Forestry Herbicide Residues in Plants Important to California Tribal People

R. Segawa, C. Ando, K.S. Goh, L. Li
Roger Sava, Carissa Gana, Johanna Walters
Department of Pesticide Regulation

P. Lee, J. Hsu, D. Tran, J. White, H. Feng,
T. Mok, J. Hernandez, C. Cooper
Center for Analytical Chemistry
California Dept. Food & Agriculture

Outline

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Introduction

- U.S. Forest Service's herbicide applications
- California Tribes' plant uses
- Herbicide exposure concerns
- Lack of residue and exposure data
- Tribes, CIBA, USFS consultations

Objectives

- Dissipation:
  - How soon can I return to the treated areas to gather ?
- Off-Site Movement:
  - How close to the treated areas can I gather?

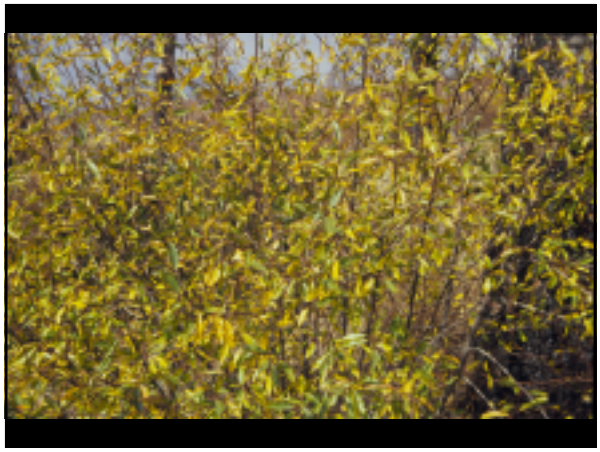
Materials & Methods Monitoring Sites

- Lassen National Forest
- Eldorado National Forest
- Stanislaus National Forest
- Sierra National Forest

Basketry Plants

- Buckbrush Shoot (Ceanothus cuneatus)
- Deerbrush Shoot (Ceanothus integerrimus)
- Soaproot Bulb (Chlorogalum pomeridianum)
- Dogwood Shoot (Cornus spp)
- Deergrass Stalk (Muhlenbergia rigens)
- Bittercherry Shoot (Prunus emarginata)
- Braken Fern Root (Pteridium aquilinum var. pubescens)
- Willow Shoot (Salix. spp)

Deergrass



Medicinal Plants

- Pearly everlasting foliage (Anaphalis margaritacea)
- Golden fleece foliage (Ericameria arborescens)

Pearly everlasting

Golden Fleece

Food Plants

- Manzanita berries (Arctostaphylos spp)
- Acorns (Quercus spp)
- Watercress foliage (Rorippa nasturtium-aquaticum)
- Elderberry berries (Sambucus mexicana)

Manzanita Berries

Black Oak Acorns

Elderberry

Phyllis Montgomery

The Herbicides

- Ground Application
  - Glyphosate (Accord®)
  - Hexazinone (Velpar® L)
  - Triclopyr (Garlon® 4)
- Air Application
  - Hexazinone (Pronone® 10G)

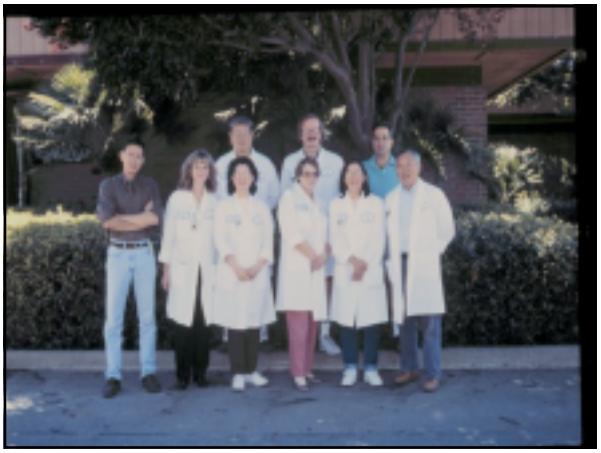
Field Sampling

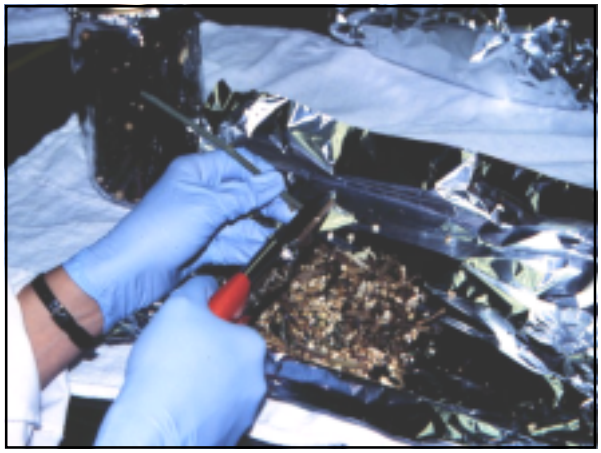
12 wks Pronone

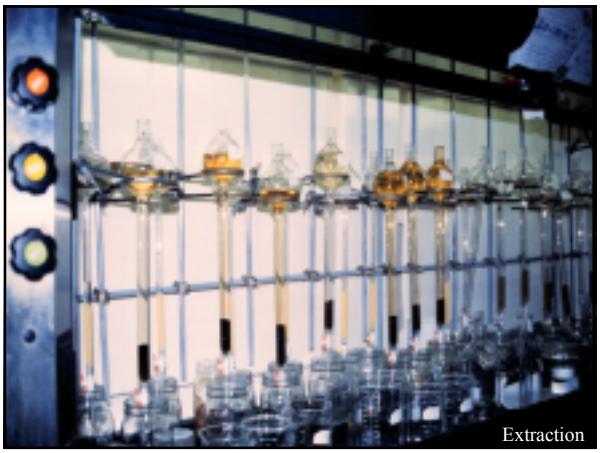
Bracken fern

12 wks Pronone

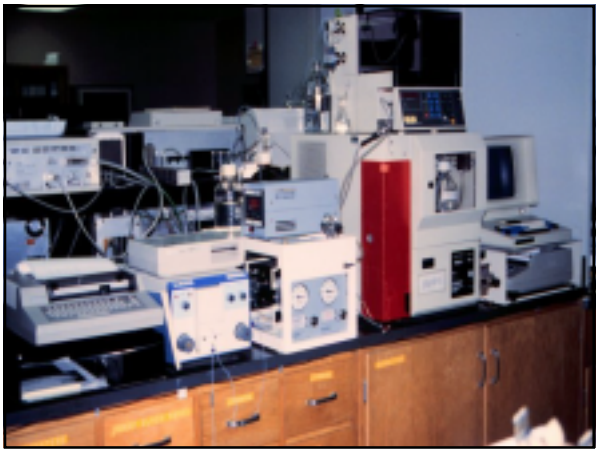
Herbicide Residue Analysis







Extraction



Analytical Methods

Reporting Limit (ppm)

Plant	Glyphosate	Hexazinone	Triclopyr
bitter cherry shoot	0.10	0.10	0.07
bracken fern root	0.10	0.07	0.03
buckbrush shoot	0.10	0.10	0.10
deer brush shoot	0.10	0.10	0.03
deergrass stalk	0.10	0.05	0.05
dogwood shoot	0.10	0.10	0.03
elderberry fruit	0.10	0.05	0.01
golden fleece foliage	0.10	0.10	0.07
manzanita berry	0.10	0.05	0.03
oak acorn	0.10	0.10	0.01
pearly everlasting	0.10	0.20	0.07
soaproot bulb	0.10	0.05	0.03
watercress foliage	0.10	0.05	not analyzed
willow shoot	0.10	0.05	0.03

Results and Discussion

Offsite movement

Table 1. Offsite movement of herbicides by national forests, 1997-1999.

Forest	5-15 ft	20-40 ft	50-70 ft	80-100 ft	No. Sample Taken	% Offsite
Eldorado	3	2	1	1	64	10.9
Sierra	1	1	1	0	48	6.3
Stanislaus	4	1	3	1	208	4.3
Lassen	0	0	0	0	8	0
Total	**8**	**4**	**5**	**2**	**328**	**5.8**

Table 2. Offsite movement of herbicides (ppm)

Chemical	5-15 ft	20-40 ft	50-70 ft	80-100 ft
Glyphosate	0.1	-	-	-
"	0.101	-	-	-
"	0.121	-	-	-
"	0.197	-	-	-
"	2.68	-	-	-
"	-	0.11	-	-
"	-	0.1-1	-	-
Pronone	0.1-1	-	0.1-1	-
"	-	-	0.131	-
Triclopyr	1.56	0.07	0.06	0.03
"	0.03-0.3	0.03-0.3	0.03-0.3	-
Velpar	-	-	0.673	-
"	-	-	-	0.124

Table 3. Offsite movement of herbicides by plants

Media	Chemical	5-15 ft	20-40 ft	50-70 ft	80-100 ft
Buckbrush	Glyphosate	0.1	-	-	-
"	"	-	0.11	-	-
"	Pronone	-	-	0.131	-
"	Velpar	-	-	0.673	-
"	"	-	-	-	0.124
Deerbrush	Glyphosate	-	0.1-1	-	-
"	"	2.68	-	-	-
"	"	0.121	-	-	-
"	"	0.197	-	-	-
"	"	0.101	-	-	-
"	Pronone	0.1-1	-	0.1-1	-
"	Triclopyr	1.56	0.07	0.06	0.03
"	"	0.03-0.3	0.03-0.3	0.03-0.3	-

Table 3. Offsite movement of herbicides by time

Post Application (weeks)	Chemical	5-15 ft	20-40 ft	50-70 ft	80-100 ft
0	Glyphosate	0.1	-	-	-
0	Glyphosate	0.197	-	-	-
0	Glyphosate	2.68	-	-	-
0	Pronone	0.1-1	-	0.1-1	-
0	Pronone	-	-	0.131	-
0	Triclopyr	1.56	0.07	0.06	0.03
0	Triclopyr	0.03-0.3	0.03-0.3	0.03-0.3	-
0	Velpar	-	-	-	0.124
4	Glyphosate	0.101	-	-	-
4	Glyphosate	0.121	-	-	-
12	Glyphosate	-	0.1-1	-	-
12	Glyphosate	-	0.11	-	-
12	Velpar	-	-	0.673	-

Dissipation

Fig. 1 Herbicide dissipation in plants

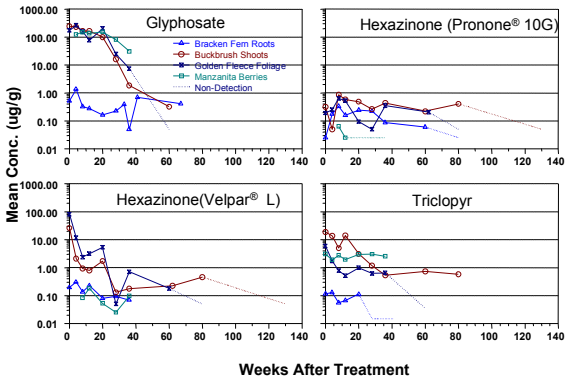
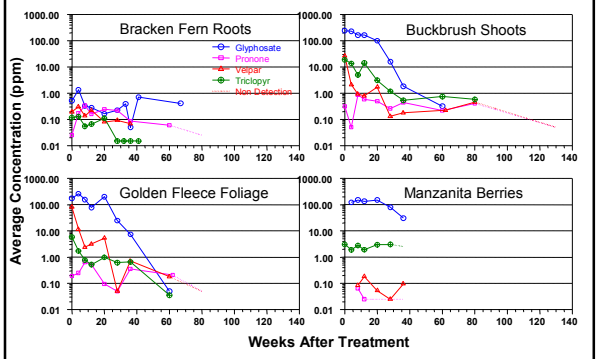


Figure 2. Plant materials on the dissipation of herbicides



Average herbicide half-life (weeks) in plants (p=0.10)

Herbicide	Bracken Fern Roots	Buckbrush Shoots	Golden Fleece Foliage	Manzanita Berries
Glyphosate	11.5	9.8	8.2	n/a
Pronone	n/a	n/a	n/a	1.7
Velpar	18.5	17.6	0.6	n/a
Triclopyr	6.1	2.4	5.1	n/a

Conclusions

1) • Small amounts of herbicides were detectable in some plants for at least 1.5 years
• Do not gather from treated areas for 1.5 years

2) • Offsite movements are minor at 5.8 %
• Gather beyond 100 feet from treated areas

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Lassen National Forest

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Analytical Method Validation

	% Recovery			
Herbicide	Bracken Fern Roots	Buckbrush Shoots	Golden Fleece Foliage	Manzanita Berries
Glyphosate	76.9	86.4	90.0	95.3
Hexazinone	88.1	94.3	89.4	90.0
Triclopyr	77.8	86.2	69.7	86.2

Nine spiked samples for each herbicide and plant: 3 conc. x 3 reps

Storage Stability

	% Loss			
Herbicide	Bracken Fern Roots	Buckbrush Shoots	Golden Fleece Foliage	Manzanita Berries
Glyphosate	56	39	0	0
Hexazinone	0	27.5	0	73.9
Triclopyr	87	82	0	0.3

Spiked samples stored for nine weeks at -20 °C