

The Bulb Garden



~Gardening with Bulbs ~

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What's Inside...

- > In this issue, Mike Mace continues his examination of the World's Summer-Dry Climates. We hope you enjoy his amazing maps!

Mapping the World's Summer-Dry Climates, Part II

Mike Mace

This is a most unusual issue. In the Winter 2013 issue Mike Mace began his analysis of the world's summer-dry climates, where so many of our favorite bulbs come from. In this issue he continues that analysis, sharing detailed maps showing the complex patterns that result from the consideration of winter cold. Because we wanted the maps to be readable and provide the greatest amount of useful information for bulb growers, we have given over the entire issue to them.

Mike is one of the volunteer admin-

relative term. There's huge variation in temperature and rainfall among the world's summer-dry climates. That makes it hard to know exactly how you should grow a particular bulb.

Part I of this article described an effort to map the world's summer-dry climates according to winter cold and the severity of the summer drought. The result was twenty-eight summer-dry climate zones, shown in *Figure 1*.

When you apply the zones to maps, you start to see some interesting patterns. Let me talk about each of the summer-dry areas separately, and then

		Summer Rainfall							
		G. Wetter (two months <2in/5.1cm precip, driest month <1/4 wettest month)	F. Wet (two months <.9in/2.3cm precip)	E. Moist (three months <.9in/2.3cm precip)	D. Damp (three months <.5in/1.25cm precip)	C. Dry (three months <.25in/.6cm precip)	B. Moderate desert (6-10 inches/15-25cm total rain per year, almost all in winter)	A. Extreme desert (2-6 inches/5-15 cm total rain per year, almost all in winter)	
Coldest Winter Month	4. Temperate (lows average 45-60F / 7-15C)	G4 Esperance, Au. Messina, Italy	F4 Adelaide Valencia, Spain Hout Bay, SA	E4 Perth Lisbon Cape Town	D4 Tunis Geraldton, Au. Hopefield, SA	C4 Los Angeles Casablanca Valparaiso, Chile Clanwilliam, SA	B4 Alexandria Salidanha, SA Lazaro Cardenas, MX Illapel, Chile	A4 Guerrero Negro, MX La Serena, Chile Port Nolloth, SA	
	3. Cool (lows average 40-45F / 4-7C)	G3 Naples Perpignan, France Mt. Gambier, Au. Temuco, Chile	F3 Athens Stil Bay, SA Point Reyes, Ca.	E3 Algiers Southern Cross, Au. Stellenbosch, SA Eureka, Ca.	D3 Mendocino, Ca. Constitution, Chile Caledon, SA Izmir, Turkey	C3 Santiago Jerusalem San Luis Obispo, Ca.	B3 Riverside, Ca. Worcester, SA Salamanca, Chile Misratah, Libya	A3 Havasay City, Ariz. Ovalle, Chile Vanrhynsdorp, SA	
	2. Cold (lows average 30-40F / -1-4C)	G2 Colipulli, Chile Rome Seattle	F2 Madrid Eugene, Oregon	E2 Istanbul Grants Pass, Oregon Tatca, Chile	D2 Ceres, SA Red Bluff, Ca. Manisa, Turkey	C2 Sacramento, Ca. Amman Rancagua, Chile	B2 Rancagua, Chile Nieuwerdrift, SA Palmdale, Ca. Tel Aviv	A2 Bakersfield, Ca. Semnan, Iran Springbok, SA	
	1. Frigid (lows average <30F / -1C)	G1 Sandpoint, Idaho	F1 Pullman, Wash.	E1 Yosemite, Ca. Ankara, Turkey	D1 Bend, Oregon Tabriz, Iran	C1 King's Canyon, Ca. Kabul, Afghanistan	B1 Reno, Nevada Ashgabat, Turkmenistan	A1 Victorville, Ca. Isfahan, Iran	

Figure 1, Summer Rainfall, by Mike Mace. See our previous issue for a larger version.

istrators of the PBS wiki. He lives in San Jose, California, where he gardens on a half-acre hillside of heavy, rocky clay infested with gophers, two feral cats, and a couple of near-sighted Boston terriers.—Ed.

Most of the world's flower bulbs come from parts of the world that are dry in summer. Unfortunately, dry is a

I'll make some comparisons between them. (You can find higher-resolution versions of these maps at <http://www.pacificbulbsociety.org/pbswiki/index.php/Climate>.)

Summer-dry climates

In South Africa there are, broadly speaking, three summer-dry areas with
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Mapping the World's Summer-Dry Climates, Part II (cont'd)

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 different rainfall patterns. The southern tip of Africa, extending from Cape Town east along the coast, has relatively moist summers with a relatively short summer drought. Those are the green and blue areas you

see on the map (Figure 2).

The west coast, from just north of Cape Town up to Clanwilliam, has longer and dryer summers than the south. Those are the orange and yellow areas on the

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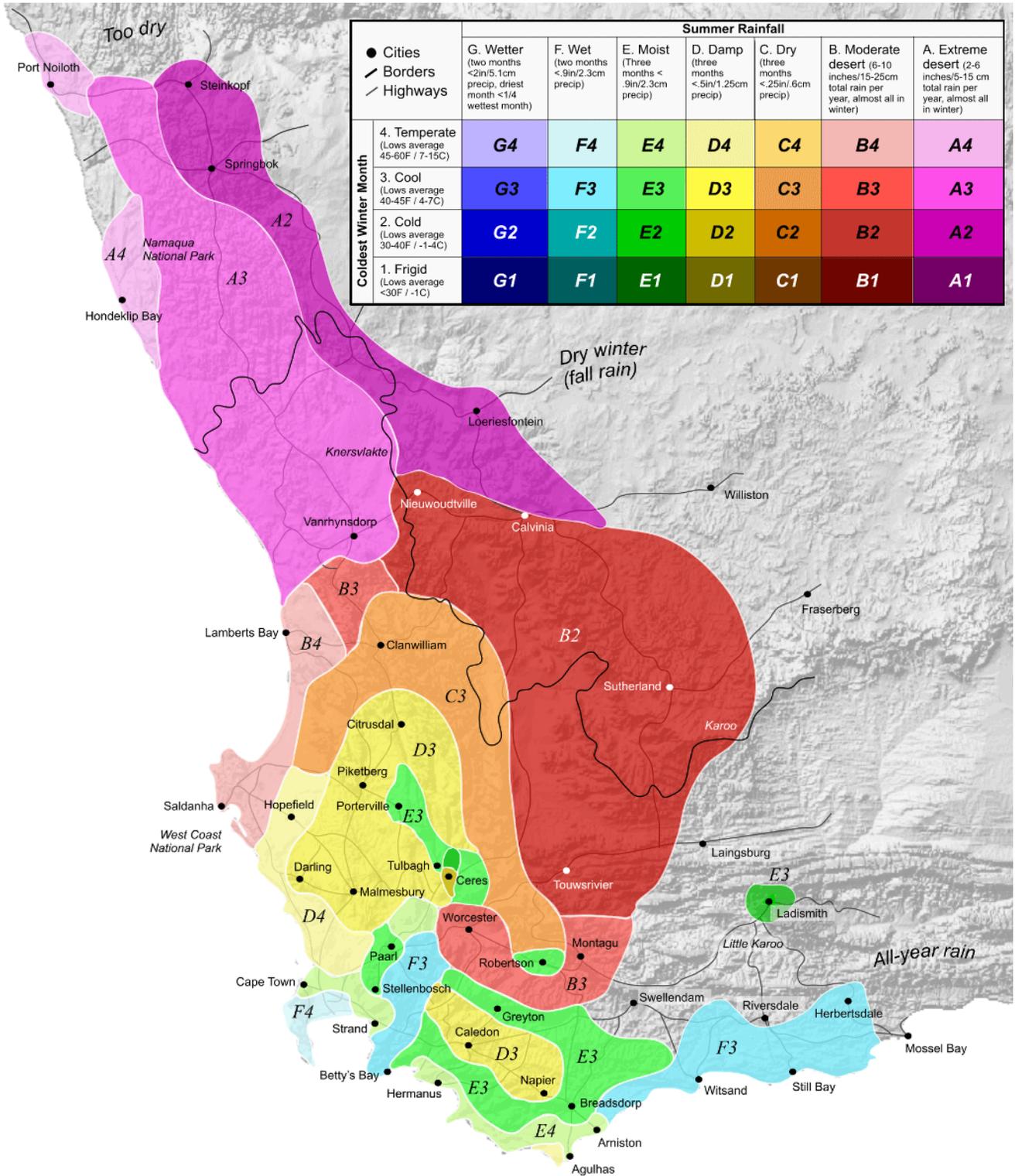


Figure 2, South Africa, by Mike Mace.

Mapping the World's Summer-Dry Climates, Part II (cont'd)

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 map. North and east of them, the red and purple areas, are summer-dry deserts. They're not usually included in maps of "mediterranean" South Africa, but they include important bulb centers like Nieuwoudtville.

In **Australia** the map of summer-dry areas is dominated by greens and blues, meaning they get a bit of summer rainfall in an average year (Figure 3). Along the coastlines

find any data to document them, so I left those areas blank.

In the **Mediterranean area** the combination of mountains and the sea makes for a very complicated picture (Figure 5). The northern Mediterranean coast is generally blues and greens, meaning it tends to get some summer rain. In fact, parts of the coast, such as the area around Barcelona, get so much summer rain that I don't

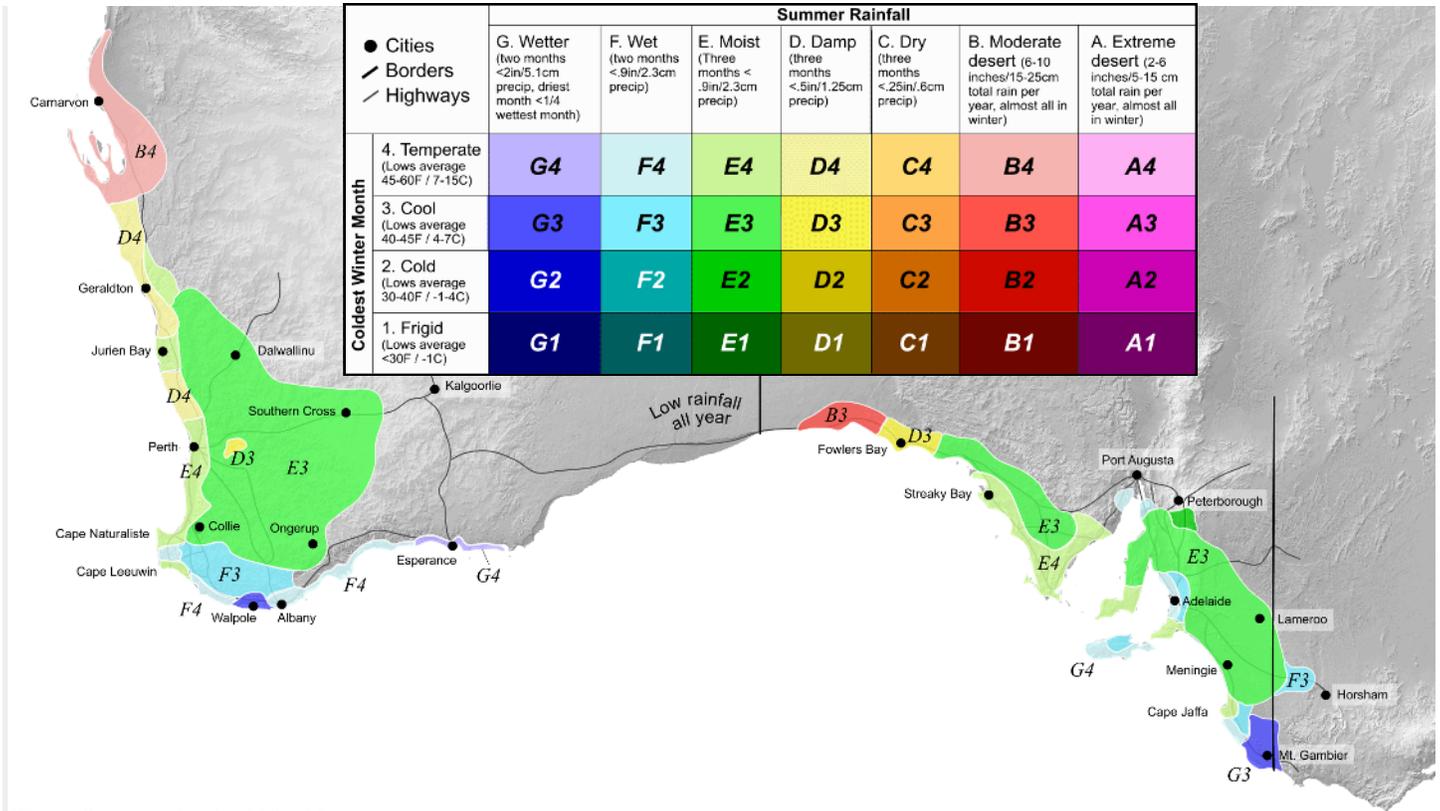


Figure 3, Australia, by Mike Mace.

are strips with very light color, meaning they almost never experience freezing temperatures. There are two summer-dry desert areas, near Carnarvon on the west coast and west of Fowler's Bay in the south. But most of the desert areas in Australia have almost no rain at all, or there's no seasonality to the rain that they get, so they're not included in this map.

The map of **Chile** looks a bit like a rainbow ironed flat (Figure 4). In general, the farther south you go, the shorter and milder the summer drought becomes. The Andes Mountains restrict the summer-dry climate to a relatively narrow strip along the coast, although there are a couple of summer-dry pockets to the east in the rain shadow of the Andes.

The weather data available online for Chile is sparser than for other countries, and there is almost no weather information for the Andes themselves. I think there are probably some strips of cold summer-dry climate in the mountains to the east of the zones I've drawn, but I can't

think you can call them summer-dry, even though they are officially classified as "mediterranean" climate.

The southern Mediterranean (North Africa) is yellow and orange along the coast, meaning it's dryer than the north. There are splotches of blue and green where the Atlas Mountains produce higher rainfall. Then to the south of the mountains, in their rain shadow, are deserts. As you move east along the coast of North Africa, Libya and Egypt have narrow strips of summer-dry desert along the edge of the water. The eastern edge of the Mediterranean Sea is mostly oranges and yellows, meaning it's close to desert conditions, and much dryer in summer than the northern Mediterranean.

Inland Turkey is filled with dark colors, meaning it gets very cold in winter, but is summer-dry. These areas are not classified as mediterranean climate, but they're an important homeland for many bulbs, some of which require cold storage in winter. If you want to know why
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Mapping the World's Summer-Dry Climates, Part II (cont'd)

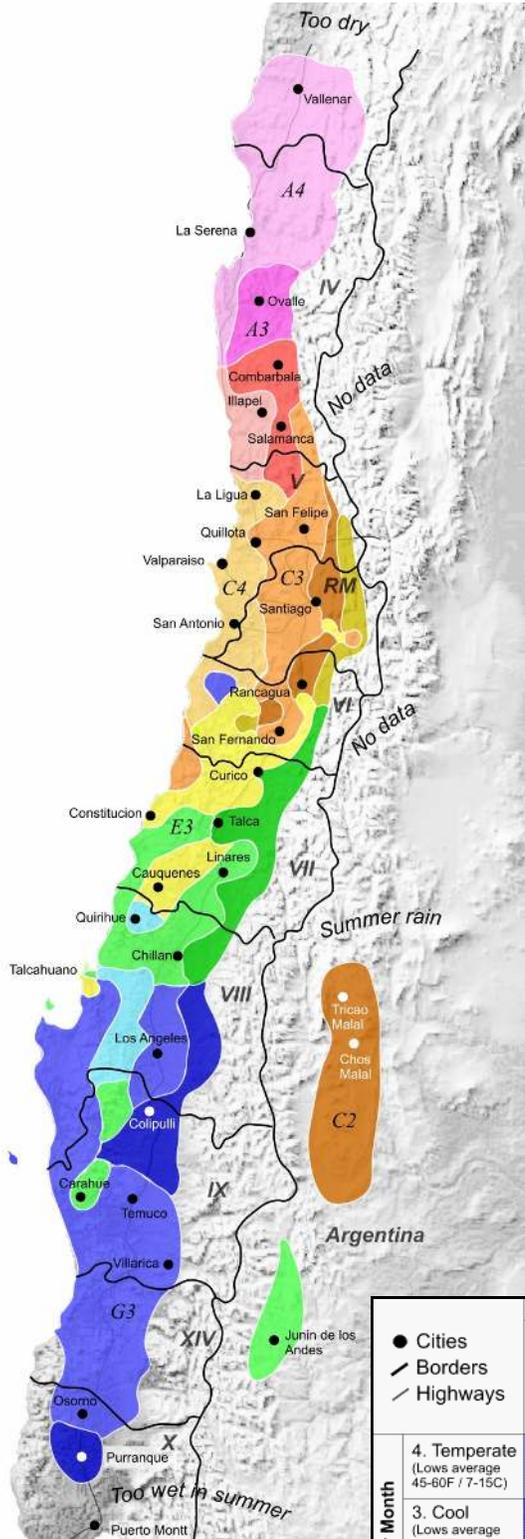


Figure 4, Chile, by Mike Mace.

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you have to store tulips in a refrigerator in order to get them to bloom, this is why.

In **California**, as in Europe, the combination of ocean and mountains makes the weather very complex (Figure 6). At the southern tip of the state of California, extending down into Baja California, is an area of summer-dry desert (purple zones on the map). In the Baja peninsula this desert, sandwiched between the Pacific Ocean and the Sea of Cortez, has mild winter lows (light purple). In southeastern California it's dark purple because the desert there is farther inland and gets a lot colder in winter. In northern Baja there is also a patchwork of other colors in the center of the peninsula where the mountains produce more rainfall.

Much of southern and central California is orange and yellow, indicating near-desert rainfall with relatively long dry summers. The colors are dark; California gets a fair amount of frost, especially away from the immediate coast. A band of dark green marks the Sierra Nevada mountains, which freeze under snow cover in the winter.

The **Middle East and South Asia** are not classified as mediterranean climate, but they have huge summer-dry areas and are important bulb territory (Figure 7). Much of Saudi Arabia and the area around the Persian Gulf is summer-dry desert with mild winter temperatures (light purple). South Asia, meanwhile, is dominated by dark browns and purples, indicating cold summer-dry deserts. The combination of mountains, seas, and lowlands makes the climate in this area very complicated, and there are relatively few weather stations. So the zones I drew here are approximate.

The **Pacific Northwest**, north of Red Bluff in California, all the way up to southern British Columbia, is a band of green and blue (Figure 8). You may be surprised to see these areas mapped at all, but they have a pronounced summer drought and a rainfall pattern similar to areas of France and Italy that are

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	G. Wetter (two months <2in/5.1cm precip, driest month <1/4 wettest month)	F. Wet (two months <.9in/2.3cm precip)	E. Moist (three months < .9in/2.3cm precip)	D. Damp (three months <.5in/1.25cm precip)	C. Dry (three months <.25in/.6cm precip)	B. Moderate desert (6-10 inches/15-25cm total rain per year, almost all in winter)	A. Extreme desert (2-6 inches/5-15 cm total rain per year, almost all in winter)	
Coldest Winter Month	4. Temperate (Lows average 45-60F / 7-15C)	G4	F4	E4	D4	C4	B4	A4
	3. Cool (Lows average 40-45F / 4-7C)	G3	F3	E3	D3	C3	B3	A3
	2. Cold (Lows average 30-40F / -1-4C)	G2	F2	E2	D2	C2	B2	A2
	1. Frigid (Lows average <30F / -1C)	G1	F1	E1	D1	C1	B1	A1

Mapping the World's Summer-Dry Climates, Part II (cont'd)

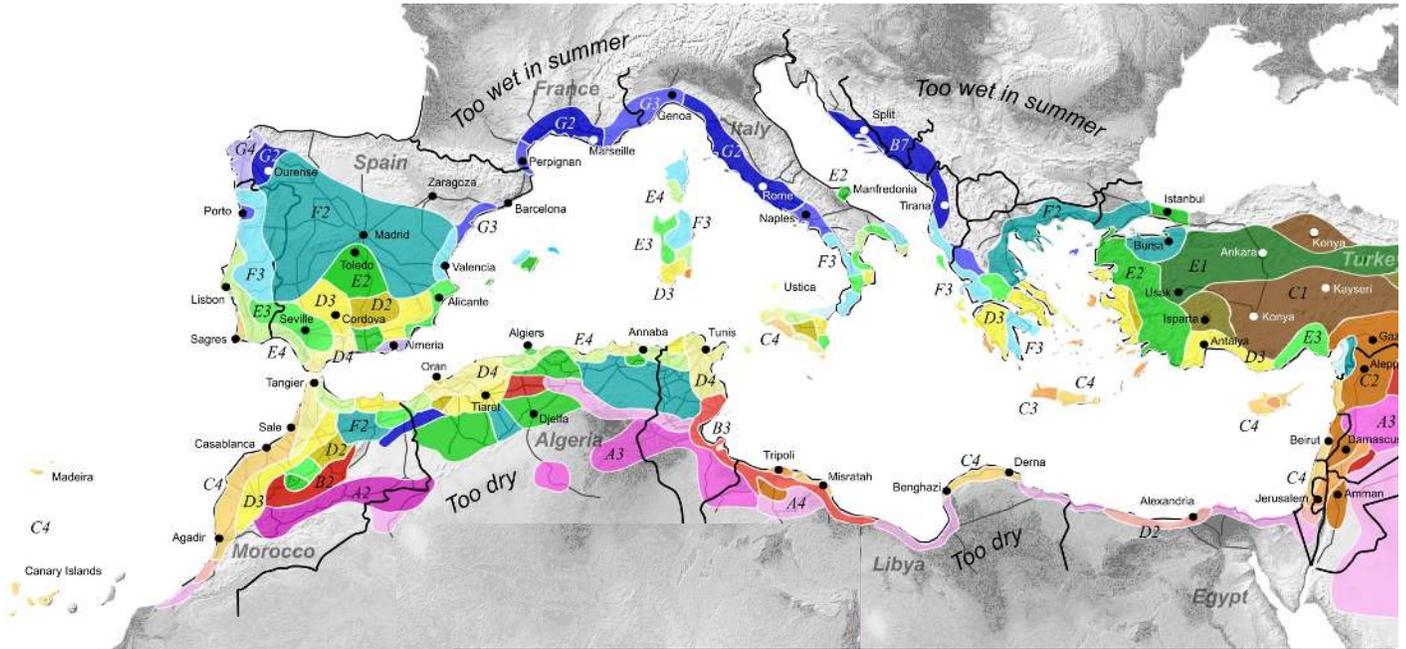


Figure 5, The Mediterranean, by Mike Mace.

(continued from previous page) considered mediterranean. They are also the home to substantial numbers of bulbs, so they belong in any map of summer-dry bulb climates. Winter temperatures in the Pacific Northwest can be cold, especially as you get away from the coast. To the east are very large summer-dry areas reaching into Idaho and Nevada, all of them cold in winter (dark colors), some of them officially deserts (dark red/brown). Bulbs from these areas generally need to be refrigerated in winter and do most of their growing in early spring when the snow would be melting in their native climates. But like other summer-dry bulbs, they go completely dormant in summer.

Comparing the summer-dry climates

A couple of important differences stand out to me. The first is **winter cold**. Much of summer-dry South Africa and Australia rarely see serious frost, whereas it's much more common in other summer-dry zones. That means people growing South African bulbs in areas that can freeze need to

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	3. Cool (Lows average 40-45F / 4-7C)	G3	F3	E3	D3	C3	B3	A3	
	2. Cold (Lows average 30-40F / -1-4C)	G2	F2	E2	D2	C2	B2	A2	
	1. Frigid (Lows average <30F / -1C)	G1	F1	E1	D1	C1	B1	A1	

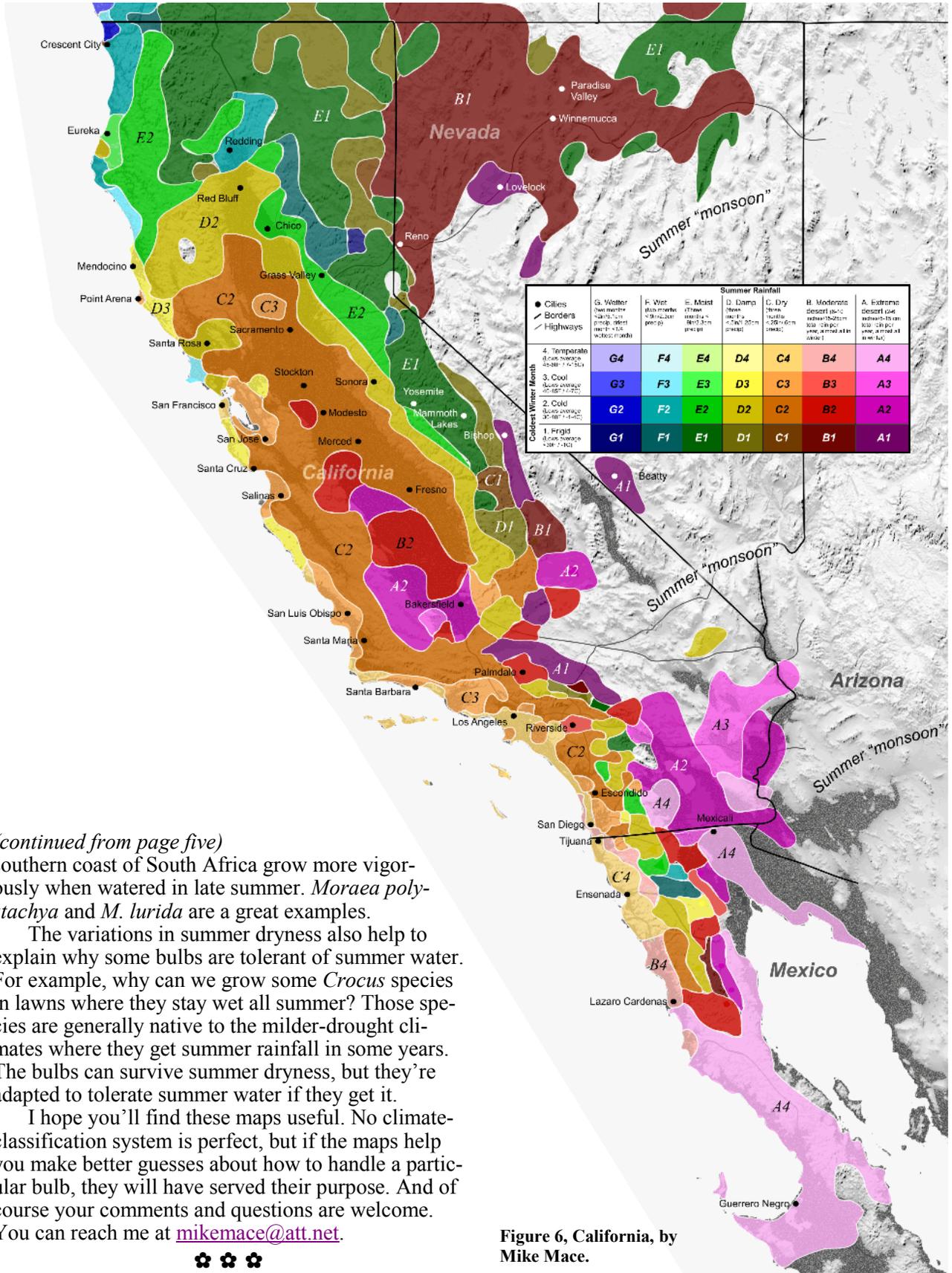
be careful about protecting their bulbs. For example, California occasionally experiences bitterly cold freezes in winter. There hasn't been a really serious freeze there in more than a decade, but in the 1990s there were heart-breaking stories of major bulb collections being wiped out by a sudden freeze. If you grow South African bulbs in one of the areas that can get cold snaps, you should have a contingency plan to protect your bulbs in a climate emergency. That can be as simple as having a tarp you can throw over them and a couple of strings of incandescent Christmas lights to provide a little bit of warmth under the cover.

The second systematic difference is **summer dryness**. Parts of Chile,

California, and North Africa get much deeper summer droughts than the northern Mediterranean and southern tip of South Africa. Bulbs from the dryer areas may need protection from excess rainfall when grown in other regions. Conversely, bulbs from the mild-summer areas may need extra water when grown in dryer regions. I live in San Jose, California, which has a fairly long summer drought. I've often wondered why some of my South African bulbs sprout on their own in September, as much as two months before the rain starts here. I am starting to think those bulbs are expecting a longer rainy season. I've definitely determined that some bulbs native to the

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Mapping the World's Summer-Dry Climates, Part II (cont'd)



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 southern coast of South Africa grow more vigorously when watered in late summer. *Moraea polystachya* and *M. lurida* are great examples.

The variations in summer dryness also help to explain why some bulbs are tolerant of summer water. For example, why can we grow some *Crocus* species in lawns where they stay wet all summer? Those species are generally native to the milder-drought climates where they get summer rainfall in some years. The bulbs can survive summer dryness, but they're adapted to tolerate summer water if they get it.

I hope you'll find these maps useful. No climate-classification system is perfect, but if the maps help you make better guesses about how to handle a particular bulb, they will have served their purpose. And of course your comments and questions are welcome. You can reach me at mikemace@att.net.



Figure 6, California, by Mike Mace.

Mapping the World's Summer-Dry Climates, Part II (cont'd)

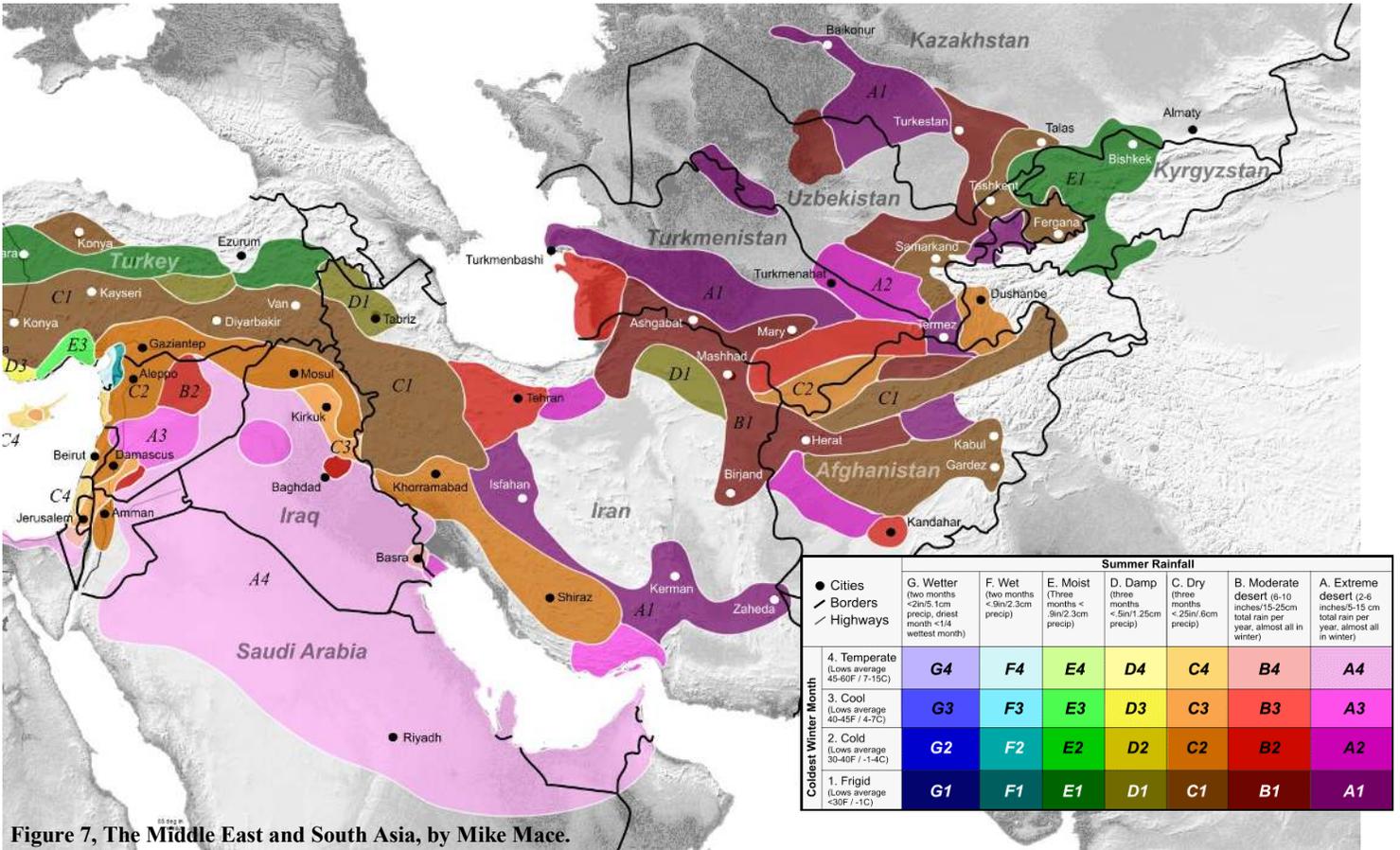
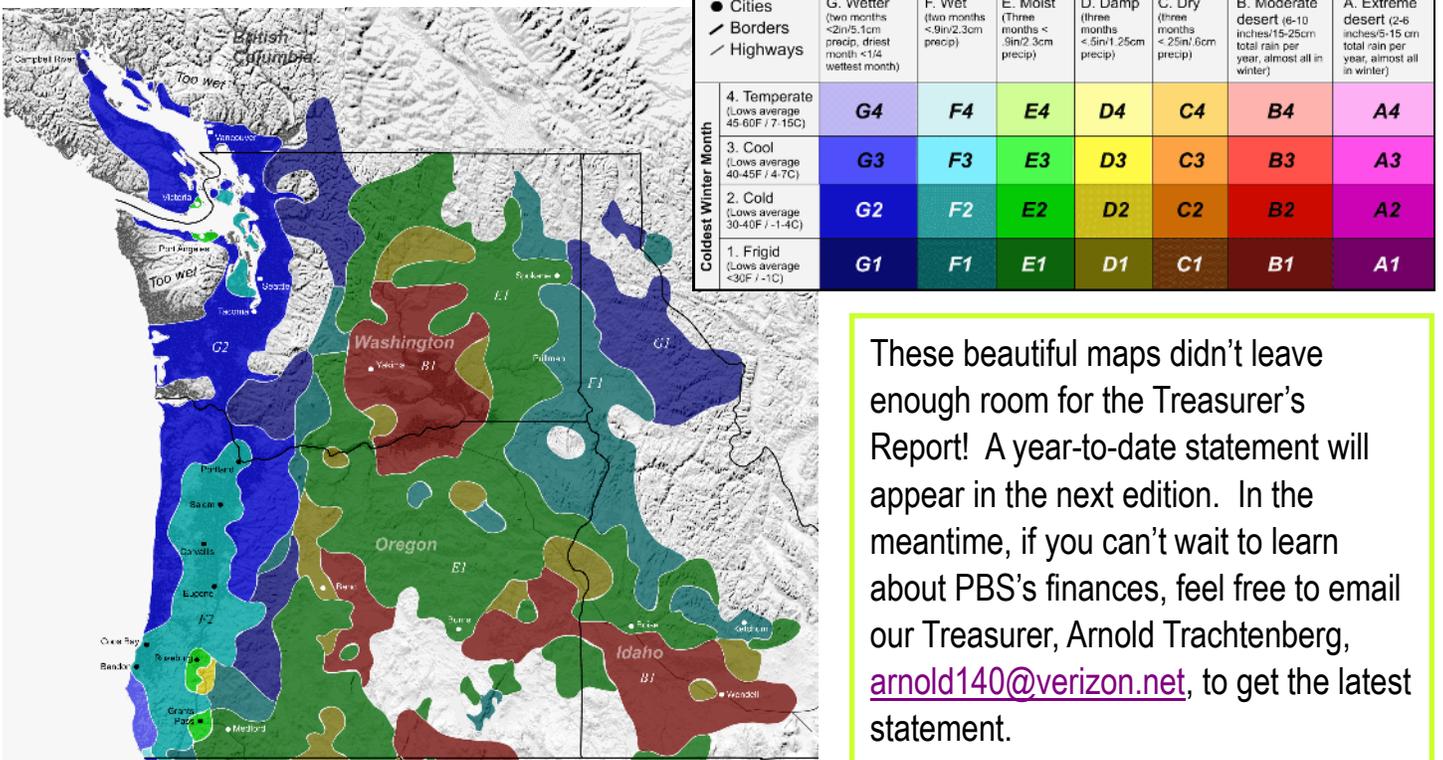


Figure 7, The Middle East and South Asia, by Mike Mace.

Below: Figure 8, The Pacific Northwest, by Mike Mace.



These beautiful maps didn't leave enough room for the Treasurer's Report! A year-to-date statement will appear in the next edition. In the meantime, if you can't wait to learn about PBS's finances, feel free to email our Treasurer, Arnold Trachtenberg, arnold140@verizon.net, to get the latest statement.

Gardening with Bulbs



Crocus sieberi ssp. *sublimus* 'Tricolor' grows in the Mediterranean's summer-dry climate. Mike Mace's analysis of summer-dry regions continues inside. Photo by Arnold Trachtenberg.

Inside This Edition:

This edition focuses exclusively on Part II of Mike Mace's article on summer-dry climates accompanied by his beautifully detailed maps. Enjoy!

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The Bulb Garden is the newsletter of the Pacific Bulb Society (PBS). It is published, if enough articles are submitted, around the third week of each quarter and is available to PBS members. This newsletter provides gardening or bulb related articles, news of interest to members, and announcements of the PBS organization.

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