REPTILE LIGHTING GUIDE

A reference for UVI, visible light and near-infrared levels for commonly kept species.

SPECIES		FERGUSON ZONES UVI	LUX	BASKING SPOT TUNGSTEN LAMP POWER DENSITY (TLPD)
Latin	English	UV Light **280-400nm**	Visible Light **400-700nm**	Near-Infrared Light (NIR) **700-2600nm**
		Extreme Sunlight Levels UVI 8.0 - 10.0+ FZ Warning	**Level 8** 60,000 - 140,000 Lux	**Warning. Power density over 450W/m²** This level can be a life/health threat
Cyclora cornuta *Sauromalus ater* *Uromastyx spp.* *Dipsosaurus dorsalis*	Rhinoceros Iguana Chuckwalla Uromastyx Desert Iguana	**Very High Sunlight Levels** **Max. UVI:** 7.0 - 8.0 **FZ4 Range:** 4.5 - 8.0 **Target UVI in basking zone:** 4.5 - 6.0	**Level 7** 30,000 - 59,999 Lux Illuminance can be provided by LEDs or metal halide lamps. Light at this power will add heat to the basking spot.	**Basking Level A (375–449W/m²)** **Recommended level:** 400W/m² **Usage notes:** This level is at the highest intensity and is avoided for basking by most reptiles. Some animals are adapted to this extreme. Air temperatures may become excessive and animals will seek shelter. **Husbandry notes:** Shelter must be provided in a cool humid spot within the enclosure. Air often low in moisture.
Crotaphytus spp. *Pogona vitticeps* *Varanus acanthurus* *Iguana iguana* *Centrochelys sulcata* *Stigmochelys pardalis* *Varanus exanthematicus* *Testudo spp.*	Collared Lizard Bearded Dragon Ackie Monitor Green Iguana Sulcata Tortoise Leopard Tortoise Savannah Monitor Spur-thighed and Hermann's Tortoise	**High Sunlight Levels** **Max. UVI:** 7.0 **FZ3 Range:** 2.9 - 7.4 **Target UVI in basking zone:** 4.0 - 4.5		**Basking Level B (300–374W/m²)** **Recommended level:** 325W/m² **Usage notes:** This level is used by reptiles in the most open basking habitats. All of these animals can and do have the capability to survive the full sun for a period. Most hide by late morning. **Husbandry notes:** Shelter must be provided in a cool humid spot within their enclosure.
Salvator merianae *Furcifer pardalis* *Chamaeleo calyptratus* *Laudakia stellio* *Timon lepidus* *Lepidothyris fernandi* *Lacertid spp.* *Chelonoidis carbonaria* *Emydidae spp.*	Black and White Tegu Panther Chameleon Veiled Chameleon Painted Agama Jewelled Lizard Fire Skink Wall and Green Lizards Red-footed Tortoise European and North American Turtles			**Basking Level C (225–299W/m²)** **Recommended level:** 250W/m² **Usage notes:** This level is for temperate biome animals. Many of our species fall into this group. By late morning and with higher sun elevations, animals will have completed their warm up, and started their days activities. Mid-day is too hot for many. Cryptic basking often seen now. Local air temperatures now also at working metabolic levels. **Husbandry notes:** Shelter must be provided in a cool spot in their enclosure.
Thamnophis spp. *Pituophis melanoleucus* *Boa constrictor* *Lampropeltis spp.* *Pantherophis guttatus* *Python regius* *Terrapene spp.* *Heterodon nasicus* *Litoria caerulea*	Garter Snakes Northern Pine Snake Boas King Snakes Corn Snake Ball Python Box Turtles Western Hognose Snake Whites Tree Frog	**Medium Sunlight Levels** **Max. UVI:** 3.0 **FZ2 Range:** 1.1 - 3.0 **Target UVI in basking zone:** 2.0 - 2.5	**Level 6** 10,000 - 29,999 Lux	**Basking Level D (150–224W/m²)** **Recommended level:** 175W/m² **Usage notes:** This level is for cooler biome animals. Many animals start basking early, and at this level there is sufficient energy to enable metabolic increase. This will coincide with local air temperatures rising to operating levels and is sufficient to kickstart the days activity. These levels can occur in large patches of sunlight in the forest.
Rhacodactylus auriculatus *Correlophus ciliatus* *Eublepharis macularius* *Gekko gecko* *Dendrobatidae* *Caudata* *Pleurodeles waltl* *Ambystoma mexicanum*	Gargoyle Gecko Crested Gecko Leopard Gecko Tokay Gecko Dart Frogs Salamanders and Newts Spanish Ribbed Newt Axolotl	**Lowest Sunlight Levels (Dawn/Dusk)** **Max. UVI:** 2.0 **FZ1 Range:** 0.7 - 1.4 **Target UVI in basking zone:** 1.0	**Level 5** 5,000 - 9,999 Lux	**Basking Level E (50–149W/m²)** **Recommended level:** 125W/m² **Usage notes:** This level occurs when the first sunlight becomes effective for basking. Many of these animals enjoy gentle basking, but here the variability of the biome has a significant effect.
			Level 1-4 1 - 4,999 Lux	**Basking Level F (0–49W/m²)** **Notes:** No practical basking occurs but a gentle thermal gradient across this range could be provided, along with good ambient lighting.

Solarmeter 6.5 UV Index Meter
Also sold as 6.5R and with several other brand labels.

WapoRich RQ-881D

RS PRO Solar Power Meter ISM400
This meter is also available under other names:
- PCE-SPM 1 Solar Radiation Meter
- TES-1333 Handheld Digital Solar Power Meter
- General Tools DTBU 1300 Solar Power BTU meter

They are all the same.

The measurement of the three lighting groups should be conducted with the instruments shown above. 1) There is no alternative for a Solarmeter 6.5. 2) The LUX meter shown is inexpensive and provides reliable readings. Apps available in phones for measuring Lux are considered unreliable and often have inadequate range. 3) Other power density meters should not be used as they may be calibrated differently.

IMPORTANT
When taking a measurement from a lamp ensure other light sources are extinguished and point the meter sensor directly at the centre of the lamp.

AUTHOR NOTES

Statement of purpose:
This table is a guiding framework for providing *balanced* basking radiation to reptiles and amphibians living in captivity. Suggested values for each loose (!) grouping are purposefully *moderate* and adapted to use in vivaria. Many animals have extensive ranges and may well fit into more than one category.

Tropical canopy effects on sunlight:
Foliage modulates and creates photo-environments. Depending on foliage density, trees and tree canopies substantially reduce irradiation levels underneath. Gaps produce distinct shafts or patches of bright sunlight which many forest and tree-dwelling animals use, whose strength sometimes approaches out-in-the-open levels.

An overview for the guide

A print ready version of this Reptile Lighting Guide is available and posted in the link below.

The Reptile Lighting Poster offers guidelines, not instructions. The philosophy has been to provide numbers that in the first instance are safe, those same numbers should fall into what is now described as a biomodulationary sweet spot.

The species chosen are grouped in accordance with the intensity of sunlight. Starting with the sun at its strongest (at the top) through to its lowest intensity at the bottom. So for a Jewelled lizard you might offer somewhere between 3 and 4 UVi, over 30,000 lux visible light and about 250W/m^2 PD from a tungsten lamp. As a keeper, you will know that they have a wide range of sunlight strength through the seasons and that they hibernate. You would provide lower irradiation values then, in the winter period. The values offered here are a good start point.
When installed the lamps should be arranged such that they all illuminate the basking spot to produce a “patch of sunlight”

This guide has been developed over the last 3 years, using data gathered by a small team from across the world and matching against known solar irradiation models. In the process we were also validating our test methods and assumptions. The model and the results using our methods match well.

The challenge was finding a way of converting that collected data into something simple and presentable, It is hoped that this has been achieved.
More data is still being collected and eventually a paper(s) will be produced. It is certain that new information will emerge, new tools will enable us to review and reconsider what has been said, so do check for document updates.

The Excel spread that is used to produce the ISO charts, is always being improved. Many of the features don’t work on line and it has to be down loaded for full functionality.

Link to
Reptile Husbandry and Lighting Guide.
https://e.pcloud.link/publink/show?code=kZBmHNZTKz4z0IRXCLIC96LuvWjlFzc8Cdk
The link gives access to
Reptile Husbandry Notes,
Reptile Lighting Guide,
Reptile Lighting Lamp ISO charts.

On the matter of the automated timing of lamps.
Technology allows us to set up complex ramp dimming and timing functions for our lighting systems. The complexity will add to systems failing or mis-operating, simplicity is best. The daily cycle of sunlight can be simulated sufficiently well by turning on the Tungsten lights first, then after 45 minutes turn on the visible light lamps, finally after another 45 minutes turn on the UVb lamp. The reverse is true at the end of the day.

A thermostat is still required as a safety feature should the temperature in the vivarium become too high for whatever reason. The thermostat should be monitoring the cool shaded area and must turn off all your heat generating sources in danger.

Lastly, the Reptile Lighting Guide graphic design was done by Chris Hunt. He endured very many tedious modification, error corrections and simple cock-ups, all with good humour and we thank him for that.