Integrated Pest Management (IPM) Conservation Activity Plan (CAP)

For Managing Herbicide Resistance

1. Definition:

Use the NRCS Integrated Pest Management (IPM) practice and other key conservation practices including Conservation Crop Rotation, Cover Crop, and Residue and Tillage Management to proactively manage herbicide resistance and protect natural resources from the impacts of additional control measures that are required to manage herbicide-resistant weeds. The IPM practice utilizes four IPM strategies: Prevention, Avoidance, Monitoring and Suppression to prevent or mitigate pest management risks to natural resources.

Key Planning Considerations

A. Monitor weed species and their stage of development
B. Compare monitoring results with established weed thresholds and weed resistance management objectives
C. Manage the weed population with crop canopy shading
D. Manage the weed population with mulching
E. Suppress weeds at appropriate stages (i.e., seedling stage, before flowering, before maturity) to minimize weed seed production
F. Use herbicides with different sites of action in mixtures, sequences and/or rotation.
G. Utilize mechanical suppression techniques (note that soil disturbing techniques cannot increase erosion beyond tolerable levels so hand weeding may be necessary)
H. Increase the use of Conservation Crop Rotation, Cover Crop, and Residue and Tillage Management conservation practices to prevent early-term resistant weeds
I. The plan must address the operator's objectives
J. The plan must meet NRCS quality criteria for soil, water, air, plants and animals
K. The plan must comply with federal, state, tribal, and local laws, regulations and permit requirements

2. IPM Plan Criteria for Managing Herbicide Resistance

This section establishes the minimum criteria to be addressed in the development and implementation of the IPM Plan for managing herbicide resistance on cropland.

A. General Criteria:

1. An IPM Plan for managing herbicide resistance shall be developed by certified Technical Service Providers (TSPs). In accordance with Section 1240 (A), the Environmental Quality Incentive Program (EQIP) program provides funding support through contracts with eligible producers, to obtain services of certified TSPs for development of an IPM Plan for managing herbicide resistance. The specific TSP criteria required are located on the TSP registry (TechReg) web site at: http://techreg.usda.gov/.

B. The planner shall address the following items during the development of the IPM Plan for managing herbicide resistance:

1. Background and site information;
2. Site-specific natural resource concerns and a risk analysis that identifies how each weed suppression alternative may impact those resources;
3. Weed monitoring guidelines – see local extension recommendations [Also see the Weed Science Society of America (www.wssa.net), The Herbicide Resistance Action Committee (www.hracglobal.com) and IPM guidelines for specific crops (www.ipmcenters.org/ipmelements/index.cfm) for more information];
4. Mitigation required to address natural resource concerns associated with all planned weed suppression activities;
5. Record keeping;
6. References, as needed.

C. Criteria for the IPM Plan

1) **Background and site information:**
   a) Name of owner/operator;
   b) Tract and field numbers;
   c) Soil map units;
   d) Cropping history and general management applied;
   e) History of weed management activities.

2) **Site-specific natural resource concerns and a risk analysis that identifies how each weed suppression alternative may impact those resources:**

   a) Conservation Plan map;
   b) Field locations of planned areas;
   c) Soil types and characteristics;
   d) Site conditions including field slope and surface cover;

e) Current cropping information and degree of weed infestation;
f) Drainage system and management (where appropriate)
g) Irrigation system and management (where appropriate);
h) Locations of sensitive resource areas identified on the plan map including nearby streams and other surface water bodies, wetlands, wells and groundwater recharge areas, as well as parks, schools and other areas where bystanders could be impacted, location of organic farming operations;
i) Sensitive wildlife habitat (on and off-site) including food plots;
j) Potential off-target drift areas:
k) Potential for impacting pollinators in the field and in nearby habitat;
l) IPM risk mitigation techniques and conservation practices in use including Grassed Waterway, Filter Strip, Field Border and other buffer practices. .

3) **Weed monitoring guidelines:**
   a) List of crops to be maintained;
   b) Weed population thresholds for each weed in each crop where available – note that there may be a need to shift from economic thresholds to thresholds that are appropriate for herbicide-resistant weeds in some cases;
   c) A scouting plan for weeds including who will do it, when, where and how it will be done, and how the results will organized and stored to support future decision-making;
   d) Soil organic matter and pH test results to support efficacious herbicide application rates (where appropriate);
   e) Weather forecasting information that will be utilized to guide efficacious herbicide application. [Light to moderate rainfall soon after application can help activate pre-emergent herbicides, but heavy rainfall soon after application can be the primary driver of losses to nearby water bodies.]

Scouting is critical for detection and management of herbicide-resistant weeds. Scouting frequency may be reduced after crop harvest, but herbicide-resistant weeds should not be allowed to mature and produce seed. The table below provides general guidance for scouting herbicide-resistant weeds:

Scouting Guidelines	
Frequency	**Effectiveness**
Scout prior to treatment and twice after treatment	Good
Scout prior to treatment and once after treatment	Fair
Scout prior to treatment	Poor

4) **Mitigation required to address natural resource concerns associated with all planned weed suppression activities:**

a) *Integrated Pest Management (Code 595)* is used to apply IPM techniques that prevent or mitigate herbicide impacts on water and air quality. Appropriate techniques include application timing to reduce losses based on temperature, rain, relative humidity, and wind, the use of formulations and adjuvants that reduce losses, the use of weed monitoring and herbicide application based on economic thresholds and/or weed resistance management objectives, partial treatment, soil incorporation of herbicides, the use of smart sprayers and spray nozzles that reduce losses, and partial substitution with cultural, mechanical and biological weed suppression techniques.

b) *Conservation Crop Rotation* (Code 328) is the initial building block of an IPM Plan for managing herbicide resistance. It provides crop diversity, improves soil quality and aids crop growth by decreasing weed pressure. The table below provides general guidance for crop rotation effectiveness.

Conservation Crop Rotation	
Diversity	**Effectiveness**
4 or more different crops in rotation	Good
2 or 3 different crops in rotation	Fair
1 continuous crop	Poor

c) *Cover Crop* (Code 340) is a building block of an IPM Plan for managing herbicide resistance. Cover crops are used in combination with conservation crop rotation to help suppress weeds. Cover crops are essential for soil quality and crop production. They can be effectively terminated by harvesting, mowing, tilling, crimping, frost, or an herbicide application to prepare for the next crop and suppress weeds. Varying cover crops each season can help to decrease herbicide-resistant weeds.

d) *Residue and Tillage Management* is another supporting component of IPM systems for weed suppression. Applicable conservation practices include:

1. Mulching (Code 484);
2. Residue and Tillage Management, Mulch Till (Code 345).
3. Residue and Tillage Management, No-Till / Strip Till / Direct Seed (Code 329)

4. Residue and Tillage Management, Ridge-Till (Code 346);

5. Residue Management, Seasonal (Code 344);

e) *Herbicide use* is final component of the IPM Plan for managing herbicide resistance. Herbicides should be used judiciously according to label specifications with the appropriate application rate, method and timing to minimize offsite losses. All pesticide label guidelines must be followed and all herbicide applications must be recommended by Extension or an appropriately certified crop consultant. Additionally, herbicides with different sites of action should be used in mixtures, sequences or rotations to retard herbicide-resistance. Sole reliance on a single herbicide without other mechanical or cultural weed control methods over an extended period of time is strongly discouraged. The table below provides general guidance for resistance management:

Sole Reliance on a Single Herbicide	
Frequency	**Resistance Management**
Never	Good
1-2 Seasons	Fair
3 or more Seasons	Poor

The **Window Pesticide Screening Tool (WIN-PST)** is an NRCS supported tool that is used to evaluate pesticide leaching, solution runoff, and soil-adsorbed runoff risks to human drinking water and aquatic habitat. WIN-PST analysis is based on:

- Soil properties
- Pesticide physical properties
- Pesticide toxicity data

The major components of the NRCS non-point source water quality pesticide risk analysis are:

1) The potential for pesticide losses:
    - Dissolved in water that percolates below the root zone;
    - Dissolved in water that runs off the edge of the field;
    - Adsorbed to sediment that runs off the edge of the field.

2) Chronic (long-term) pesticide toxicity to humans in drinking water and fish;

3) The combination of pesticide loss potential with pesticide toxicity to provide site-specific ratings for pesticide hazards to human drinking water and aquatic habitat in leaching, solution runoff and sediment-adsorbed runoff.

The Overall Conservation Plan should address the identified environmental risks associated with weed suppression activities. The record of decisions shall include the planned practice(s), schedule for implementation, and site-specific specifications to apply the conservation practice. The site-specific specifications for non-engineering practices can be documented in an NRCS Job sheet for the conservation practice or in a narrative form. Engineering practices shall include the conservation practice and schedule of implementation that is identified on the plan map. The plan may include, but shall not be limited to the conservation practices listed below.

a) Brush Management (314)
b) Conservation Crop Rotation (328)
c) Cover Crop (340)
d) Conservation Cover (327)
e) Early Successional Habitat Development/Management (647)
f) Filter Border (386)
g) Hedgerow Planting (422)
h) Irrigation System, Microirrigation (441)
i) Irrigation Water Management (449)
j) Land Smoothing (466)
k) Mulching (484)
l) Nutrient Management (590)
m) Pasture and Hayland Planting (512)
n) Prescribed Grazing (28)
o) Residue and Tillage Management, Mulch Till (345)
p) Residue and Tillage Management, No-Till / Strip Till / Direct Seed (329)
q) Residue and Tillage Management, Ridge Till (346)
r) Residue Management, Seasonal (344)
s) Stripcropping (585)
t) Terrace (600)
u) Upland Wildlife Habitat Management (645)
v) Windbreak/Shelterbelt Establishment (380)

5) **Recordkeeping.**

A complete list of records shall be maintained including:

a) Date of monitoring;
b) Results of monitoring;
c) Identification of crop and/or plant community condition;
d) Threshold or resistance management objective for each specific weed
e) Suppression tactics implemented with dates
f) All records required by state and federal law;
g) All records needed to document compliance with applicable IPM guidelines from Extension or the local Land Grant University.

6) **References:** USDA NRCS Field Office Technical Guide

7) **Deliverables for the Client – hardcopy of the plan that includes:**

- Cover page – name, address, phone of client and TSP; Total Acres of the plan, signature blocks for the TSP, producer, and a signature block for the NRCS acceptance.
- Soils map and appropriate soil descriptions.
- Resource assessment result (wind and water erosion, water availability, soil fertility, and other that may be needed).
- The planned management practices and the site specific specifications on how each practice will be applied, when the practice specifications are to be applied, the practice method and the extent (number of acres) that will be addressed.
- For engineering/structural practices. The engineering/structural practices plan that includes dates, extent and location on a conservation plan map.

8) **Deliverables for NRCS Field Office:**

- Complete hardcopy and electronic copy of the client's plan (MsWord copy).
- Digital Conservation Plan Map with field location, features, and structural practices to be used.
- Digital soils maps.