

GNPS

Habitat Restoration Manual

Introduction/Overview:

This manual is intended to be a guide for individuals and groups who have seen the beauty and diversity of native plants and their habitats and who want to recreate a native habitat or to restore one to its natural condition. We have based this manual on standard professional practices, but we have modified them in order to make them more accessible to non-professionals.

This manual includes guidelines for you to follow in planning and executing your habitat restoration project. In addition to guidelines, the appendices have most of the additional information you will need, such as an outline for doing a site assessment, protocols for eradicating pest plants, descriptions of the primary habitats found in Georgia with plant lists, reference materials, resource lists, contact information, etc. The guidelines themselves are based on the Guidelines for Developing and Managing Ecological Restoration Projects, published by the Society for Ecological Restoration, and written by Andre Clewell, John Rieger, and John Munro, dated June 24, 2000. Most of the guidelines are quoted directly therefrom. We have, however, restructured, reordered, and reworded in order to simplify the process for non-professionals and make the concepts more accessible.

The guidelines are intended to be an ideal process to follow in a habitat restoration. In practice, you may find that different projects are in different stages of development or that different groups have different objectives, preferences, capabilities, etc. As a facilitator of the project, you will need to guide individuals and groups in making good decisions, but you need to be flexible and realistic about what you can accomplish, and adapt the guidelines to each specific project. In most cases you will find that you will have to compromise certain steps in order to complete a project. With the view that an “ecologically beneficial treatment short of full restoration” (see below) is a step in the right direction, such compromises are reasonable.

What is habitat restoration?

There are various different definitions of habitat restoration. From a technical/scientific standpoint, habitat restoration is *the re-establishment of a healthy, functional, and self-sustaining ecosystem appropriate for a given geographic location*. From a practical standpoint (i.e. from the standpoint of practitioners in the GNPS program), habitat restoration is the removal of pest plants and the reintroduction of native plants appropriate for a given site. Habitat restoration isn't gardening with native plants. This wonderfully rewarding activity is fully addressed in many of the published gardening guides. Habitat restoration has a more specific objective. The operative word in both the technical and practical definitions is “appropriate.” For while most plants are native to at least one habitat, there are few plants that are native to all habitats, i.e. there are “appropriate” choices for practitioners to make at any given site. This manual will help you make appropriate choices.

We have separated the habitat restoration process into four main steps: preliminary planning, detailed planning, implementation, and follow-up. Many people get so excited about a project that they break-out the chainsaws and shovels first, and then figure out what they are doing as they proceed. While their enthusiasm is admirable, they run the risk of inflicting significant damage on a site. Moreover, a lot of valuable time and energy will be wasted in the process, which increases the probability that the project will be left unfinished. Good planning is crucial to a successful project. If you complete a sound plan and never lift a shovel, you will have accomplished something significant. A completed plan can be shelved until a later date, or it can be passed on to other leaders who can then pick up the ball and run with it.

Why is habitat restoration important?

Habitat restoration is an opportunity to reverse ecological damage. There are many benefits to both large and small projects including maintenance and enhancement of bio-diversity, the preservation of native

species (including threatened and endangered species), the improvement of air and water quality, and ecological functions. Habitat restoration can also be a vehicle for educating the public about native plants, animals, geography, and geology.

From a macro perspective, a restoration project such as a backyard habitat or a neighborhood park may be a very, very small part of the larger regional, national, or even global ecosystem, but individual projects can, in the aggregate, reverse some of the fragmentation of the natural environment, which has been identified as a primary source of environmental damage. Moreover, individual projects can become a focus for the activities of groups, neighborhoods and communities that may ultimately result in regional and/or national action.

Before you get down to the details take a few moments to ask yourself the following questions:

What do you want to do? Why do you want to do it?

There are many different types of habitat restoration projects ranging from very technical restorations of wetlands, stream banks and grasslands/prairies, to more familiar projects like neighborhood park renovations, nature trails, installation of schoolyard habitats, demonstration gardens, etc. Take a few moments to determine what you want to accomplish.

Once you have identified what your project is, you need to ask yourself why you want to do it. Stewardship of nature is a primary motivator for many people. They feel a sense of duty to take care of and protect the natural environment in an active way. Other people have recreational, educational, or aesthetic reasons for undertaking a project. Still others are working for specific goals such as protection of threatened or endangered species, water and air quality improvement. Be clear about the why the project is worth your time and energy and what benefits are expected to result from it.

Am I qualified to do this?

It isn't necessary for you to be an ecologist or a botanist to undertake a habitat restoration project. A working knowledge of native plants and their habitats is helpful, but something that is readily acquired. Your primary responsibility in undertaking a project will be to act as a facilitator, which involves bringing people together, finding answers, planning, and moving the project forward, etc. The primary qualifications are a commitment to make the "appropriate" choices and a commitment to attain the goal of the project.

Depending on the scope of your project, you may need professional help in the form of consultants to guide you in making the right choices or in the form of qualified contractors that may deliver certain services. If your site has endangered species, for example, you will need a consultant to help ensure their protection. If you are undertaking a restoration that involves a stream bank, you will need professional assistance. The need for professional support will become clear in the planning stage.

An overriding principle for your actions should be: DO NO HARM. If you do not have the information or expertise to make an appropriate choice, you must find someone who does. There are a lot of resources available to help you.

Another key factor you should consider is time. You need to be realistic about the amount of time you have to devote to the project. The worst thing you can do is undertake a project and then leave it unfinished, which could result in damage to the site.

Who will undertake the project? Who can help you?

Unless you are working in your own backyard, habitat restoration is a team effort. You will need someone to manage the project, someone to recruit and coordinate volunteers, and the volunteers themselves. Depending on the scope of your project, you may need a designer, an ecologist, someone to handle

finances, some one to handle publicity and communications, and some one to document the project. Successful projects have a large and motivated team of people.

A key part of building your team is identifying the stakeholders in the project and involving them early in the planning process. Some of your stakeholders will be obvious, such as the residents who live in the immediate vicinity of the site. Other stakeholders may be less apparent, such as city and county authorities. You will need to enlist the support of all stakeholders to build a shared vision and to develop and implement the project. Stakeholders have a way of becoming roadblocks if they are not included in the planning process.

Another key will be a volunteer base. In addition to the people that will help you manage the restoration, you will need volunteers. You will likely find that volunteer recruitment and training is a “full time” function that one of your partners will need to manage.

You will also need partnerships and support from a variety of people and organizations. There are many resources out there. You will need to find and engage them. Check the resources section of the manual for a list.

How much will the project cost? Where will we get the money?

Small projects can be successfully done using “freebies,” such as volunteer labor, loaned tools, rescued plants, etc. Many professionals are willing to contribute some time or materials to worthy causes. Larger projects, however, will often require professional help that will cost money, such as consultant’s fees, pest plant eradication, special tools and materials. Such costs will be funded by contributions from interested parties or by a grant. The grant application process is very involved and time consuming. You should plan thoroughly and well in advance if your project will require significant contributions or a grant.

When do we start and how long will it take?

You can start the planning process immediately. Good planning takes what seems to be a lot of time, but it ensures efficient use of resources and effective results. You can plan on taking several months to gather information, brainstorm, analyze, set goals and objectives, etc. The specific actions you take, such as pest plant removal, transplanting rescued plants, etc. will seem to move forward very quickly once you’ve written your plan. Such actions will be implemented according to the season.

The duration of a project depends on its size and scope, the objectives that you lay out for yourself, the size and depth of your team, etc. A small project, such as a backyard habitat may be accomplished in one season. A large project may require several years. In general, habitat restoration is a slow and deliberate process, which ensures that the appropriate choices are made, that no damage is done and that the site has a firm footing on which to recover.

Georgia Native Plant Society

Guidelines for Habitat Restoration Projects

Based on Guidelines for Developing and Managing Ecological Restoration Projects
Published by the Society for Ecological Restoration, by Andre Clewell, John Rieger, and John Munro, June 24, 2000

Introduction:

The primary goal of your habitat restoration project will be to re-establish (or in some cases to establish) a healthy, functional, self-sustaining ecosystem appropriate for your site. Two features of a healthy functional ecosystem are species richness and community structure. Species richness is an indication that there is an adequate diversity and density of species to ensure sustainable populations. Good community structure is an indication that the species are able to interact and carry on their natural function in the ecosystem. Good physical conditions ensure that the species and their functions in the ecosystem are sustainable. True and complete habitat restoration is a delicate, complex and long-term undertaking, which is usually beyond the capabilities of non-professional practitioners.

While true and complete restoration may not reasonably be fully achieved, your project may be considered a *rehabilitation*, which may be defined as any ecologically beneficial treatment short of full restoration. All GNPS restoration (in its deepest sense as defined above) should be the ultimate goal of all GNPS projects.

For the purposes of these guidelines, the term “restoration” will be used as an all-encompassing term for restoration, rehabilitation, and renovation.

Ancillary to the primary goal of (re)establishing a functional ecosystem may be several other goals such as improvement of water and air quality, recreation, education, preservation of native species, etc.

The guidelines are divided into four main sections: Preliminary Plan, Detailed Plan, Execution, and Evaluation. The Preliminary Plan is an outline of the project. It is a brief description of the goals and logistics of the project with an estimate of costs. The Detailed Plan is a detailed description of the objectives of the project, the actions necessary to achieve the objectives and a description of how you will measure attainment of the objectives. The Execution section lays out the steps involved in executing the plan. The Evaluation section is an outline you can use to evaluate the attainment of your goal and the success of your project. You will notice that the Execution and Evaluation sections are short compared to the Preliminary and Detailed Plans. This is the case because successful projects require thoughtful detailed planning.

If you are planning to apply for a grant to accomplish all or part of your objectives, you should have completed both the Preliminary and Detailed Plans.

GNPS HABITAT RESTORATION PROGRAM
PRELIMINARY PLAN
(Name of Project)

1. Identify site.

Identify the location of the project and the boundaries of the site. Delineate soil, watershed and any other material features. Attach a topographic map and/or aerial photograph. Identify ownership of site including: name, address, telephone number, e-mail address. If an organization or institution owns or manages the land, specify names, titles, addresses, and contact information for key decision makers. Identify under what auspices actions will be conducted (e.g. Atlanta City Parks, Etowah Water and Sewer Authority).

2. Identify the goals of the restoration.

Why is the project warranted? What is special about the property/project? What will be the intended benefits of restoration? Are there social and cultural goals for this project, such as recreation, education, aesthetic, preservation of cultural heritage, conservation of native species, water quality improvement, air quality improvement, quality of life improvement, etc.?

Are these goals congruent with the primary goal of reestablishing and/or enhancing a functional ecosystem on the project site?

Remember that successful projects evolve out of a shared vision of all the stakeholders. You should get your stakeholders together and agree on the goals for the project.

3. Identify the kind of habitat to be restored and the type of project.

Identify the habitat to be restored. Consult with a GNPS Habitat Restoration committee member, ecologist, botanist or landscape architect/designer, if necessary. You may or may not have a model habitat (reference ecosystem) to refer to in your description.

Are there any special habitats and plant or animal communities that are targeted for restoration? Identify any threatened or endangered species on the site.

Identify the degree of restoration that you plan to undertake. Which of the following is most descriptive of your goal: restoration, rehabilitation, renovation, creation? Are you undertaking a complete restoration of the site? Are you planning to achieve only one beneficial effect? Do you plan to repair a damaged habitat? Or are you planning to create a replacement habitat for one that was lost. Or are you planning to create a new habitat?

4. Identify site conditions in need of repair/change.

You should assess the topography and soil conditions, the water and light regimes, the existing flora, the sensitivity of the site to disturbance, etc. with a view to developing a comprehensive list of repairs or changes that should be undertaken in order to achieve a beneficial effect.

For example, you should identify any pest plants and the extent of the infestation.

5. Identify actions (interventions) that are needed.

For each condition in Step 4, identify actions that are required to achieve goal. For example, what steps should be taken to eradicate any pest plants. What species should be reintroduced or augmented – plants, animals, and other, including mycorrhizal fungi, N-fixing bacteria, or other microbial species?

Identify any special needs of the habitat. For example, some habitats require special stressors to become a functional ecosystem. Examples of special stressors include fires, flooding, periodic drought, salinity shocks associated with tides and coastal aerosols, freezing temperatures, and unstable substrates caused by water, wind or gravity as on beaches, dunes, and flood plains.

6. Identify requisite resources.

Identify what labor, materials and equipment will be needed. Who will implement the project? Is professional expertise is required? What biotic resources are required – seeds, plants, animals, etc?

The key question for most community-based projects will be: WHO? You need to have a well-defined project team with clear responsibilities. You need to know who all your “stakeholders” are so that you can draw on that pool of bodies.

7. Describe any maintenance, management.

Most projects will require some initial and on-going maintenance/management in order to become self-sustaining. Depending on its nature and scope, your project may require long-term maintenance and management. Describe what maintenance/management will be required and identify who will do it. Also, most sites will need some form of protection from damage, either natural or man-made.

8. Estimate costs & identify funding sources.

Itemize costs associated with steps 5-9. Include any costs necessary to complete the Detailed Plan, e.g. consultants’ fees, etc. Sum these costs and estimate the total cost of the project.

What are the sources of funds to cover the cost the project (definite and potential)?

9. Identify legal restrictions.

What permits may be required by federal, state, and/or local authorities, e.g. dredge and fill, wetland disturbance, endangered species, historic sites, etc.? What landscape/land use/water use restrictions are there -- present and future? What other specifications, restrictions or other legal constraints may there be?

10. Identify project time line.

Be realistic. Successful projects proceed carefully and methodically.

GNPS HABITAT RESTORATION PROGRAM
DETAILED PLAN
(Name of Project)

11. Identify the Project Team.

Identify project manager and team members. Give name, address, e-mail, telephone numbers.

Identify alternate responsible party. Who will pick up responsibility for the project if the project manager resigns or becomes incapacitated?

Identify any other requisite expertise such as designer/landscape architect, ecologist/academic/consultant.

Identify a volunteer recruiter/coordinator. Identify your volunteers/work crew.

Depending on the nature of your project, you may want to solicit input/support from the general public and any residents in the immediate area of the site.

12. Identify a reference ecosystem for the project.

Identify the reference ecosystem, i.e. that habitat upon which the restored habitat will be modeled and against which it will be evaluated. If possible, complete site assessments and data collection reports on three sites.

Consult with botanist, ecologist, landscape architect or GNPS Habitat Restoration committee member.

13. Conduct a site assessment. Document site conditions, plants and animals.

Describe the site conditions – topography, hydrology, and soil. Comment on any site history that may be pertinent. Describe existing plant and animal species, take note of composition, abundance, etc. Document structure of component communities.

Document any baseline measurements necessary for measuring effectiveness of restoration tactics and for ongoing monitoring such as water quality and groundwater levels, soil profile, etc. and document any pertinent autecological information for key species.

Mark significant features, including significant features to be changed, removed, protected, or added.

Refer to Appendix XX for an outline for a site assessment.

A good site assessment may take a year or more to complete. Allowing ample time for site assessment will ensure that important plant populations (e.g. ephemerals) and site conditions (e.g. seasonal flooding) are identified and documented.

14. Determine if goals are realistic or if they need modification.

Are the goals defined in the Preliminary Plan realistic or do they need modification? On the basis of information gained so far, you should conduct a feasibility study to determine if the type of restoration (Guideline #4) and the original project goals (Guideline #3) are realistic. If not, modifications should be proposed.

15. Prepare a list of objectives designed to achieve restoration goals.

Objectives are the features of the project necessary to achieve the goals. Objectives are explicit, measurable, and have a designated time element. Some examples of objectives are:

Remove all privet, English ivy, and kudzu at the site.
Increase the number of hardwoods (site appropriate) at the site.
Enhance the diversity of the herbaceous species at the site
Attract more birds to the site.
Increase the depth of the topsoil at the site and improve its tilth and fertility.
Improve the site's water quality.
Improve pedestrian access to the site.

16. Identify the actions that will be necessary to attain each objective.

Identify all actions and treatments (interventions) needed to accomplish each objective listed in Guideline #18. Provide detailed instructions for implementing each of these interventions. Give sequencing of interventions. Provide a detailed list of labor, equipment, supplies, and biotic stocks.

State how much of the restoration can be accomplished passively. (In many cases, restoration may be accomplished simply by creating the circumstances under which natural processes may resume. This may be as simple as removing invasive exotics which in turn will allow native seeds in the soil seed bank to germinate.)

17. Define all maintenance/management tasks necessary to attain each objective.

Plans for watering, pruning, supplemental pest plant treatments, etc.

18. Have Detailed Plan reviewed by professional, if necessary.

Depending on the scope of your objectives, the particulars of your interventions, etc., you may need a qualified professional such as an ecologist, landscape architect/planner, or forester review your detailed plan to ensure that you are making appropriate choices. Ideally, this person would be involved throughout the entire process. Most professionals, however, will expect to be compensated for their consulting time, so a final review of a detailed plan may be the most cost effective. Ask the GNPS Habitat Restoration committee to refer you to a qualified professional.

19. Define a plan to demonstrate success of project.

You should plan on measuring the success of your project. Determine what measurements are necessary to demonstrate that each objective has been attained. Determine how and when measurements will be taken. The measurements should be empirical, and they must be readily collected so that monitoring is not onerous.

20. Schedule the tasks needed to fulfill each objective.

Scheduling must take into account: season, need for contract stock, need for seed stock, availability of labor and equipment, weather, etc. Most objectives are implemented within the first or second year of installation. Some objectives may have to be delayed. For example, the re-introduction of plants and animals with specialized habitat requirements may have to be postponed several years until habitat conditions become suitable.

21. Prepare a detailed budget for restoration plan.

Review and refine estimates from Preliminary Plan. Determine final estimates for each cost. Solicit bids from commercial service providers. Include a contingency amount.

22. Secure funding to cover costs of project.

If you need money to complete your project, get a commitment for it before you start.

23. Build a project network.

Establish a liaison with other interested groups or agencies. See Resources List to begin assembling your network.

24. Publicize the project.

Solicit public participation in project implementation. Contact media when appropriate.

EXECUTION

25. Secure permits required by regulatory and zoning authorities.

These are the permits identified in guidelines #11.

26. Engage and train personnel who will supervise and conduct project installation tasks.

Recruit Volunteers. Engage professional assistance. Schedule training.

27. Install access infrastructure needed to facilitate project implementation.

Roads, footpaths, etc.

28. Procure equipment, supplies, and biotic resources.

Care should be taken to assure that regional ecotypes of biotic resources are obtained to increase the chances for genetic fitness and to prevent needless and harmful introductions of non-indigenous ecotypes and species.

29. Mark boundaries and secure the project area.

Document with pictures.

30. Install monitoring requirements.

E.g. transect lines, staff gauges, piezometer wells, etc., if necessary

31. Initiate restoration interventions.

Restoration tasks are identified in Guideline #19. The project manager should supervise project installation or delegate supervision to project team members.

32. Take steps to protect the project site against vandals and herbivory.

33. Perform post-implementation maintenance/management.

Described in Guideline #20.

34. Perform monitoring as required to document the attainment of performance standards.

In addition to taking necessary measurements, any necessary revisions to tasks and/or objectives should be promptly identified.

35. Define and implement adaptive management procedures as needed.

EVALUATION

36. **Determine if performance standards are being met and report.**

Review each objective in light of its expected performance criteria. Make a conclusion and report.

37. **Describe any aspects of the restored ecosystem that are not covered by monitoring data.**

38. **Determine if project goals were met, including those for social and cultural values and report.**

Make conclusion and report.

39. **Publish an account of the restoration project and otherwise publicize it.**

Appendix I

Site Assessment

Procedure

Revised March 2002

In order to do an appropriate habitat restoration, you must have a precise knowledge of what habitats are (and/or were at one time) at the site. Remember that any one site may have multiple different habitats. Complete a written site assessment using the following categories.

Region: There are five primary physiographic regions in Georgia: the Cumberland Plateau, the Ridge and Valley area, the Blue Ridge, the Piedmont, and the Coastal Plain. Some of these are further subdivided in more specific regions. Refer to Appendix XX to familiarize yourself with the primary regions and their features.

Topography: Identify on a map the site's significant topographical features and the topography of the area around the site. Common topographical features are: mountain, ridge, slope, valley, field, cove, rock outcrops, river, stream, creek, etc. For a list of common topographical features see appendix X.

Aspect: Identify the aspect of the site(s), i.e. facing North, South, East or West.

Water: There are three primary distinctions to make with respect to the amount of water at any location: wet, mesic (sometimes wet/sometimes dry), and dry (xeric). You should remember that your observation is occurring at a particular point in time. Because the amount of water at a location is determined by factors such as weather, season, etc., you may need to make several observations over the course of a year (or in some cases over several years) in order to make an accurate observation. And remember that sites evolve over time.

If a location is predominantly wet, it is a wetland. There are eight different wetland habitats. From wettest to driest, they are: rivers, streams, springs i.e. flowing water; lakes, ponds & bays, i.e. standing water; marsh; bog; pocosin; savannah; swamp; flood plain/bottom land. Please refer to appendix X for a definition of these wetlands.

Soil: Soil types are very complex and beyond the scope of this overview. On the basis of soil surveys available from the DNR, try to make a basic determination of what the characteristics of the soil are. For example: sand, clay, or loam.

Vegetation: There are six types of vegetation, trees, shrubs, herbaceous plants, vines, grasses, ferns. (mosses and lichens ?).

Structure: When doing a site assessment, you need to make a determination of the structure of the vegetation at the site. How many layers of vegetation are there at the site? The typical layers are canopy, sub canopy, shrub, herbaceous, vines and epiphytes. When making this determination, start at the very highest layer and work your way down.

Dominance: You should identify the dominant species in each layer. In a forest/woodland ecosystem, the dominant vegetation will be trees. In a field/meadow ecosystem, the dominant vegetation will be grasses. Try to estimate the amount of cover (the percent of the site covered) occupied by the significant species. A precise estimate is difficult without doing a detailed measurements and calculations; however, you can make rough estimates using a common sense breakdown into light cover (1-10%), medium cover (10-50%), dense cover (50-100%).

Scientists have identified several well-known forest types. The primary forest types in Georgia are: the mixed mesophytic forest, the Oak-Pine Forest (oak-hickory-pine per Midgley), and the southern mixed hardwood forest. For more detailed descriptions of these forest types, please refer to appendix X.

There are several other well-known habitats, including fields/meadows, rock outcrops, etc. Please refer to appendix X for more information.

Light: Related to structure, dominance, topography and aspect, is the issue of light. Some sites are sunny others are shady. The degrees of light and shade and the change in light over the course of the day and the season are important factors in a given habitat.

Fauna: Make a note of any fauna that you observe during your site visits identifying (to the best of your ability) species, number, and location.

Climate & Weather: The obvious is often overlooked. There are significant differences in climate and typical weather patterns between the mountains in north Georgia and the coast in south Georgia.

Processes & History: A key aspect of understanding an existing site is knowing what stage in its lifecycle the habitat is in and whether the habitat has been modified (as is usually the case in Georgia) by agricultural activity. Forests, for example, follow a particular pattern of growth, the typical stages of which are: recently cut, new growth, old growth, second growth, etc. Grasslands and wetlands also follow a natural progression. Related to the natural progression of a habitat are stressors (both natural and human) that alter the habitat such as fire, flooding, agriculture, logging, etc. See Appendix XX for descriptions.

Conclusion: The goal of the site assessment is to lay the groundwork for your restoration actions and to determine what plant communities exist at the site, whether they are native/appropriate for the site, and how the site compares with the reference ecosystem (your model). If possible, your conclusion should use the US National Vegetation Classification terms. You may want to use the reference ecosystem descriptions in Appendix X in order to facilitate this process.

Appendix II

Pest Plant Eradication Procedure

Revised August 2002

Training sessions for lay persons.

Informational sessions for residents in immediate area.

There are 6 primary pest plants (invasive exotic species) in Georgia: Privet (*Ligustrum sinense* & *japonicum*), English ivy (*Hedera* sp.), Kudzu (*Pueraria montana*), Japanese honeysuckle (*Lonicera japonica*), Mimosa (*Albizia julibrissin*), Princess tree (*Paulownia tomentosa*), among several others.

The procedure of eradication is determined by the following: (1) which pest plant is being attacked; (2) what the site conditions are; (3) what the season and weather conditions are; (4) what the relative availability of labor, chemicals and machinery are; (5) what the preferences of the owners/managers of the site are. The project manager should draft a pest plant eradication plan for the project taking all of these factors into account. This plan will be used to direct volunteers and/or commercial service providers.

While the primary goal of all plans will be to eradicate any/all pest plants at a given site, there are several secondary goals that should be kept in mind. They are: (1) to ensure the safety of volunteers and personnel; (2) to maximize effectiveness of treatment; (2) to minimize use of chemicals; (3) to minimize disturbance/damage to site and adjacent sites; (4) to prepare the site for other restoration actions.

It is important that volunteers or commercial service providers are able to recognize the plants that are to be removed, that they understand the procedure being used and the boundaries of the site. It is best to conduct a brief training session before each treatment. Refer to The Bugwood Network website for plant descriptions and other information at www.bugwood.caes.uga.edu/weeds/forexotics.html.

Privet, *Ligustrum sinensis*

Privet is, perhaps, the most destructive of all pest plants in Georgia because of its ability to adapt to a variety of site conditions (sun, shade, wet, and dry), its ability to quickly dominate a location with a extremely dense growth, shading out natives and soaking up available water. Also, privet has a remarkable ability to recover from treatment actions. With mature stands of privet, there is often a seed layer that will sprout once mature plants are removed. Also, roots of mature plants that are broken off in the ground resprout readily. Often, a secondary treatment will be necessary.

General: Use a combination of hand, mechanical and herbicide treatment depending on the size of the plants.

For small plants, seedlings, etc., pull plants up by hand. These small plants usually do not have deep roots and pull up easily. Depending on the season and expected weather conditions, small plants may be disposed of by dropping the plant in place or by removing the plant to a brush pile. Dropping the plant in place is more efficient from a labor standpoint; however, it is only appropriate if the plants can reasonably be expected to dry out and die in place. Otherwise the plants should be piled in brush piles where they can dry out or be shredded into mulch.

For medium-sized plants, ¼ inch to 2 inch caliper plants, dig plants up using a shovel, pick ax, or other levering tool. For the larger plants, it is best to work in teams of two, where one person can dig and lever the root ball, the other can pull the stems and remove the brush. The partners can switch off to relieve fatigue/monotony. Plants should be piled in a brush pile where they can dry out and die, be shredded into mulch, or be burned. Large stems of privet do not decay readily, so shredding or burning may be desirable for aesthetic reasons. Root balls frequently break off from medium and large roots. These roots will often resprout, which will necessitate a secondary treatment.

For large plants, 2 inch and greater caliper plants, cut plants with a chain saw or pruning saw. Make the cut flat not angled. Spray or paint the cut with an herbicide immediately after cutting. Work in teams of three: one person to cut, one person to remove the brush, one person to spray the stump. It is not practical to shred the stems of large plants into mulch. The brush from large stems can be lopped off and shredded. The stems themselves can be scattered in a forested area and left to decay, removed and disposed of, or piled and burned. As with medium sized plants, privet will often resprout necessitating a secondary treatment.

Herbicide: A recommended herbicide for privet under standard conditions is glyphosphate (Roundup). A recommended herbicide for privet near water is _____. Persons applying herbicide must be appropriately licensed and must follow manufacturers' directions for application.

Additional Tips: Clearly define the area you are clearing. Be realistic about the area that you can cover with the resources you have. Do not attempt to clear too much area during any one work session. It is better to thoroughly treat a smaller area than it is to do an incomplete job on a large area.

If an individual plant (even a small one) does not yield readily to hand or shovel removal, do not try to struggle with it. Take a practical approach and go on to another plant. Focus on covering a defined area as quickly as possible using a given method. Once you have finished covering the defined area, determine whether a supplemental treatment with cutting and herbicide will be necessary.

Some stands of privet (large, medium or small) are so dense that it is impractical to pull by hand. In certain soils, even small plants will not pull easily by hand. In these cases, it is most effective to cut the plants close to the ground with a weed-whacker or a bushhog. If you use a weed-whacker, you should use one with a blade attachment rather than a string attachment. Once the plants resprout, they should be treated with herbicide(see below). Small plants will create a thin mat over the ground that can be effectively sprayed. Large plants will create a compact bush that can be effectively sprayed. Both cases will minimize the amount of chemical used.

Site conditions: The site conditions that are relevant for the eradication of privet are as follows:

Proximity to water: In order to minimize soil erosion and damage to a stream bank, privet should not be pulled or dug within ___ (15?) feet of flowing water, the buffer zone. Privet in the buffer zone should be cut, allowed to resprout, and sprayed with an appropriate herbicide. If there is the probability of flooding in the area, your plan should include provisions for streambank stabilization. One provision for stabilization is to treat alternating square/rectangular segments of an appropriate size, i.e. like a checkerboard, such that the entire area can be treated over a 2 or 3 year period. This will allow some segments to stabilize before additional segments are treated.

Privet does not usually survive in bogs, swamps, and other wetland areas that are constantly wet. If privet is found in these habitats, it should be pulled or cut. Herbicide may be used only if there is at least one seasonal dry period during which it can be applied, or if it can be painted carefully on stumps without the risk of contaminating water.

Topography: Privet usually grows on bottom land. If it is to be removed from a sloped area, care should be taken to minimize soil disturbance and the potential for erosion by pulling carefully, refilling holes with dirt/mulch and compacting loose soil with your foot. In vulnerable areas such as the buffer zone, exposed steep slopes, etc., cutting and spraying with herbicide is preferable to manual/mechanical removal.

Season and weather: The best time of year to undertake manual and mechanical treatment of privet is in the winter and early spring. The best time to apply glyphosphate is during the growing season (Spring through late Summer) when it is warm (xx degrees or higher). You should apply glyphosphate only when there is no rain expected during or immediately after application. Also, like many plants, privet can go dormant during an extreme drought. Because glyphosphate is a systemic herbicide and must be absorbed and distributed throughout the plants system in order to act effectively, it is best to avoid applications during extreme drought.

Ivy, *Hedera sp.*

Ivy is an extremely destructive pest plant in Georgia because of the dense layer of growth that it forms which prevents native herbaceous plants and shrubs from reproducing and growing. Ivy grows aggressively in the dense shade of old growth forests, generally in mesic and xeric conditions. Because it has a thick waxy coat on mature leaves, ivy is often resistant to herbicide treatment, and therefore difficult to eradicate. Once area has been effectively treated, however, follow up treatments are generally minimal and complete eradication is quickly achieved.

General: Use a two step process of removing mature growth with a combination of hand, mechanical treatment followed by an application of herbicide.

Topography: On flat or gently sloping terrain, cut and shred mature vines and foliage with a mulching lawnmower, brush cutting mower, or weed whacker. Debris may be left to decay in place; however, it must be thoroughly shredded. On steep terrain and/or cliffs, ivy vines should be cut at the ground by hand. Care should be taken not to disturb the soil or substrate when doing manual work, as this could result in erosion and provide an opportunity for other pest plants to invade.

Herbicide: A recommended herbicide for ivy under standard conditions is _____. A recommended herbicide for ivy near water is _____. Persons applying herbicide must be appropriately licensed and must follow manufacturers' directions for application.

Proximity to water: When working within 15 feet of a streambank, the "buffer zone", extreme care should be taken not to disturb the soil. Otherwise treatment is the same as above. Also, staging of the treatment should be planned so that the buffer has time to recover.

Season and weather: The best time of year to undertake manual and mechanical treatment of ivy is in the fall and winter. This treatment is then followed up with an application of herbicide the following spring when new growth reappears. At this time, the waxy coating on the mature leaves has not developed, and it is easy to kill the roots with a small amount of chemical. This will also allow you to apply the chemical only to the ivy and avoid blanket spraying which often kills desirable natives. You should apply herbicide only when there is no rain expected during or immediately after application.

Additional Tips: Clearly define the area you are clearing. Be realistic about the area that you can cover with the resources you have. Do not attempt to clear too much area during any one work session. It is better to thoroughly treat a smaller area than it is to do an incomplete job on a large area.

Kudzu *Pueraria lobata*

Other Pest Plants

Johnson Grass

Ilex & Eleagnus – Not as invasive as privet but pest plants nevertheless. Treat like privet. However, both have deep strong root. Best to cut and spray stump with herbicide

Appendix III
Bibliography

SER Guidelines and Primer

The SER Primer on Ecological Restoration, Society of Ecological Restoration Science & Policy Working Group. 2002. www.ser.org/.

Brown, Lester; Eco-economy xxx (available for free download from the Internet at www.xxx).

Wharton, xxx; The Natural Environments of Georgia;

Cecil Frost; North Carolina Department of Agriculture, presentation at 1997 Cullowhee Conference, titled Re-creating Native Plant Communities: A New Frontier in Landscaping with Native Plants.

Appendix IV
Resources

Newman Wetlands Center, Clayton County Water Authority, 2755 Freeman Rd.
Hampton, 770/603-5606, www.ccwa1.com

Appendix V
Physiographic Provinces

Appendix VI
Primary Habitats & Plant Communities