53 (crabapples)	10/02/95	NA	-	0.024	NA	-	0.008	0.008	0.008
OFF-SITE White Rock (squash)	08/27/95	<0.12	BDL	0.014	<0.12	BDL	0.056	0.056	0.056
San Ildefonso (spinach)	08/95	NA	-	0.030	NA	-	0.040	0.040	0.040
RSRL				0.0756					

^a Values reported as a dry weight
^b UNC - Counting uncertainties as reported by contract laboratory (3 sigma)
^c < - Indicates that concentration was not detected above method detection limits
^d BDL - Below detection limits
^e NA - Not analyzed
^f RSRL - LANL's Regional Statistical Reference Level: the upper limit background concentration mean + 2 standard deviations from long term data

Table A-2. Flora Radionuclide analysis 1996 *

STATION ID	DATE	NMED C-137 (pCi/g)	LANL C-137 (pCi/g)	NMED Am-241 (pCi/g)	LANL Am-241 (pCi/g)	NMED Pu-238 (pCi/g)	LANL Pu-238 (pCi/g)	NMED Pu-239/240 (pCi/g)	LANL Pu-239/240 (pCi/g)
ON-SITE LANL, TA-3 (peas)	08/16/96	<0.101 ^b BDL ^c	-0.0034 0.01488	<0.347 BDL	0.000251 0.000118	0.00 0.01	0.0 0.000019	0.00 0.01	0.000019 0.000025
LANL, TA-21 (apples)	08/16/96	<0.076 BDL	0.0025 0.00288	<0.262 BDL	0.000169 0.000086	-0.01 0.12	0.000011 0.000036	0.00 0.01	0.000043 0.000050
LANL, TA-35 (peaches)	08/17/96	<0.099 BDL	0.0365 0.01672	<0.374 BDL	0.000015 0.000076	0.00 0.03	0.000015 0.000076	0.00 0.01	-0.000008 0.000076
OFF-SITE PERIMETER L.A. Townsite (apples)	08/96	<0.153 BDL	-0.0065 0.0173	<0.649 BDL	-0.000011 0.000173	0.00 0.01	0.000014 0.000038	0.00 0.01	0.000090 0.000079
Pena Blanco(green beans)	08/96	<0.125 BDL	0.0125 0.00936	<0.585 BDL	0.000273 0.000137	0.00 0.01	0.000016 0.000109	0.00 0.02	0.000226 0.000187
San Ildefonso (tea) ^d	07/3/96	<6.33 BDL	NA ^e	<3.5 BDL	NA	0.00 0.07	NA	-0.01 0.08	NA
White Rock (squash)	08/14/96	<0.288 BDL	0.0236 0.0707	<1.32 BDL	0.000563 0.000419	0.00 0.01	-0.000052 0.000157	0.00 0.01	0.000249 0.000314
OFF-SITE REGIONAL Jemez (cucumbers)	08/96	<0.335 BDL	0.0466 0.1383	<1.50 BDL	0.00004 0.000213	0.00 0.02	-0.00008 0.000027	0.00 0.01	0.000106 0.000133
RSRL ^f		-	0.690	-	0.000522	-	0.000354	-	0.000679
STATION ID	DATE	NMED Sr-90 (pCi/g)	LANL Sr-90 (pCi/g)	NMED Cs-137 (pCi/g)	LANL Cs-137 (pCi/g)	NMED Pu-238 (pCi/g)	LANL Pu-238 (pCi/g)	NMED Pu-239/240 (pCi/g)	LANL Pu-239/240 (pCi/g)
ON-SITE LANL, TA-3 (peas)	08/16/96	<0.12 BDL	-0.0062 0.062	<0.101 ^b BDL ^c	-0.0034 0.01488	0.00 0.01	0.0 0.000019	0.00 0.01	0.000019 0.000025
LANL, TA-21 (apples)	08/16/96	<0.11 BDL	-0.0072 0.0072	<0.076 BDL	0.0025 0.00288	-0.01 0.12	0.000011 0.000036	0.00 0.01	0.000043 0.000050
LANL, TA-35 (peaches)	08/17/96	<0.13 BDL	0.0076 0.0152	<0.099 BDL	0.0365 0.01672	0.00 0.03	0.000015 0.000076	0.00 0.01	-0.000008 0.000076
OFF-SITE PERIMETER L.A. Townsite (apples)	08/96	<0.11 BDL	0.0576 0.0216	<0.153 BDL	-0.0065 0.0173	0.00 0.01	0.000014 0.000038	0.00 0.01	0.000090 0.000079
Pena Blanco(green beans)	08/96	<0.12 BDL	0.156 0.1716	<0.125 BDL	0.0125 0.00936	0.00 0.01	0.000016 0.000109	0.00 0.02	0.000226 0.000187
San Ildefonso (tea) ^d	07/3/96	<0.70 BDL	NA	<6.33 BDL	NA ^e	0.00 0.07	NA	-0.01 0.08	NA
White Rock (squash)	08/14/96	<0.12 BDL	0.0262 0.0524	<1.32 BDL	0.000563 0.000419	0.00 0.01	-0.000052 0.000157	0.00 0.01	0.000249 0.000314
OFF-SITE REGIONAL Jemez (cucumbers)	08/96	0.13 0.07	0.0667 0.0566	<0.335 BDL	0.0466 0.1383	0.00 0.02	-0.00008 0.000027	0.00 0.01	0.000106 0.000133
RSRL ^f		-	0.0756	-	0.000522	-	0.000354	-	0.000679

* Values reported as a dry weight
^b msc - Counting uncertainties as reported by contract laboratory (2 sigma)
^c < - Indicates that constituent was not detected above method detection limits
^d BDL - Below detection limits
^e - Independent sample, reported as pCi/L
^f NA - Not analyzed
^g RSRL - LANL's Regional Statistical Reference Level; the upper-limit background concentration mean + 2 standard deviations from long term data

Table A-3. Flora trace metal analysis 1996 ^a

STATION ID ON-SITE	DATE	Ba		Be		Cd		Pb		
		NMED mg/kg	LANL mg/kg	NMED mg/kg	LANL mg/kg	NMED mg/kg	LANL mg/kg	NMED mg/kg	LANL mg/kg	
LANL, TA-3 (pears)	08/16/96	<10 ^b	6.58	<0.5	<0.12 ^c	<0.5	<0.24 ^c	<0.3	11.6	
LANL, TA-21 (apples)	08/16/96	<10	3.33	<0.5	<0.12	<0.5	<0.24	0.3	6.2	
LANL, TA-35 (peaches)	08/17/96	<10	2.49	<0.5	<0.12	<0.5	<0.24	<0.3	4.3	
OFF-SITE PERIMETER										
L.A Townsite (apples)	08/96	<10	2.27	<0.5	<0.12	<0.5	<0.24	<0.3	3.3	
Pena Blanca(green beans)	08/96	<10	8.22	<0.5	<0.12	<0.5	<0.24	<0.3	4.4	
San Ildefonso (tea) ^d	07/3/96	0.2	NA ^e	<0.005	NA	<0.005	NA	<0.003	NA	
White Rock (squash)	08/14/96	30	10.00	<0.5	<0.12	<0.5	<0.24	0.4	1.6	
	RSRL ^f	-	27.43	-	0.53	-	0.46	-	22.0	

^a Values reported as a dry weight

^b < indicates that constituent was not detected above method detection limits by NMED's contract Laboratory

^c < indicates that constituent was not detected above method detection limits by LANL (this number is reported by LANL as one-half the concentration in the ESR 96.)

^d Independent samples, reported as pCi/L

^e NA - Not analyzed

^f RSRL - LANL's Regional Statistical Reference Level: the upper limit background concentration mean + 2 standard deviations from long term data

Table A-4. Fauna Radionuclide analysis 1995 ^a

STATION ID	DATE	Radionuclides										
		NMED C-137 (pCi/dry wt) UMC ^b	LANL C-137 (pCi/dry wt) UMC	NMED Am-241 (pCi/dry wt) UMC	LANL Am-241 (pCi/dry wt) UMC	NMED Pu-238 (pCi/dry wt) UMC	LANL Pu-238 (pCi/dry wt) UMC	NMED Pu-239/240 (pCi/dry wt) UMC	LANL Pu-239/240 (pCi/dry wt) UMC			
Cochiti Lake (Catfish ashed)	06/14/95	<0.0178 ^c BDL ^d	0.0083	0.0258	NA ^e	-	<0.00156 BDL	0.0	0.0	<0.00078 BDL	0.0	0.0
RSRL ^f		-	0.2690	-	-	-	-	-	0.000098	-	-	0.000192
		NAMED Total-U (mg/dry wt) UMC		LANL Total-U (mg/dry wt) UMC								
Cochiti Lake (Catfish ashed)	06/14/95	16.38	3.12	13.8	3.68							
RSRL ^f		-	16.2	-	-							

Table A-5. Fauna Radionuclide analysis 1996 ^a

STATION ID	DATE	Radionuclides								
		NMED C-137 (pCi/dry wt) UMC ^b	LANL C-137 (pCi/dry wt) UMC	NMED Am-241 (pCi/dry wt) UMC	LANL Am-241 (pCi/dry wt) UMC	NMED Sr-90 (pCi/dry wt) UMC	LANL Sr-90 (pCi/dry wt) UMC			
TA-21/State Road 502 (Deer Bone)	11/25/96	<0.093 ^c BDL ^d	0.0	0.206	0.00043	0.000344	3.18	0.65	2.193	0.258
RSRL ^f		-	0.0079	-	0.00043	-	-	-	1.029	-
		NMED's selected Metals analysis mg/dry wt								
		Lead mg/kg	Barium mg/kg	Beryllium mg/kg	Cadmium mg/kg					
TA-21/State Road 502 (Deer Bone)	11/25/96	< ^g	200	<0.5	<0.5					

^a Values reported as a dry weight
^b UNC - Counting uncertainties as reported by contract laboratory (2 sigmas)
^c < - Indicates that constituent was not detected above method detection limits
^d BDL - Below detection limits
^e NA - Not analyzed
^f RSRL - LANL's Regional Statistical Reference Level; the upper limit background concentration mean + 2 standard deviations from long term data.
^g Detection limit raised. Sample obtained to reduce matrix interference

Table A-6. Fauna Polychlorinated Biphenyls/Mercury analysis 1996^a

STATION ID	Date	PCB's (ug/kg)								Mercury mg/kg
		1016	1221	1232	1242	1248	1254	1260		
<u>Upper Cochiti Lake</u> Northern										
Pike (skinned) ^b	08/08/96	<100 ^c	<100	<100	<100	<100	<100	<100	46j ^d	0.1
Northern Pike (with skin) ^b	08/08/96	<100	<100	<100	<100	<100	<100	<100	<100	0.1
White Bass ^e	08/08/96	<100	<100	<100	<100	<100	<100	<100	<100	0.7
Catfish (large)	08/08/96	<100	<100	<100	<100	<100	<100	<100	<100	0.2
Catfish (small)	08/08/96	<100	<100	<100	<100	<100	<100	<100	100	<0.1
Carp	08/08/96	<100	<100	<100	<100	<100	<100	<100	<100	0.4
Crappie	06/12/96	<100	<100	<100	<100	<100	<100	<100	<100	NA ^f
Bluegill	06/12/96	<100	<100	<100	<100	<100	<100	<100	<100	NA
<u>Sandia Canyon Insects</u>										
Damsel Flies (2.55g)	07/29/96	<390	<390	<390	<390	<390	<390	<390	<390	NA
Dragon Flies (4.87g)	07/30/96	<210	<210	<210	<210	<210	<210	<210	<210	NA

^a PCBs/Mercury reported as a wet weight

^b Pike samples are from the same fish

^c < indicates that constituent was not detected above method detection limits

^d j flag indicates value detected below normal reported limit but above instrument detection limits

^e Composite of 4 small fish

^f NA - Not analyzed

Appendix B
Fish Consumption Guidelines
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Table B-1 Mercury Consumption Guidelines for Fish

Summary of State of New Mexico consumption groups, estimated mercury concentrations, and size-based consumption guidelines for Cochiti Reservoir fish

(From Preliminary Guidelines for Cochiti Reservoir, Issued December 1991 in NMDOH 1993 and by Merker 1999)

Concentration Range	Detect - 0.25	0.26 - 0.50	0.51 – 0.75	0.76 and Greater
Guideline Group	Group 1	Group 2	Group 3	Group 4
Channel Catfish	L.T. 13 in	13 - 19 in	19 – 26 in	G.T. 26 in
Black Crappie	L.T. 8 in	Unknown	Unknown	Unknown
Walleye				All Sizes

L.T. = less than
G.T. = greater than

The relationship of mercury concentration to fish consumption guideline groups is shown above. The published guidelines are based on an estimated relationship of concentration to fish length. According to the estimates, a fish of a specific length is expected to contain mercury in the concentration indicated in the guideline group.

The consumption guidelines are as follows:

Group I Fish: Women who are pregnant should not eat more than one meal per month of fish this size. No other restrictions apply.

Group II Fish: Fish of this size should not be eaten by pregnant women, breast feeding women, women who plan to have children or anyone under the age of 18. Everyone else should not eat more than 26 meals of this fish in a year and no more than 13 of these 26 meals should be consumed in one month. It is advised that the remaining meals be evenly spaced throughout the year.

Group III Fish: Fish of this size should not be eaten by pregnant women, breast feeding women, women who plan to have children or anyone under the age of 18. Everyone else should eat no more than 13 meals of this fish in a year and no more than seven of the 13 meals in any single month. It is advised that the remaining meals be evenly spaced over the remainder of the year.

Group IV Fish: Fish of this size should not be eaten.

Table B-2 Polychlorinated Biphenyl Consumption Guidelines for Fish

Summary of recommended restrictions, which apply to the consumption of fish containing 100 µg/wet kg PCBs (Aroclor-1254)

From *Guidance for Assessing Chemical Contaminant Data for Use in Fish Advisories, Volume 2, Risk Assessment and Fish Consumption Limits*, EPA, 1997.

Endpoint	3 or 4 oz. Meal Size	12 or 16 oz. Meal Size
Chronic Systemic Health Endpoints for the General Population	No more than three 4 oz. Meals per month	No more than six 16 oz. meals per year
Developmental Health Endpoints for Women of Reproductive Age	No more than three 4 oz. Meals per month	No more than six 16 oz. meals per year
Developmental Health Endpoints for Children	No more than one 3 oz. Meal per month and no more than six 4 oz. meals per year	No meals should be consumed
Carcinogenic Health Endpoints for the General Population (Total PCBs)	No meals of 4 oz. or greater should be consumed	No meals should be consumed

The table uses Aroclor 1254 for risk calculation with the exception of the carcinogenic health endpoints which use total PCBs. Carcinogenic health endpoints are based on a 10^{-6} cancer risk calculation using an adult body weight of 70 kg and a cancer potency factor of 2.0 per mg/kg/d.

