Approximating Natural Ecology:

1. Fresh, unpolluted air: This is hard to accomplish if one lives in an urban environment. If needed, use filters in the home and office.
2. Know your air shed/air basin: Know where your air comes from and what affects the quality. Know that particulates from China reach the west coast and particulates from Africa reach the east coast. Know how human activities affect the pollutants in the air and how these affect your health.
3. Smell the air: Sense the air. Many pollutants do not have odors, but many do. You may notice that, in general, cities stink. Also notice the smells of flowers, trees, forests, and ocean air. Notice the smell of rain, summer heat, winter cold, and snow.
4. Use passive solar for heating, convection and evaporation for cooling: The quickly adapts to temperature changes and these physiological compensations help to maintain resilience. Use natural sources of heating and cooling when possible, let your body adapt to the ambient and seasonal temperatures, and compensate further with clothing and activity changes.
5. Minimize fragrances, perfumes, etc.: These produce a “personal cloud” of dense particulate pollution around each person’s body. Many of these compounds are well known to be harmful.
6. Minimize off gassing material: Much of the material used in building, furniture, painting, plastic products, carpeting, and etc. produces harmful gases which we then chronically inhale. Become familiar with these materials and always look for opportunities to minimize or eliminate such exposures.
7. Practice balancing breathwork: In addition to what we breathe, it matters how we breathe. Practice balancing breathing techniques. There are many. Look into pranayama and find techniques which are most attractive to you. Try breathing comfortably deep but not too deep for 5 seconds in and then 5 seconds out and continue this. Think of something that brings you joy. Try alternate nostril breathing. As you practice any of these, they change your physiology for more lasting benefits.

Air pollutants, sources, and health consequences:

**Outdoor:** The primary source of outdoor air pollutants is fossil fuel combustion. Personal automobiles lead the list of contributors.
1. NOx (Nitrogen Oxides): Inflammation, oxidation, airway irritation, asthma.
2. SOx (Sulfur Oxides): Inflammation, oxidation, airway irritation, asthma.
3. O3 (Ozone): Inflammation, oxidation, airway irritation, asthma.
4. PM2.5 (fine and ultrafine particulate matter): Systemic inflammation, heart disease, hypertension, cancer, diabetes, dementia, reduced life expectancy, adverse pregnancy outcomes and childhood illnesses.
5. VOCs (Volatile organic compounds) and Aldehydes: Inflammation, cancers.
Indoor:

1. CO (Carbon Monoxide): decreases O2 in blood, cellular dysfunction, brain damage and death at high levels. Source: low heat combustion (furnace, smoke, etc.)
2. PM2.5 (fine and ultrafine particulate matter): Systemic inflammation = heart disease, hypertension, cancer, diabetes, dementia, reduced life expectancy, adverse pregnancy outcomes and childhood illnesses. Source: fragrances, dust, smoke.
3. VOCs (Volatile organic compounds), Aldehydes, Dioxins: Inflammation, cancers. Source: plastics, solvents, wood treatments, glues, etc.

Air pollution avoidance and prevention (source reduction):

Driving:

1. Use the recirculation button on your air control counsel. This dramatically reduces the otherwise direct exposure to harmful pollutants emitted by the vehicles in front of you. This can be turned off in settings without nearby vehicles or smog in order to introduce fresh air into the cabin.
2. Commute by bike, walk, or car pool to reduce the environmental burden of combustion related pollutants.

Outdoor:

1. Get to know your “air shed.” Pollutant concentrations may be quite variable in any particular region due to atmospheric dynamics and topography. Understanding this will allow you to spend more time in less polluted areas.
2. Plan outdoor exercise for early morning before rush hour, when most pollutants are at the lowest levels. The one exception to this may be during the winter time “inversions” which occur in certain locations (such as Denver, CO). Pollutants may accumulate overnight and then get released into the upper atmosphere during the warming day when the inversion “burns off.” Check online for air quality before heavy exercise, [www.airnow.gov](http://www.airnow.gov).
3. Minimize or avoid the use of highly polluting equipment such as fossil fuel burning leaf blowers, lawnmowers, chainsaws, trimmers, generators, etc. Use electric or non-powered versions of this equipment when possible.
4. In high pollutant settings such as bicycle commuting with traffic, operating gas or diesel motors, or working with chemicals (paint, solvents, etc.), use masks with the appropriate filters (HEPA for particulates, activated charcoal for VOCs, etc., [www.respro.com](http://www.respro.com) is one option) and/or maintain fresh air ventilation.
**Indoor:**

1. Minimize or avoid the use of vapor emitting materials and products in your home (vinyl, particle and fiber board, wood composites and pressure treated lumber, carpet flooring, paints and stains, plastic furniture and toys, air fresheners, etc.) Prioritize untreated, naturally finished, handmade wood and natural fiber products when possible.

2. Minimize or avoid the use of particulate and vapor emitting personal care and cleaning products (fragrances, perfumes, cologne, scented lotions, hair sprays, hair dyes and perm treatments dry cleaning, stain removers, bleach, etc.). Botanical (plant) based formulations free of added fragrances, dyes, colors, and preservatives may be safer, but large exposures can still be inflammatory.

3. Minimize or avoid using pesticides and herbicides within or around the perimeter of your home. Many effective and safer alternatives exist, such as eliminating favorable pest environments and access points and using natural deterrents.

4. Minimize or avoid burning candles and wood fires. Ensure proper operation and maintenance of fireplaces. Make sure firewood is completely dry before burning.

5. Prioritize non-carpeted flooring when possible, such as hardwood or tile. This helps to reduce the accumulation of particulates (including dust, dust mites, and dirt) in the house and reduces the need for cleaning treatments.

6. Avoid placing high use printers and copiers in high occupancy areas (eg. next to a desk or in a small office).

7. Test for radon levels. One option is [www.emsl.com](http://www.emsl.com). The risk for radon is assumed to be linear, meaning that the increase in lung cancer risk rises in proportion to the elevation of radon. Therefore, I recommend mitigating for levels above 1.5 picocuries/L, especially if the area is a high use area, exercise area, or children spend time in the area. The EPA recommends mitigating for levels above 4 picocuries/L. See radon mitigation below.

8. Inspect for water damage and mold growth in bathrooms, around water heaters, in attic spaces, around windows, etc. Use a dehumidifier if you reside in a humid environment. If humidifiers are used for a dry environment, clean them regularly. Plants can serve as natural humidifiers. Ideal humidity for air quality preservation is under 50%.

9. Have your HVAC system inspected and certified before the heating season. For homes over 10 years of age, ductwork inspection and cleaning may reduce some particulate exposure.

10. Obtain and maintain (test regularly) smoke and carbon monoxide detectors.

**Air pollution mitigation:**

1. **Filters:** There is actually very little research on indoor air filtration, mostly due to difficulty in standardizing the testing environment. Therefore, the following recommendations are based on basic science rather than health related evidence.
   a. **Natural (plants):** Probably provide little benefit in removing pollutant with the exception of some volatile compounds, but may, nonetheless, condition the air by providing humidity and a slightly increased oxygen to carbon dioxide ratio.
b. **Mechanical:** Pleated HEPA-type filters remain the most efficient option for removing fine particulates. These filters are available for residential HVAC units (as slightly less efficient filters, minimum efficiency reporting values (MERV) of 7-16) as well as in mobile units intended for use in individual rooms. Combining both whole house filters and mobile units may offer the greatest reduction in particulate matter. Filter air-flow volume must match the room volume. Search air cleaner ratings and specifications here: http://www.cadr.org/consumer-certified.htm.

c. **Sorbent:** Activated carbon filters can remove volatile organic compounds, aldehydes, and other chemical vapors. These are best used in combination with HEPA filters.

d. **Ionizers and electrostatic filters:** At this time, these filter technologies do not appear to offer significant advantages over HEPA and activated carbon filters, and may produce ozone.

e. **Ozone generators:** Avoid these. Harmful levels of ozone are needed to destroy other pollutants, thus not providing any net benefit.

2. **Radon mitigation:** Sub-slab depressurization systems remain the most popular option due to their favorable cost-efficacy. Sealing cracks and other entry points in the slab and foundation may also help reduce radon infiltration. New homes can be built with an impermeable lining below the slab.

**Breathwork: Breathing for health**

1. **Breath Work:** Pranayama is a branch of the ancient Indian medical system known as Ayurveda, which involves breathing exercises. There are thousands of documented breathing exercises, but nearly all are capable of exerting influence over the two arms of the autonomic nervous system. Regular practice will improve the balance and tone of both sympathetic and parasympathetic arms, reduce stress and anxiety, and improve cardiovascular and bowel function. Two of the most common breathing exercises include the 4-7-8 breath and alternate nostril breathing.

   a. **4-7-8 Breath:** For this exercise, one breaths in through the nose using a deep abdominal breath for a count of 4, holds the breath for a count of 7, then exhales through the mouth with pursed lips (making a rushing air sound) for a count of 8. Immediately repeat the cycle for a total of 4-8 cycles at one time. The tip of the tongue is to be touching the ridge of the upper mouth just behind the two upper central incisors during the exercise. This is a favorite of Dr. Andrew Weil at the University of Arizona.

   b. **Alternate Nostril Breathing:** For this exercise, plug one nostril and slowly breathe in using abdominal breathing through the open nostril. Then plug the open nostril and exhale slowly through the previously plugged nostril. Next, inhale through the already open nostril (the one you just exhaled through), plug this nostril, and exhale through the other nostril. Basically, you are switching nostrils at the top of each inhalation. Continue this for 5-30 minutes. This is apparently one of the favored techniques in modern day India.
2. **Heart Rate Variability Biofeedback and the Quick Coherence Technique**: This is a very powerful and rapid method of increasing parasympathetic tone and autonomic balance. The Quick Coherence Technique also boasts the benefit of increased clarity of thought and elevated mood due to the synchronization of respiratory, heart, and brain rhythms. Research has shown that regular use of this technique can lower blood pressure, reduce cortisol, increase DHEA, and improve quality of life.

The **Quick Coherence technique** involves three steps:

a. Become aware of your heartbeat (you may put a hand over your chest or on your pulse).

b. Breathe in slowly and comfortably for a count of 5 and then smoothly transition to breathing out for a count of 5, and so on.

c. Think of something that brings you joy or gratitude.

You may use the technique to quickly shift your physiology and state of mind away from stress and anxiety anytime you need to. You may also maintain the breathing and feelings of appreciation for 20-30 minutes each day (or twice each day ideally) in order to retrain your body to operate in this “coherent” state as a default. For more information or to purchase your own biofeedback software for the home or office, see [www.heartmath.org](http://www.heartmath.org).