ECOSYSTEM SERVICES TEMPLATE

1. Please fill out this table for the local area represented by your LTER site, for example the Colorado Front Range similar to the NWT LTER.
2. If there are multiple entries for a given row (e.g., several types of food produced locally), make a separate row for each important type, listed in order of importance (most important listed first). Each ecosystem service is described in footnotes below the table. If a service seems unimportant at your site, write “none” in the “specific service” column. If there are ecosystem services you feel are important but not represented in the categories listed, please add them at the bottom in the row marked “other”.
3. Please fill in as many of the cells as possible. If the answers are highly uncertain, include question marks. These are areas where future research may be necessary.
4. Here is a brief description of each column:
    a. Specific service: Specify the service(s) at your site, for example the types of foods raised; ways in which ecosystem regulate erosion; ecosystem attributes that lead to different recreational uses.
    b. Direction of change: described in column heading.
    c. Primary drivers of change: e.g., climate, land-use change, urbanization
    d. Public awareness: Awareness of the societal importance of this service: high (public keenly aware), medium (informed scientists, managers, and/or leaders aware), low (seldom considered in discussions or implementation of policies.
    e. Institutions that manage: e.g., state agency, market processes, NGOs

LTER site (BIOME): Niwot Ridge: Alpine tundra/subalpine forest; represents Central Rocky Mountains

Ecosystem Service	Specific services that are important at your site	Direction of change (improving, degrading, about the same, unknown	Primary drivers of change, if known	Public awareness of service (high, medium, low)	Institutions that manage this service
Provisioning Services					
Food	None	------	-------	-------	--------
Fiber	None	------	-------	-------	--------
Fuel	Yes	Improving	Landuse change	medium	USFS
Genetic Resources	Yes	Same	unknown	medium	USFW
Biochemicals & pharmaceuticals	None	-------	--------	--------	--------
Ornamental resources	None	-------	---------	---------	-------
Fresh Water	Yes	degrading	climate	high	NRCS, City of Boulder, State of Colorado
Other service					
Regulating Services					
Air quality regulation	Yes	Degrading	Emissions	High	Federal
Climate regulation	Yes	Degrading	Climate change	High	Federal
Water regulation	Yes	Degrading	Climate change	High	State, county
Erosion regulation	Yes	About same	Climate change	Medium	State, county
Water purification and waste treatment	Yes	Degrading	Climate change; emissions	High	State, county
Disease regulation	Yes	Degrading	Landuse change	High	State
Pest regulation	Yes	Degrading	Landuse change	Medium	State, county
Pollination	Yes	Degrading	Climate change	Low	Federal
Natural hazard regulation	Yes	About the same	Landuse change	High (forest fire)	Federal
Other service					
Cultural Services					
Cultural diversity	No	-------	--------	--------	---------
Spiritual and	Yes	About the	Climate	High	Federal

religious values		same	change		
Knowledge systems	Yes	About the same	No directional drivers	Medium	Federal
Educational values	Yes	Improving	No directional drivers	Medium	County, federal, NGO
Inspiration	Yes	Improving	No directional drivers	High	?
Aesthetic values	Yes	About the same	Landuse change	High	?
Social relations	Yes	About the same	Landuse change	High	?
Sense of place	Yes	Improving	Climate change	High	?
Cultural heritage values	Yes	About the same	Landuse change	High	?
Recreation and ecotourism	Yes	About the same	Landuse change	High	?
Other service					
Supporting Services					
Soil formation	Yes	Improving	Landuse change	Low	Federal
Photosynthesis	Yes	About the same	Landuse change	Low	Federal
Primary production	Yes	Improving	Landuse change	Medium	Federal
Nutrient cycling	Yes	Improving	Climate change	Low	Federal
Water cycling	Yes	Degrading	Climate change	High	State, county
Other service					

The following description of ecosystem services is taken from the Millennium Ecosystem Assessment Synthesis Report
http://www.millenniumassessment.org//en/Products.Synthesis.aspx

Ecosystem services are the benefits people obtain from ecosystems. These include provisioning, regulating, and cultural services that directly affect people and the supporting services needed to maintain other services.

Provisioning services. These are the products obtained from ecosystems, including:

Food. This includes the vast range of food products derived from plants, animals, and microbes.

Fiber. Materials included here are wood, jute, cotton, hemp, silk, and wool.

Fuel. Wood, dung, and other biological materials serve as sources of energy.

Genetic resources. This includes the genes and genetic information used for animal and plant breeding and biotechnology.

Biochemicals, natural medicines, and pharmaceuticals. Many medicines, biocides, food additives such as alginates, and biological materials are derived from ecosystems.

Ornamental resources. Animal and plant products, such as skins, shells, and flowers, are used as ornaments, and whole plants are used for landscaping and ornaments.

Fresh water. People obtain fresh water from ecosystems and thus the supply of fresh water can be considered a provisioning service. Fresh water in rivers is also a source of energy. Because water is required for other life to exist, however, it could also be considered a supporting service.

Regulating Services. These are benefits obtained from the regulation of ecosystem processes, including:

Air quality regulation. Ecosystems both contribute chemicals to and extract chemicals from the atmosphere, influencing many aspects of air quality.

Climate regulation. Ecosystems influence climate both locally and globally. At a local scale, for example, changes in land cover can affect both temperature and precipitation. At the global scale, ecosystems play an important role in climate by either sequestering or emitting greenhouse gases.

Water regulation. The timing and magnitude of runoff, flooding, and aquifer recharge can be strongly influenced by changes in land cover, including, in particular, alterations that change the water storage potential of the system, such as the conversion of wetlands or the replacement of forests with croplands or croplands with urban areas.

Erosion regulation. Vegetative cover plays an important role in soil retention and the prevention of landslides.

Water purification and waste treatment. Ecosystems can be a source of impurities (for instance, in fresh water) but also can help filter out and decompose organic wastes introduced into inland waters and coastal and marine ecosystems and can assimilate and detoxify compounds through soil and subsoil processes.

Disease regulation. Changes in ecosystems can directly change the abundance of human pathogens, such as cholera, and can alter the abundance of disease vectors, such as mosquitoes.

Pest regulation. Ecosystem changes affect the prevalence of crop and livestock pests and diseases.

Pollination. Ecosystem changes affect the distribution, abundance, and effectiveness of pollinators.

Natural hazard regulation. The presence of coastal ecosystems such as mangroves and coral reefs can reduce the damage caused by hurricanes and large waves.

Cultural Services. These are the nonmaterial benefits people obtain from ecosystems through spiritual enrichment, cognitive development, reflection, recreation, and aesthetic experiences, including:

Cultural diversity. The diversity of ecosystems is one factor influencing the diversity of cultures.

Spiritual and religious values. Many religions attach spiritual and religious values to ecosystems or their components.

Knowledge systems (traditional and formal). Ecosystems influence the types of knowledge systems developed by different cultures.

Educational values. Ecosystems and their components and processes provide the basis for both formal and informal education in many societies.

Inspiration. Ecosystems provide a rich source of inspiration for art, folklore, national symbols, architecture, and advertising.

Aesthetic values. Many people find beauty or aesthetic value in various aspects of ecosystems, as reflected in the support for parks, scenic drives, and the selection of housing locations.

Social relations. Ecosystems influence the types of social relations that are established in particular cultures. Fishing societies, for example, differ in many respects in their social relations from nomadic herding or agricultural societies.

Sense of place. Many people value the "sense of place" that is associated with recognized features of their environment, including aspects of the ecosystem.

Cultural heritage values. Many societies place high value on the maintenance of either historically important landscapes ("cultural landscapes") or culturally significant species.

Recreation and ecotourism. People often choose where to spend their leisure time based in part on the characteristics of the natural or cultivated landscapes in a particular area.

Supporting Services. Supporting services are those that are necessary for the production of all other ecosystem services. They differ from provisioning, regulating, and cultural services in that their impacts on people are often indirect or occur over a very long time, whereas changes in the other categories have relatively direct and short-term impacts on people. (Some services, like erosion regulation, can be categorized as both a supporting and a regulating service, depending on the time scale and immediacy of their impact on people.) These services include:

Soil formation. Because many provisioning services depend on soil fertility, the rate of soil formation influences human well-being in many ways.

Photosynthesis. Photosynthesis produces oxygen necessary for most living organisms.

Primary production. The assimilation of accumulation of energy and nutrients by organisms.

Nutrient cycling. Approximately 20 nutrients essential for life, including nitrogen and phosphorous, cycle through ecosystems and are maintained at different concentrations in different parts of ecosystems.

Water cycling. Water cycles through ecosystems and is essential for living organisms.nd is essential for living organisms.