Human Health and Safety Working Paper
NNIS Project Environmental Assessment
Shawnee National Forest
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Human Health and Safety

This section describes the human health and safety concerns within the project area, including: (1) Affected Environment, (2) Design Criteria developed to protect human health and safety, and (3) a discussion of the potential effects of each of the proposed alternatives.

Affected Environment – Human Health and Safety

The primary human health and safety issue in this analysis is the protection and preservation of human health and safety. A variety of potentially hazardous materials, including manufactured and natural pesticides, have been proposed for use in the project. Trained Forest Service personnel will be applying these chemicals as well as participating in other invasive species management activities that may have an effect on human health and safety. Because all project-related activities will be confined to the Shawnee National Forest, and the area under consideration are a number of project areas included within the Shawnee National Forest, and all potentially hazardous materials will be used according to safe-handling directions, it is reasonable to limit the analysis to the Shawnee National Forest boundary. The temporal boundary is the amount of time required for the proposed chemicals, if any, to break down. These boundaries were determined through an analysis of: 1.) the proposed disturbance (chemical, mechanical and manual), 2.) protections resulting from treatment protocol and design criteria implemented in order to prevent chemicals from l drifting and/or entering water systems, 3.) the limited mobility of the proposed herbicides, 4.) the relatively quick decomposition of the manufactured and natural herbicides, and 5.) the inability of the Forest Service to predict and control activities outside of the Forest boundaries.

Design Criteria – Human Health and Safety

The Forest Service implements a Safety and Health Program that is an integral part of the national and international mission of the organization. The Health and Safety Code Handbook is the primary source of standards for safe and healthful workplace conditions and operational procedures and practices in the Forest Service. Direction in the Handbook applies to all Forest Service employees. The Handbook is consistent with the standards and regulations of the Occupational Safety and Health Administration (OSHA).

The Handbook includes safety practices and procedures for activities included in invasive species management project alternatives, such as manual and mechanical vegetation treatment, and prescribed fire (brushing and piling, torching, and chainsaw operation), as well as for herbicide application. For these activities, and others associated with invasive species management on the Shawnee National Forest, personal protective equipment is required for use by all applicators and employees. A Job Hazard analysis (JHA) is also required. The Job Hazard Analysis is an analytic process used to identify safety and health hazards in work projects or activities. It is used to identify potential hazards and develop actions to reduce those hazards.

The Forest Service's Forest Health Protection staff has the responsibility of managing and coordinating the proper use of pesticides on National Forests. It is responsible for providing technical advice and support, and for conducting training to maintain technical expertise. In order to achieve this function, the Forest Service maintains a cadre of Pesticide coordinators and specialists located at Regional Offices and at some Forest Supervisor's Offices. Service policy and direction on pesticide use is outlined under the Forest Service Manual Chapter 2150.

The Forest Service is authorized by the Federal Insecticide, Fungicide and Rodenticide Act and the Cooperative Forestry Assistance Act to use pesticides for multiple-use resource management and to restore and maintain the value of the environment, within the legal framework provided by the National Environmental Policy Act (NEPA) and the Council of Environmental quality (CEQ) regulations. The significance of the three acts is described as follows:

- The Federal , Fungicide and Rodenticide Act, amended (17U.S.C. 136), is the authority for the registration, distribution, sale, shipment , receipt, and use pesticides. The Forest Service may use only pesticides registered or otherwise permitted with this act;
- The Cooperative Forestry Assistance Act of 1978, (16 U.S.C. 2101), as amended by the Food, Agriculture and Trade Act of 1990 (7 U.S.C. 1421) is the authority for assisting and advising States and private forest land owners in the uses of pesticides and other toxic substances applied to trees and other vegetation and to wood products; and
- The provisions of the NEPA (42 U.S.C. 4321) and the CEQ implementing regulations apply to pesticide management (FSM 1950; FSH 1909.5).

Federal law requires that before selling or distributing a pesticide in the United States, a person or company must obtain a registration or license from the U.S. Environmental Protection Agency. Before registering a new pesticide or new use for a previously registered pesticide, EPA must first ensure that the pesticide, including all adjuvants, surfactants, or other ingredients included within the product content, when used according to label directions, can be used with a reasonable certainty of no harm to human health and without posing unreasonable risks to the environment. To make such determinations, EPA requires more than 100 scientific studies and tests from applicants (US EPA 204). In 1966, Illinois became one of the first states to regulate pesticides and continues to have one of the most thorough licensing and enforcement programs, surpassing even federal guidelines. The Illinois Department of Agriculture Environmental Program administers programs directed toward control and eradication of plant pests and disease. It regulates pesticide use by registering products, certifying and licensing applicators, and investigating suspected misuse. Illinois Department of Agriculture staff also administers programs concerning proper pesticide record keeping and waste reduction; pesticide and fertilizer storage, containment and disposal; pesticide container recycling; noxious weed control; and other groundwater protection initiatives. A department laboratory tests groundwater, plant, animal and soil samples for pesticide residues.

Effects of the Alternatives

This analysis includes the direct and indirect effects associated with three alternatives, including Alternative 2, the proposed action.

Alternative 1

There will be no direct, indirect or cumulative effects to human health and safety as a result of the implementation of this alternative because no additional invasive species management

projects would be implemented. Mechanical, biological, or chemical control measures would not be used and, therefore, activities that might potentially harm human health and safety would not take place. Currently 100-150 acres of non-native invasive species are either pulled or spot torched. Treatment of invasive species with manual (hand pulling herbaceous invasive plants such as garlic mustard and Japanese stiltgrass), or torching would have no effect on human health and safety. Many infestations of invasive plant species would go untreated.

There is at least one species of invasive plants that do pose a risk to human health: tree of heaven. It has been reported that exposure to the sap of tree-of-heaven by workers clearing infested areas has caused fever, chills, chest pain, and shortness of breath, as well as an inflammation of the heart muscle. Its pollen is also suggested to have caused rhinitis, conjunctivitis, and asthma (Beck et al 2008, Bolero et al. 2003). Tree-of-heaven is known to be located in a number of locations across the forest, and probably occurs in many more areas yet to be inventoried for invasive plant species. Although injury has not been reported to date, under Alternative 1, failure to control tree of heaven infestations on NFS lands could indirectly pose a health threat to workers and forest visitors as it is allowed to spread.

Alternative 2

There will be no direct, indirect or cumulative effects on heritage resources as a result of the implementation of an action alternative. Methods used to control invasive species as outlined above include the use of prescribed fire, mowing and weed-whipping, tarping (smothering or covering the plants with a tarp to block photosynthesis), hand- and mechanical-pulling and digging with a shovel, spot-torching, tilling and herbicide treatments.

The manual, mechanical and chemical control methods pose little safety risk to workers or the public, as routine safety practices will be observed. These safety practices address hazards related to operating mechanical equipment such as weed wrenches, brush cutters, and spot torches, as well as exposure of workers to tree-of-heaven sap and other natural hazards such as poison ivy, stinging insects, or falling branches. Often times volunteers seek to help eradicate NNIS on the Shawnee National Forest. All volunteers are provided the same safety orientation, training and personal protective equipment as Forest Service employees.

The herbicides proposed for use under Alternative 2 were selected largely for their low toxicity to humans and the environment (Table HS.1). As noted earlier, federal law requires that before selling or distributing a pesticide in the United States, a person or company must obtain a registration or license from the EPA. Before registering a new pesticide or a new use for a registered pesticide, EPA must first ensure that the pesticide (including any adjuvants, surfactants, or other ingredients comprising the product contents), when used according to label directions, can be used with a reasonable certainty of no harm to human health and without posing unreasonable risks to the environment. To make such determinations, the EPA requires scientific studies and tests from applicants (see U. S. EPA's Regulating Website at www.epa.gov/pesticides/regulating/index.htm#eval).

Human Health and Ecological Risk Assessments have been prepared for the herbicides proposed for use on the Shawnee National Forest I Alternative 2 (SERA 2001; 2003a; 2003b; 2004a; and 2004b). In these documents, the process of risk analysis is used to quantitatively evaluate the probability that use of a given herbicide might impose harm on humans or other species in the environment. It is the same process used for regulation of food activities, medicine, cosmetics and other chemicals. Each risk assessment used extensive literature

searches and unpublished studies submitted to U.S. EPA to support the herbicide registration. Measures of risk were based on typical Forest Service uses of each herbicide.

Potential effects relate to direct contact with the herbicide, exposure to treated vegetation, or consumption of contaminated water, fish or vegetation. Direct exposure of workers or the public to vegetation that has been treated is low since notices will be posted. The greatest risk of exposure to herbicides would be to the workers mixing and applying them. Following label directions as mentioned in the Design Criteria will minimize exposure of workers during application and during clean-up of apparatus. The herbicide label of some formulations places restrictions on re-entry of people to treated areas.

Table HS.1. Human Health Risk Characterizations for Herbicides Proposed for use in Alternative 2 (SERA 2001; 2003a; 2003b; 2004a; 2004b; Tu et al. 2001).

Clopyralid	
Eye Risk	Can cause persistent damage to eyes if direct contact occurs.
Inhalation Risk	Harmful if inhaled. Does not readily volatize.
Dermal Risk	Transient dermal redness; does not cause skin sensitization.
Cancer Risk	No evidence of cancer with use of clopyralid. However, the technical grade contains hexachlorobenzene as a contaminant; it is classified as a potential human carcinogen by US EPA. No basis for asserting that its presence in technical grade clopyralid will substantially impact cancer risk under conditions characteristic of applications made in Forest Service programs.
Reproductive Effects	Does not produce developmental effects at doses that do not produce maternal toxicity.
Glyphosate	
Eye Risk	Non-irritating to slightly irritating if direct contact occurs; no permanent damage reported.
Inhalation Risk	Inhalation is not an important route of exposure because of its low volatility.
Dermal Risk	Poorly absorbed through skin.
Cancer Risk	Classified as Group E pesticide by US EPA: "Evidence of non-carcinogenicity for humans".
Reproductive Effects	Adverse Reproductive effects have not been noted.
Sethoxydim	
Eye Risk	Irritating upon direct contact.

Inhalation Risk	Some irritation at high exposure levels. Does not readily volatize.
Dermal Risk	Irritating to the skin.
Cancer Risk	Based on studies, no evidence of cancer risk.
Reproductive Effects	Based on studies, no evidence of reproductive risks.
Triclopyr	
Eye Risk	May cause irritations to eyes.
Inhalation Risk	Inhalation exposures to not be of toxicologic concern. Ester formulations can be volatile, and care should be taken during application. Salt formulation is much less volatile than the ester formulation.
Dermal Risk	May cause irritations to skin.
Cancer Risk	The U.S. EPA/OPP has reviewed these studies and determined that the evidence for carcinogenicity is marginal (Group D pesticide).
Reproductive Effects	Does not produce reproductive or developmental effects at doses that do not produce maternal toxicity.
Picloram	
Eye Risk	Can cause irritation to the eyes.
Inhalation Risk	No toxic effects from acute inhalation exposure to aerosolized picloram acid
Dermal Risk	Although picloram is not a strong skin irritant, repeated dermal exposures may lead to skin sensitization.
Cancer Risk	Out of several bioassays, none have shown that picloram has carcinogenic potential. Technical grade picloram does contain hexachlorobenzene, a compound that has shown carcinogenic activity in three mammalian species and has been classified as a potential human carcinogen by the U.S. EPA.
Reproductive Effects	Does not produce reproductive or developmental effects at doses that do not produce maternal toxicity.

There is very little risk that the public may unknowingly come into direct contact with treated vegetation because notices would be posted at all herbicide treatment areas. The design criteria were constructed exclusively for Alternative 2, and adhere to all label instruction; the criteria reduce the risk for drift of herbicide or possibility of off-site movement into water or wetlands. If necessary, additives can be added to the mixture to reduce drift. All herbicides would be hand-applied which lends itself to ensuring limited environmental exposure to the chemicals. When using spraying apparatus, which is still applied by hand, the label directions place restrictions on spraying at certain wind speeds.

Some of the chemical herbicide solutions have an odor that may persist at spray sites for several days. Vapor drift is possible if equipment is calibrated for a small droplet size or fine mist and

there is wind present. The chemicals chosen do not readily volatilize, that is vaporize into the air, with the exception of triclopyr. In order to protect the public and FS and volunteer applicators, volatilization will be minimized by applying the herbicide following label directions. The odor may persist at spray sites for several days.

The herbicides selected have relatively short half lives and will not build up in the environment. They have limited ground mobility, and no application near water is proposed unless it is a herbicide that is approved for aquatic use. There are no application methods as proposed that are a substantial risk to ground water and soil contamination (see Soil, Groundwater, and Surface Water Resources).

Based on the estimated levels of exposure and the criteria for chronic exposure developed by the U.S. Environmental Protection Agency, there is no evidence that typical or accidental exposures will lead to dose levels that exceed the level of concern. In other words, all of the anticipated exposures - most of which involve highly conservative assumptions - are at or below the reference dose. The use of the reference dose - which is designed to be protective of chronic or lifetime exposures - is itself a very conservative component of this risk characterization because the duration of any plausible and substantial exposures is far less than lifetime (SERA 2003a; 2003b; 2004a; and 2004b). None of the application areas will exceed the threshold amount of herbicide allowed per label instruction. Therefore there will be no significant direct, indirect or cumulative effects to human health and safety.

Alternative 3

There will be no direct, indirect or cumulative affects to human health and safety as a result of the selection of Alternative 3. The methods to control invasive plant species proposed in Alternative 3 consist of aggressive manual and mechanical treatments (prescribed fire, clipping, cutting, torching, weed whipping, hand and mechanical pulling, grubbing, tilling, tarping, and bull dozing and/or back hoeing. Natural weed killers would be applied when manual and mechanical methods are ineffective. This alternative is designed to control invasive plant species, but not eradicate them.

The effects to human health and safety would be similar to those described for mechanical controls under Alternative 2. The difference would be related to the fact that more mechanical control is planned in Alternative 2. Mechanical control of certain plants (e.g., multiflora rose, tree-of-heaven) could increase the risk of worker injury. For example, workers would more likely be scratched and cut by multiflora rose if they were grubbing out plants than if they were applying herbicides. Similarly, workers could be more likely to come into contact with tree-of-heaven sap if they are required to chainsaw and grub out stumps, rather than applying a basal bark application of herbicide. Design Criteria for Alternative 3 will protect FS employees, trained volunteers, and the public from natural herbicide applications, as well as hand and mechanical treatments.

Natural weed killers such as acetic acid (vinegar) can be effective in killing weeds but even those have limitations. It does kill annual plants, but does not kill the perennial plant root systems. It does appear to be safe for human health and safety, and even though vinegar is an acid, it breaks down quickly in the soil and is not likely to accumulate enough to affect soil pH for more than a few days. However, it is important to note that "vinegar with acetic acid concentrations greater than 5 percent may be hazardous and should be handled with appropriate precautions. Vinegar solutions of 11-percent strength can cause skin burns and eye injury. Also note that the use of a vinegar product for killing weeds, unless the material is specifically labeled as a herbicide, is illegal and a violation of federal pesticide laws" (Lerner 2003).

Another plant killing tool included Alternative 3 is the Waipuna Hot foam system, which lays down a layer of very hot foam made of sugar water on the targeted plants. The foam boils the plants and kills them in a very short time. The Waipuna poses little threat to health and safety; no chemically-produced herbicides are used. However, because the foam is very hot, protective clothing and gloves are necessary when using the Waipuna system. The foam can cause eye irritation.

Table HS 2. Human Health Risk Characterizations for Herbicides Proposed for use in Alternative 3 (MSDS).

Acetic Acid (Vinegar)	
Eye Risk	Immediate pain; may cause eye irritation and possible damage; can cause injury to corneal membrane.
Inhalation Risk	Effects may be delayed. May cause respiratory tract irritation.
Dermal Risk	May cause severe skin irritation. May cause skin sensitization, an allergic reaction, which becomes evident upon re-exposure to this material.
Ingestion Risk	May cause gastrointestinal irritation with nausea, vomiting and diarrhea.
Cancer Risk	Not considered to be a carcinogen
Reproductive Effects	At the highest dose tested (1600 mg/kg/day) in the mouse, the rat, and the rabbit, there were no effects on nidation (fertilization), or on maternal or fetal survival.
18% clove Oil/ 30% Citric Acid	
Eye Risk	Contact with this product will result in eye irritation.
Inhalation Risk	Breathing vapors will cause significant respiratory irritation.
Dermal Risk	Contact with this product will cause severe skin irritation.
Ingestion Risk	Ingestion of this product could cause burns and destroy tissue in the mouth, throat, and digestive tract.
Cancer Risk	Not considered to be a carcinogen
Reproductive Effects	N/A

Cumulative Effects

Because all project-related activities will be confined to the Shawnee National Forest, and the area under consideration are a number of project areas included within the Shawnee National

Forest, and all potentially hazardous materials will be used according to safe-handling directions, it is reasonable to limit the analysis to the Shawnee National Forest boundary. The temporal boundary is the amount of time required for the proposed chemicals, if any, to break down; beyond that timeframe any impacts from these activities would have been stabilized and no longer contributing to the cumulative effects. Five years was chosen to look back at these specific actions because their effects would be negligible beyond a five-year timeframe.

The analysis of cumulative-effects takes into account all known past actions, present and reasonably foreseeable future actions which would be likely to affect the area of analysis, none of which have an cumulative effect on human health and safety located within the project area. Prescribed fire, timber harvest and timber stand improvement, tree planting, openland management, utility right-of-way, special-use permits, trail construction and maintenance, and recreation use will have no cumulative effect because there are no direct or indirect effects as a result of the implementation of any of the alternatives. A methodology which includes mitigation measures, is in place to protect human health and safety associated with the activities listed above.

Agriculture, residential development, ATV use and use of non-system trails, and NNIS treatment on private lands will not have a cumulative effect on human health and safety on the Shawnee National. All of these actions have the ability to affect human health and safety, but SHF management has no control over them (residential development and invasive species management). Other actions that may affect human health and safety on federal land, but are not controlled by Forest Service management (wildfires, ATV use and non-system , undesignated trails). The effects to human health and safety will remain the same regardless of which alternative is chosen.

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Table X. Design Criteria Summary for the Non-Native Invasive Species Project.		
Resource Area	**Design Criteria**	**Rationale / Effectiveness**
Human Health And Safety	Job Hazard Analyses (JHA), Material Safety Data Sheets (MSDS) and product labeling will be reviewed and followed in order to insure the preservation and protection of human health and safety of FS employees, contract and volunteer applicators, and the general public. FS employees, contractors and volunteers will be trained in the safe handling and application of all natural and synthetic herbicides.	Following JHA, MSDS, and product labeling for work activity and herbicide product, both natural and synthetic, and implementing safe handling and application guidelines from approved training will ensure the health and safety of FS employees, volunteer applicators, and the general public will be protected. In addition, the following standards will be rigorously adhered to: **Pre-application** • Use herbicides only when they will provide the most effective control relative to potential hazards of other proposed management techniques; choose the most effective herbicide requiring the least number of applications. • The use of pesticides must comply with the product label • All applications would be under the direction of a Certified Pesticide Applicator • All individuals working with herbicides will review corresponding Material Safety Data Sheets. • Herbicide label directions would be carefully followed. This could include temporary closure of treatment areas for public health and safety • Weather forecasts will be obtained prior to herbicide treatment. Treatment activities would be halted, if necessary, to prevent runoff during heavy rain or high wind events; To minimize herbicide drift, herbicide application would only occur when wind speeds are less than 10 mph, or according to label direction. Appropriate personal protective gear (ppe) will be worn by herbicide applicators per label direction **Application** • Use the lowest pressure, largest droplet size, and largest volume of water permitted by the label to obtain adequate treatment success.; use the lowest spray boom and release height possible consistent with operator safety. • Apply pesticides during periods of low visitor use when possible; areas treated with pesticides shall be signed, as appropriate, to ensure users are informed of possible exposure • When using herbicides where run-off may easily enter the water table, (i.e. creeks, rivers, wetlands, caves, sink holes, or springs), minimize the use of pesticides, herbicides, fertilizers, or hazardous materials; use only pesticides labeled for use in or near aquatic systems. Clopyralid, if selected, would not be used where the water table is within 6 feet of the surface or where soil permeability would be conducive to groundwater contamination.

		Post Application • Herbicides stored on-site would have Material Safety Data Sheets per Forest Service guidelines. • Washing and rinsing of equipment used in the mixing and application of pesticides will occur in areas where runoff will not reach surface waters, wetlands, fens, sinkholes, or other special habitats • Rinse water for cleaning or rinsing actions in conjunction with herbicide treatment would be disposed of according to Environmental Protection Agency regulations. • Herbicide containers would be disposed of following label specifications, state and federal laws, and Forest Service guidelines • All requirements in a Safety and Spill Plan (Appendix X) would be followed

Table X. Mitigation Measures, Human Health & Safety, Non-Native Invasive Species Project.		
Resource Area	**Design Criteria**	**Rationale / Effectiveness**
Human Health And Safety	The Design Criteria for the protection and preservation of the health and safety of FS employees, volunteers, and the general public will be implemented and rigorously adhered to.	Mitigation measures include review of JHAs, MSDS, and natural and synthetic product labeling, to ensure safe handling, application and clean-up and storage of potentially hazardous material. Human and Ecological Risk Assessments have been prepared for the USDA Forest Service for all the synthetic herbicides planned for use. These documents are available at www.fs.fed.us/foresthealth/pesticide/risk/shtml.
	After completion, this project will be included in the Forest monitoring plan in order to assess the degree of effectiveness of the selected management activities.	The implementation of alternatives 1 to 3 will have no effect on human health and safety. Monitoring this project will determine the effectiveness of the agreed upon invasive species management design criteria.

Table X. Monitoring, Human Health & Safety, Non-Native Invasive Species Project.		
Resource Area	**Design Criteria**	**Rationale / Effectiveness**
Human Health And Safety	Ensure the Human Health and Safety Design Criteria were implanted as determined in the Environmental Assessment. Visual inspection of project activity daily during project implementation. Weekly water testing for inclusion of selected natural or synthetic herbicides	Evidence of reduction of invasive species as well as the continued health of the project area, including water, and the human health and safety of FS employees, volunteers and the general public.