

## Protecting Colorado Native Plants

**Subject Area:** Plant Science

**Unit Title:** Colorado Native Plants

**Grade Level:** 4th & 5th

**Objectives:** To create an understanding of different Colorado native plants and how we can protect them.

**Colorado Content Standards to be covered:**

### SCIENCE

**Standard III** - Life Science: Students know and understand the characteristics and structure of living things, the processes of life, and how living things interact with each other and their environment.

### Anticipatory Set:

Copy and hand out blank venn diagrams (see last pages). Before the lesson, ask your students to write down anything they know about native plants and non-native plants, and compare and contrast them on the venn diagram. Then have them add more information to the three areas in the venn diagram as you go through the lesson. Or, you can model the process on an overhead projector.

### Input:

A native plant is one that evolved in a given region. Native plants are a key part of all healthy ecosystems. They produce oxygen and filter the air we breathe. They provide shelter for animals. Each native plant contributes to a balanced ecosystem that developed over millions of years. They help keep the system functioning. We cannot afford to lose native plants. There is an amazing number of different plants in Colorado. One reason we have so many is that we have different elevations. This results in several life zones. Some plants can grow in many life zones. Others grow in only one life zone.

A non-native or exotic plant evolved in other places. People accidentally or intentionally brought or are bringing them to America. Some of these exotic plants become noxious weeds. Are all exotic species bad? Of course not. Many plants were intentionally introduced for their economic value and beauty. Many are useful in reclamation efforts, especially as a short term solution until native plants can re-establish themselves. Many have been introduced as ornamentals in gardens. True native plants make good landscaping plants. This is because they are hardy and grow well in our climate and soil types.

What are characteristics of plants that are considered weeds? They are plants that:

- reproduce quickly, produce many seeds and have well developed root systems
- invade a new area quickly
- are able to adapt quickly to new conditions
- do not have natural enemies that are able to keep the population in check.

Both native and non-native plants can have characteristics of weeds.

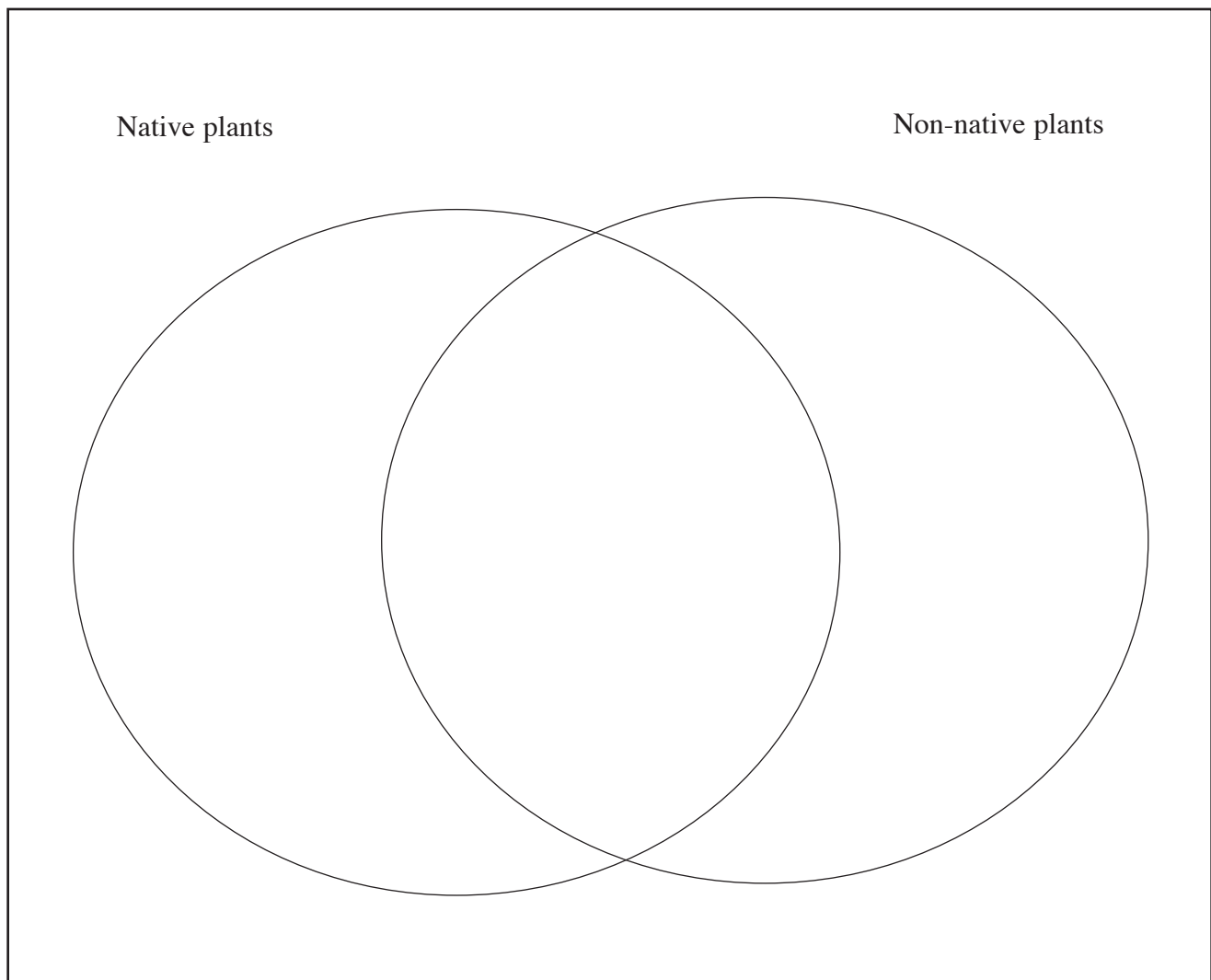
**Checking for Understanding:** At the end, of this section choose one of the following for a quick check: ask the students to partner share and think, pair and share, do a quick 3 word write up as an exit slip, do a quick sketch or give each other a quick thumbs up or down to check for understanding. Determine the level of mastery for each student and provide individual remediation as needed.

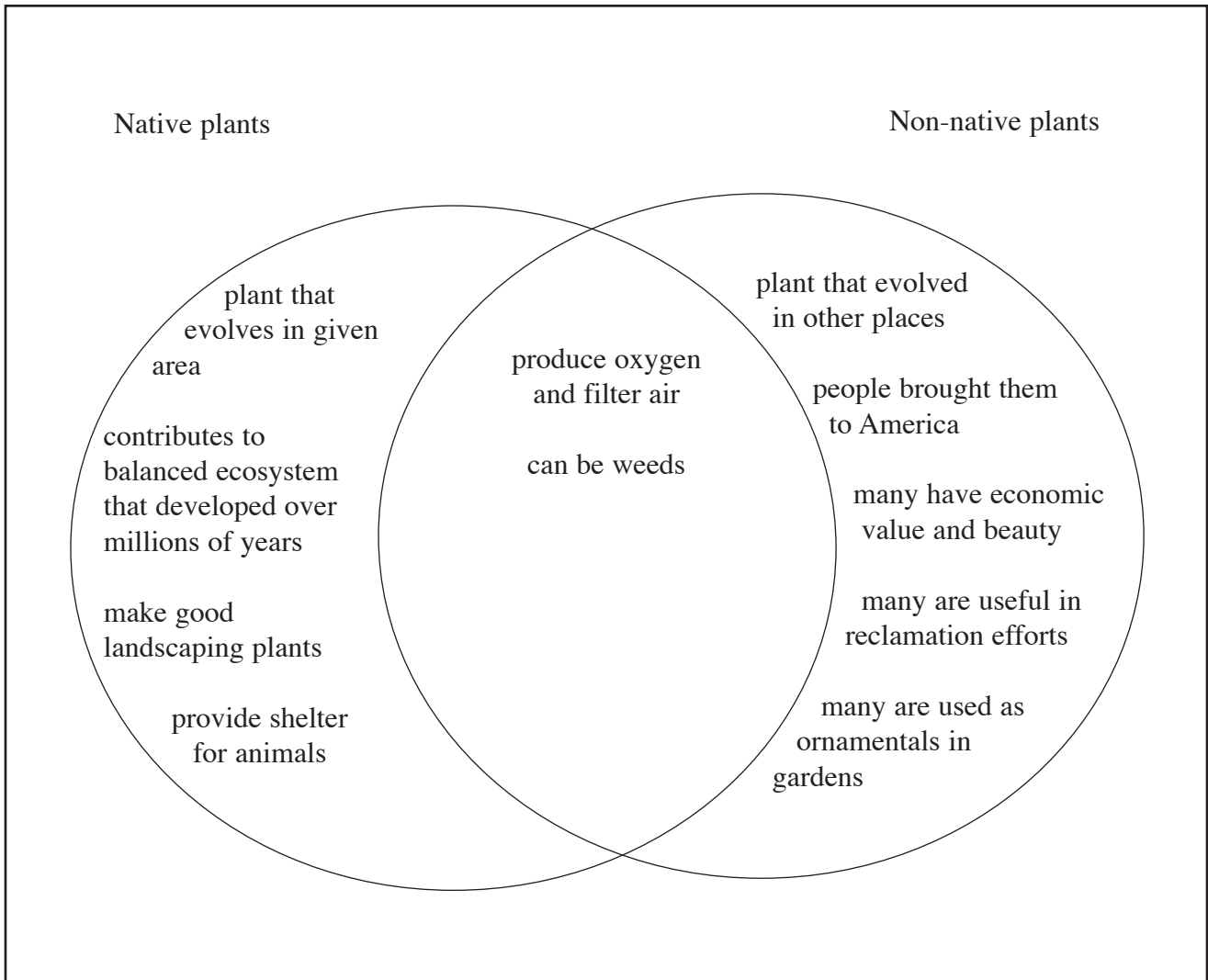
**Discussion****Protecting Native Plants**

Lead a discussion with your students about how to protect native plants. Here are some suggestions:

1. When you hike or ride bikes, stay on trails, don't cut switchbacks.
2. Get involved in organizations that encourage native plant conservation.
3. Don't pick wildflowers – leave them so that others who visit after you can see them. Some pretty wildflowers are noxious weeds; if you pick them you may help to spread their seeds.
4. Learn which wildflowers are actually noxious weeds.
5. Encourage using native plants to replant areas in your community.
6. Garden responsibly. Choose native plants and non-native plants that are not aggressive. If you see plants escaping from your garden, pull them up and replace them with less aggressive plants. Don't plant flowers considered noxious weeds.

**Closure:** Copy and handout the “How Fast Will They Grow” handouts (last pages). Have your students read through the two examples and do the math at the end. The math is pretty complicated even with a calculator, so you may choose to walk through it with them. Then discuss why the alien invader might be a threat to the native plant.





**How Fast Will They Grow?**

**Native Plant:** *Osterhout Milkvetch*

**Facts on file:**

Narrow endemic (found in a small area), reproduces by seed only.

A long-lived perennial.

Flowers and seeds are eaten by blister beetles and seed weevils. On average, each plant produces 100 fruits per year.

Only 2 seeds per fruit will grow into a seedling. Each year half (50%) of the seedlings will die before producing fruit.

*If 6 milkvetch seeds were dropped in an area, how many plants and how many seeds would be produced in three years?*

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**Alien invader:** *Carduus nutans L. or musk thistle*

**Facts of file:**

Reproduces by seed only.

Each plant produces seed one time then dies (annual).

Each plant can produce 20,000 seeds, with 90% of these seeds able to sprout into new plants each year.

*If 5 musk thistle seeds were dropped in an area, how many plants and how many seeds would be produced in three years?*

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**How Fast Will They Grow?****1. Native Plant: *Osterhout Milkvetch*****Facts on file:**

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**30,603 plants and 6,120,000 seeds for the fourth year**

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**2. Alien invader: *Carduus nutans L. or musk thistle*****Facts of file:**

Reproduces by seed only.

This plant is a biennial, meaning that it lives for two years and does not produce flowers and seeds until the second year.

Each plant produces seed one time then dies (annual).

Each plant can produce 20,000 seeds in its second year of life. 90% of these seeds able to sprout into new plants each year.

*If 5 musk thistle seeds were dropped in an area, how many plants and how many seeds would be produced in four years?*

**90,000 plants and 1,800,000,000 seeds after the fourth year**

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**Reviewing the “How Fast Will They Grow” Handout**

**Question #1** - Osterhout’s Milkvetch is a native species that is only found around Kremmling, Colorado. The Latin name for this species is *Astragalus osterhoutii*. Often the Latin name of the plant reflects the name of the individual who found or first described the plant. An amateur botanist by the name of George Osterhout discovered the plant in 1905. This plant is a member of the Fabaceae (Pea) Family. Other members of the Pea family include: soy beans, pinto beans, peas, lima beans and many more beans that are important sources of food.

Osterhout’s Milkvetch is found in a narrow endemic. This means that it only grows in a specific area and its distribution is extremely small. Very few populations of this species are known.

On average each plant produces 100 fruits per year, 2 seeds from each fruit will germinate into a new plant. Each year half (50%) of the new plants die before producing fruits. If a plant makes it through the first year, we assume it will live for many years. We begin with 6 seeds of Osterhout’s Milkvetch. How many plants and seeds will be produced in 3 years? Assume the plants produce fruit in the first year.

1st year: We start with 6 seeds. All sprout and begin growing. Half of these plants die before producing fruit. ( $6 \times .5 = 3$  plants). These 3 plants produce fruit in the fall. ( $3 \times 100$  fruits = 300 fruits)

2nd year: 2 seeds from each of the 300 fruits germinate for a total of 600 new plants ( $300 \text{ fruits} \times 2 \text{ seeds/fruit} = 600$ ). Half of these new plants die before producing fruit ( $600 \times .5 = 300$ ). In the second year, we have a total of 303 plants that produce fruits (3 established plants and 300 new plants). Each plant produces 100 fruits. ( $303 \text{ plants} \times 100 = 30,300 \text{ fruits}$ ).

3rd year: The  $30,300 \text{ fruits} \times 2 \text{ seeds/fruit} = 60,600$  new seeds. The new seeds germinate and grow into 60,600 new plants, but half of these plants die leaving 30,300 new plants plus the 303 plants from the first two years = 30,603 plants. Each of the plants produce 100 fruits or 3,060,300 new fruits. In the following year, each of these fruits will produce 2 viable seeds for a total of 6,120,600 new seeds.

After three years, there is a total of 30,603 established plants and 6,120,000 viable seeds for the fourth year. This example does not include the effects of animals eating the plants, fruits or seeds. In addition, many seeds do not find a good site for germination, or cannot withstand the hot and dry summer weather of the shrub steppe. Thus, the number of plants calculated here are larger than in real-life situations.

**Question #2:** This example shows the dynamic growth potential of *Carduus nutans* L., an extremely invasive and dangerous plant. Musk thistle was introduced to the U.S. from southern Europe and western Asia. It was brought to the U.S. in the early 1900s and is now widespread throughout the U.S. and Canada.

Musk thistle is very aggressive, quickly overtaking roadsides, stream banks, pastures, rangeland, and even forests. Dense stands of musk thistle can form and eliminate all native and beneficial plant species. This plant is a biennial, meaning that it lives for two years, and does not produce flowers and seeds until the second year. After releasing a huge number of seeds, the plant dies.

A single musk thistle produces 20,000 seeds in its second year of life. 90% of these seeds will sprout into new plants in the following year. If 5 musk thistle seeds were dropped in an area, how many plants would be produced after 4 years?

1st year: We start with 5 seeds Each germinates and grows, but no flowers or seeds are produced.

2nd year: The 5 plants flower, and each plant produces 20,000 seeds for a total of 100,000 seeds ( $5 \times 20,000$ ). The seeds will not germinate until spring of the third year. The 5 original plants die.

3rd year: There are 100,000 seeds, but only 90% will become plants. ( $100,000 \times 90\%$ ) = 90,000 plants will become established, although none will flower or produce seeds this year.

4th year: 90,000 plants will produce 20,000 seeds each for a total of 1,800,000,000 seeds. ( $90,000 \times 20,000$ ) This invasive species multiplies incredibly fast. Musk thistle destroys the native plants in an area by overtaking their habitat. The thistle is of little value to birds, animals and insects, whereas native plants provide food, shelter, protection and high levels of species diversity, benefitting the whole community.

**IMPORTANT:** Natives vs. Invasives- The rates of growth and reproduction are very different between native and invasive species. Natives tend to foster high levels of diversity in plants, which beneficially affect animals, insects and birds. Invasives overtake areas, reducing diversity and making the land less hospitable for other plants and animals. The structure of a community is based in plant diversity. Most other life forms depend on many different types of plants to provide the essentials of existence.