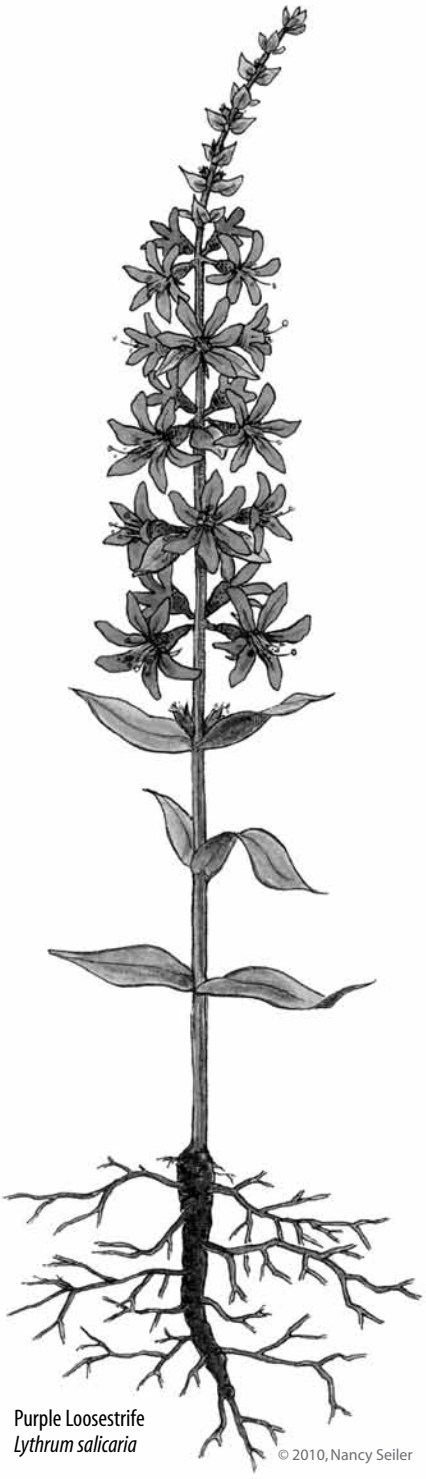
Introduction

Almost anyone who has spent time outdoors in Montana has been affected by non-native, invasive plants (often referred to as "weeds"). Whether it is seeing knapweed replacing native wildflowers in your favorite family camping spot, struggling to keep leafy spurge from taking over livestock range, or keeping thistles out of crop lands, invasive plants impact Montanans. And humans aren't the only inhabitants affected; invasions in natural areas can result in losses of native plants and cause changes in the fauna that depend on them.

Plant and animal species are introduced, purposefully or unintentionally, from all over the world. While only about 1% of introduced organisms become invasive—that is, grow and spread rapidly in their new environment—those relatively few invasive species can have enormous impacts. Invasive plants are highly successful organisms that are very good at their evolutionary jobs of survival and reproduction. These traits, while admirable in the abstract, cause significant problems in some cases. Some species can be difficult or impossible to control where they invade. Controlling them costs ranchers, farmers, conservation groups, utility companies, governments, and citizens millions of dollars each year. For example, in Montana alone, spotted knapweed is estimated to cost $42 million each year (Montana's Statewide Noxious Weed Awareness and Education Program, 2005).

The complexity of managing invasive plants is a reflection of the complexity of ecology and the various priorities of the people involved. For example, priorities and objectives for controlling invasive plants in a park may be very different than those on agricultural land. Issues of expense, effort, safety, effectiveness, and unintended consequences must be considered, and research on invasive plants is an important component of their management.

Education about invasive species, their effects, and their management is essential for many reasons. Human actions can have a tremendous impact on the spread of invasive species in many ways. Awareness of the issues surrounding invasive plants and their management can help prevent their introduction into new places and encourage individual and group efforts to restore desirable plant communities. Even as youth, students can have both direct and indirect effects on invasive species management, and so education at the school level is very important. The students of today will become adults of tomorrow, potentially participating in important decisions related to invasive plants in their communities, and this background knowledge will provide a basis from which they can build a deeper understanding of the issues. Although there are many invasive plant curricula available throughout the U.S., most of these are geographically inappropriate for Montana or limited in the types of land use or management they cover. It was felt that the need exists for a comprehensive,



Purple Loosestrife
Lythrum salicaria

place-based, and scientifically accurate curriculum that promotes effective, inquiry-based teaching about invasive plants in all the diverse landscapes of Montana.

The **kNOweeds: K-12 Montana Invasive Plant Curriculum Guide** provides such a place-based, ecologically accurate curriculum for Montana K-12 schools. The curriculum was designed as a supplementary resource for teachers who want to integrate the topic of invasive plant species into their existing courses. Instructors can select lessons from a wide range of topics based on their specific needs and grade level(s). The primary audiences of this curriculum guide are teachers of kindergarten through high school level students. However, many lessons are also appropriate for educators in non-school settings, such as resource professionals whose work includes teaching about invasive plants in Montana.

The **kNOweeds Guide** incorporates a variety of learning styles at all levels and draws on a wide range of subject areas across the curriculum. However, there is an emphasis on encouraging scientific inquiry, where students use observation, data collection, and deductive reasoning to develop their own answers. Some lessons use a very guided approach to student inquiry, while others are more open-ended and allow students to develop their own methods of investigation.

The Guide contains place-based lessons that encourage student inquiry and reflect the diversity of land values and users throughout the state. A conceptual framework was developed to ensure ecological comprehension and pedagogical correctness. Lessons are linked to national and state curriculum standards, and external piloting and field testing of the guide by Montana educators ensure its usefulness in both formal and informal educational settings.

The Guide will provide educators with a curriculum that helps students learn about important concepts in basic ecology as well as develop the awareness, knowledge, and skills for responsible land stewardship in Montana.