Ecoregions of New England Ecoregions denote areas of general similarity in ecosystems and in the type, quality, and 5 level III ecoregions and 40 level IV ecoregions in the New England states and many Commission for Environmental Cooperation Working Group, 1997, Ecological regions of North America

the research, assessment, management, and monitoring of ecosystems and ecosystem components. By recognizing the spatial differences in the capacities and potentials of ecosystems, ecoregions stratify the environment by its probable response to disturbance (Bryce and others, 1999). These general purpose regions are critical for structuring and implementing ecosystem management strategies across federal agencies, state agencies, and nongovernment organizations that are responsible for different types of resources within the same geographical areas (Omernik and others, 2000).

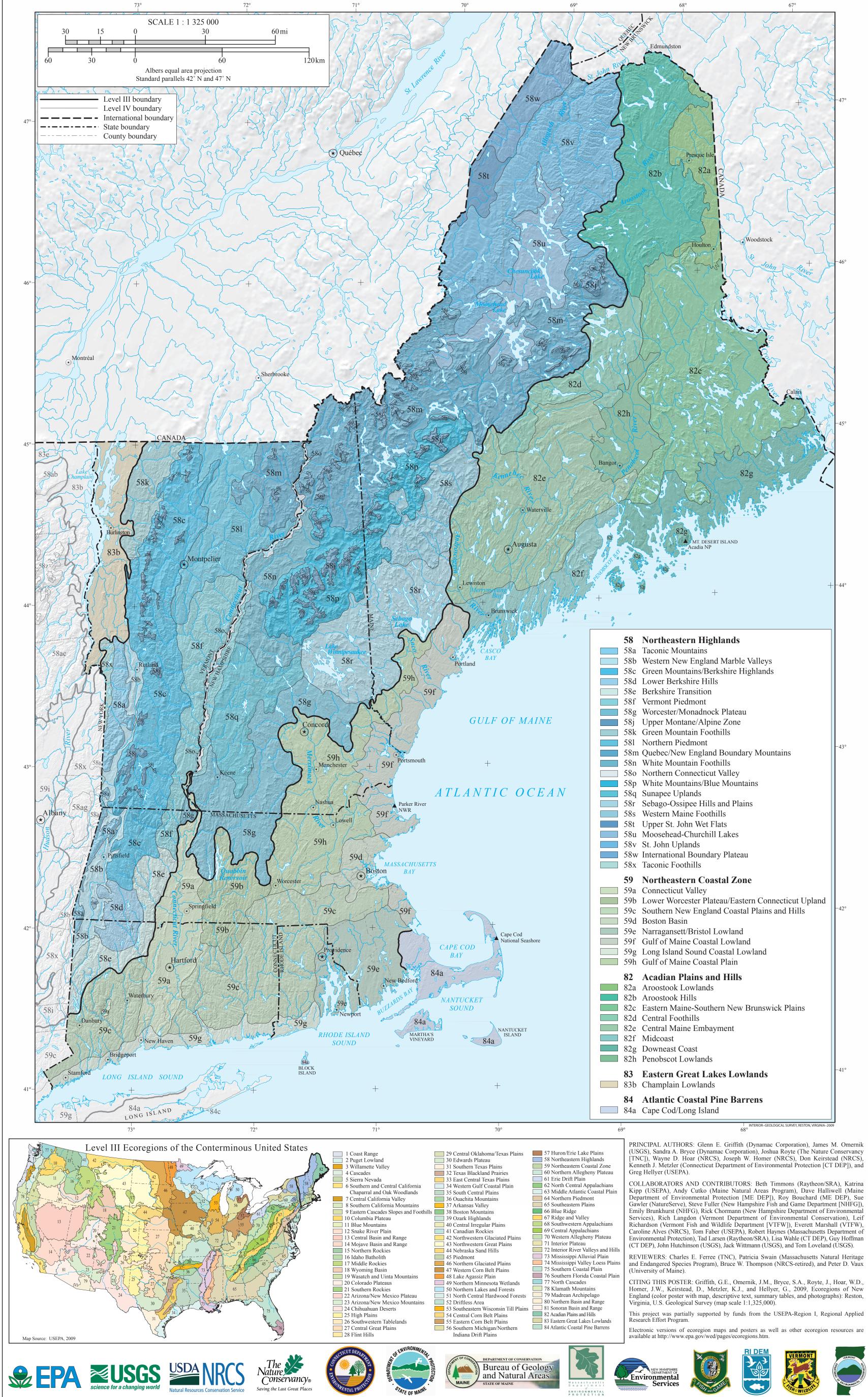
subdivides an earlier national ecoregion map that was originally compiled at a smaller scale and mapping methodologies applied to develop the most common ecoregion-type (USEPA, 2009; Omernik, 1987). The approach used to compile this map is based on the frameworks, including those developed by the USDA–Forest Service (Bailey and others, premise that ecological regions can be identified through the analysis of the spatial patterns 1994, Cleland and others 2007), the USEPA (Omernik, 1987, 1995), and the NRCS (U.S. and the composition of biotic and abiotic phenomena that affect or reflect differences in Department of Agriculture–Soil Conservation Service, 1981, U.S. Department of ecosystem quality and integrity (Wiken, 1986; Omernik, 1987, 1995). These phenomena Agriculture-Natural Resources Conservation Service, 2006). As each of these frameworks Omernik, J.M., 2004, Perspectives on the nature and definition of ecological regions: Environmental include geology, physiography, vegetation, climate, soils, land use, wildlife, and hydrology. is further refined, their differences are becoming less discernible. Collaborative ecoregion The relative importance of each characteristic varies from one ecological region to another projects, such as this one in New England, are a step toward attaining consensus and Omernik, J.M., Chapman, S.S., Lillie, R.A., and Dumke, R.T., 2000, Ecoregions of Wisconsin:

regardless of the hierarchical level. A Roman numeral hierarchical scheme has been adopted for different levels of ecological Literature Cited: regions. Level I is the coarsest level, dividing North America into 15 ecological regions. Level II divides the continent into 50 regions (Commission for Environmental Cooperation Working Group, 1997). At level III, the continental United States contains 104 ecoregions and the conterminous United States has 84 ecoregions (United States Environmental Protection Agency [USEPA], 2009). Level IV is a further subdivision of level III ecoregions. Explanations of the methods used to define the USEPA's ecoregions are given in Omernik (1995, 2004), Omernik and others (2000), and Gallant and others (1989). New England contains low coastal plains, rocky coasts, river floodplains, alluvial valleys, glacial lakes, forested mountains, and alpine peaks. Ecological diversity is great. There are

quantity of environmental resources; they are designed to serve as a spatial framework for continue into ecologically similar parts of adjacent states or provinces. National Health and Environmental Effects Research Laboratory (Corvallis, Oregon), U.S. Department of Agriculture (USDA)–Natural Resources Conservation Service (NRCS), and several state agencies of Maine, New Hampshire, Vermont, Massachusetts,

The New England ecoregion map was compiled at a scale of 1:250,000. It revises and Reaching that objective requires recognition of the differences in the conceptual approaches

consistency in ecoregion frameworks for the entire nation. Bailey, R.G., Avers, P.E., King, T., and McNab, W.H., eds., 1994, Ecoregions and subregions of the United States (map) (supplementary table of map unit descriptions compiled and edited by McNab. W.H. and Bailey, R.G.): Washington, D.C., U.S. Department of Agriculture–Forest Service, scale 1:7,500,000. Brvce, S.A., Omernik, J.M., and Larsen, D.P., 1999, Ecoregions – a geographic framework to guide risk characterization and ecosystem management: Environmental Practice, v. 1, no. 3, p. 141-155. Cleland, D.T., Freeouf, J.A., Keys, J.E., Jr., Nowacki, G.J., Carpenter, C., and McNab, W.H., 2007,



Connecticut, and Rhode Island. The project is associated with an interagency effort to

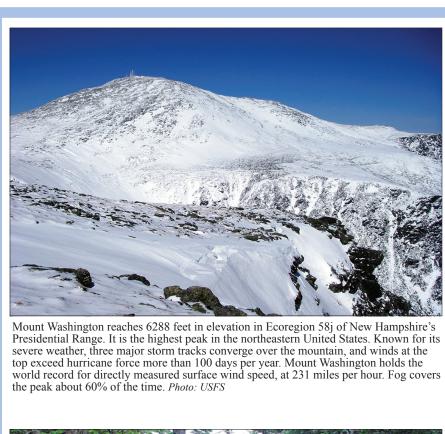
Ecological subregions - sections and subsections of the conterminous United States: Washington,

- toward a common perspective: Montreal, Commission for Environmental Cooperation, 71 p. This poster is part of a collaborative project primarily between USEPA Region I, USEPA Gallant, A.L., Whittier, T.R., Larsen, D.P., Omernik, J.M., and Hughes, R.M., 1989, Regionalization as a tool for managing environmental resources: Corvallis, Oregon, U.S. Environmental Protection Agency, EPA/600/3-89/060, 152 p. U.S. Geological Survey (USGS)–Earth Resources Observation and Science (EROS) Center, McMahon, G., Gregonis, S.M., Waltman, S.W., Omernik, J.M., Thorson, T.D., Freeouf, J.A., Rorick, A.H., and Keys, J.E., 2001, Developing a spatial framework of common ecological regions for the conterminous United States: Environmental Management, v. 28, no. 3, p. 293-316. develop a common framework of ecological regions (McMahon and others, 2001). Omernik, J.M., 1987, Ecoregions of the conterminous United States (map supplement): Annals of the Association of American Geographers, v. 77, no. 1, p. 118-125, scale 1:7,500,000. mernik, J.M., 1995, Ecoregions - a framework for environmental management, in Davis, W.S. and Simon, T.P., eds., Biological assessment and criteria-tools for water resource planning and decision making: Boca Raton, Florida, Lewis Publishers, p. 49-62. Management, v. 34, Supplement 1, p. s27-s38.

Transactions of the Wisconsin Academy of Sciences, Arts, and Letters, v. 88, p. 77-103. U.S. Department of Agriculture-Natural Resources Conservation Service, 2006, Land resource regions and major land resource areas of the United States, the Caribbean, and the Pacific Basin: Washington, D.C., U.S. Government Printing Office, Agriculture Handbook 296, 669 p. + map. . Department of Agriculture-Soil Conservation Service, 1981, Land resource regions and major land resource areas of the United States: Agriculture Handbook 296, 156 p. U.S. Environmental Protection Agency, 2009, Level III ecoregions of the continental United States revision of Omernik, 1987): Corvallis, Oregon, USEPA – National Health and Environmental Effects Research Laboratory, Map M-1, various scales. , U.S. Department of Agriculture-Forest Service, General Technical Report WO-76, scale Wiken, E., 1986, Terrestrial ecozones of Canada: Ottawa, Environment Canada, Ecological Land

Classification Series no. 19, 26 p.

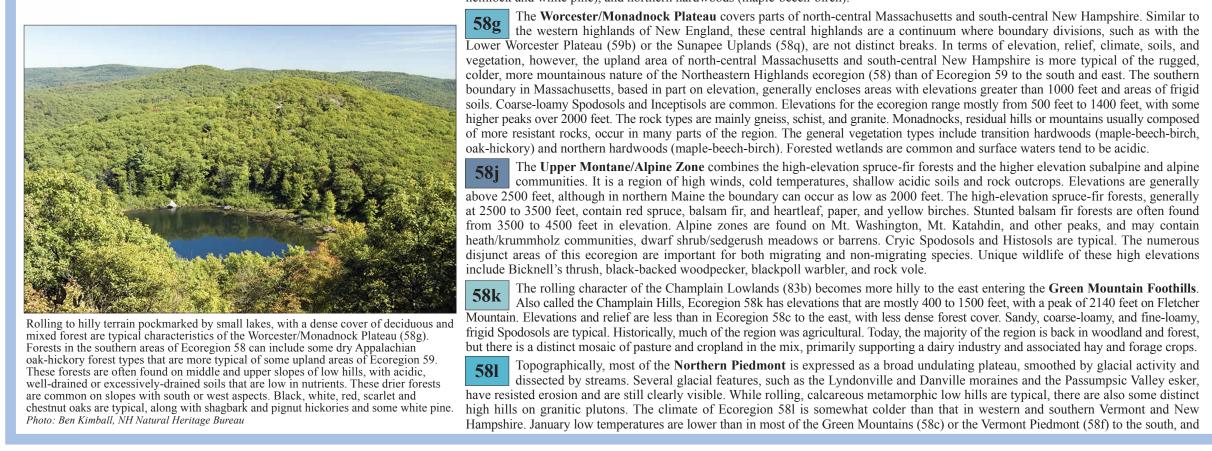
COLLABORATORS AND CONTRIBUTORS: Beth Timmons (Raytheon/SRA), Katrina mily Brunkhurst (NHFG), Rick Chormann (New Hampshire Department of Environmental

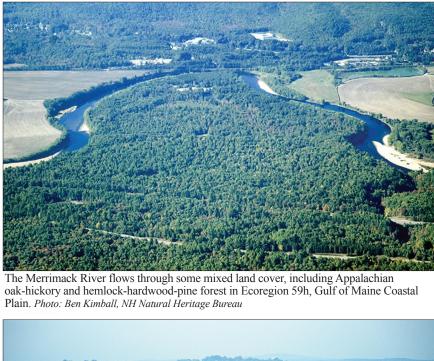


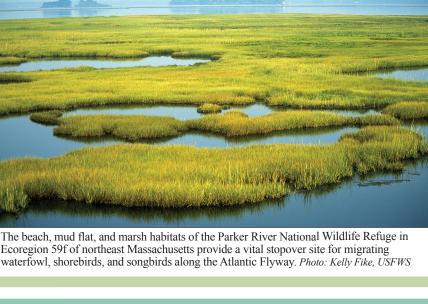


pruce grouse, dark-eyed junco, bay-breasted warbler, blackbacked woodpecker,

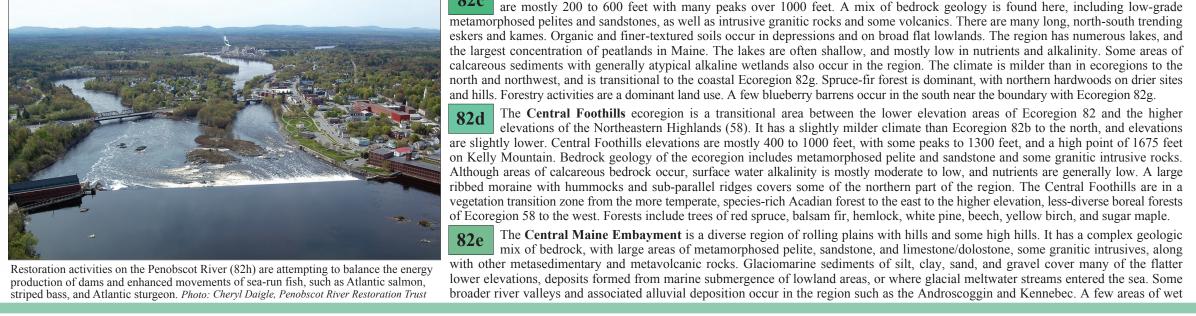


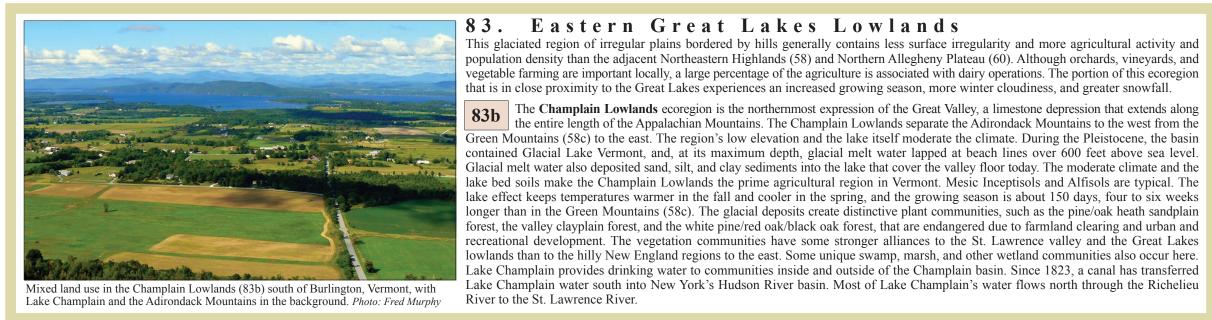












58. Northeastern Highlands The Northeastern Highlands ecoregion covers most of the northern and mountainous parts of New England as well as the Adirondacks in New York. It is a relatively sparsely populated region compared to adjacent regions, and is characterized by hills and mountains, a most



the forest cover that includes northern hardwoods (sugar maple, birch, beech) with the addition of boreal elements such as balsam fir a spruce. The region also contains a higher density of lakes than the Vermont Piedmont (58f) to the south, but similar to Ecoregion 58 calcium-rich soils occur. Coarse-loamy, frigid Inceptisols and Spodosols are typical. In the Northern Piedmont, human populations are less than in southern or western Vermont, but a strong cultural identity accompanies the region's pastoral character. Occuring along the Canadian border, the Quebec/New England Boundary Mountains ecoregion extends from northeastern Vermont across northern New Hampshire and into northwestern and north-central Maine. Its open low mountains are densely plant species in Maine and New Hampshire. is restricted to four islands in the Caribbean. forested, and it has one of the coldest climates in New England. The region contains numerous large lakes and ponds and is not as steeply Photo: Ben Kimball, NH NHB sloping or as high in elevation as the White Mountains/Blue Mountains (58p) to the south where few lakes occur. Compared to Ecoregion 58p, the Boundary Mountains have broader river valleys, more wetlands, more complex geology with some phyllites and slates along with intrusions of granite, somewhat less acidic surface waters, and a more boreal vegetation pattern. Soils are mostly loamy and coarse-loamy, frigid Spodosols, formed typically in dense glacial till. The low-grade pelite bedrock weathers to form more silty soils. Lower elevation forests include northern hardwoods as well as spruce and fir forests on cooler lowland slopes. High elevation spruce-fir forests occur above 2500 feet, most of which are delineated in Ecoregion 58j. Woody species richness increases somewhat in the eastern portion of the region. The human population here is relatively low for New England. Timber production, recreation, and wildlife habitat are major land uses. The White Mountain Foothills ecoregion of New Hampshire is a transitional area between Ecoregions 58q, 58p, 58m, and 58l, and consists of well-dissected rolling hills and open low mountains. It has lower elevation and less relief than Ecoregion 8p, and a few more northerly characteristics in climate, soil, and vegetation than Ecoregion 58q. Coarse-loamy, frigid Spodosols are typical. Elevations are mostly 900 to 2000 feet, but range from 500 to over 3000 feet. Mt. Cardigan (3115 feet) and Smarts Mountain (3240 feet) are high points in the southern end of the region. Granite, granodiorite, and metavolcanic rocks are typical, covered by northernmost part of Ecoregions 58j and is found in northern boreal forests. Although shallow, stony soils. A few small lakes occur in the region, but somewhat less than in Ecoregion 58q to the south. Surface waters have 58m) provides sacred ground and lower nutrients and alkalinity than Ecoregions 58f and 58l to the west. Northern hardwoods of sugar maple, American beech, and yellow recreational opportunities to residents of hare are the main prey. The lynx is at the birch are common, with lowland spruce-fir and a few patches of high elevation spruce-fir forest. The narrow Northern Connecticut Valley ecoregion contains primarily the alluvial low terraces and floodplain of this riverine the highest mountain in Maine (5267 feet) snowfall in recent decades has allowed the region. It has some glacial outwash and glacial lake deposits that abut the lower slopes of adjacent hills composed of glacial till and the terminus of the Appalachian Trail. more aggressive bobcat to displace the lynx typical of the bordering ecoregions 581 and 58f. Areas of glacio-fluvial deposits tend to be coarser sands and gravels, while some of the Photo: B. Monkman glacio-lacustrine deposits from glacial Lake Hitchcock are finer-textured. Inceptisols and Entisols are common, with mesic soils in much of the region, and some frigid soils in the north. The Northern Connecticut Valley has a milder climate than the surrounding hilly ecoregions, and its vegetation includes more southerly species. This greatly altered landscape is dominated by agricultural, urban and residential, and transportatation uses, and the river regime has been altered by dams and channel modification. Some wetland and riverside communities contain several rare plant and animal species. The White Mountains/Blue Mountains ecoregion is one of the most rugged in New England. Ecoregion 58p differs from the Quebec/New England Boundary Mountains (58m) in having higher elevations, steeper slopes, more narrow valleys, more areas of bedrock outcrop, fewer wetlands, more acidic surface waters, and a more transitional (somewhat less boreal) vegetation pattern. The 📲 ecoregion includes not only the White Mountains and Blue Mountains but also the Mahoosuc Range, Pilot Range, and Pliny Range. The mostly acidic uplands include some high elevation spruce-fir, widespread northern hardwood-conifer forests, and at lowest elevations some transition hardwood-conifer forests. Geology includes Mesozoic and Paleozoic igneous and metamorphic rocks of granite, syenite, rhyolite, granodiorite, quartzite, and schist. Coarse-loamy, frigid Spodosols and Inceptisols are typical. Surface waters are acidic and low (Gavia immer) is primarily inland lakes with Mountain Foothills (58n) is characterized by in nutrients. Elevations are generally 1000 feet to over 3000 feet, with inclusions of higher peaks occuring in the Upper Montane/Alpine undeveloped shorelines and abundant fish subalpine heath/krummholz and rocky bald Zone of Ecoregion 58j. The Sunapee Uplands ecoregion of New Hampshire represents a transition from Ecoregion 58g in the south to the colder northern mats to hold the nest and avoid egg-eating of trees found near or at timberline. Heaths regions. It consists of open low mountains, with lower elevation and less relief than in Ecoregion 58p to the north, but more than in predators. Lead poisoning from lead sinkers include sheep laurel and Labrador tea. Ecoregion 58g to the south. With numerous, rolling, rocky hills and mountains, elevations are mostly 1000 to 2000 feet, but range from 500 to and jigs has been a major cause of death for *Photo: Ben Kimball, NH Natural Heritage Bureau* over 3000 feet. Monadnock Mountain anchors the southern end of the region at 3165 feet. Granite and granodiorite rocks are common with adult loons in New England. Photo: USFWS shallow, stony frigid soils, mostly coarse-loamy Spodosols. The uplands are dissected by numerous streams, and small lakes dot the landscape. Surface waters have lower nutrients and alkalinity than Ecoregions 58f and 58l to the west and north. Northern hardwoods of sugar maple, American beech, and yellow birch are common, along with hemlock and some oak forests. Some lowland and montane spruce and fir also occur. The **Sebago-Ossipee Hills and Plains** ecoregion is a transitional area between the northern reaches of Ecoregion 59 and the more mountainous Northeastern Highlands (58). It contains some rugged hills and isolated mountains scattered on a landscape of rolling plains that are dotted with numerous lakes and wetlands. This "lake region" includes Lake Winnepesaukee, the largest lake in New Hampshire. Sandy glacial till is common, along with some glacial outwash kames, eskers, and deltaic deposits. Well-drained, sandy loam and loamy sand soils are typical. Relative to other parts of Ecoregion 58, these are somewhat warm and dry soils. Most of the region has soils with a frigid temperature regime, although in New Hampshire, some mesic soils occur in the southwest part of the region. The ecoregion is in a vegetation transition zone from warm temperate to cool temperate and boreal. Hemlock-hardwood-pine and some northern hardwood-conifer forest types occur. It mostly lacks the Appalachian oak-pine found in Ecoregion 59h to the south. On some glacial outwash deposits, fire-dependent pitch pine-scrub oak woodlands occur. In Maine, several northern species reach their southern limits near Sebago Lake. The Western Maine Foothills ecoregion is hillier, has higher relief and elevations, more northern hardwoods and less oak/white pine, and fewer lakes than does Ecoregion 58r to the south. It has lower elevations and less relief than Ecoregion 58p the northwest. The western boundary of the region with Ecoregion 58p is generally about 1000 feet, a transitional zone from temperate The Chesuncook soil series, the state soil of forest species to more boreal species. Many of the peaks are near or above 2000 feet. Woody species richness is less in this region Maine, is a Spodosol of the northern forested compared to ecoregions to the east or south. Soils are typically coarse-loamy, frigid Spodosols. Woodland and forest land uses, along regions. It is typically very deep, moderately with recreation and tourism, are important in the region, and there is little cropland and pasture compared to Ecoregion 82e to the east. The Upper St. John Wet Flats ecoregion has some similarities to the International Boundary Plateau (58w), although there is less relief here, and more open and forested wetlands. The majority of the ecoregion extends west and southwest into Quebec, Canada. oraine leff dense highly d of the year. Loamy, frigid Spodosols, Inceptisols, and Histosols occur. Black spruce grows slowly in the cold, wet, and mossy flats. Beaver meadows, sedge fens, and northern white cedar swamps occur. Low hills support mid-successional forests of poplar, birch, and aspen. The **Moosehead-Churchill Lakes** ecoregion is an area of rolling plains with a few low hills and numerous large lakes Moosehead and Chesuncook lakes in the southern part of the region drain to the Kennebec River and West Branch Penobscot River respectively, while the northern lakes drain to the Allagash River. At about 35 miles long and 10 miles wide, Moosehead Lake is the largest lake in New England east of Lake Champlain. While there are some similarities in ecological characteristics with Ecoregion 58v, the Moosehead-Churchill Lakes region has lower elevations and less relief than the surrounding Ecoregions 58v and 58m, and slightly milder annual temperatures. Elevations are mostly 900 to 1400 feet with 300 feet of relief. There are some soil differences from hillier uplands in adjacent ecoregions, with more poorly-drained soils. Some areas of the region have intensive forestry activities, while Some landscapes in Ecoregion 58f, 58k, and Sugar maple and other maple trees are real estate and timber investment organizations have subdivision and resort development plans in southern parts of the region. Rolling uplands and open high hills on a well-dissected landscape characterize the St. John Uplands. The eastern boundary dairy farms than in other parts of the U.S., months in the labor-intensive process, with generally occurs at the 1000-foot elevation contour, and elevations in most of the region are 1000 to 2000 feet, with some proper livestock grazing management is freezing nights and warm days needed for peaks reaching 2400 feet. It has higher elevations and more relief than the Aroostook Hills (82b) to the east, with more boreal and fewer and reactions and are sources of temperate species. The region is more hilly, with greater relief, and some higher elevations than Ecoregion 58w to the west. Typical soils sediment, nutrients, and bacteria to surface and New York. Photo: Branon Farms, VT include loamy, frigid Spodosols. Surface waters are slightly to moderately buffered and drain mostly to the Saint John and Allagash waters. Photo: Tim McCabe, NRCS rivers that flow north through the region. The Saint John River then flows east through New Brunswick to the Bay of Fundy. The International Boundary Plateau has a rolling plateau surface, mostly 1000 feet to 1600 feet in elevation, with few lakes and one of the coldest climates in Maine. The region has some similarities to Ecoregion 58v to the east, although Ecoregion 58w is slightly less hilly with less relief. It has more relief and fewer wet flats than Ecoregion 58t to the south. Similar to the Upper St. John Wet Flats (58t), there are areas of stagnation moraines and some wetlands, including ribbed fens and other peatlands. Loamy and coarse-loamy, frigid Spodosols are common. Compared to ecoregions further east or south, this region has relatively low species richness. The spruce-fir forest contains red spruce, black spruce, and balsam fir, with some sugar maple and yellow birch. Similar to ecoregions 58t and most of 58v, forestry is a dominant land use and there are few or no permanent settlements. Located between the Hudson Valley (59i) of New York and the Taconic Mountains (58a), the **Taconic Foothills** ecoregion is transitional between lowland and highland. The rolling hills contain a mosaic of woodland, pasture, and some minor cropland. Elevations of the small portion of the region in Vermont are mostly 350 to 1000 feet. Bedrock is composed of metamorphosed The presence of brook trout (Salvelinus The largest wild mammal in New England, a mudstones, slate, phyllite, and schist, with some minor lenses of limestone. Loamy and coarse-loamy, mesic Inceptisols are common. *fontinalis*) in a watershed indicates excellent bull moose (Alces alces) can weigh more Appalachian oak-hickory forests are typical on the lower and drier slopes, with some beech-maple mesic forests. Especially in the water quality, as they require clean, cold, than one thousand pounds and stand 6 feet at southern part of the region in New York, presettlement forests had a greater proportion of white oak, black oak and hickories, and forests well-oxygenated water. They have disappeared from many waters that have disappeared from many waters that have once dominated by American chestnut. The present dominance of chestnut oak, red maple, white pine, and sugar maple is likely due to been affected by dams, culverts, recolonization after farming and timber cutting. Although oaks grow as far north as the Champlain Lowlands (83b), northern hardwood sedimentation, chemical pollutants, or habitat willows, birches, aspens, maples, fir, and forests become more prominent in the northern parts of Ecoregion 58x.

9. Northeastern Coastal Zone The Northeastern Coastal Zone ecoregion covers most of southern New England and the coastal areas of New Hampshire and southern Maine. Its landforms include irregular plains and plains with low to high hills. Appalachian oak forests and northeastern oak-pine forests are the

wever, contains considerably less surface irregularity and greater concentrations of human population than Ecoregion 58. Although attempts were made to farm much of the Northeastern Coastal Zone after the region was settled by Europeans, land use now mainly consists of prests, woodlands, and urban and suburban development, with only some minor areas of pasture and cropland. The **Connecticut Valley** of southern New England is a distinctive ecoregion where the boundaries are easily defined by bedrock geology and physiography. The topography is mostly level to rolling, with some higher hills. Although the dominant geology is nentary, such as arkose, siltstone, sandstone, shale, and conglomerate, tilted basalt layers have formed distinctive ridges in many parts f the valley. The Jurassic-age Holyoke basalt results in a prominent north-south trending ridge from southern Connecticut into central sachusetts, which then curves to trend east-west in the Holyoke Range. Surficial geology deposits in the valley are relatively thick and nclude outwash, alluvial, and lake bottom deposits, in contrast to the mostly till deposits of adjacent ecoregions. With a climate milder than that found on surrounding uplands, and with relatively rich soils and level terrain, the valley has long attracted human settlement. Urban and suburban land cover is common, along with cropland and pasture, and deciduous forest mostly on the ridges. The forests contain central and transition hardwoods, and floodplain forests of silver maple and cottonwood occur. Surface water nutrients and alkalinity in he ecoregion are relatively high. A small disjunct area of the ecoregion occurs in the Pomperaug Valley of western Connecticut. The Lower Worcester Plateau/Eastern Connecticut Upland ecoregion is generally higher in elevation than the adjacent Southern New England Coastal Plains and Hills (59c). Its relief of 300 to 500 feet is relatively moderate compared to other upland or highland areas nearby in Ecoregion 58. The same north-south trending geologic belts that are found in Ecoregion 58g to the oak-hickory and hemlock-hardwood-pine forest in Ecoregion 59h, Gulf of Maine Coastal north occur here; mostly gneiss, schist, and granofels. The soils developed primarily on glacial till in the upland areas, and on stratified deposits of sand, gravel, and silt in the valleys. Coarse-loamy, mesic Inceptisols are typical upland soils. The major forest types are transition hardwoods (maple-beech-birch, oak-hickory) with some central hardwoods (oak-hickory). Lakes, ponds, and acidic wetlands are common, and some exceptional freshwater marshes occur along the Quaboag and Brookfield rivers. Surface water alkalinity is mostly moderate, with small areas of low values. The **Southern New England Coastal Plains and Hills** ecoregion covers much of Connecticut. Rhode Island, and southeastern Massachusetts, and is diverse in its characteristics and habitats. The landforms of the ecoregion are irregular plains with low hills and some open high hills with relief of about 100 to 400 feet. Elevations range up to about 1000 feet, with the highest elevations found in western Connecticut. Bedrock types are mostly granites, schist, and gneiss, although some soft marble occurs in western onnecticut. Surface materials are mostly glacial till, with some stratified deposits in valleys. Soil patterns are complex and progeneous where the numerous, small, till-covered bedrock hills rise above the valleys and general level of outwash. Coarse-loamy and sandy, mesic Inceptisols and some Entisols are typical. Historically, forests were dominated by a mix of oaks. American chestnut,

ickories, other hardwoods, and some hemlock and white pine. As with many other areas of New England, these forests were cleared, ther for agriculture and grazing or for the production of charcoal. A variety of dry to mesic successional oak and oak-pine forests cover region today, along with some elm, ash, and red maple that are typical of southern New England's forested wetlands. An inner **Boston Basin** occurs at a geologic and topographic break that encloses an area composed of the Cambridge argillite and Roxbury conglomerate rock units. Low hills, such as the Blue Hills in the south and the escarpment from Waltham to Lynn the north, mark this basin's rim. The larger Boston Basin ecoregion delineated here also includes the hilly urbanized ring and some utlying lowlands occurring on different metamorphic and volcanic rock types. The area is drained primarily by the Neponset, Charles, Mystic and Saugus rivers, and there are many urban ponds, lakes, and reservoirs. The basin is not a level plain but has low rolling topography, with stratified drift surrounding drumlins and till-covered bedrock hills. The few areas of flat ground such as the glacial clay areas on the outskirts of Cambridge, Belmont, and Arlington were once intensively cultivated vegetable fields and greenhouses, but now almost the entire region is urban and suburban land. Estuaries, bays, and islands occur along the eastern edge.

The Narragansett/Bristol Lowland ecoregion includes the Narragansett Basin, a distinct unit of Pennsylvanian-age sedimentary rock (sandstone, graywacke, shale, conglomerate) that stands in contrast to the surrounding igneous and metamorphic rocks. The ecoregion is more extensive than the Narragansett Basin proper, extending south across some granitic rocks to Buzzards Bay. Bedrock outcrops are not common here, however, with an extensive covering of glacial till and outwash plains deposits. The western and northern boundaries of the ecoregion are tied closely to geology and topography, while the southeastern boundary with Around Boston, urban land covers almost Cape Cod (84a) coincides more with changes in vegetation and soils. This lowland ecoregion has flat to gently rolling irregular plains all of Ecoregion 59d. Urban sprawl occurs of Ecoregion 59h are fire-prone and have an with most elevations under 200 feet. Coarse-loamy and sandy, well-drained, mesic Inceptisols and Entisols are common soils on the low in several other parts of the Northeastern open canopy, stunted trees, and shallow soils. hills, ridges, outwash plains, kames, and eskers, with some poorly drained Inceptisols formed in glacial till. Histosols also occur. The vegetation is varied, with some of the oak-hickory and oak-pine forests having coastal influences. Land cover is mostly mixed forest with numerous wetlands and small areas of cropland and pasture. Cranberry bogs are abundant. The various types of wetlands provide important recharge to aquifers in the region. Surface water alkalinity is variable, with some acidic areas. The Gulf of Maine Coastal Lowland ecoregion is a 10- to 20-mile wide coastal strip, stretching from Casco Bay in Maine to Plymouth Bay in Massachusetts. It is mostly an arcuate embayment type of coast, a different form from coastal ecoregions 82f and 82g to the northeast. Extensive glacial sand, silt, and clay deposits blanket this region, with a coastal pattern typified by plutonic capes and intervening sand beaches that front the region's largest salt marshes. The ecoregion has relatively low relief, and elevations are mostly from sea level to 250 feet. Mt. Agamenticus, west of Ogunquit, Maine, is the atypical high spot at 691 feet. Bedrock geology consists mostly of metasedimentary rocks, intruded by several Paleozoic and Mesozoic plutonic bodies. Soils have a mesic temperature regime in most of the region, although frigid soils occur in the Maine portion. The vegetation mosaic includes white oak and red oak forests, some isolated chestnut oak woodlands, extensive post-settlement white pine, pitch pine in sandy areas, pitch pine bogs, some Atlantic white cedar swamps, Mixed land use in the Connecticut Valley High numbers of white-tailed deer (Odocoileus red maple swamps, and *Spartina* saltmarsh. The vegetation contains some southern hardwood species (e.g., shagbark hickory, flowering (Ecoregion 59a) of Massachusetts. *Photo: virginianus*) in Ecoregion 59 can alter the dogwood, and chestnut oak) that reach the northern limit of their range within this ecoregion. There are also some subarctic maritime Bruce Molnia, USGS species that reach their southern limit in Ecoregion 59f, such as crowberry, golden heather, and oysterleaf. The region's forests and farms are being rapidly converted to residential developments and bedroom communities of larger nearby cities. The Long Island Sound Coastal Lowland ecoregion is the coastal strip occurring in southern Connecticut and Rhode Island that borders Long Island Sound and Block Island Sound. It includes low-elevation rolling coastal plain, tidal marshes, estuaries, sandy dunes and beaches, and rocky headlands. This ecoregion has one of the mildest climates of New England. The coastal hardwood forests contain black, red, and white oaks, hickories, and black cherry. Dense thickets of vines and shrubs such as catbrier, greenbrier, and poison ivv are common. Some Southeastern flora and fauna species of the Piedmont and coastal plain reach their northern limit in this ecoregion, including holly, post oak, sweetgum, and persimmon. On coastal headlands, pitch pine and post oak occur, while some scarlet oak and sassafras stand on stabilized dunes. Parts of the ecoregion are highly urbanized, especially from New Haven westward. The **Gulf of Maine Coastal Plain** ecoregion occupies a more inland position than Ecoregion 59f to the east. It has higher elevations, greater relief, and less maritime climate than the Gulf of Maine Coastal Lowland (59f). Ecoregion 59h is less hilly Cranberries in Ecoregion 59e are often grown Numbers of the New England cottontail with more rolling topography and lower elevations than Ecoregion 58g to the west, and has a greater human population density. Glacial on drained bog soil. Water is used for rabbit (*Sylvilagus transitionalis*) are rapidly drumlins are common in the ecoregion, while in the Merrimack River valley, glacial outwash and glacial lake deposits occur. collection and for protection from freezing decreasing as its thicket and early successional Coarse-loamy and sandy-skeletal, mesic Inceptisols and Entisols are typical in most of the region, while frigid Spodosols are common in and dessication in winter. Massachusetts forest habitat is altered. Its range in southern the Maine portion. Ecoregion 59h has more pine in the forest mosaic than Ecoregion 59c to the south.

natural vegetation types, with mostly mesic Inceptisol soils. Similar to the Northeastern Highlands (58), the Northeastern Coastal Zone contains relatively nutrient-poor soils and concentrations of continental glacial lakes, some of which are sensitive to acidification. This ecoregion,

82. Acadian Plains and Hills This mostly forested region, with dense concentrations of continental glacial lakes, is less rugged than the Northeastern Highlands (58) to the west and considerably less populated than Ecoregion 59 to the south. Vegetation here is mostly spruce-fir on lowlands with maple, beech, and birch on the hills. Soils are predominantly frigid Spodosols. By contrast, the forests in the Northeastern Coastal Zone (59) to the south are mostly Appalachian oak or northeastern oak-pine, and the soils are generally mesic Inceptisols and Entisols.

The **Aroostook Lowlands** ecoregion has lower elevations than adjacent Maine ecoregions, with almost no large lakes or ponds. Elevations are generally 400 to 800 feet, with some higher hills. The region has a milder climate than ecoregions 82b, 58v, or 8w. Calcareous bedrock, till, and soils are typical of the ecoregion, developed from the Carvs Mills Formation of interbedded pelite and mestone/dolostone. The glacial till and soils are relatively deep, with fine-loamy and coarse-loamy, frigid Spodosols and Inceptisols. Surface water alkalinity and nutrient levels are high. There are some circumneutral cedar swamps and weakly calcareous fens. There is a elatively high woody species richness in this ecoregion compared to the other northern Maine ecoregions (82b, 58v, and 58w). It also ontains some calciphiles that do not occur elsewhere in Maine, such as alpine milk-vetch, Fries' pondweed, Anticosti aster, and hoary willow. Land cover in the region has a high percentage of cropland, mostly of potatoes, but also some oats, hay, peas, buckwheat, and roccoli. More open-land fauna species occur here than in adjacent forested ecoregions. The climate, terrain, and other characteristics of the Aroostook Hills ecoregion are intermediate between those of Ecoregion 58v to the west and Ecoregion 82a to the east. It is a region of plains with hills, with elevations mostly 600 to 1000 feet, with some higher peaks. Mt. Chase is an atypical high point at 2440 feet. Spruce-fir and northern hardwoods are common, and the forests are e temperate and diverse than in the hillier, more boreal Ecoregion 58 to the west. The forest habitat diversity is also affected by the gion's geologic variability. The geology consists mostly of weakly metamorphosed pelite, sandstone, and conglomerate, with some calcareous rocks. Smaller areas of metavolcanic rocks and guartz diorite plutons also occur. A moderate number of lakes and peatlands occur in the Aroostook Hills. Eccentric bogs and concentrically patterned raised bogs reach their western limit in Maine within this ecoregion. The **Eastern Maine-Southern New Brunswick Plains** have a generally low-relief landscape, but some hills occur. Elevations

are mostly 200 to 600 feet with many peaks over 1000 feet. A mix of bedrock geology is found here, including low-grade metamorphosed pelites and sandstones, as well as intrusive granitic rocks and some volcanics. There are many long, north-south trending eskers and kames. Organic and finer-textured soils occur in depressions and on broad flat lowlands. The region has numerous lakes, and the largest concentration of peatlands in Maine. The lakes are often shallow, and mostly low in nutrients and alkalinity. Some areas of calcareous sediments with generally atypical alkaline wetlands also occur in the region. The climate is milder than in ecoregions to the north and northwest, and is transitional to the coastal Ecoregion 82g. Spruce-fir forest is dominant, with northern hardwoods on drier sites and hills. Forestry activities are a dominant land use. A few blueberry barrens occur in the south near the boundary with Ecoregion 82g. 82.d The Central Foothills ecoregion is a transitional area between the lower elevation areas of Ecoregion 82 and the higher elevations of the Northeastern Highlands (58). It has a slightly milder climate than Ecoregion 82b to the north, and elevations re slightly lower. Central Foothills elevations are mostly 400 to 1000 feet, with some peaks to 1300 feet, and a high point of 1675 feet on Kelly Mountain. Bedrock geology of the ecoregion includes metamorphosed pelite and sandstone and some granitic intrusive rocks. though areas of calcareous bedrock occur, surface water alkalinity is mostly moderate to low, and nutrients are generally low. A large bbed moraine with hummocks and sub-parallel ridges covers some of the northern part of the region. The Central Foothills are in a getation transition zone from the more temperate, species-rich Acadian forest to the east to the higher elevation, less-diverse boreal forests Ecoregion 58 to the west. Forests include trees of red spruce, balsam fir, hemlock, white pine, beech, yellow birch, and sugar maple. 82e The Central Maine Embayment is a diverse region of rolling plains with hills and some high hills. It has a complex geologic mix of bedrock, with large areas of metamorphosed pelite, sandstone, and limestone/dolostone, some granitic intrusives, along with other metasedimentary and metavolcanic rocks. Glaciomarine sediments of silt, clay, sand, and gravel cover many of the flatter

83. Eastern Great Lakes Lowlands This glaciated region of irregular plains bordered by hills generally contains less surface irregularity and more agricultural activity and population density than the adjacent Northeastern Highlands (58) and Northern Allegheny Plateau (60). Although orchards, vineyards, and

vegetable farming are important locally, a large percentage of the agriculture is associated with dairy operations. The portion of this ecoregion that is in close proximity to the Great Lakes experiences an increased growing season, more winter cloudiness, and greater snowfall. The **Champlain Lowlands** ecoregion is the northernmost expression of the Great Valley, a limestone depression that extends along the entire length of the Appalachian Mountains. The Champlain Lowlands separate the Adirondack Mountains to the west from the reen Mountains (58c) to the east. The region's low elevation and the lake itself moderate the climate. During the Pleistocene, the basin ntained Glacial Lake Vermont, and, at its maximum depth, glacial melt water lapped at beach lines over 600 feet above sea level. Glacial melt water also deposited sand, silt, and clay sediments into the lake that cover the valley floor today. The moderate climate and the lake bed soils make the Champlain Lowlands the prime agricultural region in Vermont. Mesic Inceptisols and Alfisols are typical. The lake effect keeps temperatures warmer in the fall and cooler in the spring, and the growing season is about 150 days, four to six weeks longer than in the Green Mountains (58c). The glacial deposits create distinctive plant communities, such as the pine/oak heath sandplain forest, the valley clayplain forest, and the white pine/red oak/black oak forest, that are endangered due to farmland clearing and urban and recreational development. The vegetation communities have some stronger alliances to the St. Lawrence valley and the Great Lakes

flats with swamp and bog deposits occur, but not as many as in Ecoregion 82h to the east. Surface water alkalinity values tend to be higher than adjacent ecoregions. The region has a relatively moderate climate, transitional between the coastal climates and inland continental regions, and diverse flora and fauna. Vegetation transition zones occur in the region, and the northern range limits of many woody and herbaceous species are reached here. Transition hardwoods, northern hardwoods, northern hardwoods-spruce forests are major forest types. The ecoregion has a relatively high population density for Maine, with an extensive pattern of settlement and roads. Less developed than Ecoregion 59f to the south, the Midcoast ecoregion of Maine is an indented shoreline type of coast, or drowned coast", with long, narrow, rocky peninsulas and intervening deep, narrow estuaries. North-striking metasedimentary rocks occur with deep glacially scoured valleys. Eroding bluffs of glaciomarine clay provide sediments in the sheltered embayments to form extensive mud flats and salt marshes. Many riverine and estuarine wetlands occur here. Merrymeeting Bay is the largest freshwater but have increased in recent decades. tidal bay north of the Chesapeake in the eastern U.S., and provides important waterfowl habitat. The coastal waters of the ecoregion are *Photo: Chessie Johnson, www.maine.gov* a year. *Photo: Albert Theberge, NOAA* the northern limit for some marine invertebrates, such as the American oyster and quahog clam. The Camden Hills area, including peaks such as Mt. Megunticook overlooking Penobscot Bay, contains some of the highest hills along the Maine coast, outside of Mount Desert Island in Ecoregion 82g. Forests of beech, birch, maple, red oak, and white pine occur. Pitch pine also grows here on isolated coastal bluffs. It has much less maritime spruce-fir forest than Ecoregion 82g to the east. With a transitional nature to the vegetation, the region has the highest woody species richness in Maine; several southern New England woody species reach their northern range limit here, and some northern species reach their southern range limit. The Downeast Coast ecoregion includes an island-bay coastal type east of Penobscot Bay and a mostly cliffed coastal margin east of Machias Bay. Rocky headlands and islands are abundant with few isolated pocket beaches. Some gravel beaches and coarse-grained tidal flats occur. The region has very few large tidal marshes. Granitic plutons are common, with less resistent, low-grade metamorphic rock occurring in the deeply embayed areas. Fine and coarse-loamy, frigid Inceptisols and Spodosols are typical. For Maine coastal regions to the east of Penobscot Bay, most forests contain a large percentage of spruce and fir. The Downeast Coast has Marsh and forest land along Deer Meadow Potatoes are typical in the cropland of the more fog and precipitation than other coastal regions, and the wet, cool, foggy climate supports these spruce-fir forests of a more Brook of the Midcoast (82f). Photo: USFWS Aroostook Lowlands (82a). Photo: Vikram Bisht northern character. The boreal features include rocky woodlands of patchy black spruce and heaths, as well as some boreal plant species

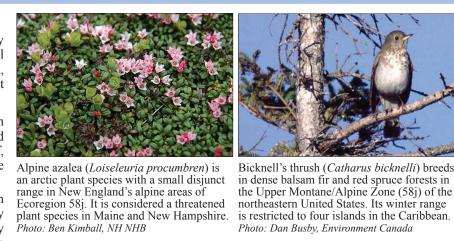
that are otherwise restricted to alpine and subalpine areas of Maine, such as black crowberry, baked appleberry, and roseroot. Coastal raised peat bogs occur. There are also some areas of jack pine woodland, near its southern range limit, on the dry, rocky ridges of Mount Desert Island. The unique area around Acadia National Park also has some transitional features to mid- and south-coast flora, including areas of pitch pine and some oak woodlands. A variety of vegetation types and rare plants occur on Cadillac Mountain, the highest peak along the eastern coast of the United States. Tidal amplitudes of the Downeast Coast are great, and the offshore waters are nutritionally richer and cooler than those offshore of ecoregions 82f and 59f to the south. The **Penobscot Lowlands** ecoregion is lower and flatter than surrounding ecoregions. A distinguishing characteristic is its deep ine sediments and many areas of wet flats with swamp and bog deposits. Glaciomarine sediments of silt, clay, sand, and gravel cover many of the flatter lower elevations, deposits formed from marine submergence of lowland areas, or where glacial meltwater streams entered the sea. Some alluvial deposition of deep, coarser sediments occur along the Penobscot River. Fine and fine-silty, frigid Native to New England rivers, most runs of Low-bush blueberry barrens are found mostly Inceptisols, loamy Spodosols, and Histosols are typical. The region has a relatively moderate climate and diverse flora and fauna. Atlantic salmon (*Salmo salar*) have been in Ecoregion 82g. Some grassland nesting bird Northern hardwoods and northern hardwoods-spruce forests are major forest types. Second growth hemlock forests are common with extirpated. Some self-supporting runs persist species, such as the grasshopper sparrow and scattered sugar maples, big-tooth aspen, paper birch, and white pine. Areas of red pine occur on some low ridges. Settlement and road in eastern Maine, and restoration efforts are upland sandpiper, use this human-controlled patterns are less dense than in Ecoregion 82e to the west. The many open wetlands provide breeding habitat for wetland-dependent birds.

84. Atlantic Coastal Pine Barrens This is a transitional coastal plain ecoregion, distinguished from the coastal ecoregion (63) to the south by its coarser-grained soils, cooler climate, and Northeastern oak-pine potential natural vegetation. The climate is milder than the coastal ecoregion (59) to the north that contains Appalachian oak forests and some northern hardwoods forests. The physiography of this ecoregion is not as flat as that of the Middle Atlantic Coastal Plain (63), but it is not as irregular as that of the Northeastern Coastal Zone (59). The shore characteristics of sandy beaches, grassy dunes, bays, marshes, and scrubby oak-pine forests are more like those to the south, in contrast to the more rocky, jagged, forested coastline found to the north.

Nantucket. Martha's Vinevard, and the Elizabeth Islands of Massachusetts, Rhode Island's Block Island, and a large part of New York's Long Island. These lands were made by the continental glacial ice sheet, with the advances and retreats of three lobes of the Wisconsinan stage playing a major role in the formation of Cape Cod. The resulting terminal moraines, outwash plains, and coastal deposits, reshaped by wind and water, are the dominant landform features. Elevations are mostly less than 150 feet, and relief is typically less than 60 feet. Cape Cod's bedrock geology of granites, gneiss, and schist has limited ecological relevance because it is covered with 200 to 400 feet or more of gravel, sand, silt and clay. Mesic Entisols are common, and soils are often well-drained to excessively-drained on the sandy outwash plains. Sandy and loamy soils occur on moraines, and a few areas of finer-textured soils have developed in the glacial lake deposits. Some of the unique ecological features that distinguish this ecoregion from mainland ecoregions include its moderate maritime climate, stunted pine and oak forests, numerous kettle ponds, and unique habitats in salt and freshwater marshes,

winter fog is common. In addition, summer high temperatures are cooler than other parts of Vermont. The colder climate is reflected

degement till. This dense basal till keeps the water table at or near the surface for m



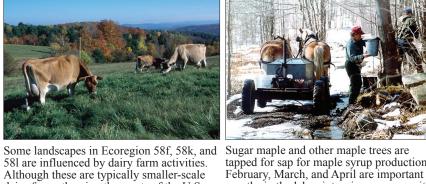
The area around Mount Katahdin (the Maine. Named Katahdin ("The Greatest southern edge of the range in New England Mountain") by the Penobscot Indians, it is and is listed as a threatened species. Decreased

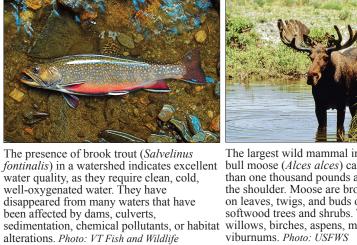


populations. They prefer lakes with little vegetation communities. Krummholz is listurbance and with small islands or bog wind-dwarfed and pruned clumps and thickets



well-drained, and formed over dense glacial







The area around Mooselookmeguntic La

is a typical landscape where Chesuncook

soils are found. These soils have a high

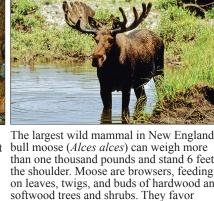
west of Rangeley, Maine, in Ecoregion 58m

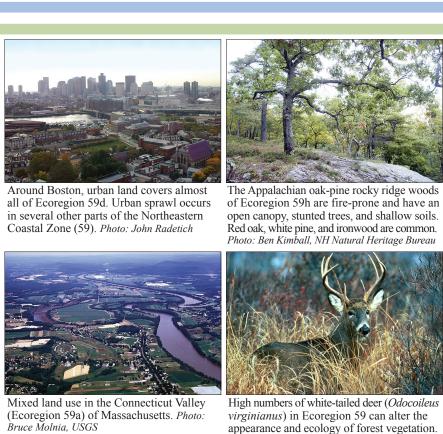
woodland productivity rating and cover more

than 150,000 acres of Maine. Photo: NRCS

The elusive Canada lynx (Lynx canad

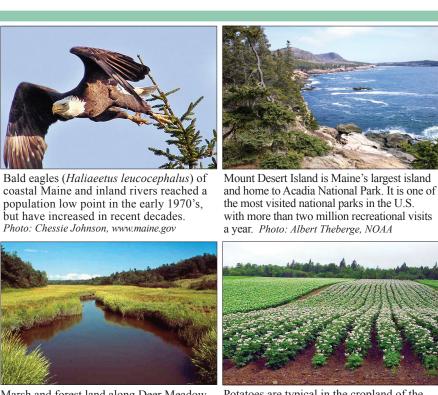
lvnx hunt birds, rodents, and deer, snowshoe







ranks second in U.S. cranberry production. New England and New York has shrunk by Photo: Cape Cod Cranberry Growers Association more than 75%. Photo: G. Smith



underway in a few other New England rivers. shrub habitat. Photo: Washington County Soil and Water Conservation Distric



wind, wave, and tidal energy. Photo: John Radetich

Complex dynamics occur in Cape Cod's coastal environments with continual changes due to

84a The Cape Cod/Long Island ecoregion includes Cape Cod and an inland area from Plymouth to the head of Buzzards Bay, swamps, bogs, and sand dunes. Many of the lakes are low in alkalinity values, and have variable nutrient levels.