

Attachment 1

Section 1: Introduction to Study

Hi, my name is _____ and I'm calling on behalf of TNR, an independent public opinion research company. We're conducting a survey about important issues in San Luis (Lew-iss) Obispo (O-biss-po) County and we would like to get your opinions.

If needed: This is a survey about important issues in your community. I'm NOT trying to sell anything and I won't ask for a donation.

If needed: The survey should take about 10 minutes to complete.

If needed: If now is not a convenient time, can you let me know a better time so I can call back?

If the person says they are an elected official or is somehow associated with the survey, politely explain that this survey is designed to measure the opinions of those not closely associated with the survey, thank them for their time, and terminate the interview.

Section 2: Age & Gender Screener

For statistical reasons, I would like to speak to the youngest adult male currently at home that is at least 18 years of age. *(if there is no male currently at home that is at least 18 years of age, then ask):* Ok, then I'd like to speak to the youngest female currently at home that is at least 18 years of age.

(If there is no adult currently available, then ask for a callback time.)

NOTE: Adjust this screener as needed to match sample quotas on gender & age

If respondent asks why we want to speak to a particular demographic group, explain: Its important that the sample of people for the survey is representative of the adult population in the County for it to be statistically reliable. At this point, we need to balance our sample by asking for people who fit a particular demographic profile.

Section 3: ZIP Screener

SC1	To begin, what is the zip code at your residence? <i>(Read zip code back to them to confirm correct)</i>		
	1	Cambria	93428
	2	Templeton	93465
	3	Los Osos/Baywood Park	93402, 93412
	4	Oceano	93445, 93475
	5	Nipomo	93444
	6	Other	Any Other Zip Code
			<i>Terminate</i>

Section 4: Importance of Issues & Environmental Problems							
Q1	For each of the following issues, please tell me how important you feel the issue is to you, using a scale of extremely important, very important, somewhat important or not at all important.						
	Here is the first issue: _____. Do you think this issue is extremely important, very important, somewhat important, or not at all important?						
	<i>Randomize</i>	Extremely Important	Very Important	Somewhat Important	Not at all Important	Not sure	Refused
A	Improving public education	1	2	3	4	98	99
B	Preserving open space	1	2	3	4	98	99
C	Protecting water quality	1	2	3	4	98	99
D	Reducing stormwater pollution	1	2	3	4	98	99
E	Improving public safety	1	2	3	4	98	99
F	Reducing global warming	1	2	3	4	98	99

Section 5: Knowledge & Awareness of Stormwater Pollution					
Q2	Next, I'm going to read a series of statements. For each I read, I'd like you to tell me whether you agree or disagree with the statement.				
	Here is the (first/next) one: _____. Do you agree or disagree?				
	<i>Ask in Order</i>	Agree	Disagree	Not sure	Refused
A	Water that flows through street gutters and storm drains goes through a treatment facility before being released into the ocean.	1	2	98	99
B	Stormwater pollution is primarily caused by commercial businesses.	1	2	98	99
C	Stormwater runoff is the leading cause of water pollution in the County	1	2	98	99
D	I live far enough away from the ocean that I don't have an impact on ocean water quality.	1	2	98	99
E	Local governments, businesses and residents are all responsible for reducing stormwater pollution.	1	2	98	99

Q3	Overall, how informed do you feel about the causes of stormwater pollution in your area? Would you say you feel well informed, somewhat informed, slightly informed, or not at all informed?	
	1	Well-informed
	2	Somewhat-informed
	3	Slightly informed
	4	Not at all informed
	98	Not sure (<i>Don't read</i>)
	99	Refused (<i>Don't read</i>)
Q4	Do you think there are actions that residents in your area can take to reduce stormwater pollution?	
	1	Yes <i>Ask Q5</i>
	2	No <i>Skip to intro preceding Q6</i>
	98	Not sure (<i>Don't read</i>) <i>Skip to intro preceding Q6</i>
	99	Refused (<i>Don't read</i>) <i>Skip to intro preceding Q6</i>
Q5	What actions can they take to reduce stormwater pollution? <i>Probe: Any others? Do NOT read options. Continue to probe up to 5 responses.</i>	
	1	Pick up trash and litter that is in the gutter near their property/Prevent trash and litter from getting into gutter
	2	Dispose of hazardous wastes properly
	3	Use less toxic chemicals for gardening , or switch to more environmentally friendly options
	4	Use less toxic chemicals for household cleaning , or switch to more environmentally friendly options
	5	Reduce/Reuse/Recycle
	6	Don't use disposable plastic shopping bags, food or beverage containers
	7	Maintain septic system properly
	8	Pick up after pet
	9	Maintain car to prevent oil leaks
	10	Recycle used motor oil
	11	Vegetate bare spots in yard so soil does not wash away
	12	Wash car at a car wash or on lawn - not in driveway or on the street
	13	Use a broom to clean driveway or sidewalk rather than spraying it with a hose
	14	Other <i>Specify</i>
	98	Don't Know/Not Sure

99	Refused	
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Section 6: Reducing Stormwater Pollution – Personal Behavior

We recognize that people have very demanding schedules and lifestyles. Making changes to reduce stormwater pollution can be difficult for many people, and impossible for others. For these next few questions, please give us your honest opinions.

Q6 In the past 12 months, have you taken any actions **specifically** for the purpose of reducing stormwater pollution?

1	Yes	Ask Q7
2	No	Skip to Q8
98	Not sure (<i>Don't read</i>)	Skip to Q8
99	Refused (<i>Don't read</i>)	Skip to Q8

Q7 What actions did you take to reduce stormwater pollution? *Probe: Any others? Do NOT read options. Allow up to 3 responses.*

1	Picked up trash and litter that is in the gutter near their property/Prevented trash and litter from getting into gutter	
2	Disposed of hazardous wastes properly	
3	Used less toxic chemicals for gardening , or switched to more environmentally friendly options	
4	Used less toxic chemicals for household cleaning , or switched to more environmentally friendly options	
5	Reduced/Reused/Recycled	
6	Reduced use disposable plastic shopping bags, food or beverage containers	
7	Maintained septic system properly	
8	Picked up after pet	
9	Maintained car to prevent oil leaks	
10	Recycled used motor oil	
11	Vegetated bare spots in yard so soil does not wash away	
12	Washed car at a car wash or on lawn – not in driveway or on the street	
13	Used a broom to clean driveway or sidewalk rather than spraying it with a hose	
14	Other	<i>Specify</i>
98	Don't Know/Not Sure	
99	Refused	

Q8	Looking forward to the next 12 months, are there any actions that you are willing to take to reduce stormwater pollution?								
	1	Yes	Ask Q9						
	2	No	Skip Q10						
	98	Not sure (<i>Don't read</i>)	Skip Q10						
	99	Refused (<i>Don't read</i>)	Skip Q10						
Q9	Some actions are easier for people to take than others. As I read each of the following actions, please indicate how difficult it would be for you to take this action using a scale from one to five. A one means that it would be easy for you to take the action, whereas a five means it would be very difficult for you to take the action. You can use any number between one and five. If the action doesn't apply to you for some reason, just say so. <i>Make sure respondent understands the scale.</i>								
	<i>Randomize</i>		Easy (1)	2	3	4	Very Difficult (5)	Doesn't Apply	Refused
A	Pick up trash and litter that is in the gutter near your property		1	2	3	4	5	98	99
B	Dispose of household hazardous wastes by taking them to a collection center		1	2	3	4	5	98	99
C	Use gardening products that are less toxic and better for the environment		1	2	3	4	5	98	99
D	Use household cleaning products that are less toxic and better for the environment		1	2	3	4	5	98	99
E	Reduce your use disposable plastic shopping bags, food or beverage containers by at least 25%		1	2	3	4	5	98	99
F	Pick up pet waste on your property and put it in the trash, even if it is not from your pet		1	2	3	4	5	98	99
G	Fix your car immediately if you notice any oil stains on your driveway or under your car		1	2	3	4	5	98	99
H	Recycle your used motor oil		1	2	3	4	5	98	99
I	Wash your car at a carwash or on your lawn, not in your driveway or on the street		1	2	3	4	5	98	99
J	Fix your sprinklers so they do not wash soil into the street		1	2	3	4	5	98	99
K	Keep your trash and recycling bins covered to prevent litter from blowing into the street		1	2	3	4	5	98	99
L	Vegetate bare spots in your yard so that soil does not wash away		1	2	3	4	5	98	99
M	Use a broom to clean your driveway or sidewalk rather than spraying it with a hose		1	2	3	4	5	98	99

Section 7: Pollution-Causing Activities								
Q10	How often do you see the following in your neighborhood: _____? At least once per week, two to three times per month, once per month, several times per year, or never?							
	<i>Randomize</i>	At least once per week	2 to 3 times per month	Once per month	Several times per year	Never	Doesn't Apply	Refused
A	Dog waste being left in the street, sidewalk or gutter	1	2	3	4	5	98	99
B	Cars being washed in the driveway or in the street	1	2	3	4	5	98	99
C	People washing or blowing leaves or yard waste off their property into the street or gutter	1	2	3	4	5	98	99
D	People using pesticides or fertilizers on their lawns or gardens	1	2	3	4	5	98	99
E	Trash bins left uncovered so that litter is blown into the street	1	2	3	4	5	98	99
F	People hosing down their driveway or the sidewalk to clean it	1	2	3	4	5	98	99
G	People pouring or spilling motor oil into the street or on the ground	1	2	3	4	5	98	99
H	People washing paint brushes in the street or gutter	1	2	3	4	5	98	99
I	Driveways or parking spaces that have fresh oil spots due to vehicle oil leaks	1	2	3	4	5	98	99
Q11	Prior to taking this survey, were you aware that there was a local hotline you could call to report activities that are causing stormwater pollution?							
	1	Yes						
	2	No						
	98	Not sure (<i>Don't read</i>)						
	99	Refused (<i>Don't read</i>)						
Q12	If someone in your neighborhood was causing stormwater pollution, would you be willing to dial an anonymous hotline so that the person could be notified to stop the activity?							
	1	Yes						
	2	No						
	98	Not sure (<i>Don't read</i>)						
	99	Refused (<i>Don't read</i>)						

Section 8: Media & Message Exposure		
Q13	Let's change gears a bit. In the past three months, have you heard, read, or seen any new stories or public service announcements about stormwater pollution and ways that residents can prevent it?	
	1	Yes <i>Ask Q14</i>
	2	No <i>Skip to Q17</i>
	98	Not sure (<i>Don't read</i>) <i>Skip to Q17</i>
Q14	Where did you see or hear the public service announcement? <i>Don't read choices. Probe: Any other sources? Record all mentions.</i>	
	1	Television
	2	Radio
	3	Newspaper
	4	Website
	5	Brochure
	6	Other
	98	Not sure (<i>Don't read</i>)
Q15	Did the public service announcement have a character or mascot in it?	
	1	Yes <i>Ask Q16</i>
	2	No <i>Skip to Q17</i>
	98	Not sure (<i>Don't read</i>) <i>Skip to Q17</i>
Q16	Can you name or describe the character? <i>Don't read options.</i>	
	1	Sammy the Steelhead <i>Skip to intro preceding D1</i>
	2	A fish/trout <i>Skip to intro preceding D1</i>
	3	Other <i>Ask Q17</i>
	98	Not sure (<i>Don't read</i>) <i>Ask Q17</i>
Q17	Prior to taking this survey, do you recall seeing or hearing a public service announcement in which a fish called "Sammy the Steelhead" talked about ways to prevent stormwater pollution?	
	1	Yes
	2	No
	98	Not sure (<i>Don't read</i>)

Section 9: Background/Demographics		
Thank you so much for your participation. I have just a few background questions for statistical purposes.		
D1	How long have you lived in San Luis (Lew-iss) Obispo (O-biss-po) County?	
	1	Less than 1 year
	2	1 to 4 years
	3	5 to 9 years
	4	10 to 14 years
	5	15 years or longer
	99	Refused
D2	In what year were you born?	
		<i>Record two-digit year: 19__ (range = 00 to 91)</i>
	99	Refused (<i>Don't read</i>)
D3	How many children under the age of 18 do you have in your household?	
		<i>Record number of children (range = 0 to 9)</i>
	99	Refused (<i>Don't read</i>)
D4	Do you own or rent your residence?	
	1	Own
	2	Rent
	99	Refused
D5	Which of the following best describes your home?	
	1	Detached, single-family home
	2	Townhome
	3	Condominium
	4	Apartment
	5	Mobile home
	99	Refused

D1	What is the last grade or level you completed in school? (<i>Don't read choices</i>)	
	1	Elementary (8 or fewer years)
	2	Some high school (9 to 11 years)
	3	High school graduate (12 years)
	4	Technical / Vocational school
	5	Some college
	6	College graduate
	7	Some graduate school
	8	Graduate, professional, doctorate degree (DDS, DVM, JD, LLM, MA, MS, MBA, MD, PhD)
	98	No opinion/Not sure
	99	Prefer not to answer
D2	What ethnic group do you consider yourself a part of or feel closest to? <i>Read list if respondent hesitates.</i>	
	1	Caucasian/White
	2	Latino/Hispanic/Mexican
	3	African-American/Black
	4	American Indian or Alaskan Native
	5	Asian -- Korean, Japanese, Chinese, Vietnamese, Filipino or other Asian
	6	Pacific Islander
	7	Mixed Heritage
	98	Other
	99	Refused
<p>Those are all of the questions that I have for you! Thanks so much for participating in this important survey!</p>		

Post-Interview & Sample Items

S1	Gender (<i>Determined by voice of respondent</i>)	
	1	Male
	2	Female
S2	Language of Interview	
	1	English
	2	Spanish

Attachment 2

Current Run For Example

Spot Calendar By Station

SANTA BARBARA Television

Client: San Luis Obispo County-Environmental Programs Div
 Brand/Product: environmental division / environmental division
 Campaign: TV - SLO County Env.Pro 2008
 Flight: 04/28/2008 - 06/29/2008
 Sweeps: Share Feb 07 -> HUT/PUT Jul 06
 Station: KSBY, CHARC

Barnett Cox & Associates
 711 Tank Farm Rd., Ste. 210
 San Luis Obispo, CA 93401



Buyer: Shari Clark
 Rate: Station Gross
 Estimate:

Weekly Distribution

STN	DAYS	TIME	LEN	PROGRAM	Apr	May	May	May	May	Jun	Jun	Jun	Jun	SPOTS	GRP's	P 18+ DMA (R) RTG	CPP
					28	05	12	19	26	02	09	16	23				
KSBY																	
PA	MTWTF--	05:00 pm - 08:00 pm		NEWS/JEP/WHEEL	0	2	2	2	1	0	1	0	1	9	43.2	4.8	52.08
PA	MTWTF--	06:00 am - 09:00 am		DAYBK/TODAY	0	2	2	2	0	1	0	1	0	8	21.6	2.7	46.30
EM	MTWTFSS	06:00 am - 12:00 am		BONUS ROTATOR	0	4	4	4	1	1	1	1	1	17	32.3	1.9	0.00
KSBY Weekly Dollars					0	750.00	750.00	750.00	250.00	125.00	250.00	125.00	250.00				
KSBY Weekly GRP's					0	22.6	22.6	22.6	6.7	4.6	6.7	4.6	6.7				
KSBY Spot Totals					0	8	8	8	2	2	2	2	2	34	97.1		33.47
CHARC																	
PT/FXNC	MTWTF--	04:00 pm - 12:00 am		FOX NEWS	0	5	5	5	5	2	2	2	2	28	22.4	0.8	52.50
PT/AEN	--TFSS	04:00 pm - 12:00 am		AEN	0	5	5	5	5	2	2	2	2	28	5.6	0.2	0.00
PT/TNT	MTWTF--	04:00 pm - 12:00 am		TNT	0	3	5	5	3	1	1	1	1	20	6.0	0.3	116.67
PT/HIS	MTWTF--	04:00 pm - 12:00 am		HISTORY	0	3	5	5	3	1	1	1	1	20	6.0	0.3	0.00
CHARC Weekly Dollars					0	315.00	385.00	385.00	315.00	119.00	119.00	119.00	119.00				
CHARC Weekly GRP's					0	6.8	8	8	6.8	2.6	2.6	2.6	2.6				
CHARC Spot Totals					0	16	20	20	16	6	6	6	6	96	40		46.90
Weekly Schedule Cost					0	24	28	28	18	8	8	8	8	130	137.1		37.39

Spot Length Breakout
 # Spots

Spot Calendar By Station

SANTA BARBARA Television

Client: San Luis Obispo County-Environmental Programs Div
 Brand/Product: environmental division / environmental division
 Campaign: TV - SLO County Env.Pro 2008
 Flight: 04/28/2008 - 06/29/2008
 Sweeps: Share Feb 07 -> HUT/PUT Jul 06
 Station: KSBY, CHARC



Barnett Cox & Associates
 711 Tank Farm Rd., Ste. 210
 San Luis Obispo, CA 93401

Buyer: Shari Clark
 Rate: Station Gross
 Estimate:

Weekly Distribution

STN	DAYS	TIME	LEN	PROGRAM	RATE	COST
KSBY						
PA	MTWTF--	05:00 pm - 08:00 pm		NEWS/JEP/WHEEL	250.00	2,250.00
PA	MTWTF--	06:00 am - 09:00 am		DAYBK/TODAY	125.00	1,000.00
EM	MTWTFSS	06:00 am - 12:00 am		BONUS ROTATOR	0.00	.00
KSBY Weekly Dollars						
KSBY Weekly GRP's						
KSBY Spot Totals						3,250.00
CHARC						
PT/FXNC	MTWTF--	04:00 pm - 12:00 am		FOX NEWS	42.00	1,176.00
PT/AEN	---TFSS	04:00 pm - 12:00 am		AEN	0.00	.00
PT/TNT	MTWTF--	04:00 pm - 12:00 am		TNT	35.00	700.00
PT/HIS	MTWTF--	04:00 pm - 12:00 am		HISTORY	0.00	.00
CHARC Weekly Dollars						
CHARC Weekly GRP's						
CHARC Spot Totals						1,876.00
Weekly Schedule						
Cost						5,126.00

Spot Length Breakout
 # Spots

TV Reach & Frequency Distribution

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Market: SANTA BARBARA
 Client: San Luis Obispo County-Environmental Programs I
 Brand: environmental division
 Product: environmental division
 Campaign: TV - SLO County Env.Pro 2008
 Flight Dates: April 28, 2008 - June 29, 2008
 Survey: Share February 07 -> HUT/PUT July 06 (NSI)

Buyer: Shari Clark
 Estimate:
 Curve Type: MRP, Weeks: 9
 Station: AEN, FXNC, HIS, KSBY, TNT



Date: 5/5/2008 12:27:49 PM

Demo: P 18+ Pop: 477,430

Station	Spots	Cost	GRPs	CPP	CPR	Reach %	Frequency
AEN	28	0.00	5.6	0.00	0.00	4.8	1.2
FXNC	28	1,176.00	22.4	52.50	64.97	18.1	1.2
HIS	20	0.00	6.0	0.00	0.00	5.4	1.1
KSBY	34	3,250.00	97.1	33.47	79.08	41.1	2.4
TNT	20	700.00	6.0	116.67	129.63	5.4	1.1
Market	130	5,126.00	137.1	37.39	86.88	59.0	2.3

Attachment 3

Some representative screen shots from the Sammy the Steelhead TV PSAs



Attachment 4

Current Run For Example

Spot Calendar By Station

SAN LUIS OBISPO Radio

Client: San Luis Obispo County-Environmental Programs Div
 Brand/Product: environmental division / environmental division
 Campaign: Radio - SLO Cnty EnvPro 2008
 Flight: 04/28/2008 - 06/29/2008
 Sweeps: Fall 06, Spring 06
 Station: KKJG-FM, KSTT-FM, KZOZ-FM

Barnett Cox & Associates
 711 Tank Farm Rd., Ste. 210
 San Luis Obispo, CA 93401



Buyer: Shari Clark
 Rate: Station Gross
 Estimate:

Weekly Distribution

STN	DAYS	TIME	LEN	FORMAT	Apr	May	May	May	May	Jun	Jun	Jun	Jun	SPOTS	GRP's	P 18+		
					28	05	12	19	26	02	09	16	23			MSA (R)	RTG	CPP
KKJG-FM																		
DA	-T-TF--	06:00 am - 07:00 pm	30	Country	0	4	5	5	2	1	0	1	0	18	19.8	1.1	36.36	40.00
DA	--WTF--	06:00 am - 07:00 pm	30	Country	0	4	5	5	2	1	0	1	0	18	19.8	1.1	0.00	0.00
	NON-PROFIT BONUS																	
KKJG-FM Weekly Dollars					0	160.00	200.00	200.00	80.00	40.00	0	40.00	0					
KKJG-FM Weekly GRP's					0	8.8	11	11	4.4	2.2	0	2.2	0					
KKJG-FM Spot Totals					0	8	10	10	4	2	0	2	0	36	39.6		18.18	
KSTT-FM																		
DA	-T-TF--	06:00 am - 07:00 pm	30	Adult Contemporary	0	4	5	5	2	0	1	0	1	18	23.4	1.3	21.54	28.00
DA	MTW----	06:00 am - 07:00 pm	30	Adult Contemporary	0	4	5	5	2	0	1	0	1	18	23.4	1.3	0.00	0.00
	BOGO SALE																	
KSTT-FM Weekly Dollars					0	112.00	140.00	140.00	56.00	0	28.00	0	28.00					
KSTT-FM Weekly GRP's					0	10.4	13	13	5.2	0	2.6	0	2.6					
KSTT-FM Spot Totals					0	8	10	10	4	0	2	0	2	36	46.8		10.77	
KZOZ-FM																		
DA	-T-TF--	06:00 am - 07:00 pm	30	Classic Rock	0	4	5	5	2	1	0	1	0	18	14.4	0.8	47.50	38.00
DA	MTW----	06:00 am - 07:00 pm	30	Classic Rock	0	4	5	5	2	1	0	1	0	18	14.4	0.8	0.00	0.00
	NON-PROFIT BONUS																	
KZOZ-FM Weekly Dollars					0	152.00	190.00	190.00	76.00	38.00	0	38.00	0					
KZOZ-FM Weekly GRP's					0	6.4	8	8	3.2	1.6	0	1.6	0					
KZOZ-FM Spot Totals					0	8	10	10	4	2	0	2	0	36	28.8		23.75	
Weekly Schedule					0	24	30	30	12	4	2	4	2	108	115.2		16.56	
Cost																		
Spot Length Breakout																		
# Spots																		
30					0	24	30	30	12	4	2	4	2	108	115.2		16.56	

Report Date: 5/5/2008

Spot Calendar By Station

SAN LUIS OBISPO Radio

Client: San Luis Obispo County-Environmental Programs Div
 Brand/Product: environmental division / environmental division
 Campaign: Radio - SLO Cnty EnvPro 2008
 Flight: 04/28/2008 - 06/29/2008
 Sweeps: Fall 06, Spring 06
 Station: KKJG-FM, KSTT-FM, KZOZ-FM



Barnett Cox & Associates
 711 Tank Farm Rd., Ste. 210
 San Luis Obispo, CA 93401

Buyer: Shari Clark
 Rate: Station Gross
 Estimate:

Weekly Distribution

STN	DAYS	TIME	LEN	FORMAT	COST
KKJG-FM					
DA	-T-TF--	06:00 am - 07:00 pm	30	Country	720.00
DA	--WTF--	06:00 am - 07:00 pm	30	Country	.00
	NON-PROFIT BONUS				
KKJG-FM Weekly Dollars					
KKJG-FM Weekly GRP's					
KKJG-FM Spot Totals					720.00
KSTT-FM					
DA	-T-TF--	06:00 am - 07:00 pm	30	Adult Contemporary	504.00
DA	MTW----	06:00 am - 07:00 pm	30	Adult Contemporary	.00
	BOGO SALE				
KSTT-FM Weekly Dollars					
KSTT-FM Weekly GRP's					
KSTT-FM Spot Totals					504.00
KZOZ-FM					
DA	-T-TF--	06:00 am - 07:00 pm	30	Classic Rock	684.00
DA	MTW----	06:00 am - 07:00 pm	30	Classic Rock	.00
	NON-PROFIT BONUS				
KZOZ-FM Weekly Dollars					
KZOZ-FM Weekly GRP's					
KZOZ-FM Spot Totals					684.00
Weekly Schedule					
Cost					1,908.00
Spot Length Breakout					
# Spots					
30					1,908.00

Report Date: 5/5/2008

Radio Reach & Frequency

powered by SmartPlus®

Market: SAN LUIS OBISPO
 Client: San Luis Obispo County-Environmental Programs I
 Brand: environmental division
 Product: environmental division
 Campaign: Radio - SLO Cnty EnvPro 2008
 Flight Dates: April 28, 2008 - June 29, 2008
 Survey: Fall 06, Spring 06 (ARB)

Buyer: Shari Clark
 Estimate:
 Curve Type: MRP
 Station: KKJG-FM, KSTT-FM, KZOZ-FM



Date: 5/5/2008 4:44:00 PM

Demo: P 18+ MSA Pop: 209,000

Station	Spots	Cost	GRPs	CPP	CPM	CPR	GRIs (00)	Net Reach (00)	Reach %	Frequency
KKJG-FM	36	720.00	39.6	18.18	9.52	50.35	756	298	14.3	2.8
KSTT-FM	36	504.00	46.8	10.77	5.60	31.90	900	331	15.8	3.0
KZOZ-FM	36	684.00	28.8	23.75	11.18	57.00	612	251	12.0	2.4
Market	108	1,908.00	115.2	16.56	8.41	52.27	2,268	763	36.5	3.2

Attachment 5 Samples of Some of the Key Print Materials Available for Residential Audiences

***Note: Not all pieces are available due to their size. Some pieces are not available in electronic formats or are copyright protected.**



Sammy the Steelhead Trout here

Did you know that stormwater runoff is a leading cause of water pollution in California?

Here are 10 things you can do at home to prevent stormwater pollution.

1. Never let anything except rain go into storm drains, gutters, ditches, or creeks.
2. Use less toxic household chemicals and dispose of your household hazardous wastes properly.
3. Eliminate or reduce your use of toxic pesticides and herbicides. Use less toxic alternatives.
4. Reduce trash and litter. Reduce, Reuse, Recycle. Just say no to disposable plastic shopping bags and food and beverage containers. Bring your own bag for shopping.
5. Reduce your use of fertilizers. Try making your own compost or use slow release fertilizers.
6. Maintain your septic system properly.
7. Pick up after your pet.
8. Maintain your car to prevent oil leaks and recycle used motor oil.
9. Vegetate bare spots in your yard so soil stays put.
10. Wash your car at a car wash or on your lawn instead of on the driveway. Use environmentally friendly cleaners.



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10. Wash your car at a car wash or on your lawn instead of on the driveway. Use environmentally friendly cleaners.

Please report stormwater pollution.

**Call the SLO County Stormwater Pollution
Prevention Hotline at**

781-5544

For more information about the County's Stormwater Management Program, please call or email Jill Falcone, Stormwater Pollution Prevention Coordinator at

788-2767 or jfalcone@co.slo.ca.us

You can find a copy of the County's Stormwater Program on the County's website at <http://www.slocounty.ca.gov/pw/stormwater>

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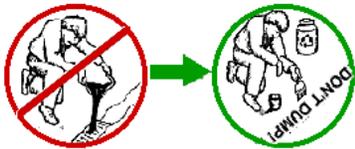
788-2767 or jfalcone@co.slo.ca.us

You can find a copy of the County's Stormwater Program on the County's website at <http://www.slocounty.ca.gov/pw/stormwater>

causing bacteria and parasites that can make people and other animals sick. Pick up your pet's poop and dispose of it in the trash.



8. Maintain your car to prevent automotive fluid leaks and recycle your used motor oil.

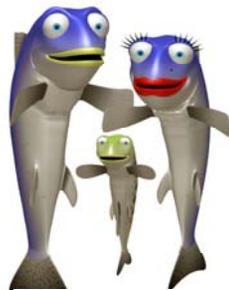


9. Hold on to your dirt! Vegetate bare spots in your yard so soil stays put and don't overwater. Try capturing rainwater using rain gardens or rain barrels to conserve water and save \$.

10. Wash your car at a car wash that recycles wash water or wash your car on your lawn instead of the driveway. Don't let your wash water run down the street and into a storm drain. Sweep, don't hose down your driveway and sidewalks. Sammy the Steelhead can't swim in your dirt and wash water.



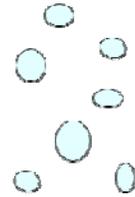
For more information about Stormwater Pollution Prevention, call Sammy at **788-FISH** or check out the County Stormwater Pollution Prevention website at <http://www.slocounty.ca.gov/pw>



Remember:
“You are the solution to stormwater pollution!”

SLO County Partners for Water Quality

Sammy the Steelhead here



“Did you know that stormwater runoff is a leading cause of water pollution in SLO County?”



Help Prevent Stormwater Pollution and Keep SLO County Beautiful

This brochure contains tips on how you can reduce the amount of pollutants that enter storm drains, creeks, and the ocean. **Sammy** says, *“You are the solution to stormwater pollution. Here are 10 things you can do to help.”*

1. Never let anything except rain go into storm drains, gutters, ditches, creeks, or the ocean. Stormwater isn't treated so dirt, sediments, oil, pesticides, trash, and other pollutants left on the ground go directly into our waterbodies during storm events and dry weather flows such as over-irrigation.



2. Use less toxic household products and dispose of your household hazardous wastes at a County Household Hazardous Waste (HHW) Facility. Go green and save money too. See http://www.swrcb.ca.gov/nps/docs/fs_lates_use_less_toxic.pdf for recipes to make your own safe substitute cleaning products. Take your Household Hazardous Waste to any of the County's HHW facilities. **It's FREE!** For more information, see <http://www.iwma.com> or the Recycling section of the SBC Yellow Pages.

3. Eliminate toxic pesticides for a healthy home and garden. Use less toxic alternatives. See the *Our Water Our World Program* at <http://www.ourwaterourworld.org/> for more information.



4. Don't Trash California! Keep a lid on trash and litter. Reduce, Reuse, Recycle. Just say no to disposable plastic shopping bags and food and beverage containers. Bring your own bags for shopping.



5. Reduce the use of fertilizers and don't fertilize just before it rains. Fertilizers contribute to high nutrient levels in our waterbodies. Try making your own compost or use slow release organic fertilizers instead.

6. If you have a septic system, inspect and maintain it on a regular basis.

7. Pick up after your pet. Would you like to swim in or drink water that is contaminated with pet poop? Pet poop contains disease



The Healthy Home and Garden

for You,
Your Family,
and Pets

ACKNOWLEDGMENTS

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Marin County Stormwater Pollution Prevention Program

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OUR WATER – OUR WORLD: HOW TO CREATE A HEALTHY HOME AND GARDEN

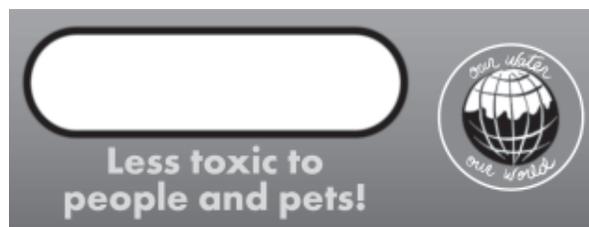
You can maintain a lovely home and garden and still protect the health of your family, your pets, and the environment! This booklet will tell you how—by offering some less toxic, common-sense techniques for managing some common pests found in the home and/or garden.

If you can't find the answer to your pest problem in this booklet, visit the *Our Water – Our World* website where you can ask a question and get a personal response from our “bug” experts at: www.ourwaterourworld.org

The *Our Water – Our World* program is a partnership between many different water pollution prevention agencies and stores that sell pesticides to the public. The goal is to help you manage home and garden pests in a way that protects the health and safety of your family, pets, and the environment.

This program can help you identify methods and techniques for managing pests without using any pesticide products. However, if you do need a pest control product, you can use the website listed above to find the name of some of the least toxic alternatives available—as well as a list of stores in your community where they can be found. In addition, the fact sheets in this booklet provide some product information.

When you shop for less-toxic products in one of the many stores participating in this program, you'll find the tags shown below. Look for them to help you locate less-toxic products quickly and easily.



Not All Alternatives Are the Best Choice for Water Quality!

Be aware that some products that are advertised as alternatives to conventional pesticides, e.g., synthetic pyrethroids, are actually very toxic to aquatic life. These pyrethroids may be listed on products under a variety of names such as bifenthrin, cyfluthrin (including beta-cyfluthrin), cypermethrin, deltamethrin, esfenvalerate, lambda-cyhalothrin, permethrin, and tralomethrin. Though not used as widely outdoors (therefore less of a threat to water quality), pyrethroids such as resmethrin and tetramethrin can be found in aerosol products. Aerosols disperse chemicals in a way that significantly increases the risk of exposure to unintentional targets—including you, pets, and your family.

INTEGRATED PEST MANAGEMENT: A SAFER WAY TO “BUG” PESTS

Aphids on your roses, ants in your cereal, fleas on the dog—we’ve all been bugged by pests. For many people, the first response to pest problems is to reach for the bug spray. But the chemical products we use to control these pests can cause serious health and environmental problems, especially where children are concerned. There is a better way to solve pest problems, and it is called Integrated Pest Management or IPM.

WHAT IS INTEGRATED PEST MANAGEMENT (IPM)?

IPM is an effective and environmentally friendly approach to pest management that uses a combination of strategies to keep pest damage at an acceptable level. With IPM, the focus is on preventing pest problems through healthy gardening practices and avoiding the use of chemicals when they are not really needed. The goal of IPM is to manage garden and household pests with as little impact to our families, pets, and the environment as possible.

WHY SHOULD I USE IPM?

When rain and over-watering wash fertilizers, pesticides, and herbicides into storm drains, they wind up in local creeks and waterways. If these products are poured (or the containers are rinsed) down household drains, many of the chemicals cannot be removed by sewage treatment plants—so again they end up in the water. This growing chemical pollution has an impact on the health of our families and pets, it degrades the environment, and it harms wildlife. IPM uses chemical controls only as a last resort, relying on the least-toxic chemicals possible.

Also, keep in mind that **98% of the bugs in our gardens are actually working hard for us by eating pests, pollinating plants, recycling dead plant material into healthy soil, and providing food for wildlife.** Pesticides kill these helpful bugs along with the pests.

HOW DOES IPM WORK?

IPM emphasizes checking your garden and home often to catch pests before they become a major problem. When you do find a bug, make sure it is actually a pest. Many bugs and their larvae may look ferocious but are actually good for your garden. Before trying to get rid of it, ask yourself if real damage is taking place or if the damage is at an acceptable level. When you do need to control pests, try a combination of the following IPM techniques:

Horticultural Controls

Keep gardens healthy and pest free by practicing the following: select native plants and/or disease resistant plants that are appropriate to your area, choose the right plant for your type of soil and weather conditions, rotate crops, clean up overripe fruit and diseased leaves, use compost or slow-release fertilizers, and mulch to prevent weeds.

Physical Controls

Hand pick pests, protect delicate seedlings with fabric row covers, attract and trap pests with sticky traps, spray plants with a hose to dislodge and kill pests, and caulk or seal up cracks where bugs might enter the house.

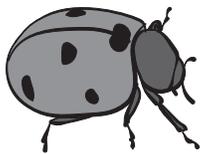
Biological Controls

Many of the bugs found naturally in a healthy garden, including dragonflies, spiders, ladybugs, praying mantids, and lacewings, eat huge numbers of pests. Plants with small flowers and lots of pollen, like yarrow, alyssum, dill, and buckwheat, will attract these "good bugs" to your garden.

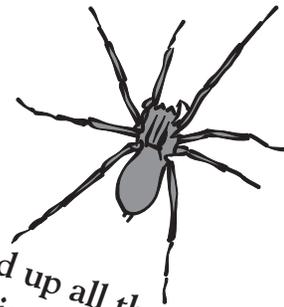
Chemical Controls

If a chemical control is needed at all, choose a less-toxic product such as insecticidal soaps, horticultural oils, and boric acid. Use only the amount needed, and keep these products safely stored in the original container.

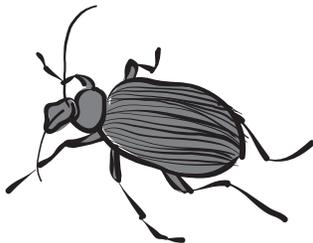
Following these IPM strategies will help you create a natural balance in your garden, making your home and garden a safer place for your family, pets, and wildlife.



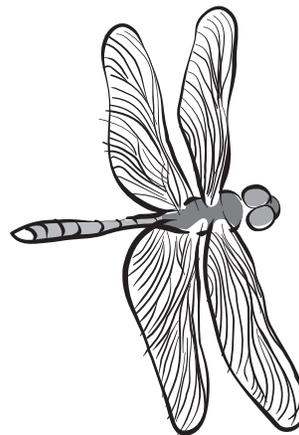
One ladybug can eat 5,000 aphids in its lifetime.



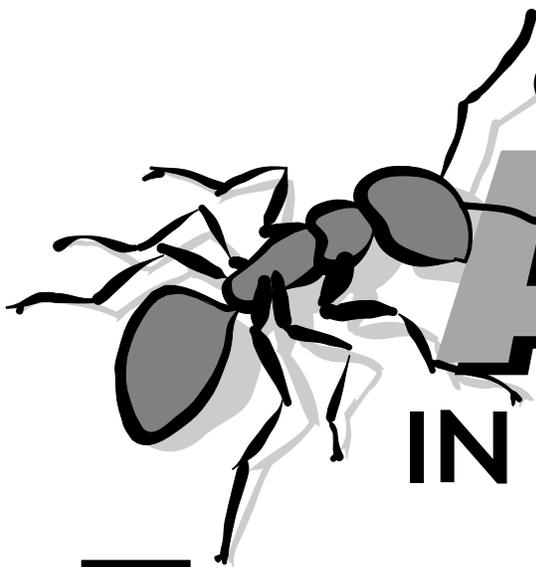
If you piled up all the pests that spiders eat in a year, they would weigh more than 50 million people!



At night, ground beetles use their powerful jaws to munch on garden pests such as snails and slugs.



Dragonflies have huge appetites and can eat 300 mosquitoes in a day.



CONTROLLING ANTS IN YOUR HOUSE

The Argentine ant is a frequent invader in California homes. Although they can be pests, ants provide an ecological cleansing and fertilization service of considerable importance. For example, they kill and eat many pest insects, aerate the soil, and recycle dead animal and vegetable material.

Because of these beneficial aspects, it is undesirable (and probably downright impossible) to eliminate ants from their outside habitat. The best approach to ant management is to try to keep them outdoors.

DETECTION

Look for individual “scouts” or long lines of ants in or around the house near food or water. Distinguish Argentine ants from Carpenter ants by size. Argentine ants are small ($\frac{1}{8}$ ”), and their queens are slightly larger. Carpenter ants are $\frac{1}{4}$ ” or larger and require different management techniques from those listed below for Argentine ants.

LESS-TOXIC CONTROLS

INSIDE YOUR HOME

- **Kill the scouts** so they can’t call in the hordes when they find a tasty tidbit.
- **Use ant baits** because they use a minimum of insecticide and confine it to a very small area (see “Tips for Using Ant Baits” on back).
- **Use insecticidal dusts** such as diatomaceous earth (DE) in wall voids and cracks before they are sealed. Use a hand duster to apply DE and wear a dust mask and goggles. DE has little toxicity to humans or pets, but kills insects by absorbing their outer waxy coating, causing dehydration and death.

OUTSIDE YOUR HOME

- **Use sticky barriers** around the trunk of a tree or bush to prevent ants from protecting aphids and other “honeydew”-producing insects. Prune any branches that touch walls, fences or the ground so ants cannot find alternate routes into the plant.
- **Ant Baits.** If you can find the spot outside where ants are entering the building (this is often difficult to do), place bait stations there; otherwise use baits only inside. Outside, rain and sprinklers can wash baits away, and you may end up *attracting* ants to your house.

PREVENTION

- **Store food in containers that seal tightly** or in the refrigerator when you notice ant activity.
- **Keep things clean and dry** and fix leaking faucets and pipes (ants need food *and* water).
- **Caulk cracks** where ants are entering the house. Weather-strip doors and windows.
- **Put pet dishes in a soapy moat.** Partially fill a wide, shallow container with soapy water and place pet dishes in the water.

TIPS FOR USING ANT BAITS

Ant baits contain a pesticide mixed with an attractive food substance. Ants take small quantities of bait back to their nest to share with their nest mates. In this way the entire nest can sometimes be eliminated.

- Use baits with boric acid, hydramethylnon, fipronil, or arsenic as an active ingredient.
- Keep several different baits on hand because Argentine ants change their food preferences frequently. If one bait is not working, try another. Wait at least a day to see if they take the bait.
- Use baits inside (outside you may attract more ants to the house and rain and sprinklers will wash away bait).

TIPS FOR USING ANT BAITS, CONT.

- Do not spray insecticide around the bait; it will repel the ants.
- When ants are gone, remove the bait so you don't attract more ants. If the bait you are using comes enclosed in a bait station, return it to its original

box to save and use again. Put the box inside a plastic bag and seal it with a twist-tie.

- Baits may take several weeks to kill the ants. At first you may see more ants coming to the bait, but after a few days to a week you should see a significant reduction.

PRODUCTS

Examples of trade names of products listed in this fact sheet

Desiccating Dust: Concen Diatomaceous Earth Crawling Insect Killer, Safer Ant and Crawling Insect Killer

Hand-Duster: Pest Pistol

Sticky Barrier: Tanglefoot and Stickem Tree Pest Barrier

Baits containing Boric acid: Terro Ant Killer II, Drax Ant Kill Gel

Baits containing Hydramethylnon: Combat Ant Control

Baits containing Arsenic: Grants Kills Ants

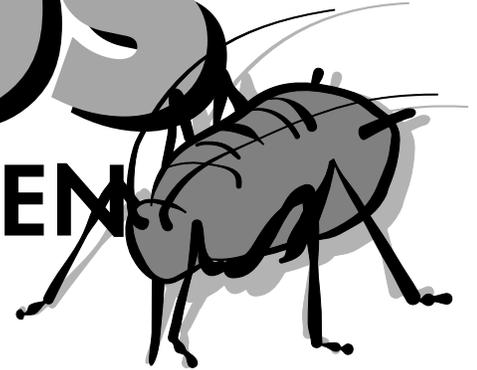
Baits containing Fipronil: Combat Quick Kill Ant Bait



QUICK FIX FOR AN ANT EMERGENCY

1. Find what ants are after (usually left-over food) and where they are entering the room (usually through a crack in the wall). Mark it so you can find it again. If you can't find an entry point, see Step 5.
2. Don't remove the food until after Step 3 because ants will scatter. They are easier to kill in a line.
3. Clean up lines of ants with a vacuum, or spray ants with soapy water and wipe up with a sponge. Soap washes away the chemical trail ants follow.
4. Next, block entry point temporarily with a smear of petroleum jelly or a piece of tape. Use silicone caulk to permanently close cracks in walls, along moldings and baseboards, and in gaps around pipes and ducts.
5. If you can't find an entry point, clean up the ants (Step 3) to a convenient (preferably out-of-the-way) spot. Place the bait station on the line the ants had been following. Always remove the bait station when the line of ants has disappeared so you don't attract more ants into the house (see "Tips for Using Ant Baits").
6. If ants are nesting in a potted plant, move it outdoors. Water it thoroughly and place it in a bucket filled with water that comes an inch below the rim of the pot. Using a stick, make a bridge for the ants to get out of pot and bucket without getting in the water. The ants will soon begin carrying their white-colored young to safety. When no more ants emerge, drain the pot and return it to the house.

CONTROLLING APHIDS IN YOUR GARDEN



Most plants can tolerate low to moderate numbers of aphids without noticeable damage. On some plants, however, large numbers of aphids can distort foliage and flowers and stunt plant growth. Some species of aphids can also transmit plant diseases when they puncture plant tissues to feed.

Aphids excrete “honeydew,” a sweet substance that forms a harmless but sticky coating on leaves. The honeydew is soon colonized by a fungus called “sooty mold,” which is also harmless, but makes leaves look black and dirty. Argentine ants love to feed on honeydew, and to ensure a continuing supply, they protect aphids from their natural enemies. When this happens, aphid management must include ant management (see the Ant fact sheet in this series).

DETECTION

Aphids are very small insects with soft, pear-shaped bodies. They have long legs and antennae, and most have two tube-like structures called cornicles on their hind end. Adults of some species have wings. Aphids can be many colors and are usually on buds or the undersides of leaves.

TOLERATE SOME APHIDS

- **Tolerate low to moderate numbers of aphids** as long as they aren't causing noticeable plant damage. There is a reason for this: aphids have many natural enemies such as spiders, ladybugs, lacewings, and minute parasitoids (tiny non-stinging wasps) that often keep aphid numbers below damaging levels. These beneficial insects rarely appear on the scene until *after* aphids have begun attacking plants. This “lag-time” can be a day or two or as long as several weeks. As the season progresses, aphid control by these natural enemies improves because more natural enemies are attracted to your garden and more stay to breed.
- **Aphids commonly found on trees will not infest your garden annuals**, and these aphids can help attract natural enemies that will attack pests on other plants.

LESS-TOXIC CONTROLS

- **Learn to recognize beneficial insects.** Among the most important natural enemies of aphids are the tiny wasp parasitoids that lay their eggs inside the bodies of aphids. These tiny wasps *cannot* sting people. A parasitized aphid (called a “mummy”) looks puffed-up, and its skin hardens and changes color, often to tan, light brown, or black.
- **Attract beneficials to your garden** by planting a wide variety of flowering plants. (See fact sheet in this series called “Growing a Healthy Garden to Manage Pests Naturally”). The adult forms of many beneficial insects, including tiny wasps and lacewings, feed on pollen and nectar.
- **Consider buying beneficial insects** (see the Products and Resources box on back). Lacewings are more likely to stay in your garden than commercially available ladybugs.
- **Buy beneficials before aphid numbers are high.** If you have an aphid emergency, first use soap or oil sprays (see Products and Resources below) to reduce the population. Then, if necessary, release natural enemies. On the other hand, don't purchase beneficial insects before you have aphids. You will be releasing them into your garden to starve.

LESS-TOXIC CONTROLS, CONT.

- **Wipe off or prune away** colonies of aphids from leaves and buds.
- **Use a forceful stream of plain water** to wash off aphids and honeydew. Do this on a warm, sunny day so that foliage dries off before night.
- **Use insecticidal soaps** to kill aphids on contact and spare beneficials such as lacewings. These products do not leave toxic residues.
- **Use spray (horticultural) oils** to control aphids without leaving toxic residues for natural enemies.

Note: Soaps and oils must coat the bodies of the insects to be effective.

PREVENTION

- **Use slow-release fertilizers.** Some aphids reproduce more quickly on plants with high levels of nitrogen in their leaves and buds. Fertilizers such as compost, sewage sludge, or encapsulated materials are better because they slowly release moderate levels of nutrients.
- **Avoid excessive pruning** because it stimulates aphid-attracting growth.
- **Use a row cover** to exclude aphids and other pests but allow air, light, and irrigation water to reach plants.
- **Control ants** by spraying or painting a 4" wide sticky barrier around woody shrubs or trees. (See the Ant fact sheet in this series.)

APHIDS — SO MANY, SO FAST

The remarkable life cycle of aphids helps to explain how they can quickly appear in large numbers. In spring in temperate climates, female aphids called “stem mothers,” emerge from “overwintering” eggs. These plump, distinctive-looking aphids do not need to mate to reproduce. Stem mothers give birth to live daughters, and these offspring give birth to more live daughters — all without the need of mating. The swiftly growing female aphid colonies cluster around the stem mother and continue to multiply long after her death. At the end of the season, aphids begin to produce both sons and daughters. When these males and females mature, they mate and the females lay eggs on bud scales or bark to “overwinter” and begin the cycle again.

PRODUCTS AND RESOURCES

Examples of trade names of products listed in this fact sheet:

(Note: Product labels should list plants to be treated.)

Insecticidal Soaps:

Safer Insecticidal Soap, Bonide
Insecticidal Soap, Garden Safe
Insecticidal Soap, EB Stone Insect
Soap, Concern Insect Killing Soap

Insecticidal Soap w/Pyrethrin:

Safer Yard and Garden
Insect Killer

Spray (Horticultural) Oils:

SunSpray Ultrafine, Volck

Sticky Barrier:

Tanglefoot, Stickem Tree Pest
Barrier

Encapsulated Fertilizers:

Osmocote

Row Covers:

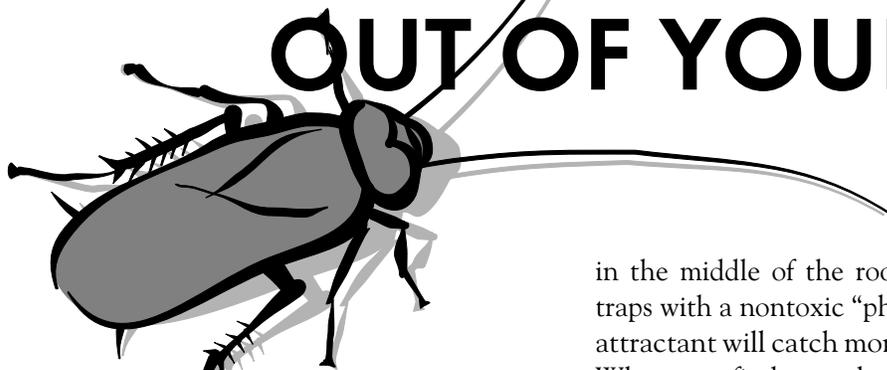
Fast Start Seed Blanket, Easy
Gardener Plant and Seed Blanket

Sources for Lacewings:

Buena BioSystems
P.O. Box 4008
Ventura, CA 93007
(805) 525-2525
www.buenabiosystems.com

Rincon-Vitova Insectaries
P.O. Box 1555
Ventura, CA 93002
(800) 248-2847
www.rinconvitova.com

KEEPING COCKROACHES OUT OF YOUR HOUSE



Although cockroaches are useful outdoors, where they help recycle plant and animal wastes, they are not welcome indoors. Research clearly indicates that roaches can carry disease-causing organisms from sewers, garbage cans, or bathrooms to kitchen counters and human food. Cockroaches can also trigger allergic reactions in some people.

DETECTION

Except for size and markings, all cockroaches have a similar appearance. These insects are dark in color, oval-shaped, and have long antennae. Roaches are mainly active at night and generally remain hidden during the day in cracks and crevices near their source of food.

- **Use nontoxic sticky traps to locate roach habitat.** Roaches like to travel by touching the edges of objects. Place traps along the edges of walls, appliances, cupboards, etc., and not

in the middle of the room. Sticky traps with a nontoxic “pheromone” attractant will catch more roaches. When you find out where roaches are hiding, you’ll know where to concentrate your efforts.

LESS-TOXIC CONTROLS

- **Use sticky traps for small infestations.** If you only have a few roaches, you may be able to control the problem with sticky traps.
- **Use a strong vacuum with a crevice attachment** to pull roaches from their hiding places.
- **Use insecticidal dusts such as diatomaceous earth (DE) or boric acid** in wall voids or cracks and crevices before you seal them, under large appliances, or in other prime habitats. One way to gain access to a wall void is to remove the cover plates on electrical outlets and switches. Always turn off the power before applying products near electrical outlets.

When properly used, DE has little toxicity to humans and pets, but kills insects by absorbing their outer waxy coating, causing dehydration and death. Use DE sold for pest control and *not* for pool filters.

Although boric acid has a low acute (immediate) toxicity for humans and pets, it should be handled carefully and kept out of the reach of children and pets. For roaches, boric

acid is a slow-acting but effective stomach poison.

When applying these dusts, use a hand duster and wear a dust mask, gloves, and safety goggles. Apply a very light coating because roaches will avoid piles of dust.

- **Use cockroach baits** because they use minimal amounts of insecticide and confine the poison to a very small area (see Tips for Using Cockroach Baits on back).

PREVENTION

Prevent cockroach infestations by denying them access to your home and to the food, water, and shelter they need to survive.

- **Store food in the refrigerator or in containers that seal tightly.**
- **Keep things clean and tidy.** Thoroughly clean counters and vacuum or sweep floors daily in eating and food preparation areas. Don’t leave dirty dishes out overnight, even in the dishwasher. Any garbage containing food scraps should be removed from the house nightly. Thoroughly clean recyclables before storing them. At night, place pet food and water bowls in a moat of soapy water. Reduce clutter in all rooms (it provides habitat for roaches).
- **Keep things dry.** Fix leaky plumbing. Keep kitchen surfaces dry whenever they are not in use, especially overnight.

PREVENTION, CONT.

- Seal cracks and crevices. Before sealing, vacuum and wash the area to eliminate all roach egg cases, fecal matter, or other debris. Caulk and paint cracks around baseboards, cupboards, pipes, sinks, etc. Use mildew-resistant caulk in moist areas.
- **Weatherstrip** around doors and windows and repair holes in screens.
- **Inspect materials you bring into your house** for roaches or their egg cases (small, dark, kidney bean shaped). Pay special attention to used furniture and appliances and cardboard cartons from food stores.
- **Monitor with sticky traps.** Once you have eliminated roaches or significantly reduced their numbers, con-

tinue to use sticky traps to alert you to a new infestation or a rise in the population. This is especially important in apartment buildings, condominiums, or other connected dwellings where roaches can easily move from one household to another.

TIPS FOR USING COCKROACH BAITS

- Use baits indoors.
- Use baits with boric acid, fipronil, or hydramethylnon.
- Reduce or eliminate food sources so roaches will feed on baits.
- If you are using a gel bait, put small dabs in a number of locations rather than large blobs in a few locations.
- Place baits near areas where roaches are hiding and between their hiding places and food sources.
- Place baits where roaches are most likely to travel or congregate, such as along the edges of walls, appliances, cupboards, etc. — *not* in the middle of the room.
- Keep baits out of the reach of children and pets.
- Check bait stations frequently, especially if you have a large infestation. Empty bait stations should be removed because they make great roach hiding spots.

PRODUCTS

Examples of trade names for the products listed in this fact sheet:

Desiccating Dust: Concern[®] Diatomaceous Earth Crawling Insect Killer, Grow More[®] Diatomaceous Earth, Surefire[®] Crawling Insect Killer

Boric Acid Powder: Roach Prufe[®], Victor[®] Boric Acid Powder

Hand-Duster: Pest Pistol[®] (if unavailable locally, call (888) 784-1722 or visit www.groworganic.com)

Sticky Traps: Black Flag[®] Roach Motel

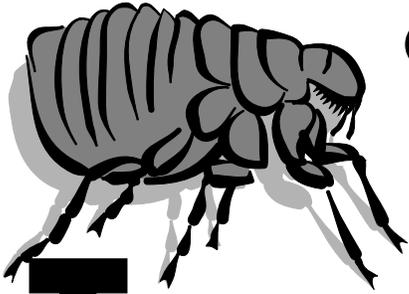
Sticky Traps with pheromone attractant: Victor[®] Roach Magnet

Baits containing boric acid: Niban[®] Granular Bait, Niban[®] FG, Seabright[®] Roach Free System Bait

Bait containing fipronil: Combat[®] Quick Kill Roach Bait Stations, Combat[®] Quick Kill Roach Control Gel

Bait containing hydramethylnon: Combat[®] Roach Control System, Combat[®] Roach Control Gel

KEEPING FLEAS OFF YOUR PETS AND OUT OF YOUR YARD



The flea most commonly found in and around the home is the cat flea, *Ctenocephalides felis*. Despite its name, the cat flea finds dogs and humans quite tasty too. Flea bites cause irritation, but also serious allergies in some animals and humans.

DETECTION

Adult fleas spend almost all of their time on an animal's body. In order to know when to begin and end your flea-control efforts, use a specially manufactured flea comb on your pet to keep track of the flea population.

Look for tiny eggs and tiny, white, worm-like flea larvae on the floor, in rugs, in cracks and crevices, and anywhere pets rest or sleep. Larvae feed on dried blood excreted by adults.

Flea traps can help you pinpoint a problem if you don't own a pet but still have fleas. Animals nesting near your house may be the source.

LESS-TOXIC CONTROLS

INSIDE YOUR HOME

- **Comb your pet** with a metal flea comb, available at pet stores. Focus around the neck and base of the tail. Keep a wide container of soapy water nearby to drown captured fleas.
- **Bathe dogs** to drown fleas. Use a dog shampoo and increase effectiveness by using a flea comb while the pet is lathered. It is not necessary to use shampoo with insecticide.
- **Vacuum carpets, floors, and upholstered furniture frequently** throughout the year. Vacuuming carpets picks up adult and egg-stage fleas, but is less effective at removing larvae. Clean cracks and crevices; or better still, seal permanently with caulk. Try gently vacuuming your animal's coat to remove adult fleas.
- **Use diatomaceous earth (DE)** to treat carpets, upholstered furniture, and pet bedding or blow it into cracks and crevices. Use a hand duster to apply a fine layer of DE. Wear a dust mask and goggles and avoid getting dust in your pet's eyes. DE has little toxicity to humans and pets, but kills fleas by absorbing the waxy coating on their bodies, causing dehydration and death.
- **Use borate-based carpet treatments.** Borates have a low toxicity to humans and pets. Fleanix carpet treatment can control fleas in carpet-

ing for up to a year. Mix the powder with water in a rug shampooing machine with or without detergent. During shampooing, borate binds to carpet fibers and cannot be vacuumed up. Borate applied in water poses less hazard to the lungs than borate applied as a dust.

- **Flea traps** attract adult fleas to the warmth and light of an electric bulb and the fleas are caught on sticky paper. Fleas prefer a warm body so traps will work better in areas where you can exclude animals and humans.

OUTSIDE YOUR HOME

- **Treat outside only where you have found high flea populations.** To find these areas, walk around the yard in a pair of white socks. Check areas where animals rest, sleep, or regularly travel. You will easily see fleas that jump onto the socks.
- **Do not try to combat fleas by spraying around the perimeter of your house or spraying your entire yard.** Spot-treat only those areas where you find large populations of fleas. Fleas will more likely be on an animal or inside your home. Concentrate your efforts there.
- **Check for wild animals** like raccoons and opossums nesting under the house or porch. Dead animals can also be the source of a flea infestation. Treat nests under the house with diatomaceous earth.

OUTSIDE YOUR HOME, CONT.

- Use **beneficial nematodes** in soil where you have found fleas. Apply beneficial nematodes to soil where you have found fleas. The soil temperature must be between 60°F and 90°F, and the soil should be moist.

Irrigate before and after application, but don't soak the area. For sources of nematodes, see the Products and Resources box.

FOR YOUR ANIMAL

- **Ultrasonic collars and machines are not effective.** There is no scientific evidence that these products affect fleas, and they are not recommended.

The following insecticides should only be used during flea season. Unnecessary use may speed up the process of fleas becoming resistant to these chemicals:

- **Fipronil (Frontline) and imidacloprid (Advantage)** are applied to the skin of the animal in a small amount at one spot, usually at the base of the neck or between the shoulder blades. The insecticide spreads over

the entire body of the pet and is effective for at least a month. These products have a low acute toxicity for mammals (chronic toxicity of fipronil unknown) but can be irritating to eyes and should not be ingested. Use gloves when applying them.

- **Lufenuron (Program)** is given orally to the animal. Fleas that ingest this chemical produce only a few viable eggs, and larvae from those eggs cannot mature. Because lufenuron accumulates in fat and crosses the placental barrier, do not treat pregnant, nursing, or very young animals.
- **Insect growth regulators (IGRs)** such as methoprene (Precor) and pyriproxyfen (Nylar) do not kill adult fleas, but break the flea reproduction cycle by preventing flea larvae from turning into adults. IGRs are sold in a variety of applications including spot-on formulations and tablets for your animal. Some products combine IGRs with other pesticides. In general, products containing just IGRs pose the fewest risks. IGRs have low toxicity

to mammals, but are toxic to some aquatic organisms; therefore, it's best to limit the use of IGRs to indoor applications where the product won't go down an indoor drain.

PREVENTION

- **Restrict pets to a regular sleeping space** so you can focus cleaning efforts on fewer areas.
- **Use washable pet bedding** that can be gathered up easily by the four corners and laundered frequently. Soapy water destroys all flea stages.
- **For highly allergic people:** Protect yourself by wearing a long-sleeved shirt and long pants tucked into socks. If the weather is hot, just a pair of long white socks will offer some protection. Pick off fleas and drop them into soapy water. Apply insect repellents to shoes and clothing rather than to skin.
- **Keep wild animals and rodents away from the house.** Patch holes or cover them with screen (1/4" hardware cloth) to prevent animals from getting in.

PRODUCTS AND RESOURCES

Examples of trade names of products listed in this fact sheet:

Insecticidal Dusts: Safer and Concern Crawling Insect Killer

Hand Duster: Pest Pistol (If unavailable locally, call (888) 784-1722 to order); www.groworganic.com

Borate-based Carpet Treatments: Fleanix (If unavailable locally, call (415) 459-4003 to order)

Flea Trap: Raid Flea Killer Plus

Beneficial Nematodes (*Heterorhabditis bacteriophora*):

Rincon Vitova Insectaries, P.O. Box 1555, Ventura, CA 93002; (800) 248-2847; www.rinconvitova.com

Buena BioSystems, P.O. Box 4008, Ventura, CA 93007; (805) 525-2525
www.buenabiosystems.com

TIPS FOR A HEALTHY

BEAUTIFUL LAWN



Lawns *can* look beautiful without using pesticides and fertilizers which may contribute to water quality problems in a local creek, the Bay or Delta. The tips below will help you maintain a healthy and beautiful lawn that can outcompete weeds and other lawn pests.

Problems with lawns, including insect pests and diseases, can most often be traced to stresses caused by an inappropriate choice of grass species or improper care. Prevention is always the best way to go, but if you do have lawn problems, first identify the underlying causes and pests. For tips on troubleshooting lawn problems, visit: www.ipm.ucdavis.edu/TOOLS/TURF/.

IRRIGATE AN ESTABLISHED LAWN PROPERLY

- Before you irrigate, check the soil moisture with a soil probe or trowel. The top 2" to 3" should feel almost dry before you add more water.
- After watering, test for water penetration again with the soil probe or trowel. Push a trowel into the soil and tilt it forward. If the soil isn't wet 4" to 6" down, continue watering until it is. Grass roots will grow deeper and the lawn will be healthier. Track the watering time so you know about how long to water.
- Irrigate slowly so that water doesn't run off. Overwatering is wasteful and can wash pesticides and fertilizers into the storm drains.
- If water runs off or pools even with slow irrigation, soil compaction may be a problem (see Lawn Aeration on the next page).
- Clay soils hold more moisture and dry out more slowly; thus they may need less frequent irrigation.
- Sandy soils dry out more quickly and may need more frequent irrigation.

FEED YOUR SOIL BY LEAVING GRASS CLIPPINGS ON THE LAWN

- Grass clippings can provide most of the nutrients needed by a lawn if the clippings are small enough to decompose quickly without forming mats on top of the living grass. Remove only $\frac{1}{3}$ of the blade at any one time (see Mow the Right Way, below).
- To decompose clippings, soil must be biologically active, i.e., contain bacteria, fungi, insects, worms, and oxygen. Soil under a lawn that has been heavily fertilized or frequently treated with pesticides may be deficient in these conditions.

MOW THE RIGHT WAY

- Mow when the grass is dry.
- During the summer months, cut the grass higher to help retain soil moisture.
- Remove no more than $\frac{1}{3}$ of the leaf blade at one cutting. Removing more can be very stressful for the plant and increase pest and disease problems.
- Alternate your mowing pattern frequently to avoid compacted ruts.

MOW THE RIGHT WAY, CONT.

- Keep mower blades sharp. Dull blades wound the grass and make it more vulnerable to pests and diseases.
- If rust disease is present in your lawn, clean your mower between mowings to prevent spreading the disease.

For information on keeping a pesticide-free lawn, visit www.beyondpesticides.org/pesticidefreelawns.

DEAL SENSIBLY WITH WEEDS

- Decide how many weeds you can tolerate. It is not realistic to expect a completely weed-free lawn.
- Dig up weeds by hand and sprinkle grass seed on any bare spots so weeds can't fill in. Water regularly with a fine spray until the grass sprouts.
- Keep grass growing vigorously to crowd out weeds. Don't mow grass too short; taller blades can shade the soil enough to prevent some weed seeds from germinating.
- Use corn gluten meal to prevent certain broadleaf weeds from germinating. Apply in spring or fall a few weeks before annual weeds begin to germinate.
- Using combination weed and feed products is not the most accurate way to control weeds; unnecessary herbicides are likely to be broadcast onto lawn areas where there are no weeds and into adjacent areas where non-target plants will be damaged. Certain trees growing in lawn areas can also be damaged when their shallow roots take up herbicides.

LAWN AERATION

- Aerate spots where you can't push a screwdriver five to six inches into the soil, where water pools, where grass looks thin, or where there is heavy traffic.

- Use a hollow-tined aerator that removes plugs of soil, either a foot-operated or motorized model.
- Irrigate deeply (soil should be moist 5" to 6" down) so you can push the aerator into the soil as far as possible. Allow soil to dry slightly before you begin.
- Leave the plugs on the lawn and break them up with a garden rake.

DETHATCHING LAWNS

- Thatch is dead and dying, matted grass parts that accumulate on top of the soil. Thatch prevents air, water, and fertilizer from reaching the soil.
- Remove thatch with a rake if more than 1/2" thick.
- Aeration (see above) can help prevent thatch buildup.
- When soil is biologically active, grass clippings decompose and do not contribute to thatch buildup. This is a good reason to eliminate the use of broad-spectrum pesticides that can destroy soil organisms.

FERTILIZING

- Unless the soil texture is sandy, nutrient deficiencies are unlikely and you may not need to fertilize at all. If in doubt, have your soil professionally tested.
- Grass clippings left on the lawn can provide most of the fertilizer.
- If you need to fertilize, use natural fertilizers or slow-release fertilizers, such as sulfur- or polymer-coated urea. These products release nutrients slowly over a longer period, allowing the grass to absorb nutrients more efficiently.
- Fertilizers, if misapplied, can kill soil life and ruin soil structure in even the best soils.

LAWN SUBSTITUTES

Americans spend a great deal of time on their lawns, using an abundance of water, fertilizer, pesticides, and time. If a grass surface is not required, consider replacing all or some of your lawn with an attractive alternative. The following plants require little water and will accept occasional foot traffic:



SOME PREFERRED GRASSES FOR CALIFORNIA

“Cool Season” Grasses (growing season is during cool weather)

Tall fescue (*Festuca arundinacea*)

Dwarf tall fescue (dwarf varieties of *Festuca arundinacea*)

“Warm Season” Grasses (growing season is during warm weather)

Bermudagrass (*Cynodon dactylon*): loses color during cold weather; hybrids need more care

St. Augustinegrass (*Stenotaphrum secundatum*): most shade-tolerant of warm season grasses

Buffalograss (*Buchloe dactyloides*): cannot tolerate shade, dies back in winter

- Woolly Yarrow (*Achillea tomentosa*) — Plant from flats or small pots, 6" apart; mow in March and July to a height of 2". Yellow flowers. Keep soil on the dry side
- Caraway-Scented Thyme (*Thymus herba-barona*) — Plant all thymes from flats or small pots, 6" to 8" apart. Mowing is not necessary. Rose-pink flowers in early summer attract bees.
- Creeping Thyme (*Thymus praecox-arcticus*) — Mow to 1½" in July and fertilize; purple flowers in summer attract bees.
- Strawberry Clover (*Trifolium fragiferum*) — Plant from seed in fall; mow to 2" in April, June, August; white to pink flowers in summer attract bees.
- Garden Chamomile (*Chamaemelum nobile*) combined with strawberry clover — Plant chamomile from flats or from small pots, 6" to 8" apart. Plant strawberry clover as noted above and mow both ground covers to 2" in April, June, and August. In areas with serious drainage problems, chamomile may not grow. In those spots, combine the clover with either of the thymes listed above.

See "For More Information" and "Products and Resources" sections for sources of information on other lawn substitutes.

PLANTING A NEW LAWN

START OUT RIGHT

- Have your soil professionally tested so you know the texture, pH, and salt and nutrient levels.
- Choose a mixture of the right varieties of grass suited to your climate and the conditions in your yard (see Preferred Grasses for California).
- Choose pest- and disease-resistant varieties (ask your nursery).
- Choose sod that has been propagated in soil similar to your own.

WHITE GRUBS



California lawns sometimes suffer from white grubs, the larval (immature) stage of several species of beetles. The genus of beetles most common in California is *Cyclocephala*, the masked chafer. Masked chafer adults do not eat but in their grub stage can cause patches of lawn to die when they feed on grass roots.

Birds, moles, raccoons, opossums, and skunks can add to the damage when they dig in the turf looking for tasty grubs. But just finding wilted patches of grass or animals digging in the lawn does not mean that you have white grubs! You need to find grubs by verifying their presence in several places.

DETECTION

The C-shaped grubs can be up to an inch long and are white with a brown head and three pairs of conspicuous legs.

Damage from grubs can begin to show as early as June or July or as late as August or September and can be mistaken for wilted grass under drought stress. Later, irregular patches die and can be lifted up or rolled back like a carpet. Grub feeding can make the ground feel spongy.

If you have had white grub problems before or suspect you have them this year, begin looking in mid-May by using a cylindrical bulb planting tool to extract a core of lawn so you can examine the roots. Pay particular attention to spots that look unusual.

WHAT CAN YOU DO?

- Pay special attention to drainage and compaction. Healthy lawns can recover more easily from white grub damage.
- Products with imidacloprid may be used to control grubs. This material has a low acute toxicity to mammals. However, imidacloprid can easily wash off and leach into groundwater, and if the insecticide becomes as popular as diazinon was, its use also may lead to water quality impacts. The best approach for grub control is to maintain a healthy lawn without using insecticides.
- Don't treat late in the season when you find dead patches of turf. By this time grubs have done all their damage for the season and are ready to stop eating. Treating now is fruitless. Remove the dead grass, cultivate, and reseed the area.
- Plant warm season grasses, such as bermudagrass, St. Augustinegrass, or buffalograss, or cool season grasses, such as tall or dwarf fescues. These grasses are more tolerant of white grubs.
- Apply beneficial nematodes (*Heterorhabditis bacteriophora*) in late spring before adult beetles emerge, or in mid summer to early fall when larvae are maturing. Nematodes must be applied when the soil temperature is between 60°F and 90°F and the soil is moist. Irrigate the soil before and after application, but don't soak the area. Nematodes need moisture to move around in the soil and to prevent their bodies from dehydrating. Apply nematodes in early evening to minimize damage from UV light. Avoid using fertilizers 2 weeks before and 2 weeks after the application.

Choose a reputable supplier. To make sure nematodes are alive, place a small quantity of the nematode-containing material in water and observe whether they are moving. Look closely because the nematodes are very small. A hand lens or magnifying glass will make it easier to see them. For more information, see the web sites listed on the back page.

PREPARE THE SOIL BEFORE INSTALLING A NEW LAWN

- Don't work the soil when it is very wet. You can damage its structure.
- Thoroughly mix soil layers of different textures before planting. Poor

soil preparation can cause poor drainage, resulting in weak turf.

- Break up all clods into fine particles and remove pebbles and stones.
- Check for low spots by irrigating. Smooth out areas where you see puddles (very important if you are seeding a lawn).

IRRIGATE A NEW LAWN

- Be sure to keep the soil under a new lawn thoroughly moist until the lawn becomes established, but don't drown the plants. Too much water can also wash away seeds.

PRODUCTS AND RESOURCES

Soils Laboratory (see also the Yellow Pages)

A&L Western Agricultural Labs
1311 Woodland Ave., #1
Modesto, CA 95351
209-529-4080
www.al-labs-west.com

Corn Gluten Meal (pre-emergent herbicide)

Supressa
Concern Weed Prevention Plus

Slow Release Fertilizer

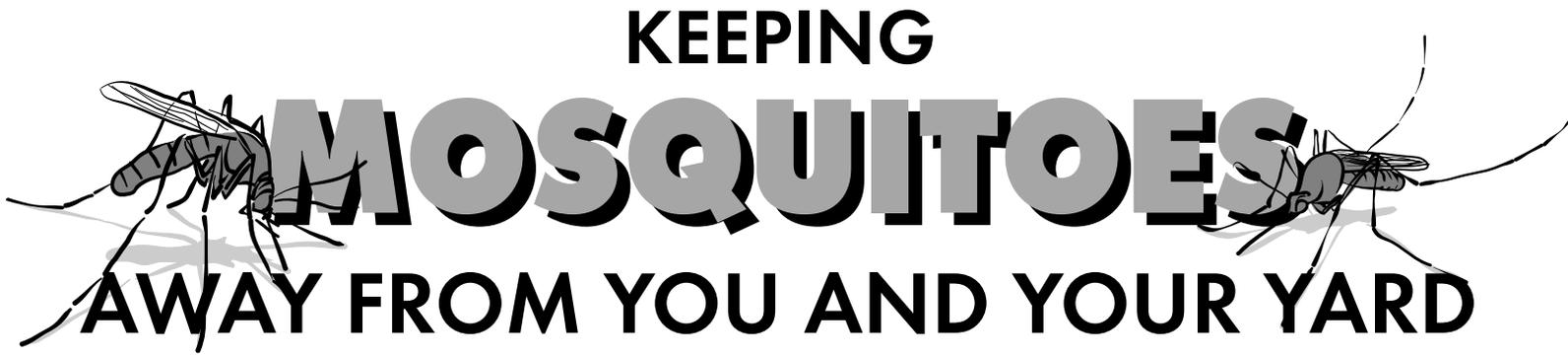
Vigoro Lawn Fertilizer and organic fertilizers such as Ringer Lawn Restore, Dr. Earth Lawn Food, EB Stone Nature's Green Lawn Food, Bradfield Organics

Beneficial Nematodes (*Heterorhabditis bacteriophora*):

Rincon Vitova Insectaries, P.O. Box 1555, Ventura, CA 93002; (800) 248-2847; www.rinconvitova.com
Buena BioSystems, P.O. Box 4008, Ventura, CA 93007; (805) 525-2525; www.buenabiosystems.com

For more information on how to apply nematodes see:
www.oardc.ohio-state.edu/nematodes/default.htm

KEEPING MOSQUITOES AWAY FROM YOU AND YOUR YARD



Mosquitoes are delicious food for fish and other aquatic creatures, but their buzzing and itchy bites make them a great annoyance to people. Mosquitoes can also carry a variety of diseases; so controlling them, especially by eliminating breeding sites, should be a priority for everyone in the community.

The emergence of West Nile virus (for more information, see inside) has focused public attention on mosquitoes. Fear may cause us to reach for a pesticide spray can, but this is an ineffective control. Pesticide sprays reach relatively few mosquitoes, and outside, they probably cause more harm to beneficial insects. Residents can have a greater effect on the numbers of mosquitoes in urban areas by following the tips in this fact sheet.

The young (or larvae) of mosquitoes live in water and feed on microorganisms and organic matter. Just about any area or container that can hold water for more than a few days can produce a large crop of mosquitoes. Only adult female mosquitoes bite humans and

Note: If you are experiencing serious or persistent mosquito problems, call your mosquito and vector control district (see inside) before considering the use of pesticides.

other animals to feed on blood. Adult male mosquitoes feed on flower nectar.

There are many different species of mosquitoes. Some bite during the day, while others feed at night. Although some mosquitoes can fly long distances from their watery breeding sites, others travel only a short distance to find their blood meals. Your bites may be coming from mosquitoes you are raising in your own backyard.

PREVENTION

The most effective way to control mosquitoes is to find and eliminate their breeding sites.

- **Eliminate standing water in containers** around the home, including water in cans, plastic containers, potted plant saucers, buckets, garbage cans, barrels, wheelbarrows, and any other container that holds water for more than a few days. Empty the water and then either: invert, cover, punch drainage holes in, or dispose of these containers.
- **Change water in birdbaths** and pet water dishes at least once a week, preferably every 2 to 3 days.
- **Fix leaky outdoor faucets and sprinklers**, and don't overwater your yard. Any standing water can produce mosquitoes.
- **Recycle tires or store them so they do not collect water.** Tires are extremely hard to drain, and each one can produce thousands of mosquitoes.
- **Keep roof gutters clean** so water drains; otherwise mosquitoes can breed in the leaf and water mixture.
- **Don't dump yard waste into street gutters, storm drains, or creeks.** It can impede the flow of water, allowing mosquitoes to breed. The decaying organic matter then provides food for dense numbers of growing mosquito larvae.
- **Drain plastic wading pools or fountains when not in use**, or cover tightly to deny access to mosquitoes. If the fountain is large enough, stock with mosquitofish (see below).
- **Keep swimming pools and hot tubs chlorinated and filtering.** When not in use for extended periods, cover pools or tubs tightly or stock with mosquitofish (see below). One untended pool or hot tub can breed enough mosquitoes to affect a whole neighborhood.
- **Use mosquitofish (*Gambusia affinis*)** in backyard ponds or water gardens, watering troughs, and stockponds. These fish are available, at no cost, from your mosquito and vector control district (see inside).

PREVENTION, CONT.

Gambusia are cannibalistic, so be sure to provide rocks and plants in your backyard pond to help shelter young fish, but not so many plants that the pond becomes heavily shaded. *Gambusia* do not require supplemental food. Overfed fish may not feed on mosquitoes, and excess food in the water may cause bacterial blooms that harm the fish. Do not release mosquitofish into the wild. *Caution: Check with your water district before using tap water to fill your pond. Water containing chloramine is toxic to mosquitofish and must be chemically treated first. Products (such as Aqua Plus) are readily available at pet stores.*

- **Fill tree holes** with a polymer such as Soil Moist or Broadleaf P4. In the winter, the granules absorb water and eliminate mosquito breeding habitat. The granules can last for many years, absorbing water in winter and drying out in the summer. If necessary, consult a certified arborist about the condition of the tree.

The western tree hole mosquito is the primary vector of canine heartworm in this area. Keep your dog's heartworm medicine up to date.

- **Contact your local mosquito and vector control district** if you are aware of uncontrolled mosquito sources in your neighborhood, or if you need assistance with a mosquito problem on your property. Most district services are provided free of charge.

PROTECT YOURSELF

- **Install screens on windows and doors** and keep them in good repair.
- **Certain species of mosquitoes are attracted to light, so keep outside lighting to a minimum near entry doors;** keep those doors screened or close them at sunset.

* For more information on DEET, see the *New England Journal of Medicine* (www.nejm.org), July 4, 2002, Volume 347, Number 1, pages 13 to 18: "Comparative Efficacy of Insect Repellents against Mosquito Bites" by Mark S. Fradin, M.D., and John F. Day, Ph.D.

- **Wear long sleeves and long pants** when mosquitoes are biting. Learn the times of day when mosquitoes are most active in your area and avoid outdoor activity at those times.
- **Use insect repellents.** Studies show that DEET-based repellents are the most effective.* (DEET has been in use for 40 years. After nearly 8 billion human applications, fewer than 50 cases of serious toxic effects have been documented in the medical literature.) Don't use a stronger or longer-lasting product than you need. The American Academy of Pediatrics says that repellents with a DEET concentration of 30% are safe for both children and adults, but that a concentration of 10% can be used on children if there is concern about potential risks and the threat of mosquito-borne disease is low. Apply repellent to exposed skin and wash treated skin with soap and water after coming indoors. Do not apply to infants under 2 months old, and follow all directions on the product container.

PRODUCTS AND RESOURCES

Examples of trade names of products listed in this fact sheet.

Polymer for filling tree holes (also for use in soil to reduce plant waterings):

Soil Moist
Broadleaf P4

***Bacillus thuringiensis* subsp. *israelensis* (Bti):**

Bayer Mosquito Preventer Granules
Mosquito Dunks
Mosquito Bits
Vectobac

Insect Repellents

Bite Blocker (active ingredients: soybean, coconut, and geranium oils)
Cutter Advanced Insect Repellent (active ingredient: picaridin)
OFF! (active ingredient: DEET)
Repel Lemon Eucalyptus (active ingredient: oil of lemon eucalyptus)

Product for making chloramine-treated water safe for fish:

Aqua Plus

Methoprene (insect growth regulator):

Pre-Strike (granule type only)

Bite Blocker, made from soybean, coconut, and geranium oils, is the next most effective repellent. In one study, it compared very favorably with a 6.65% concentration of DEET for repelling mosquitoes for 3½ hours.

Note: If mosquito-borne disease is a serious concern, other repellents should not be relied upon for prolonged protection.

Wristbands treated with insect repellent have been shown to be ineffective since repellents protect only a few centimeters from the site of application. Ultrasonic devices are also ineffective. Products containing other plant oils, such as citronella, have been found to provide little if any protection.

- Use a screen tent for outdoor eating (it will keep out yellowjackets too).

MOSQUITO TRAPS AND ELECTRIC BUG ZAPPERS

Propane powered traps, such as Mosquito Magnet, are not recommended by the American Mosquito Control Association. Although they attract adult mosquitoes with carbon dioxide

and heat, they do not reduce the chance of being bitten. These devices can be very expensive and they only remove adult mosquitoes without addressing their source. Energy and money would be better spent reducing breeding habitat and purchasing products containing *Bacillus thuringiensis* (see left) that can provide more effective control.

Don't use electric bug zappers because they kill far more beneficial and neutral insects than mosquitoes.

LESS-TOXIC CONTROLS

The products described below can be used in ponds and water gardens, bird-baths, fountains, pools, tree holes, and other standing water where mosquitoes lay eggs. Apply when mosquito larvae are first noted in the spring and continue at the intervals recommended on the package.

- *Bacillus thuringiensis* subsp. *israelensis* (Bti) is the active ingredient in a number of mosquito control products (Mosquito Dunks, Mosquito Bits, Vectobac) that are used in water. This bacterium is a stomach poison and must be con-

sumed by mosquito larvae to be effective. Only mosquitoes, black flies, and some midges are susceptible. Other aquatic life are unaffected. Follow all label directions.

- **Methoprene** (Pre-Strike) is an insect growth regulator that interferes with the normal development of mosquitoes. It must be present in the larval habitat to be effective. Larvae continue to grow until they reach the pupal stage, at which point they die. Do not apply to waters that drain into public waterways.

OTHER PESTICIDES

- Do not use pesticide sprays to control adult mosquitoes. Use a combination of the techniques listed above or call your mosquito and vector control district.
- Do not treat street gutters or storm drains with pesticides. Storm drains are connected directly to the Bay, and pesticides cause serious problems for aquatic life. Call your mosquito and vector control district if you suspect mosquitoes are breeding in the storm drains or catch basins.

WEST NILE VIRUS

West Nile virus made its appearance in the U.S. in 1999. Most of the small number of serious cases in this country have been among the elderly. According to the Centers for Disease Control and Prevention, only 1% of people bitten by infected mosquitoes become seriously ill — most people who get infected do not develop any disease.

Birds serve as a host for this virus. Mosquitoes acquire the virus from infected birds and then transfer the virus to people. The Department of Health Services is encouraging anyone who finds a dead bird (especially a crow, raven, magpie, jay, or hawk) to report it by calling:

877-WNV-BIRD (877-968-2473)

Do not pick up the bird with your bare hands.

WEB SITES FOR MORE INFORMATION:

California Department of Health Services: www.westnile.ca.gov

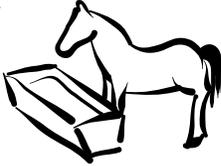
Mosquito & Vector Control Association of California: www.mvcac.org

including contact information for your local Mosquito and Vector Control District.

Target the source.

Trough

- Stock large troughs with mosquitofish.
- Clean small weedy troughs weekly.



Hole in Tree

- Check frequently for water.
- Consult tree specialist to see if hole may be safely filled with a polymer product.
- Place Bti larvicides in hole.



Pool/Hot Tub

- Operate filter and skimmer every day to remove egg rafts and larvae.
- Provide drainage for filter and pump sumps.
- Remember, chlorine will NOT kill mosquito larvae.
- Keep covers tight. Remove water from top of cover weekly.
- Stock unused pools with mosquitofish.

Open Boat

- Keep tightly covered. Check and drain cover weekly if necessary.



Clogged Rain Gutter

- Clean frequently to remove leaf litter and keep water flowing.

Bird Bath

- Change water weekly.



Rain Barrel

- Screen top with fine wire mesh.
- Change water weekly. Treat with Bti.



Anything That Will Hold Water More Than a Few Days

- Dispose of, turn upside down, or store indoors.



Storm Drain

- If mosquito breeding is suspected, contact vector control.

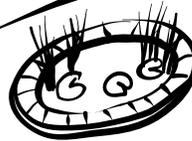


Leaky Water Equipment

- Repair.

Pond/Water Garden

- Stock with mosquitofish or use *Bacillus thuringiensis israelensis* (Bti) larvicides (i.e., Mosquito Dunks). Inquire at your local hardware store or nursery.
- Thin out aquatic vegetation.



Street Gutter

- If standing water persists for more than a few days, remove source of water (for example, adjust sprinklers to stop overwatering).

Protect yourself and your family.

WONDERFUL ROSES!



To grow beautiful roses, you don't need to use pesticides and fungicides that may contribute to local water quality problems. By choosing appropriate rose varieties, planting roses properly, and carefully following recommended cultural practices, you can grow roses that are less susceptible to pests and diseases. Roses have certain minimum requirements, so if you have soil that drains slowly or a shady yard (roses need six hours of direct sunlight a day), look for plants that will be more appropriate for your garden.

The following tips can help you to protect your family's health and the environment while you grow strong, healthy roses with glorious blooms.

CHOOSING THE RIGHT ROSE

- Start with healthy plants. Look for glossy foliage and an evenly moist rootball. Avoid plants with spindly stems, discolored or spotted leaves, or roots that are coiled around the container.
- Choose rose varieties that are disease-resistant *and* suited to your particular climate. Some roses are difficult to grow successfully in the cool and foggy summers of our coastal areas. No roses are completely disease-free, but many can be grown with minimal care.
- Visit a local rose garden at various times during the growing season to see what particular varieties look like and to learn about different roses' growing habits and requirements.
- Ask local gardeners and rosarians for suggestions. Try to find people who are growing roses with minimal pesticides.
- Contact local rose societies, nurseries, and Master Gardeners for lists of roses they recommend for your area.

PLANTING ROSES

Before you plant, spend some time finding the best spot in the garden for your roses.

WHERE TO PLANT

- Roses need full sun, which means at least six hours of direct sunlight per day. Sunlight encourages blooms and discourages disease.
- Roses require good drainage. In the spot you've chosen for planting, dig a hole the size of a gallon jug and fill it with water. If the hole doesn't drain in one hour, you should choose another spot or make a raised bed for planting the roses.
- Give your roses plenty of room to grow so that they won't be crowded. Get an idea of the mature size of the rose when you buy it. Good air circulation is crucial in preventing disease.
- Consider planting roses in mixed beds rather than traditional rose beds. This diversity of plants will attract beneficial insects and cut down on the spread of rose pests and diseases.

WHEN TO PLANT

- Roses purchased in pots can be planted any time of year, but the best selection is available in nurseries from December to May. Potted roses can be planted immediately, or they can remain in their pots for several months.
- Bare root roses (plants with no soil on their roots) are available December through February. They should be planted right after you buy them so that they don't dry out. Soak the plants overnight in water before planting.

HOW TO PLANT

Planting in Containers

For container planting, choose roses that don't grow more than 4 feet tall. Choose a container at least 20" deep and wide. Use a premium commercial potting soil. You may also want to add organic matter such as compost or high-quality rose planting mix. Water well after planting.

Planting in the Ground

- Dig a hole the depth of the container and at least two times the diameter of the container. For bare root roses dig a hole that will comfortably hold the roots of the plant. Roots need to reach out laterally as far as possible in order to take advantage of water and nutrients.
- Do not amend the soil in the planting hole. Research has shown that soil amendments are not necessary in most soils, including clays.
- Place the rose in the hole so that the bud union (the knobby part of the trunk where the rose was grafted) is 2" to 3" above the soil. For roses grown on their own roots, look for the "root crown," the area where the roots meet the trunk. Plant with the root crown above the soil, but not so high the roots are exposed.
- Fill in the hole with the soil you removed and gently tamp it down.

- Water thoroughly. If the rose sinks after watering, you may need to remove it and replant it higher to keep the soil from touching the root crown or to keep the bud union at least 2" above the ground.
- Cover the soil with 2" to 3" of organic mulch. See below for more details.

CARING FOR YOUR ROSES

WATERING

The amount of water your roses will need depends on the climate and the weather, the type of soil, and the type of rose. In areas with summer fog, roses will need less water than in areas with summer heat. You will have to water more frequently if you have sandy soil than if you have clay soil. It is important to give your roses the right amount of water. Waterlogged soil will kill roses, and drought conditions can stress plants, making them more susceptible to pests and diseases.

- Keep the soil moist. Use your finger or a soil probe to test the soil and check roses in pots at least twice a week.
- Watering with soaker hoses or a drip irrigation system delivers water to the soil without wetting the foliage. This can help prevent fungal diseases. If you water with a sprinkler, water early in the day so the foliage will dry out before evening.
- If you use granular fertilizer, water it in with a hose. Drip systems don't provide enough water to dissolve the granules.

FERTILIZING

Roses prefer a slightly acidic soil (pH 6.2 to 6.8) that is not high in salt. Fertilizers such as alfalfa meal, cottonseed meal, blood meal, and bat guano can acidify the soil. Animal manures are generally high in salts.

- Use slow-release fertilizers such as compost or those listed above or encapsulated materials such as Osmocote.

These fertilizers release nutrients slowly over a long period, preventing spurts of succulent growth which attract aphids and diseases. Organic natural fertilizers, including compost, will also provide soil structure and moisture retention and will improve food for essential soil organisms.

- If you choose a synthetic commercial fertilizer, choose one formulated for roses and try applying it at half-strength.
- If you have sandy soil that is deficient in nutrients and organic matter, you may need to apply fertilizer every month during the growing season. (Note that a slow-release fertilizer like Osmocote does not have to be applied every month.) Roses growing in clay soil containing organic matter may need fertilizing only once a year.
- Avoid using fertilizer/systemic insecticide combinations. These can cause stunted and deformed leaves, especially when the weather is cool. They may also harm soil-dwelling organisms.
- Fertilize during the growing season after the soil has warmed up. Plants will not take up fertilizer when the soil is cold.
- Sweep up any fertilizer that spills on driveways or paths and place around plants. Irrigation or rain can wash fertilizer into storm drains where it causes problems for aquatic life when it reaches a creek or the Bay.
- If you are concerned about the fertility of your soil and are considering an extensive fertilization program, have your soil tested by a professional lab first. The lab analysis will provide you with recommendations for specific amendments. (Try A&L Western Agricultural Labs, 1311 Woodland Ave., #1, Modesto, CA 95351; (209) 529-4080; www.al-labs-west.com).

MULCHING

Mulching with organic materials, like compost and shredded leaves, helps to conserve moisture, control weeds, improve soil structure, and keep roots cool in summer heat. Mulch can also prevent the spread of diseases like black spot by keeping disease spores from splashing up onto the plant from the soil. Spread a two- to four-inch layer of mulch around each plant, keeping the mulch a few inches away from the trunk.

PRUNING

Careful pruning can keep roses healthy and help to prevent disease and pest

problems. Pruning allows you to remove dead, spindly or diseased plant material, helps to shape plants and promote flowering and new growth, and provides good air circulation to discourage diseases. Use sharp tools so you won't tear the bark or damage the cane.

- During the growing season, remove any leaves and shoots affected by disease but do not prune too heavily. The plant will respond with new, succulent growth that is susceptible to aphids and powdery mildew. During winter pruning (December to February), remove any diseased portions of the plant.
- Good sanitation is essential in reducing disease problems. Remove all

diseased prunings and rake up any diseased leaves and blossoms as they fall. Do not compost them unless you have reliably hot compost that you turn regularly. Diseases can be transmitted from stems, leaves, and petals lying on the ground and from diseased plant material.

- The modern Hybrid Tea Roses and Floribundas only produce flowers on new growth so prune to remove last year's wood. Cut these bushes back every winter, leaving 2/3 of the canes' height at the base for light pruning, 1/2 of the height for medium pruning, and 1/3 of the height for heavy pruning.

MANAGING COMMON ROSE PESTS AND DISEASES WITHOUT PESTICIDES

Inspect plants regularly to detect any diseases or pests before they become a problem. Become familiar with the pests and diseases that are common in your area. Before you treat plants for insect problems, look for beneficial insects such as ladybugs, lacewings, syrphid flies, and orange-and-black soldier beetles. If you see these natural enemies of rose pests, refrain from using an insecticide because you will kill more useful insects than pests. (See following page for less-toxic chemical control for rose diseases.)

APHIDS

Tiny (1/8"), sucking insects that feed on plant sap. Often found in clusters on new shoots and flower buds, especially on over-fertilized plants. May cause leaves to discolor or turn black with sooty mold. Natural predators can reduce their numbers. **Controls:** Wipe off by hand or spray off with water, prune off infested growth, spray with an insecticidal soap, use slow-release fertilizers to prevent growth spurts.

BLACK SPOT

Optimum conditions for infection: 64°F to 75°F and 95% relative humidity. Spores must be continuously wet for 7 hours for infection to occur. **Symptoms:** circular black spots with fringed edges on leaves and stems. Leaves may yellow and drop. Spores overwinter on infected stems and fallen leaves and are spread by splashing water, cultivation, and insects. This disease is more common along the coast. Inland it may indicate excessive moisture, insufficient light, or poor air circulation. **Controls:** Choose resistant varieties, prune away and destroy infected plant material, increase air circulation, destroy fallen leaves, mulch to prevent spread of spores.

POWDERY MILDEW

Optimum conditions for infection: Night — 61°F and 95% to 99% relative humidity; day — 81°F and 40% to 70% relative humidity. Grows well only on new growth. **Symptoms:** curled leaves and a white or gray powdery coating on leaves, shoots, and flower buds. Spores overwinter on leaves and leaf buds, and are spread by wind. **Controls:** Plant disease-resistant varieties, wash leaves in early afternoon with a strong spray, avoid heavy fertilization or heavy pruning that causes spurts of new, highly susceptible growth.

RUST

Optimum conditions for infection: 64°F to 70°F and continuous moisture for 2 to 4 hours. Cold winters and very hot summers limit development. **Symptoms:** small orange or yellow spots on any green portion of the plant. On the leaves, symptoms start on the undersides and progress to the upper surfaces. Infected leaves may drop. Overwinters on leaves and stems and is spread by wind, rain, and overhead watering. **Controls:** Choose resistant varieties, remove and destroy fallen leaves, mulch to prevent spread of spores, remove and destroy infected shoots (look for dark, corky lesions). Use soaker hoses or drip irrigation.

PRUNING, CONT.

- Arching shrub roses should be pruned lightly so their naturally elegant shape is not destroyed. Thin the canes so they do not cross or rub, and cut back the lateral shoots.
- Climbers should also be pruned lightly. Don't cut back long canes. Train them into a horizontal or diagonal position to encourage lateral shoots that produce flowers all along the cane rather than just at the tip. Trim back lateral shoots to 2 or 3 nodes. Remove canes that cross or rub.
- Roses that bloom once in the spring should be pruned right after they have flowered.
- For more information, look for classes at public gardens, garden clubs, your local nursery or University of California Cooperative Extension Master Gardeners.

LESS-TOXIC CHEMICAL CONTROLS

If disease or pest problems are persistent in your garden, you may want to use one of these less toxic chemicals. Because these products prevent *but do not cure* disease, treatments must begin before symptoms are widespread. Be sure to coat both sides of the leaves. To decrease the possibility of burning leaves or flowers, water plants the day before you treat them and test a few leaves and petals before spraying the whole plant.

- Potassium bicarbonate is similar to common baking soda and can be used to prevent powdery mildew. It must be applied weekly. Or, use this baking soda mixture: 1 tablespoon baking soda, plus 2 tablespoons horticultural oil in 1 gallon of water. Spray when you first detect disease, and repeat when new symptoms appear.
- Sulfur and lime can be effective against black spot, powdery mildew, and rust. Do not use when temperatures exceed 85F° because you will burn the leaves.

- Antitranspirants and horticultural oil have been observed to provide roses with protection from fungal diseases. They create a thin coating that can prevent spores from fungal diseases from invading the leaves. Treatment is begun when new leaves appear in spring and must be repeated whenever you see new growth.

NOTE: In its ready-to-use form, the antitranspirant Cloud Cover is too strong for roses. The concentrate can be mixed 1 part Cloud Cover to 12 parts water to prevent burning. Use a 1% solution of horticultural oil and water (about 3 tablespoons of oil in 1 gallon of water).

- Neem oil can help prevent powdery mildew, black spot, and rust. Neem oil can be toxic to bees, so it is safest to spray it in the evening.
- Biofungicides attack and outcompete pathogens for nutrients and for space on leaves.

PRODUCTS AND RESOURCES

Examples of trade names of products listed in this fact sheet:

Horticultural Oil: Bonide All Seasons Spray Oil

Slow Release Fertilizer: Osmocote

Neem Oil: Rose Defense, Bonide Rose RX 3 in 1, Garden Safe Fungicide 3

Potassium Bicarbonate: Kaligreen

Soil Probe: Check your nursery

Antitranspirant: Cloud Cover; Wilt Pruf

Biofungicide *Bacillus subtilis*: Serenade Garden Disease Control

Recommended Reading

Contact local rose societies, nurseries, and Master Gardeners for lists of roses they recommend for your area.

Handbook for Selecting Roses, American Rose Society. 1998. Shreveport, LA. (318-938-5402)

Healthy Roses, University of California, Div. of Agriculture and Nat. Resources. 2002. Berkeley. (800-994-8849)

The Natural Rose Gardener, Lance Walheim. 1994. Ironwood Press.

The Organic Rose Garden, Liz Druitt. 1996. Taylor Publishing Company. Dallas.

The Rose Book, Maggie Oster. 1994. Rodale Press. Emmaus, PA.

CONTROLLING SNAILS AND SLUGS IN YOUR GARDEN



Amazing as it seems, our pest snails were originally imported from France for culinary purposes. Unfortunately, they escaped to become a major garden and agricultural problem. Snails and slugs are closely related. They both have soft, oblong bodies and produce quantities of slime to help them move around. The most obvious difference is that snails have shells.

DETECTION

Are your vegetable and flower seedlings being devoured overnight? Are you finding large ragged holes in your prized ornamentals? Do you see slime trails across your walkways? If so, your garden is probably harboring snails and slugs.

Snails and slugs are active mostly at night and on dark, cloudy days. On sunny days they can be found in moist, shady spots. Look for their eggs in the soil (about an inch down) or under rocks, boards, or plant debris. The eggs are laid in masses of up to 100 and resemble small pearls. When you find

eggs, crush them or scoop them into a plastic bag, seal it, and put the bag in the garbage.

LESS-TOXIC CONTROLS

Keeping down the population of slugs and snails requires persistence. By using a combination of two or more of the following methods, you should be able to reduce their numbers, and keep snails and slugs at acceptable levels in the garden.

HAND-PICK AT NIGHT

- To be effective, hand-picking must be thorough and it must be done regularly. Collect nightly until it's hard to find snails and slugs, then check once a week.
- The best time for hand-picking is before dawn or after 10 or 11 pm when they come out to feed. You can go out earlier, but you won't find as many.
- A flashlight and pair of gloves or tongs will make collecting these slimy creatures easier.
- Crush snails and slugs completely (otherwise they may recover and walk away) or drown them in a pail of soapy water (they survive in plain water). A few dead snail and slug bodies left on the soil surface will attract more snails and slugs and make your collecting easier, but large piles will breed flies. Burying crushed

mollusks 3 or 4 inches underground will add nutrients to the soil and avoid fly problems.

USE BARRIERS

Before using barriers, hand-pick for a couple of nights. After the barriers are in place, check for snails and slugs caught inside the barrier.

- Wrap a strip of copper (Safer Slug and Snail Copper Barrier Tape) around a tree trunk, flower pot, or the wooden sides of garden beds or fences. Snails and slugs are repelled by the unpleasant reaction between their bodies and the copper.
- Cover seedlings with small cages made from plastic or galvanized metal window screen. Push the cages into the soil so snails and slugs can't squeeze under.
- Cover rows of vegetables with special horticultural fabric (Fast Start, Seed Blanket) that lets in light and water but excludes snails and slugs.
- Use a product like SlugStop (coconut oil soap) to repel slugs and snails. Apply the material in a ring around individual plants.
- Snails and slugs may cross barriers such as diatomaceous earth, lime, sawdust, ashes, etc., especially when these barriers are wet. Lime, sawdust, and ashes can also be detrimental to your soil.

USE TRAPS

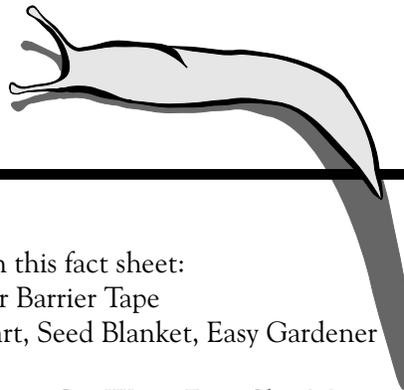
- Snails and slugs can be trapped under upside-down flower pots, dark-colored plastic sheeting, and wooden boards. Place these traps around the garden and collect snails and slugs in early morning.
- Homemade or commercial pit traps that use beer or yeast mixtures to lure snails and slugs to a drowning death may help, but hand-picking will probably still be necessary.

ENCOURAGE NATURAL PREDATORS

Many common ground beetles kill snails and slugs. Most of these beetles are large (1 to 2 inches), black, tank-like creatures. They are found in the same moist habitats as their prey: under rocks, boards, leaves, etc. Avoid killing these allies.

USE IRON PHOSPHATE BAIT

- Choose a bait product carefully. Baits containing methiocarb kill earthworms and beneficial insects.
- Baits containing iron phosphate (see product list below) are safer for children and pets than baits containing metaldehyde. Nevertheless, always keep this and all other pesticides out of the reach of children and pets.
- After eating iron phosphate, snails and slugs stop feeding and die within 3 to 6 days. They often crawl into secluded places, so you may not see dead bodies.
- Reapply iron phosphate baits every 2 weeks.



PREVENTION

- Snails and slugs find large expanses of ivy, nasturtiums, and other succulent ground covers particularly attractive, and they also hide in clumps of agapanthus, lilies, daffodils, and iris. They are less attracted to plants with dry, hard leaves like rhododendrons, junipers, and bamboo. If you can't remove the attractive plants, regularly search them for pests.
- Moisture makes an area much more attractive to snails and slugs. Avoid over-watering and use drip emitters to deliver water only where it is needed. Water early in the day to allow the area to dry out before nightfall. It may be necessary to remove mulch from areas with severe problems.
- Remove any boards and flower pots that you aren't using as traps.

PRODUCTS

Examples of trade names of products listed in this fact sheet:

Copper Barrier: Safer Slug and Snail Copper Barrier Tape

Horticultural Fabric (Row Cover): Fast Start, Seed Blanket, Easy Gardener Plant and Seed Blanket

Baits containing Iron Phosphate: Sluggo, Escar-Go, Worry Free, Slug Magic, Bayer Advanced Dual Action Slug and Snail Killer Bait, Garden Safe Slug and Snail Bait, Spectracide Snail and Slug Killer Bait

LIVING WITH SPIDERS

THE HELPFUL HUNTERS



Spiders are beneficial creatures. Because they feed on large quantities of insects, they should be tolerated as much as possible in the home and garden. Spiders are not insects. They are classified as “arachnids” and have eight legs. Insects have six legs.

FEW SPIDERS ARE DANGEROUS

There are over 3,000 species of spiders in the U.S. and only a small number of these are dangerous to people. In California, there are only a few spiders that cause concern for people (see box on back).

CASES OF MISTAKEN IDENTITY

People often think they have been bitten by a spider when the culprit is actually a flea, tick, mite, or even a disease condition. Very few spiders are equipped with mouth parts that can pierce human skin. If the bites you are discovering are small, mild, and disappear within a day or two, there is prob-

ably nothing to be concerned about. Of course, if a bite affects a large area, is very painful, and/or is followed by dizziness, fever, nausea, or any other severe symptoms, seek medical advice immediately. Try to capture the offending spider, drop it into a small jar of rubbing alcohol, and save it for identification.

WHAT CAN I DO?

Harmless or not, the presence of spiders or their webs in the house is upsetting to many people. Unfortunately, spider webs are often associated with poor housekeeping, under the mistaken assumption that a “clean” house harbors no insects or spiders at all. On the contrary, spiders can be an asset to the conscientious housekeeper since they capture and consume many pest insects before the human residents ever see the pests.

INSIDE YOUR HOME

- **Vacuum instead of spraying around the house for spiders.** If you cannot endure spiders or their webs in your home, the easiest and safest way to get rid of them is to vacuum up both spiders and webs. The dust inside the vacuum bag will quickly suffocate any spiders you catch. Make a periodic check of the areas

where you most often find the eight-legged creatures.

- **Get rid of webs.** If you’re willing to share your house with a few spiders, you can periodically vacuum up webs that are eyesores or embarrassing to you as a housekeeper. Leaving the spiders will allow them to continue to do their pest control work.
- **Take spiders outside.** Catch spiders in a container, cover the container with a piece of paper, and release them outside.
- **Keep spiders out of the house.** Caulk cracks and crevices. Install screens on windows and doors.
- **Reduce their food supply.** What are those spiders eating — fruitflies? Try storing ripening fruit in paper bags that are folded over twice and sealed with a large clip. Are they feasting on the insects attracted to a porch light? Try a yellow bulb. Are houseflies the spider’s treat? Install screens on windows and doors.

OUTSIDE YOUR HOME

Don’t spray your garden or around the outside of your house to kill spiders. Outdoors, spiders are providing a very useful pest control service. Leave them to do their job.

BLACK WIDOW, BROWN WIDOW, AND RECLUSE SPIDERS

The black widow that is found in California is the shiny black *Latrodectus hesperus*. The female sports a characteristic red hourglass-shaped mark on the underside of her abdomen. The brown widow (*Latrodectus geometricus*), which occurs in Southern California, is a mottled brownish yellow. The brown recluse spider (*Loxosceles reclusa*) is not known to exist in California. There are, however, other recluse spiders in California that can cause problems for people. Recluse spiders vary from tan to dark brown, but they all have 6 eyes arranged in pairs. Usually it takes an expert to definitively identify a recluse spider.

Deaths from the bites of these three spiders are very rare. For many people, bite symptoms are not significant enough to warrant medical attention. Bites are of most concern to the very young, the very old, and those who are seriously ill.

These spiders are not aggressive and they are rarely encountered by people.

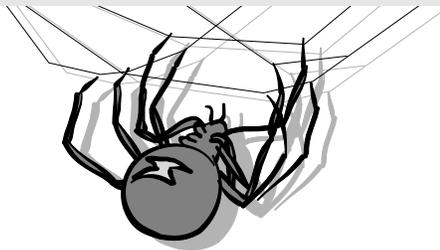
Ordinarily, the widow spiders and the recluses are reluctant to bite people. They spend their lives in their webs waiting for prey. They do not go out hunting.

Where are these spiders found?

- Usually (but not always) near the ground
- Dark, dry, protected crevices in and around buildings
- Lower portions of seldom-used cupboards, closets, or other dark, dry storage areas.
- Woodpiles, lumber piles, or rock piles
- Stacked patio furniture, flower pots, or baskets
- Rodent burrows
- Water meter boxes
- Irrigation control boxes

How to avoid bites from black widows, brown widows, and recluse spiders:

- Wear gloves to clean up garages, debris, or woodpiles outside, and relatively undisturbed storage areas and piles of clutter inside.
- If you live in an area where these spiders are common, check your bed before getting in, don't leave clothing on the floor, and shake out your shoes before putting them on.
- Teach children not to tease spiders in their webs or to poke bare fingers into dark cracks and crevices.
- Always pay attention to where you place your hands.





CONTROLLING YELLOWJACKETS AROUND YOUR HOME

With their potent sting, yellowjackets can be menacing creatures when it comes to a showdown over the picnic table. In years when the spring is warm and dry, yellowjacket populations can increase to the point of making outdoor activities difficult. But few people are aware that yellowjackets are voracious predators of insect pests such as caterpillars and flies.

IDENTIFICATION AND DETECTION

Yellowjackets are a type of wasp but they are often mistaken for bees. Sometimes they are confused with other less aggressive predatory wasps, especially paper wasps. Yellowjackets are relatively short and stout compared to paper wasps. Paper wasps have longer more slender bodies and long dangling legs. Yellowjacket nests are spherical and are enclosed in a papery envelope with a small entrance hole at the bottom. Paper wasp nests are usually suspended from eaves or porch ceilings and look like tiny umbrellas filled with hexagonal cells.

LESS-TOXIC CONTROLS

REMOVING AN INDIVIDUAL YELLOWJACKET FROM INSIDE THE HOUSE

If you are not hypersensitive to yellowjacket stings:

- don't aggravate the yellowjacket by swatting at it,
- wait until it lands on a flat surface,
- place a glass or plastic container over the insect,
- slide a stiff piece of paper under the opening of the container, and
- seal the container and place it in the freezer overnight to kill the yellowjacket or take it outside and release the insect.

If you are finding many yellowjackets inside, you may have a nest in a wall void.

DESTROYING NESTS

Because of the danger of multiple stings, we strongly recommend calling your local vector control district or a private company for information and assistance.

Yellowjackets build nests in abandoned rodent burrows and other holes in the ground, in attics, in wall voids, in shrubs and trees. Sometimes they hang their nests from eaves.

TRAPPING YELLOWJACKETS

Traps can provide temporary relief from yellowjackets, however individual yellowjackets can sometimes escape traps. There are a number of traps on the market, some disposable and others reusable. Experiment to find the trap or traps that work best for you.

- Follow label directions for setting traps, disposing of trapped yellowjackets, and cleaning and reusing traps that are reusable.
- Place a number of the traps around the periphery of your yard or picnic area to lure the yellowjackets away from your activities and food.
- Set the traps out a few hours before bringing food outdoors so the insects change their foraging patterns.
- If one of the traps is not attracting yellowjackets, move it. If you set out several traps and none of them are attracting yellowjackets even though they are present, try changing the bait. Use baits such as tuna-flavored cat food in the spring and early summer. Try using grenadine or the attractants that come with the traps in late summer and fall.

POISON BAITING

As a last resort in years when yellowjacket populations are extremely high, poison baiting may be necessary. Call a pest control professional.

PREVENTION

- Seal holes and cracks in foundations, walls, roofs, and eaves to prevent yellowjackets from entering your home.
- Cover attic and crawl space vents with fine mesh insect screen.
- Yellowjackets scavenge for meat and sweet foods and drinks in outdoor garbage and recycling bins. Clean recyclables before storing them. Keep garbage cans clean and tightly covered, or seal all food garbage in plastic bags.

WHY YELLOWJACKETS STING

Yellowjackets seldom sting when they are foraging for food, unless they feel threatened. They are, however, likely to attack when their nests are disturbed by a direct blow or by vibrations that are detected by the wasps inside. Mowing the lawn near an underground nest, construction work near a nest in a wall void, or even walking near a nest can provoke an attack by one or more

yellowjackets. This is especially true if the nest has been disturbed before.

AVOIDING STINGS

When a yellowjacket approaches:

- Remain calm
- *Do not* strike at a yellowjacket with sharp, sudden blows. Slow, gentle motions that mimic the movement of a branch in the breeze will be safer in encouraging the yellowjacket to leave.
- You can brush the yellowjacket off with a piece of paper or some other object as long as you move slowly and deliberately.
- Do not squash a yellowjacket. When crushed, many yellowjacket species emit a chemical that can cause other nearby yellowjackets to attack.

Yellowjackets can be a problem in May and June, but they are most noticeable and annoying late in the summer. During yellowjacket season, the following tips will help prevent stings.

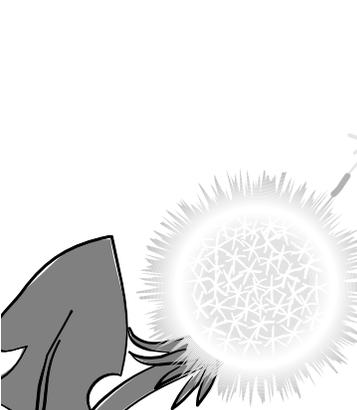
- Wear protective clothing when mowing grass where you suspect underground nests.
- If you are hypersensitive to yellowjacket stings, avoid outdoor cooking or eating. Hypersensitive people should wear clothing that covers as much skin as possible, and carry an epinephrine kit (available by prescription) at all times.
- Outdoors, do not drink soft drinks or other sugary drinks from open containers. Use cups with lids and straws, and look before you sip. Do not carry snacks containing meat or sugar in open containers.
- Do not wear perfumes. Use unscented deodorant, sun screen, hair spray, etc.
- Avoid going barefoot, especially in vegetation.
- Always examine wet towels or wet clothing before you pick them up outdoors.
- Wear light-colored clothing without patterns.

PRODUCTS

Examples of trade names for products listed in this fact sheet

Traps:

- Rescue! Yellowjacket (disposable)
- Rescue! Trap (reusable)
- Victor Yellow Jacket Trap (use liquid bait such as apple juice)
- Victor Yellow Jacket and Flying Insect Trap (use liquid bait such as apple juice)
- Seabright Yellow Jacket and Wasp Trap (use solid bait such as tuna catfood); (800) 284-7363; www.seabrightlabs.com



HOW TO CONTROL WEEDS

It is unrealistic to think that we can have a garden or a lawn that is entirely weed-free. We need to manage weeds so they don't become an overwhelming problem. This means tolerating some weeds in some situations. If you really want to solve your weed problem, you will need to spend some time, have some patience, and expend some effort.

WHAT IS A WEED?

A weed in the garden is usually a plant growing in the wrong place. This includes not only plants we normally think of as weeds, such as the dandelion, but also the tens of tomato seedlings coming up in the worm compost we've spread on a flower bed.

INVASIVES

There are, however, a number of non-native plants that are very serious pests. When these plants are introduced into natural areas, they overwhelm native vegetation and degrade the environment for wildlife and humans alike. The worst of these invasive plants are classified as noxious weeds, and the government spends millions of dollars every year to remove them.

Some commonly available garden plants are actually invasive weeds that can "escape" from our gardens into wildlands. Don't use these plants and remove any from your yard (see "Don't Plant a Pest!" brochure from Cal-IPC; www.cal-ipc.org).

WEEDS CAN BE BENEFICIAL, TOO

Deep-rooted weeds such as thistles, pigweeds, and nightshades can bring up minerals from the subsoil that are then deposited in the topsoil when the plants die and decompose. Deep roots can open pathways for water and for roots of less aggressive plants. Weeds in the sunflower (Asteraceae), parsley (Apiaceae), and mustard (Cruciferae) families produce flowers that feed beneficial insects with their nectar and pollen.

NON-CHEMICAL STRATEGIES FOR CONTROLLING WEEDS

To solve your weed problems in the long run, you must make the habitat in which weeds are growing inhospitable to them. In general, weeds prefer bare soil with lots of light; therefore, keep the soil in between your plants covered with mulch that excludes light from the soil. Patch cracks in paving, or fill cracks with special caulking compounds designed for asphalt or concrete.

It is very important to prevent weeds from going to seed. If you can reduce the number of weed seeds in and around your garden, you have won half the battle.

HAND WEEDING

Weeds are easiest to pull when they are fairly small and when the soil is moist, but not wet. There are a number of useful weeding tools for sale, and gloves will protect your hands. Any weeds you pull up (or cut off) can be used as mulch around desired plants or can be composted, *as long as they have not yet flowered and are not the kind that reproduce from plant fragments, tubers, or bulbs.* Once weeds flower, there is a danger that seeds will mature on the plants even after they are pulled.

With established perennial weeds, concentrate on digging up the roots or depriving them of energy. If you cannot dig up the roots, cut the plant down to the ground. Cover the area with thick mulch, and if plants send up new shoots, cut them down again. Don't allow the plants to flower, produce new leaves, or go to seed. With no leaves to produce energy, the roots will eventually use up their reserves and be unable to produce new shoots.

WATER MANAGEMENT

Prevent weeds from growing by keeping the soil too dry to support plants. Drip irrigation systems with drip emitters deliver water only to desirable plants.

MULCHING

A thick layer of mulch deprives weeds and their seeds of light. Organic mulches, such as compost, leaves, sawdust, straw, newspapers, and cardboard, have the added benefit of providing organic matter for soil organisms to feed on. Weed control fabric and black plastic will also exclude light from weeds and their seeds. It is important to understand that mulches only prevent weeds that are under them from growing. Most organic mulches provide a good growing medium for weed seeds that blow in on top of the mulch, but you can more easily pull weeds growing in mulch than in soil. Weeds will also grow on top of weed fabric or plastic once enough soil or organic matter has accumulated.

The particle size of the mulch will determine the depth of the application. Apply coarse-textured mulches, such as bark and wood chips, 4" deep for weed control. Apply fine-textured mulches, such as shredded leaves or dry grass clippings, about 2" deep. Keep all mulches several inches away from the stems of plants or the trunks of trees and shrubs to prevent disease.

Weed control fabric, black plastic, or layers of cardboard and newspapers are excellent for large areas with very vigorous weeds. Place drip emitters in a 12" grid on the soil under newspaper and cardboard mulch to provide water to the roots of any desirable plants in the area and to hasten the decomposition of the weeds under the mulch. Cover these "sheet" mulches with wood chips or another organic mulch.

Use sawdust mulch only where you don't want anything to grow (e.g., in a pathway) because decomposing sawdust temporarily depletes nitrogen from the soil surface and makes it hard for plants to survive.

All organic mulches deteriorate over time, some more rapidly than others. Be sure to replenish them as they decompose.

COMPETITIVE PLANTING

Vigorous ground covers and plants with dense foliage can shade the ground enough that weed seeds have difficulty germinating. Lawns that are cut high will be able to shade out most weeds. When you remove weeds from a lawn, sprinkle some grass seed in the spot so that lawn rather than weeds will fill the hole.

CULTIVATION

Cultivation is using a tool, like a shovel, hoe, or rototiller, to turn the soil or remove weeds. Cultivation can bring new weed seeds to the surface, disrupt the food web of soil organisms, and ruin soil structure, so use this technique sparingly.

MOWING

Mow weeds or cut them with a weed-whacker before they produce flowers or go to seed.

LESS-TOXIC HERBICIDES

Products containing clove oil (Burn Out II) or soap (Concern Fast Acting Weed Killer) will kill the above ground portions of weeds, but will leave roots that may resprout. Plants will be most susceptible when they are young. To kill older annual weeds or tough perennials, you will most likely have to repeat the herbicide application a number of times.

Caution: When spraying any kind of herbicide, protect desired plants from coming into contact with the spray. Do not spray on windy days. Prevent people and pets from having access to the area until the material has dried.

PESTICIDES AND WATER POLLUTION

Commonly used pesticides can be harmful to people, pets, and the environment. Part of the problem is the toxicity of some pesticides, but even more important is the sheer volume of pesticides used in this country every year. Much of it finds its way to our water, air, and soil. **Studies show that the most commonly used pesticides are the ones most likely to cause water pollution.**

Who applies all these chemicals? You might think that farmers are mainly responsible for pesticide problems, but more than half of California pesticide use is in urban areas — by residents, home gardeners, and pest control professionals in and around schools, businesses, and homes.

The *Our Water, Our World* program was developed in 1997 by clean water agencies in response to pollution problems caused by two of the most commonly used residential pesticides at that time — chlorpyrifos (Dursban) and diazinon. Both stormwater runoff and wastewater treatment plant discharges contained levels of these two pesticides that were high enough to kill aquatic organisms at the bottom of the food web. In fact, in 1998 the U.S. Environ-

mental Protection Agency (EPA) listed 85 California waterbodies as “impaired” due to diazinon.

And in 2000, because of growing concerns about the effects these chemicals have on human health, EPA announced an agreement with pesticide manufacturers to remove most products containing chlorpyrifos and diazinon from retail store shelves and to end most residential and professional uses by the end of 2004. Generally, since January 2005 professionals have virtually stopped using these two pesticides in residential areas. In spite of sales of these products being discontinued, residents may still be using old supplies — potentially causing the same problems that led to their removal from the market.

Water quality agencies urge the public not to use pesticides that contain chlorpyrifos (Dursban) or diazinon. Instead, dispose of them at a household hazardous waste facility (see below).

NEW THREATS TO WATER QUALITY

Chemical pesticides designed to replace these banned pesticides are available, but substituting another toxic chemical won't help the environment. With the phase-out of diazinon and chlorpyrifos, pesticide products have either been replaced or reformulated using other chemicals (referred to as “active ingredients”), including:

- **Pyrethroids:** Many diazinon and chlorpyrifos products have been replaced with formulations using pyrethroids. As a result, the use of synthetic pyrethroids in pesticide products has nearly tripled in just the last few years. Pyrethroids are used in hundreds of products including pesticides used outdoors on lawns or for spraying the perimeters of houses.

Pyrethroids are broad-spectrum, long-lived *synthetic* chemicals that interfere with the function of the nervous system. Designed to kill a wide variety of insect pests, (such as ants, cockroaches, and lawn grubs) they are also highly toxic to fish, aquatic insects, crustaceans, and the beneficial insects (such as ladybugs, lacewings, and earthworms), that keep pest populations under control naturally. Beneficial insects are often far more sensitive to pesticides than the pests you might be trying to kill. Once pesticides eliminate the beneficial insects, pests are free to multiply without a natural check.

Products containing pyrethroids have ingredient names typically ending in “-**thrin**,” including: permethrin, bifenthrin, cyfluthrin (including beta-cyfluthrin), cypermethrin, deltamethrin, lambda-cyhalothrin, and tralomethrin (one exception is esfenvalerate). The pyrethroids resmethrin and tetramethrin are used less widely outdoors so are not as big a threat to water quality; however,

NEW THREATS TO WATER QUALITY, CONT.

they are present in aerosol products, which disperse chemicals in a way that significantly increases the risk of exposure to unintentional targets — including people and pets.

- **Malathion and Carbaryl (Sevin):** Although these pesticides have been available for many years, with the discontinuation of diazinon, their use has increased. These chemicals, twice as toxic in salt water as in fresh water, are already detected frequently in urban and suburban waterways across the country. They are also water soluble — meaning rain and overwatering can easily cause them to wash off lawns and gardens and enter storm drains and local waterways.

PYRETHRINS VS. PYRETHROIDS

Unlike long-lived synthetic pyrethroids, natural pyrethrins are short-lived pesticides made from chrysanthemum flowers. Though natural pyrethrins are less persistent in the environment than the synthetic pyrethroids, they are still toxic to birds, fish, and beneficial insects until they break down after a few hours in sunlight. Take steps to prevent pyrethrins from running off to a street, gutter, or storm drain.

WHAT SHOULD YOU DO IF YOU HAVE UNWANTED PESTICIDE PRODUCTS AROUND THE HOUSE?

If you have unwanted or leftover pesticides, do not pour them in ANY drain inside or outside your house. Do not put pesticides in the trash. Instead, take them to a household hazardous waste collection facility or event. Call 1-800-CLEANUP or visit www.ourwaterourworld.org/disposal_info.cfm for times and locations in your community. Empty five-gallon or smaller containers with no free-flowing liquid may be put in the trash.

HOW CAN YOU BOTH MANAGE PESTS AND HELP PROTECT THE HEALTH OF PEOPLE, PETS, AND OUR ENVIRONMENT?

- Follow the suggestions for less-toxic pest control and *pest prevention* in the *Our Water, Our World* fact sheet series that can be found online at www.ourwaterourworld.org and in participating stores.
 - Another source of information on pest control alternatives is the University of California Statewide IPM Program at <http://ucipm.ucdavis.edu>.
- Try to keep your garden healthy and your home pest-free without resorting to chemical pesticides. Remember that when you apply pesticides, you are treating the *symptom*, rather than the *cause* of pest problems. **Physical barriers** (window screens and caulking to keep pests out), **biological controls** (introducing beneficial insects), and **cultural controls** (keeping a clean house and a healthy garden that attracts beneficial insects) are always preferable to chemical pesticides. In situations where a pesticide is necessary, however, the best products for the environment are *less toxic, less persistent, and more targeted on pests and not on beneficial insects and plants*.
 - Avoid wearing insect-repellent clothing. EPA recently found that wearing clothing treated with permethrin (a synthetic pyrethroid) more than once a year could increase cancer risks.

USE AND DISPOSAL OF PESTICIDES

Even when applied according to label directions, pesticides make their way into our waterways, air, rain and fog. Even small amounts of pesticides can be lethal to marine life, birds, and other life forms. Just one granule or seed treated with diazinon, a common household pesticide, is enough to kill a small bird. **So what can we do?** Instead of relying on conventional pesticides as our first line of defense against a pest, consider them as a last resort. Check out the other fact sheets in this series for tips on safer and effective alternatives for preventing and managing pest problems in your home and garden. For more information, contact the sources listed on the reverse side of this fact sheet.

IF YOU MUST USE PESTICIDES:

- Identify the pest and the afflicted plant, and then choose a product labeled for use on that pest and plant. Not all pesticides are effective against all pests.
- Aerosols may be the worst option you can choose for pest problems. They disperse chemicals in a way that significantly increases the risk of exposure to unintentional targets, including beneficial insects, birds, pets, you and your family.
- Choose the least-toxic product available. Baits and traps are safer options.
- Spot treat whenever possible.
- Buy ready-to-use products instead of concentrates. An undiluted pesticide that requires mixing is more hazardous than one that is already diluted. And, ready-to-use products avoid the use of measuring and mixing that could result in spills. When rinsing a pesticide from measuring cups, applicators or containers, use the rinse as you would the pesticide — for the target pest. Don't wash it down a drain. (See *Proper Disposal* section.)
- Read the label and use only the amount recommended to do the job. More is not better.
- If the label instructs you to use protective gear, heed the advice — your health could depend on it. The use of gloves, for example, is not intended to avoid staining your hands; rather, it offers protection against having the chemicals enter your blood stream through your skin.

- Homeowners who apply pesticides outdoors (including applications on lawns) can unknowingly carry residues into their home on clothing and shoes. Pets can also be carriers. Be mindful that residues, whether tracked in from outdoors or as a result of indoor use, can contaminate carpets and floors where children play.

SIGNAL WORDS

Caution, Warning, and Danger are signal words placed on product labels to alert consumers to the relative toxicity of the products — *Caution* being the least toxic and *Danger* being the most toxic. These signal words, however, pertain only to the **acute** or **immediate** hazard of the product. Labels do not provide information about the chronic or long-term hazards to humans, animals or the environment. For example, *nothing* on the product label tells you whether a product contains a chemical suspected of causing birth defects, kidney or liver damage, cancer, lung disease, etc.

INERT INGREDIENTS

Inert ingredients (called “inerts” or “other ingredients” on product labels) can comprise up to 99.9% of a pesticide product. Contrary to what the name implies, inerts are not necessarily safe chemicals — nor have they necessarily been tested for any long-term health implications like cancer, nervous system damage, reproductive harm, or gene mutations. If you want to try to avoid exposure to chemicals suspected of causing long-term health impacts, select pest control products that are non-toxic (e.g., traps), those that offer the least amount of pesticide exposure (e.g., baits), or those that offer the least toxic chemical (e.g., horticultural oil). For more information on choosing the least-toxic pest control product available, refer to the other fact sheets in this series or contact the organizations listed in this fact sheet. For more information on inert ingredients, go to: www.pesticide.org.

KNOW WHAT YOU'RE BUYING

- Just because a product is purchased over-the-counter, doesn't mean that it has been tested for its ability to cause long-term health or environmental damage. In 2001, the U.S. Environmental Protection Agency worked with product manufacturers to remove the pesticide Dursban (or chlorpyrifos) from being sold because of its toxicity to children. Chlorpyrifos was first registered for sale in 1965. Diazinon, a close relative, will be removed from store shelves by 2005 — also because of its toxicity to children. It has been registered for sale since 1956.
- Research has shown that pesticide residues are detected on many foods

purchased from grocery stores. For more information about pesticides in food, go to: www.foodnews.org (Environmental Working Group); or call the Natural Resources Defense Council at (415) 777-0220.

- If you have any questions about the safety, environmental impact, or proper use of a pesticide, call the National Pesticide Information Center 24-hour hotline at (800) 858-PEST, www.npic.orst.edu.

STORING PESTICIDES AND APPLICATION EQUIPMENT

- Store pesticides in their original containers, in a place that cannot be accessed by children or pets.

- Never remove the labels.
- Clearly mark containers, applicators and utensils used for mixing or applying pesticides and store them with the pesticides. Never use them for any other purpose.

DISPOSE OF PESTICIDES SAFELY AND LEGALLY

- Unwanted pesticides should be brought to your local household hazardous waste collection program. In California, it's illegal to dispose of partially used containers of pesticides (or any hazardous waste) in the trash, in spite of what the label says. It is legal to dispose of empty (no free-flowing liquid) pesticide containers in the trash if they are 5 gallons or less in capacity.
- *Never* dispose of pesticide-tainted water in any indoor or outdoor drain. Though **indoor** drains flow to treatment plants, pesticides can pass right through the plants and enter local waterways. Water used to rinse out a sprayer or applicator should be applied like the pesticide. In most communities, **outdoor** drains flow directly to local waterways.
- *Never* use or give away any pesticide that is no longer available in the marketplace such as chlordane, DDT, and chlorpyrifos (Dursban).
- For more information on pesticide disposal, call 1-800-CLEANUP or visit: www.1800CLEANUP.org.

GROWING A HEALTHY GARDEN TO MANAGE PESTS NATURALLY



A healthy garden filled with a wide variety of flowering plants will be more resistant to significant pest damage. A healthy, diverse garden will also attract beneficial creatures, such as dragonflies, ladybugs, lacewings, syrphid flies, and “miniwasps,” which feed on pests.

ATTRACTING AND KEEPING BENEFICIAL INSECTS

- Become familiar with what beneficial insects look like in their various forms of development. Many people kill ladybugs in their larval form without realizing it. Other bugs suffer the same fate. Go to www.ipm.ucdavis.edu/PMG/NE/index.html to see what these garden predators look like as “babies” and adults!
- **Reduce or eliminate the use of broad-spectrum pesticides in your garden.** Bees and other beneficial insects are often far more sensitive to pesticides than the pests you might be trying to kill. Once pesticides eliminate the beneficial insects, pests are free to multiply without a natural

check. As pest populations rise, you may be tempted to spray more frequently, but pesticides leave genetically resistant strains of pests to breed, creating an increasingly resistant pest population. The harder it becomes to kill the pest, the more you’ll need to spray and the fewer natural enemies you’ll have to help you out.

- **Provide food and water for the adult forms of beneficial insects.** Although many beneficial insects perform their pest control services only during an immature stage, the adult stage feeds on nectar and pollen. You can attract and keep a wide variety of beneficial insects in your garden by including flowering plants that are rich in pollen and nectar. The box on the back page lists a number of these “insectary” plants. Some adult beneficial insects also need water from dew, irrigation, or other sources to sustain them during dry periods.

CHOOSING THE RIGHT PLANT

One of the most important preventive steps in the pest management process is selecting appropriate plants for a particular location. Usually we choose plants for their beauty, but to minimize pest problems, consider other plant characteristics and the site where it will

grow. It’s easier to plant a compatible species for your site than to try to alter the growing conditions.

- Understand the soil conditions in your yard. Soil conditions must match the requirements of your plants. For example, some plants are well adapted to salty or compacted soil or soil with poor drainage.
- Know the sun and shade characteristics of your garden. Consider times of day and different seasons.
- Know that watering requirements differ depending upon the soil and plant type.
- Select pest- and disease-resistant plants.
- Don’t plant invasive species (some are available as garden plants), and remove those growing on your property (see “Don’t Plant a Pest!” brochure from Cal-IPC; www.cal-ipc.org).
- Plant a diversity of species. Include native plants and plants from other Mediterranean climates. This ensures that a single pest problem will not devastate your entire landscape.
- To attract and keep beneficial insects, include “insectary” plants in your landscape (see box on back).
- You can get help in choosing the right plants from California Certified Nursery Professionals, University of California Cooperative Extension Master Gardeners, Horticultural

CHOOSING THE RIGHT PLANT, CONT.

Consultants, ISA Certified Arborists (see the Yellow Pages index), California Invasive Plant Council, or local gardening clubs. Also, see the books recommended on the back side of this fact sheet.

PLANTING AND CARING FOR YOUR PLANTS

Start your plants out right by choosing healthy specimens and planting them properly. Keep your plants healthy by correctly watering, pruning, and fertilizing them (if needed).

- Before you buy a plant, ask to examine the roots. Do not buy plants with roots that are kinked or circling the container. Also check the “root crown,” the region where the roots meet the stem or trunk. Don’t buy the plant if that area is soft, rotten, or deformed.
- Don’t pile soil around the plant any higher than the root crown. Don’t plant in a depression that will allow water to wash soil down around the

stem or trunk and cover the root crown. A continually moist root crown can cause rot.

- Since a young plant doesn’t have an extensive root system, it can dry out quickly. Water thoroughly and keep the soil moist, but don’t drown the plant.
- Cover bare soil with mulch. Mulch conserves soil moisture so plants don’t dry out as quickly. A four-inch layer of mulch will prevent most annual weeds from growing, and any weeds that do sprout can be pulled out more easily.
- Use a mulch of leaves, bark, or composted manure and/or garden waste to provide organic matter to the soil and a slow, steady flow of nutrients to plants.
- Use slow-release chemical fertilizers only if soil testing indicates a specific deficiency.
- Different plants require different kinds of pruning (if they need it at all). Learn how and when to prune your plants, and do so judiciously. Severe pruning can damage the plant and encourage pests and diseases.

RECOMMENDED READING

- *The Best of Fine Gardening: Healthy Soil* by the editors of *Fine Gardening* magazine, published 1995 by Taunton Press, Newtown, CT; (800) 888-8286.
- *California Master Gardeners’ Handbook* published 2002 by the University of California Division of Agriculture and Natural Resources, Berkeley, CA.
- *Natural Enemies Handbook* by Mary Louise Flint and Steve H. Dreistadt, published 1998 by University of California Division of Agriculture and Natural Resources, Berkeley, CA.
- *Sunset Western Garden Book*, Sunset Publishing, 2001.

INSECTARY PLANTS

The flowers on these and many other plants have nectar and pollen that are accessible to beneficial insects.

Aster (*Aster*)
Baby blue eyes (*Nemophila menziesii*)
Calendula (*Calendula*)
Calif. lilac (*Ceanothus*)
Calif. poppy (*Eschscholzia californica*)
Chervil (*Anthriscus cerefolium*)
Chrysanthemum (*Chrysanthemum*)
Coriander (*Coriander sativum*)
Cosmos (*Cosmos*)
Coyote brush (*Baccharis pilularis*)
Dill (*Anethum graveolens*)
Elderberry (*Sambucus mexicana*)
Fleabane (*Erigeron*)
Holly-leaved cherry (*Prunus ilicifolia*)
Monkey flower (*Mimulus*)
Native buckwheat (*Eriogonum*)
Pincushion flower (*Scabiosa*)
Rosemary (*Rosmarinus officinalis*)
Rudbeckia (*Rudbeckia*)
Sunflower (*Helianthus*)
Sweet alyssum* (*Lobularia maritima*)
Tidy-tips (*Layia platyglossa*)
Toyon (*Heteromeles arbutifolia*)
Yarrow (*Achillea*)
Zinnia (*Zinnia*)

*Do not plant on or near coastal bluffs.
Can be invasive.

FINDING A COMPANY THAT CAN PREVENT PEST PROBLEMS

If you have a pest problem, you may be able to solve it yourself with the help of the resources listed at the end of this fact sheet. However, if you want or need to hire a professional pest control service, look for a company that offers less-toxic pest control or Integrated Pest Management (IPM). IPM focuses on long-term prevention of pests and their damage through a combination of techniques such as habitat modification, biological control, and physical control. Pesticides are used only if truly necessary and are selected to be effective against a specific pest while minimizing risks to you, your family and pets, wildlife, beneficial insects, and our environment. IPM is a common sense preventative approach and is less toxic than conventional spraying. IPM methods are based on extensive scientific research.

Studies have demonstrated that using less-toxic pest management or IPM saves money compared to conventional pest control. Because the initial costs are typically higher, companies that haven't adopted less-toxic approaches

DOING YOUR PART

For any pest control to work, you must do your part. If the pest control company makes recommendations about cleanup, home repairs, or other steps you should take to help prevent pest problems, make sure you follow their instructions.

may believe they cost more. However, less-toxic pest management pays for itself in the long term because it treats the underlying problem (why you have pests); conventional controls typically treat just the symptoms.

ASK BEFORE YOU HIRE

When you first contact a company, tell them that you are concerned about the use of pesticides and would like them to use only less-toxic pest control methods. Some companies may try to convince you that chemical sprays are safe and more effective. Be persistent. Find out to what extent a company you're considering uses non-chemical approaches to pest control and how it would approach your particular problem. Here's what to look for:

APPROACH

- **Ask if they are willing to do pest control without sprays.** Their response will help you determine their philosophical approach to pest control.
- **Discuss various methods and determine if the company provides**

less-toxic options, such as those discussed below. A company that offers less-toxic pest control or IPM should use conventional chemicals for only a fraction of their jobs.

- **Inspection** — Ask how the company will find out how the pests are entering, where they are hiding, what's attracting them, and what they are eating. A less-toxic approach will begin with a thorough inspection to determine *why* you have a pest problem, as well as the extent of the problem. The key to effective pest control is detailed information about the pest. It is very difficult to control a pest if the company doesn't know specifically what species it is. The company should also ask you whether anyone living in the house is pregnant, less than one year old, chemically sensitive, asthmatic or elderly, and whether you have pets.
- **Habitat modifications** — Ask what the company will do to prevent a re-infestation of the pest. Since pests need food, water, and shelter to survive, eliminating or reducing one of these via habitat modification (for example, by caulking cracks, screening holes, and replacing door thresholds) will reduce the pest population.
- **Other physical controls** — Physical controls may be used to trap or kill the pest, not just modify its habitat. Physical controls include vacuuming up pests or using traps or barriers.

APPROACH, CONT.

- **Biological controls** — Some companies will use other organisms, such as beneficial nematodes or lacewings, to control certain pests.
- **Horticultural controls** — Horticultural controls involve how the yard and garden are cared for. For example, plants produce less top growth if fed a slow-release or organic fertilizer — making them less attractive to certain pests. Good horticultural practices are important, since a healthy lawn and garden will naturally resist or outgrow most pest damage.

CHEMICAL CONTROLS

Less-toxic chemical controls

- **Ask how the company makes decisions about when, where, and what (if any) pesticides to use.** A less-toxic pest control service will not spray routinely and, if it sprays at all, will only spray where the pest is a problem. Chemical sprays should not be used to prevent infestations.
- **Look for a company that chooses less-toxic chemicals such as borates or boric acid, diatomaceous earth (DE), insecticidal soaps, horticultural oils, and those contained in bait stations.** A capable provider of less-toxic pest management or IPM will select the most effective, least toxic chemical to complete the

job and will use it only in the areas where the pests are a problem.

Conventional chemicals

- **Ask for copies of labels and “material safety data sheets” (or “MSDS”) for any pesticide a company plans to use in your home or yard.**
- **Ask if the company uses chemical pesticides only as a last resort.** If the pesticide applicator is going to spray, look for someone who will spray selectively to reach the target pest and won’t spray the whole yard or the entire perimeter of your home.
- **Ask to see a copy of the “service ticket” they will use.** Check to make sure the following will be on it: target pest, name of any pesticides used and their EPA registration number (for non-food-grade products), how much pesticide was applied and where and when it was applied.
- If the company must use a chemical spray, **ask it to post the areas to be treated with warning signs or flags — prior to the treatment and for 72 hours afterwards.**
- **Monitoring** — Discuss the actions the company will take if pests re-occur. Monitoring is important: when less-toxic pest controls are used, insects will die back gradually instead of all at once as they do with conventional pesticides. The company should place monitors around the home and check them regularly

to make sure the control is working and to change it if necessary.

- **References** — Interview several companies. Ask for and contact references.
- **Licensing and training** — Make sure the company and on-site technicians are registered and licensed.
- **Claims** — Be cautious if a company claims it uses “safe pesticides” or “safe chemicals.” Pesticides can be applied safely, but no pesticide (even a less-toxic one) is entirely safe. “Odorless” does not mean safe. **Be cautious of claims that a company can control “ALL insects.”** If they claim to control all insects, you can be sure they are using a broad-spectrum pesticide that will kill even beneficial insects such as ladybugs, honeybees, and butterflies.
- **Contracts** — Be cautious of the **monthly service contract.** A less-toxic approach should ALWAYS include regular monitoring of pest populations but NEVER calendar applications of pesticide — whether or not you have a pest problem. Do not authorize any pest treatment without reading and signing a detailed written contract.
- **Records and reporting** — Ask the company to provide you with regular reports, including an inspection report with a specific pest identification and monitoring reports.

LEARN MORE ABOUT PESTICIDES AND SAFER ALTERNATIVES

Books

The Gardener's Guide to Common-Sense Pest Control, William Olkowski, Taunton Press, 1995.

The Organic Gardener's Handbook of Natural Insect and Disease Control, Barbara Ellis, Rodale Press, 1996.

Organic Pest and Disease Control: How to Grow a Healthy, Problem Free Garden, Barbara Ellis, Houghton Mifflin Co., 1997.

Controlling Pests and Diseases, Patricia S. Michalak, Rodale Press, 1994.



MAIL ORDER HOUSES

Peaceful Valley Farm Supply
<http://groworganic.com>
(888) 784-1722 (toll free)

Gardens Alive
www.gardens-alive.com
(812) 537-8650

Extremely Green Gardening Company
www.extremelygreen.com
(781) 878-5397

Harmony Farm Supply
www.harmonyfarm.com
(707) 823-9125



WEBSITES/ORGANIZATIONS

American Rose Society
<http://www.ars.org/>

Audubon At Home "You Have a Choice"
(415) 388-2524 (215) 355-9588
www.audubon.org/bird/athome/alternatives.html

Beyond Pesticides
(202) 543-5450
www.beyondpesticides.org

Bio-Integral Resource Center
(510) 524-2567
www.birc.org

California Invasive Plant Council (Cal-IPC)
www.cal-ipc.org

California Native Plant Society
www.cnps.org



WEBSITES/ORGANIZATIONS, CONT.

Common Ground Organic Garden Supply and Education Center
(650) 493-6072
www.commongroundinpaloalto.org

Department of Pesticide Regulation (CA)
www.cdpr.ca.gov

Environmental Working Group
www.foodnews.org

Master Gardeners
To see if a Master Gardener's office is located in your community, check in the County Government section of your phone book under University of California Cooperative Extension; or, look under "Bug ID" in the Our Water – Our World website (see below).

Northwest Coalition for Alternatives to Pesticides
(541) 344-5044
www.pesticide.org

Office of Environmental Health Hazard Assessment
www.oehha.ca.gov/pesticides.html

Our Water – Our World
www.ourwaterourworld.org

Pesticide Action Network
(415) 981-6205
www.panna.org or www.pesticideinfo.org

State Water Resources Control Board (CA)
www.waterboards.ca.gov

University of California
www.ipm.ucdavis.edu or www.ipm.ucdavis.edu/WATER/U/index.html

U.S.EPA
www.epa.gov/pesticides



www.ourwaterourworld.org

Household Hazardous Waste Facilities



San Luis Obispo County



Take your Household Hazardous Waste to the following facilities - **FREE*** service

Atascadero

Chicago Grade Landfill
Homestead Road
Open 11am-3pm on Saturday only

Morro Bay

Morro Bay Wastewater Plant
160 Atascadero Road
Open 11am-3pm on Saturday only

Nipomo

Nipomo HHW Facility
509 Southland
Open 11am-3pm on Saturday only

Paso Robles

Paso Robles Landfill
Hwy 46 East
Open 11am-3pm on Saturday only

San Luis Obispo

Cold Canyon Landfill
Highway 227
Open 11am-3pm on Friday and Saturday

All facilities are closed when raining

* Businesses that are CESQG should call 800-400-0811 before visiting facilities.

HHW Facilities Accept:

- Auto fluids
- Paints and thinners
- Household cleaners
- Pesticides
- Motor oil
- Pool chemicals



Drop off limit is 15 gallons or 125 pounds.
No charge to SLO County residents.

Other HHW Information

If you have explosive material, including ammunition, do not bring it to a Household Hazardous Waste Drop Off Facility! Call your local police department or the San Luis Obispo County Sheriff (805-781-4550) for details on proper disposal.

Safe methods of disposal for medical sharps or needles are necessary for many people who routinely check their own blood levels or give themselves medical injections. If these needles are not properly disposed of, they could injure collection or landfill employees.

Never dispose of sharps in the garbage or recycling bin!

The Integrated Waste Management Authority operates a Home Generated Sharps Disposal Program. Needles, syringes, lancet and other sharp objects should be placed in a sturdy container such as a coffee can or liquid detergent bottle.

Call 800-400-0811 for disposal information or go to www.iwma.com and look under Infectious/Medical Waste.

Ni-Cd (Nickel Cadmium), Li-ion (Lithium ion) and Ni-MH (Nickel Metal Hydride) rechargeable batteries now have the "chasing arrows" symbol with the word "Recycle." The toxics in these batteries can leach into water supplies if land filled or enter the atmosphere if incinerated.

Safely dispose of your batteries by taking them to a Household Hazardous Waste drop off facility or to a participating retail store. Call the Rechargeable Battery Recycling Corporation (RBRC) at 1-800-8-BATTERY for the closest retail store where you can drop off your used rechargeable batteries.

Additional recycling information can be found in the SMART Yellow Pages of your SBC (formerly PacBell) telephone book, under 'Recycling'.

Why You Want These Bugs in Custody

Most insects found in your garden don't harm plants. In fact, 97% of the insects you see fall into this category! Such insects are called "beneficials" because they benefit the garden by pollinating plants, improving soil, and eating the pests that really harm plants. These hard-working "beneficials" can be a gardener's best friend by keeping problem pests under control naturally, without the use of harmful chemicals.

Making a Positive Identification

Before you stomp on or spray any unfamiliar bugs in your garden, make sure you know the good guys from the bad guys. Remember that most insects go through several changes during their life cycle, so the young (larva or nymph) may look totally different from the adult. And, keep in mind, it is often the "young" of the insect that eats the most pests. This brochure will help you to identify some of the most common beneficials (both adults and their young) found in local gardens. Here are some tips for attracting and keeping beneficials in your garden:

- **Go Undercover:** Provide beneficials with shelter and over-wintering sites by covering bare dirt with an organic mulch like leaves or bark. Remember to leave a small area of exposed soil to encourage solitary native bees that are "ground-nesters."
- **Lure Them Out of Hiding:** Include a variety of different pollen and nectar-rich plants to provide beneficials with a food source – in addition to pests.
- **Crack Down on Crime:** Pesticides (particularly broad-spectrum pesticides that don't target single pests) kill the beneficials as well as true garden pests. Protect beneficial insects by not using pesticides! These chemicals can also run off gardens and lawns with rain and over-watering, entering storm drains – a direct route to local creeks and other bodies of water – where they can harm water quality and wildlife. For information on pesticide alternatives, go to www.OurWaterOurWorld.org.



Bringing in the FBI: Flowers for Beneficial Insects

Most beneficial insects need to supplement their diets with pollen and nectar. You can attract them to your garden, and encourage them to stay and hunt for pests, by offering them a variety of nectar and pollen-rich flowers. Plants with daisy-like flowers or plants with clusters of multiple small flowers are especially attractive to beneficials. Choose a diversity of plants that bloom at different times so that the beneficials can feed throughout the year. Many common garden plants suited to our Mediterranean climate will attract beneficials, including oregano, alyssum, borage, dill, angelica, cosmo, tansy, calendula and rosemary.

Here are some California native plants guaranteed to draw in many of the 10 most wanted



Having a Good Defense

Many native plants have developed **natural defenses** to ward off insect pests and diseases. These defenses can eliminate the need for pesticides and reduce maintenance costs. Because native plants have adapted to grow in our specific climate, they often require very little care once established and are generally more tolerant of drought. The diversity of natives available offers gardeners great choices for both fragrant flowers and beautiful foliage – and provides food and habitat for our native birds, wildlife, butterflies, and beneficial insects.

Early Fall is an ideal time to plant natives. The cool weather and rainfall will help young plants establish a healthy root system before colorful Spring blooms emerge.

Photo Credits • Ed Ross: Green Lacewing Larva, Ground Beetle, Bumblebee + Nest, Syrphid Fly + Larva, Soldier Beetle, Parasitic Wasp + Larva, Spider, Ladybeetle + Larva, Tachinid Fly, California Lilac • **Jack Kelly Clark** courtesy UC Statewide IPM Program: Dragonfly Nymph, Ground Beetle Larva, Soldier Beetle Larva, Tachinid Fly Eggs on a Caterpillar © by the Regents of UC • **Mostly Natives, Tomales CA:** Yarrow, Buckwheat, Goldenrod, California Aster • **Susan Van Der Wal:** Dragonfly, Seaside Daisy • **Saint Mary's College of California:** Slender Sunflower © 1995 • © **Jscalve | Dreamstime.com:** Green Lacewing

FLOWER PLANT PROFILES VISITING RIGHTS



Seaside Daisy/
Fleabane
(*Erigeron glaucus*)

Evergreen, low-growing perennial has daisy-like flowers that bloom in pinks, whites and lavenders.

butterflies
bees
lacewings
syrphid flies



Yarrow
(*Achillea millefolium californica*)

Small perennial to 1' tall, with clusters of tiny, whitish flowers and feathery, green foliage. Some cultivars have yellow or pink flowers.

butterflies
bees
ladybugs
parasitic wasps
tachinid flies



Slender Sunflower
(*Helianthus gracilentus*)

Perennial with hairy stems and large, yellow daisy-like flowers. Fall blooming.

bees
butterflies
lacewings
syrphid flies
parasitic wasps



Buckwheat
(*Eriogonum species*)

Perennial that ranges from small ground covers to 3' tall shrubs. Blooms are clusters of tiny pink, white or yellow flowers. Foliage ranges from green to silver/gray.

syrphid flies
tachinid flies
parasitic wasps
lacewings
ladybugs



Goldenrod
(*Solidago californica*)

Perennial with graceful stalks of tiny yellow flowers. Fall blooming

soldier beetles
parasitic wasps



California Lilac
(*Ceanothus species*)

Many different evergreen species including both shrubs and groundcovers. Blooms are showy clusters of blue, purple or white flowers.

syrphid flies
ladybugs
lacewings
bees



California Aster
(*Aster chilensis*)

Shrubby, deciduous perennial produces lavender daisy-like flowers. Blooms from summer through fall.

bees
butterflies
lacewings
ladybugs
syrphid flies

EXPAND YOUR SEARCH!

BOOKS

- *Good Bugs for Your Garden*, Allison Mia Starcher, Algonquin Books, 1995.
- *Natural Enemies Handbook*, Mary Louise Flint and Steve Dreistadt, University of California ANR Publications, 1998.
- *Natural Insect Control, The Ecological Gardener's Guide to Foiling Pests*, Brooklyn Botanic Garden, 1994.



WEBSITES

- Bee Gardens <http://nature.berkeley.edu/urbanbeegardens>
- Bug Guide: ID, Images for Insects, Spiders & Their Kin <http://bugguide.net>
- Invasive Plants and Alternatives www.cal-ipc.org (CA Invasive Plants Council) www.plantright.org (PlantRight Program)
- Native Plants www.cnps.org (CA Native Plant Society) www.mostlynatives.com/guide.htm (Mostly Natives Nursery) www.laspilitas.com/plants/plants.htm (Las Pilitas Nursery)
- Natural Enemies Gallery from the University of California Statewide IPM Program www.ipm.ucdavis.edu/PMG/NE/index.html
- Pesticide Alternatives (Least Toxic) www.OurWaterOurWorld.org (Our Water – Our World)
- Pesticide Hazards (Beyond Pesticides) www.beyondpesticides.org/gateway/index.htm



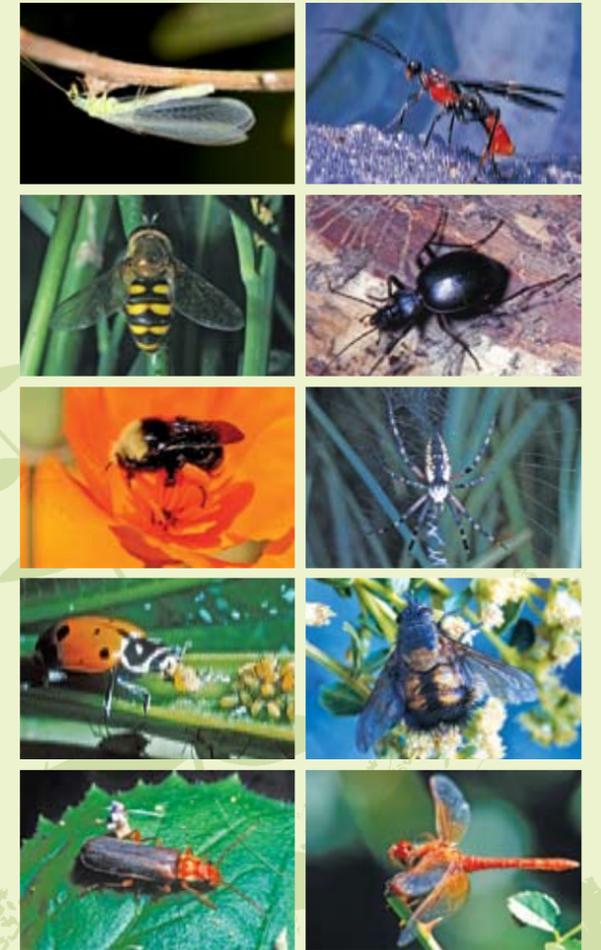
Crime Scene Investigators: Developed by Debi Tidd Consulting with Gina Purin from Marin County Stormwater Pollution Prevention Program 415/499-3202. Designed by Schmidt Creative. Reviewed by M.L. Flint, UC Statewide IPM Program.

Printed on FSC Certified recycled paper – 50% Recycled, 25% Post Consumer Waste

Mug shots approved for posting by:



The 10 'Most Wanted' Bugs in Your Garden



Guilty of: Controlling garden pests without the need for toxic chemicals

Reward: A healthy, sustainable garden that saves money and resources and protects the health of families, pets and the environment

ASSESSING THE LINE-UP

Here are rap sheets and mug shots on ten beneficial bugs that consume large numbers of pests or pollinate plants. Do not attempt to apprehend them. . . just let them serve time in your garden!



Lacewing larva and aphid

Green Lacewing

Aliases: Aphid wolf, aphid lion.

Wanted For: Aggressively devouring aphids, thrips, mealybugs, scale, spider mites, leafhoppers and insect eggs.

Family History: Adult green lacewings feed on nectar, pollen, and honeydew – at dawn and dusk. Juveniles are voracious predators known to eat up to 20 or 30 aphids a day.

Sightings: Last seen around nectar-producing plants like sunflowers, tansy and buckwheat.



Soldier beetle larva

Soldier Beetle

Aliases: Leatherwings.

Wanted For: Attacking and feeding on aphids and other soft-bodied insects.

Family History: Adults feed on pollen and insect pests on plants. The larva (or “young”) hunt for pests in leaf litter and soil.

Sightings: Known to feed on the pollen of flowers like goldenrod and milkweed while waiting for its prey. Reports of sightings appear in early spring, shortly after aphids begin hatching.



Dragonfly nymph

Dragonfly

Aliases: Mosquito hawk, darter.

Wanted for: Preying on unsuspecting flying insects like mosquitoes, flies and midges.

Family History: The dragonfly’s excellent eyesight, strong jaws and agile flight make it a deadly predator able to catch prey in mid-air. Dragonfly larvae (nymphs) live in water and are also efficient hunters eating mosquito larvae and other insects, snails and even small fish.

Known Accomplices: Often seen in the company of its relative, the damselfly, another insect predator. Don’t be fooled: when at rest, dragonflies hold their wings outstretched while damselflies fold their wings closed over their bodies.

Sightings: Last seen near garden ponds, streams and other bodies of water.



Bumblebee nest cells cut open to show developmental stages

Bee

Aliases: European honeybee, bumblebee. (Also includes hundreds of native bee species including leafcutter and orchard bees.)

Wanted For: Pollinating the flowers of many of our ornamental, fruit and vegetable plants.

Family History: Specially equipped for moving large quantities of nectar and pollen, honeybees are usually found in colonies in hives. Most native bees are masters at eluding notice and often live alone in ground nests. Bee populations are diminishing due to pesticide use, and loss of habitat.

Sightings: Usually seen in gangs in the vicinity of flowers high in nectar and pollen including asters, sunflowers, mints, lavender, rosemary and sages.



Syrphus larva eating broccoli aphids

Syrphid Fly

Aliases: Hoverfly, flower fly.

Wanted For: Hunting down aphids, mealybugs and other pests, and for pollinating plants.

Family History: Adults are known to be important pollinators. The larvae suck the juices out of their victims. A single larva can consume hundreds of victims a month.

Sightings: Larvae are usually found under leaves in the company of aphids. Adults have been seen lurking around ceanothus, sunflowers, feverfew and other nectar-rich flowers.

Master of Disguise: With their yellow and black stripes the adults appear to be bees. They have only one set of wings and can’t sting. The larva look like fat, legless caterpillars.



Ground beetle larva

Ground Beetle

Aliases: Predacious ground beetle, and carabids, among others.

Wanted For: Conspiring to eat many soil-dwelling pests like slugs, snails, cutworms and root maggots.

Family History: Fast-moving predator, armed with strong jaws. Generally dark brown or black with long legs, and shiny, hard front wing covers that sometimes have a metallic sheen. Usually hunts at night. Reported to be able to consume its body weight in food each day. Larva also feed on soil insects.

Sightings: Usually sighted hiding in soil or under rocks, dried leaves and mulch.



Parasitoid wasp cocoons on caterpillar

Parasitic Wasp

Aliases: Trichogramma, Braconid, Hyposoter and Ichneumon, among others.

Wanted For: Parasitizing the eggs of cutworms, cabbage loopers, codling moths, tomato hornworms, aphids, whiteflies, scales and other pests.

Family History: These tiny, notorious wasps lay their eggs on or inside of pests or insect eggs and the larva eat the pest. Can be tracked by the tell-tale signs they leave behind, like tiny, white cocoons on caterpillars, or “aphid mummies,” – the tan, dried up husks of aphids stuck to a leaf.

Sightings: Suspected of foraging for nectar on tiny flowers like alyssum, yarrow, tansy, and clover.



Orb weaver spider
Juveniles closely resemble adults

Spider

Aliases: Funnel weavers, crab spiders, and golden orb spiders, among others.

Wanted For: Trapping and bugnapping a wide variety of insect pests.

Family History: The most deadly natural enemy of pests, spiders are skilled predators. They may hunt with webs or track their victims on the ground and on plants. Can be identified as arachnids, with eight legs and two body parts.

Sightings: All over your garden, and on front porches near lights.

Warning: Spiders are thought of as fearsome creepy crawlers but very few have a bite that is harmful. Always wear gloves when cleaning garages, debris, woodpiles, storage areas or piles of clutter.



Ladybug larva and pupa

Ladybeetle

Aliases: Ladybug, ladybird beetle, seven-spotted ladybeetle.

Wanted For: Gorging on soft-bodied insects like aphids, scale, thrips, mealybugs and spider mites.

Family History: Both adults and larva eat large numbers of pests. It is believed that one ladybug can devour 5,000 aphids in its lifetime. Most common suspect is red with black spots – but watch for many other species in a variety of colors, with or without spots.

Warning: Be on the lookout for a ladybug look-alike: the spotted cucumber beetle! This green beetle with black spots feeds on crops and foliage.

Sightings: Known to loiter on nectar-rich flowers like yarrow, clover and tansy.



Tachinid fly eggs on a caterpillar

Tachinid Fly

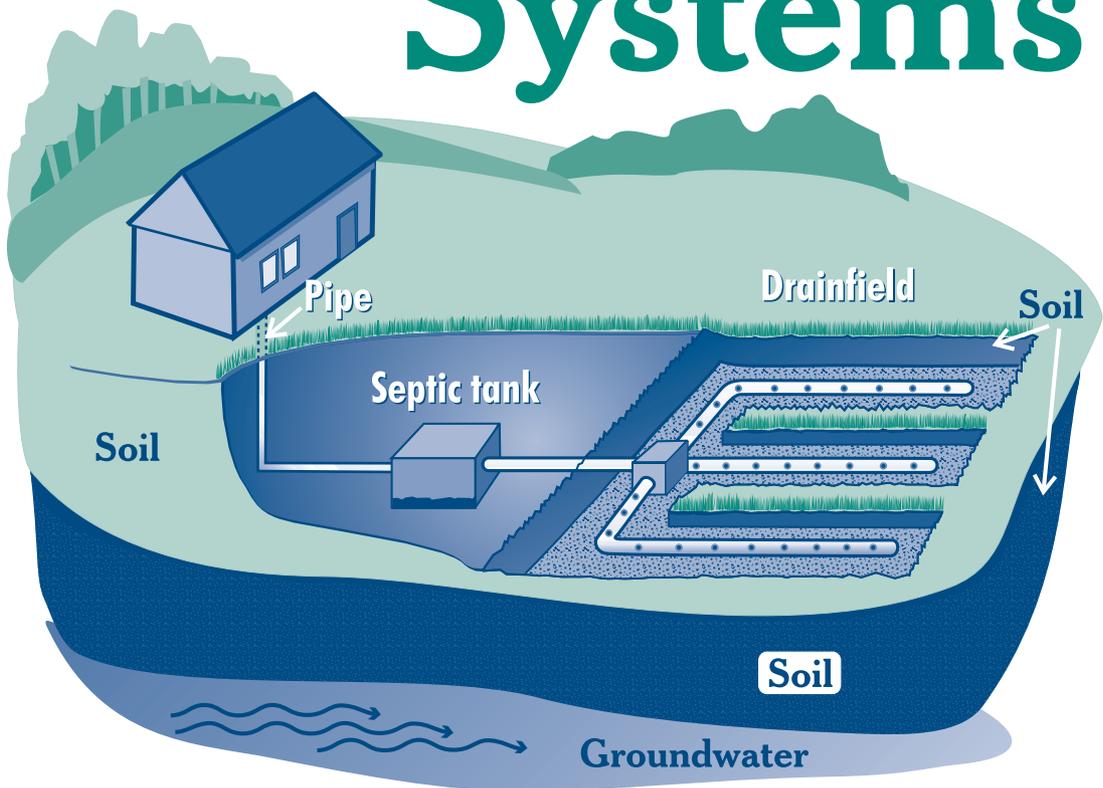
Aliases: Diptera.

Wanted For: Attacking unsuspecting caterpillars and beetles.

Family History: Disguised as a hairy housefly, this parasitic insect lays its eggs on caterpillars, grubs and other insects. When the eggs hatch, the young (larva) tunnel into their victims and eat them.

Sightings: Often seen stealing the nectar and pollen of tansy, milkweed and Queen Anne’s Lace.

A Homeowner's Guide to Septic Systems



What's Inside

Your septic system is your responsibility	1
How does it work?	1
Why should I maintain my septic system?	4
How do I maintain my septic system?	5
What can make my system fail?	9
For more information	13

Your Septic System is your responsibility!

Did you know that as a homeowner you're responsible for maintaining your septic system? Did you know that maintaining your septic system protects your investment in your home? Did you know that you should periodically inspect your system and pump out your septic tank?

If properly designed, constructed and maintained, your septic system can provide long-term, effective treatment of household wastewater. If your septic system isn't maintained, you might need to replace it, costing you thousands of dollars. A malfunctioning system can contaminate groundwater that might be a source of drinking water. And if you sell your home, your septic system must be in good working order.

This guide will help you care for your septic system. It will help you understand how your system works and what steps you can take as a homeowner to ensure your system will work properly. To help you learn more, consult the resources listed at the back of this booklet. A helpful checklist is also included at the end of the booklet to help you keep track of your septic system maintenance.

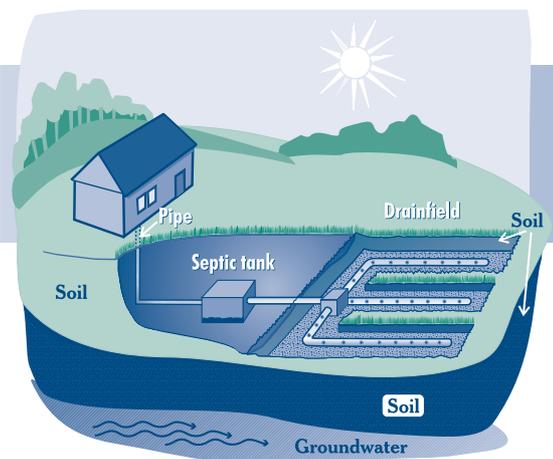
Top Four Things You Can Do to Protect Your Septic System

1. **Inspect your system (every 3 years) and pump your tank as necessary (generally every 3 to 5 years).**
2. **Use water efficiently.**
3. **Don't dispose of household hazardous wastes in sinks or toilets.**
4. **Care for your drainfield.**

How does it work?

Components

A typical septic system has four main components: a pipe from the home, a septic tank, a drainfield, and the soil. Microbes in the soil digest or remove most contaminants from wastewater before it eventually reaches groundwater.



Typical onsite wastewater treatment system

Septic system aliases:

- On-lot system
- Onsite system
- Individual sewage disposal system
- Onsite sewage disposal system
- Onsite wastewater treatment system

Pipe from the home

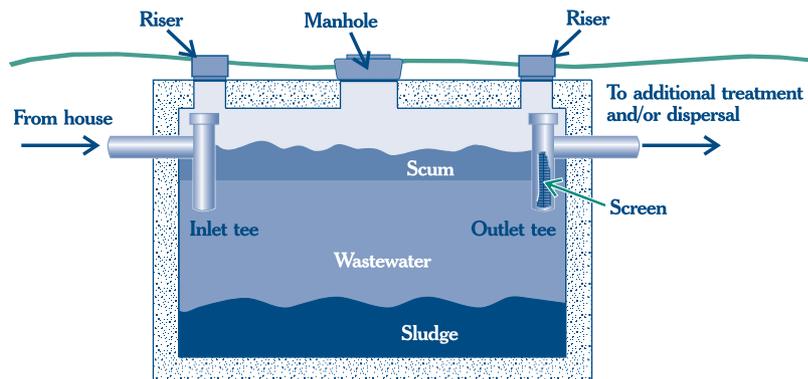
All of your household wastewater exits your home through a pipe to the septic tank.

Septic tank

The septic tank is a buried, watertight container typically made of concrete, fiberglass, or polyethylene. It holds the wastewater long enough to allow solids to settle out (forming sludge) and oil and grease to float to the surface (as scum). It also allows partial decomposition of the solid materials. Compartments and a T-shaped outlet in the septic tank prevent the sludge and scum from leaving the tank and traveling into the drainfield area. Screens are also recommended to keep solids from entering the drainfield.

Newer tanks generally have risers with lids at the ground surface to allow easy location, inspection, and pumping of the tank.

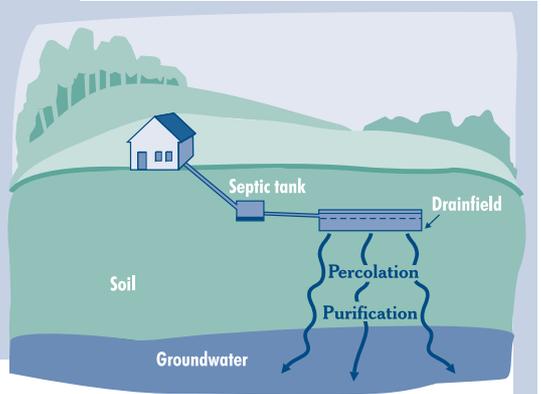
Typical single-compartment septic tank with ground-level inspection risers and screen



Tip To prevent buildup, sludge and floating scum need to be removed through periodic pumping of the septic tank. Regular inspections and pumping as necessary (generally every 3 to 5 years) are the best and cheapest way to keep your septic system in good working order.

Finding Your System

Your septic tank, drainfield, and reserve drainfield should be clearly designated on the “as-built” drawing for your home. (An “as-built” drawing is a line drawing that accurately portrays the buildings on your property and is usually filed in your local land records.) You might also see lids or manhole covers for your septic tank. Older tanks are often hard to find because there are no visible parts. An inspector/pumper can help you locate your septic system if your septic tank has no risers.



Drainfield

The wastewater exits the septic tank and is discharged into the drainfield for further treatment by the soil. The partially treated wastewater is pushed along into the drainfield for further treatment every time new wastewater enters the tank.

If the drainfield is overloaded with too much liquid, it will flood, causing sewage to flow to the ground surface or create backups in plumbing fixtures and prevent treatment of all wastewater.

A reserve drainfield, required by many states, is an area on your property suitable for a new drainfield system if your current drainfield fails. Treat this area with the same care as your septic system.

Soil

Septic tank wastewater flows to the drainfield, where it percolates into the soil, which provides final treatment by removing harmful bacteria, viruses, and nutrients. Suitable soil is necessary for successful wastewater treatment.

Alternative systems

Because many areas don't have soils suitable for typical septic systems, you might have or need an alternative system. You might also have or need an alternative system if there are too many typical septic systems in one area or the systems are too close to groundwater or surface waters. Alternative septic

systems use new technology to improve treatment processes and might need special care and maintenance. Some alternative systems use sand, peat, or plastic media instead of soil to promote wastewater treatment. Other systems might use wetlands, lagoons, aerators, or disinfection devices. Float switches, pumps, and other electrical or mechanical components are often used in alternative systems. Alternative systems should be inspected annually. Check with your local health department or installer for more information on operation and maintenance needs if you have or need an alternative system.

Why should I maintain my septic system?

When septic systems are properly designed, constructed, and maintained, they effectively reduce or eliminate most human health or environmental threats posed by pollutants in household wastewater. However, they require regular maintenance or they can fail. Septic systems need to be monitored to ensure that they work properly throughout their service lives.

Saving money

A key reason to maintain your septic system is to save money! Failing septic systems are expensive to repair or replace, and poor maintenance is often the culprit. Having your septic system inspected regularly (at least every 3 years) is a bargain when you consider the cost of replacing the entire system. Your system will need pumping (generally every 3 to 5 years), depending on how many people live in the house and the size of the system. An unusable septic system or one in disrepair will lower your property value and could pose a legal liability.

Protecting health and the environment

Other good reasons for safe treatment of sewage include preventing the spread of infection and disease and protecting water resources. Typical pollutants in household wastewater are nitrogen, phosphorus, and disease-

causing bacteria and viruses. If a septic system is working properly, it will effectively remove most of these pollutants.

With one-fourth of U.S. homes using septic systems, more than 4 billion gallons of wastewater per day is dispersed below the ground's surface. Inadequately treated sewage from septic systems can be a cause of groundwater contamination. It poses a significant threat to drinking water and human health because it can contaminate drinking water wells and cause diseases and infections in people and animals. Improperly treated sewage that contaminates nearby surface waters also increases the chance of swimmers contracting a variety of infectious diseases. These range from eye and ear infections to acute gastrointestinal illness and diseases like hepatitis.

How do I maintain my septic system?

Inspect and pump frequently

You should have your septic system inspected at least every 3 years by a professional and your tank pumped as recommended by the inspector (generally every 3 to 5 years). Systems with electrical float switches, pumps, or mechanical components need to be inspected more often. Your service provider should inspect for leaks and look at the scum and sludge layers in your septic tank. If the bottom of the scum layer is within 6 inches of the bottom of the outlet tee or the top of the sludge layer is within 12 inches of the outlet tee, your tank needs to be pumped. Remember to note the sludge and scum levels determined by your service provider in your operation and maintenance records. This information will help you decide how often pumping is necessary. (See the checklist included at the end of the booklet.)

What Does an Inspection Include?

- Locating the system.
- Uncovering access holes.
- Flushing the toilets.
- Checking for signs of backup.
- Measuring scum and sludge layers.
- Identifying any leaks.
- Inspecting mechanical components.
- Pumping the tank if necessary.

Four major factors influence the frequency of pumping: the number of people in your household, the amount of wastewater generated (based on the number of people in the household and the amount of water used), the volume of solids in the wastewater (for example, using a garbage disposal increases the amount of solids), and septic tank size.

Some makers of septic tank additives claim that their products break down the sludge in septic tanks so the tanks never need to be pumped. Not everyone agrees on the effectiveness of additives. In fact, septic tanks already contain the microbes they need for effective treatment. Periodic pumping is a much better way to ensure that septic systems work properly and provide many years of service. Regardless, every septic tank requires periodic pumping.

In the service report, the pumper should note any repairs completed and whether the tank is in good condition. If the pumper recommends additional repairs he or she can't perform, hire someone to make the repairs as soon as possible.

Use water efficiently

Average indoor water use in the typical single-family home is almost 70 gallons per person per day. Leaky toilets can waste as much as 200 gallons each day. The more water a household conserves, the less water enters the septic system. Efficient water use can improve the operation of the septic system and reduce the risk of failure.

High-efficiency toilets

Toilet use accounts for 25 to 30 percent of household water use. Do you know how many gallons of water your toilet uses to empty the bowl? Most older homes have toilets with 3.5- to 5-gallon reservoirs, while newer high-efficiency toilets use 1.6 gallons of water or less per flush. If you have problems with your septic system being flooded with household water, consider reducing the volume of water in the toilet tank if you don't have a high-efficiency model. Plastic containers (such as 1/2-gallon plastic milk jugs) can be filled with small rocks and placed in a toilet tank to reduce the



amount of water used per flush. (Be sure that the plastic containers do not interfere with the flushing mechanisms or the flow of water.) You'll save about ½ gallon of water per flush! You might also consider replacing your existing toilet with a high-efficiency model to achieve even more water savings.

Faucet aerators and high-efficiency showerheads

Faucet aerators help reduce water use and the volume of water entering your septic system. High-efficiency showerheads or shower flow restrictors also reduce water use.

Water fixtures

Check to make sure your toilet's reservoir isn't leaking into the bowl. Add five drops of liquid food coloring to the reservoir before bed. If the dye is in the bowl the next morning, the reservoir is leaking and repairs are needed.

A small drip from a faucet adds many gallons of unnecessary water to your system every day. To see how much a leak adds to your water usage, place a cup under the drip for 10 minutes. Multiply the amount of water in the cup by 144 (the number of minutes in 24 hours, divided by 10). This is the total amount of clean water traveling to your septic system each day from that little leak.

Use Water Efficiently!

- **Install high-efficiency showerheads**
- **Fill the bathtub with only as much water as you need**
- **Turn off faucets while shaving or brushing your teeth**
- **Run the dishwasher and clothes washer only when they're full**
- **Use toilets to flush sanitary waste only (not kitty litter, diapers, or other trash)**
- **Make sure all faucets are completely turned off when not in use**
- **Maintain your plumbing to eliminate leaks**
- **Install aerators in the faucets in your kitchen and bathroom**
- **Replace old dishwashers, toilets, and clothes washers with new, high-efficiency models.**

For more information on water conservation, please visit www.epa.gov/owm/water-efficiency/index.htm



Watch your drains

What goes down the drain can have a major impact on how well your septic system works.

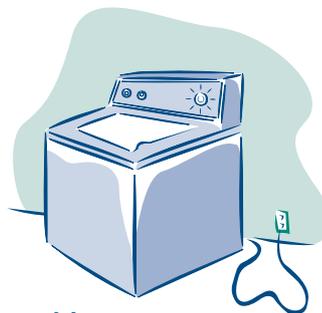
Waste disposal

What shouldn't you flush down your toilet? Dental floss, feminine hygiene products, condoms, diapers, cotton swabs, cigarette butts, coffee grounds, cat litter, paper towels, and other kitchen and bathroom items that can clog and potentially damage septic system components if they become trapped. Flushing household chemicals, gasoline, oil, pesticides, antifreeze, and paint can stress or destroy the biological treatment taking place in the system or might contaminate surface waters and groundwater. If your septic tank pumper is concerned about quickly accumulating scum layers, reduce the flow of floatable materials like fats, oils, and grease into your tank or be prepared to pay for more frequent inspections and pumping.

Washing machines

By selecting the proper load size, you'll reduce water waste. Washing small loads of laundry on the large-load cycle wastes precious water and energy. If you can't select load size, run only full loads of laundry.

Doing all the household laundry in one day might seem like a time-saver, but it could be harmful to your septic system. Doing load after load does not allow your septic tank time to adequately treat wastes. You could be flooding your drainfield without allowing sufficient recovery time. Try to spread water usage throughout the week. A new Energy Star clothes washer uses 35 percent less energy and 50 percent less water than a standard model.



Care for your drainfield

Your drainfield is an important part of your septic system. Here are a few things you should do to maintain it:

- Plant only grass over and near your septic system. Roots from nearby trees or shrubs might clog and damage the drainfield.
- Don't drive or park vehicles on any part of your septic system. Doing so can compact the soil in your drainfield or damage the pipes, tank, or other septic system components.
- Keep roof drains, basement sump pump drains, and other rainwater or surface water drainage systems away from the drainfield. Flooding the drainfield with excessive water slows down or stops treatment processes and can cause plumbing fixtures to back up.

What can make my system fail?

If the amount of wastewater entering the system is more than the system can handle, the wastewater backs up into the house or yard and creates a health hazard.

You can suspect a system failure not only when a foul odor is emitted but also when partially treated wastewater flows up to the ground surface. By the time you can smell or see a problem, however, the damage might already be done.

By limiting your water use, you can reduce the amount of wastewater your system must treat. When you have your system inspected and pumped as needed, you reduce the chance of system failure.

A system installed in unsuitable soils can also fail. Other failure risks include tanks that are inaccessible for maintenance, drainfields that are paved or parked on, and tree roots or defective components that interfere with the treatment process.

Failure symptoms

The most obvious septic system failures are easy to spot. Check for pooling water or muddy soil around your septic system or in your basement. Notice whether your toilet or sink backs up when you flush or do laundry. You might also notice strips of bright green grass over the drainfield. Septic systems also fail when partially treated wastewater comes into contact with groundwater. This type of failure is not easy to detect, but it can result in the pollution of wells, nearby streams, or other bodies of water. Check with a

septic system professional and the local health department if you suspect such a failure, and remember to have your septic system inspected by a professional at least every 3 years.

Stop, look, and smell!

Failure causes

Household toxics

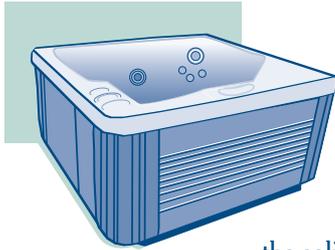
Does someone in your house use the utility sink to clean out paint rollers or flush toxic cleaners? Oil-based paints, solvents, and large volumes of toxic cleaners should not enter your septic system. Even latex paint cleanup waste should be minimized. Squeeze all excess paint and stain from brushes and rollers on several layers of newspaper before rinsing. Leftover paints and wood stains should be taken to your local household hazardous waste collection center. Remember that your septic system contains a living collection of organisms that digest and treat waste.

Household cleaners

For the most part, your septic system's bacteria should recover quickly after small amounts of household cleaning products have entered the system. Of course, some cleaning products are less toxic to your system than others. Labels can help key you into the potential toxicity of various products. The word "Danger" or "Poison" on a label indicates that the product is highly hazardous. "Warning" tells you the product is moderately hazardous. "Caution" means the product is slightly hazardous. ("Nontoxic" and "Septic Safe"



are terms created by advertisers to sell products.) Regardless of the type of product, use it only in the amounts shown on the label instructions and minimize the amount discharged into your septic system.



Hot tubs

Hot tubs are a great way to relax. Unfortunately, your septic system was not designed to handle large quantities of water from your hot tub. Emptying hot tub water into your septic system stirs the solids in the tank and pushes them out into the drainfield, causing it to clog and fail. Draining your hot tub into a septic system or over the drainfield can overload the system. Instead, drain cooled hot tub water onto turf or landscaped areas well away from the septic tank and drainfield, and in accordance with local regulations. Use the same caution when draining your swimming pool.

Water Purification Systems

Some freshwater purification systems, including water softeners, unnecessarily pump water into the septic system. This can contribute hundreds of gallons of water to the septic tank, causing agitation of solids and excess flow to the drainfield. Check with your licensed plumbing professional about alternative routing for such freshwater treatment systems.

Garbage disposals

Eliminating the use of a garbage disposal can reduce the amount of grease and solids entering the septic tank and possibly clogging the drainfield. A garbage disposal grinds up kitchen scraps, suspends them in water, and sends the mixture to the septic tank. Once in the septic tank, some of the materials are broken down by bacterial action, but most of the grindings have to be pumped out of the tank. Using a garbage disposal frequently can significantly increase the accumulation of sludge and scum in your septic tank, resulting in the need for more frequent pumping.



Improper design or installation

Some soils provide excellent wastewater treatment; others don't. For this reason, the design of the drainfield of a septic system is based on the results of soil analysis. Homeowners and system designers sometimes underestimate the significance of good soils or believe soils can handle any volume of wastewater applied to them. Many failures can be attributed to having an undersized drainfield or high seasonal groundwater table. Undersized septic tanks—another design failure—allow solids to clog the drainfield and result in system failure.

If a septic tank isn't watertight, water can leak into and out of the system. Usually, water from the environment leaking into the system causes hydraulic overloading, taxing the system beyond its capabilities and causing inadequate treatment and sometimes sewage to flow up to the ground surface. Water leaking out of the septic tank is a significant health hazard because the leaking wastewater has not yet been treated.

Even when systems are properly designed, failures due to poor installation practices can occur. If the drainfield is not properly leveled, wastewater can overload the system. Heavy equipment can damage the drainfield during installation which can lead to soil compaction and reduce the wastewater infiltration rate. And if surface drainage isn't diverted away from the field, it can flow into and saturate the drainfield.

For more information

Local Health Department

EPA Onsite/Decentralized Management Homepage

www.epa.gov/owm/onsite

EPA developed this Web site to provide tools for communities investigating and implementing onsite/decentralized management programs. The Web site contains fact sheets, program summaries, case studies, links to design and other manuals, and a list of state health department contacts that can put you in touch with your local health department.

National Small Flows Clearinghouse

www.nesc.wvu.edu

Funded by grants from EPA, the NSFC helps America's small communities and individuals solve their wastewater problems. Its activities include a Web site, online discussion groups, a toll-free assistance line (800-624-8301), informative publications, and a free quarterly newsletter and magazine.

Rural Community Assistance Program

www.rcap.org

RCAP is a resource for community leaders and others looking for technical assistance services and training related to rural drinking water supply and wastewater treatment needs, rural solid waste programs, housing, economic development, comprehensive community assessment and planning, and environmental regulations.

National Onsite Wastewater Recycling Association, Inc.

www.nowra.org

NOWRA is a national professional organization to advance and promote the onsite wastewater industry. The association promotes the need for regular service and educates the public on the need for properly designed and maintained septic systems.

Septic Yellow Pages

www.septicyellowpages.com

The Septic Yellow Pages provides listings by state for professional septic pumpers, installers, inspectors, and tank manufacturers throughout the United States. This Web site is designed to answer simple septic system questions and put homeowners in contact with local septic system professionals.

National Association of Wastewater Transporters

www.nawt.org

NAWT offers a forum for the wastewater industry to exchange ideas and concerns. The NAWT Web site lists state associations and local inspectors and pumpers.



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Septic System Dos and Don'ts

(adapted from National Small Flows Clearinghouse)

Dos

- Check with the local regulatory agency or inspector/pumper if you have a garbage disposal unit to make sure that your septic system can handle this additional waste.
- Check with your local health department before using additives. Commercial septic tank additives do not eliminate the need for periodic pumping and can be harmful to the system.
- Use water efficiently to avoid overloading the septic system. Be sure to repair leaky faucets or toilets. Use high-efficiency fixtures.
- Use commercial bathroom cleaners and laundry detergents in moderation. Many people prefer to clean their toilets, sinks, showers, and tubs with a mild detergent or baking soda.
- Check with your local regulatory agency or inspector/pumper before allowing water softener backwash to enter your septic tank.
- Keep records of repairs, pumpings, inspections, permits issued, and other system maintenance activities.
- Learn the location of your septic system. Keep a sketch of it with your maintenance record for service visits.
- Have your septic system inspected at least every 3 years and pumped periodically (generally every 3 to 5 years) by a licensed inspector/contractor.
- Plant only grass over and near your septic system. Roots from nearby trees or shrubs might clog and damage the drainfield.

Don'ts

- Your septic system is not a trash can. Don't put dental floss, feminine hygiene products, condoms, diapers, cotton swabs, cigarette butts, coffee grounds, cat litter, paper towels, latex paint, pesticides, or other hazardous chemicals into your system.
- Don't use caustic drain openers for a clogged drain. Instead, use boiling water or a drain snake to open clogs.
- Don't drive or park vehicles on any part of your septic system. Doing so can compact the soil in your drainfield or damage the pipes, tank, or other septic system components.

Homeowner Septic System Checklist

Septic System Description

Contact your local authority if you don't have this information.

Date system installed _____

Installer _____

Phone _____

Tank size _____ gallons

Capacity _____ bedrooms

Type conventional

alternative (type) _____

Things to keep in mind:

- ✓ *Inspect your system (every 1 to 3 years) and pump your tank (as necessary, generally every 3 to 5 years).*
- ✓ *Use water efficiently.*
- ✓ *Don't dispose of household hazardous wastes in sinks and toilets.*
- ✓ *Plant only grass over and near your septic system. Roots from nearby trees or shrubs might clog and damage the drainfield.*
- ✓ *Don't drive or park vehicles on any part of your septic system. Doing so can compact the soil in your drainfield or damage the pipes, tank, or other septic system components.*

Not in My Septic System!





For more information about septic systems, contact:

U.S. Environmental Protection Agency
www.epa.gov/owm/onsite/



Septic System Maintenance Record

Next Service	Scheduled Activity	Pumping Co./ Phone	Activities Completed	Comments
Jan. 2003	inspection	Joe Pumper 555-1234	inspection	sludge layer okay-may need pumping next year

Place on electrical box (fuse box) or other convenient location.

Get Rid of Pests Without the Poison

The Our Water Our World Program points the public towards less toxic solutions that protect water quality

How to get rid of pesky ants, hungry snails, or threatening spiders without poisoning your family or pets is a big concern for many people. Not to mention the threats to water quality posed by toxic sprays or pellets. What to do? The Our Water Our World program in San Luis Obispo County has the answers.

As a result of a partnership called "Our Water, Our World", eleven businesses throughout the County now display information about less toxic pesticide products in their stores. Customers can visit participating stores and find free fact sheets on specific pest problems and the "Our Water, Our World" logo next to a variety of less toxic products to help customers make more informed choices when purchasing pesticide products. Participating stores include:

- Orchard Supply Hardware stores in Paso Robles and Pismo Beach,
- Miner's Ace Hardware stores in Atascadero, Los Osos, and Morro Bay,
- Farm Supply stores in Paso Robles, San Luis Obispo, and Arroyo Grande,
- Pacific Home Improvement in San Luis Obispo,
- Cambria Nursery, and
- Old Towne Nursery in Nipomo.

The "Our Water, Our World" program is aimed at informing consumers about less toxic alternatives to common household pesticides that threaten water quality in water bodies nationwide. Rain water and over-irrigation of gardens and lawns can send these pesticides into streets and storm drains, especially when they are over-used. Remember that storm water is not treated and flows directly into our rivers, lakes, and streams.

The program in San Luis Obispo County is sponsored by the SLO County Partners for Water Quality, a coalition of municipalities working together to prevent storm water pollution. The "Our Water, Our World" program is part of a larger campaign involving garden supply stores and local government agencies throughout California.

For more information, go to www.ourwaterourworld.org.



Prevent *Toxoplasma gondii* infection

- Cook meat to an internal temperature of 151°F or until all appearance of pinkness has disappeared.
- Wash meat preparation utensils and cutting boards with hot, soapy water.
- Feed your cat dry or canned cat food, or cook fresh meat thoroughly before feeding it to your cat.
- Rinse vegetables to be consumed raw thoroughly with tap water before eating.
- Avoid drinking water from creeks and streams.
- Wash your hands after gardening and soil contact, taking care to clean dirt from under your nails.
- Wash your hands thoroughly with warm, soapy water after cleaning out the cat litter box.
- Clean out your cat litter box daily—it generally takes about 24 hours for the oocyst to become infective.
- To prevent spread of oocysts in soils near your home, place cat feces collected from the litter box or your yard in plastic bags, and dispose of them in your garbage. DO NOT flush your cat litter down the toilet or deposit it outdoors.



Protect your environment

Keep water going to sewage treatment plants or septic systems *T. gondii*-free. Cat feces in your yard can also reach oceans and rivers in storm runoff.

Current methods of sewage treatment may not destroy all of the oocysts in cat feces. Throwing cat litter down the toilet or outdoors could put *T. gondii* oocysts into our water treatment systems, and ultimately into our rivers and oceans.

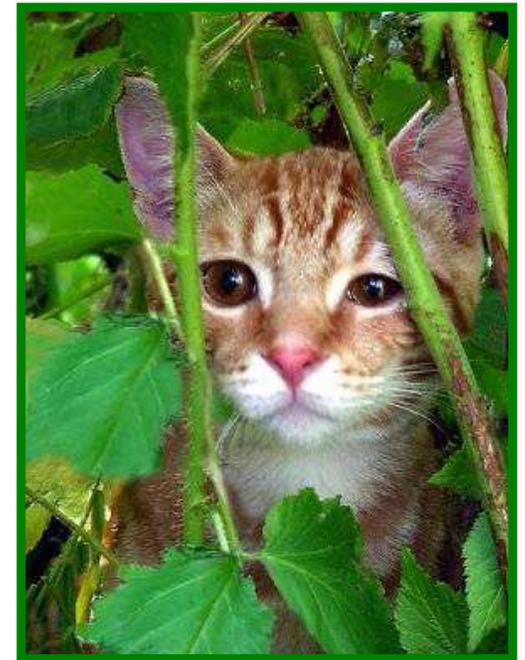
- Dispose of all cat feces in plastic bags in your trash can.
- Remove cat feces found in your yard. The oocysts are very hardy, may accumulate in the environment, and are spread by water and insects.

Following these guidelines will help prevent *T. gondii* infections in humans and their pets.

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One Shields Ave.
Davis, CA 95616
Web-based version at:
www.seaotterresearch.org
under publications

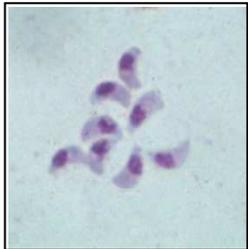
Toxoplasma gondii

What everyone should know

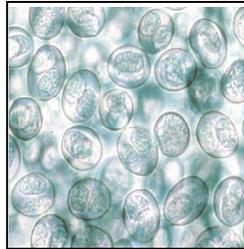


Toxoplasma gondii

- *Toxoplasma* is a small, single-celled parasite (left) with a complicated life cycle that infects some birds and most mammals, including humans. The egg-like stage of the parasite is called the oocyst (right).



Toxoplasma tachyzoites

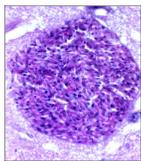


oocysts in cat feces

- Only cats and members of the cat family, including mountain lions (center) and bobcats (right), shed *Toxoplasma* oocysts in their feces. After initial infection, cats may shed millions of oocysts in their feces over a 7-14 day period.

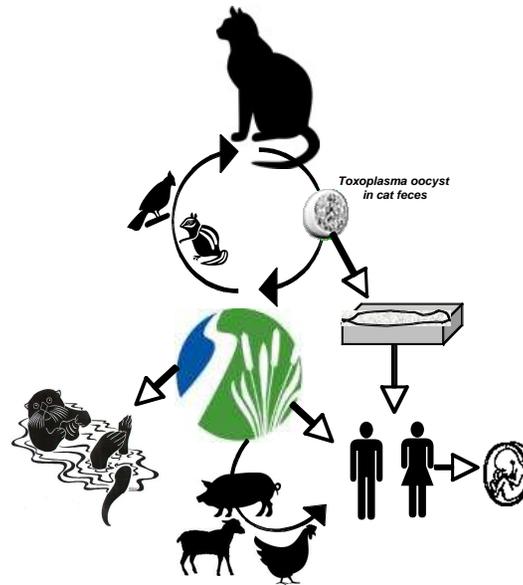


- Infective stages of the parasite spread to tissues and cause tissue cysts in places like the lung, spleen, eye and brain of cats and other hosts.



Toxoplasma tissue cyst

How do cats and humans become infected?



Infection may occur by:

- Eating raw or undercooked meat containing the tissue cyst stage of the parasite - cats are often infected by ingesting infected birds and rodents.
- Drinking water contaminated with oocysts.
- Ingesting or inhaling oocysts while gardening or playing in soil contaminated with infected cat feces.
- Ingesting or inhaling oocysts while removing feces from the cat litter box.
- If a pregnant woman is infected for the first time during pregnancy, the parasite may be transmitted to the baby in the womb.

Recent studies suggest shellfish (mussels, oysters) can uptake oocysts from contaminated water. Therefore, shellfish, like other meat, should be cooked.

Symptoms of infection

Toxoplasma rarely causes fatal infections in humans or their cats.

Most cat owners will never know their cat has been infected with the parasite, but studies show that 40-80% of cats in the U.S.A. have been exposed to *Toxoplasma* at some time in their lives.

Symptoms of infection in humans can last about 2 weeks and may include:

- Fever
- Headache and muscle aches
- Sore throat and cough
- Flu-like symptoms
- Swollen lymph nodes, especially in the neck

Many people have such mild symptoms, they don't know they were ever infected.

Severe disease may result if a person infected with *Toxoplasma* undergoes immunosuppressive or chemotherapy, or becomes HIV-infected. In these situations, parasites encysted in tissues may become reactivated and cause encephalitis (brain inflammation),

Infection of an unborn child may cause birth defects, blindness and brain damage.

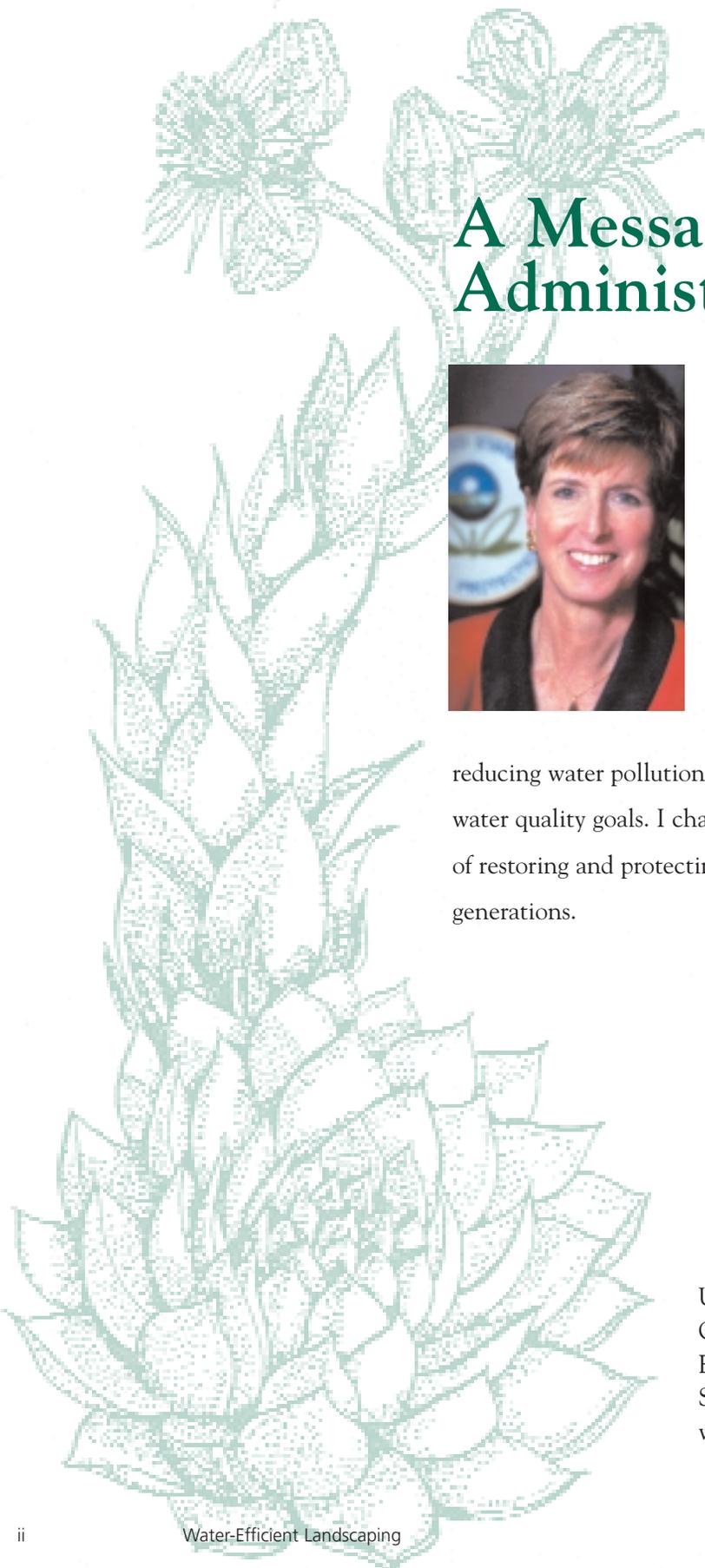
If you think you may have been exposed to *Toxoplasma* and might be infected, consult your doctor.



Water-Efficient Landscaping:



Preventing
Pollution &
Using Resources
Wisely



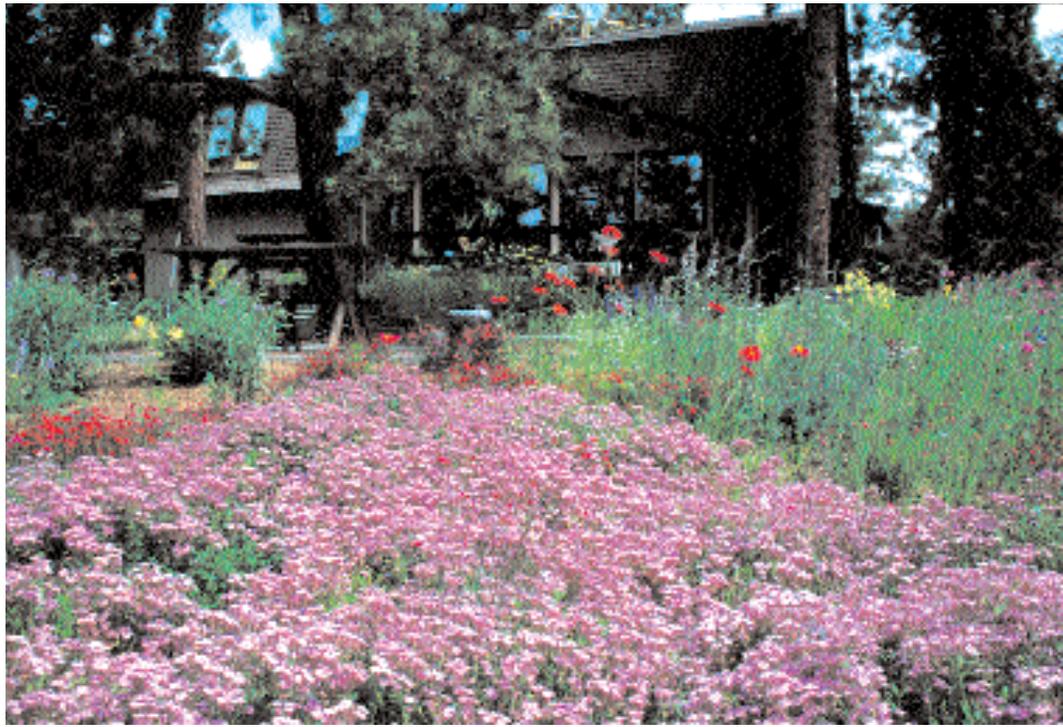
A Message from the Administrator

Christine Todd Whitman



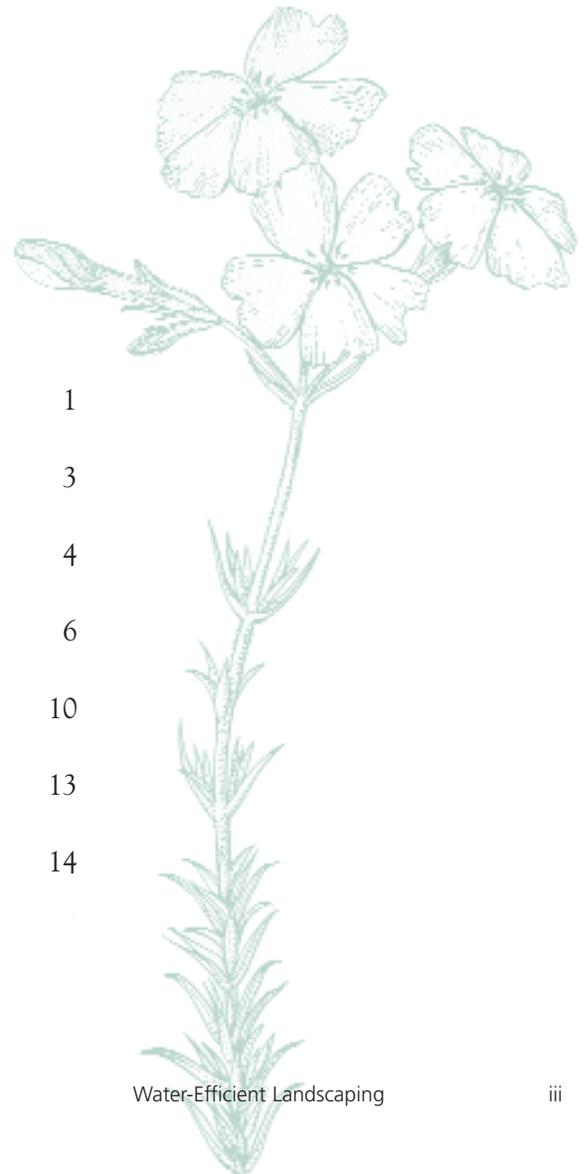
I believe water is the biggest environmental issue we face in the 21st Century in terms of both quality and quantity. In the 30 years since its passage, the Clean Water Act has dramatically increased the number of waterways that are once again safe for fishing and swimming. Despite this great progress in reducing water pollution, many of the nation's waters still do not meet water quality goals. I challenge you to join with me to finish the business of restoring and protecting our nation's waters for present and future generations.

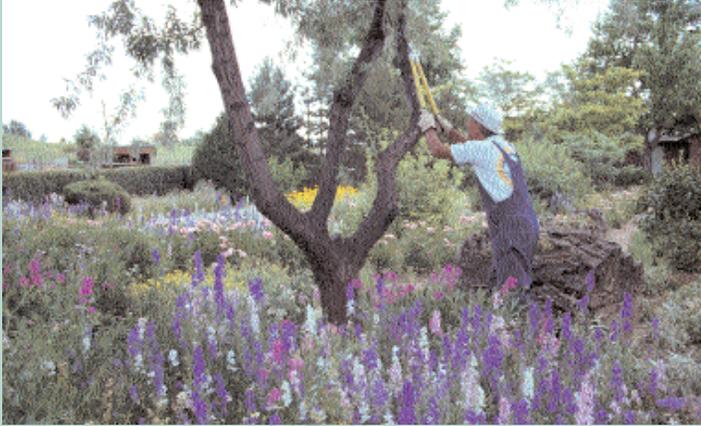
United States Environmental Protection Agency
Office of Water (4204M)
EPA832-F-02-002
September 2002
www.epa.gov/owm/water-efficiency/index.htm



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What is Water-efficient Landscaping?

Water, many agree, is our most precious natural resource; without it, life ceases. Yet judging by our water use and consumption practices, many of us in the United States seem to take it for granted. A typical household uses approximately 260 gallons of water per day. “Water conscious” individuals often install high-efficiency shower heads and toilets and wash only full loads of clothes and dishes to reduce consumption. But in the summer, the amount of water used outdoors by a household can exceed the amount used for all other purposes in the entire year. This is especially true in hot, dry climates.

Gardening and lawn care account for the majority of this seasonal increase, but other outdoor activities, such as washing cars and filling swimming pools, also contribute. According to the U.S. Geological Survey, of the 26 billion gallons of water consumed daily in the United States¹, approximately 7.8 billion gallons, or 30 percent², is devoted to outdoor uses. The majority of this is used for landscaping. In fact, it is estimated that the typical suburban lawn consumes 10,000 gallons of water above and beyond rainwater each year (Vickers, p 140).

Many mistakenly believe that stunning gardens and beautiful lawns are only possible through extensive watering, fertilization, and pesticide application. As this booklet will demonstrate, eye-catching gardens and landscapes that save water, prevent pollution, and

protect the environment are, in fact, easily achieved by employing water-efficient landscaping. Water-efficient landscaping produces attractive landscapes because it utilizes designs and plants suited to local conditions.

This booklet describes the benefits of water-efficient landscaping. It includes several examples of successful projects and programs, as well as contacts, references, and a short bibliography. For specific information about how to best apply water-efficient landscaping principles to your geographical area, consult with your county



Xeriscape garden at Denver Water

extension service and local garden and nursery centers. Local governments and water utilities also possess a wealth of information and suggestions for using water more efficiently in all aspects of your life, including landscaping.

¹ W.B. Solley, R.R. Pierce, and H.A. Perlman. 1998. *Estimated Use of Water in the United States in 1995* (USGS Circular 1200). USGS. Reston, VA. p.27.

² Amy Vickers. 2001. *Handbook of Water Use and Conservation*. WaterPlow Press. Amherst, MA. p. 140.



Xeriscaped front yard in Colorado Springs

Many terms and schools of thought have been used to describe approaches to water-efficient landscaping. Some examples include “water-wise,” “water-smart,” “low-water,” and “natural landscaping.” While each of these terms varies in philosophy and approach, they are all based on the same principles and are commonly used interchangeably. One of the first conceptual approaches developed to formalize these principles is known as “Xeriscape³ landscaping.” Xeriscape landscaping is defined as “quality landscaping that conserves water and protects the environment.” The word “Xeriscape” was coined and copyrighted by

Denver Water Department in 1981 to help make water conserving landscaping an easily recognized concept. The word is a combination of the Greek word “xeros,” which means “dry,” and “landscape.”

The seven principles upon which Xeriscape landscaping is based are:

- Proper planning and design
- Soil analysis and improvement
- Appropriate plant selection
- Practical turf areas
- Efficient irrigation
- Use of mulches
- Appropriate maintenance

The eight fundamentals of water-wise landscaping, below, illustrate the similarities in the underlying concepts and principles of Xeriscape landscaping and other water-efficient approaches.

- Group plants according to their water needs.
- Use native and low-water-use plants.
- Limit turf areas to those needed for practical uses.
- Use efficient irrigation systems.
- Schedule irrigation wisely.
- Make sure soil is healthy.
- Remember to mulch.
- Provide regular maintenance.

In short, plan and maintain your landscape with these principles of water efficiency in mind and it will continue to conserve water and be attractive.

³ Denver Water welcomes the use of the term Xeriscape in books, articles, and speeches promoting water conserving landscape. EPA is using this term with permission from Denver Water. For permission to use “Xeriscape” in your publications, call Denver Water at 303 628-6330.

Why Use Water-efficient Landscaping?

Proper landscaping techniques not only create beautiful landscapes, but also benefit the environment and save water. In addition, attractive, water-efficient, low-maintenance landscapes can increase home values.

Water-efficient landscaping offers many economic and environmental benefits, including:

- Lower water bills from reduced water use.
- Conservation of natural resources and preservation of habitat for plants and wildlife such as fish and waterfowl.
- Decreased energy use (and air pollution associated with its generation) because less pumping and treatment of water is required.
- Reduced home or office heating and cooling costs through the careful placement of trees and plants.

- Reduced runoff of stormwater and irrigation water that carries top soils, fertilizers, and pesticides into lakes, rivers, and streams.
- Fewer yard trimmings to be managed or landfilled.
- Reduced landscaping labor and maintenance costs.
- Extended life for water resources infrastructure (e.g., reservoirs, treatment plants, groundwater aquifers), thus reduced taxpayer costs.



Meadow Sage (Salvia pratensis) is the background for New Mexico Evening Primrose (Oenothera berlandieri 'siskiyou')

How is Water-efficient Landscaping Applied?

Landscaping that conserves water and protects the environment is not limited to arid landscapes with only rocks and cacti.



Dragon's Blood Sedum (*Sedum spurium*) under *Honeylocust Trees* (*Gleditsia triacanthos*)

Through careful planning, landscapes can be designed to be both pleasing to the senses and kind to the environment. One simple approach to achieving this is applying and adopting the basic principles of water-efficient landscaping to suit your climatic region. The seven principles of Xeriscape landscaping are used below to describe these basic concepts in greater detail.

Proper planning and design

Developing a landscape plan is the first and most important step in creating a water-efficient landscape. Your plan

water-efficient landscapes and allow you to continually improve your landscape over time.

Soil analysis and improvements

Because soils vary from site to site, test your soil before beginning your landscape improvements. Your county extension service can analyze the pH levels; nutrient levels (e.g., nitrogen, phosphorus, potassium); and the sand, silt, clay, and organic matter content of your soil. It can also suggest ways to improve your soil's ability to support plants and retain water (e.g., through aeration or the addition of soil amendments or fertilizers).

Appropriate plant selection

Your landscape design should take into account your local climate as well as soil conditions. Focus on preserving as many existing trees and shrubs as possible because established plants usually require less water and maintenance. Choose plants native to your region. Native plants, once established, require very little to no additional water beyond normal rainfall. Also, because they are adapted to local soils and climatic conditions, native plants commonly do not require the addition of fertilizers and are more resistant to pests and disease.

When selecting plants, avoid those labeled "hard to establish," "susceptible to disease," or "needs frequent attention," as these types of plants frequently require large amounts of supplemental water, fertilizers, and pesticides. Be careful when selecting non-indigenous species as some of them may become invasive. An invasive plant might be a water guzzler and will surely choke out native species. Your state or county extension service or local nursery can help you select appropriate plants for your area.

The key to successful planting and transplanting is getting the roots to grow into the surrounding soil as quickly as possible. Knowing when and where to plant is crucial to speeding the establishment of new plants. The best time to plant will vary from species to species. Some plants will thrive when planted in a dormant or inactive state. Others succeed when planted during the season when root generation is highest and sufficient moisture is available to support new growth (generally, spring is the best season, but check plant tags or consult with your local nursery for specific species).

Practical turf areas

How and where turf is placed in the landscape can significantly reduce the amount of irrigation water needed to support the landscape. Lawns require a large amount of supplemental water and generally greater maintenance than other vegetation. Use turf where it aesthetically highlights the house or buildings and where it has practical function, such as in play or recreation areas. Grouping turf areas can increase watering efficiency and significantly reduce evaporative and runoff losses. Select a type of grass that can withstand drought periods and become dormant during hot, dry seasons. Reducing or eliminating turf areas altogether further reduces water use.

Efficient irrigation

Efficient irrigation is a very important part of using water efficiently outdoors, and applies in any landscape—whether Xeriscape or conventional. For this reason, an entire section of this booklet addresses efficient irrigation; it can be found on page 6.

Use of mulches

Mulches aid in greater retention of water by minimizing evaporation, reducing weed growth, moderating soil temperatures, and preventing erosion. Organic mulches also improve the condition of your soil as they decompose. Mulches are typically composed of wood bark chips, wood grindings, pine straws, nut shells, small



Wine Cup (Callirhoe involucrata) and Sunset Hyssop (Agastache rupestris) in the Denver Water Xeriscape Garden

gravel, or shredded landscape clippings. Avoid using rock mulches in sunny areas or around non-arid climate plants, as they radiate large amounts of heat and promote water loss that can lead to scorching. Too much mulch can restrict water flow to plant roots and should be avoided.

Appropriate maintenance

Water and fertilize plants only as needed. Too much water promotes weak growth and increases pruning and mowing requirements. Like any landscape, a water-efficient yard will require regular pruning, weeding, fertilization, pest control, and irrigation. As your water-efficient landscape matures, however, it will require less maintenance and less water. Cutting turf grass only when it reaches two to three inches promotes deeper root growth and a more drought-resistant lawn. As a rule of thumb, mow your turf grass before it requires more than one inch to be removed. The proper cutting height varies, however, with the type of grass, so you should contact your county extension service or local nursery to find out the ideal cutting height for your lawn. Avoid shearing plants or giving them high nitrogen fertilizers during dry periods because these practices encourage water-demanding new growth.

Water-efficient Landscape Irrigation Methods

With common watering practices, a large portion of the water applied to lawns and gardens is not absorbed by the plants. It is lost through evaporation, runoff, or being pushed beyond the root zone because it is applied too quickly or in excess of the plants' needs. The goal of efficient irrigation is to reduce these losses by applying only as much water as is needed to keep your plants healthy. This goal is applicable whether you have a Xeriscape or a conventional landscape.

To promote the strong root growth that supports a plant during drought, water deeply and only when the plant needs water. For clay soils, watering less deeply and more often is recommended. Irrigating with consideration to soil

type, the condition of your plants, the season, and weather conditions—rather than on a fixed schedule—significantly increases your watering efficiency. Grouping plants according to similar water needs also makes watering easier and more efficient.

Irrigating lawns, gardens, and landscapes can be accomplished either manually or with an automatic irrigation system. Manual watering with a hand-held hose tends to be the most water-efficient method. According to the AWWA Research Foundation's outdoor end use study, households that manually water with a hose typically use 33 percent less water outdoors than the average household. The study also showed that households with in-ground sprinkler systems used 35 percent more water, those with automatic timers used 47 percent more water, and those with drip irrigation systems used 16 percent more water than households without these types of systems. These results show that in-ground sprinkler and drip irrigation systems must be operated properly to be water-efficient.

You can use a hand-held hose or a sprinkler for manual irrigation. To reduce water losses from evaporation and wind, avoid sprinklers that produce a fine mist or spray high into the air. Soaker hoses can also be very efficient and effective when used properly. Use a hand-held soil moisture probe to determine when irrigation is needed.

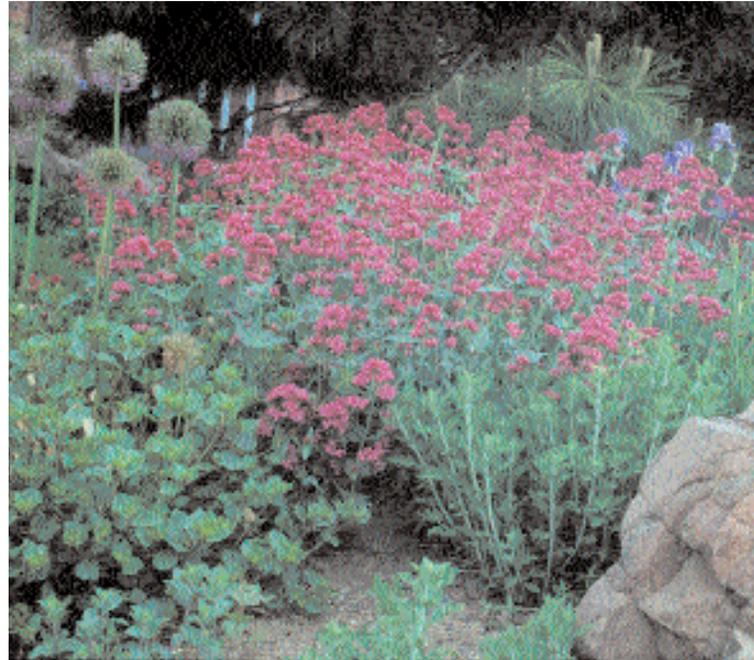
To make automatic irrigation systems more efficient, install system controllers such as rain sensors that prevent sprinkler systems from turning on during and immediately after rainfall, or soil moisture sensors that activate sprinklers only when soil moisture levels drop below pre-programmed levels. You can also use a weather-



Purple Fountain Grass (Pennisetum setaceum "Rubrum") and Marigolds (Calendula officinalis) in planter bed

driven programming system. Drip-type irrigation systems are considered the most efficient of the automated irrigation methods because they deliver water directly to the plants' roots. It is also important to revise your watering schedule as the seasons change. Over-watering is most common during the fall when summer irrigation schedules have not been adjusted to the cooler temperatures.

To further reduce your water consumption, consider using alternative sources of irrigation water, such as gray water, reclaimed water, and collected rainwater. According to the AWWA Research Foundation, homes with access to alternative sources of irrigation reduce their water bills by as much as 25 percent.⁴ Graywater is untreated household waste water from bathroom sinks, showers, bathtubs, and clothes washing machines. Graywater systems pipe this used water to a storage tank for later outdoor watering use. State and local graywater laws and policies vary, so you should investigate what qualifies as gray water and if any limitations or restrictions apply. Reclaimed water is waste water that has been treated to levels suitable for nonpotable uses. Check with local water officials to determine if it is available in your area. Collected rainwater is rainwater collected in cisterns, barrels, or storage tanks. Commercial rooftop collection systems are available, but simply diverting your downspout into a covered

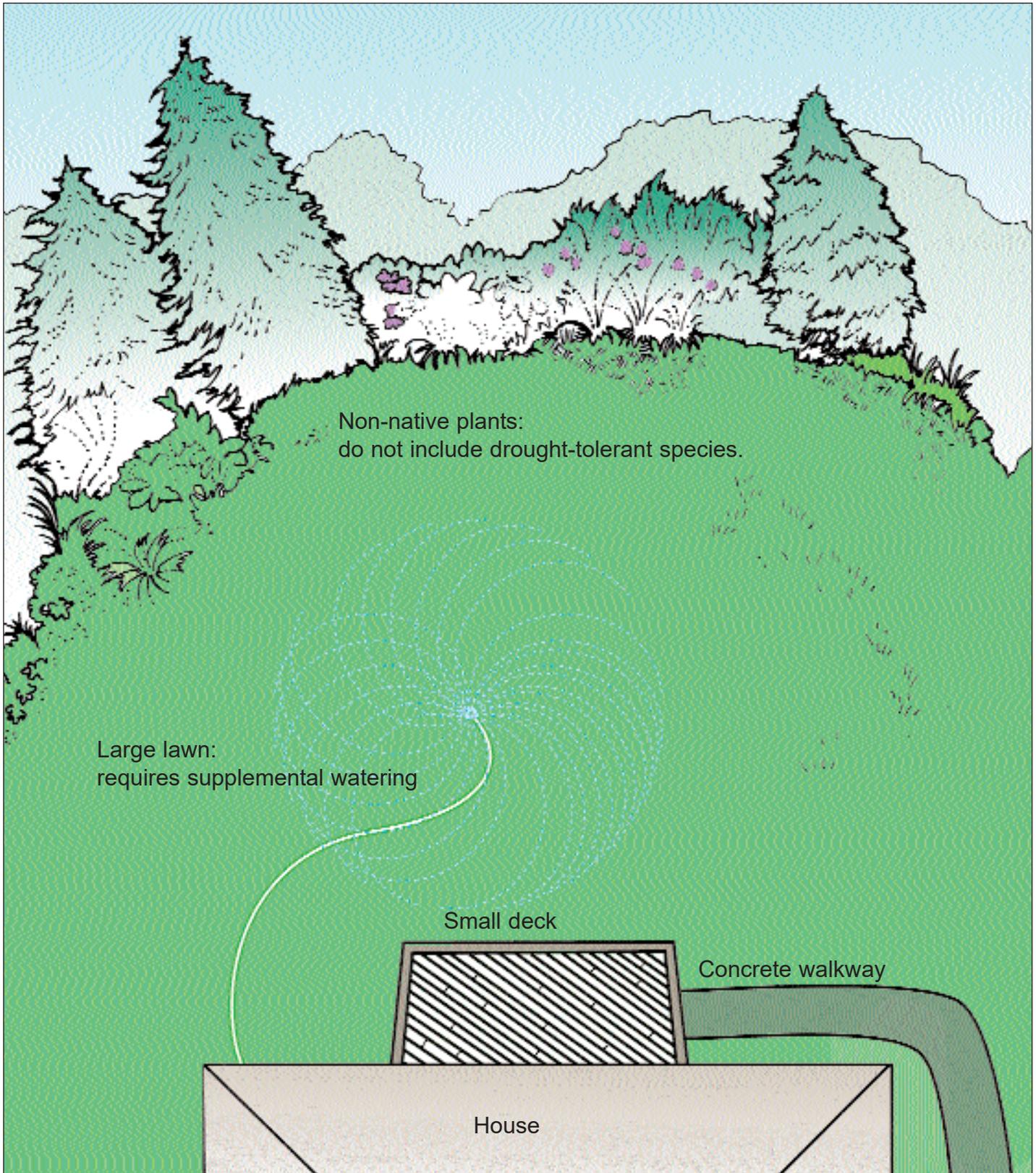


Red Valerian (Centranthus ruber)

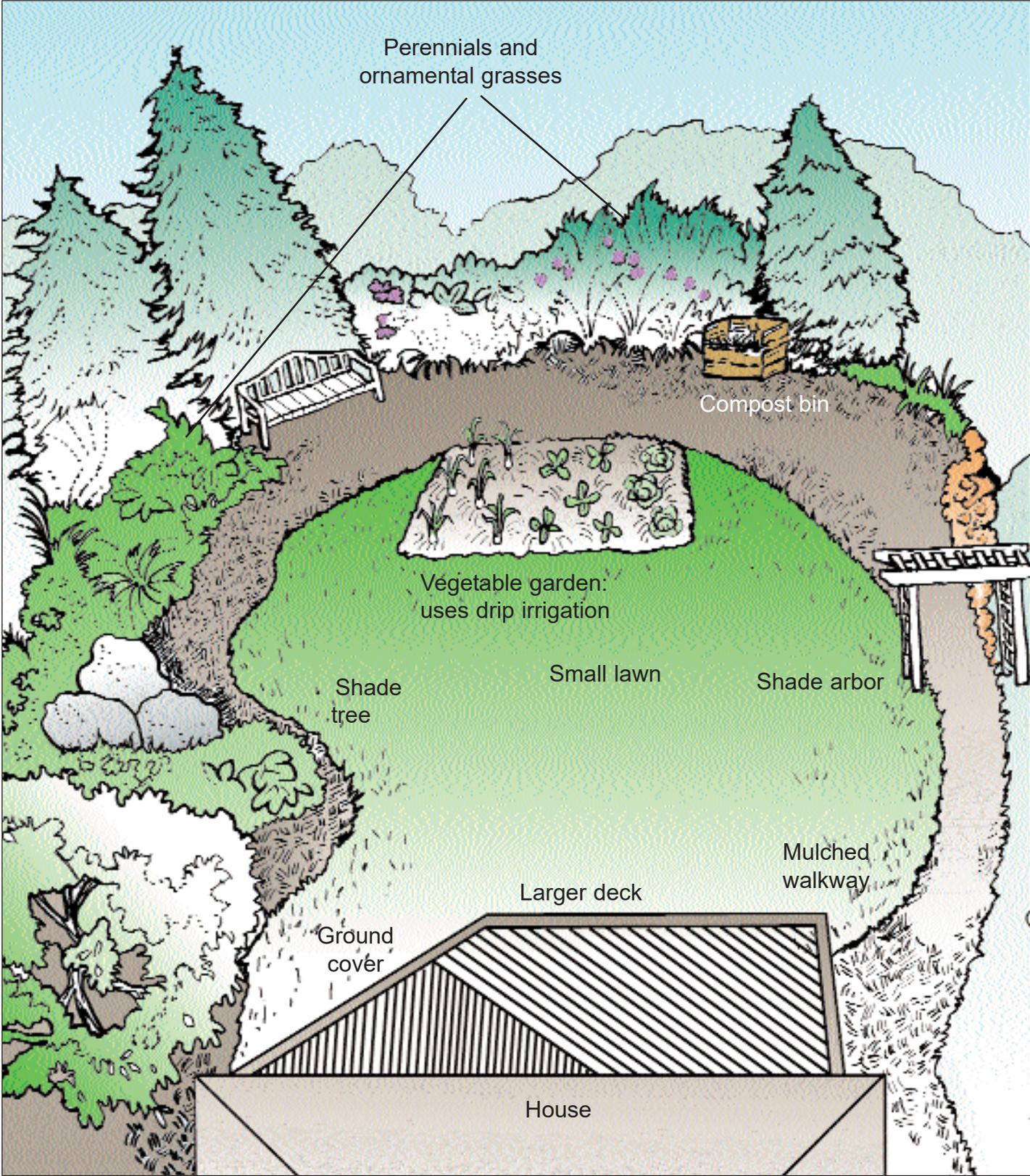
barrel is an easy, low-cost approach. When collecting rainwater, cover all collection vessels to prevent animals and children from entering and to prevent mosquito breeding. Some states might have laws which do not allow collection of rainwater, so be sure to check with your state's water resource agency before implementing a rainwater collection system.

⁴ AWWA Research Foundation. 1999. *Residential End Uses of Water*. <www.waterwiser.org>

Non-xeriscaping



Xeriscaping



Examples of Successful Water-efficient Landscaping Projects

Water-efficient landscaping techniques can be used by individuals, companies, state, tribal, and local governments, and businesses to physically enhance their properties, reduce long-term maintenance costs, and create environmentally conscious landscapes. The following examples illustrate how water-efficient landscapes can be used in various situations.



Oriental Poppies (Papaver orientale)

Homeowner–public/private partnership

- The South Florida Water Management District, the Florida Nurserymen and Growers Association, the Florida Irrigation Society, and local businesses worked together to produce a television video called “Plant It Smart with Xeriscape.” The video shows how a typical Florida residential yard can be retrofitted with Xeriscape landscaping to save energy, time,

and money. The showcase yard (selected from 70 applicants) had a history of heavy water use—more than 90,000 gallons per month. After the retrofit, the yard’s aesthetic value was enhanced; plus it now uses 75 percent less water and relies on yard trimmings for mulch and compost.

- The Southwest Florida Water Management District (SWFWMD), the City of St. Petersburg, and Pinellas County, Florida, produced a video called “Xeriscape It!” It shows a landscape being installed using the seven Xeriscape principles. The SWFWMD also funded several Xeriscape demonstration sites and maintains a Xeriscape demonstration garden at its Brooksville, Florida, headquarters. The garden features a variety of native and non-native plants and is available for public viewing, along with a landscape plant identification guide.
- Residents of Glendale, Arizona, can receive a \$100 cash rebate for installing or converting more than half of their landscapable area to non-grass vegetation. The Glendale Water Conservation Office conducts an inspection of the converted lawn to ensure compliance with rebate requirements and then issues a rebate check to the homeowner. The purpose of the Landscape Rebate Program is to permanently reduce the amount of water used to irrigate grass throughout Glendale.

State government

- Although perceived as a water-rich state, Florida became the first to enact a statewide Xeriscape law. Florida’s legislature recognized that its growing population and vulnerable environment necessitated legal safeguards for its water resources. The Xeriscape law requires Florida’s Departments of Management Ser-

vices and Transportation to use Xeriscape landscaping on all new public properties and to develop a 5-year program to phase in Xeriscape on properties constructed before July 1992. All local governments must also consider requiring the use of Xeriscape and offering incentives to install Xeriscaping.

- Texas also developed legislation requiring Xeriscape landscaping on new construction projects on state property beginning on or after January 1994. Additional legislation, enacted in 1995, requires the Department of Transportation to use Xeriscape practices in the construction and maintenance of roadside parks. All municipalities may consider enacting ordinances requiring Xeriscape to conserve water.

City government

In Las Vegas, Nevada, homeowners can receive up to \$1,000 for converting their lawn to Xeriscape, while commercial landowners can receive up to a \$50,000 credit on their water bill. The city and several other surrounding communities hope these eye-catching figures will help Las Vegas meet its goal of saving 25 percent of the water it would otherwise have used by the year 2010; to date, it has saved 17 percent. Local officials plan to reach the target with the assistance of incentive programs encouraging Xeriscape, a city ordinance limiting turf to no more than 50 percent of new landscapes, grassroots information programs, and a landscape awards program specifically for Xeriscaped properties. Preliminary results of a five-year study show that residents who converted a portion of their lawns to Xeriscape reduced total water consumption by an average of 33 percent. The xeric vegetation required less than a quarter of the water typically used and one-third the maintenance (both in labor and expenditures) compared to traditional turf.



Yellow Ice Plant (Delosperma nubigenum) close-up

Developers

Howard Hughes Properties (HHP), a developer and manager of more than 25,000 acres of residential, commercial, and office development property, has enthusiastically used drought tolerant landscaping on all of its properties since 1990. Most of the company's properties are located in Las Vegas, one of the country's fastest growing metropolitan areas. To conserve resources, the city and county have implemented regulations requiring developers to employ certain Xeriscape principles in new projects. Specifically, a limited percentage of grass can be used on projects, and it must be kept away from streets. As the area's first large-scale developer to recognize the need and value in incorporating drought tolerant landscaping in parks, streetscapes, and open spaces, HHP uses native and desert-adaptive plants that survive and thrive in the Las Vegas climate with minimal to moderate amounts of water.

Drip system irrigation controllers are linked to weather stations that monitor the evapotranspiration rate. This allows HHP to determine the correct amount of water to be applied to plants at any given time. HHP tests the irrigation systems regularly and adds appropriate soil amendments to promote healthy plant growth. The maintenance program also includes pest management, the use of mulching mowers, and the use of rock mulch top dressing on all non-turf planting areas. These measures combine to ensure a beautiful, healthy, and responsible landscape.

Public/private partnerships

Even the most water-conscious homeowners in Southern California are over-watering by 50 to 70 gallons per day. The excess water washes away fertilizers and pesticides, which pollute natural waterways. The quantity of water wasted (and the dollars that pay for it) are even more substantial for large-scale commercial properties and developments.

An innovative partnership in Orange County links landscape water management, green mate-

rial management, and non-point source pollution prevention goals into one program—the Landscape Performance Certification Program. This program emphasizes efficient landscape irrigation and features a “landscape irrigation budget” based on a property’s landscape area, type, and the daily weather. The Municipal Water District monitors actual water use through a system of 12,000 dedicated water meters installed by participating landscape managers.

Participants, including landscapers, property managers, and homeowner associations, can compare the actual cost of water used on their property with the calculated budget. Those staying within budget are awarded certification, a proven marketing tool. This new voluntary program is implemented by the Municipal Water District with input from the California Landscape Contractors’ Association, the Orange County Integrated Management Department, the Metropolitan Water District of Southern California, and local nurseries and has the support of 32 retailing water suppliers. The program is already credited with increasing the use of arid-climate shrubs and landscaping to accommodate drip irrigation, and has resulted in cost savings to water customers.



Miscanthus sinensis
(Miscanthus grass, also called
Maiden grass) variety with
leaves turning yellow for fall.



For More Information

The following list of organizations can provide more information on water-efficient landscaping. This is not meant to be an exhaustive list, rather it is intended to help you locate local information sources and possible technical assistance.

Water Management Districts or Utilities

Your local water management district often can provide information on water conservation, including water efficient landscaping practices. Your city, town, or county water management district can be found in the Blue Pages section of your local phone book or through your city, town, or county's Web site if it has one. If you do not know your city, town, or county's Web site, check for a link on your state's Web site. URLs for state Web sites typically follow this format: <www.state.(two letter state abbreviation).us>.

State/County Extension Services

Your state or county extension service is also an excellent source of information. Many extension services provide free publications and advice on home landscaping issues including tips on plant selection and soil improvement. Some also offer a soil analysis service for a nominal fee. Your county extension service can be found in the Blue Pages section of your local phone book under the county government section or through your county's Web site if it has one. The U.S. Department of Agriculture's Cooperative State Research, Education, and Extension Service (www.reeusda.gov/statepartners/usa.htm) provides an online directory of land-grant universities which can help you locate your state extension service. Government Guide (www.governmentguide.com) is yet another online resource that might prove helpful in locating state or local agencies.

Organizations

The following is a partial list of organizations located across the United States that provide helpful information on water-efficient landscaping.

American Water Works Association (AWWA)

6666 West Quincy Avenue
Denver, CO 80235

Telephone: 303 794-7711
and

1401 New York Avenue, NW, Suite 640
Washington, DC 20005

Telephone: 202 628-8303
Web: <www.awwa.org>

Arizona Municipal Water Users Association (AMWUA)

Web: <www.amwua.org/program-xeriscape.htm>

BASIN

City of Boulder Environmental Affairs
P.O. Box 791

Boulder, CO 80306
Phone: 303 441-1964

E-mail: basin@bcn.boulder.co.us
Web: <bcn.boulder.co.us/basin/local/seven.html>

Denver Water

1600 West 12th Avenue
Denver, CO 80204

Phone: 303 628-6000
Fax: 303 628-6199

TDDY: 303 534-4116

Office of Water Conservation hotline:
303 628-6343

E-mail: jane.earle@denverwater.org

Web: <www.water.denver.co.gov/conservation/conservframe.html>

New Mexico Water Conservation Program/Water Conservation Clearinghouse

P. O. Box 25102

Santa Fe, NM 87504

Phone: 800 WATER-NM

E-mail: waternm@ose.state.nm.us

Fax: 505 827-3813

Web: <www.ose.state.nm.us/water-info/conservation/index.html>

Project WET - Water Education for Teachers

201 Culbertson Hall

Montana State University

Bozeman, MT 59717

Phone: 406 994-5392

Web: <www.montana.edu/wwwwet>

Rocky Mountain Institute

1739 Snowmass Creek Road

Snowmass, CO 81654-9199

Phone: 970 927-3851

Web: <www.rmi.org>



Turkish Speedwell (Veronica liwanensis) in background and tulips in foreground.

Southern Nevada Water Authority
1001 S. Valley View Boulevard, Mailstop #440
Las Vegas, NV 89153
Phone: 702 258-3930
Web: <www.snwa.com>

Southwest Florida Water Management District
2379 Broad Street
Brooksville, FL 34604-6899
Phone: 352 796-7211 or 800 423-1476 (Florida only)
Web: <www.swfwmd.state.fl.us/watercon/xeris/swfxeris.html>

Sustainable Sources Green Building Program: Sustainable Building Source Book
E-mail: info@greenbuilder.com
Web: <www.greenbuilder.com/sourcebook/xeriscape.html>

Water Conservation Garden – San Diego County
12122 Cuyamaca College Drive West
El Cajon, CA 92019
Phone: 619 660-0614
Fax: 619 660-1687

E-mail: info@thegarden.org
Web: <www.thegarden.org/garden/xeriscape/index.html> and <www.sdcwa.org/manage/conservation-xeriscape.phtml>

WaterWiser: The Water Efficiency Clearing House
(Operated by AWWA in cooperation with the U.S. Bureau of Reclamation)
6666 West Quincy Avenue
Denver, CO 80235
Phone: 800 559-9855
Fax: 303 794-6303
E-mail: bewiser@waterwiser.org
Web: <www.waterwiser.org>

Xeriscape Colorado!, Inc.
P.O. Box 40202
Denver, CO 80204-0202
Web: <www.xeriscape.org>

Resources

The following is a partial list of publications on resource efficient landscaping. For even more information, particularly on plants suited to your locale, consult your local library, county extension service, nursery, garden clubs, or water utility.

Ball, Ken and American Water Works Association Water Conservation Committee. *Xeriscape Programs for Water Utilities*. Denver: American Water Works Association, 1990.

Bennett, Jennifer. *Dry-Land Gardening: A Xeriscaping Guide for Dry-Summer, Cold-Winter Climates*. Buffalo: Firefly, 1998.

Bennett, Richard E. and Michael S. Hazinski. *Water-Efficient Landscape Guidelines*. Denver: American Water Works Association, 1993.

Brenzel, Kathleen N., ed. *Western Garden Book*, 2001 Edition. Menlo Park: Sunset Publishing Corporation, 2001.

City of Aurora, Colorado Utilities Department. *Landscaping for Water Conservation: Xeriscape!* Aurora: Colorado Utilities Department, 1989.

Johnson, Eric and Scott Millard. *The Low-Water Flower Gardener: 270 Unthirsty Plants for Color, Including Perennials, Ground Covers, Grasses & Shrubs*. Tucson: Ironwood Press, 1993.

Knopf, James M. *The Xeriscape Flower Gardener*. Boulder: Johnson Books, 1991.

Knopf, James M., ed. *Waterwise Landscaping with Trees, Shrubs, and Vines: A Xeriscape Guide for the Rocky Mountain Region, California, and the Desert Southwest*. Boulder: Chamisa Books, 1999.

Knox, Kim, ed. *Landscaping for Water Conservation: Xeriscape*. Denver: City of Aurora and Denver Water, 1989.

Nellis, David W. *Seashore Plants of South Florida and the Caribbean: A Guide to Identification and Propagation of Xeriscape Plants*. Sarasota: Pineapple Press, Inc., 1994.

Perry, Bob. *Landscape Plants for Western Regions: An Illustrated Guide to Plants for Water Conservation*. Claremont: Land Design Publishing, 1992.

Phillips, Judith. *Natural by Design: Beauty and Balance in Southwest Gardens*. Santa Fe: Museum of New Mexico Press, 1995.

- Phillips, Judith. *Plants for Natural Gardens: Southwestern Native & Adaptive Trees, Shrubs, Wildflowers & Grasses*. Santa Fe: Museum of New Mexico Press, 1995.
- Robinette, Gary O. *Water Conservation in Landscape Design and Maintenance*. New York: Nostrand Reinhold, 1984.
- Rumary, Mark. *The Dry Garden*. New York: Sterling Publishing Co., Inc., 1995.
- Springer, Lauren. *The Undaunted Garden: Planting for Weather-Resilient Beauty*. Golden: Fulcrum Publishing, 1994.
- Springer, Lauren. *Waterwise Gardening*. New York: Prentice Hall Gardening, 1994.
- Stephens, Tom, Doug Welsh, and Connie Ellefson. *Xeriscape Gardening, Water Conservation for the American Landscape*. New York: Macmillan Publishing, 1992.
- Sunset Books, eds. *Waterwise Gardening: Beautiful Gardens with Less Water*. Menlo Park: Lane Publishing Company, 1989.
- Vickers, Amy. *Handbook of Water Use and Conservation*. Amherst, MA: WaterPlow Press, 2001.
- Weinstein, Gayle. *Xeriscape Handbook : A How-To Guide to Natural, Resource-Wise Gardening*. Golden: Fulcrum Publishing, 1998.
- Williams, Sara. *Creating the Prairie Xeriscape*. Saskatchewan: University Extension Press, 1997.
- Winger, David, ed. *Xeriscape Plant Guide: 100 Water-Wise Plants for Gardens and Landscapes*. Golden: Fulcrum Publishing, 1998.
- Winger, David, ed. *Xeriscape Color Guide*. Golden: Fulcrum Publishing, 1998.
- Winger, David, ed. *Evidence of Care: The Xeriscape Maintenance Journal, 2002, Vol. 1*, Colorado WaterWise Council, 2001.

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EPA Water Resources Center (RC-4100)
U.S. Environmental Protection Agency
Ariel Rios Building, 1200 Pennsylvania Avenue, NW.
Washington, DC 20460

For more information regarding water efficiency, please contact:

Water Efficiency Program (4204M)
U.S. Environmental Protection Agency
Ariel Rios Building, 1200 Pennsylvania Avenue, NW.
Washington, DC 20460
<www.epa.gov/OWM/water-efficiency/index.htm>



United States
Environmental Protection Agency (4204M)
Washington, DC 20460

Official Business
Penalty for Private Use \$300