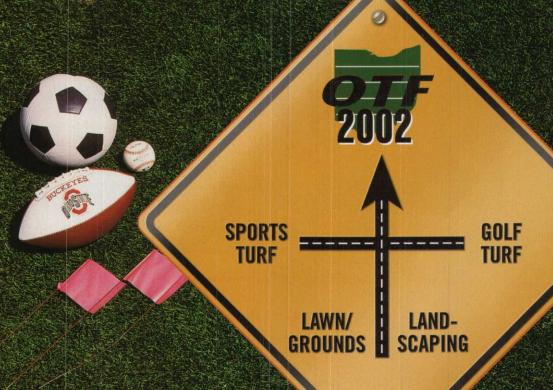
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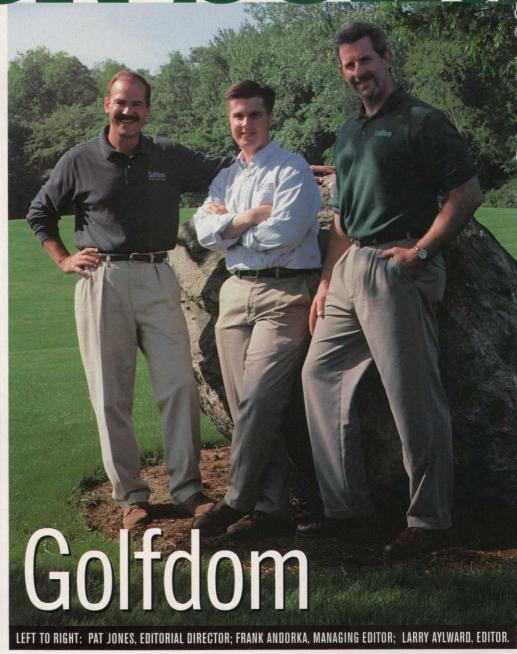












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# **Know Your Turfgrass Terminology...**

## ...when it comes to managing turfgrass stress

BY KARL DANNEBERGER

uperintendents earn their keep by managing turf under severe environmental stresses caused by temperature, moisture and light. The first step in managing turf under severe stress is to understand the terminology that comes with the territory.

For instance, "stress tolerance" is not the same as "stress resistance," and knowing the difference is important in turfgrass selection and management programs. Resistance is the umbrella term for describing a plant's ability to withstand stress, while tolerance is one of three components that comprises resistance. Stress resistance is comprised of escape, tolerance and avoidance.

Escape, although a component in resistance, is not one that many superintendents would want their turf to expe-



Poa annua is a classic example of a plant that uses escape as a means of resistance.

rience. Plants that use escape as a means of resistance generally die before the onset of the stress and then regenerate from seed. The classic example of a turfgrass plant that uses this mechanism is *Poa annua*. It produces seed prior to the onset of summer stresses, including both high temperature and moisture stress. After producing seed and prior to the arrival of these summer stresses, *Poa annua* dies. Once the summer stress period passes, it regenerates from seed.

Obviously, shutting down and dying prior to the bad

news is a mechanism of resistance. But it's not a mechanism that we would like to see in our cool- and warm-season turfgrasses.

The major components of turfgrass resistance are tolerance and avoidance. Tolerance is the internal ability of the plant to prevent or reduce injury when exposed to stress. For example, the reported cold temperature that a turfgrass can survive is an example of toler-

ance. The plant's tolerance is its ability to prevent, minimize or repair the injury caused by the stress, in this case suboptimal temperatures. Another example would be the ability to prevent an external drought situation through internal osmotic adjustments.

Avoidance is the ability to prevent or reduce the exposure to the stress. Avoidance mechanisms are probably the easiest for superintendents to relate. Tall fescue avoids drought stress by producing a deep root system relative to other cool-season turfgrasses, which allows it to absorb water deeper in the soil profile.

Cool-season turfgrasses can better avoid high temperature stress by being planted on north-facing slopes rather than south-facing slopes. Planting a cool-season turfgrass in shade enables it to avoid high summertime temperatures.

Bermudagrass avoids suboptimal temperatures through rhizomes, which are located within the soil profile and are able to avoid the low temperature stress better than crowns.

Management practices often influence the stress resistance of turfgrass. Improper fertilization that promotes excessive or succulent growth at the wrong time, improper watering and mowing heights often influence the stress resistance of a plant.

There are several environmental turfgrass stresses that nearly every superintendent will experience at his or her golf course. A clear understanding of the components is the start to proper turfgrass selection and management programs that will favor turfgrass survival.

Danneberger is a professor of turfgrass science at The Ohio State University and Golfdom's chief science editor

# Seed Availability at a Glance

here's good news for golf courses that use bentgrass and bermudagrass. Prices of cultivars are stable and equal to last season.

The news is better for bentgrass in the availability department, where many cultivars are at an expected surplus, and several have an adequate supply. Most bermudagrass cultivars have an an adequate supply.

Overall, the turf seed industry is making headway in matching supply with demand. This is especially true with perennial ryegrass.

Overproduction of perennial ryegrass in Oregon's Willamette Valley led to bargain prices in recent years, but growers reduced the number of acres planted in 2001 to 164,000 and chopped it again this year to 130,000. What's this mean? Expect the price of most varieties to rise.

Meanwhile, prices of many varieties of turf-type tall fescue seed could actually be lower because of a large crop of K-31.

Growing conditions in the prime Kentucky bluegrass seed-producing regions of the Inland Northwest were

pretty good this season, so there should be adequate supplies of most Kentucky bluegrass varieties.

For performance results on each variety in your area, review National Turfgrass Evaluation data www.ntep.org.

#### **KEY (AVAILABILITY):**

#### KEY (PRICE):

H = higher price than last seasoS = stable, equal to last season

CULTIVAR	MARKETER	AVAILABILITY	PRICE
Bentgrass			
Bardot Colonial	Barenbrug USA	В	S
Backspin	Turf Merchants	A	S
Cato	Pickseed West	В	S
Century	Proseed	A	S
Cobra	Cebeco	В	S
Crenshaw	Proseed	A	S
Dominant X-treme	SR Oregon	A	S
Grand Prix	LESCO	Α	S
Imperial	Proseed	Α	S
Independence	Lebanon Seaboard	С	S
L-93	Jacklin	В	S
Penn-G6	Pennington	A	S
Pin-High	Barenbrug USA	В	S
Putter	Jacklin	В	S
Princeville	LESCO	A	S
Regent	Barenbrug USA	В	S
Southshore	Jacklin	В	S
SR 1119	SR Oregon	Α	S
SR 1020	SR Oregon	Α	S
Tiger II	Cebeco	С	new
Trueline	Turf Merchants	A	S
Vesper	Pickseed West	В	S
Viper	Cebeco	В	S
Bermudagrass			
Jackpot	Jacklin	С	S
LaPrima	SR Oregon	Α	S
Mirage	Cebeco	В	S
Pyramid	Cebeco	В	S
Riviera	Johnston Seed	В	new
Southern Star	Jacklin	В	S
SR 9554	SR Oregon	В	S
Sundevil	Jacklin	В	S
Sunstar	LESCO	В	S
Yukon	Johnston/Seed Research C	OR C	S
Kentucky Bluegrass			
Adams	Jonathan Green	С	S
		Charles and the Control of the Contr	

CULTIVAR	MARKETER	AVAILABILITY	PRICE
America	Pickseed West	В	S
Apollo	Scotts/Proseed/Landmark	Α-	S
Arcadia	SR Oregon	С	S
Barcelona	Barenbrug USA	В	S
Baron	Barenbrug USA	В	S
Bartitia	Barenbrug USA	В	S
Blackstone	Scotts	В	S
Blue Ridge	Pennington	С	S
Bedazzled	Turf Merchants	С	new
Blue Knight	DLF-Jenks	В	L
Bordeaux	Lebanon Seaboard	В	S
Boutique	Merchants	С	S
Broadway	DLF-Jenks	В	S
Brooklawn	Turf Merchants	С	S
Cabernet	Lebanon Seaboard	В	S
Champagne	Lebanon Seaboard	В	S
Chateau	ULTRATurf	В	S
Chicago II	Jacklin	В	S
Coventry	Scotts	В	S
DEEPBLUE	Jonathan Green	В	S
Dragon	Proseed	Α	S
Fortuna	Cebeco	C-	S
Julius	Cebeco	С	S
Hallmark	LESCO	Α	S
Jefferson	Jonathan Green	В	S
Quantum Leap	Roberts Seed	Α	S
Langara	Pickseed West	В	S
Limousine	Roberts Seed	Α	S
Mallard	Pennington	С	S
Monte Carlo	Pennington	С	S
Moonshadow	Pickseed West	В	S
NuGlide	Jacklin	В	S
P-105	Proseed	C	S
Rugby II	Roberts Seed	Α	S
Shamrock	LESCO/DLF-Jenks	A-	S
Showcase	SR Oregon	В	S
SR 2284	SR Oregon	С	new
Tsunami	Jacklin	В	S
Wildwood	LESCO	A	S

Pine   Fescue   Ambassador Chewings	CULTIVAR	MARKETER	AVAILABILITY	PRICE
Ambassador Chewings         Lebanon Seaboard         B         S           Aruba Creeping Red         Jacklin         B         L           Azay         Pickseed West         B         S           Badger Creeper         Scotts         A         S           Bardur Hard         Barenbrug USA         B         S           Beristahire Hard         Scotts         A         S           Britany Chewings         LESCO         A         L           Camen Chewing         Jonathan Green         B+         S           Celestial         Turf Merchants         C         new           Cindy         Cebeco         B+         S           Celestial         Turf Merchants         C         new           Cindy         Cebeco         B+         S           Celestial         Jurf Merchants         A         H           Legral Land         LeSCO         A         L           Celestial         Jacklin         B         L           Leurka         Cebeco         B         S           Hardtop Hard         Barenbrug USA         B         S           Hardtop Hard         Barenbrug USA         B         S <td>Fine Fescue</td> <td></td> <td></td> <td></td>	Fine Fescue			
Aruba Creeping Red         Jacklin         B         L           Azay         Pickseed West         B         S           Bardger Creeper         Scotts         A         S           Bardur Hard         Barenbrug USA         B         S           Berkshire Hard         Scotts         A         S           Biritany Chewings         Barenbrug USA         B         S           Biritany Chewings         Barenbrug USA         B         S           Biritany Chewings         Barenbrug USA         B         S           Biritany Chewings         Deceded         B         L           Carmen Chewing         Jonathan Green         B+         S           Celestial         Turf Merchants         C         new           Columbia Chewings         Proseed         A         H           Deflant Hard         LESCO         A         L           Ecostar         Jacklin         B         L           Eureka         Cebeco         B         S           Hardtoph Hard         Barenbrug USA         B         S           Intrigue         Turf Merchants         A         S           Jasper II         Pickseed West		Lebanon Seaboard	R	9
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Badger Creeper         Scotts         A         S           Bardur Hard         Barenbrug USA         B         S           Berkshire Hard         Scotts         A         S           Bridgeport Chewings         Barenbrug USA         B         S           Brittary Chewings         LESCO         A         L           Carmen Chewing         Jonathan Green         B+         S           Celestial         Turf Merchants         C         new           Cindy         Cebeco         B         H           Columbia Chewings         Proseed         A         H           Deffant Hard         LESCO         A         L           Ecostar         Jacklin         B         L           Eureka         Cebeco         B         S           Hardtop Hard         Barenbrug USA         B         S           Hardtop Hard         Barenbrug USA         B         S           Intigue         Juri Merchants         A         L           Leukan         Cebeco         B         S           Intigue         Turi Merchants         A         L           Copsprey Hard         SR Coregon         A         S		100000000000000000000000000000000000000	J	100
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Berkshire Hard         Scotts         A         S           Bridgeport Chewings         Barenbrug USA         B         S           Brittany Chewings         LESCO         A         L           Carmen Chewing         Jonathan Green         B+         S           Celestial         Turf Merchants         C         new           Cindy         Cebeco         B         H           Columbia Chewings         Proseed         A         H           Defiant Hard         LESCO         A         L           Ecostar         Jacklin         B         L           Eureka         Cebeco         B         S           Hardtop Hard         Barenbrug USA         B         S           Hood Chewing         Jonathan Green         B+         S           Houting         Jonathan Green         B+         S           Longter         Jacklin         B				1000
Britdapport Chewings         Barenbrug USA         B         S           Brittary Chewings         LESCO         A         L           Carmen Chewing         Jonathan Green         B+         S           Celestial         Turf Merchants         C         new           Cindy         Cebeco         B         H           Columbia Chewings         Proseed         A         H           Defiant Hard         LESCO         A         L           Ecostar         Jacklin         B         L           Eureka         Cebeco         B         S           Hardtop Hard         Barenbrug USA         B         S           Hood Chewing         Jonathan Green         B+         S           Intrigue         Turf Merchants         A         S           Hood Chewing         Jonathan Green         B+         S           Intrigue         Turf Merchants         A         S           Longfellow II         Cebeco         B         H           Minotaur         Turf Merchants         A         L           Cosprey Hard         SR Oregon         A         S           Carbefollow II         Robected         B	The state of the s			
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Carmen Chewing         Jonathan Green         B+         S           Celestial         Turf Merchants         C         new           Cindy         Cebeco         B         H           Columbia Chewings         Proseed         A         L           Defiant Hard         LESCO         A         L           Ecostar         Jacklin         B         L           Eureka         Cebeco         B         S           Hardtop Hard         Barenbrug USA         B         S           Hardtop Hard         Barenbrug USA         B         S           Hood Chewing         Jonathan Green         B+         S           Intrigue         Turf Merchants         A         S           Jasper II         Pickseed West         B         S           Longfellow II         Cebeco         B         H           Minotaur         Turf Merchants         A         L           Cosprey Hard         SR Oregon         A         S           Oxford         Lebanon Seaboard         B         S           Patthfinder         Lebanon Seaboard         B         S           Reliant II         Proseed         A         H				
Celestial         Turf Merchants         C         new           Cindy         Cebeco         B         H           Columbia Chewings         Proseed         A         H           Defiant Hard         LESCO         A         L           Ecostar         Jacklin         B         L           Eureka         Cebeco         B         S           Hardtop Hard         Barenbrug USA         B         S           Hardtop Hard         Barenbrug USA         B         S           Hood Chewing         Jonathan Green         B+         S           Intrigue         Turf Merchants         A         S           Jasper II         Pickseed West         B         S           Jasper III         Pickseed West         B         S           Pathinder         Lebanon Seaboard         B         S           Pathinder         Lebanon Seaboard         B <t< td=""><td></td><td>Jonathan Green</td><td></td><td></td></t<>		Jonathan Green		
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Defiant Hard         LESCO         A         L           Ecostar         Jacklin         B         L           Eureka         Cebeco         B         S           Hardtop Hard         Barenbrug USA         B         S           Hood Chewing         Jonathan Green         B+         S           Intrigue         Turf Merchants         A         S           Jasper II         Pickseed West         B         S           Longfellow II         Cebeco         B         H           Minotaur         Turf Merchants         A         L           Coprey Hard         SR Oregon         A         S           Oxford         Lebanon Seaboard         B         S           Pathfinder         Lebanon Seaboard         B         S           Pathfinder         Lebanon Seaboard         B         S           Reliant II         Proseed         A         H           Rescue 911         Jacklin         B         L           Ridu Hard         DLF-Jenks         B         H           Rose Chewings         DLF-Jenks         B         H           Salem Creeping         Proseed         A         S	Cindy	Cebeco	В	Н
Defiant Hard         LESCO         A         L           Ecostar         Jacklin         B         L           Eureka         Cebeco         B         S           Hardtop Hard         Barenbrug USA         B         S           Hood Chewing         Jonathan Green         B+         S           Intrigue         Turf Merchants         A         S           Jasper II         Pickseed West         B         S           Longfellow II         Cebeco         B         H           Minotaur         Turf Merchants         A         L           Coprey Hard         SR Oregon         A         S           Oxford         Lebanon Seaboard         B         S           Pathfinder         Lebanon Seaboard         B         S           Pathfinder         Lebanon Seaboard         B         S           Reliant II         Proseed         A         H           Rescue 911         Jacklin         B         L           Ridu Hard         DLF-Jenks         B         H           Rose Chewings         DLF-Jenks         B         H           Salem Creeping         Proseed         A         S	Columbia Chewings	Proseed	A	Н
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Oxford         Lebanon Seaboard         B         S           Pathfinder         Lebanon Seaboard         B         S           Reliant II         Proseed         A         H           Rescue 911         Jacklin         B         L           Ridu Hard         DLF-Jenks         B         H           Rose Chewings         DLF-Jenks         B         H           Salem Creeping         Proseed         A         H           Sandpiper Chewings         SR Oregon         A         S           Shademark         LESCO         A         L           Creeping Red         Silhouette Chewings         Roberts Seed         A         S           Shademark         LESCO         A         L         C           Creeping Red         Jonathan Green         A         S         S           Shadomark         Lesco         B         S         Weston Creeping Red Jonathan Green         B+         S           Wrigley Chewings         DLF-Jenks         B         H         T         Tall Fescue           Admiral         Burlingham         A         L         A         L           Arid 3         Jacklin         B         L <td>The state of the s</td> <td></td> <td>3/2</td> <td></td>	The state of the s		3/2	
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Rescue 911         Jacklin         B         L           Ridu Hard         DLF-Jenks         B         H           Rose Chewings         DLF-Jenks         B         H           Salem Creeping         Proseed         A         H           Sandpiper Chewings         SR Oregon         A         S           Shademark         LESCO         A         L           Creeping Red         Creeping Red         A         S           Silhouette Chewings         Roberts Seed         A         S           SR 3200 Blue         SR Oregon         A         S           Treazure Chewings         Scotts         A         S           Victory 2         Pickseed West         B         S           Weston Creeping Red         Jonathan Green         B+         S           Wrigley Chewings         DLF-Jenks         B         H           Tall Fescue           Admiral         Burlingham         A         L           Admiral         Burlingham         A         L           Arid 3         Jacklin         B         L           Balrexas II         Barenbrug USA         B         S           Birgo	Reliant II	Proseed	A	
Ridu Hard         DLF-Jenks         B         H           Rose Chewings         DLF-Jenks         B         H           Salem Creeping         Proseed         A         H           Sandpiper Chewings         SR Oregon         A         S           Shademark         LESCO         A         L           Creeping Red         Creeping Red         A         S           Silhouette Chewings         Roberts Seed         A         S           SR 3200 Blue         SR Oregon         A         S           Treazure Chewings         Scotts         A         S           Victory 2         Pickseed West         B         S           Weston Creeping Red         Jonathan Green         B+         S           Wijdery Chewings         DLF-Jenks         B         H           Tall Fescue         A         S         S           Admiral         Burlingham         A         L           Arid 3         Jacklin         B         L           Barlexas II         Barenbrug USA         B         S           Biltmore         LESCO         A         S           Biration         Cebeco         B         L     <	Rescue 911	AND DEPRESENTATION ()		
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Silhouette Chewings       Roberts Seed       A       S         SR 3200 Blue       SR Oregon       A       S         Treazure Chewings       Scotts       A       S         Victory 2       Pickseed West       B       S         Weston Creeping Red       Jonathan Green       B+       S         Wrigley Chewings       DLF-Jenks       B       H         Tall Fescue         Admiral       Burlingham       A       L         Arid 3       Jacklin       B       L         Barlexas II       Barenbrug USA       B       S         Biltmore       LESCO       A       S         Bingo       Cebeco       B       L         Black Magic       Jonathan Green       C       S         Bravo       LESCO       A       S         Chieftain II       Roberts Seed       A       L         Coyote       Scotts       C       H         Crew-Cut II       SR Oregon       A       L         Crossfire II       Pickseed West       B       L         Dominion       Scotts       A       L         Dominion       Scotts       A	Creeping Red			
SR 3200 Blue         SR Oregon         A         S           Treazure Chewings         Scotts         A         S           Victory 2         Pickseed West         B         S           Weston Creeping Red         Jonathan Green         B+         S           Wrigley Chewings         DLF-Jenks         B         H           Tall Fescue           Admiral         Burlingham         A         L           Arid 3         Jacklin         B         L           Barlexas II         Barenbrug USA         B         S           Biltmore         LESCO         A         S           Bingo         Cebeco         B         L           Black Magic         Jonathan Green         C         S           Bravo         LESCO         A         S           Chieftain II         Roberts Seed         A         L           Coyote         Scotts         C         H           Crew-Cut II         SR Oregon         A         L           Crossfire II         Pickseed West         B         L           Dominion         Scotts         A         L           Dominion         Scotts <td< td=""><td></td><td>Roberts Seed</td><td>Α</td><td>S</td></td<>		Roberts Seed	Α	S
Treazure Chewings         Scotts         A         S           Victory 2         Pickseed West         B         S           Weston Creeping Red         Jonathan Green         B+         S           Wrigley Chewings         DLF-Jenks         B         H           Tall Fescue           Admiral         Burlingham         A         L           Arid 3         Jacklin         B         L           Barlexas II         Barenbrug USA         B         S           Biltmore         LESCO         A         S           Bingo         Cebeco         B         L           Black Magic         Jonathan Green         C         S           Bravo         LESCO         A         S           Chieftain II         Roberts Seed         A         L           Coyote         Scotts         C         H           Crew-Cut II         SR Oregon         A         L           Crossfire II         Pickseed West         B         L           Daytona         Burlingham         A         L           Dominion         Scotts         A         L           Dynasty         Pickseed West         <		USA CENTRAL CARROLL		2000
Victory 2         Pickseed West         B         S           Weston Creeping Red         Jonathan Green         B+         S           Wrigley Chewings         DLF-Jenks         B         H           Tall Fescue           Admiral         Burlingham         A         L           Arid 3         Jacklin         B         L           Barlexas II         Barenbrug USA         B         S           Biltmore         LESCO         A         S           Bingo         Cebeco         B         L           Black Magic         Jonathan Green         C         S           Bravo         LESCO         A         S           Chieftain II         Roberts Seed         A         L           Coyote         Scotts         C         H           Crew-Cut II         SR Oregon         A         L           Crossfire II         Pickseed West         B         L           Daytona         Burlingham         A         L           Defiance         SR Oregon         A         S           Dominion         Scotts         A         L           Dynasty         Pickseed West         B </td <td>Treazure Chewings</td> <td></td> <td></td> <td></td>	Treazure Chewings			
Weston Creeping Red         Jonathan Green         B+         S           Wrigley Chewings         DLF-Jenks         B         H           Tall Fescue           Admiral         Burlingham         A         L           Arid 3         Jacklin         B         L           Barlexas II         Barenbrug USA         B         S           Biltmore         LESCO         A         S           Bingo         Cebeco         B         L           Black Magic         Jonathan Green         C         S           Bravo         LESCO         A         S           Chieftain II         Roberts Seed         A         L           Coyote         Scotts         C         H           Crew-Cut II         SR Oregon         A         L           Crossfire II         Pickseed West         B         L           Daytona         Burlingham         A         L           Defiance         SR Oregon         A         S           Dominion         Scotts         A         L           Dynasty         Pickseed West         B         L           Empress         Roberts Seed         A		Pickseed West	В	S
Tall Fescue           Admiral         Burlingham         A         L           Arid 3         Jacklin         B         L           Barlexas II         Barenbrug USA         B         S           Biltmore         LESCO         A         S           Bingo         Cebeco         B         L           Black Magic         Jonathan Green         C         S           Bravo         LESCO         A         S           Chieftain II         Roberts Seed         A         L           Coyote         Scotts         C         H           Crew-Cut II         SR Oregon         A         L           Crossfire II         Pickseed West         B         L           Daytona         Burlingham         A         L           Defiance         SR Oregon         A         S           Dominion         Scotts         A         L           Dynasty         Pickseed West         B         L           Empress         Roberts Seed         A         L           Focus         Turf Merchants         C         S           Gazelle         Roberts Seed         A         L		Jonathan Green	B+	S
Tall Fescue           Admiral         Burlingham         A         L           Arid 3         Jacklin         B         L           Barlexas II         Barenbrug USA         B         S           Biltmore         LESCO         A         S           Bingo         Cebeco         B         L           Black Magic         Jonathan Green         C         S           Bravo         LESCO         A         S           Chieftain II         Roberts Seed         A         L           Coyote         Scotts         C         H           Crew-Cut II         SR Oregon         A         L           Crossfire II         Pickseed West         B         L           Daytona         Burlingham         A         L           Defiance         SR Oregon         A         S           Dominion         Scotts         A         L           Dynasty         Pickseed West         B         L           Empress         Roberts Seed         A         L           Focus         Turf Merchants         C         S           Gazelle         Roberts Seed         A         L	Wrigley Chewings	DLF-Jenks	В	Н
Admiral         Burlingham         A         L           Arid 3         Jacklin         B         L           Barlexas II         Barenbrug USA         B         S           Biltmore         LESCO         A         S           Bingo         Cebeco         B         L           Black Magic         Jonathan Green         C         S           Bravo         LESCO         A         S           Chieftain II         Roberts Seed         A         L           Coyote         Scotts         C         H           Crew-Cut II         SR Oregon         A         L           Crossfire II         Pickseed West         B         L           Daytona         Burlingham         A         L           Defiance         SR Oregon         A         S           Dominion         Scotts         A         L           Dynasty         Pickseed West         B         L           Empress         Roberts Seed         A         L           Focus         Turf Merchants         C         S           Gazelle         Roberts Seed         A         L           Grande         SR Ore				
Arid 3         Jacklin         B         L           Barlexas II         Barenbrug USA         B         S           Biltmore         LESCO         A         S           Bingo         Cebeco         B         L           Black Magic         Jonathan Green         C         S           Bravo         LESCO         A         S           Chieftain II         Roberts Seed         A         L           Coyote         Scotts         C         H           Crew-Cut II         SR Oregon         A         L           Crossfire II         Pickseed West         B         L           Daytona         Burlingham         A         L           Defiance         SR Oregon         A         S           Dominion         Scotts         A         L           Dynasty         Pickseed West         B         L           Empress         Roberts Seed         A         L           Focus         Turf Merchants         C         S           Gazelle         Roberts Seed         A         L           Grande         SR Oregon         A         L           Houndog         Cebeco<				
Barlexas II         Barenbrug USA         B         S           Biltmore         LESCO         A         S           Bingo         Cebeco         B         L           Black Magic         Jonathan Green         C         S           Bravo         LESCO         A         S           Chieftain II         Roberts Seed         A         L           Coyote         Scotts         C         H           Crew-Cut II         SR Oregon         A         L           Crossfire II         Pickseed West         B         L           Daytona         Burlingham         A         L           Defiance         SR Oregon         A         S           Dominion         Scotts         A         L           Dynasty         Pickseed West         B         L           Empress         Roberts Seed         A         L           Focus         Turf Merchants         C         S           Gazelle         Roberts Seed         A         L           Grande         SR Oregon         A         L           Houndog         Cebeco         B         L           Jaguar 3         Jackli	The second secon		A	L
Biltmore         LESCO         A         S           Bingo         Cebeco         B         L           Black Magic         Jonathan Green         C         S           Bravo         LESCO         A         S           Chieftain II         Roberts Seed         A         L           Coyote         Scotts         C         H           Crew-Cut II         SR Oregon         A         L           Crossfire II         Pickseed West         B         L           Daytona         Burlingham         A         L           Defiance         SR Oregon         A         S           Dominion         Scotts         A         L           Dynasty         Pickseed West         B         L           Empress         Roberts Seed         A         L           Focus         Turf Merchants         C         S           Gazelle         Roberts Seed         A         L           Grande         SR Oregon         A         L           Houndog         Cebeco         B         L           Jaguar 3         Jacklin         B         L           Laramie         Lebanon Seaboard				
Bingo         Cebeco         B         L           Black Magic         Jonathan Green         C         S           Bravo         LESCO         A         S           Chieftain II         Roberts Seed         A         L           Coyote         Scotts         C         H           Crew-Cut II         SR Oregon         A         L           Crossfire II         Pickseed West         B         L           Daytona         Burlingham         A         L           Defiance         SR Oregon         A         S           Dominion         Scotts         A         L           Dynasty         Pickseed West         B         L           Empress         Roberts Seed         A         L           Focus         Turf Merchants         C         S           Gazelle         Roberts Seed         A         L           Grande         SR Oregon         A         L           Houndog         Cebeco         B         L           Jaguar 3         Jacklin         B         L           Laramie         Lebanon Seaboard         B         S	ALIGNA CONTRACTOR OF THE PROPERTY OF THE PROPE		- Alexander	
Black Magic         Jonathan Green         C         S           Bravo         LESCO         A         S           Chieftain II         Roberts Seed         A         L           Coyote         Scotts         C         H           Crew-Cut II         SR Oregon         A         L           Crossfire II         Pickseed West         B         L           Daytona         Burlingham         A         L           Defiance         SR Oregon         A         S           Dominion         Scotts         A         L           Dynasty         Pickseed West         B         L           Empress         Roberts Seed         A         L           Focus         Turf Merchants         C         S           Gazelle         Roberts Seed         A         L           Grande         SR Oregon         A         L           Houndog         Cebeco         B         L           Jaguar 3         Jacklin         B         L           Laramie         Lebanon Seaboard         B         S				
Bravo         LESCO         A         S           Chieftain II         Roberts Seed         A         L           Coyote         Scotts         C         H           Crew-Cut II         SR Oregon         A         L           Crossfire II         Pickseed West         B         L           Daytona         Burlingham         A         L           Defiance         SR Oregon         A         S           Dominion         Scotts         A         L           Dynasty         Pickseed West         B         L           Empress         Roberts Seed         A         L           Focus         Turf Merchants         C         S           Gazelle         Roberts Seed         A         L           Grande         SR Oregon         A         L           Houndog         Cebeco         B         L           Jaguar 3         Jacklin         B         L           Laramie         Lebanon Seaboard         B         S	The state of the s			
Chieftain II         Roberts Seed         A         L           Coyote         Scotts         C         H           Crew-Cut II         SR Oregon         A         L           Crossfire II         Pickseed West         B         L           Daytona         Burlingham         A         L           Defiance         SR Oregon         A         S           Dominion         Scotts         A         L           Dynasty         Pickseed West         B         L           Empress         Roberts Seed         A         L           Focus         Turf Merchants         C         S           Gazelle         Roberts Seed         A         L           Grande         SR Oregon         A         L           Houndog         Cebeco         B         L           Jaguar 3         Jacklin         B         L           Laramie         LeSCO         A         S           Masterpiece         Lebanon Seaboard         B         S			THE RESERVE AND DESCRIPTION OF THE PERSON NAMED IN COLUMN TWO	
Coyote         Scotts         C         H           Crew-Cut II         SR Oregon         A         L           Crossfire II         Pickseed West         B         L           Daytona         Burlingham         A         L           Defiance         SR Oregon         A         S           Dominion         Scotts         A         L           Dynasty         Pickseed West         B         L           Empress         Roberts Seed         A         L           Focus         Turf Merchants         C         S           Gazelle         Roberts Seed         A         L           Grande         SR Oregon         A         L           Houndog         Cebeco         B         L           Jaguar 3         Jacklin         B         L           Laramie         LeSCO         A         S           Masterpiece         Lebanon Seaboard         B         S		A TOTAL CONTRACTOR OF THE PARTY		
Crew-Cut II         SR Oregon         A         L           Crossfire II         Pickseed West         B         L           Daytona         Burlingham         A         L           Defiance         SR Oregon         A         S           Dominion         Scotts         A         L           Dynasty         Pickseed West         B         L           Empress         Roberts Seed         A         L           Focus         Turf Merchants         C         S           Gazelle         Roberts Seed         A         L           Grande         SR Oregon         A         L           Houndog         Cebeco         B         L           Jaguar 3         Jacklin         B         L           Laramie         LESCO         A         S           Masterpiece         Lebanon Seaboard         B         S				
Crossfire II         Pickseed West         B         L           Daytona         Burlingham         A         L           Defiance         SR Oregon         A         S           Dominion         Scotts         A         L           Dynasty         Pickseed West         B         L           Empress         Roberts Seed         A         L           Focus         Turf Merchants         C         S           Gazelle         Roberts Seed         A         L           Grande         SR Oregon         A         L           Houndog         Cebeco         B         L           Jaguar 3         Jacklin         B         L           Laramie         LESCO         A         S           Masterpiece         Lebanon Seaboard         B         S				90%
Daytona         Burlingham         A         L           Defiance         SR Oregon         A         S           Dominion         Scotts         A         L           Dynasty         Pickseed West         B         L           Empress         Roberts Seed         A         L           Focus         Turf Merchants         C         S           Gazelle         Roberts Seed         A         L           Grande         SR Oregon         A         L           Houndog         Cebeco         B         L           Jaguar 3         Jacklin         B         L           Laramie         LESCO         A         S           Masterpiece         Lebanon Seaboard         B         S				
Defiance         SR Oregon         A         S           Dominion         Scotts         A         L           Dynasty         Pickseed West         B         L           Empress         Roberts Seed         A         L           Focus         Turf Merchants         C         S           Gazelle         Roberts Seed         A         L           Grande         SR Oregon         A         L           Houndog         Cebeco         B         L           Jaguar 3         Jacklin         B         L           Laramie         LESCO         A         S           Masterpiece         Lebanon Seaboard         B         S	<u>alesanian</u>			-
Dominion         Scotts         A         L           Dynasty         Pickseed West         B         L           Empress         Roberts Seed         A         L           Focus         Turf Merchants         C         S           Gazelle         Roberts Seed         A         L           Grande         SR Oregon         A         L           Houndog         Cebeco         B         L           Jaguar 3         Jacklin         B         L           Laramie         LESCO         A         S           Masterpiece         Lebanon Seaboard         B         S				
Dynasty         Pickseed West         B         L           Empress         Roberts Seed         A         L           Focus         Turf Merchants         C         S           Gazelle         Roberts Seed         A         L           Grande         SR Oregon         A         L           Houndog         Cebeco         B         L           Jaguar 3         Jacklin         B         L           Laramie         LESCO         A         S           Masterpiece         Lebanon Seaboard         B         S				
Empress         Roberts Seed         A         L           Focus         Turf Merchants         C         S           Gazelle         Roberts Seed         A         L           Grande         SR Oregon         A         L           Houndog         Cebeco         B         L           Jaguar 3         Jacklin         B         L           Laramie         LESCO         A         S           Masterpiece         Lebanon Seaboard         B         S				
Focus         Turf Merchants         C         S           Gazelle         Roberts Seed         A         L           Grande         SR Oregon         A         L           Houndog         Cebeco         B         L           Jaguar 3         Jacklin         B         L           Laramie         LESCO         A         S           Masterpiece         Lebanon Seaboard         B         S				
Gazelle         Roberts Seed         A         L           Grande         SR Oregon         A         L           Houndog         Cebeco         B         L           Jaguar 3         Jacklin         B         L           Laramie         LESCO         A         S           Masterpiece         Lebanon Seaboard         B         S		a distribution of the contract		-
Grande         SR Oregon         A         L           Houndog         Cebeco         B         L           Jaguar 3         Jacklin         B         L           Laramie         LESCO         A         S           Masterpiece         Lebanon Seaboard         B         S				
Houndog         Cebeco         B         L           Jaguar 3         Jacklin         B         L           Laramie         LESCO         A         S           Masterpiece         Lebanon Seaboard         B         S	- Continue of			
Jaguar 3         Jacklin         B         L           Laramie         LESCO         A         S           Masterpiece         Lebanon Seaboard         B         S				177
Laramie     LESCO     A     S       Masterpiece     Lebanon Seaboard     B     S				
Masterpiece Lebanon Seaboard B S				
		I Describeration		
Millennium Turf Merchants A L	Annual Control of the			
	Millennium	Turt Merchants	Α	L

CULTIVAR	MARKETER	AVAILABILITY	PRICE
	Pickseed West	В	L
Mustang 3 Obsidian	Jonathan Green	C	S
Onyx	Jonathan Green	С	S
Picasso	Lebanon Seaboard	В	S
Pixie	Jacklin	В	L
Plantation	Pennington	Α	L
Rebel Exeda	Pennington	Α	L
Rembrandt	Lebanon Seaboard	В	S
Reserve	DLF-Jenks	В	L
2nd Millennium	Turf Merchants	С	new
Signia	Pennington	Α	L
Southern Comfort	DLF-Jenks	В	L
Tempest	Burlingham	A	L
Tomcat	Cebeco	C-	S
Tracer	Barenbrug USA	В	S
Vegas	Barenbrug USA	В	S
Wildfire	DLF-Jenks Scotts	B	H
Wyatt	Scotts	C	П
Perennial Ryegrass			
Accent	Jacklin	В	S
Affirmed	Lebanon Seaboard	В	Н
Allsport	LESCO	B+	S
AllStar2	Cebeco	C-	Н
Applaud	Pennington	С	S
Barlennium	Barenbrug USA	В	S
Caddyshack	Jacklin	В	S
Calypso II	Roberts Seed	Α	Н
Champion GC	SR Oregon	Α	S
Churchill	Lebanon Seaboard	В	Н
Cutter	Pickseed West	С	Н
Dogstar	Jonathan Green	A	S
Elfkin	DLF-Jenks	В	Н
Esquire	DLF-Jenks	В	H
Exacta	Lebanon Seaboard	В	Н
Fiesta 3	Pickseed West Scotts	C	H
Gallery Gator 3	Cebeco	C	Н
Hawkeye	SR Oregon	В	new
Icon	Burlingham	A	H
Inspire	Scotts	C	Н
Integra	Pennington	C	Н
Jet	Pennington	A	S
Jockey	Jonathan Green	Α	S
Keystone	DLF-Jenks	С	Н
Line Drive	LESCO	B+	S
Mach I	Roberts Seed	С	Н
Majesty	Scotts	В	Н
Manhattan 3	Turf Merchants	Α	S
Pacesetter	LESCO	B+	S
Palmer III	Proseed	Α	Н
Paragon	Turf Merchants	С	S
Pennant II	Proseed	Α	Н
Pinnacle II	Barenbrug USA	В	S
Pizzazz	Turf Merchants	Α	Н
Plymouth	Jonathan Green	Α	S
Prelude III	Proseed	A	Н
Premiere II	Barenbrug USA	В	S
Racer II	Roberts Seed	A	Н
Seville II	Pickseed West	С	Н
SR 4220	SR Oregon	С	new
Stallion Supreme	ULTRA Turf	В	Н
TopGun	Jacklin	В	S
Top Hat	Cebeco	В	H
Vixen	Burlingham	Α	Н

## **Real-Life Solutions**

MANAGING NATIVE AREAS

## The Natural Look

Colbert Hills features an array of prairie grasses and wildflowers, but managing the native areas is like a judo match with Mother Nature

#### BY CURT HARLER

t's the constant interplay between weed and wildflower that makes Colbert Hills GC a key part of the distinctive prairie environment in and around Manhattan, Kan.

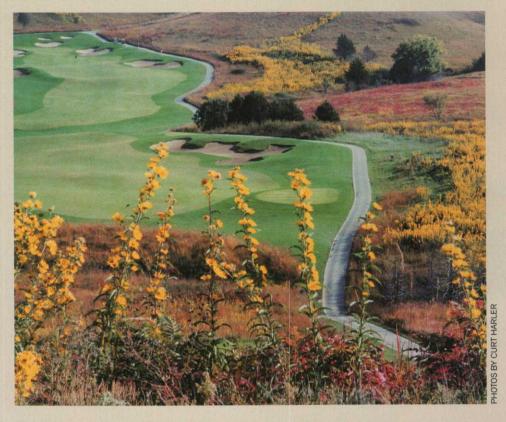
Colbert Hills, a track owned by Kansas State University's Golf Course Management and Research Foundation, was designed in part and named after KSU alumnus and current Senior PGA Tour pro Jim Colbert. The course, which opened in 2000, is a living

### **Problem**

Can a golf course commit to extensive use of native grasses without inviting a full-scale weed invasion?

#### Solution

A combination of controlled burning and selective herbicide use can keep weeds to a minimum.



laboratory for KSU researchers. That's because more than 800 acres of the course are maintained in native prairie grasses and wildflowers.

At first glance, the course, while one of the more stunning looking in the Heartland, is typical: L93 bentgrass comprises the greens, fairways are Meyer zoysia, and the perimeter rough is a combination of Kentucky Bluegrass varieties.

However, most holes feel isolated from each other, thanks to the sharply rolling topography and wide expanses of native grasses surrounding them, which iso-

lates one fairway from the next. Players can easily believe they are the only ones on the course.

"The original idea was to minimize the environmental impact and soil erosion at the site," says certified superintendent David Gourlay, Colbert Hills' director of golf operations and general manager. "It cost us a little more money in the beginning, but it made a big difference environmentally."

The course is not without its challenges, however, that are directly related to the native grasses and indigenous plants. More than 800 acres of Colbert Hills GC are maintained in native prairie grasses and wildflowers.

#### The problem

When the decision was made to go natural with native and indigenous plants, species like Johnsongrass, nutsedge and a host of woody invaders didn't get the message they would not be welcome at Colbert Hills.

Managing native grasses is like a judo match with Mother Nature. One parlays Her strengths and moves to meet the needs of a premier golf course while trying not to get

tossed for a loss by an unexpected twist of fate.

The natural areas begin just 10 yards beyond the rough. While the near-in areas are mainly turf-type tall fescue for perhaps 10 yards, there's a full array of native species beyond that.

"We had Kansas State come up with a blend of native grasses: fescues, little and big bluestem, Maximilian sunflowers, other sunflower species and native plants," Gourlay says. A seed supplier provided for the blending, but species not in the original mix are thriving, too, Gourlay adds.

The native grasses received a boost of fertilizer when they were planted, since they can take up to two years to mature. However, Gourlay says the native grasses don't need a lot of supplemental assistance. "We found if we overfertilize native areas, the grasses tend to become too dense and over the

winter lay down from snow and are smothered," Gourlay says.

After more than two years, the native grasses are mature and prospering. But around tee boxes, native species gulp the irrigation water that drifts to the wild areas. This doesn't help Gourlay's management program because the native grasses are getting denser all the time. Hence, golfers are losing more balls.

In a way, Gourlay works against himself. He wants to increase native areas in nonplaying locations, but not lost golf balls. Native species are allowed to creep in closer in areas not in play.

A good example is the "Little Amen Turn" at Nos. 10, 11 and 12. No. 12 is a 434 yarder and trends a bit uphill. Nobody hits a ball 350 yards from the tee. So in that area, Gourlay is allowing native grasses to move in behind the fairway bunkers. "It re-

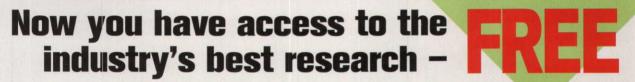
duces maintenance costs, irrigation costs and gives a better backdrop for the tee shot," he feels. "The wildlife sure likes it."

But while turf-type fescue does its job along the margins, Gourlay stresses that it's not impervious to invaders. Johnsongrass, nutsedge, and other grassy species are constantly on the move. So something has to be done.

#### The solution

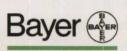
The best way to assure continuity of native grasses is to burn the prairie, and that's what they do at Colbert Hills. The City of Manhattan Fire Department does a controlled burn of the course in late March or early April. The burn serves as a learning lab for firefighters and helps control the sumac and evergreen woody plants.

Continued on page 58



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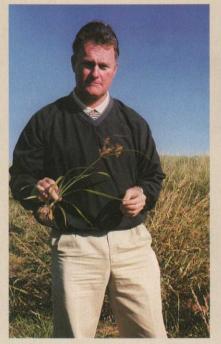
Continued from page 57

The fire department burns 450 acres in three to four days. Yet even fire does not seem to slow down some species. Red sumac, for example, is aggressive. "It's a good soil stabilizer, especially in shallow soils, but it's tough to eradicate," Gourlay says.

The burning strategy is to hit the more visible areas hard and eliminate invading perennials and annuals.

Noting that Colbert Hills is a laboratory, Gourlay says he will experiment with both mechanical and chemical control of noxious and woody invaders. Some areas will be mowed, and some areas may be treated with pre-emergent and postemergent herbicides.

"Our biggest concern is to make [the course] more uniform and not too weedy-looking," Gourlay says.



David Gourlay says he wants to make the course more uniform but not too weedy-looking.

#### Outlook

In addition to staying on top of the many native species of native vegetation and plants, the program run by KSU at Colbert Hills monitors water and soil quality, aquatic ecosystems, wildlife and insects. The course has plenty of room for coyote, deer, birds, snakes and other indigenous species.

It's the natural areas that give Colbert Hills the unmistakable look and feel of playing on the great prairies of the Midwest. Colbert Hills is one of a handful of Audubon's Silver Signature courses in the world, boasting everything from lark sparrows and Eastern meadowlarks to hawks.

Like a partner in any good marriage, Gourlay knows Colbert Hills and Mother Nature are in a long-term, give-and-take relationship.

Harler is a free-lance writer from Cleveland.



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