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Some days it hits us from all directions—environmental concerns are in our news, our classrooms, our sermons, our conversations. Our way of life and our abuse of the earth in today’s global economy lead to more and more land and habitat destruction, pollution, and species extinction. Our appetite for fossil fuels and large-scale destruction of forests lead to a warming of the earth, which can lead to a domino effect on climates, rainfall, food production, natural disasters—even the melting of earth’s ice caps.

In response to all this, what’s a Christian to do? Is there reason for concern? Yes. Is there anything we can do about these enormous degradations? Yes.

And our first response, says author, professor, and lifelong environmentalist Calvin B. DeWitt, is to regain a joyful, positive attitude about our ability to work for good in the world: “Ours is not to grovel in polluted gutters or to wring our hands over our sins. Instead, we are called to go about reclaiming creation for our Lord, knowing that ‘the earth is the Lord’s, and everything in it’ (Ps. 24:1) and that we may eagerly do so out of joyful gratitude for God’s great gift of salvation.” This book, now in its second edition, helps to provide you with the information and encouragement you need to become truly earth-wise.

Calvin B. DeWitt is a professor of environmental studies at the University of Wisconsin-Madison. He helped found and is president emeritus of the Au Sable Institute of Environmental Studies (www.ausable.org). He also serves as president of the Academy of Evangelical Scientists and Ethicists, an organization dedicated to responsible Christian environmental stewardship.

Foreword by Joel C. Hunter
EARTH-WISE

A BIBLICAL RESPONSE TO ENVIRONMENTAL ISSUES

Calvin B. DeWitt

FAITH ALIVE
Christian Resources
Grand Rapids, Michigan
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The earth was given to man, with this condition, that he should occupy himself in its cultivation. . . . The custody of the garden was given in charge to Adam, to show that we possess the things which God has committed to our hands, on the condition that, being content with the frugal and moderate use of them, we should take care of what shall remain. Let him who possesses a field, so partake of its yearly fruits, that he may not suffer the ground to be injured by his negligence, but let him endeavor to hand it down to posterity as he received it, or even better cultivated. Let him so feed on its fruits, that he neither dissipates it by luxury, nor permits it to be marred or ruined by neglect. Moreover, that this economy, and this diligence, with respect to those good things which God has given us to enjoy, may flourish among us; let everyone regard himself as the steward of God in all things which he possesses. Then he will neither conduct himself dissolutely, nor corrupt by abuse those things which God requires to be preserved.

—John Calvin on Genesis 2:15; Commentary on Genesis, 1554.
though he probably has not known this, Calvin DeWitt has been my mentor. I have wanted to make a difference with my life. I have wanted to make a servant’s impact for God upon all his creation. And for that I have needed great teachers.

Cal DeWitt has everything to recommend him as a great teacher. He has advanced training in the sciences of which he speaks. He has studied Scripture with his heart and soul as well as his mind. Cal is also respected highly by his peers. He is a cofounder of the leading evangelical network on the environment (Evangelical Environmental Network), and he was the founding director of an institute for environmental studies (AuSable Institute). Cal is personally intrigued and delighted by God’s creation—and has been so from his boyhood. His students revere him not only for his knowledge but also for his integrity. And, besides all that, Cal’s work is fun to read.

That’s what else I needed: a good textbook. I entered into the advocacy of creation care through the recommendation of other evangelical leaders. I did not know much about the field, but I love to study. I am a pastor, so I was not reading just for me but also for thousands who listen to me. Therefore, I had to be very careful about my reference material. Dr. DeWitt to my rescue! I read Earth-Wise as one of my resource books, and I thought, “How could I have missed this as an important part of following and worshiping God?”

I challenge you to learn from Cal DeWitt (with me), and we will benefit others together. The care of God’s creation is not just a way to honor the Creator, although it is that. The care of God’s creation is not just a way to love your neighbor (and grandchildren) as you love yourself, although it is that too. The care of God’s creation is not just another way to obey God’s command to cultivate and keep the earth, though it is also that too. The care of creation is a crucial issue. The way we address it could mean life or death for millions of people around the world. We can help protect those least able to cope with environmental degradation. They are among the “least of these” whom Jesus specifically taught about in Matthew 25.

So this is more than a textbook, and Cal DeWitt is more than a teacher. This is a book of life and a book of love. This is a book that will make your life count more
for the benefit of others. This is a book that will help you love the natural world that fascinated you as a child. This is a book that will help you love your neighbor in a practical way.

Read this book and you will be different. So will the world.

— Dr. Joel C. Hunter
Senior Pastor, Northland—A Church Distributed
Orlando, Florida

Editor’s note: Currently serving on the board of directors of the National Association of Evangelicals, Joel Hunter has helped raise awareness of environmental concerns through his work for the Evangelical Climate Initiative, through preaching and speaking engagements and media interviews, and in his book Right Wing, Wrong Bird: Why the Tactics of the Religious Right Won’t Fly with Most Conservative Christians (2006), re-released as A New Kind of Conservative (Regal Books/Gospel Light/CBD, 2008).
Introduction

have been in love with the Creator since my childhood and have been inspired and awed by God’s creation for more than half a century. I gained an early appreciation for God’s creatures from caring for and keeping animals in the backyard zoo of my childhood and youth.

I am a teacher, and I love to teach about the wonders of the beautiful life that envelops the earth. From my first teaching assignment at age 16—a course in herpetology for young people at the Grand Rapids (Mich.) Public Museum—I went on to teach thousands of college and university students (and nearly every other person I’ve ever met), helping them to develop a sense of awe and wonder for God’s world. Like the great Teacher—my model—I too like to teach on field trips! And I am a continuous student, learning from the “university of creation” and from God’s holy Word.

One Sunday evening when I was in my teens, I overheard my uncle ask my dad a question about me: “Shouldn’t you help Cal do something more important than this—something that will help him get a job?” My dad was guiding him down the basement stairs to see my birds and fish while my mom and aunt prepared after-church coffee and goodies in the kitchen above. As they approached the door to my aviary and aquaria, I heard my dad softly reply that he thought I was doing just fine. You see, my dad had told me earlier to keep doing what I loved to do; that would mean I would do it very well—and that meant eventually someone would even pay me for it. In this—his rendition of Matthew 6:33—he proved to be ever so right! I now get paid for what I love to do. My profession is caring for God’s creation and helping others to do so.

From the subtitle A Biblical Response to Environmental Issues, it would seem reasonable to conclude that this book is rooted in “the environment.” But my own vocation—and “where I’m coming from”—stems from a time before anyone heard or taught much about “the environment” or “environmentalism.” So is this an “environmental” book? Yes, and no. While it is a response to environmental issues, its root—and the root of my vocation—comes from my delight in God’s creation. My motivation is summed up pretty well by Psalm 111:2: “Great are the works of the Lord; they are pondered by all who delight in them.” What a wonderful world God has given us! It’s a world so convicting of God’s divinity and everlasting power that everyone is left without an excuse for not knowing something about God from
his delightful creation (Rom. 1:20). Our delight calls for our study, our seeking out, and our full investigation of this marvelous creation!

This book aims both to lighten the load we carry and to urge us to joyful, redeeming action in and with God’s amazing world. It will not pile on guilt. God knows that we, along with the rest of humanity, are guilty, “for all have sinned and fall short of the glory of God” (Rom. 3:23). But ours is not to grovel in polluted gutters or to wring our hands over our sins. Instead, we are called to go about reclaiming creation for our Lord, knowing that “the earth is the LORD’s, and everything in it” (Ps. 24:1) and that we may eagerly do so out of joyful gratitude for God’s great gift of salvation.

Even as we begin, we are uplifted by the knowledge of God’s rule, of God’s loving gift of Jesus—through whom the world was made and in whom “all things hold together” (Col. 1:17). Jesus Christ is the one given by God to reconcile all things to himself (Col. 1:20). We know he is the one we must follow. Jesus is our best example of practicing dominion and stewardship.

So let’s join together, not only to explore the dark recesses of creation’s degradations but also to resurface into the Bible’s teachings on creation’s care and keeping—and then to ascend into joyful stewardship of the faithful children of God!

—Calvin B. (“Cal”) DeWitt
I was born and raised in the city of Grand Rapids, Michigan, and for more than thirty-five years now I have inhabited the Great Waubesa Marsh in Wisconsin. In many ways it is easier to learn of the workings of God’s creation in this wetland ecosystem, but the city of my youth also provided a wonderful place to learn creation’s lessons. With my brother and sister I felt the drifting wetness of torrential rains and gentle drizzles as we swung on a suspended canvas swing in the shelter of our front porch. One day a tornado’s immense funnel cloud roared menacingly over the roof of the nearby Baxter Laundry. On summer evenings we heard the noisy “zzbbrrraaaaaaaanngggggg!” of nighthawks breaking the silence of the night sky as they pulled out of their dramatic plunging dives. We also watched bats zig-zagging in flight around our corner streetlight to keep insects in check. And then there was Mrs. Lockhart’s Dutchman’s-pipe—a climbing vine with heart-shaped leaves—on which pipevine swallowtail caterpillars ate away with her reluctant approval. These caterpillars eventually transformed into magnificent butterflies that fluttered around the neighborhood or flopped around as they emerged as captives in my mother’s canning jars. Better still were my bike rides to the dump at the edge of town and into the countryside, where I could find frogs, salamanders, snakes, and turtles. I brought home many of these treasures to my backyard zoo where I could study them for hours and days on end.

There was no question in my mind about the reason for all this wonderful life. What I was learning from these beautiful creatures was fully consistent with what I was hearing from sermons in church and from lessons at Baldwin Christian School. All these were God’s creatures, works of the Master, the Creator in whom all creatures great and small—his Master-pieces—lived and moved and had their being. They were among the ones we sang about each Sunday: “Praise God . . . all creatures here below!”

Day after day this world opened new lessons about God’s creatures and presented new things for which to give God praise. The psalms I sang in church beautifully complemented what I was learning in creation. Remember how Psalm 148 goes, for example? This is the way we sang it:

Hallelujah, praise Jehovah,
From the heavens praise His Name;
Praise Jehovah in the highest,
All His angels, praise proclaim.
All His hosts, together praise Him,
Sun and moon and stars on high;
Praise Him, O ye heavens of heavens,
And ye floods above the sky.

And then, in the next stanza:

Let them praises give Jehovah,
They were made at His command;
Them forever He established,
His decree shall ever stand.
From the earth, O praise Jehovah,
All ye seas, ye monsters all,
Fire and hail and snow and vapors,
Stormy winds that hear His call.

Then we burst forth with everything we had as we sang of trees, frogs, turtles, elephants, Holsteins, Jerseys, birds, kings, and relatives and neighbors:

All ye fruitful trees and cedars,
All ye hills and mountains high,
Creeping things and beasts and cattle,
Birds that in the heavens fly,
Kings of earth, and all ye people,
Princes great, earth’s judges all;
Praise His Name, young men and maidens,
Aged men and children small.
Let them praises give Jehovah
For His Name alone is high,
And His glory is exalted,
   And His glory is exalted,
   And His glory is exalted,
Far above the earth and sky.

—Psalter Hymnal, 1959, 1976; 304

Years later on Sunday evenings when friends and neighbors from around our marsh and the nearby city of Madison came together, we often sang that very song. And when we followed our singing with a walk through this wetland, a neighbor shouted, “Birds that in the heavens fly!”

All creation praises God. Of this I am fully convinced. But beyond that, all creation breaks forth with a marvelous testimony—one so powerful that it leaves everyone without excuse for knowing something of God’s everlasting power and lordship over all things. I remember in my youth savoring Article 2 of the Belgic Confession because it affirmed, in a deep theological way, the worth of my continuous observation and study of animals and plants in the city, the dump, and the outlying countryside:

**Article 2: The Means by Which We Know God**

We know him by two means:

First, by the creation, preservation, and government of the universe,
since that universe is before our eyes
like a beautiful book
   in which all creatures,
great and small,
are as letters
to make us ponder
the invisible things of God:
   his eternal power
   and his divinity,
as the apostle Paul says in Romans 1:20.

   All these things are enough to convict men
   and to leave them without excuse.

Second, he makes himself known to us more openly
by his holy and divine Word,
as much as we need in this life,
for his glory
and for the salvation of his own.

I knew from this marvelous confession that reading and study of the Bible in my home, school, and church was very important. And—wonderfully!—this confession also affirmed the importance of reading and studying the “beautiful book” of God’s creation.

Today the heavens continue to tell the glory of God, and earth’s creatures continue to pour forth their testimony to God’s eternal power and divine majesty (see Ps. 19:1-4).

In early spring the Waubesa Marsh bursts forth with extravagant abundance of life. Geese arrive, and soon afterward sandhill cranes wing down, announcing with their clangoring calls the arrival and revival of life on the great marsh.

Why such praise? Why such splendor and rebirth in springtime? A joyful reading of Psalm 104 helps provide the answer. This psalm celebrates God as the great Provider and masterful Creator. God’s provisions for life and breath are everywhere evident. God’s provisions are so numerous and interwoven with each other that we cannot begin to give them their proper due.

Yet it is vitally important for us to put these provisions of our Creator into perspective. Bringing all this in through our senses and incorporating it into our mind’s eye helps us see more clearly God’s “eternal power and divine nature” (Rom. 1:20). And through our study we grow to pour more meaning into our singing of doxologies, as in “Praise God . . . all creatures here below!” and “Gloria in excelsis Deo.”

Many of us have had awesome experiences in God’s creation. Perhaps we have stood at the edge of a great canyon, or at the feet of giant trees in an ancient forest, or in the eye of a great storm. Perhaps we’ve enjoyed a flowering meadow as the morning mists lifted quietly, and we found ourselves humming “How Great Thou Art.” How I wish we could walk together now to a place that would bring forth that song; it would put us into the right frame of mind for understanding God’s provisions for creation. Let’s open our minds now to the awesome wonder of our Lord’s creation!

If at this moment you can put yourself in an environment that calls forth praise to God—do so! Maybe you have a creation-celebrating psalm or recording at your fingertips, or an inspiring view outside your window or in the yard, some flowers on a windowsill, or an open window to let in fresh air. At the very least, shift your position and put your mind in a mood for bringing God praise.

SEVEN PROVISIONS OF THE CREATOR
Let’s reflect on seven of God’s magnificent provisions for creation. These provisions—many of which are celebrated in Psalm 104—tell something of the remarkable integrity and beauty that have engendered awe, wonder, and respect for the Creator and creation through the ages.

7

14
Earth’s Energy Exchange with the Sun and Space

Our star, the sun, radiates immense energy in all directions, heating whatever is in the path of its rays. This great thermonuclear energy source—the star that brightens earthly life—is a great empowering provision of God’s love. It energizes nearly everything we know on earth: green plants and all creatures that eat them, great flows of water and air across the globe, movement of automobiles and aircraft, heating for homes and factories.

Our earth also radiates energy, emitting not visible light but invisible infrared “light”—radiation below the red end of the spectrum. If the heat that earth takes in from the sun is not balanced with heat radiated out by earth into space, the earth’s temperature rises. If our earth loses more heat than it gains, it cools. Earth’s energy balance—its temperature—needs to be relatively constant for the planet to remain habitable.

Enveloping the earth is its atmosphere. The atmosphere is a protective layer of air situated between us and the sun, and between us and outer space. Among its many functions—like providing the air we breathe—the atmosphere controls energy exchange between the earth and sun and between the earth and outer space. It does this by means of “doorkeeper” gases. Doorkeeper gases—such as carbon dioxide and water vapor—let most of the sun’s energy move through the atmosphere to the earth. But these very same gases restrict and delay the flow of energy that the earth radiates into outer space. They do this because they are more transparent to visible light than to infrared radiation. The result is that the earth keeps warm—but not too warm—so that life flourishes. The doorkeeper gases work to make a habitable earth.

Window glass in our cars, homes, and greenhouses works similarly. Such glass lets visible light through to the interior but does not let much infrared radiation out. So the inside of our cars, homes, and greenhouses warms up when the sun shines. Because doorkeeper gases act in a way similar to window glass, they also are called “greenhouse gases.” In addition, the effect of greenhouse gases being largely transparent to visible light but not to infrared radiation is called “the greenhouse effect.” For our earth, this greenhouse effect results in just the right amount of heat leaving the earth to balance the earth’s heat gain from energy coming from the sun. This great provision of God for making the earth habitable by living creatures—including us!—brings joy to our hearts and praise to earth’s Maker.

If David or another biblical psalmist had known of this provision, we might have a psalm in our Bible that praises God like this:

You energize the earth with an outpouring of light;
you bathe it with empowering rays.
You keep the earth warm as with a blanket;
you keep its heat near your creatures’ hearts.
Your biosphere flourishes;
the earth is full of your creatures.
Not all of the sun’s energy supports life, however. It also includes harmful, dangerous, and even deadly radiation—powerful invisible rays above the blue and violet end of the spectrum. Maybe you’ve seen “black lights” that we can install in some of our electrical light fixtures today. They give off no visible light, but they make light-colored clothing and various minerals appear to “glow in the dark.” Such “near ultraviolet” lights produce radiation immediately above the visible end of the spectrum and are not very dangerous. The next higher level of radiation, however—“far ultraviolet”—can be very dangerous. When far ultraviolet radiation is absorbed by living and non-living things, not only does it make them warm up, but it conveys such high levels of energy that it ruptures chemical bonds, breaks molecules apart, and disrupts and destroys living tissues. Of particular concern is the breaking of DNA—the genetic blueprint chemical of living things. Damage and breakup of DNA can result in death to cells and microscopic creatures and can affect the instructions given by DNA in ways that produce skin cancer.

But very little ultraviolet radiation ever reaches the earth—and almost no far ultraviolet! It is intercepted in the atmosphere by a “guardian gas” called ozone. Sometimes we experience the sharp smell of ozone produced by arcing electric motors or lightning strikes. This gas can be dangerous for people and other creatures when it occurs in significant quantities near the surface of the earth, and this situation can prompt “ozone alerts” in some large metropolitan areas. In the upper atmosphere, however, ozone is vital; the protective “ozone shield” is another of God’s remarkable provisions. If we could collect all the ozone from the upper atmosphere and place it at sea-level atmospheric pressure and at 32 degrees Fahrenheit (0 degrees Celsius), it would be only about one-eighth of an inch (3 mm) thick! And yet that amount of ozone is enough to prevent most of the sun’s ultraviolet radiation from penetrating our atmosphere and entering the household of life. That’s another reason why God’s creatures are able to live on the earth.

If the biblical psalmist had known of this provision by the Creator, we might have a stanza like this in one of the psalms:

The creatures that dwell in the shelter of God’s providence
rest in the shadow of the Almighty.
God covers his earth with a protective shield;
God guards the life he has made to inhabit the earth.
How great are your provisions, O Lord!
You so love your world that you protect its life!

**Soil Building**

Soils build and develop. We learn something of this from gardening, in which we spade plants back into the soil and add compost to make it richer. This process also takes place naturally in fields, forests, and wetlands as organic plant and animal matter decomposes and accumulates. In addition, soil is produced and enriched by the weathering of rocks and grains of sand.
Soil gets richer and more supportive of life as it responds through time to climate, rainfall, and the myriad organisms that live in it. Topsoil builds up, becoming richer in nutrients and more supportive of plant life. Various remarkable cycles are involved in this development: the carbon cycle, the water cycle, the nitrogen cycle—to name just a few. These cycles contribute to a veritable symphony of processes that bring bare landscapes—even bare rock—eventually to support a rich and diverse fabric of living things.

Soil building teaches patience. It can take a hundred years to form an inch (2.5 cm) of topsoil—and yet more often only an eighth-inch (3 mm) of soil is produced in that amount of time! The dynamic fabric of roots, soil organisms, and soils that bind together the surface of the biosphere makes one stand in awe of God’s patience as Provider. For “with the Lord a day is like a thousand years, and a thousand years are like a day” (2 Pet. 3:8).

Where does this soil building happen? Everywhere! In the cool of temperate zones, this soil building produces our prairie and woodland soils. Farther toward the north pole it produces the soils of our boreal forests. And in the tropics it produces reddish laterite soils—rich in iron oxides and aluminum hydroxide from the weathering of rocks. All around the world the land is nurtured, refreshed, and renewed.

Soil building helps to hold the whole world together. It helps support creation’s integrity by renewing the face of the earth. It is yet another God-given provision, an expression of God’s bountiful care for the world. If in 1923 Thomas Chisholm had wanted to include this (and the next) provision in his famous hymn about God’s faithfulness, he might have written something like this:

> Summer and winter and springtime and harvest,  
> sun, moon, and stars in their courses above  
> join with all nature in manifold witness  
> to thy great faithfulness, mercy, and love.  
> Air and all elements, marvelously cycling,  
> tuned to the will of thy most loving grace,  
> Building earth’s soils and supporting thy creatures  
> steeped in thy love across earth’s wondrous face.

—adapted from “Great Is Thy Faithfulness,” Psalter Hymnal, 1987, 1988; 556

**Cycling and Recycling in the Biosphere**

Recycling is not a recent invention. It is part and parcel of the way the world works. The whole creation uses, reuses, and uses again the various substances contained in soil, water, and air for maintaining its living and nonliving fabric.

**The Carbon Cycle.** Carbon is the basic raw material from which the carbon-based stuff of life is made. Even as you read this book, you’re contributing to the
process of recycling this remarkable substance. As every living thing—whether human, raccoon, lizard, or gnat—breathes out, carbon dioxide enters the atmosphere. This in turn is taken up by green plants to remake the carbon-based raw material of life that again is transferred to animals and microscopic life that depend on it for food. And sooner or later these consuming creatures return the carbon to the atmosphere as they again breathe out carbon dioxide or as they die and decay.

**The Hydrologic Cycle.** Water too is cycled and recycled—in more ways than by our water-treatment facilities.

- Taken up in the bodies of animals, water is released again and again through breathing, sweating, panting, and waste discharge. It then reenters the atmosphere, surface water, and groundwater through natural means as well as through our sewage treatment plants or septic tanks.
- Taken up by the roots of plants, water is pumped up through bundles of tubing in the roots, stems, and leaves of plants and evaporated or transpired back into the atmosphere. Other water taken up by plants is used together with carbon dioxide to make the stuff of life that, after use by plants and animals as building materials and fuels, is again returned to the atmosphere, surface water, and groundwater.
- The water that goes into the atmosphere from plants, animals, and people joins water evaporated from lakes, streams, soil, and other surfaces. This water eventually forms dew, rain, sleet, or snow that again waters the face of the earth. Some of this water is stored in packs of snow high in the mountains, or in glaciers great and small, that in time will slowly melt and run down to streams and rivers below. Still other quantities of this water are stored in wetlands that will also in time slowly discharge water during times of drought. Other water from rain, sleet, or snow runs off to streams and other surface waters to evaporate to form clouds again. Some percolates through the soil back to the roots of plants. Some slips past roots to enter the groundwater to be pumped by wells for human use or to emerge again as springs and eventually to return to the clouds it came from.

As water is evaporated or transpired to the air, almost everything that was dissolved in it is left behind. This sweet distillation expresses God’s bountiful love for the world. And the clouds—great condensations of distilled watery vapors—rain down this symbol of God’s love again to water the earth. This cycle inspired the writing of Psalm 104, which testifies,

> He makes springs pour water into the ravines;  
> it flows between the mountains.  
> They give water to all the beasts of the field;  
> the wild donkeys quench their thirst.  
> The birds of the air nest by the waters;
they sing among the branches.
He waters the mountains from his upper chambers;
the earth is satisfied by the fruit of his work.

—Psalm 104:10-13

Cycles upon cycles . . . cycles within cycles . . . cycles of cycles—the creation is permeated with cycles. Each of these is empowered by energy poured out from the sun; each is empowered by energy poured out through God’s Son.

The biosphere—the great big envelope of life that embraces the face of the earth—is what we and all God’s creatures inhabit. And all of it relies upon the cycles in creation. The biosphere consists of prairies, oceans, forests, lakes, glades, woodlands, brooks, and marshes. In other words, it is made up of wonderful and highly varied ecosystems.

Waubesa Marsh—the great wetland on which I live—is one of these ecosystems. Like every other ecosystem on earth, this marsh has its plants, animals, soils, and climate:

- sandhill cranes whose six-foot wingspans, seventy-year lifespans, and bugling calls seemingly command the great marsh
- iron bacteria whose smallness would escape our notice except for the oil-like film they create over quiet waters
- deep peat soil at the edge of Lake Waubesa, soil that extends to a dizzying depth of 95 feet (29 m) and holds a record of pollens, seeds, and other remains that define its long history
- the ebb and flow of water that comes in from bubbling springs and falling rain—and then leaves again by means of flowing streams, transpiration through the pores of wetland plants, and evaporation from the many land and water surfaces

All of these features and their interactions, and much more, make up the tapestry of the wetland ecosystem. Though it might not seem so at first glance—particularly for many wetlands—ecosystems are places of immense ecological harmony. Not every feature plays the same tune, but in many ways they are all in tune with each other. Each wetland, forest, prairie, lake, and desert is a kind of symphony.

The biosphere is like a symphony of symphonies. In relationship to each other, all plants and creatures and processes great and small contribute to the ecosystems of which they are a part, maintaining and sustaining the living fabric of the biosphere. They continue to bring forth life from death, cycling and recycling the basic stuff of creation, all powered by the sun.

**Water Purification and Detoxification**

Taking a cue from nature, many water treatment plants in our cities purify water by filtering it through beds of sand in a process called *percolation*. Water that perco-
lates naturally through the soil is purified in the same way, but usually over greater
distances through soil and rock to the groundwater below. By the time it joins with
groundwater that we can pump up to our homes from wells, this percolated water is
usually fit to drink. This same purified water eventually also emerges from springs
that feed wetlands, lakes, and streams.

As noted in the earlier description of the hydrologic cycle, purified water is
returned to the air by evaporation from the surfaces of water, land, and organisms,
and from transpiration through the pores of leaves. We call this process *evapo-
transpiration*, or simply *ET*. ET from plants around the globe is essential for re-
turning water to the atmosphere.

Flowing waters and their living inhabitants also serve as water purifiers. Normal
levels of nutrients that enter streams from the land are processed by stream
life. If not overloaded, this “ecosystem service” is another of God’s important pro-
visions that serves the biosphere well.

In addition, wetlands of many kinds across the globe act as water purification
systems. Wetland plants filter out eroded soil carried by moving water and draw
dissolved chemicals out of the water as they take up nutrients for growth. Mercury
and other toxic heavy metals, for example, are taken up by wetlands and stored in
the peat soils they form below. The result is that wetlands produce clear water for
rivers and streams, thus keeping flowing waters and lakes habitable. Water clarity
allows sunlight to reach aquatic plants, and water purification allows for fish and
other aquatic life to flourish.

There is wonder in all of this! God remarkably provides for the production of
pure water in nature. Contaminated again and again by sediments and dissolved
substances, water is made pure again and again . . . and again!

**Fruitfulness and Abundant Life**
The whole creation is blessed with fruitfulness and abundant life! The home we
call the biosphere is woven into a beautiful fabric of life that envelops earth. This
fabric includes 250,000 species of flowering plants—orchids, grasses, daisies,
maples, sedges, lilies—in amazingly colorful abundance and beauty. All of these
interrelate with water, soil, air, and numerous organisms as they live interdepen-
dently and yet in their own distinctive ways. Beyond these are another quarter
million species, and many more beyond that—all connected in a web of intricate
dynamic interrelationships.

**Millions of Fruitful Species.** When I was in the ninth grade, I learned that
there were about a million different kinds of living creatures. By the time I was
in graduate school, I was taught that there were about 5 million species. Scientists
today estimate that there may be up to 40 million species of living things on earth!
The biodiversity of earth is so great that we are only just beginning to name its
creatures. So far we have named only about 1.5 million species.
It is difficult to convey my utter amazement at the seemingly infinite variety of life on earth. I’m even more amazed that despite the dangers nearly every species faces as it goes through its life cycle, most species persist generation after generation, reproducing according to their kinds. Even in naturally occurring shifts in climate, landscape, forest cover, and other environmental surroundings, species persist from generation to generation because they can adapt to changing conditions. Each generation even has its own variety—hardly any two offspring are exactly alike. Such variety produces individuals that are endowed to adapt to new and unanticipated changes in their environment. God not only provides for each species to continue into future generations but also gives each one the blessed adaptability to flourish in new and changing situations. In other words, life not only persists—it flourishes.

Again we can turn to the psalmist to lead us in praise:

How many are your works, Lord!
In wisdom you made them all;
the earth is full of your creatures.
There is the sea, vast and spacious,
teeming with creatures beyond number—
living things both large and small.

—Psalm 104:24-25

I remember vividly a reading of Genesis 1 by Atibisi, an African palynologist (palynology is the study of pollen and tiny plant fragments found in sediments and peat deposits). She sat on the floor with a group of us scientists and theologians in a meeting room in Malaysia prior to deliberations on the status of God’s creation and our stewardship. She recited this passage with awesome wonder and God-praising joy. This scientist, who used pollen profiles in layered peat deposits to unravel the earth’s record going back to the earliest days of African agriculture, read the passage as an African storyteller. At the conclusion of her reading, this doctor proclaimed, “This is so true; never has there been written a more beautiful and truthful account of the coming of the biological diversity of our Lord’s earth. ‘God said, “Let the waters bring forth swarms of living creatures, and let birds fly above the earth across the expanse of the sky.” . . . And the Lord blessed them and said, “Be fruitful and increase in number and fill the water in the seas, and let the birds increase on the earth”’” (see Gen. 1:20, 22).

God causes the waters to bring forth swarms of creatures, and creation is blessed with fruitfulness. God’s blessing is everywhere evident, awesome, and wondrous!

Habitats. Though God likely made special provisions and arrangements for the animals on Noah’s ark, that ship would not have been the best place for animals to live out their entire lives. Neither is a zoological park or a botanical garden! Thinking of Noah’s ark and zoos and botanical gardens brings to mind the impor-
tance of habitats in the life of earth’s creatures. The ark needed someone like Noah, a zoo needs a zookeeper, and a botanical garden needs a gardener. But a natural habitat needs none of these—only the sustaining provision of the Lord. While a human protector or restorer of habitats can be helpful, habitats are by nature self-sustaining and have existed in some form throughout the histories of the various species present with us on the earth today.

A habitat provides all the requirements needed by a living species to be fruitful and multiply. It allows a species to fulfill its role or “ecological niche” in the biosphere. Remarkably, with the great variety of ecosystems across the face of the earth and through the interrelations of geography, soils, climate, and living creatures, habitats are continuously being sustained and renewed. Often the actions of some species help produce the conditions required by other species. Added to this complexity is flexibility for the requirements of migrating animals. Shorebirds, for example, need a chain of favorable habitats along migration routes that include nesting grounds and—as much as ten thousand miles (16,000 km) away—an over-wintering habitat.

The distribution of living creatures and their habitats around the globe is the subject matter of biogeography. The biogeography of a given species is described by the size and distribution of its supportive habitats. Variations in climate, soils, and many other factors produce biogeographic patterns and structure. Tundra habitats, for example, are found near the poles and high in mountains; deserts are often in the rain shadows of mountain ranges; and deciduous forests flourish in the mid-latitudes of the southern and northern hemispheres.

In their remarkable diversity, patterns, and supportive features, habitats are still another of God’s bountiful provisions for life on earth. This provision—with its patterned structure now so evident in satellite imagery of the earth—beautifully makes God’s glories known.

The Fabric of Energy Relationships. Already we have briefly recognized that our star, the sun, energizes every green plant on earth and all creatures that eat them. The word trophic is from a Greek word that means “to nourish,” and relationships that transfer nourishing energy from one species to another are called trophic relationships. These relationships are extremely important in the networking of living things across the entire world.

Green plants are at the first trophic level, meaning they get their energy directly from the sun. Other parts of God’s creation—including us—receive energy indirectly from the sun by eating plants or by eating animals or other organisms that get their energy from plants. Rabbits are at trophic level 2 because they eat only plants. Bald eagles are at a higher trophic level because they eat fish that eat either plants or other things that eat plants. Everything that is not a green plant depends on eating living things for its energy. God’s creatures produce and consume, multiply and diminish, develop and decompose, each depending directly or indi-
rectly on the sun’s light and each having a particular role in sustaining biospheric integrity.

Why must the plants be green? Because they contain green chlorophyll and are thus the only organisms on earth that can engage in the remarkable process of photosynthesis. Photosynthesis, the foundation of trophic relationships, is the means by which the sun’s energy is captured by green plants for the benefit of all other living things on earth. Energy is the “currency” of creation’s economy, and photosynthesis undergirds the trophic fabric that interlaces all of life.

A great provision by God, then, is (again) the sun. Another is photosynthesis, which converts solar energy into a form that plants and other creatures can use. Still another is the meshwork of trophic relationships that provide all earth’s creatures the energy they need in order to live, reproduce, and flourish.

We—all creatures great and small—depend on these provisions for life. All of these are God’s provisions—for which people pray, lions roar, and ravens cry to God. “The lions roar for their prey and seek their food from God” (Ps. 104:21). And God not only asks Job, “Where were you when I laid the earth’s foundation?” but also inquires, “Do you hunt the prey for the lioness and satisfy the hunger of the lions . . . ? Who provides food for the raven when its young cry out to God . . . ?” (Job 38:4, 39,41a). The answer is clear: God is the provider of all these things.

As we focus on these amazing discoveries, our understanding of the symphonies of the biosphere grows. Along with the symphonies of trophic relationships and photosynthesis, there is even the symphony of “peculiar honors” each creature brings to creation’s King.

Jesus shall reign where’er the sun  
Does its successive journeys run;  
His kingdom stretch from shore to shore,  
Till moons shall wax and wane no more.

Let every creature rise and bring  
Peculiar honors to our King,  
Angels descend with songs again  
And earth repeat the loud Amen.

—Isaac Watts; Psalter Hymnal, 1959, 1976; 399

**Global Circulations of Water and Air**

Because of its 23½-degree tilt, our earth is unequally heated from season to season. The northern hemisphere gets far more solar radiation in summer than in winter. The opposite is true of the southern hemisphere. Besides these seasonal differences there are, of course, daily differences brought about by the rotation of the earth, which provides night and day, coolness and warmth, in a 24-hour cycle.

These seasonal and daily differences drive the flows of water and air from place to place. Constraining and shaping these flows, however, are land masses, ridges,
valleys, and mountain ranges—both above and below sea level. These wonderful movements of water and air combine with all other symphonies in the biosphere to sustain life on earth.

As water and air circulate around the globe, they transport many different things such as carbon dioxide produced by animal and plant respiration, oxygen produced by photosynthesis, and water vapor breathed out by earth’s creatures and evaporated from moist and wet surfaces. Carbon dioxide produced by animal and plant respiration is moved and mixed in the atmosphere in ways that bring it into contact with plants. Then plants take up this vital gas to use it in building the carbon backbone of all plant life and the animals that feed on it. Oxygen produced by photosynthesis is similarly circulated by air and water to supply vital respiration and energy conversion for animals and plants.

Global circulations are also vital movers of water vapor. The water put into the air by ET and evaporation rises to form clouds that in turn blow across land and sea to bring water to other places as rain, sleet, or snow. Global circulations are the ventilation system of the biosphere. Global circulations provide the “breath of life” on a planetary scale and are vital to the watering of God’s great “garden”—the intricately interwoven fabric of life that covers the earth.

If biblical psalmists had known of these global circulations and of creation’s dependence on them, we might have had a psalm in our Bible that went something like this:

You refresh the creatures with vital breath;
you bathe your works in winds of life.
Your providence is everlasting.
Pastures green breathe life to flocks,
to which your sheep return their wind.
Creation is securely held by your grace.
You ventilate the land and aerate your creatures.
Your blowing renews the face of the earth.

Human Ability to Learn from Creation

God endowed us human beings with the ability to learn from creation. The precious gift of being able to learn from the “beautiful book” of nature gives us the ability to observe, behold, investigate, and record in our mind’s eye what we see, feel, hear, and smell. The images and ideas that then take shape in our minds help us plan and do our work in this world to the glory of our Creator. The learning we gain is also continually tested against our experience. We learn from our mistakes, learn from others whose observations and experiments we trust, and revise our models of the world to better represent the reality of the creation we live in.

This ability to learn from creation comes from God. A 1975 study of the Hanunoo tribe in the Philippine Islands, for example, found that an average adult from the tribe could identify 1,600 different species—all without the help of modern
science. These people had knowledge of some 400 more plant species than were previously recorded in a modern systematic botanical survey. What’s more, they also knew how to use these plants for food, construction, crafts, and medicine. And they knew where to find all of them—they knew the plants’ habitats and their ecology. Studies have produced similar findings in other areas of the world, such as Nigeria.2

The ability to build mental models of all aspects of creation—from atoms to plants to habitats to the cosmos—is essential for meaningful human life. These models are nurtured and often refined by our human culture, which is also a gift from God. Early in life we learned the warmth of our family’s love, and we grew with love for our Creator as we learned about life in our community, school, and church family. We now continue enjoying these blessings daily as we also learn in our vocations and from the people and other communities around us.

Along the way we are also often “re-minded” by persons and situations. We may be called to reevaluate what we hold in our minds to be true. When presented with concrete evidence or convincing arguments, we might even change our minds. In divine providence our minds are informed, cultured, and cultivated by God’s world and God’s Word.

People who read God’s Word are “re-minded” that “the earth is the Lord’s, and everything in it” (Ps. 24:1). They are cultured by the teachings of the Bible to learn of the One through whom all things were made, all things hold together, and all things are reconciled to God (Col. 1:15-20). More than that, believers in Christ are encouraged to be like-minded with Jesus Christ, who reconciles all creation to its Creator. Learning to adopt the mind of the Creator, Sustainer, and Reconciler is a joy and task that lasts a lifetime. The Christian culture with which we are infused therefore prays,

May the mind of Christ, my Savior,
live in me from day to day,
by his love and power controlling
all I do and say.

—Kate B. Wilkinson; Psalter Hymnal, 1987; 291

What does it mean to have the mind of Christ, of whom it is written:

The Son is the image of the invisible God, the firstborn over all creation. For in him all things were created: things in heaven and on earth, visible and invisible, whether thrones or powers or rulers or authorities; all things have been created through him and for him. He is before all things, and in him all things hold together. And he is the head of the body, the church; he is the beginning

and the firstborn from among the dead, so that in everything he might have the supremacy. For God was pleased to have all his fullness dwell in him, and through him to reconcile to himself all things, whether things on earth or things in heaven, by making peace through his blood, shed on the cross.

—Colossians 1:15-20

The Creator, in providing for all people, has given us minds and cultural worldviews that allow us to imagine and learn how the world works. We human beings have been given the ability to know God from his created world and from his Word, and to act on that knowledge. This provision of God allows for the adoption of the mind of Christ. This means that we not only learn from creation but also engage in its care, keeping, and reconciliation in harmony with God’s love for the world.

Suggestions for Group Session

GETTING STARTED
The busy pace of modern life easily distracts us from looking closely at God’s provisions for us and for the rest of creation. Many of us get so fully occupied on the treadmill of busyness that we have little time to reflect on God’s amazing gifts. The air we breathe, the rain that waters the land, the new life that breaks forth from tiny seeds—often we take all this for granted. We might never take time to think of the wheat plants whose fruit we enjoy every day, or of the remarkable beauty of the leaves we enjoy in our salads, or of why we never have to rake the leaves that fall in the forest. The greatest gifts are free. God pours out these gifts to each of us—and to all creation—every day and hour. This chapter celebrates these gifts.

Opening
If you are meeting as a group for the first time, begin by each mentioning a part of God’s creation for which you are especially thankful. If you wish, describe a recent experience in which you’ve particularly enjoyed some aspect of the creation, large or small.

Then you might enjoy reading these words from Our World Belongs to God (st. 9):

God formed the land, the sky, and the seas,
making the earth a fitting home
for the plants, animals,
and humans he created.
The world was filled with color, beauty, and variety;
it provided room for
work and play,
worship and service,
love and laughter.

Join together in prayer, thanking God for these and other provisions in creation. Give praise to Jesus Christ as the one through whom all things have been made, hold together, and are reconciled to their Creator (Col. 1:15-20).

To prepare for your discussion of this chapter, you may also wish to read Psalm 104 together.

FOR DISCUSSION
Here are some suggestions for a variety of activities you can do together in your group. You probably won’t have time to do them all, so just choose the questions and activities that you think are most appropriate.

From this chapter
1. This chapter describes seven provisions that God has established for creation. Talk about one or two of these that impressed you most. Or maybe one of these provisions surprised or delighted you because you hadn’t noticed it before or had forgotten about it. What do these provisions tell us about God?

2. What other provisions has God given us in creation? Try to identify one or two more than the seven identified in this chapter. How many provisions do you think there are? Do you think you could describe them all? Explain. (If you have time, you might tie this discussion in with a reading of some of the poetry in Job 38-41.)

From the Bible
1. Read Romans 1:20. What does this verse say about God’s self-revelation in nature?

2. What does Colossians 1:16-17 say about God’s continuing care for creation?

3. Read Psalm 19:1-6. What does this passage say about creation’s response to God?

From your experience
1. How does God express love for the world? On a large sheet of paper, make a list of all the ways in which God shows love to the world. You may want to divide into small groups of three or four persons to come up with ideas. Think of the teachings of the Bible and about the evidence we see in creation of God’s love for the world. Confine your list to the left half of your sheet of paper.
2. How might we image God’s love for the world? On the right side of your paper, jot down ideas on how we can act to show God’s love and care for creation. Try to pair each idea with a corresponding item in the left column.

**CLOSING**

In prayer as a group, with various members contributing if they wish, give thanks for God’s creation, provisions, love, and care for the world. Conclude with praise to God for sending Jesus Christ, God’s one and only Son, our Savior, in whom all things hold together and are reconciled to God (Col. 1:17, 20).