Appraisal of Various Safety and Risk Issues Relating to Wood Treated with CCA, Creosote, and Pentachlorophenol as Currently Used by Residential Consumers in the U.S.

Prepared for
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Introduction

John Paling and Company, Inc., has evaluated the most recent evidence for the safety of pressure treated wood. We found nothing that contradicts the Environmental Protection Agency's earlier conclusion: "…pressure treated wood did not present unreasonable risks to children or adults, either from direct contact with the wood … or from direct contact with surrounding soil where some releases may have occurred"(US EPA, 1997).

In other words we believe that, when used and disposed of as currently recommended by the EPA, woods treated with CCA, pentachlorophenol and creosote are "safe" -- in the same sense that our nation's food and water supplies are safe.

But safety is not a yes-or-no thing, and one would be hard-pressed to find any substance that could never harm anyone in any circumstance. For this reason, we believe that safety levels can only be understood when presented in context and in relationship to other risks that are familiar experiences from daily life. To that end, we have assembled a wide range of risk figures for wood treated with the most common preservatives. We have attempted to demonstrate how to put the technical risk numbers in a context that can be simply understood.

Because of our background as an independent risk communication and research company, we were retained by the American Wood Preservers Institute (AWPI) to look into and report on the safety of wood treated with the three most commonly used wood preservatives.

Since trustworthiness and openness are essential in effective communication, we believe it is important to state our own predispositions in this field. AWPI knew of our company's philosophy because Paling had delivered keynote speeches at various conferences of the treated wood industry. In addition, Paling wrote an opinion article for the *Gainesville Sun* (unsolicited and initially unremunerated), which AWPI later reproduced as part of its campaign to help quell what it described as ongoing "alarmist stories" in the media.

Because AWPI paid for its services, John Paling & Co might reasonably be viewed as partisan regarding the risk of

treated wood. Despite the company's seeming support for the AWPI position, Paling insisted on his independence to investigate the topic ruthlessly. As part of that process, he involved the services of a long-term associate and professional toxicologist, Dr. Christopher Borgert, to serve as a trusted, independent technical advisor and interpreter.

Dr. Borgert examined points of contention between experts and activists in the field. He also provided advice on converting technical risk assessments into estimates of the odds of the different risks so that they might be put into context on Paling Perspective Scales. He stayed away from producing new risk assessments.

Our approach to carrying out the work was that we would not set ourselves up as being the judge over any conflicting attitudes to risk assessments for the safety of the chemicals involved. Instead, we would try to cover views from all sides but make clear the key assumptions made by the different parties so that the public has a better basis to decide for itself which version is most reasonable. In addition we gave particular attention to the criticisms that have been leveled against the products and used these as the focus of our investigations. In some ways, we tried to adopt the role of an advocate for concerned citizens being critical of AWPI and its members.

Safety and Risk

There is always a temptation for parties who deal with the public to speak of safety as a black and white issue. Is it safe, or isn't it? Politicians at all levels use this oversimplification to show their determination to vigorously act in the public interest. Members of the media use it to simplify reality in order to hold their audience. Industry representatives rarely challenge it for fear of breathing a hint of risk that might be taken out of context and used against them.

We believe that the general public is capable of understanding the reality of safety and risk issues, and we advocate trusting the public to make fair judgments. One example we can point to is the tragic July 25, 2000, crash of the Concorde near Paris. Even though 113 lives were lost, we believe that the public understands what a good safety record that airplane has had until now, having flown

for 25 years with nothing more than a burst tire. In other words, the public is in touch with the reality of the meaning of "safe" in real life situations.

Government agencies accept this reality when they make regulations as to "safe levels." The nearest that we know to an admission of that point comes from a recent head of the Food and Drug Administration, who is quoted as saying, "Just because the food supply is safe, does not meant that it cannot be made safer!"

More specifically, the US Environmental Protection Agency for practical purposes has no choice but to allow risks of death as high one in ten thousand over a lifetime from some of the chemicals in drinking water. More typically, the agency aims to reduce the risks to no more than one in a million when it makes its safety regulations. It seeks to reduce the possibility of harm but it does not claim that that there is absolutely *no risk.* That would be both untrue and counterproductive.

In other words, for regulatory purposes, "safe" means accepting the odds that one person in a million -- and sometimes more -- might die in their lifetime from a particular substance, despite all good intentions to the contrary.

Approaches to Risk Assessment

In many industries where the safety of products is questioned, risk assessments have become battlegrounds for scientists and government regulators. As such, when we began this work, we had expected to find several detailed risk assessments from various parties for human exposure to treated wood. In reality, apart from the original work of the EPA during the process of setting the earlier regulations, it appears that there are very few.

There is lots of evidence about how poisonous the various chemicals might be at different concentrations. There is some evidence about how much of them might come off the products into the soil or water or from direct human contact. But there is a surprising lack of studies that guide us on the size of many of the key numbers that get factored in to do a risk assessment. The main thing that is missing is detailed studies about how children actually behave around treated wood.

For example, to do a realistic assessment for treated wood, we really need to record average figures for things like how long children actually play under a deck during the year; how far away from the timbers they sit; how often they put their fingers into their mouths and how much soil is likely to be under their nails or on their hands!

Risk assessors call these factors "exposure assumptions" and depending on what different people's guesses are for these unknowns, the final estimated risk levels for being around treated wood could range between very low to negligible. So, given these uncertainties, what do different experts believe are the risks?

The EPA clearly starts out with the public's confidence since the agency is mandated to look after the public's health. However, agencies sometimes make assumptions that seem to us to be excessive. (In its risk assessments for arsenic the Florida Department of Environmental Protection assumes that children play beneath decks 350 days each year. From our casual experience of watching children, this figure seems far too high. Also, the amount of arsenic in the soil is assumed to be the same as if they always play right up close to the CCA-treated timbers –whereas we know that the level of chemicals (already very small) drops off significantly the further away you move from the treated wood. Other assumptions–for example that 100% of any arsenic that might get into the gut is absorbed–is not supported by most recent research on animals. In our opinion, putting all these unrealistically high assumptions together leads to the risks calculated this way to be significantly overstated.)

In the absence of other direct evidence, AWPI commissioned Dr. Chris Teaf, president and director of toxicology of Hazardous Substance & Waste Management Research Inc., to make what he believed were reasonable estimates of exposure. We analyzed his report to separate out the main differences between the Florida Department of the Environment's estimates of exposure and those used by Teaf. We also further took the liberty to work with the Teaf assumptions to come up with figures to make the technical language of his professional report more easily understood.

We consider the figures used by Teaf to be far more realistic than assumptions in the Florida Department of

Environmental Protection risk assessments. *However we display both with equal prominence in this report*.

It is important to try to keep in mind that real life experience often does not support theoretical risk estimates. One example of this is the fact that some EPA estimates suggest that as many as one person in five hundred will contract skin cancer from drinking ordinary tap water that contains some arsenic at the currently permitted levels. If that were correct, then the incidence of skin cancer would be far higher than the direct evidence of what medical records show.

In other words, common sense reminds us that we should never ignore what real-life experience shows us. From the point of view of direct observations, to the best of our knowledge, no one appears to be harmed when treated wood is properly handled and used.

Risks Associated with CCA

Key issues:

Most concern about this product has centered on:

1. Human health risks from its use for wooden structures in school playgrounds, where children might spend disproportionate amounts of time.
2. Human health risks from its use in residential decks, where children playing under decks may be exposed to washed-out chemicals in the soil.
3. Human health risks from its disposal -- particularly in a state like Florida, where large quantities of preserved wood are now in use. The fear here is that chemicals might leach from unlined landfills and find their way into the nearby aquifer for local communities.
4. Environmental risks due to the levels of copper in the water and its effects on aquatic life. (This was not part of our study for AWPI.)
5. Whether alternative products exist that do an acceptable job and that may pose lower risks.

Concerns about arsenic and human health:

Arsenic can potentially harm people in two ways, and the EPA calculates and regulates these two possible effects differently. Under some circumstances, arsenic can cause cancer, and the EPA considers this a risk that adds up bit by bit over a lifetime. On the other hand, risks of poisoning (known as "non-cancer hazard") come about only if people are exposed to too much arsenic over a short period.

In assessing risks from CCA-treated wood, it turns out that if there is not enough arsenic in soil to produce a significant risk of cancer, there will not be enough to pose a non-cancer hazard either. In other words, if we concentrate of checking out the estimated risks of cancer, we are also covering non-cancer risks too. The illustrations that follow this report put those risks in perspective using The Paling Perspective Scale©.

Concerns about chromium and human health:

Chromium is also a component of CCA, and may also pose both carcinogenic and non-carcinogenic hazards. However, the levels of risk from chromium in CCA are about three hundred times less than the equivalent risk from arsenic. Even if the worst estimates for arsenic were correct, the risks from chromium would not be greater than the level that the public generally accepts. For this reason, we viewed the risks of chromium in the context of what we learned about the risks from arsenic.

Concerns about copper and human health

Copper is not a human carcinogen but under certain conditions it does present non-cancer or toxic risks to both humans and the environment. The Florida Department of Environmental Protection judges copper to be about two hundred times less risky than arsenic at the same levels of concentration, and tests indicate that the levels of copper in soil around CCA-treated wood are similar to those of arsenic. On this basis, we consider that if the arsenic that might wash out from CCA does not pose significant risks of cancer, then there will be no significant risk from copper either.

The above remarks apply only to CCA-treated wood and not to other wood preservatives that contain different levels of copper as well as chemicals other than arsenic, copper and chromium. The toxic hazards from copper would of course be higher if other treatments are used which allow more of this chemical to leach from the wood than would be the case from using CCA.

Risks Associated with Pentachlorophenol

Key issues:

Most concern about this product has centered on whether, when properly used and disposed of, it is a human carcinogen, chiefly due to the presence of dioxin in penta formulations. Penta was once a general use herbicide and at one time was widely used residentially, on farms and elsewhere. Concerns about the safety of this type of use led to its being banned as a general-use pesticide.

Opponents of Penta focus on the "poison pole" issue and argue that safer and economically comparable alternatives exist (primarily steel or concrete poles as replacements for penta-treated poles), but they provide no scientific evidence for residential risks based on the way penta-treated wood is used currently.

We found no recent risk assessment studies for pentachlorophenol-treated wood as it applies currently to residential populations. Since years ago penta was used widely as a pesticide, many older people may still have residues from those days in their systems. While pentachlorophenol itself has been extensively studied, it is very difficult to know how such information applies to preserved wood, because of the lack of exposure data regarding residential populations. The exposure data that we could find is from occupational scenarios or occupational estimates, and these estimates indicate very low risk when properly used. It stands to reason that residential exposures would be much lower since penta is not used in residential situations.

The best evidence for safety we could come up with is from the EPA risk assessment studies that were made during the registration of wood preservatives in 1982. There it was calculated that for workers applying the chemical and only wearing gloves, the risk was no greater than around one in

a million. For residents, the risks were described as less than that. In both of these cases, the EPA's figures show levels of risks that are far below those that people are generally "at home" with.

Risks Associated with Creosote

Key issues:

Currently, there appears to be little concern about this product, in part because it serves a specialized market and is not typically sold to the public. Another factor in its acceptance is simply that it has been around so long.

The components of creosote vary in detail according to the different sources and manufacturers. It contains compounds with both carcinogenic and non-carcinogenic risks, but the few risk assessments that do exist suggest that the total risks are far below the level that the public is typically comfortable with.

The best risk assessment evidence for safety we found is from the EPA studies that were made during the registration of the product in 1982. There it was calculated that for workers applying the chemical and only wearing gloves, the risk was no greater than around one in a million. For residents, the risks were described as less than that. As in the case of pentachlorophenol, the EPA's figures are well within most people's comfort zone.

Risks Associated with Alternative Products

Key issues:

It was not part of our work order to consider alternative products, but we considered this appropriate because several people contacted during this research said, effectively, "There's an alternative product that seems just as good but is nowhere near as toxic." For that reason, we spent a little time researching ACQ in the hope of shedding light on the suggestion that it offers less risk with comparable performance. We understand that all the major producers of CCA manufacture alternative products, but we focused on ACQ because it was the one most often mentioned.

First, we looked at the possibility that ACQ is “just as good as CCA” and found that there has simply not been enough time to justify this claim. The product has only been is use for about ten years and so it may not have the same longevity as CCA-treated wood, which has been in service for more than 50 years. Second, we tried to investigate the rumored superior safety for ACQ but were told that the manufacturer makes no claims that ACQ is safer. The product is marketed simply as "an alternative to CCA for those individuals who choose not to use products containing arsenic."

While no specific safety claims are made, the fact that an alternative product focuses its entire marketing effort on the implied "advantage" that it does not contain arsenic clearly contributes to the on-going suspicions against the safety of CCA.

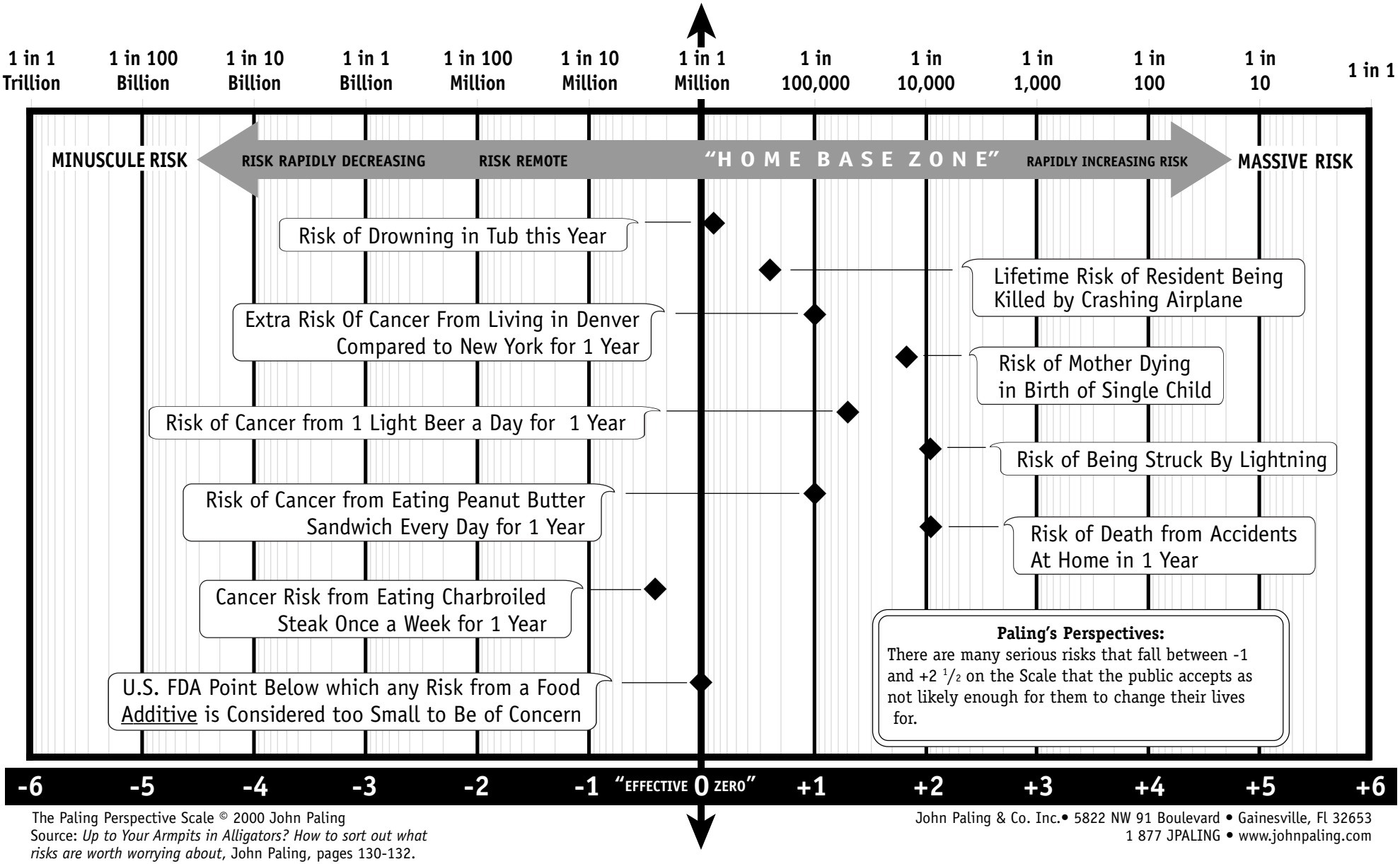
The Paling Perspective Scale©

The Paling Perspective Scale is a simple tool to display and compare the odds of different risks (or benefits) so that non-technical people can begin to put risks into perspective for themselves. Using this scale gives members of the public a visual context for understanding the different likelihoods for different risks and so to make their own judgments about whether some alleged hazard is really worth bothering about. Along the bottom line of our charts is a scale ranging from -6 to 0 and one to +6. Every risk that we know of can be positioned on this scale. Along the top of the scale, those same risks are expressed a different way. The zero line is one in a million, +1 is one in a hundred thousand, +2 is one in ten thousand, and so on to +6, which is one in one. In the other direction, -1 is one in ten million, -2 is one in a hundred million, and so on to -6, which is one in a trillion.

It appears that the public generally is comfortable with lifetime risks as high as +2 1/2, or about one in a four thousand. People apparently consider the possibility of harm from those risks as not likely enough to cause them to change their habits.

The charts that follow show where various risks–including those pertaining to preserved wood–fall on The Paling Perspective Scale©.

Scale 1. Risks with which We Are "At Home"



Source: *Up to Your Armpits in Alligators? How to sort out what risks are worth worrying about*, John Paling, pages 130-132.

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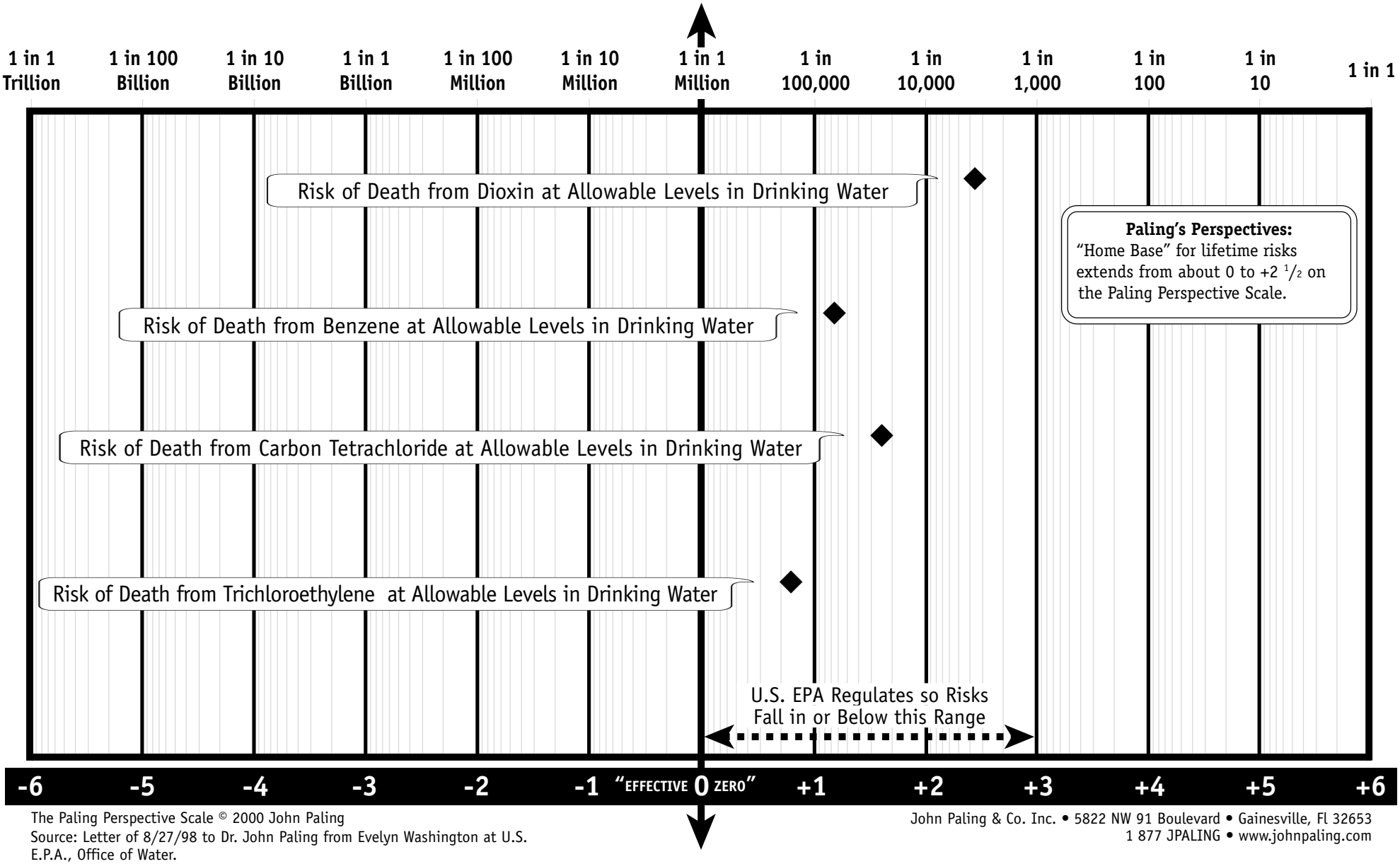
Scale 2. Lifetime Risks of Death from Drinking Tap Water

EPA Translation of their MCLs (allowable level) for Contaminants in Drinking Water



Source: Letter of 8/27/98 to Dr. John Paling from Evelyn Washington at U.S. E.P.A., Office of Water.

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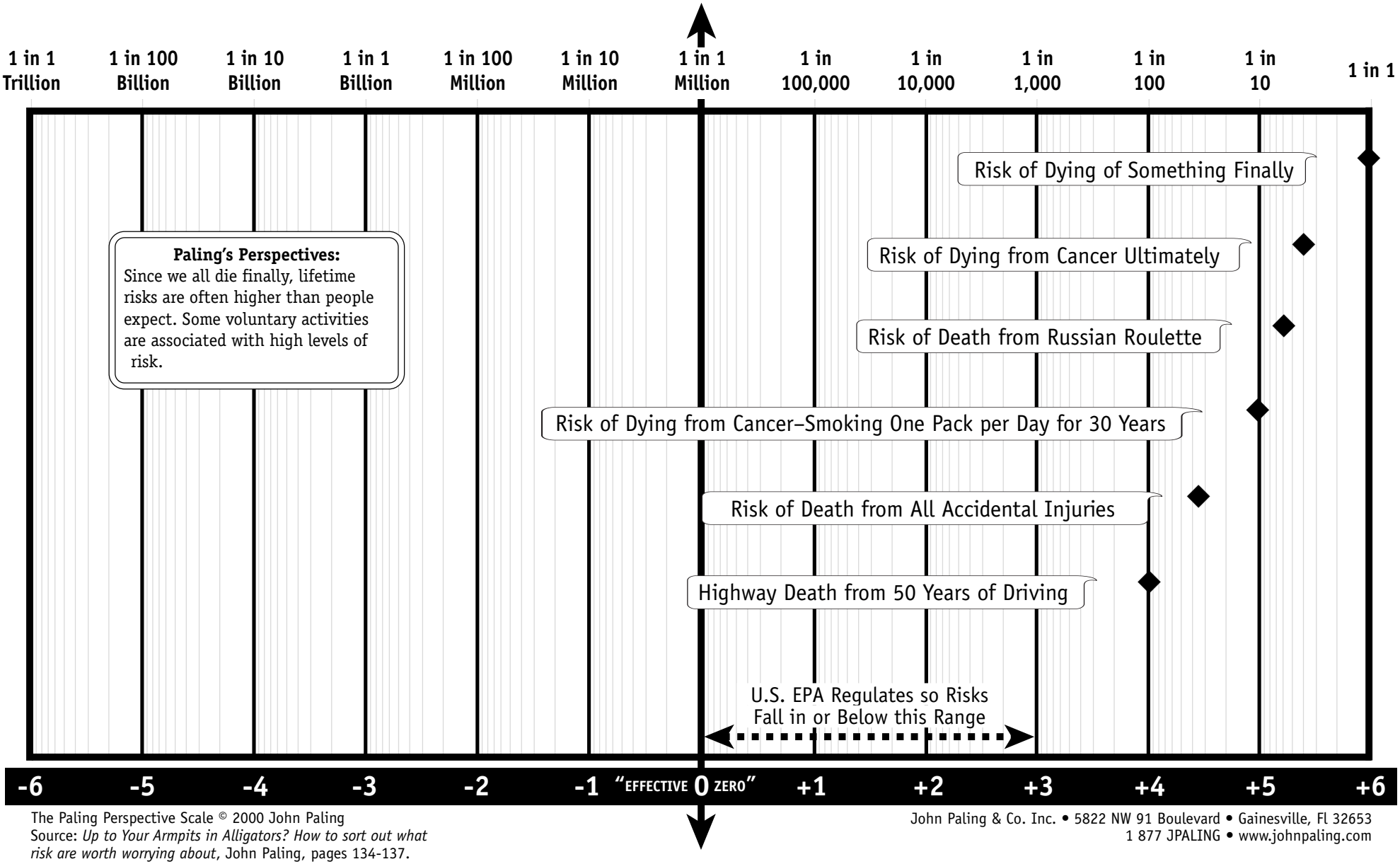
Scale 3. Some More Risky Lifetime Risks of Death



Source: *Up to Your Armpits in Alligators? How to sort out what risk are worth worrying about*, John Paling, pages 134-137.

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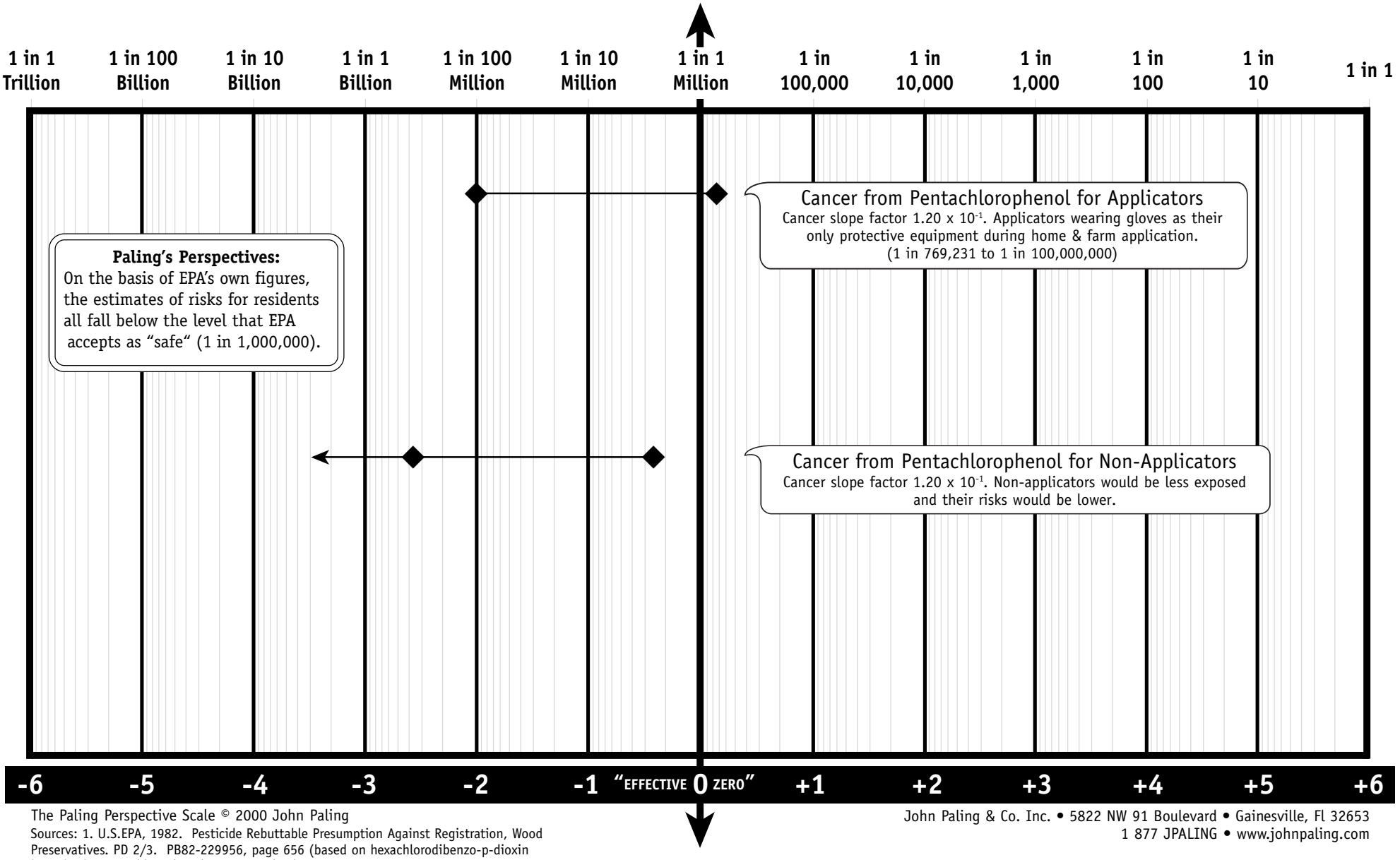
Scale 4: Estimated Lifetime Cancer Risks from Pentachlorophenol

For farm and home applicators and residents



Sources: 1. U.S.EPA, 1982. Pesticide Rebuttable Presumption Against Registration, Wood Preservatives. PD 2/3. PB82-229956, page 656 (based on hexachlorodibenzo-p-dioxin impurity in Pentachlorophenol, pre-1982 data).

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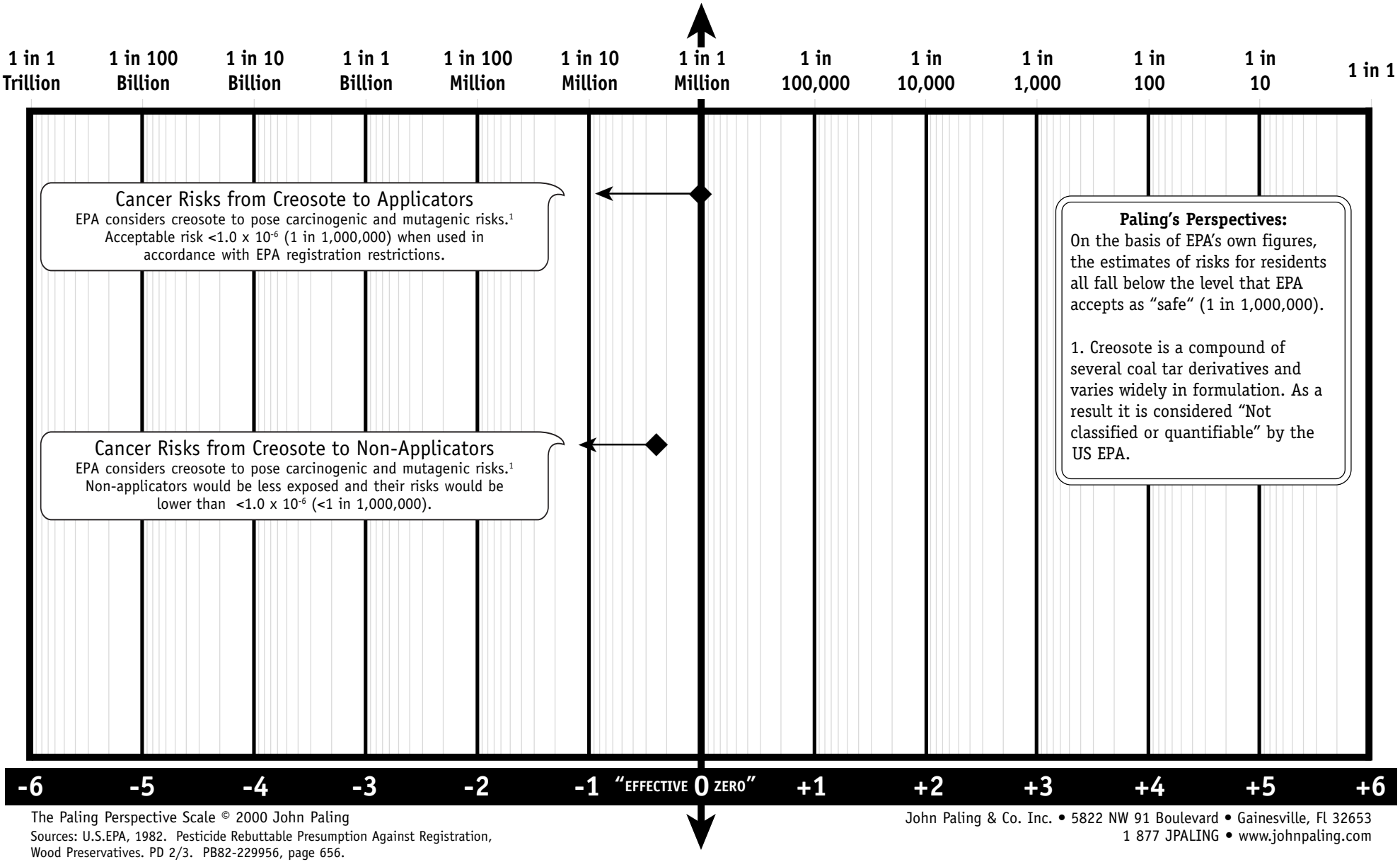
Scale 5: Estimated Lifetime Cancer Risks from Creosote

Not classified or quantifiable. EPA considers creosote to pose carcinogenic and mutagenic risks.



Sources: U.S.EPA, 1982. Pesticide Rebuttable Presumption Against Registration, Wood Preservatives. PD 2/3. PB82-229956, page 656.

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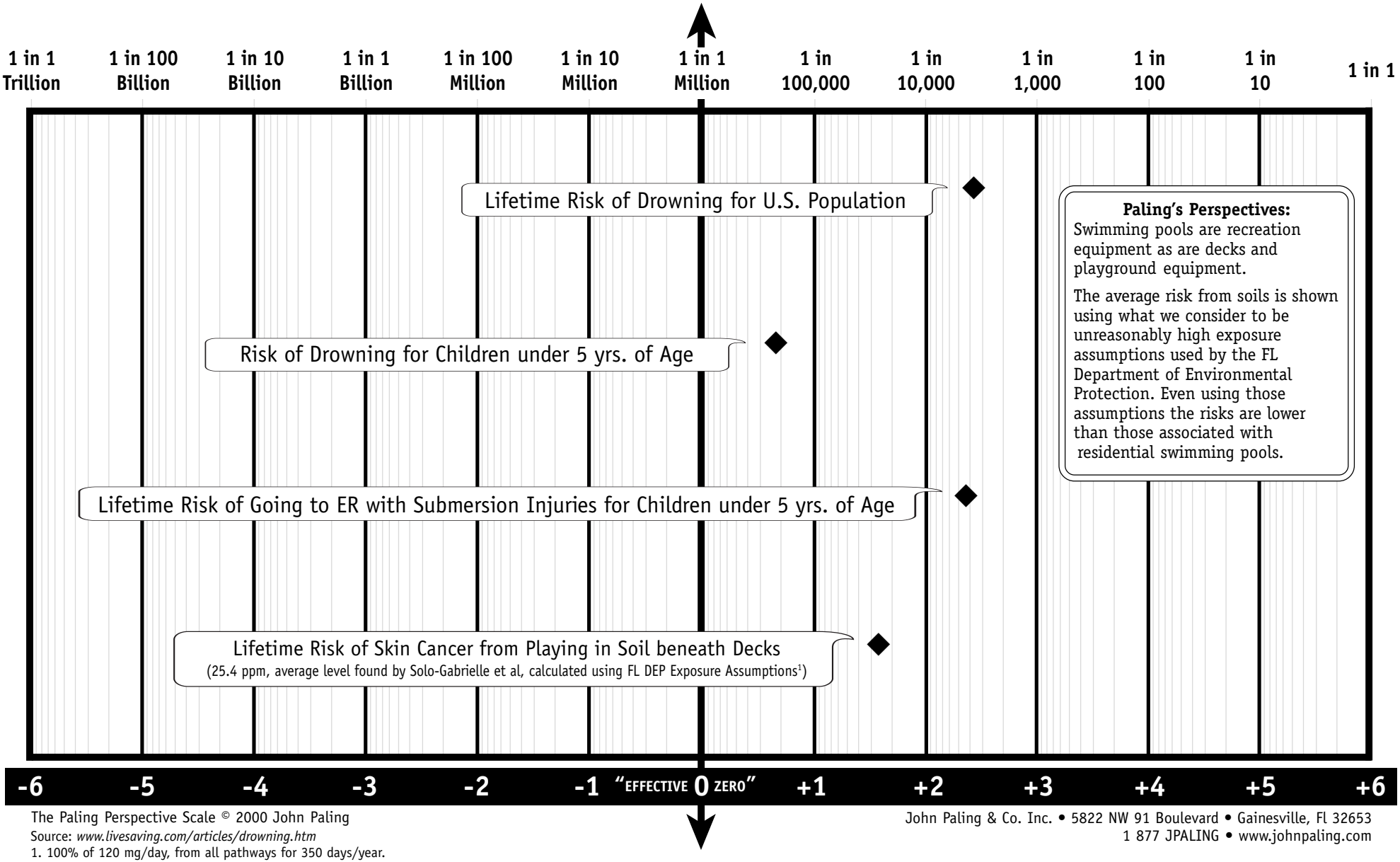
Scale 6. Comparing Risks Associated with Residential Swimming Pools with Arsenic Risks from Soil Below Decks



Source: *www.livesaving.com/articles/drowning.htm*
1. 100% of 120 mg/day, from all pathways for 350 days/year.

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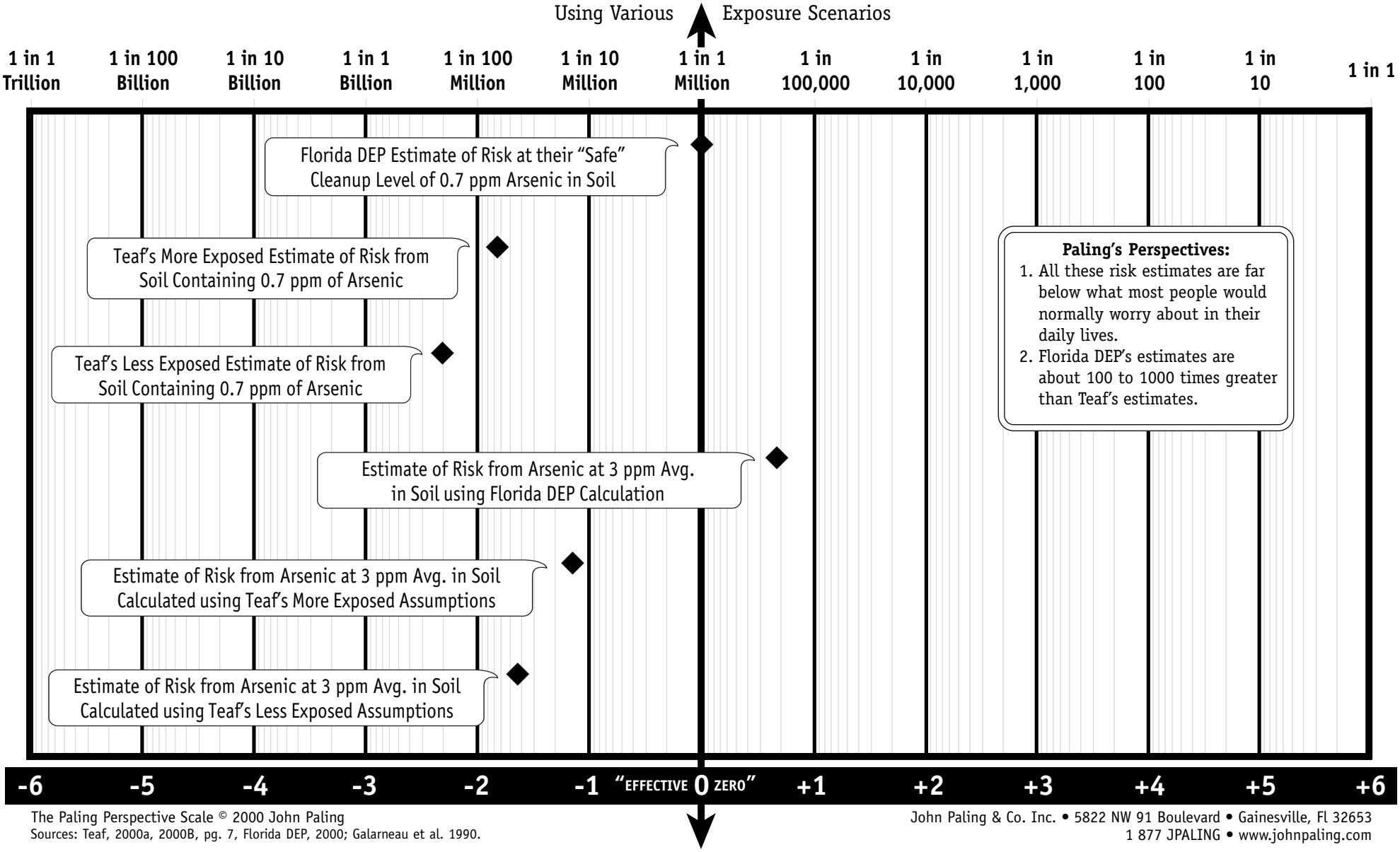
Scale 7. Comparing Estimates for Lifetime Cancer Risks from Arsenic at 0.7 ppm and 3 ppm in Soil under Playground Equipment



Sources: Teaf, 2000a, 2000B, pg. 7, Florida DEP, 2000; Galarneau et al. 1990.

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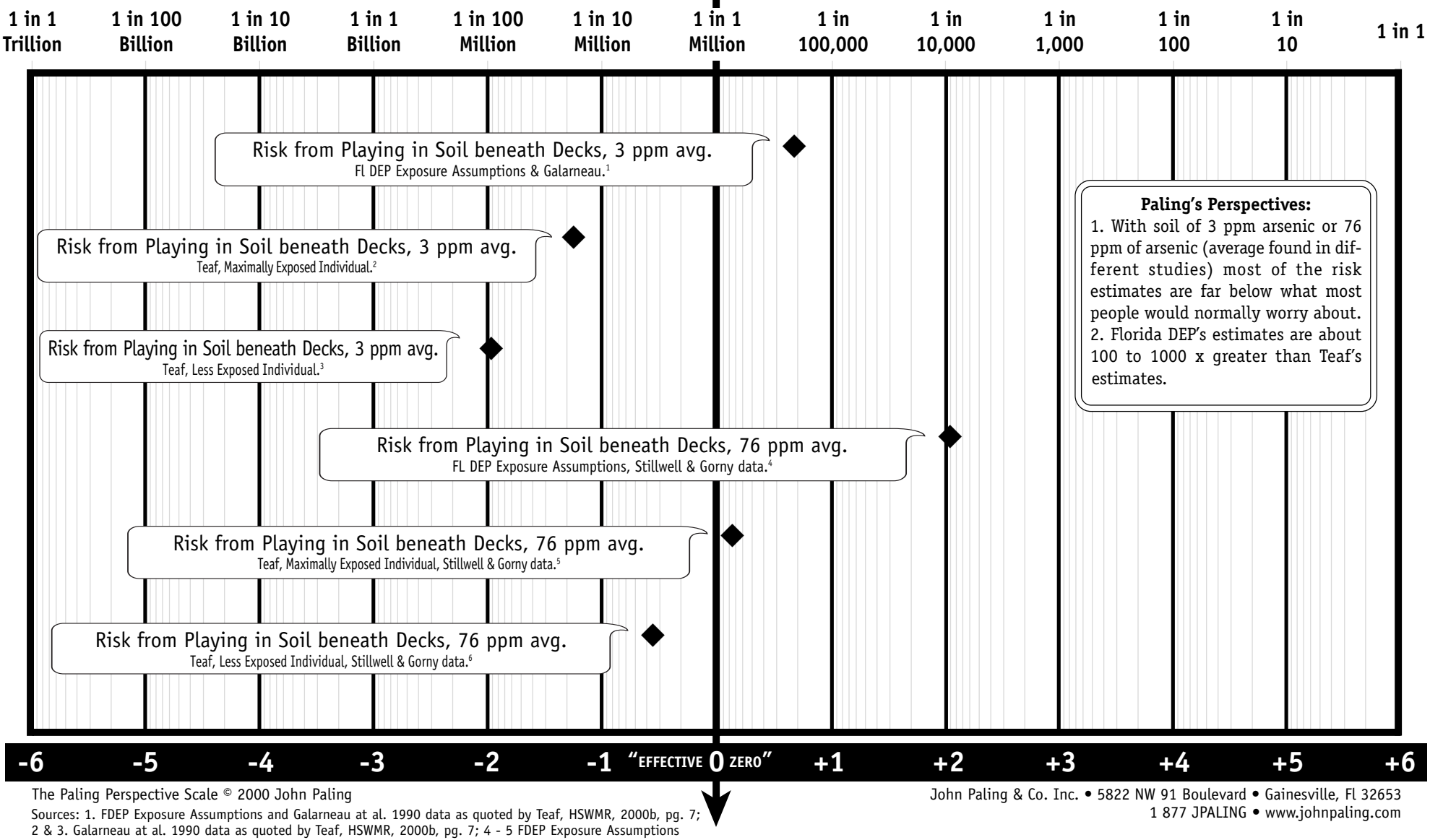
Scale 8. Comparing Estimates for Lifetime Cancer Risks from Arsenic at 3 ppm and 76 ppm in Soil under Decks

Using Various Exposure Scenarios



Sources: 1. FDEP Exposure Assumptions and Galarneau at al. 1990 data as quoted by Teaf, HSWMR, 2000b, pg. 7; 2 & 3. Galarneau at al. 1990 data as quoted by Teaf, HSWMR, 2000b, pg. 7; 4 - 5 FDEP Exposure Assumptions and Stillwell and Gorny, 1997 data.

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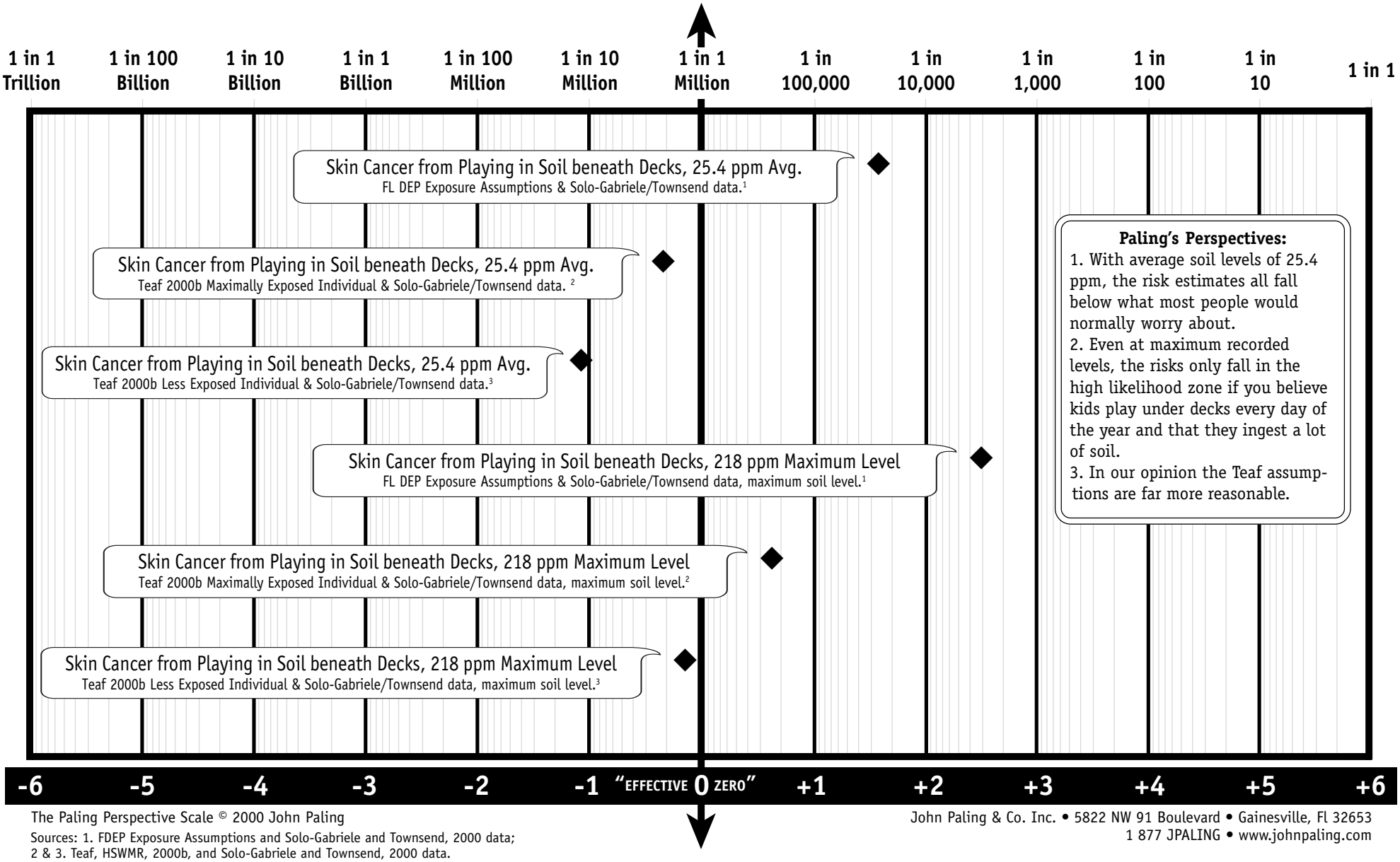
Scale 9. Comparing Estimates for Lifetime Cancer Risks from Arsenic at 25.4 ppm and 218 ppm in Soil under Decks

Various Exposure Assumptions; Average and Maximum Levels Recorded by Solo-Gabriele/Townsend



Sources: 1. FDEP Exposure Assumptions and Solo-Gabriele and Townsend, 2000 data;
2 & 3. Teaf, HSWMR, 2000b, and Solo-Gabriele and Townsend, 2000 data.

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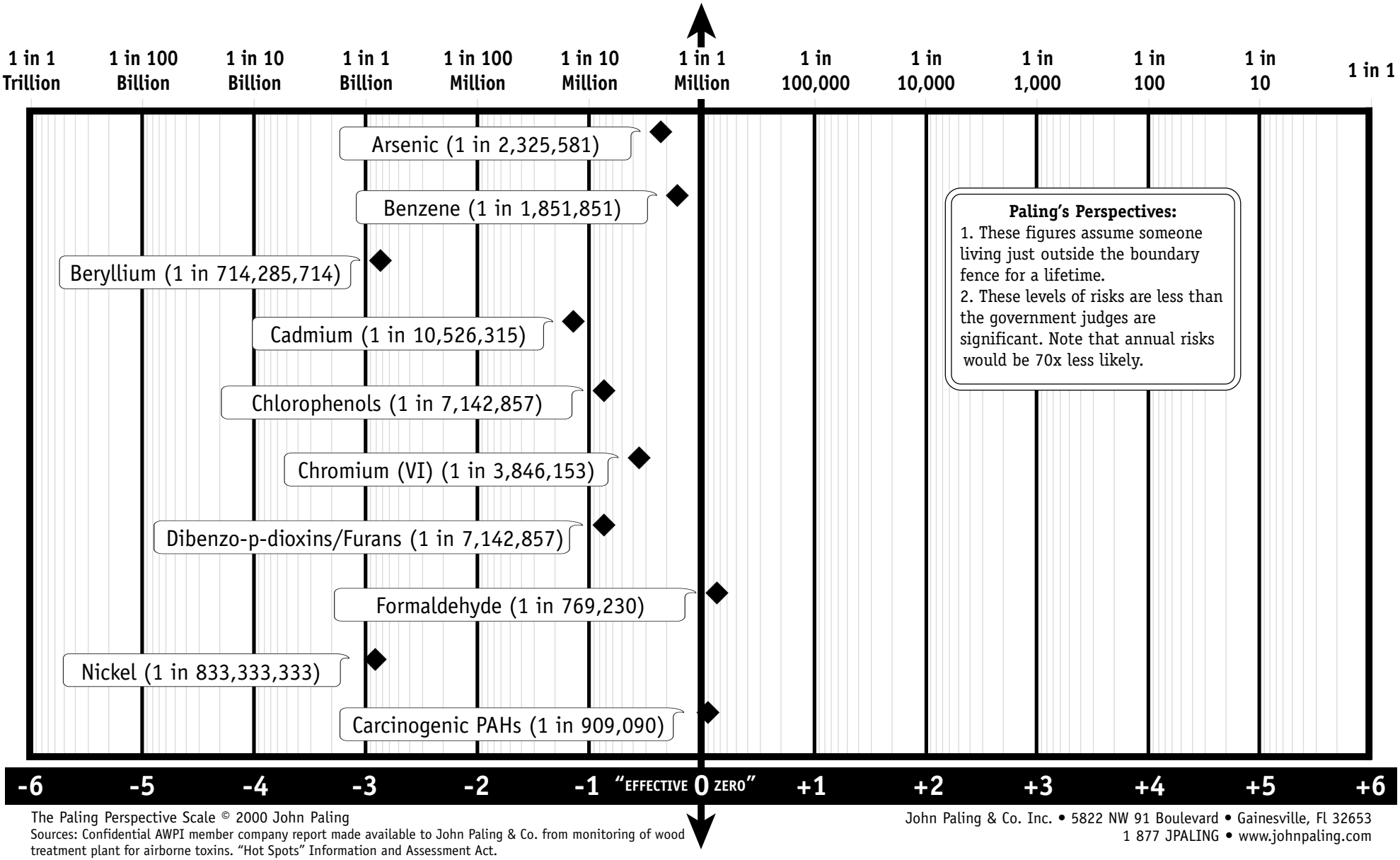
Scale 10. Lifetime Cancer Risks to Residents from Single AWPI Member Facility from Airborne Emissions of Different Substances



Sources: Confidential AWPI member company report made available to John Paling & Co. from monitoring of wood treatment plant for airborne toxins. "Hot Spots" Information and Assessment Act.

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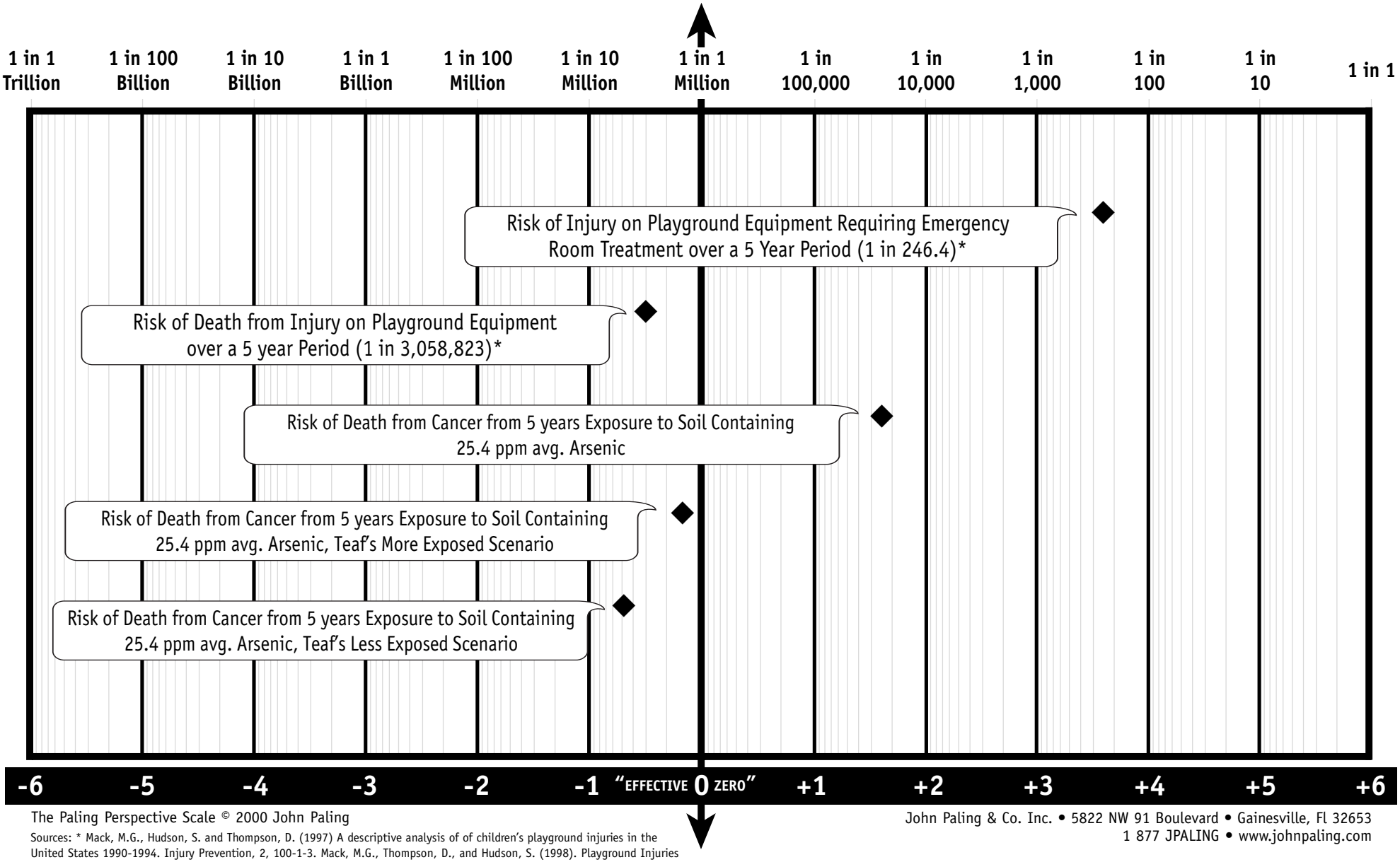
11. Risks Associated with Children and Playground Equipment

Physical Risks of Injury or Death and Cancer Risks from Arsenic in Soil



Sources: * Mack, M.G., Hudson, S. and Thompson, D. (1997) A descriptive analysis of of children's playground injuries in the United States 1990-1994. Injury Prevention, 2, 100-1-3. Mack, M.G., Thompson, D., and Hudson, S. (1998). Playground Injuries in the 90's. Parks & Recreation, 33 (4), 88-95. Florida DEP, 2000; Solo-Gabriele & Townsend, 2000; Teaf, 2000a, 2000B.

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Table 1: Assumptions Used in Making Calculations for Risk Estimates

Chemical	**Source of Risk Estimate**	**Ingestion Rate (amount of soil ingested per day)**	**Exposure Frequency**
Pentachlorophenol **(Scale 4)**	Cancer slope factor 1.20 x 10^{-1}.	Applicators wearing gloves as their only protective equipment.	Home & farm application. Non-applicators would be less exposed.
Creosote **(Scale 5)**	Not classified or quantifiable. EPA considers creosote to pose carcinogenic and mutagenic risks.	Acceptable risk <1.0 x 10^{-6} (1 in 1,000,000) when used in accordance with EPA registration restrictions.	Non-applicators would be less exposed.
Arsenic **(Scales 6, 7, 8, and 9)**	FL DEP Residential Exposure Scenario	100% of 120 mg/day through all pathways	350 days/year
	Skin cancer risk for HSWMR Maximally Exposed Individual playing beneath play set.	25% of (75 mg/day oral + inhalation + skin contact)	67 days/year
	Skin cancer risk for HSWMR Less Exposed Individual playing beneath play set.	17% of (75 mg/day oral + inhalation + skin contact)	58 days/year

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Board Member, Center for Cooperative Learning, Shands Hospital, University of Florida
Visiting Scientist, Center for Environmental & Human Toxicology, University of Florida,
Research Professor, Center for Risk Analysis, College of Public Health, University of South Florida

Appointments

1958-1964	The University of Birmingham, England
1964-1968	Oxford University, University Lecturer in Zoology
1966-1976	Oxford University, Oriel College, Lecturer in Zoology
1978	Regents Professor, University of California, Santa Cruz
1983-1987	Professor of Wildlife Cinematography, University of Florida
1989-1991	Visiting Professor, Department of Education, University of Florida
1989-present	Visiting Scientist, Center for Environmental Toxicology, University of Florida
1996-present	Board Member, Center for Cooperative Learning, Health Science Center, University of Florida
1999-present	Research Professor, Center for Risk Analysis, College of Public Health, University of South Florida

University Degrees

1961	B.Sc., with First Class honors
1963	M.Sc., qualifying towards Ph.D.
1964	Ph.D., Birmingham University, England
1965	M.A., Oxford University, England
1980	M.A., (Honorary) Open University, England (for outstanding effectiveness in popularizing science on television)

Books and Articles

1996	Public Panic over Pesticides: How golf course superintendents communicate the safety of chemical treatments. *USGA Green Section Record*, May-June 1996, 11-13.
1997	“Up to Your Armpits in Alligators? How to sort out what risks are worth worrying about!” Revised 2nd Edition, 153 pp.