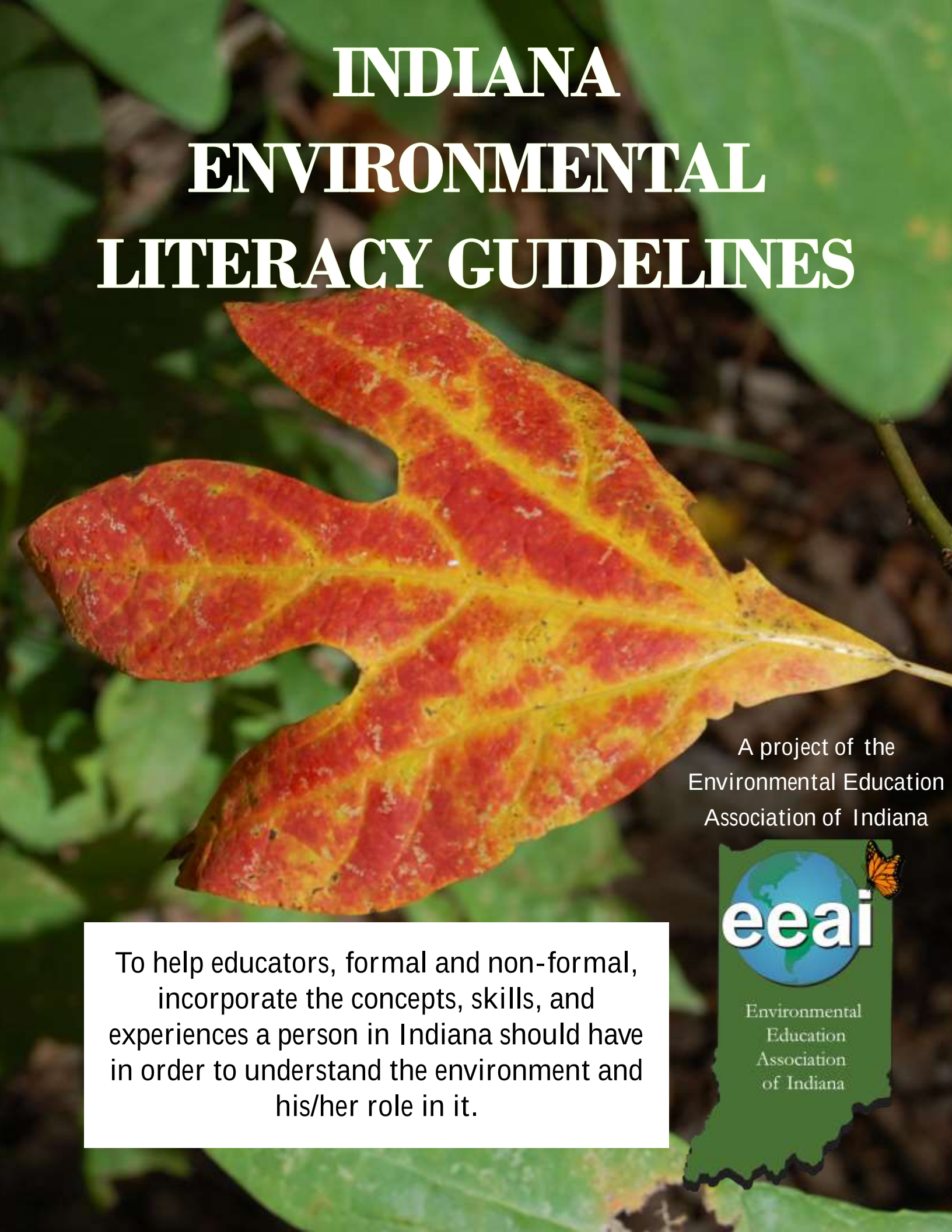
INDIANA ENVIRONMENTAL LITERACY GUIDELINES



A project of the
Environmental Education
Association of Indiana

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Environmental
Education
Association
of Indiana

To help educators, formal and non-formal, incorporate the concepts, skills, and experiences a person in Indiana should have in order to understand the environment and his/her role in it.

Environmentally Literate Citizen:

An environmentally literate citizen has the knowledge, tools, and balanced perspective to weigh various sides of environmental issues to make responsible decisions as individuals and as members of their community.

Environmental Literacy Defined:

1. An understanding of the Earth's systems locally and globally as well as the role humans and their societies play within these systems.

2. A familiarity with some basic modes of inquiry, critical and creative thinking skills, and an ability to interpret and synthesize information.

3. An understanding of the ideals, principles, and practices of citizenship in order to participate in resolving issues at both the local and global levels.

4. Motivation and empowerment to act, understanding that the choices humans make, including as consumers, can help or harm the environment.

> "There are two things that interest me: the relation of people to each other and the relation of people to the land."
> – Aldo Leopold

Using the Guidelines:

These Environmental Literacy guidelines have been developed for use by formal and informal educators across Indiana.

There are four Strands:
1. Questioning, Analysis, and Interpretation
2. Knowledge of Environmental Processes and Systems
3. Skills for Understanding and Addressing Environmental Issues
4. Personal and Community Action

Each section includes a description and a list of the concepts, skills and experiences students should have by the end of grades four, eight and twelve.

Environmental Literacy Strands:

Strand 1: Questioning, Analysis, and Interpretation:

How to ask questions, analyze information, and interpret scientific data

An environmentally literate person can take action on their own and make informed decisions about the environment and environmental issues. This includes being able to ask questions and seek information to find answers. It involves being able to make predictions and offer a hypothesis. A person must also be able to gather, organize and interpret information and data, and then be able to communicate their findings in an understandable way. (This process is often referred to as 'inquiry' or the 'scientific method'.) Indiana's environmentally literate citizens are able to apply these skills locally – in their own backyards, nearby natural areas, and to the unique ecosystems and issues that exist in Indiana.

Strand 2: Knowledge of Environmental Processes and Systems:

What we need to know about how the environment works

The core of environmental literacy is having an understanding of natural systems and dynamic ecological processes, and how human activity interacts with them. This understanding is based on knowledge acquired from across many different subjects. In this section, the Performance Measures are divided into three categories: natural systems/energy flow, ecological change, and human societies and the management of natural resources.

Strand 3: Skills for Understanding and Addressing Environmental Issues:

Skills that we need in order to understand and solve environmental issues

The ability to understand and address environmental issues requires the skills to recognize, define, learn about, discuss, evaluate, find solutions to, and implement solutions to environmental problems. Students also need to be familiar with current environmental laws and regulations when they are considering proposed solutions. Students need to know how to manage risks and make decisions in uncertain circumstances. This process provides students the opportunity to apply and improve their ability to think globally and understand what a sustainable world would look like. Using their knowledge of both social/cultural systems and ecological systems, students should be able to identify interactions between the two systems and identify some of their own personal impacts and role in those systems.

Strand 4: Personal and Community Action:

Our role in the environment, personally and as a citizen

Environmentally literate citizens have developed a sense of place and a personal connection to the environment. They understand the impacts their choices have on their local and global environments. They have developed self-confidence in their ability to inquire, analyze and take effective actions that help maintain economic and ecological sustainability. They are able to make sound conclusions about what should be done to sustain a healthy environment.

Strand 1: QUESTIONING, ANALYSIS, AND INTERPRETATION:

How to ask questions, analyze information, and interpret scientific data

An environmentally literate person can take action on their own and make informed decisions about the environment and environmental issues. This includes being able to ask questions and seek information to find answers. It involves being able to make predictions and offer a hypothesis. A person must also be able to gather, organize and interpret information and data, and then be able to communicate their findings in an understandable way. (This process is often referred to as 'inquiry' or the 'scientific method'.) Indiana's environmentally literate citizens are able to apply these skills locally – in their own backyards, nearby natural areas, and to the unique ecosystems and issues that exist in Indiana.

Performance Measures:

By the end of Grade 4, students will be able to:

- develop questions that help them learn about organisms, objects, places, and relationships in the local environment, especially in nearby outdoor areas with which students have a personal connection;
- design simple investigations for both classroom and outdoor settings to help answer their questions. Their investigations will include making predictions, developing an hypothesis, making observations, and drawing conclusions;
- locate and collect information about the environment and environmental topics by using tools, maps, technology, and basic field skills (observing, interviewing, measuring);

- explain why it is important to use reliable information and be able to judge the merits of various sources of information;
- present data, summarize observations, and organize information to describe relationships and patterns;
- use models to demonstrate relationships, patterns, and processes;
- develop and communicate simple explanations that address their questions

By the end of Grade 8, students will be able to:

- identify specific environmental questions, problems, or situations related to local, national and global environmental issues;
- design focused environmental investigations using appropriate measurements, observations and tools;
- use a variety of methods and sources to locate and collect reliable information and data about environmental topics;

- evaluate data and information to determine if it is accurate, relevant, clear and credible. Be able to determine if the information is biased toward one position over the other.
- classify, organize, and display data and information in ways that help others be able to understand, analyze and interpret the data
- use computer modeling to represent and analyze data, recognizing the limitations of models and simulations;
- synthesize and communicate observations and findings clearly. Be able to describe the strengths and weaknesses of the data and one's own interpretation. Based on one's findings, be able to form new questions to pursue further.

By the end of Grade 12, students will be able to:

- develop, modify, clarify, and explain questions about important environmental issues, and describe why and how they arrived at those questions;
- design and develop investigations to specific questions, problems or phenomena;
- use appropriate problem solving methods, tools, and technology to do the investigations;
- locate and collect reliable information from a variety of sources, paying attention to whether the information is biased; use appropriate technology to analyze the information;
- apply logic and reasoning to identify and evaluate accuracy, bias, errors, or flaws when reporting environmental information, particularly information that has been misrepresented in the media and/or public debate;

- organize and display data and information using a variety of technology and media, always paying attention to accuracy and scale;
- use mathematics and technology to create computer models and simulations;
- compare the usefulness of various models based on how each model is designed;
- use evidence and logic in developing the explanations about students' original hypotheses: use statistics and be able to distinguish between cause and effect;
- know what information is needed in situations when a hypothesis is rejected; from the results, be able to form questions to pursue further;

Strand 2: Knowledge of Environmental Processes and Systems:

What we need to know about how the environment works

The core of environmental literacy is having an understanding of natural systems and dynamic ecological processes, and how human activity interacts with them. This understanding is based on knowledge acquired from many different subjects. In this section, the Performance Measures are divided into three categories: natural systems and energy flow, ecological change, and human societies and the management of natural resources.

Performance Measures :

By the end of Grade 4, students will be able to:

Natural systems and energy flow

- describe the flow of energy in natural systems, citing the sun as the source of energy on the earth and that which drives the food web;
- illustrate how they use energy in their daily lives;
- list sources of energy, and be able to tell the difference between renewable and non-renewable sources;
- define a healthy ecosystem and list the components of one;
- draw a simple hydrologic cycle;
- describe and give examples of natural resources; e.g., water, minerals, soils, air, etc.;

Ecological change

- identify possible causes of natural and human-made pollution;
- give examples of how different organisms adapt to changes in their habitat;

Human societies and management of natural resources

- be able to tell the difference between and give examples of natural, human-influenced and human-built ecosystems in Indiana;
- distinguish between renewable, non-renewable and recyclable resources;
- introduce the concept of resource depletion and its impact on society;
- list jobs in the community that result from or are influenced by processing and/or using natural resources;
- identify possible causes of natural and human-made pollution

By the end of Grade 8, students will be able to:

Natural systems (biotic and abiotic) and energy flow

- describe the flow of energy in a natural and a human-managed ecosystem using the laws of thermodynamics;
- explain biodiversity;
- describe major ecosystems of Indiana;
- illustrate the conservation of matter using biogeochemical cycles (carbon cycle, nitrogen cycle);
- explain how organisms or populations of organisms interact with one another;
- compare our society to an ecosystem, describing similarities and differences

Ecological change/variability (natural and human-driven)

- explain how humans' use of our resources can impact the environment and deplete resources;
- identify major air, water, or land pollutants and their sources;
- identify and analyze individual, local, regional, national, and global effects of pollution;
- explain how change is a natural process, citing examples of succession, evolution, and extinction;
- explain and give examples of how humans shape the environment;
- explain how the ways in which we manage our natural resources can impact the quality, availability and productivity of the resources

"It is the little things citizens do. That is what will make the difference. My little thing is planting trees." – Wangari Maathai

Human societies and management of natural resources

- give examples of human impact on various ecosystems;
- explain and give examples of how humans shape the environment;
- diagram how natural resources are distributed throughout your community, our country, and the world;
- identify the natural resources that are found in Indiana and those that are imported;
- analyze how human populations impact their environment through their use of natural resources;
- recognize that energy, economics and the environment are all related to one another and each affects whether resources are available;
- recognize the effects on society when resources are used and/or depleted;
- explain how humans' use of our resources can impact the environment and deplete resources
- identify major air, water, or land pollutants and their sources;
- explain the difference between point and nonpoint source pollution;
- identify types of waste and methods for waste reduction;
- identify and analyze individual, local, regional, national, and global effects of pollution;

- explain how the ways in which we manage our natural resources can impact the quality, availability and productivity of the resources;
- create a timeline of how Indiana's natural resources have been managed throughout history
- provide examples of how different cultures use natural resources;
- explain how the environment is perceived differently by people of various ages and cultures;
- explain how perception of the environment by different cultures has changed over time

By the end of Grade 12, students will be able to:

Natural systems and energy flow

- evaluate the relationships of matter, energy, and the flow of energy in three different systems: natural, human-managed, and human-built;
- describe the value of ecosystems from both natural and human perspectives; e.g., food, shelter, flood control, water purification, etc.;

- evaluate the stability and sustainability of ecosystems in response to changes in environmental conditions;
- analyze the factors that determine carrying capacity (the number of organisms that can exist in a given area);
- evaluate the importance of biodiversity

Ecological change

- evaluate the stability and sustainability of ecosystems in response to changes in environmental conditions;
- analyze the factors that determine carrying capacity (the number of organisms that can exist in a given area);
- predict how changes in the environment will impact populations;
- relate the positive and negative impacts of human activities in ecosystems to the natural process of change, citing examples of succession, evolution, extirpation, extinction, and climate change;
- analyze environmental cause and effect relationships and differentiate between correlation and causation

Human societies and management of natural resources

- describe the value of ecosystems from both natural and human perspectives; e.g., food, shelter, flood control, water purification, etc.;
- evaluate ways in which technology has expanded our ability to alter the environment and its capacity to support humans and other living organisms;
- identify and evaluate multiple uses of natural resources and how society is influenced by the availability of these resources;
- assess how changes in the availability and use of natural resources (especially water and energy sources) will affect society and human activities such as transportation, agricultural systems, and manufacturing;

- evaluate the costs and benefits to the environment and society when resources are allocated in different ways; identify ways to manage resources so that both the economy and environment are sustained;
- analyze how different political and governmental systems manage resource development, distribution, consumption, and waste disposal;
- investigate how technological developments have influenced human relationships and our understanding of the environment;
- describe changes in the rates of human population growth in various societies and how those changes relate to economic and environmental sustainability;
- analyze how owning and trading natural resources influences local, national, and global economies;
- explain the concept of exported/imported pollution (for example, pollution coming from smokestacks, moving across watersheds, and carried by weather systems);
- analyze the cause and effect relationships of pollutants and environmental changes on human health;
- illustrate how environmental quality affects the economic well-being of a community;
- analyze the environmental costs versus human benefits of manufacturing; suggest alternate ways of manufacturing that will result in positive environmental outcomes;
- research careers related to natural resource management and other environmental fields;
- research individuals who have made important contributions to the field of resource management

Strand 3: Skills for Understanding and Addressing Environmental Issues:

Skills that we need in order to understand and solve environmental issues

The ability to understand and address environmental issues requires the skills to recognize, define, learn about, discuss, evaluate, find solutions to, and implement solutions to environmental problems. Students also need to be familiar with current environmental laws and regulations when they are considering proposed solutions. Students need to know how to manage risks and make decisions in uncertain circumstances. This process provides students the opportunity to apply and improve their ability to think globally and understand what a sustainable world would look like. Using their knowledge of both social/cultural systems and ecological systems, students should be able to identify interactions between the two systems and identify some of their own personal impacts and role in those systems.

Performance Measures:

By the end of Grade 4, students will be able to:

- identify environmental problems and issues in local environments and communities;
- identify sources of information on an environmental issue or problem and evaluate the reliability of the sources;
- design a simple field investigation to explore questions about an environmental issue;

- apply knowledge from the past, present and of future trends to understand and address local environmental problems and issues. for example, describe what has changed, is changing and could change to predict future issues and potential solutions;
- identify people and groups of people who are involved in an issue, consider their points of view, and describe how they impact and are impacted by the issue;
- communicate clearly, using appropriate technology, to explain an issue and potential solutions;
- identify some of the decisions and actions related to an issue and explain why those decisions and actions occurred;
- identify and evaluate proposed solutions to an environmental issue and
- determine what types of citizen action are appropriate;
- develop and explain an action plan for an issue, and describe the actions that can be done by individuals, groups or as a class;
- describe how their own actions and those of others have affected an issue

By the end of Grade 8, students will be able to:

- describe and explain specific environmental issues, including the history and origins of an issue, actions that have been taken to address the issue, the effects of these actions, and the current situation;
- use environmental monitoring techniques to collect data about environmental issues;
- use questioning and analysis skills to understand the beliefs, attitudes, and values held by people involved in an environmental issue;
- evaluate the credibility of information, taking into account social, economic, political, environmental, and educational influences on the information;
- identify people and groups of people who are involved in an issue, be able to express the viewpoints of those people and groups, the types of action they support, and where they agree and disagree;
- articulate and justify their own views on an issue based on information from a variety of credible sources and logical deduction;
- identify different forms of action that citizens can take: actions in the economic, political, and legal spheres; actions designed to directly improve or maintain the environment; or actions that persuade others to take action;
- develop action plans that can be carried out by individuals, in small groups or with a class, club or larger organization;
- analyze the effects decisions, policies, and actions taken by individuals and groups on a particular issue have had on the elements, systems and processes of the environment

By the end Grade 12, students will be able to:

- define and clearly articulate environmental issues, taking into consideration connections to other issues, how widespread its effects are, and whether it is unique to a particular area;
- design and conduct a field investigation to gather information and data on an environmental issue in order to guide decisions on action steps;
- compare the effects of natural and human-caused activities that contribute to or challenge an ecologically and economically sustainable environment;
- evaluate the consequences of an environmental issue, taking into consideration historical perspective, impacts of technological developments, and knowledge of similar issues;

- explain the factors that influence how individuals and society develop environmental values;
- ask questions, offer alternative explanations, and defend interpretations of environmental issues;
- evaluate whether action is warranted in specific situations, taking into consideration the following factors: existing information about the issue and proposed solutions, uncertainty around an issue, scale of the issue; social, economic, and ecological consequences, environmental laws and rules; risks involved and alternatives to citizen action;
- synthesize different perspectives, types of data, and ways of analyzing the data in order to propose solutions to environmental issues;
- develop action plans that can be carried out by individuals, in small groups or with a class, club or larger organization;
- develop action plans based on an understanding of how complex the issue is; set realistic goals and include measures of success that match the abilities and capacities of the groups involved;
- decide whether their plan should be implemented immediately or at another time, modified, or abandoned; and carry through with action when appropriate;
- evaluate the effects, intended or unintended, of citizen action on the environment, political situation, and individuals involved;

"The best friend on earth of man is the tree. When we use the tree respectfully and economically, we have one of the greatest resources on earth." — Frank Lloyd Wright

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STRAND 4: Personal and Community Action:

Our role in the environment, personally and as a citizen

Environmentally literate citizens have developed a sense of place and a personal connection to the environment. They understand the impacts their choices have on their local and global environments. They have developed self-confidence in their ability to inquire, analyze and take effective actions that help maintain economic and ecological sustainability. They are able to make sound conclusions about what should be done to sustain a healthy environment.

PERFORMANCE MEASURES

By the end of grade 4, students will be able to:

- connect with their local environment through a variety of positive outdoor experiences;
- understand what is meant by the term 'environmental stewardship';
- understand how their civic responsibilities promote personal actions that support their environment;
- help create simple but effective plans and take successful actions that will have positive consequences for their local environment

By the end Grade 8, students will be able to:

- expand their personal connections with their local environment,
- develop a sense of place and understand their unique position in the global environment;
- explain how characteristics such as trust, patience, self-discipline, respect and open-mindedness help people function together to resolve environmental issues. Practice exhibiting these important characteristics in addressing a variety of environmental issues;
- create and put into action a personal plan for themselves and their families for effective environmental stewardship;

By the end Grade 12, students will be able to:

- articulate their personal beliefs regarding their relationship to the environment and how they arrived there by citing personal experiences, alternative viewpoints, and the research of scientifically-relevant sources;
- understand the history of environmentalism and be able to reference environmental legislation and related social movements, and articulate actions that are still needed;
- write a comprehensive and feasible plan of action based on personal goals of stewardship for an economically and ecologically sustainable environment, and take informed and effective action that will contribute to the resolution of somewhat complex and controversial local and global environmental issues

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Thank you to the following individuals who devoted their time and effort to draft these guidelines as part of Indiana's Environmental Literacy Plan.

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ELP Next Steps:

The guidelines are a great first step for **Indiana's Environmental Literacy Plan,** but there is still more work to be done. As stated in the proposed No Child Left Inside Legislation, Indiana still needs to address: Standards, Curriculum, and Instruction, Professional Development Assessment, Implementation and Funding to be qualified to apply for grants through NCLI.

If you are interested in joining the ELP effort in Indiana, please visit:

www.eeai.org

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EEAI Mission Statement

The mission of the Environmental Education Association of Indiana is to work cooperatively to promote opportunities that will educate, motivate, and inspire the citizens of Indiana to conserve natural resources and meet the needs of our society while maintaining a healthy environment now and in the future.

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