

AGRICULTURAL EXPERIMENT STATION ANALYTICAL LABORATORY SERVICES GUIDE



**MONTANA STATE UNIVERSITY
McCall Hall, Bozeman MT 59717-3620**

Phone: (406)994-3383

Fax: (406)994-4494

<http://ag.montana.edu/analyticallab>

Revised: September 2008

ABOUT US

Mission Statement

The mission of the AES Analytical Laboratory is to provide reliable, efficient analytical services to the public on nutritional and toxic substances in forage, animal feed, fertilizer, soil and water.

What We Offer

- Comprehensive quality control and quality assurance for all laboratory procedures
 - State of the art instrumentation and sound, validated methods
 - Use of official AOAC, NFTA, EPA and FDA methods
 - Regular participation in proficiency testing
 - Long-term contracts at stable, reduced charges
 - Consultation to ensure the client's results provides the right information at minimum cost
-

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GENERAL INFORMATION

Sample Submission

- Fill out appropriate sample submission form (page 5 or 11). Ensure each sample is uniquely identified.
- If shipping pesticides or other toxic material, please review the regulations of the U.S. Department of Transportation (DOT) to comply with their shipping regulations.

Interpretation of Analytical Results

- If you are not sure what to test your samples for or need help understanding your results, consult with your County Extension Agent or other resources listed on page 7.

Confidentiality

- Analytical data is confidential and provided only to the person who submitted the samples and paid for the analytical services.
- Copies of the report of analyses may be sent to other parties if requested.

Sample Security

- Sample security is recommended for regulatory or litigation situations for a fee of \$25.00 per sample.
- Notify the laboratory by checking the sample security box located on the sample submission form.
- Sample security insures strict chain-of-custody procedures are followed and a chain-of-custody report is included with the analytical report.

Sample Disposal

- Non-perishable samples are disposed four weeks after reporting.
- Perishables are disposed two weeks after reporting.

Pricing and Discounts

- Fees exceeding \$200.00 must be paid in advance before the analytical results are released. The invoice is sent by fax to the responsible party. The analytical report is released when payment is received.
- Out-of-State customers: 10% surcharge
- Sample security charge: \$25.00 per sample.
- Multiple sample discounts are available. See schedule below.

Discount Schedule

To be eligible for the discount, samples must be submitted at the same time for the same test.

Samples	Discount
1	No Discount
2-5	15% Discount
6-20.....	20% Discount
>21.....	Contact the laboratory

Estimated Sample Turn-Around Time

Pesticide.....	10 - 14 working days
Commercial Feed, Fertilizer and Nutrition.....	7 - 10 working days

NOTE: Turn around time is dependent on the number of samples submitted, analyses requested and the laboratory sample backlog.

NON-PESTICIDE SAMPLE SUBMISSION

Hay/Straw/Other Feedstuffs

- Sample size: ~ 1 - 2 pounds.
 - Sampling:
 - a. Walk the field in a “W” pattern and take a sample at each point of the W.
 - b. Probe hay bales or stacks. Do not mix different types or cuttings of forage. Take as many cores as possible, at least twenty per stack or field, more for larger or heterogeneous lots.
 - c. Cut standing plants to obtain the same portion as would be harvested (or eaten).
 - d. Do not pull up plants by their roots and do not include soil in the sample.
 - Shipping:
 - a. Ship wet sample in a plastic bag. Ice (“blue ice”) the package to prevent spoilage.
 - b. Ship samples for nitrate only in a paper bag.
 - c. Dry material such as baled hay can be shipped in plastic zipper bags.
-

Haylage/Silage

- Sample Size: ~ 1 - 4 pounds.
 - Sampling: Collect several grab samples to ensure a representative sample is obtained.
 - Shipping:
 - a. Ship in airtight containers (well-sealed double plastic bag or plastic bottle).
 - b. To prevent loss of components (water, ammonia, etc.) and spoilage, freeze samples and pack with blue ice. Use a container with flexible sides and do not fill completely full.
-

Grain

- Sample size: ~ 1 - 2 pounds.
 - Sampling: Use a large grain probe for sampling.
 - Shipping: Ship in a plastic or paper bag.
-

Commercial Feed and Fertilizer

- Sample size: ~ 1 - 2 pounds.
 - Sampling:
 - a. Include a claim label to expedite the turn around time.
 - b. Mix liquid feeds in the storage tank before sampling.
 - Shipping:
 - a. Ship dry samples in a plastic bag.
 - b. Ship liquid samples in glass or polyethylene bottles.
-

Water (for non-pesticide analysis)

- Sample size: ~ 1 - 2 quarts.
- Sampling: Contact the laboratory for more information.
- Shipping: Use U.S. EPA guidelines. This information is available from the laboratory.

Agricultural Experiment Station Analytical Laboratory McCall Hall, Rm. 10 MSU Bozeman, MT 59717-3620 Phone: 406-994-3383 Fax: 406-994-4494	Non-Pesticide Sample Submission Form & Fees	Date Received: _____
		Sample Number: _____

		Invoice Number: _____

Bill to:	Report to:
Attn:	Attn:
Address:	Address:
City: St. Zip	City St. Zip
Phone:	Phone:
Fax:	Fax:

SAMPLE DESCRIPTION: (check one or more)			
<input type="checkbox"/> Alfalfa hay	<input type="checkbox"/> Oat hay	<input type="checkbox"/> Wheat straw	<input type="checkbox"/> Concentrate (need tag)
<input type="checkbox"/> Alfalfa-grass hay	<input type="checkbox"/> Pea hay	<input type="checkbox"/> Wheatgrass hay (crested)	<input type="checkbox"/> Fertilizer (need tag)
<input type="checkbox"/> Barley hay	<input type="checkbox"/> Pea and oat hay	<input type="checkbox"/> Wheatgrass hay (slender)	<input type="checkbox"/> Water
<input type="checkbox"/> Barley straw	<input type="checkbox"/> Peas (whole)	<input type="checkbox"/> Small grain	<input type="checkbox"/> Biological
<input type="checkbox"/> Grass hay	<input type="checkbox"/> Timothy hay	<input type="checkbox"/> Mixed grain ration	<input type="checkbox"/> Other _____
<input type="checkbox"/> Orchard grass hay	<input type="checkbox"/> Wheat hay	<input type="checkbox"/> Commercial Feed (need tag)	

ANALYSIS REQUESTED:		
FEED & FORAGE	DRUGS, VITAMINS & AMINO ACIDS	ELEMENTAL
<input type="checkbox"/> Acid Detergent Fiber (ADF)\$15.00	<input type="checkbox"/> Amprolium\$75.00	<input type="checkbox"/> Arsenic\$35.00
<input type="checkbox"/> Ash\$5.00	<input type="checkbox"/> Chlortetracycline\$75.00	<input type="checkbox"/> Cadmium\$35.00
<input type="checkbox"/> Crude Fat\$12.00	<input type="checkbox"/> Lasalocid\$75.00	<input type="checkbox"/> Calcium\$20.00
<input type="checkbox"/> Crude Fiber\$12.00	<input type="checkbox"/> Lysine\$150.00	<input type="checkbox"/> Copper\$20.00
<input type="checkbox"/> Crude Protein\$12.00	<input type="checkbox"/> Methionine\$150.00	<input type="checkbox"/> Iron\$20.00
<input type="checkbox"/> Cyanide\$20.00	<input type="checkbox"/> Monensin\$75.00	<input type="checkbox"/> Lead\$35.00
<input type="checkbox"/> Moisture\$5.00	<input type="checkbox"/> Oxytetracycline\$75.00	<input type="checkbox"/> Magnesium\$20.00
<input type="checkbox"/> Neutral Detergent Fiber (NDF)\$15.00	<input type="checkbox"/> Sulfamethazine\$75.00	<input type="checkbox"/> Manganese\$20.00
<input type="checkbox"/> Nitrate\$12.00	<input type="checkbox"/> Vitamin A\$75.00	<input type="checkbox"/> Phosphorus\$20.00
<input type="checkbox"/> Non-protein Nitrogen (urea)\$20.00	WATER	<input type="checkbox"/> Potassium\$20.00
<input type="checkbox"/> Relative Feed Value with Protein\$45.00	<input type="checkbox"/> Alkalinity (mg CaCO ₃ /L)\$12.00	<input type="checkbox"/> Selenium\$35.00
• Includes: ADF, Crude Protein, Moisture, & NDF	<input type="checkbox"/> Hardness (mg CaCO ₃ /L)\$12.00	<input type="checkbox"/> Sodium\$20.00
<input type="checkbox"/> Salt\$25.00	<input type="checkbox"/> Nitrate\$12.00	<input type="checkbox"/> Zinc\$20.00
<input type="checkbox"/> TDN from ADF with Protein\$30.00	<input type="checkbox"/> Nitrate/Nitrite as Nitrogen\$25.00	<input type="checkbox"/> Elemental Screen\$150.00
• Includes: ADF, Crude Protein, & Moisture	<input type="checkbox"/> pH\$6.00	• Includes: Calcium, Copper, Iron, Magnesium, Manganese, Phosphorus, Potassium, Sodium, & Zinc
<input type="checkbox"/> TDN by Proximate analysis\$40.00	<input type="checkbox"/> Sulfate\$12.00	
• Includes: Ash, Crude Protein, Fat, Fiber, & Moisture	<input type="checkbox"/> Total Dissolved Solids (TDS)\$12.00	
	FERTILIZER	
	<input type="checkbox"/> K ₂ O, Soluble\$25.00	
	<input type="checkbox"/> Nitrogen, Total\$25.00	
	<input type="checkbox"/> P ₂ O ₅ , available\$25.00	

NON-PESTICIDE FEED DEFINITIONS

Feed test results are of little value unless they are understood and used. Results can be used to: (1) balance rations, (2) improve future crop management if present forage is of unsatisfactory quality, and (3) determine equitable prices for forages based on nutritive value.

ACID DETERGENT FIBER (ADF) is the portion of fiber that is composed of cellulose and lignin. ADF is related to forage digestibility (energy) and is used to calculate forage total digestible nutrients (TDN) or net energy (NE) for hay, haylage and corn silage. Forages lower in ADF are usually higher in energy.

CRUDE PROTEIN (CP) is represented by the total amount of nitrogen present when analyzed and then multiplied by a conversion factor of 6.25. This is based on the assumption that true protein contains 16% nitrogen. The term crude protein is used because it represents all of the nitrogen that is in the form of non-protein nitrogen (NPN) such as nitrates, ammonia, urea and single amino acids, as well as the nitrogen present as true protein. As plants mature, the crude protein usually decreases.

CRUDE FAT contains fat and other compounds soluble in ether. Fat contains 2.25 times the energy found in carbohydrates and proteins. It is added to rations to boost energy concentration when intake may be limiting.

CYANIDE (Prussic acid) plants that may have high cyanide potential are sorghum, sudan grass and corn. Danger of cyanide poisoning is greatest at the immature stages of growth and decreases with maturity.

DRY MATTER BASIS (DM) feeds or nutrients listed on a dry matter basis (dry weight) refers to the quantity of feed after the water is removed, i.e. after the sample has been dried to 100% dry matter. This is used as a basis for comparing feeds and estimating intakes.

FIBER is the portion of the plant that provides the plant's structural strength and form. Generally, the vegetative parts, especially the stem, have the highest fiber content. Seed hulls and/or coats also often contain fiber. Fiber is composed of several different types of compounds and is the major constituent of plant cell walls. The components of fiber that provide the 'fiber' value are hemicellulose, cellulose and lignin. An adequate amount of digestible fiber is required in the diet of ruminants for efficient production and health. Fiber values in plants are a function of the growing conditions and maturity. As plants mature, the fiber levels increase.

MINERALS are the inorganic element of animals and plants and are determined by burning off the organic matter and weighing the residue (ASH). It is the ash that represents the minerals. Minerals can be measured in percent (%), grams (g), parts per million (ppm) or milligrams per kilogram (mg/kg).

NEUTRAL DETERGENT FIBER (NDF) is the portion of fiber that is composed of hemicellulose, cellulose and lignin. NDF is related to feed intake or bulk and can be used in ration formulation to predict forage intake and quality. Forages low in NDF are usually of high quality and have high levels of intake.

NET ENERGY FOR MAINTENANCE (NE_m) is an estimate of the energy value of a feed to maintain animal tissue without gain or loss of weight. NE_m is used in formulating beef and sheep rations for maintenance plus energy for pregnancy and lactation.

NET ENERGY FOR GAIN (NE_g) is an estimate of the energy value of a feed used for body weight gain above that required for maintenance. It is used in ration balancing for beef and sheep when gain is desired.

NITRATE levels toxic to livestock frequently occur in forage crops, particularly in small grains grown under drought stress. In addition to forages and other feeds, drinking water can contribute to nitrate toxicity.

RELATIVE FEED VALUE (RFV) is used in feed marketing and comparisons, not in balancing a ration for animals. This term is useful for comparing forages of the same type. It is calculated as digestible dry matter divided by dry matter intake. Digestible dry matter is a function of ADF, and dry matter intake is a function of NDF. Therefore the fiber components have an integral affect on RFV. The relative feed value for grasses is usually lower than for mixed or legume forages. This is due to the higher fiber values associated with grasses, especially the NDF. For this reason it is questionable to compare the relative feed value of different species.

NON-PESTICIDE FEED DEFINITIONS

TOTAL DIGESTIBLE NUTRIENTS (TDN) is derived from animal studies by measuring the percentage of digestible carbohydrates, digestible protein and digestible fat (x 2.25). TDN values for hay, haylage and corn silage, however, can also be calculated on a dry matter basis using the forage Acid Detergent Fiber (ADF) analysis.

TDN FROM PROXIMATE ANALYSIS was developed over 100 years ago in an attempt to use chemical determinations to describe the value of feeds for animals. The proximate factors used as components are crude fiber (CF); crude protein (CP); crude fat, often stated as ether extract, EE; nitrogen-free extract, NFE; and ash. The most widely used proximate component analysis has been for crude protein.

(3) CP (%) = % Nitrogen x 6.25.

*Reference: Range Animal Nutrition J. E. Huston and W. E. Pinchak, Texas A&M University System
OMAFRA Information Sheet, unpublished, Pioneer Forage Manual, A Nutritional Guide, Pioneer Hi-Bred International Inc. Des Moines, Iowa.
Nitrate Toxicity of Montana Forages by Dennis Cash, Rick Funston, Marc King and Dave Wichman
Cyanide Poisoning in Livestock M. Bohosiewicz*

Extension Service Resource Directory of Specialists for Technical Assistance

Agronomy and Hay Specialist
Dr. Dennis Cash, dcash@montana.edu
406-994-5688

Animal Range/Grazing Specialist
Dr. Jeff Mosley, jmosley@montana.edu
406-994-5601

Beef Cattle Specialist
John Paterson, johnp@montana.edu
406-994-5562

Gallatin County Health Department
406-582-3120

Horse Specialist
Sandy Gagnon, gagnon@montana.edu
406-994-6623

Montana Department of Agriculture
Agricultural Sciences Division
PO Box 200201
Helena, MT 59620-0201
406-444-3144

Montana Department of Livestock
Veterinary Diagnostic Laboratory
PO Box 997
Bozeman, MT 59771
406-994-4885

Natural Resource Conservation Service
Bozeman - Provide Recommendation for Soil Analysis
406-587-6956

Pesticide Education Specialist
Cecil Tharp, ctharp@montana.edu
406-994-5067

Your local County Extension Agent

Plant Pathology
Barry Jacobsen, uplbj@montana.edu
406-994-5161

Plant Pathology, Small Grain
John Sherwood, sherwood@montana.edu
406-994-5171

Poisonous Algae - Diagnostic Lab
406-994-4885

Sheep and Wool Specialist
Dr. Rodney Kott, rkott@montana.edu
406-994-3415

Soil Fertility Specialist
Clain Jones, clainj@montana.edu
406-994-6076

Swine Specialist
Dr. Wayne Gipp, wgipp@montana.edu
406-994-3415

Tillage & Coalbed methane drilling Specialist
Dr. James Bauder, jbauder@montana.edu
406-994-5685

Water for Human Consumption: Public Health and Human
Services, Laboratory Services Bureau
406-444-3444

Water Quality Specialist
Gene Surber, gsurber@montana.edu
406-994-1971

Wildlife, Predator Management Specialist
Roy Fenster, rfenster@montana.edu
406-994-5579

Your local County Health Department
Your local Veterinarian

EQUATIONS FOR CALCULATING NUTRITIONAL VALUES

1. Total Digestible Nutrients (TDN)

- a. TDN from proximate analysis: (Moisture, ash, crude protein, fat and crude fiber)

$$\text{TDN} = \text{dig. Protein} + \text{dig. N-free extract} + \text{dig. Fiber} + 2.25 (\text{dig. Fat})$$

For digestion coefficient of selected feedstuff use the following table:

Use the following table for Digestion Coefficients				
Feed	% Crude Protein	% Crude Fat	% Crude Fiber	% NFE Extract
Alfalfa Hay	71	30	45	70
Alfalfa-grass Hay	64	29	50	62
Barley Hay	55	47	50	67
Barley Straw	19	42	57	45
Grass Hay	50	47	61	62
Oat Hay	60	65	51	57
Orchard Grass Hay	52	42	62	59
Pea Hay	71	48	51	73
Pea & Oat Hay	71	52	60	62
Peas (Whole)	86	64	50	93
Timothy Hay	50	44	61	60
Wheat Hay	54	42	41	62
Wheat Straw	8	41	52	47
Wheat grass Hay (Crested)	71	43	64	54
Wheat grass Hay (Slender)	58	31	61	62

Example: Alfalfa Hay

Moisture	10%	Crude Protein	16%
Crude Fat	2%	Crude Fiber	30%
Ash	8%		

$$\text{TOTAL} = 66\%$$

$$\text{Nitrogen Free Extract (NFE)} = 100\% - 66\% = 34\%$$

$$\% \text{TDN} = 16\%(0.71) + 34\%(0.70) + 30\%(0.45) + 2.25[2(0.30)] = 50.01\%$$

- b. TDN from Acid Detergent Fiber (ADF) analysis: (for most hay samples)

$$\text{TDN} = 96.35 - (\text{ADF} \% \times 1.15) \quad \text{ADF is on a dry weight basis}$$

2. Digestible Dry Matter (DDM): Can be calculated from ADF analysis.
 $\text{DDM} = 88.9 - (\text{ADF}\% \times 0.779)$

3. Dry Matter Intake (DMI): Can be calculated from Neutral Detergent Fiber (NDF) analysis. $DMI = \frac{120}{NDF}$

4. Various energy equations are used from ADF analysis.

a. Metabolized Energy (ME) = 0.0362 x TDN from ADF

b. Net Energy Gain (NE_G) $\frac{1.42 ME - 0.174 ME^2 + 0.0122 ME^3 - 1.65}{2.2}$

c. Net Energy Maintenance (NE_M) $\frac{1.37 ME - 0.13 ME^2 + 0.0105 ME^3 - 1.12}{2.2}$

5. Acid Detergent Protein (ADP):

In order to determine ADP, ADF and then nitrogen have to be analyzed on the same sample portion.

Acid Detergent N x 6.25 = ADP

6. Relative Feed Value (RFV): Calculated by performing both ADF and NDF analyses. DDM and DDI also need to be calculated in order to utilize the equation for RFV. RFV is used when buying or selling forages.

$$RFV = \frac{DDM \times DMI}{1.29}$$

RELATIVE FEED VALUE (RFV) TABLE	
AFGC Quality Standards	RFV
Prime	>151
1	125 - 150
2	103 - 124
3	87 - 102
4	75 - 86
5	<75



PESTICIDE SAMPLE SUBMISSION

Sample Submission

- The laboratory **MUST** be notified of sample submission **PRIOR** to shipment or personal delivery. **Contact the laboratory at 406-994-3383.**
- Complete the Pesticide Sample Submission Form. Please provide **all** information requested.

Sample Size

- Vegetation: ~ 3/4 of a pound in a secure container.
- Soil: ~ 1/2 to 3/4 pound in a secure container.
- Water: ~ two one-quart glass bottles 2/3 full.
- Other: Contact the laboratory for instructions.

Shipping

- Freeze soil and vegetation samples and refrigerate water prior to shipping.
- **PLEASE** ship **OVERNIGHT** on ice or blue ice in a cooler so samples remain refrigerated during shipment. Ship on Monday-Thursday so that the sample arrives on a weekday.
- Use care when packaging samples to ensure damage does not occur during shipment.
- **Do not ship on Friday or during a holiday.**

PESTICIDE ANALYSIS FEES

PRICES Effective September 2008		
Matrix	Individual	Multi-Residue
Water	\$150.00	\$400.00
Soil:	\$200.00	\$250.00
Vegetation	\$250.00	\$300.00



PESTICIDE SAMPLE SUBMISSION FORM

Ship To:
Agriculture Experiment Station Analytical Laboratory Montana State University McCall Hall, Rm. 10 Bozeman, MT 59717-3620 Phone: 406-994-3383 Fax: 406-994-4494

Lab Use Only
Date Received:
Delivered Via:
Invoice Number:

Customer Use Only	
Sample Security: (\$25 per sample) <input type="checkbox"/> YES <input type="checkbox"/> NO	
Bill To:	Report To:
Attn:	Attn:
Address:	Address:
City: St: Zip:	City: St: Zip:
Phone:	Phone:
Fax:	Fax:

Lab Use Only	Customer Use Only		
Laboratory Sample Number	Sample ID	Sample Type (veg/soil/water)	Analysis Requested

For more information go to: <http://ag.montana.edu/analyticalab>

PESTICIDE REFERENCE LIST

NOTE: Not every pesticide and/or metabolite is available for testing in every matrix. If needed, call the laboratory for consulting services.

2,4,5-T	Carboxin	Endrin	Imazapic glucoside
2,4-D	Chlorfenvinphos	Epoxiconazole	Imazapyr
2,4-DP	Chlorimuron ethyl	Esfenvalerate	Imazaquin
3-OH carbofuran	Chlorothalonil	Ethametsulfuron methyl	Imazethapyr
AMPA	Chlorpyrifos	Ethion	Imazethapyr alcohol
Acetochlor	Chlorpyrifos methyl	Ethoprop	Imazethapyr glucoside
Acetochlor ESA	Chlorsulfuron	Ethyl Parathion	Imidacloprid
Acetochlor OA	Clopyralid	Fenamiphos	Imine
Alachlor	Cloransulam methyl	Fenbuconazole	Isoxazole
Alachlor ESA	Cyanazine	Fenitrothion	Lindane
Alachlor OA	Cycloate	Fenpropathrin	Linuron
Aldicarb	Cyfluthrin	Fenthion	MCPA
Aldicarb sulfone	Cyhalothrin, Total	Fenvalerate	MCPB
Aldicarb sulfoxide	Cypermethrin	Flufenacet OA	MCPP
Aldrin	Cyphenothrin	Flumetsulam	Malathion
Alpha Chlordane	Cyproconazole	Fluometuron	Metalaxyl
Alpha-BHC	Deethyl atrazine	Fluroxypryr	Methidathion
Aminopyralid	Deisopropyl atrazine	Fluvalinate	Methomyl
Atrazine	Deltamethrin	Gamma Chlordane	Methoxychlor
Azinphos Methyl	Diazinon	Glutaric acid	Methyl Parathion
Azinphos methyl oxon	Dicamba	Glyphosate	Metolachlor
Azoxystrobin	Dichlorprop	Heptachlor Epoxide	Metolachlor ESA
Bensulfuron methyl	Dichlorvos	HCB	Metolachlor OA
Bentazon	Dieldrin	Halosulfuron methyl	Metribuzin
Beta-BHC	Difenoconazole	Heptachlor	Metribuzin DA
Bifenthrin	Dimethenamid	Hexaconazole	Metribuzin DADK
Bromacil	Dimethenamid OA	Hexazinone	Metribuzin DK
Bromoxynil	Dimethoate	Hydroxy atrazine	Metsulfuron methyl
Bromuconazole-46	Dinoseb	Imazalil	Mevinphos
Bromuconazole-47	Disulfoton	Imazamethabenz acid	Mirex
Butachlor	Disulfoton sulfone	Imazamethabenz methyl ester	Myclobutanil
Butylate	Disulfoton sulfoxide	Imazamox	NOA 407854
Carbaryl	Diuron	Imazapic	NOA 447204
Carbofuran	EPTC	Imazapic alcohol	Neburon

PESTICIDE REFERENCE LIST

Nicosulfuron	Propachlor	Tebuthiuron	Triasulfuron
Omethoate	Propachlor OA	Tefluthrin	Tribenuron methyl
Oxazole	Propanil	Terbacil	Triclopyr
Oxychlorane	Propazine	Terbufos	Triflurosulfuron methyl
Parathion ethyl	Propiconazole	Terbutryn	Trione
Parathion methyl	Prosulfuron	Tetrachlorvinphos	Triticonazole
Parathion methyl oxon	Resmethrin	Tetraconazole	cis-permethrin
Pendimethalin	Rimsulfuron	Tetradifon	p,p'-DDD
Phenothrin	Rotenone	Tetramethrin	p,p'-DDE
Phorate	Rotenone plus enantiomers	Thifensulfuron	p,p'-DDT
Phosmet	SYN-505164	Thifensulfuron methyl	trans-permethrin
Picloram	Siduron	Thiobencarb	zeta-Cypermethrin
Pinoxaden	Simazine	Toxaphene	
Prallethrin	Strychnine	Tralkoxydim	
Primisulfuron methyl	Sulfometuron methyl	Tralkoxydim acid	
Prometon	Sulfosulfuron	Triadimefon	
Prometryn	Sulprofos	Triadimenol	
Pronamide	Tebuconazole	Triallate	





*Analytical Services in Support of
Montana Agriculture*