User's Guide

XID Services, Inc.
EXPERT IDENTIFICATION SYSTEMS

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TUTORIAL

For use with the Tutorial Database.

Printing this Tutorial

You will find it convenient to print out this guide to read as you go through the tutorial. Just right-click anywhere in this document and select Print, or go to File > Print in the toolbar. From within the Help section of any database, click the printer icon in the tool bar. You can return to this page, from anywhere in the program, by clicking the top menu title in the upper left pane.

Below the Tutorial there is a brief User's Guide. This Guide will be printed when you print the Tutorial. Be sure to read the Guide and keep it on hand for reference. There is also detailed help on the XID Identification System under "Help" in the tool bar.

Using Attributes of Your Own Choice

When you insert the DVD, the XID Database Selection window appears which will show all of the XID databases on the DVD. When you open the XID program from the hard drive, the XID Database Selection window also appears.

Select the Tutorial Database file and click it.

The help screen for that database appears in the right pane (in this case providing you with the link to the Tutorial).

If the program is not maximized on your screen, click the Maximize button in the upper right corner (across from the database name).

The current screen shows the name of the database (Tutorial database) and its interactive menus in the upper left, a list of species names in the lower left window, and the database help screen on the right (in this case providing you with the link to the Tutorial).

In this exercise you will identify Canada thistle by saying that it has spiny leaves, rhizomes, and wind-blown seeds. These choices could be entered in any order. Note the line above the species list pane shows that there are currently 72/72 species remaining in the database.

If the menus are not shown below "Tutorial database" in the upper left pane, click the small + box to the left of "Tutorial database." The first level of the menu structure expands. If a minus sign (-)is shown in the box to the left of "Tutorial database," the first level of menus has been expanded.

Click the small + box to the left of "General." If the black text which appears in the right hand window appears distorted, please adjust your screen resolution to 1280 X 1024 or higher.

Click the small + box to the left of "Spines or Thorns." The attribute menu opens and illustrations of the attributes appear in the right hand pane.

The number (7) appears to the left of the attribute "Spines on leaves and/or stems." This is the number of species in the database which display that characteristic. There are five ways in which you can select this attribute:

1. The attribute name appears in a pop-up box when the cursor is placed on any of the images in the right hand pane. Left clicking the image of the plant with the spines on the leaves and stem will allow you to mark it as "Yes," "No," "Or" (or clear an existing mark).

2. Right-clicking on the attribute name in the menu will allow you to mark it as "Yes," "No," "Or" (or clear an existing mark).

3. Double-clicking the text (not the box) for "Spines on leaves and/or stems" will mark this attribute as "Yes." Double-clicking it again will clear the mark.

4.The "Yes, " "No," "Or," and "Clear" icons are represented on the tool bar by the icons "Y," "N," an eraser for "Clear" and "Or."

5. Clicking the dotted box to the left of the attribute will allow you to mark it as "Yes," "No," "Or" (or clear an existing mark).

Important note: Attribute marking is the main way in which the user interacts with the database. Make sure that you are familiar with all of the methods of attribute marking before proceeding. These will be referred to many times in the Tutorial as "the five methods of menu marking."

Using one of the five methods of menu marking, mark the characteristic "Spines on leaves and/or stems" as "Yes."

The number of species shown on the line above the species list is now 7/72. This means that of the original 72 species in this database, only 7 meet the criteria selected. The 7 remaining species are shown in green (with a check mark to their left) and alphabetized at the top of the species list; the eliminated species are shown in red-purple (with a red X to their left) and alphabetized below the

remaining species.

Note: You can select whether the species are alphabetized by common or scientific name by clicking "Options" in the tool bar, then "Species List Report" and marking your selection.

Click the small + box to the left of "Wind Dissemination." The attribute menu opens and illustrations of the attributes appear in the right hand pane.

Using one of the five methods of menu marking, mark "Fruit, seed, or spore wind borne" as "Yes." A message appears on the screen: "Family Identified." This means that all species remaining in the database belong to the same plant family, in this case Asteraceae.

Click "OK" to clear the "Family Identified" message. Note the number of species remaining is now 4.

Click the small box with the minus sign (-) to the left of "General" to contract the menu.

The next attribute which you will mark is "Rhizomatous." Click the small + box to the left of "Root and/or Vegetative Propagule." Note that the attributes in this menu which are not displayed by any of the remaining species (they have a frequency number of 0) are shown in gray, while those which are still applicable are shown in blue.

Using one of the five methods of menu marking, mark "Rhizomatous" as "Yes." A message now appears on the screen: "Species identified:" and provides you with scrollable photos and description of the plant on the right. Click "OK" to clear the "Species identified" message.

As well as scrolling through the images, you can click on any of the images to go into "Thumbnail" view, so that you can see all of the images for that species at once. You can expand any of the "thumbnail" images by clicking it. Click the "Close thumbnails" message in the upper left to exit this view and return to the main screen.

You can select what information is displayed for the species on the right side of the screen by clicking "Options" in the tool bar, then "Species Description," and making your selections. Your choices include:

Picture: All of the images associated with the species. Recommended!

Description: Notes and comments about the species. Recommended!

External links: If present, these can take you to web sites with additional information about the species. NOT recommended!

Picture file: Allows you to see the names of the image files associated with the species. NOT recommended!

Data: Shows the marked attributes for the species. Recommended only for verification!

Data All: Shows all of the attributes in the menus and how they are marked for the species. NOT recommended!

References: Shows the page number where the species can be found in many popular weed reference

books. Recommended!

References All: Shows all the reference books in the program and the page numbers for those where the species occurs. NOT recommended!

Click "OK" to close the "Species Description Options" window. Click the brush icon in the tool bar to clear all marks in the menu tree. The number of species remaining returns to the original number in the key (72/72), and all of the menus and attributes return to a blue color.

You can display the photo and description of any species in the species list by clicking on its name or scrolling to it in the species list using the arrow keys. A dialogue box may appear asking what information you wish to have displayed (unless you have previously selected the box which says "Don't show this dialog before every report"). Select the information you wish to display, then click "OK." You can then click "Next remaining" and "Previous remaining" to page through the species, or use the up and down arrow keys.

Using the "Yes," "No," and "Or" Commands

Using the "YES" command.

Click the small + box to the left of "Flowers," then click the small + box to the left of "Flower color."

Using one of the five methods of menu marking, mark "Yellow" as "Yes." A "Y" mark now appears to the left of "Yellow," and the number of species remaining is reduced to 25. You have said the color of the flower on your plant specimen IS yellow.

Clear the mark using one of the five methods of menu marking. Note that the number of species returns to the original number (72/72).

Marking more than one attribute in a menu with a "YES" mark causes the attributes to be combined as "AND." For example: Mark both "Yellow" and "Purple" as "Yes." The number of species remaining is now much fewer than when only "Yellow" was marked (2 instead of 25). You have said that your flower is BOTH yellow AND purple in color, or that both yellow AND purple flowers are present within the species (these situations could be distinguished by marking the "Multi-colored" attribute).

Clear both marks you have made using one of the methods of menu marking.

Using the "NO" command.

Click (don't double-click) "Green," so that it is highlighted.

Using one of the methods of menu marking, mark the attribute "No." A "N" mark now appears to the left of "Green," and the number of species remaining is reduced. You have said that the color of the flower on your specimen IS NOT green. Note that the number to the left of "Green" still shows some remaining species. This is due to the fact that "NO" marks eliminate only those species/items that are marked exclusively for that character (in that menu). To eliminate a species that can occur with more than one attribute in a menu, all possible attributes for that species must be marked as "NO" in the menu.

Click the eraser icon in the tool bar to remove the mark. Note that the number of species returns to 72/72.

Using the OR command.

Right-click the word "Yellow." Mark it as "OR." A RED "Or" appears to the left of "Yellow" and the number of species is NOT reduced (a single "Or" has no mathematical meaning). Using one of the methods of menu marking, place an "Or" mark on "Yellow-orange." A blue "OR" mark now appears to the left of both selections. You have said that you are unsure of the color of the flower on your specimen, but that you are sure it is either yellow OR yellow-orange.

Clear both marks you have made using one of the methods of menu marking.

Using the images for "OR" marking.

Click on the words "Petal tip" in the "Flowers" menu. Illustrations of all the types of petal tips appear in the right pane. Click on the illustration for "Bilobed," and select "Mark Or." A new window opens showing all the petal tips, with a blue box around the illustration of "Bilobed" (it also appears with a check mark in the menu on the left). Click the image of any other petal tips you wish to mark as "OR" (they will become marked when you click them). Click "OK" when you are done. Use the "OR" technique any time you are unsure of the exact answer. This is very helpful for highly variable attributes such as leaf shape, plant height, and characteristics open to interpretation like flower color.

Click the brush icon in the tool bar to clear all the marks you have made in the menus. Note the number of species remaining returns to 72/72, and the menus all change to blue.

Analyze Feature

In this exercise you will use the Analyze feature to aid in identifying a dandelion (Taraxacum officinale).

Click the "Eye" button on the toolbar. A "List of Useful Menus" appears on the right. This is a list of suggestions for attribute menus which will be useful in identifying your plant. The suggestions at the top are the menus that are easiest and most likely to separate between the remaining species.

Click "Flower color" in the list of suggestions.

The menu structure tree opens to the "Flower color" menu.

Double-click the word "Yellow" in the "Flower Color" menu (marking it as "Yes"). Note that the number of species remaining is now 25.

Click the "Eye" button on the toolbar.

Click the words "Life Cycle" in the list of suggestions on the right.

The "Life Cycle" menu opens in the menu structure. Double-click the word "Perennial" in the "Life Cycle" menu (marking it as "Yes"). The number of species remaining is now 8.

Click the "Eye" button on the toolbar.

Click the words "Milky Juice" in the list of suggestions on the right.

The "Life Cycle" menu opens in the menu structure. Double-click the words "Juice milky" in the menu (marking it as "Yes"). The number of species remaining is now 3.

Click the "Eye" button on the toolbar.

Click "Root or Vegetative Propagule" in the list of suggestions.

The "Root or Vegetative Propagule" menu opens in the menu structure. Double-click the word "Taproot" in the menu (marking it as "Yes"). The number of species remaining in the database is now 2 and the "Family Identified" message appears. Click "OK" to clear the message.

Click the "Eye" button on the toolbar.

Click "Main Stem Branches" in the list of suggestions on the right.

The "Main Stem Branches" menu opens in the menu structure. Double-click the words "Main stem unbranched" in the menu (marking it as "Yes").

A "Species Identified" message now appears and the species image comes up on the right. Click "OK" to clear the message.

Clear all marks in the menus by clicking the brush icon in the tool bar.

Marking attributes of your choice with "YES," "OR," or "NO" can be combined in any sequence with asking the program for suggestions (using the Analyze Feature).

Data Distribution

Expand the Flowers menu (by clicking the small plus (+) box to the left). Expand the Flower Color menu (by clicking the small plus (+) box to the left).

The number of species in the database with each of the attributes is shown at the left of the attribute. This screen tells you that for this database "Yellow" and "White" are common flower colors, but "Red-orange" and "Brown/black" are rare flower colors. Note that any time an attribute is marked the distribution numbers for all the attributes reflect the newly reduced species list. Note also that the total of the distribution numbers in a menu is often greater than the number of species in the database. This is due to species that are marked for more than one attribute in the menu.

Contract the "Flowers" menu by clicking the minus sign (-) to the left of "Flowers."

Show Marks

Expand the "General" menu, then expand the "Milky Juice" menu.

Mark "Juice milky" as "Yes."

Expand the "Leaves" menu, then the "Leaf Arrangement" menu.

Mark "Opposite" as "Yes"

The " Family Identified..." message appears. Click "OK" to clear the message. Click the two overlapping boxes (with check-mark/red X) icon on the tool bar (the fly-over window for this icon is Marked & Eliminated) . At the top of the window on the right it shows you what marks you have made in the menus, i.e., "YES" for Juice milky and "YES" for Opposite. No species will appear in the "Eliminated Species" section of this report unless you have eliminated them using the "Eliminate" command discussed later.

Show Common Attributes

Click "Database" at the top of the screen and select "Common Attributes." The attributes shown in the right pane are the attributes that are shared by the remaining (un-eliminated) species.

Clear all marks with the brush icon in the tool bar.

List Species and View References

Click the "Item/Species List" icon (just to the right of the printer icon) in the toolbar to view a scrollable list of the species in the database (along with a selection of information and images) in the right pane. Each time this button is clicked, a dialogue box appears asking what information you wish to have displayed (unless you have previously selected the box which says "Don't show this dialog before every report"). Select the information you wish to have displayed, then click "OK."

Images of the species that have not been eliminated are presented (this may take a while), allowing you to scroll down through them. If the list of species is too long for all the images to be displayed, clicking on "More" at the bottom of the scrolled images will display the next group of images.

The list displayed will be only those species which have not been eliminated by attribute marking. Along with the species names, you may have chosen to view a picture of the species, descriptive information, the filenames of the pictures in the database, and a list of references with page numbers where you may look up the species.

Show Image Gallery

Click the Gallery button (four small squares) on the toolbar. This feature allows you to display images of more than one species at a time for the purposes of comparison. You can change the size of the images, how many are presented (up to 100), and whether the species name is displayed with each image by going to "Options" in the tool bar, then "Gallery" and making your selection. Since the images are of various sizes, there may be some blank spaces in the gallery. You can also change the way that the gallery is presented by moving the "Split Line" that divides the right and left sides of the screen. If the names are included, the images are presented in a vertical arrangement. If names are not included, the images may also be presented in rows, depending on the width of the images and the width of the right window.

Go to "Options" in the tool bar, then "Gallery" to select whether or not to show the names.

In the gallery display you can click once on an image to go into "Thumbnail" mode. Closing "Thumbnail" mode returns it to its previous size.

Show Distinctive Attributes

Right-click on the top menu title (Tutorial database), then click "Expand menu tree." Mark one or more menu attributes of your choice, until the number of species remaining is around 5 to 15.

Right-click on one of the remaining species in the list and select "Distinctive Attributes."

A screen titled "Distinctive Attributes of (name of species that was highlighted) appears. The number of species with each attribute is listed on the left hand side of the screen in order of increasing frequency. Those attributes with a "1" at the left are possible only for the species selected (and named at the top of the screen). Attributes with a "2" at the left are possible for the species selected and for one additional species from the species list, and so on. This screen should be thought of as containing features the species MAY have. These features are not necessarily mandatory. For example, a plant species may have white flowers and blue flowers; the blue flowers could be a unique feature, but your specimen might only have white flowers. If your specimen had blue flowers, however, this screen would have provided a good clue.

Click the brush icon in the tool bar to clear all marks in the menus.

Eliminating Species of Your Choice

Expand "General," then "Spines or Thorns."

Double-click the attribute "Spines on leaves and/or stems" in the menu structure.

Assume you know the specimen you are trying to identify is NOT prairie wild rose or buffalobur.

Highlight each of these species in the species list and click the blue "X" button on the tool bar to eliminate those species from consideration. This leaves a yellow triangle mark to the left of each of these species and moves them into the alphabetized list of eliminated species below the list of those remaining. Eliminating species in this manner can be very helpful. Now if you were to click "Analysis," the suggestions provided will be different than they would have been, since the program now tells you how to distinguish between only those that have NOT been eliminated.

Click the two small overlapping boxes with the black check-mark and red X ("Marked & Eliminated") icon in the tool bar. This brings up a list of the attribute marks made and below it the names of those species that have been marked as eliminated. Clicking on one of these names calls up a menu box that allows you to find the species name on the species list, un-eliminate the species, or access descriptive information.

Clear all marks in the menus using the brush icon in the tool bar.

Species Description

Right-click on any name in the species list, then click "Description." (If the dialog box allowing you to select the information you wish to have presented for that species does not appear, it is because the

"Don't show..." box is checked in "Options" >"Species Description" in the tool bar). After selecting the information you wish to display, click "OK."

This screen gives you general information about the species which was highlighted. A picture of the species may be displayed as well as descriptive information, the name of the image file names for the species, the attribute data that has been entered in the database, and a list of references with page numbers for further information on the species.

Right-clicking on a species name in the list can also allow you to eliminate the species or show its "Distinctive attributes" in comparison to the other remaining (non-eliminated) species. This feature will also work on species that have been eliminated.

Forgiveness Feature

If you parse the database down to a small number of species and the one you are looking for does not appear, you are facing one of the following possibilities:

A. The species you are trying to identify may not be in the database.

B. You may have made an error, (go to "Database," "Marked Attributes and Eliminated Items," to review what you have done).

C. There may be an error in the data.

Problems B and C can be eliminated by going to "Options" in the tool bar, then "Forgiveness Level." Selecting "Level-1" will allow any one datapoint that you have selected to be incorrect without eliminating your species. Selecting "Level-2" will allow any two datapoints that you have selected to be incorrect without eliminating your species, etc. The "non-eliminated" species occur in alphabetical order in the species list, with the number of incorrect attributes to their left. Clicking any species will allow you to see which attribute is incorrect and has been "Forgiven."

Program Help

Select "Help" from the "Help" menu at the top of the screen. No matter where you are in the program, you can click "Help" which provides you with detailed information that explains how to use the XID software.

Click the black (lower) "X" button in the upper right corner to close the Help screen.

Notes

If you are sure your specimen has an attribute that is not in a menu (but the menu appears with other attributes), your species might not be in the database or the author may have chosen not to include that attribute.

Each key includes hundreds of thousands of data entries and errors are inevitable. If you believe you have found an error, please Contact Us so that we can correct the error in future updates.

In the database, "false" data may be used when it will make the program more efficient for the unskilled user. For example, dandelion is marked as both 5 (the correct answer) and >10 (the way it looks) in the "Number of Petals" menu. Because of this use of false data, the attributes marked for a species may not constitute its true botanical description.

Many families have more than one name (for example, Asteraceae and Compositae) and either one can be selected in the "Family" menu. To eliminate such a family however, both names must be marked as "NO" in the "Family" menu.

If you want to look up information about a plant, in most cases it is better to use the scientific name rather than the common name. If the scientific name has recently changed, you will be able to find the old name in the "Synonymy" menu and go directly to the species. All synonymy is based on the Synthesis of the North American Flora produced by the Biota of North America Program (BONAP) 2008. BONAP Home Page

Printing this Guide

You may find it convenient to print this guide to keep on hand as a quick reference. Just right-click anywhere in this document and select Print, or go to File > Print in the toolbar. There is much more detailed help available from with within the Help section of any database. Help can be accessed from within the program by pressing F1 at any time or selecting Help from the menu help icon on the toolbar. From within the Help section of any database, you can also click the printer icon in the tool bar.

Description

These keys to identify plants are comprised of a set of databases designed to run in the expert system software produced by XID Services, Inc. The databases are supplemented by color images of each species and line drawings to illustrate the terminology used within the menus. Such programs offer many advantages over traditional dichotomous keys. While originally produced to increase speed and ease of use, they also provide the ability to easily update the data and images and are much less expensive to produce and more compact than hard-copy guides. These databases include a large selection of plant characteristics from which to choose. In general, much more data are included on each plant than is necessary to identify it. With this abundance of data, the user can identify a plant using the characteristics most obvious and easy to describe. With each characteristic entered by the user, the program eliminates all species that do not have the combination of features entered. If you are interested in producing your own keys, to any subject matter, using the XID system please Contact Us

BOTANICAL TERMINOLOGY

The use of botanical terms has been kept to a minimum; however, some terms used to describe plants cannot easily be replaced by "common" words. Definitions of terms, and usually illustrations, are provided throughout the menus of characteristics. Terms are also cross referenced to an excellent illustrated glossary of terms, PLANT IDENTIFICATION TERMINOLOGY (Harris and Harris, 1994, ISBN# 0-9640221-5-X).

SPECIES INFORMATION

Information provided for each species may include synonyms, ethnobotanic uses and additional

information to distinguish the plant from similar species and to separate varieties. If you are looking for a scientific name and cannot find it in the species list, try the Synonymy menu. All nomenclature used is based on the Synthesis of the North American Flora 2008 by John Kartesz, Biota of North America Program (BONAP), Chapel Hill, NC. Keep in mind that the data for each species is also available from within the XID database and constitutes an extensive botanical description.

HELP

The instructions on the use of the XID software are all included in the Program Help. To access program instructions, select "Help" from the Help icon in the tool bar. Scrolling down through the text of Help information provides a detailed review of how to use the various features of the software.

ANALYSIS

One of the most useful and powerful features of the program is the Analyze Feature. It provides a list of the easiest and most effective menus of characteristics to distinguish between the remaining species that have not yet been eliminated. In the Broadleaf database, the Analyze feature may be used at any time. However, in the database for Grasslike Plants, it is important not to use the Analyze feature until the plant family for the plant has been identified. In the Grasslike database, using the Analyze feature before the family is identified runs a high risk of failing to identify the plant because it may lead the user to an attribute menu for the wrong family. If the correct family is not known, one should first go to the Family Key menu; if the family is known, go directly to the appropriate family menu and the program will identify the family after the first characteristic is entered.

INTERACTIVE IDENTIFICATION

When using the program, SELECT SPECIMENS THAT ARE OF AVERAGE SIZE FOR THAT POPULATION. Many of the easiest characteristics for the untrained user will be found in the "General" menu. The user should first enter the most obvious or unusual one or two characteristics of the plant and then use the Analyze feature to get leads for where to go from there. If you are not sure whether a characteristic fits the plant to be identified, DO NOT mark it. If you are not sure which characteristic best fits the plant (a blunt vs. rounded leaf tip, for example), USE THE "OR" FEATURE to mark them both and ensure that the correct species will not be eliminated from consideration. Also use the "OR" feature for dimensions of leaves, etc. to avoid problems from specimens outside the usual size for that species. When using the Analyze feature, the user may select any of the menus listed or select a different menu from the menu tree. Unless you have extensive training in plant terminology, avoid the more complicated or technical characteristics; they usually aren't needed anyway. Due to the large number of characteristics to choose from, there are literally hundreds of thousands of possible paths to identify the same plant. USE WHAT YOU KNOW, WHAT IS MOST OBVIOUS, AND MOST UNEQUIVOCAL.

PICTURES AND DESCRIPTIONS

Once you have reduced the number of remaining species to a relatively small number, review the photos and/or descriptions using the "Gallery" or "Species List Report." It can take as many steps in the menus to reduce the number of remaining species from 16 to 1 as it does to reduce the number from 400 to 12!! These extra steps can greatly increase the possibility of making an error (especially since these species have greater similarities). Once you have decided on the identity of your specimen, use the page number guide to the references included in XID as well as other methods

(such as internet searches) to confirm your findings.

REFERENCES

The "References" section (click the R on the tool bar) allows you to see the ISBN # for the references used in the program so that you can order those which you would like to add to your library. You can also "drag and drop" the references in the list so that those which you own will appear at the top.

This program is a tool to help in the identification of plants, and as with any key, should not be considered a final authority. Identifications should be checked against plant descriptions. A list of references and page numbers describing the plant may be called up from the Species List.

We have made every possible effort to eliminate errors from the data. In the event you find data errors, we encourage you to Contact Us so we may correct them in future versions. The data and images are being continually updated for inclusion in future versions. Please contact us if you have a better image of any species that you would like to contribute. Photographic credits are included on any images used in the databases; however, only non-copyrighted images are accepted for this purpose.

Acknowledgments

This program would not have been possible without the effort and talents of Charles Butts who developed the software for the original versions.

Many of the photographs of species used in these programs were assembled through extensive effort and travel by Bruce Barnes of Flora ID Northwest. As a result of years of work, he has developed a library of images of virtually every plant species in the Pacific Northwest. These images are available in his comprehensive databases for all native and naturalized plants in the states of: Washington, Oregon, California, Idaho, Montana, Nevada, Utah, Colorado, Wyoming, North Dakota, South Dakota, Minnesota, Kansas, Wisconsin, Nebraska, and Iowa as well as the Canadian Provinces of Alberta, British Columbia, Saskatchewan, and Manitoba.

Bruce Barnes can be contacted at:
Flora ID Northwest
PO Box 1831, Pendleton, OR 97801
541-276-5547, FAX 541-276-8405
Contact Flora ID Northwest
Flora ID Northwest Home Page

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Herbarium facilities have been made available at Oregon State University, the University of Montana, University of British Columbia, University of Wyoming, Brigham Young University, University of Colorado, Washington State University, University of Washington, Utah State University, and West Virginia University. The herbaria staff have in all cases been very helpful.

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Tenaglia for the generous contribution of images from his excellent web site on Missouri Plants. Missouri Plants Home Page

We are deeply indebted to the many photographers and agencies listed below who have graciously allowed us to digitally copy their slides for use in this program, making the end result a truly collaborative effort. Due to their generosity, images included in the program may be used for any non-profit educational purposes without obtaining additional permission, however all images must retain the photographers credits for all usages.

Photographers and agencies whose photographs may be included in this program include: Dirk V. Baker, Bruce Barnes, Bruce Barbour, Drake Barton, Robert Bellm, Howard Black, John Boyd, David Bradshaw, John Cardina (Ohio State University), Randall and Lisa Currie, Rick Boydston, Jim Copeland, George and Audrey DeLange, David Dierig, Joe DiTomaso, Joe Duft, Keith W. Duncan, Peter M. Dzuik, Don Eastman, Priscilla (Alexander) Eastman, Fred Fishel, Simon Fowler, Craig Freeman, Janet Garcia, Dave Gealy, Pat Geier, Ron Hartman, Steve Griffin, Aaron Hager, David Hallinan, Tim Higgs, Marty Hudson, Idaho Conservation Data Center, Russ Jolley, Greg Keighery, Trey Koger, Bob Korfage, Matt Lavin, Ryan Lins, Robert Mansfield, J. Gordon Miller, Ian Morrison, Barbara Moyer, Dean Nelson, Robert Nicholson, Dawn Nordby, Jason Norsworthy, Alex Ogg, Richard Old, Oregon State University Herbarium, Dallas Peterson, Lynsey Peterson, Abelino Pitty, Daniel Poston, Pottawatomie County (KS) Weed Dept., Rod Randall, Jesse Richardson, Paul Roberts, Cindy Roche', Rocky Mountain Herbarium, Steve Schoenig, Daniel Schrag, Christy Shropshire, Sasha Shaw, Samunder Singh, Ruth Smith, Kim and Forest Starr, Tracy Sterling, Bill Stringer, Ronald Taylor, Dan Tenaglia, Chris Tingle, Patrick Tranel, Karl Urban, Amber Vallotton, Roy Vidrine, Lorie Wagner, Steve Watts, Washington State Noxious Weed Control Board, Washington State University, Steve Watts, Fred Weinman, West Virginia University Herbarium.

All geography data and maps, as well as updated synonymy, are provided by the generous permission of Dr. John Kartesz of the Biota of North America Program (BONAP). If you have a serious interest in plant nomenclature or geography in North America, the BONAP Synthesis of the North American Flora is the quintessential reference. BONAP Home Page

How to Contact Us

XID Services, Inc.
PO Box 272
Pullman, WA 99163
Phone 800-872-2943
Contact Us
XID Services Home Page

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