

Evaluating the Use of PDSI in Barbados

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Palmer Drought Severity Index

PDSI

- Developed by W.C.Palmer (1965)
- Measures degree of “dryness” or “wetness” of a location based on supply and demand concept of water balance equation¹. Uses the following
 - Precipitation
 - Temperature → Thornwaite’s Potential Evapotranspiration.
 - Available Water Capacity (AWC)

¹National Agricultural Decision Support System (<http://nadss.unl.edu/PDSIRreport/pdsi/steps.html>)

Thornwaite Equation and its parameters

$$PET = 16 (10T_i / I)^\alpha (N/12) (1/30)$$

Where,

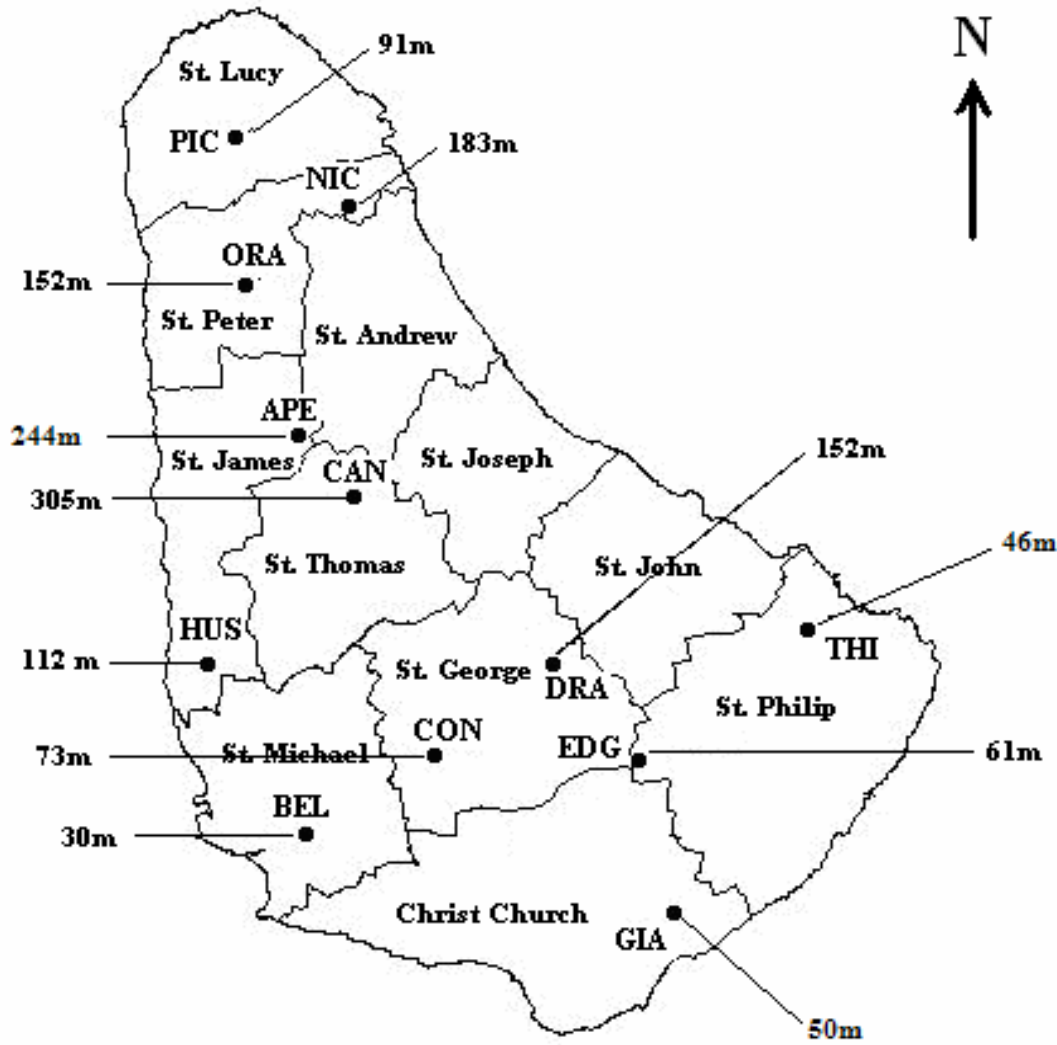
$$\alpha = (492390 + 17920 I - 771 I^2 + 0.675 I^3) \times 10^{-6}$$

$$I = \sum_{i=1}^{12} (T_i/5)^{1.514}$$

N – mean monthly sunshine hour
 T_a – mean monthly temperature $^{\circ}\text{C}$

Source: Alkaeed et. al 2006

Stations - Barbados



Station	Abbreviation
Apes Hill	APE
Bellville	BEL
Cane Field	CAN
Constant	CON
Drax Hall	DRA
Edgecumbe	EDG
Grantley Adams	GIA
Husbands	HUS
Nicholas Abbey	NIC
Orange Hill	ORA
Pickering	PIC
Thickets	THI

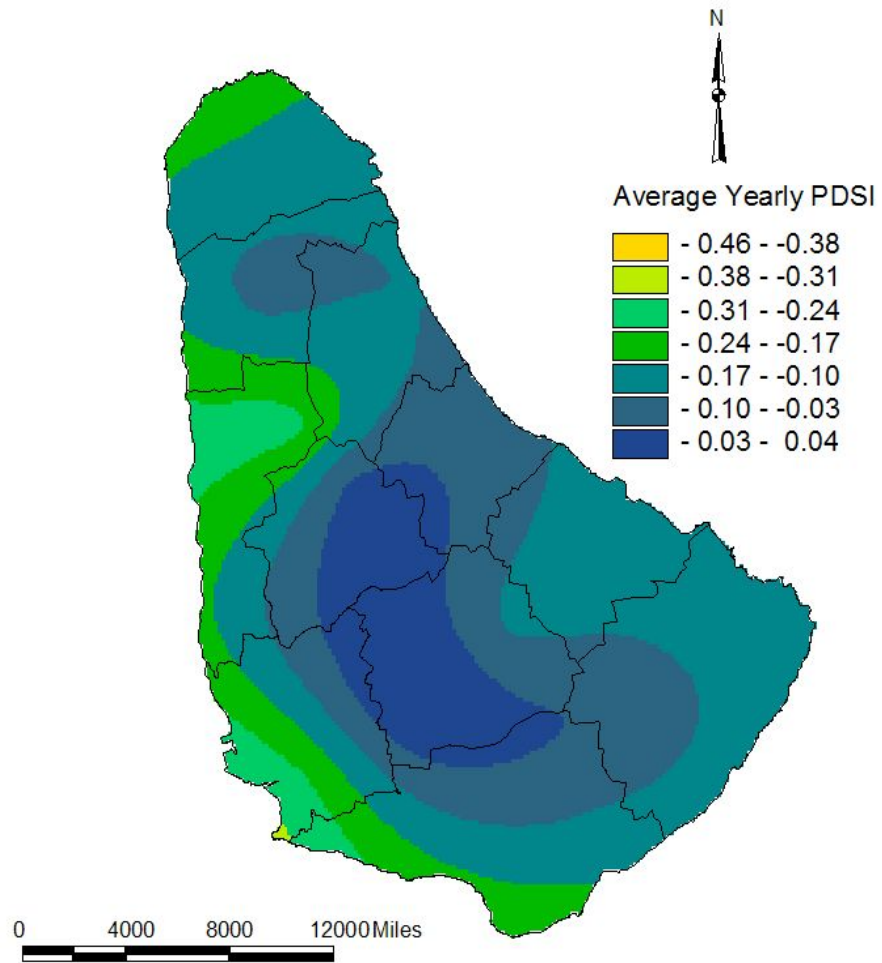
**AWC estimates for all locations using Hudson
(*pers. comm.*) and Vernon and Carroll (1966)**

Location	<i>APE</i>	<i>BEL</i>	<i>CAN</i>	<i>CON</i>	<i>DRA</i>	<i>EDG</i>
AWC (mm)	80.3	150	87.9	101	100	119.4
Location	<i>GIA</i>	<i>HUS</i>	<i>NIC</i>	<i>ORA</i>	<i>PIC</i>	<i>THI</i>
AWC (mm)	113.9	123.3	80.8	80	105	111.8

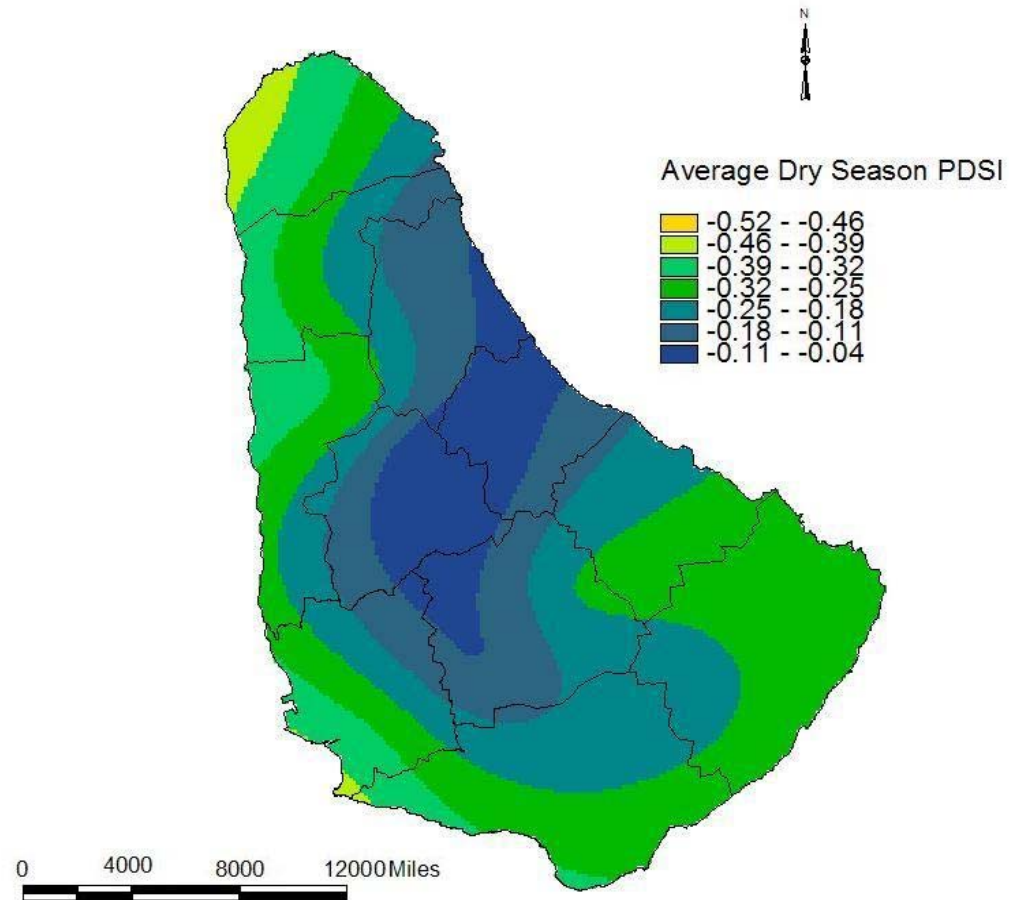
PDSI Classifications

4.0 or more	Extremely wet		-0.5 to -0.99	Incipient dry spell
3.0 to 3.99	Very wet		-1.0 to -1.99	Mild drought
2.0 to 2.99	Moderately wet		-2.0 to -2.99	Moderate drought
1.0 to 1.99	Slightly wet		-3.0 to -3.99	Severe drought
0.5 to 0.99	Incipient wet spell		-4.0 or less	Extreme drought
0.49 to -0.49	Near normal			

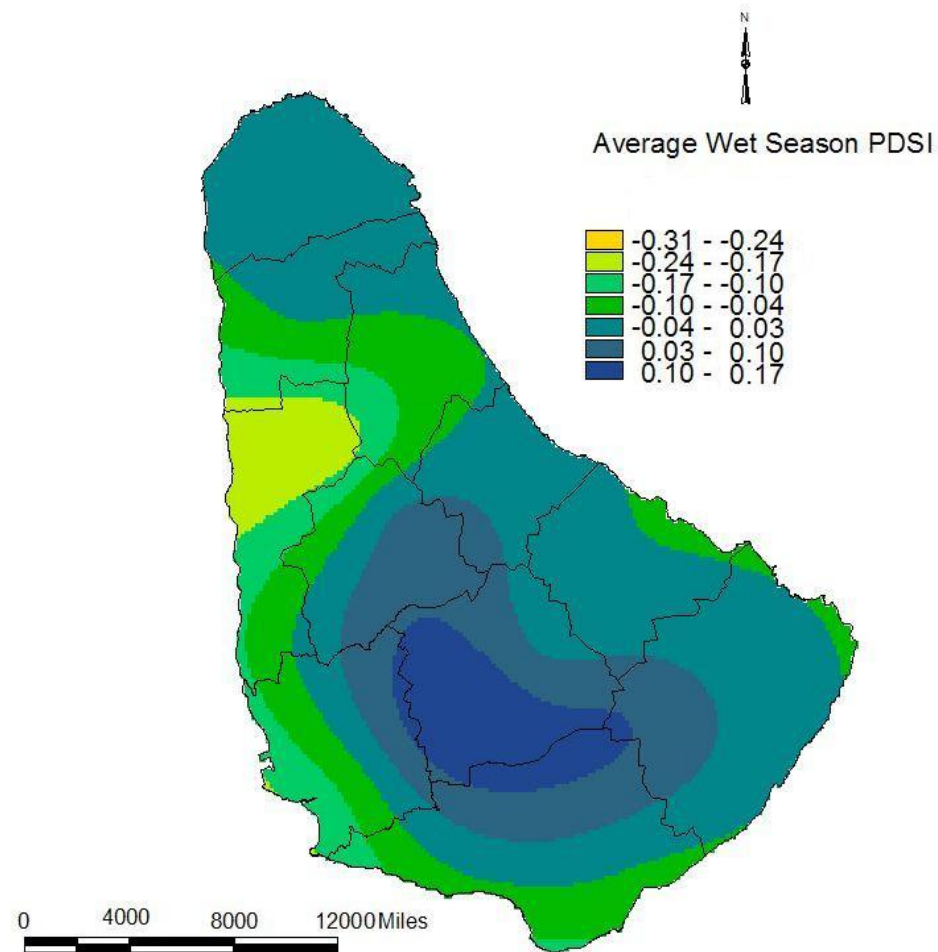
Source: <http://drought.unl.edu/whatis/indices.htm#cmi>



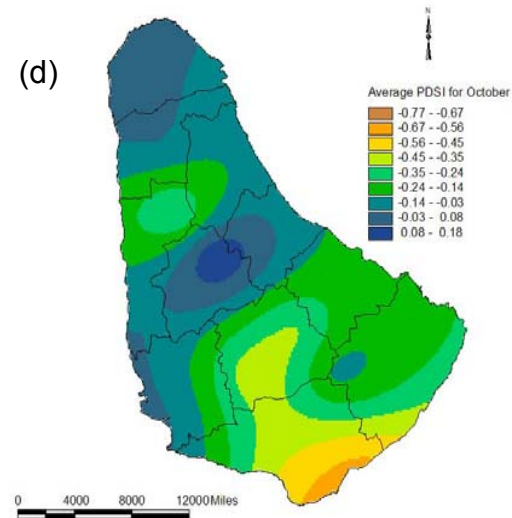
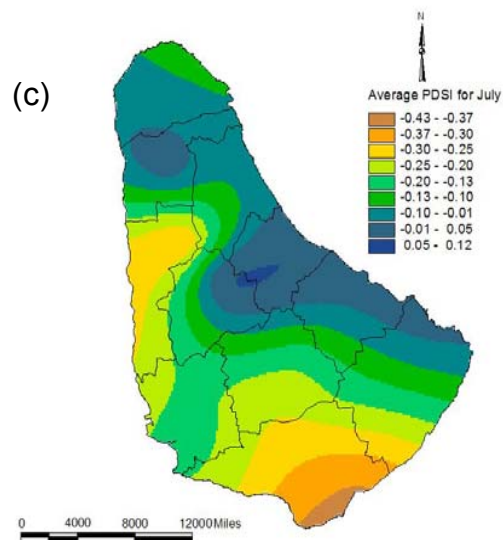
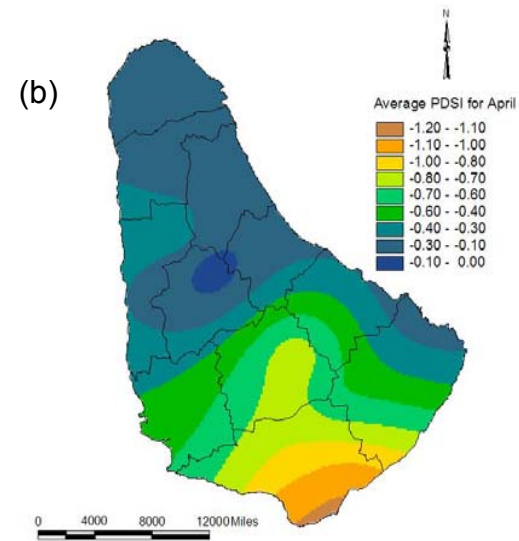
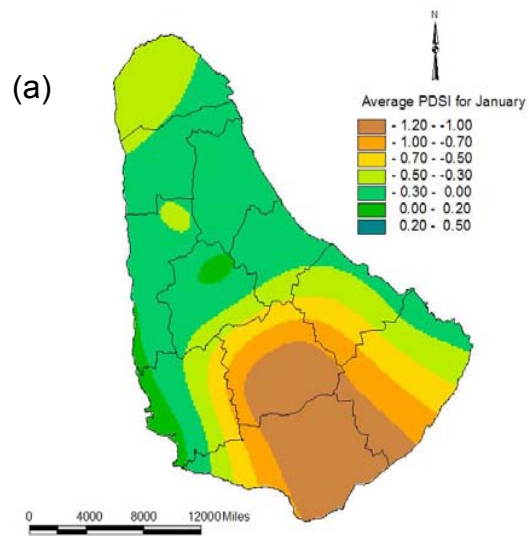
For this map, each year's PDSI is averaged over all months then averaged over the years 1975 to 2005



For this map, each year's PDSI is averaged over all dry season months then averaged over the years 1975 to 2005

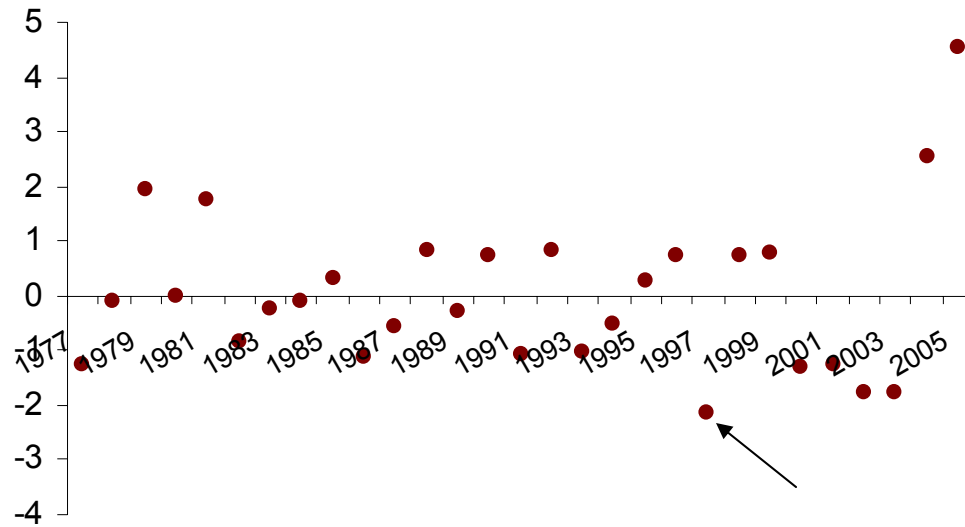


For this map, each year's PDSI is averaged over all wet season months then averaged over the years 1975 to 2005



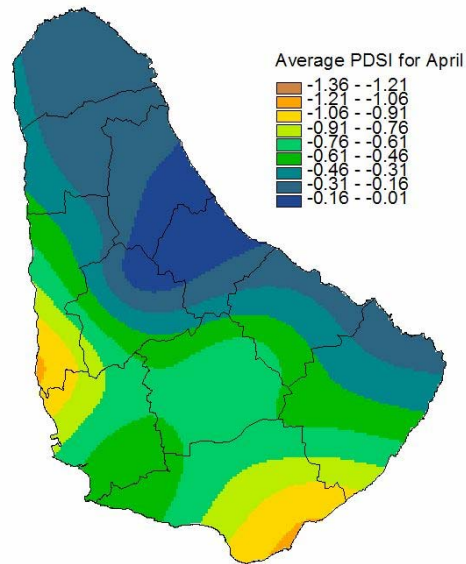
Average PDSI for each month (January, April, July, October)

PDSI Series during the Wet Season

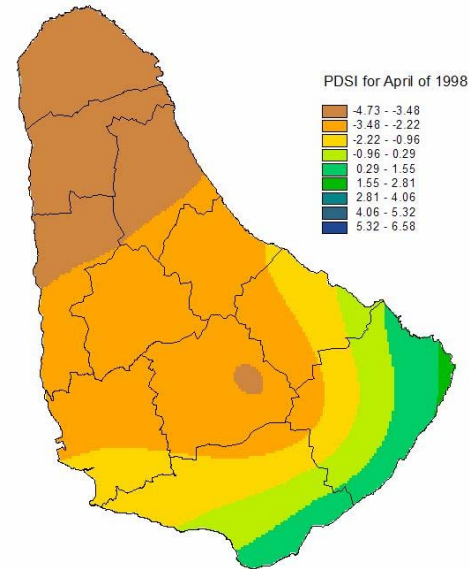


Note the wet season monthly average for 1998, an El Niño year. It suggests a moderate agricultural drought - in the wet season!

(a)



(b)



(a) Mean PDSI values for April and (b) PDSI for April 1998

Note the lower PDSI values in the El Niño year, 1998.